REQUIREMENT M

EROSION AND SEDIMENT CONTROL PLAN NARRATIVE AND DRAWINGS

Transcontinental Gas Pipe Line Company, LLC

Section 2-2 E&SC/SR Plan Narrative and Drawings

Leidy South Project – Hilltop Loop

September 2019

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1.0 Project Description (NOI Checklist Item 3.n)

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Hilltop Loop. The Hilltop Loop will take place in Chapman Township, Clinton County. The Hilltop Loop will consist of approximately 2.4 miles of 36-inch pipeline co-located with the existing Transco Leidy Lines in Clinton County, Pennsylvania. The Hilltop Loop will be offset from the existing Leidy Line A and Leidy Line C by 25 feet. Once placed into operation, Transco will refer to the Hilltop Loop as the Leidy Line D. Transco will be removing an existing Main Line Valve (MLV) at the eastern terminus of the Hilltop Loop that is no longer needed. Cathodic protection cable will be installed from approximate MP 188.05 to MP 185.37. The Hilltop Loop will include the construction of three offline temporary contractor yards and four temporary contractor staging areas along the right-of-way (ROW).

The Hilltop Loop is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

The E&SC and SR Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). Transco will use and implement the practices, measures and details outlined herein to control soil erosion and off-site sedimentation. All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Hilltop Loop will be approximately 86.6 acres. Subject to receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 3.a, 7.a)

A Project Location Map for the Hilltop Loop is included in Attachment 1. This map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Young Womans Creek and Renovo East, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 3.e, 7.e)

The following table (Table 1) list each watershed located Hilltop Loop Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters

Watershed Name	Designated Use	Existing Use	PFBC Classification
Young Womans Creek	HQ-CWF, MF	-	Naturally Reproducing Trout & Stocked Trout
Paddy Run	EV, MF	-	Naturally Reproducing Trout
Left Branch of Young Womans Creek	EV, MF	-	Naturally Reproducing Trout & Stocked Trout
Skunk Hollow	HQ-CWF, MF	-	Naturally Reproducing Trout
Post Hollow	EV, MF	-	Naturally Reproducing Trout
Dry Run	HQ-CWF, MF	-	Naturally Reproducing Trout

EV: Exceptional Value, MF: Migratory Fishes, WWF: Warm Water Fishes
HQ-CWF: High Quality- Cold Water fishes

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 11 soil mapping units located within the LOD, see Table 2 below:

Table 2 – Soils Mapping Units with Limits of Disturbance

Soil Mapping Unit	Soil Series
Bb	Barbour-Craigsville complex
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony
HkE	Hazleton channery sandy loam, 25 to 80 percent slopes, rubbly
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony
Lr	Linden silt loam, rarely flooded
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony
WgB	Wharton-Cookport complex, 0 to 8 percent slopes, very stony

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the Hilltop Loop and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Barbour	Bb	X	C	X		X	X	X				X	X				X
Clymer	CfB	X	C	X	X			X	X	X	X	X	X				X
Cookport	CpB, CpD	X	C/ S	X	X		X	X	X	X	X	X	X				X
Hazleton	HkE, HmD	X	C	X	X			X	X	X	X	X	X				
Laidig	LdC	X	C/ S	X	X		X	X	X	X	X	X	X				
Linden	Lr	X	C			X	X	X	X	X	X		X				
Wharton	WeB, WgB	X	C/ S		X		X	X	X	X	X	X	X	X			X

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.
3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.

4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc. to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Hilltop Loop does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Hilltop Loop lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the vicinity of the Hilltop Loop Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

The Hilltop Loop will be co-located with the existing Transco Leidy Lines in Clinton County, Pennsylvania. All work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. Along the edges of the ROW land use is primarily forested with some residences along Young Womans Creek. The proposed contractor yards and staging areas will be used temporarily and subsequently removed after the completion of the Project. Staging areas will be used for parking, equipment turn-arounds, and temporary storage of equipment. Transco will use contractor/pipe yards for parking, contractor offices, and the storage of construction equipment and pipes. These areas consist of agricultural fields, shrubland, forest land and area. All disturbed areas will be restored to the original contours. Transco will use and implement the practices, measures, and details to control soil erosion and off-site sedimentation during construction. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that the Hilltop Loop has been an existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years likely would have been either forested land or meadow.

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

Various erosion and sediment control measures will be used during the construction of the Hilltop Loop. BMPs proposed to be used at the Site to control soil erosion and sediment pollution are listed below. Details of BMPs proposed to be used at the Project location is included in the Erosion and Sedimentation Control Plan sheets. BMP's listed will be used at the Project location at the discretion of the environmental inspector, when found necessary to comply with 25 PA Code Chapter 102 and to adequately address potential erosion and sediment control issues.

Rock Construction Entrances

Rock construction entrances shall be installed whenever sediment tracking onto road surfaces is a potential or if required by the county conservation district or other agency. Soil erosion control measures shall be installed, if required and as needed. In special protection watersheds, either a 100' long rock construction entrance or a standard 50' rock construction

entrance with a wash rack will be used at the construction entrance to wash construction vehicle wheels before they enter the public roadway. The wash rack will discharge to a 24" compost filter sock (min.). Rock construction entrance thickness shall be constantly maintained to the specified dimensions by adding rock. All sediment deposited on roadways shall be removed and returned to the construction site immediately.

Compost Filter Sock

Compost filter sock shall be placed downslope of disturbed areas to serve as a sediment barrier and filter. Filter sock shall be placed at existing level grade, parallel to contours, with both ends of the sock extended up slope at a 45 degree angle. Socks can be used on both steep and rocky slopes. Socks can range in size from 12 inch to 32 inch diameter depending on the site conditions. The Maximum Permissible Slope Lengths Above Compost Filter Socks will be used to determine the sizes of compost filter.

Compost Filter Sock Sediment Trap

Runoff may be directed into the Compost Filter Sock Sediment Traps of sheet flow into the trap. Compost sock sediment traps shall not exceed three socks in height and shall be stacked in pyramidal form. Minimum trap height is one 24" diameter sock. Additional storage may be provided by means of an excavated sump 12" deep extending 1 to 3 feet upslope of the socks along the lower side of the trap. The maximum tributary drainage area is 5.0 acres. Since compost socks are "flow-through," no spillway is required. Installation of an excavated sump immediately above the socks may increase trap efficiency where soil conditions permit their construction.

Broad Based Dips

Broad-based dips may be used to direct runoff from access roads to well-vegetated areas. In HQ/EV watersheds, sump with compost filter sock should be utilized at the discharge end of the broad-based dip.

Waterbars

Waterbars will be aligned along the pipeline ROW to direct runoff towards the downslope side of the disturbed area and to avoid backflow into the ROW. Compost filter sock shall be installed along the edge of the limit of disturbance to slow run off. Compost filter sock hooks shall be installed at an upslope angle and shall discharge to a well-vegetated area. Upslope of the CFS, a sump shall be constructed to reduce velocity and provide a sheet flow condition to the

CFS. Permanent waterbars within the ROW shall be left in place after permanent stabilization has been achieved.

Compost Filter Sock Waterbar Discharge / Waterbar Sump

An 18" Compost Filter Sock shall be installed at the edge of the LOD where waterbar cross the LOD. Upslope of the CFS a 24" x 24" sump shall be constructed to reduce velocity and provide a sheet flow condition to the CFS. The sump shall be filled and stabilized when the CFS is removed after site stabilization.

Diversion Channels / Mountable Berms

Diversion channels or mountable berms shall be used to divert runoff from disturbed areas and convey it to appropriate BMPs such as a sedimentation basin sediment trap or clean water crossing.

Trench Plug

These will be placed at the banks of waterbodies in order to maintain stable working conditions and keep sediment from entering the waterways. Earth filled sacks will be used to secure the plug. The spacing of these structures varies based on the site and the slope of the dig location, as indicated in the plan drawings.

Erosion Control Blankets

A suitable erosion control blanket or soil stabilizer shall be used wherever earth disturbance occurs in close proximity (within 50 feet) of surface waters especially if site conditions make use of conventional E&S BMPs difficult. Erosion control blankets should be used on finished slopes greater than 3:1.

Timber Mats

Timber mats can be used for temporary wetland crossings. The timber mats are placed over the wetland to allow equipment to cross and then are removed.

Rock Bank Protection

This bank protection BMP is to be reinstalled along Young Womans Creek where the pipeline installation workspace will impact the existing rock bank protection feature.

Temporary Equipment Bridges

A temporary bridge equipment crossing will be built in order to cross any streams along the pipeline installation. The bridge equipment crossing will utilize geotextile material, timber

mats, and a timber or metal bridge with side rails any may include instream supports (where necessary). Culvert Equipment crossings may be used in areas where equipment must cross stream channels. Culverts shall be placed in the stream channel sized appropriately to convey the flow within the channel and shall be placed at least one-half their diameter apart. Coarse aggregate may be used for fill surrounding the culverts. Upon completion, all material placed in the stream channel shall be completely removed.

Flumed Crossing/ Dam and Pump Crossing / Cofferdam Crossing

These may be used when work is to be completed in a waterway. A flumed crossing involves the placement of a flume pipe within the waterway and using diversion structures up and down gradient to divert flow through the flume pipe and out of the work area. A dam and pump crossing involves placing sandbag barriers on the upstream and downstream sides of the work space to prevent water from entering the maintenance area. A cofferdam crossing involves sealing around the perimeter with sandbags or equivalent materials to prevent water entering the workspace. The cofferdam in completed in two phases from the right and left bank of the stream. A pump shall be placed to move any water from the upstream side, around the workspace and back to the downstream side of the work area. Trench plugs may be used on the banks of the stream to keep water from leaving the bed and banks limit of the waterway.

Pumped Water Filter Bag

Filter bags shall be placed in well-vegetated grassy areas and discharge onto stable, erosion resistant areas, and staked if the slope is greater than 5 percent. In the event that this is not possible, a geotextile path will be provided. A compost filter sock shall be placed below the filter bag when placed within 50 of streams or wetlands located within a HQ/EV watershed.

Trench Dewatering

Trench dewatering may be required, depending on the site conditions during the excavation. Water shall be pumped out and discharged into a filter bag or a dewatering structure when deemed necessary.

Safety Fence

Safety fence shall be installed to protect sensitive environmental features as depicted on the plan drawings. The fencing shall remain in place during all phases of construction.

Siltron Pollution Prevention Fence

Siltron Pollution Prevention Fence may be used throughout the project where environmental features make it necessary in lieu of Compost Filter Sock (CFS). The site specific sediment barriers will be selected by the environmental inspector on a site by site basis. These barriers will be placed at existing level grade, with both ends of the barrier extending at least 8' upslope at a 45 degree angle. Sediment must be removed when accumulations reach ½ the above ground height of the fence. The size and type of fence will be selected based on slope lengths as determined in the maximum slope length for Multi-Layer Geotextile Filter Fence figures. The 16-inch filter fence is equivalent to an 18-inch compost filter sock, the 21-inch filter fence is equivalent to a 24-inch compost filter sock, and a 28-inch filter fence is equivalent to a 32-inch compost filter sock. Approved for use as an Alternative E&S and PCSM BMP by PA DEP on 8/22/18.

Rock Filter Outlet

Rock filter outlets may be used to address areas where concentrated flows intersect sediment barriers. They may also be used in instances where sediment barriers such as silt fence or compost filter socks have failed due to concentrated flow.

Wetland Installation Procedures

During the course of pipeline maintenance and replacement within wetland areas, BMP's including slope breakers, equipment mats, sediment barriers, and trench plugs may be used to prevent altering the hydrology of the wetland and to prevent sediment from entering the wetland. Work within the wetland boundaries shall be limited to the extent possible. Upon completion of work the wetland area shall be restored to pre-construction grades and seeded with an appropriate wetland seed mixture.

Hydrostatic Dewatering Structure

A hydrostatic dewatering structure will be placed on a level, well vegetated site such that water will flow away from the structure and work areas. Flow rates through discharge and diverter pipes will be such that structures will not overflow. Contractor will properly remove and dispose of the dewatering structure immediately upon completion of dewatering operations.

Bored Road Crossing/Trenched Road Crossing

These may be used where pipeline installation or maintenance under a bored road is necessary. Sediment barriers shall be used around the work area. Culverts will be placed where required to maintain water flow for stormwater ditches.

Clean Water Crossings

Temporary diversion channels or mountable berms shall be used to divert runoff from undisturbed upslope areas and convey the runoff around areas of earth disturbance within the pipeline ROW corridor. From the diversion, the flow will outlet to a temporary pipe(s) crossing, which is installed across the right-of-way, and discharge to an outlet basin. Clean water leaving the outlet basin will return to sheet flow downslope of the disturbed ROW.

Revegetation Plan and Procedures

The construction site should be stabilized as soon as possible after completion. Establishment of final cover must be initiated no later than 7 days after reaching final grade. Temporary erosion and sedimentation control BMPs can be removed when the site meets final stabilization. Final stabilization means that all soil-disturbing activities are completed, and that either a permanent vegetative cover with a density of 70% or greater has been established or that the surface has been stabilized by hard cover such as pavement or buildings. It should be noted that the 70% requirement refers to the total area vegetated and not just a percent of the site.

Surface Roughening

Surface roughening is the practice of providing a rough 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.

Typical Topsoil Stockpile

The maximum stockpile height shall not exceed 35 feet. Stockpile slopes shall be no steeper than 2H:1V. Stockpiles shall be stabilized in accordance with temporary seeding specifications and mulch is to be maintained until the stockpile is stabilized. Stockpile location shown on the plans are illustrative and may vary in location as construction proceeds.

Typical Channel and Vegetation Restoration

The impacted riparian zone will be restored for a minimum of 15 feet landward of the top of bank. If the pre-impact riparian buffer of native herbaceous and shrub vegetation exceeds 15 feet beyond the top of bank, the area to be seeded should be as follows: 150 feet in High-Quality waters, 100 feet in other waters, or existing width of the riparian zone if it is less than the minimum requirements. Ernst Seed Mix 178 (Riparian Buffer Mix) or similar shall be applied on restored banks and riparian zones. In addition, where existing forested buffers are impacted these shall be replanted outside of the existing maintained ROW, as indicated in forest replanting plans for the Project outlined in the Chapter 105 permit.

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

8.0 Thermal Impacts (NOI Checklist Item 3.m, 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The pipeline installation activities will primarily take place within an existing cleared and maintained pipeline right-of-way. There will be no increase in stormwater discharge. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and Sequence of Construction outline disturbed areas being immediately revegetated. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

9.0 Antidegradation Requirements (NOI Checklist Item 3.p, 7.o)

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the eastern and western terminus of the Hilltop Loop. In order for the Project to meet the required purpose and need, siting the Hilltop Loop outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the Hilltop Loop because there are no viable non-discharge alternatives. The

Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

Pipeline installation activities along the pipeline ROW and at the contractor yards/staging areas will not result in increase in discharge of stormwater to surface waters. The existing / designated use of the streams within the Project area are to be protected through E&S and PCSM measures taken by Transco.

10.0 Riparian Buffers (NOI Checklist Item 3.o, 7.n)

Pipeline installation will take place primarily within an existing cleared and maintained pipeline ROW and forested areas. Due to the linear nature of the project, temporary impacts within riparian buffers are unavoidable. At locations where it was impossible to avoid riparian impacts, Transco will implement BMPs to minimize the impacts. After completing the construction activities, all areas will be restored back to pre-existing contours and reseeded with a riparian seed mix in areas where slopes are less than 10%. Tree and shrub plantings will also occur in forested riparian buffers outside of the maintained ROW as outlined in riparian reforestation plans outlined in the Chapter 105 permit.

Linear projects including pipelines are eligible for the Riparian Buffer Waiver under 25 PA Code §102.14(d)(2)(ii) if riparian buffers are undisturbed to the extent practicable. As such, a Riparian Buffer Waiver has been requested along with this ESCGP-3 application (Section 1-7).

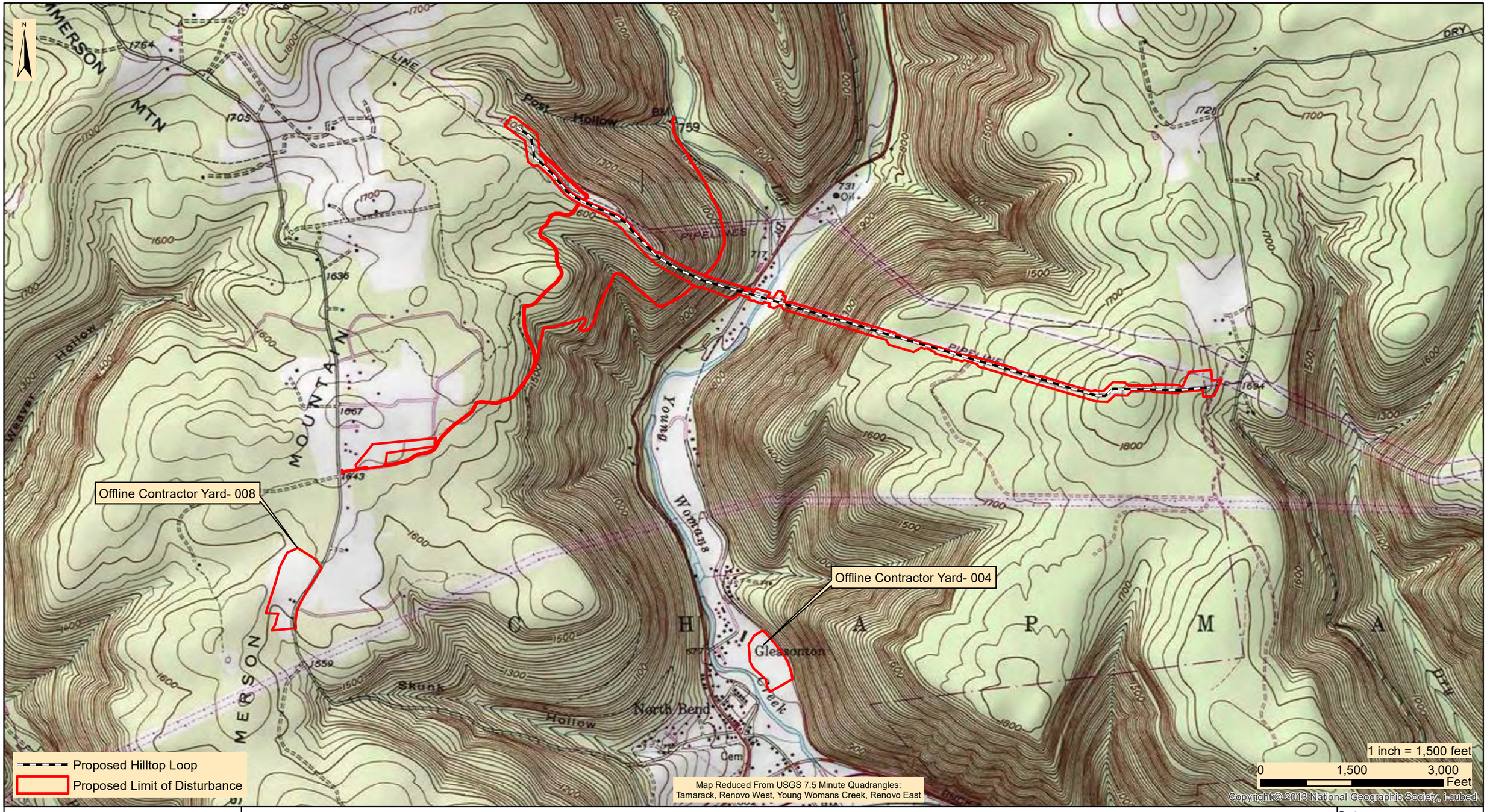
11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

Changes in Project site runoff are not anticipated as a result of the Project. The Project site is primarily an existing and maintained pipeline right-of-way in meadow condition with a forested fringe. The project site will be restored to meadow condition upon the completion of construction. Proposed BMPs were sized based on the maximum tributary drainage area anticipated during construction.

12.0 The Erosion and Sediment Control Plan Shall be Prepared By a Person Trained and Experienced in Erosion Control Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual, March 2012. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



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TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HILLTOP LOOP
PROJECT LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	8/21/2019
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	FTN
Figure Number:	2-1

ATTACHMENT 2
SOILS MAP AND REPORT

United States Department of Agriculture

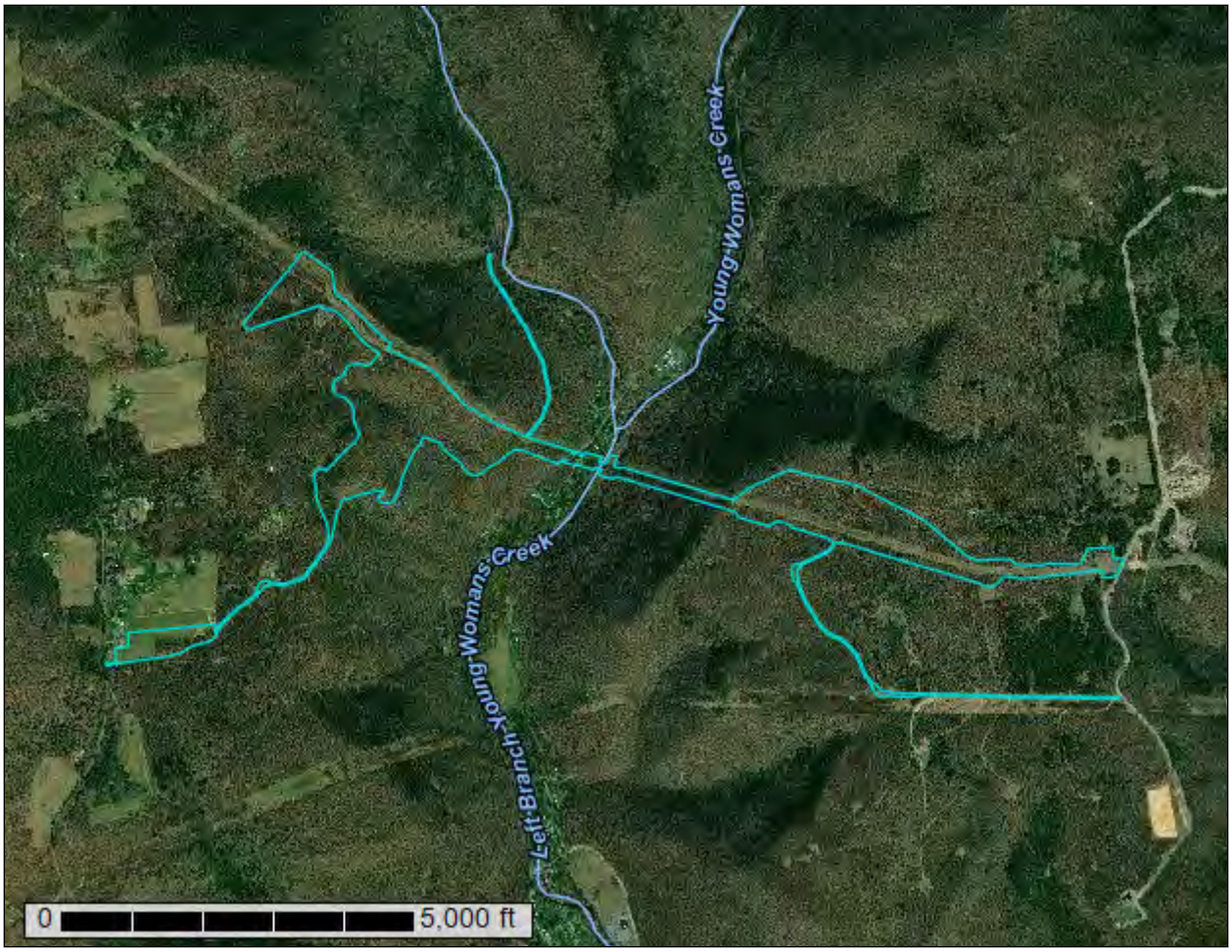
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Clinton County, Pennsylvania

Hilltop Loop



June 21, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

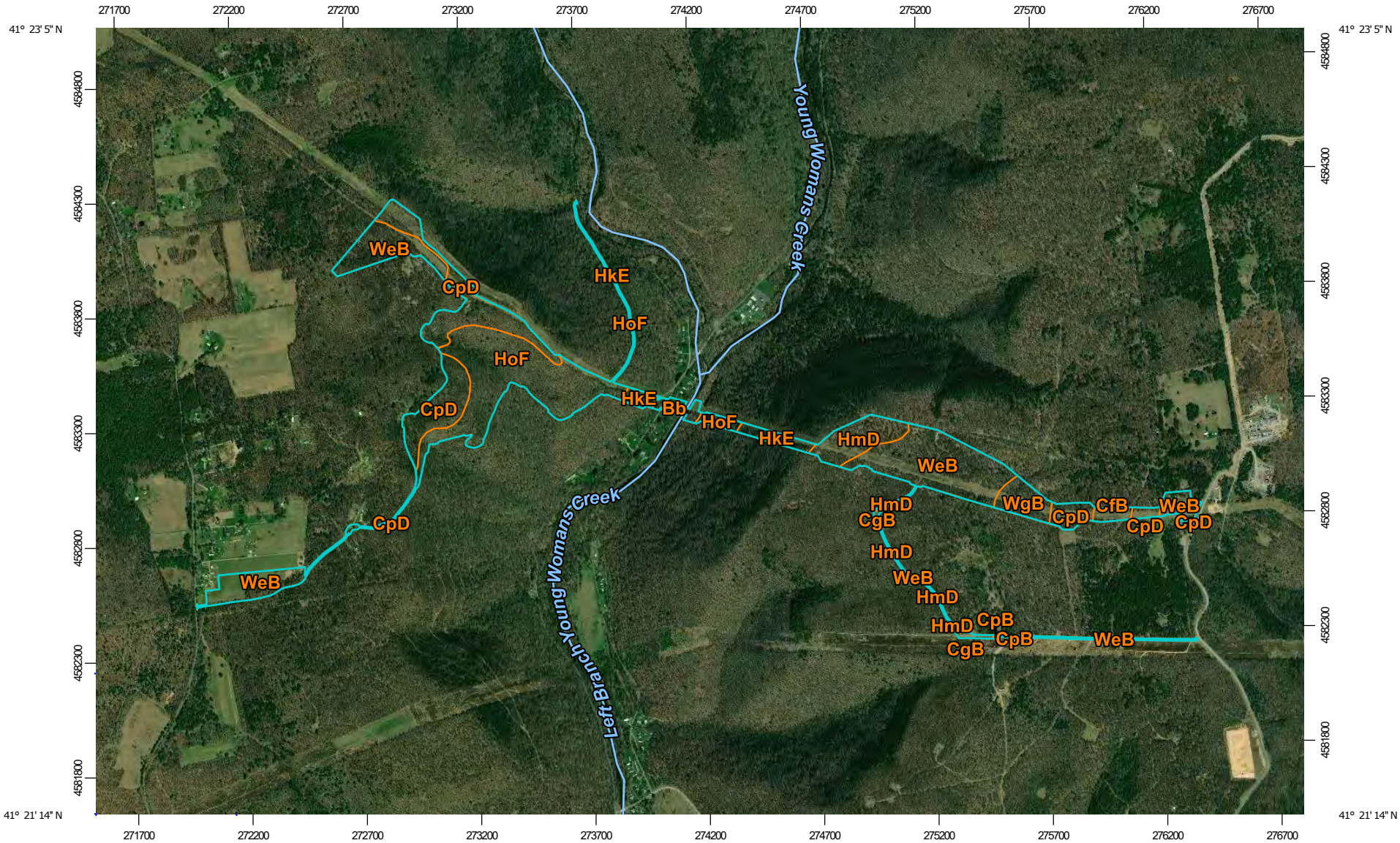
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:24,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clinton County, Pennsylvania
Survey Area Data: Version 14, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 4, 2012—Sep 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bb	Barbour-Craigsville complex	3.1	1.6%
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony	2.3	1.2%
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony	1.5	0.8%
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony	0.2	0.1%
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony	41.9	21.9%
HkE	Hazleton channery sandy loam, 25 to 80 percent slopes, rubbly	7.3	3.8%
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony	13.3	7.0%
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony	50.6	26.5%
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony	63.4	33.2%
WgB	Wharton-Cookport complex, 0 to 8 percent slopes, very stony	7.5	3.9%
Totals for Area of Interest		**191.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Pennsylvania

Bb—Barbour-Craigsville complex

Map Unit Setting

National map unit symbol: l7yn
Elevation: 400 to 3,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Barbour and similar soils: 35 percent
Craigsville and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barbour

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish coarse-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: fine sandy loam
Bw - 6 to 20 inches: fine sandy loam
C - 20 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Craigsville

Setting

Landform: Flood plains
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: gravelly loam
Bw - 5 to 32 inches: very gravelly loam
C - 32 to 65 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Philo

Percent of map unit: 5 percent
Hydric soil rating: No

Atkins

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Basher

Percent of map unit: 5 percent
Hydric soil rating: No

CfB—Clymer channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80f
Elevation: 1,000 to 4,000 feet
Mean annual precipitation: 32 to 60 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Hartleton

Percent of map unit: 5 percent
Landform: — error in exists on —
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

CgB—Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80g
Elevation: 1,000 to 2,500 feet
Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 101 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 40 percent
Cookport and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: channery loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A - 0 to 8 inches: channery loam

Bt - 8 to 22 inches: loam
Btx - 22 to 46 inches: loam
C - 46 to 54 inches: channery loam
R - 54 to 64 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Dekalb

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Buchanan

Percent of map unit: 5 percent

Hydric soil rating: No

CpB—Cookport channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshh
Elevation: 910 to 2,620 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

CpD—Cookport channery loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshq
Elevation: 610 to 2,450 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: Yes

Hazleton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

HkE—Hazleton channery sandy loam, 25 to 80 percent slopes, rubbly

Map Unit Setting

National map unit symbol: 2wkcj
Elevation: 520 to 2,310 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 50 to 56 degrees F
Frost-free period: 155 to 177 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material

Oe - 2 to 3 inches: moderately decomposed plant material
A - 3 to 6 inches: channery sandy loam
E - 6 to 9 inches: channery sandy loam
Bs - 9 to 11 inches: channery sandy loam
Bw1 - 11 to 19 inches: channery sandy loam
Bw2 - 19 to 30 inches: very channery sandy loam
C - 30 to 60 inches: very channery sandy loam
R - 60 to 70 inches: bedrock

Properties and qualities

Slope: 25 to 80 percent
Percent of area covered with surface fragments: 32.0 percent
Depth to restrictive feature: 40 to 69 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Laidig

Percent of map unit: 10 percent
Landform: Mountain slopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Clymer

Percent of map unit: 10 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

HmD—Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82t
Elevation: 800 to 4,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 50 percent
Clymer and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Hydric soil rating: No

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Laidig

Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Wharton

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent

Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

HoF—Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82w
Elevation: 800 to 2,900 feet
Mean annual precipitation: 34 to 60 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 35 percent
Laidig and similar soils: 35 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Laidig

Setting
Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sandstone and shale

Typical profile
A - 0 to 3 inches: extremely stony loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities
Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clymer
Percent of map unit: 10 percent
Hydric soil rating: No

Hapludults, nonstony
Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

WeB—Wharton silt loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86l
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave, convex
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

WgB—Wharton-Cookport complex, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86m
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 50 percent
Cookport and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear, concave
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A1 - 0 to 8 inches: channery loam
Bt2 - 8 to 23 inches: channery loam
Btx3 - 23 to 40 inches: channery sandy clay loam
C4 - 40 to 46 inches: channery sandy loam
R - 46 to 50 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 10 percent
Hydric soil rating: No

Nolo

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

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ATTACHMENT 3

E&SC AND SR PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

TABLE OF CONTENTS

Attachment

3.1 Compost Filter Sock Worksheets (Standard E&S Worksheet #1)

3.2 Channel Design Worksheets (Standard E&S Worksheet #11)

3.3 Sediment Trap Worksheets (Standard E&S Worksheet #14 and #19)

ATTACHMENT 3.1
COMPOST FILTER SOCK WORKSHEETS

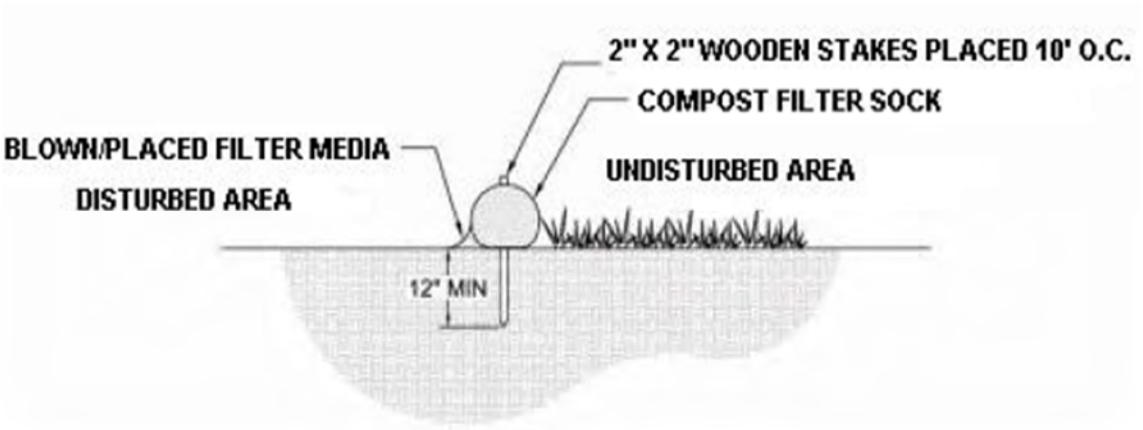
STANDARD E&S WORKSHEET #1
Compost Filter Socks

PROJECT NAME: Leidy South – Hilltop Loop

LOCATION: Hilltop Loop

PREPARED BY: FJ DATE: 7/11/2019

CHECKED BY: KCC DATE: 8/8/2019



SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 1	18	See map	4	341
CFS-HL 2	18	See map	4	341
CFS-HL 3	18	See map	4	341
CFS-HL 4	18	See map	13	130
CFS-HL 5	18	See map	13	130
CFS-HL 6	18	See map	13	130
CFS-HL 7	18	See map	13	130
CFS-HL 8	18	See map	13	130
CFS-HL 9	18	See map	6	252
CFS-HL 10	18	See map	6	252
CFS-HL 11	18	See map	6	252
CFS-HL 12	12	See map	7	111
CFS-HL 13	12	See map	7	111
CFS-HL 14	12	See map	7	111
CFS-HL 15	18	See map	12	136
CFS-HL 16	18	See map	9	215
CFS-HL 17	18	See map	9	215
CFS-HL 18	12	See map	6	161
CFS-HL 19	12	See map	6	161
CFS-HL 20	12	See map	6	142

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 21	12	See map	6	142
CFS-HL 22	12	See map	6	169
CFS-HL 23	12	See map	6	169
CFS-HL 24	12	See map	6	169
CFS-HL 25	12	See map	8	54
CFS-HL 26	12	See map	10	86
CFS-HL 27	12	See map	10	86
CFS-HL 28	12	See map	2	284
CFS-HL 28A	12	See map	2	284
CFS-HL 28B	12	See map	2	284
CFS-HL 29	12	See map	2	284
CFS-HL 30	12	See map	2	284
CFS-HL 31	12	See map	2	284
CFS-HL 32	12	See map	2	284
CFS-HL 33	12	See map	7	171
CFS-HL 34	12	See map	7	171
CFS-HL 35	12	See map	7	171
CFS-HL 36	12	See map	7	171
CFS-HL 37	12	See map	7	171
CFS-HL 38	12	See map	7	171
CFS-HL 39	12	See map	7	171
CFS-HL 40	12	See map	7	171
CFS-HL 41	12	See map	7	171
CFS-HL 42	12	See map	7	171
CFS-HL 43	12	See map	7	171
CFS-HL 44	12	See map	7	171
CFS-HL 45	12	See map	7	171
CFS-HL 46	12	See map	9	140
CFS-HL 47	12	See map	9	140
CFS-HL 48	12	See map	9	140
CFS-HL 49	12	See map	4	141
CFS-HL 50	12	See map	4	141
CFS-HL 51	12	See map	4	141
CFS-HL 52	12	See map	4	141
CFS-HL 53	12	See map	4	141
CFS-HL 54	12	See map	4	141
CFS-HL 55	12	See map	4	141
CFS-HL 56	12	See map	2	233

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 57	12	See map	2	233
CFS-HL 58	12	See map	2	233
CFS-HL 59	12	See map	2	233
CFS-HL 60	12	See map	2	233
CFS-HL 61	12	See map	2	233
CFS-HL 62	12	See map	2	233
CFS-HL 63	12	See map	2	233
CFS-HL 64	12	See map	2	233
CFS-HL 65	12	See map	16	100
CFS-HL 66	12	See map	16	100
CFS-HL 67	12	See map	16	100
CFS-HL 68	12	See map	16	100
CFS-HL 69	12	See map	16	100
CFS-HL 70	12	See map	16	100
CFS-HL 71	12	See map	16	100
CFS-HL 72	24	See map	60	60
CFS-HL 72A	24	See map	60	60
CFS-HL 73	24	See map	60	60
CFS-HL 74	24	See map	60	60
CFS-HL 75	24	See map	60	60
CFS-HL 76	24	See map	60	60
CFS-HL 77	24	See map	60	60
CFS-HL 78	24	See map	60	60
CFS-HL 79	24	See map	60	60
CFS-HL 80	24	See map	60	60
CFS-HL 81	24	See map	60	60
CFS-HL 82	24	See map	60	60
CFS-HL 83	24	See map	60	60
CFS-HL 84	24	See map	60	60
CFS-HL 85	24	See map	47	60
CFS-HL 86	24	See map	47	60
CFS-HL 87	24	See map	47	60
CFS-HL 88	24	See map	47	60
CFS-HL 89	24	See map	47	60
CFS-HL 90	18	See map	23	93
CFS-HL 91	18	See map	23	93
CFS-HL 92	18	See map	23	93
CFS-HL 93	18	See map	23	93

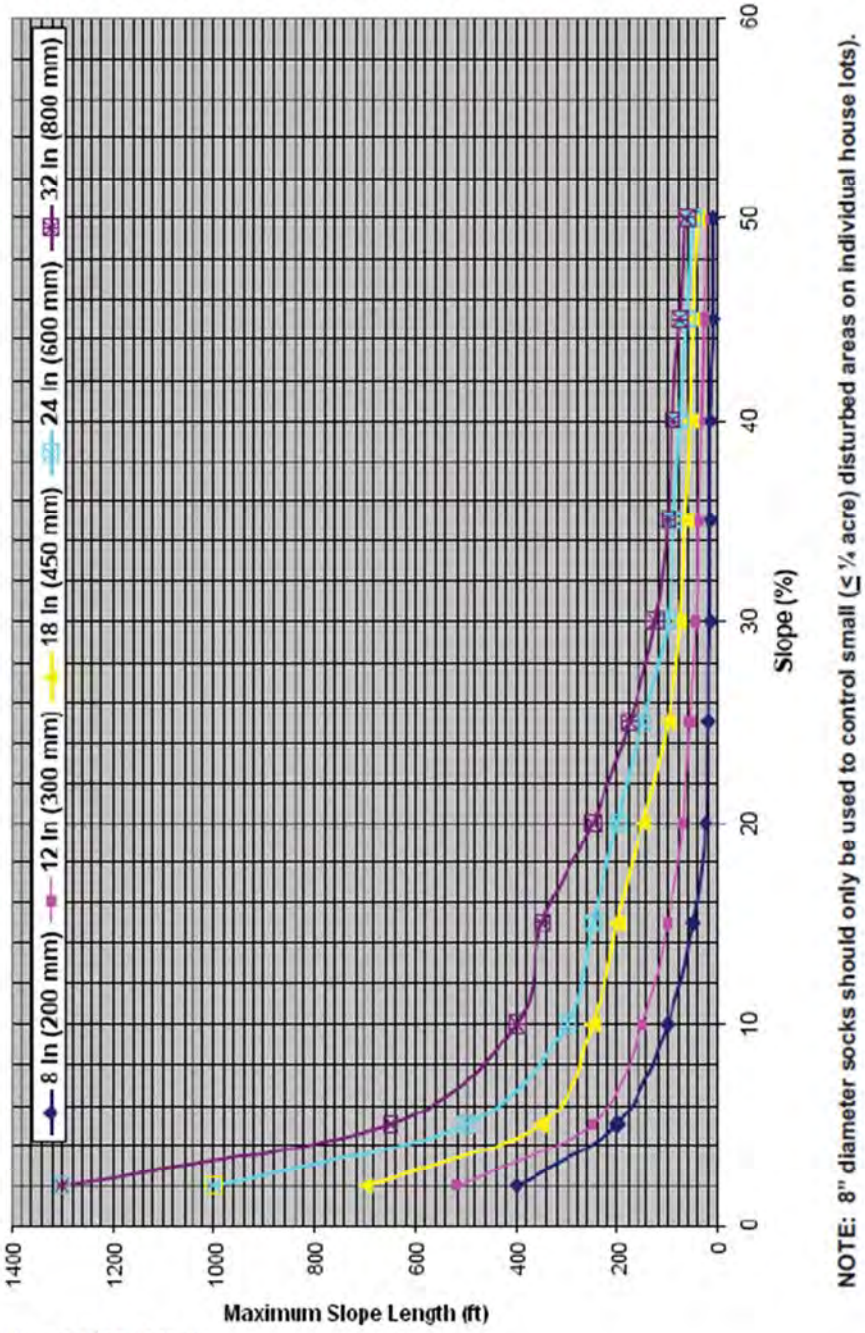
STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 94	18	See map	23	93
CFS-HL 95	18	See map	23	93
CFS-HL 96	18	See map	23	93
CFS-HL 97	18	See map	13	114
CFS-HL 98	18	See map	13	114
CFS-HL 99	18	See map	13	114
CFS-HL 100	18	See map	13	114
CFS-HL 101	18	See map	18	90
CFS-HL 102	18	See map	18	90
CFS-HL 103	18	See map	18	90
CFS-HL 104	18	See map	18	90
CFS-HL 105	18	See map	18	90
CFS-HL 106	18	See map	13	182
CFS-HL 107	12	See map	10	70
CFS-HL 108	12	See map	10	70
CFS-HL 109	12	See map	10	70
CFS-HL 110	12	See map	10	70
CFS-HL 111	12	See map	7	62
CFS-HL 112	12	See map	7	62
CFS-HL 113	12	See map	7	62
CFS-HL 114	12	See map	7	62
CFS-HL 115	12	See map	3	84
CFS-HL 116	12	See map	3	84
CFS-HL 117	12	See map	3	84
CFS-HL 118	18	See map	24	76
CFS-HL 119	18	See map	24	76
CFS-HL 120	18	See map	24	76
CFS-HL 121	18	See map	24	76
CFS-HL 122	18	See map	24	76
CFS-HL 123	18	See map	24	76
CFS-HL 124	18	See map	24	76
CFS-HL 125	18	See map	24	76
CFS-HL 126	18	See map	18	108
CFS-HL 127	18	See map	18	108
CFS-HL 128	18	See map	18	108
CFS-HL 129	18	See map	9	235
CFS-HL 130	18	See map	9	235
CFS-HL 131	18	See map	9	235

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 132	18	See map	9	235
CFS-HL 133	18	See map	9	235
CFS-HL 134	18	See map, CY#4	2	531
CFS-HL 135	18	See map, CY#4	2	531
CFS-HL 135A	18	See map, CY#4	2	531
CFS-HL 135B	18	See map, CY#4	2	531
CFS-HL 135C	18	See map, CY#4	2	531
CFS-HL 135D	18	See map, CY#4	2	531
CFS-HL 136	18	See map, CY#4	2	531
CFS-HL 137	18	See map, CY#4	2	531
CFS-HL 138	18	See map, CY#4	2	531
CFS-HL 139	24	See map, CY#5	3	641
CFS-HL 140	24	See map, CY#5	3	641
CFS-HL 141	24	See map, CY#5	3	641
CFS-HL 142	24	See map, CY#5	3	641
CFS-HL 143	32	See map, CY#8	5	650
CFS-HL 144	32	See map, CY#8	5	650
CFS-HL 145	32	See map, CY#8	5	650
CFS-HL 146	32	See map, CY#8	5	650
CFS-HL 147	32	See map, CY#8	5	650
CFS-HL 148	32	See map, CY#8	5	650
CFS-HL 149	32	See map, CY#8	5	650
CFS-HL 150	32	See map, CY#8	5	650
CFS-HL 151	32	See map, CY#8	5	650
CFS-HL 152	32	See map, CY#8	5	650
CFS-HL 153	32	See map, CY#8	5	650
CFS-HL 154	32	See map, CY#8	5	650

FIGURE 4.2
MAXIMUM PERMISSIBLE SLOPE LENGTH ABOVE COMPOST FILTER SOCKS



NOTE: 8" diameter socks should only be used to control small (≤ ¼ acre) disturbed areas on individual house lots).

Adapted from Filtrexx

ATTACHMENT 3.2
CHANNEL DESIGN WORKSHEETS

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Hilltop Loop Clean Water Crossing — Prepared by: FJ, 9/2019
LOCATION: Chapman Township, Clinton County, Pennsylvania — Checked by: KCC, 9/2019

CHANNEL OR CHANNEL SECTION		HL1	HL2	HL3-1	HL3-2	HL4
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	3.823	0.892	1.35	0.689	4.37
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	2.12	0.39	1.39	0.64	5.0
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.2	0.8	1.9	0.9	5.8
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.1	1.7	2.4	1.9	3.8
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.3	0.2	0.4	0.3	1.1
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.0	0.75	1.0	0.75	1.0
CHANNEL TOP WIDTH @ D	(FT)	6.0	5.0	6.0	5.0	6.0
d (CALCULATED FLOW DEPTH)	(FT)	0.50	0.20	0.30	0.20	0.50
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.0	2.8	3.2	2.8	4.0
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	4.0	10.0	6.67	10.0	4.0
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.5	0.48	0.78	0.48	1.5
R (HYDRAULIC RADIUS)		0.354	0.166	0.233	0.166	0.354
S (BED SLOPE)[3]	(FT/FT)	0.011	0.019	0.024	0.024	0.035
S_c (CRITICAL SLOPE)	(FT/FT)	0.028	0.035	0.032	0.035	0.028
$.7S_c$	(FT/FT)	0.0196	0.0245	0.0224	0.0245	0.0196
$1.3S_c$	(FT/FT)	0.0364	0.0455	0.0416	0.0455	0.0364
STABLE FLOW?	(Y/N)	Y	Y	N	Y	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	0.1	--	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.03	--	0.03	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South- Hilltop Loop CY005 Prepared by: FJ, 7/2019
LOCATION: Clinton County, PA Checked by: KCC: 8/2019

CHANNEL OR CHANNEL SECTION		HL-5-ECM	HL-5-ECM with grass
TEMPORARY OR PERMANENT?	(T OR P)	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	1.3	1.3
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	3.13	3.13
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.9	5.0
PROTECTIVE LINING[2]		SC250	SC250 with grass
n (MANNING'S COEFFICIENT)[2]		0.04	0.06
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.6	2.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	3.0	10.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6	0.9
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1.25
CHANNEL TOP WIDTH @ D	(FT)	6	7
d (CALCULATED FLOW DEPTH)	(FT)	0.5	0.7
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4	4.8
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	4	2.9
d_{50} STONE SIZE	(IN)	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.5	5.13
R (HYDRAULIC RADIUS)		0.354	0.464
S (BED SLOPE)[3]	(FT/FT)	0.02	0.02
S_c (CRITICAL SLOPE)	(FT/FT)	0.035	0.072
$.7S_c$	(FT/FT)	0.0245	0.0504
$1.3S_c$	(FT/FT)	0.0455	0.0936
STABLE FLOW?	(Y/N)	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.125	0.175
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South- Hilltop Loop CY008 Prepared by: FJ, 7/2019
LOCATION: Clinton County, PA Checked by: KCC: 8/2019

CHANNEL OR CHANNEL SECTION		HL-6-ECM	HL-6-ECM with grass
TEMPORARY OR PERMANENT?	(T OR P)	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	1.147	1.147
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	1.86	1.86
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.5	3.9
PROTECTIVE LINING[2]		SC250	SC250 with grass
n (MANNING'S COEFFICIENT)[2]		0.04	0.054
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.1	2.6
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	3.0	10.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.9	1.1
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1
CHANNEL TOP WIDTH @ D	(FT)	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.4	0.5
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.6	4.0
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5	4
d_{50} STONE SIZE	(IN)	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.12	1.5
R (HYDRAULIC RADIUS)		0.296	0.354
S (BED SLOPE)[3]	(FT/FT)	0.036	0.036
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.064
$.7S_c$	(FT/FT)	0.0258	0.0445
$1.3S_c$	(FT/FT)	0.0478	0.0826
STABLE FLOW?	(Y/N)	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.1	--
FREEBOARD BASED ON STABLE FLOW	(FT)	--	0.125
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HL-7-ECM	HL-7-ECM with grass
TEMPORARY OR PERMANENT?	(T OR P)	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	3.713	3.713
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	4.48	4.48
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	5.2	5.7
PROTECTIVE LINING[2]		SC250	SC250 with grass
n (MANNING'S COEFFICIENT)[2]		0.04	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.6	5.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	3.0	10.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.9	1.9
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1
CHANNEL TOP WIDTH @ D	(FT)	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.4	0.4
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.6	3.6
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5	5
d_{50} STONE SIZE	(IN)	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.12	1.12
R (HYDRAULIC RADIUS)		0.296	0.296
S (BED SLOPE)[3]	(FT/FT)	0.078	0.078
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.037
$.7S_c$	(FT/FT)	0.0258	0.0258
$1.3S_c$	(FT/FT)	0.0478	0.0478
STABLE FLOW?	(Y/N)	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.1	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	--	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

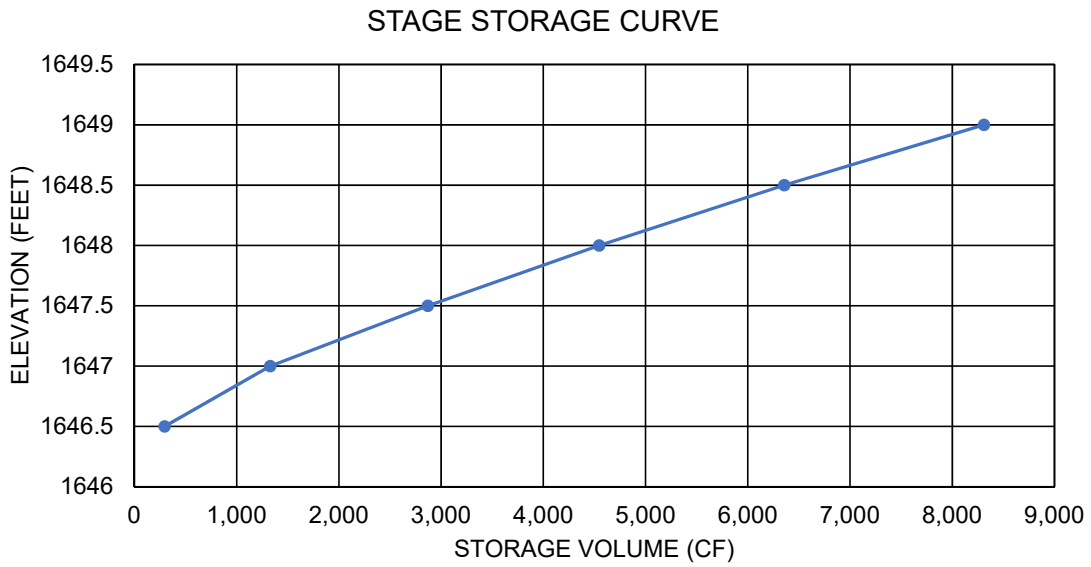
1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

ATTACHMENT 3.3
SEDIMENT TRAP WORKSHEETS

STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT NAME: Leidy South: Hilltop Loop
LOCATION: CY005-Sediment Trap #1
PREPARED BY: FJ DATE: 8/2019
CHECKED BY: KCC DATE: 8/2019

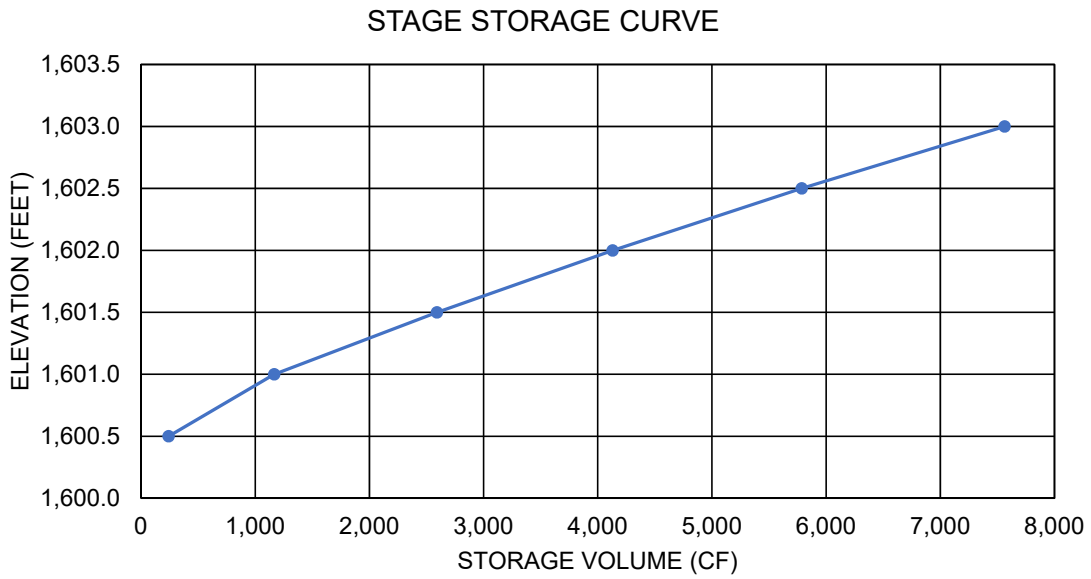
WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT)	AVERAGE (SQ.FT)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
1,644.0	0				0
		591	0.5	295.5	
1,644.5	1,182				296
		2,068	0.5	1,033.8	
1,645.0	2,953				1,329
		3,084	0.5	1,541.8	
1,645.5	3,214				2,871
		3,349	0.5	1,674.5	
1,646.0	3,484				4,546
		3,624	0.5	1,811.8	
1,646.5	3,763				6,357
		3,908	0.5	1,953.8	
1,647.0	4,052				8,311



STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT NAME: Leidy South: Hilltop Loop
LOCATION: CY008-Sediment Trap #2
PREPARED BY: FJ DATE: 8/2019
CHECKED BY: KCC DATE: 8/2019

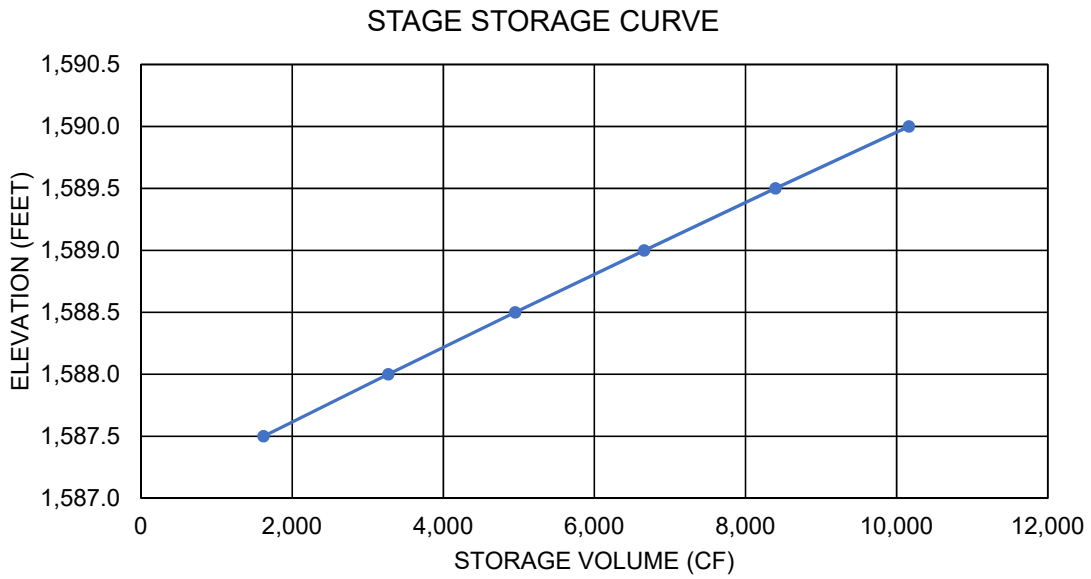
WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT)	AVERAGE (SQ.FT)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
1,599.0	0				0
		483	0.5	241.3	
1,599.5	965				241
		1,851	0.5	925.5	
1,600.0	2,737				1,167
		2,849	0.5	1,424.5	
1,600.5	2,961				2,591
		3,077	0.5	1,538.5	
1,601.0	3,193				4,130
		3,313	0.5	1,656.3	
1,601.5	3,432				5,786
		3,556	0.5	1,777.8	
1,602.0	3,679				7,564



STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT NAME: Leidy South: Hilltop Loop
LOCATION: CY008-Sediment Trap #3
PREPARED BY: FJ DATE: 8/2019
CHECKED BY: KCC DATE: 8/2019

WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT)	AVERAGE (SQ.FT)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
1,587.0	0				0
		596	0.5	298.0	
1,587.5	1,192				298
		2,515	0.5	1,257.3	
1,588.0	3,837				1,555
		3,975	0.5	1,987.3	
1,588.5	4,112				3,543
		4,253	0.5	2,126.5	
1,589.0	4,394				5,669
		4,539	0.5	2,269.3	
1,589.5	4,683				7,938
		4,831	0.5	2,415.5	
1,590.0	4,979				10,354



STANDARD E&S WORKSHEET # 19
Sediment Trap Design Data

PROJECT NAME: Leidy South-Hilltop Loop
LOCATION: Contractor Yard 005
PREPARED BY: FJ DATE: Aug 2019
CHECKED BY: KCC DATE: Aug 2019

TRAP NUMBER	#1
DRAINAGE AREA (5 ACRES MAX) (AC)	3.8
REQUIRED CAPACITY (2,000 CF/AC) (CF)	7,600
CAPACITY PROVIDED AT ELEVATION h (CF)	8,311
SOIL TYPES IN DRAINAGE AREA	WeB (silt loam)
REQUIRED SURFACE AREA (5,300 x AC)[1] (SQ. FT)	N/A
* AVERAGE BOTTOM LENGTH (FT)	
* AVERAGE BOTTOM WIDTH (FT)	
* AVERAGE TRAP LENGTH AT ELEVATION h (FT)	
* AVERAGE TRAP WIDTH AT ELEVATION h (FT)	
SURFACE AREA AT ELEVATION h (SQ FT)	4,052
BOTTOM ELEVATION (FT)	1644
CLEAN-OUT ELEVATION (@ 700 CF/AC)[2] (FT)	N/A
TOP OF EMBANKMENT ELEVATION[3] (FT)	N/A
EMBANKMENT HEIGHT (FT)	N/A
CREST OF SPILLWAY ELEVATION[4] (FT)	N/A
FLOW LENGTH AT ELEVATION h (FT)	N/A
FLOW LENGTH/WIDTH RATIO AT ELEV. h[5] (2:1 MIN)	N/A

1 If sandy clays, silty clays, silty clay loams, clay loams, or clays predominate soil types.
2 Minimum 12” above bottom of trap
3 Minimum 12” above elevation at which 1.5 cfs/acre discharge capacity is provided.
4 Minimum 24” above bottom of trap
5 4:1 Flow Length:Width ratio required for HQ and EV watersheds.

EMBANKMENT SPILLWAYS

OUTLET WIDTH (2 x # ACRES MIN.)[1] (FT)	
SPILLWAY HEIGHT h (FT)	
OUTLET SIDE SLOPES (2H:1V MAX.)	
SPILLWAY OUTSIDE SLOPE Z1 (2 MIN.)	
SPILLWAY INSIDE SLOPE Z2 (2 MIN.)	

1 6 x # Acres Min. if not discharging directly to a waterway

RISER PIPE SPILLWAYS

Dr (RISER DIAMETER, 8” MIN.) (IN)	
Db (BARREL DIAMETER, 6” MIN.) (IN)	
SPILLWAY CAPACITY WITH 12” FREEBOARD(CFS)	
BARREL OUTLET ELEVATION (FT)	
MAX WATER SURFACE ELEVATION (@ 1.5 CFS/AC. DISCHARGE) (FT)	

OUTLET BASIN

LENGTH (6 Db) (FT)	
WIDTH (3 Db) (FT)	
DEPTH (Db) (FT)	
RIPRAP PROTECTION (R-Size, R-3 min.)	

STANDARD E&S WORKSHEET # 19
Sediment Trap Design Data

PROJECT NAME: Leidy South-Hilltop Loop
LOCATION: Contractor Yard 008
PREPARED BY: FJ DATE: Aug 2019
CHECKED BY: KCC DATE: Aug 2019

TRAP NUMBER	#2	#3
DRAINAGE AREA (5 ACRES MAX) (AC)	3.25	4.75
REQUIRED CAPACITY (2,000 CF/AC) (CF)	6,500	9,500
CAPACITY PROVIDED AT ELEVATION h (CF)	7,564	10,354
SOIL TYPES IN DRAINAGE AREA	WeB, CpD (silt loam, loam)	CpB,,CpD (loam)
REQUIRED SURFACE AREA (5,300 x AC)[1] (SQ. FT)	N/A	N/A
* AVERAGE BOTTOM LENGTH (FT)		
* AVERAGE BOTTOM WIDTH (FT)		
* AVERAGE TRAP LENGTH AT ELEVATION h (FT)		
* AVERAGE TRAP WIDTH AT ELEVATION h (FT)		
SURFACE AREA AT ELEVATION h (SQ FT)	3,679	4,979
BOTTOM ELEVATION (FT)	1,599	1,587
CLEAN-OUT ELEVATION (@ 700 CF/AC)[2] (FT)	N/A	N/A
TOP OF EMBANKMENT ELEVATION[3] (FT)	N/A	N/A
EMBANKMENT HEIGHT (FT)	N/A	N/A
CREST OF SPILLWAY ELEVATION[4] (FT)	N/A	N/A
FLOW LENGTH AT ELEVATION h (FT)	N/A	N/A
FLOW LENGTH/WIDTH RATIO AT ELEV. h[5] (2:1 MIN)	N/A	N/A

1 If sandy clays, silty clays, silty clay loams, clay loams, or clays predominate soil types.
2 Minimum 12” above bottom of trap
3 Minimum 12” above elevation at which 1.5 cfs/acre discharge capacity is provided.
4 Minimum 24” above bottom of trap
5 4:1 Flow Length:Width ratio required for HQ and EV watersheds.

EMBANKMENT SPILLWAYS

OUTLET WIDTH (2 x # ACRES MIN.)[1] (FT)		
SPILLWAY HEIGHT h (FT)		
OUTLET SIDE SLOPES (2H:1V MAX.)		
SPILLWAY OUTSIDE SLOPE Z1 (2 MIN.)		
SPILLWAY INSIDE SLOPE Z2 (2 MIN.)		

1 6 x # Acres Min. if not discharging directly to a waterway

RISER PIPE SPILLWAYS

Dr (RISER DIAMETER, 8” MIN.) (IN)		
Db (BARREL DIAMETER, 6” MIN.) (IN)		
SPILLWAY CAPACITY WITH 12” FREEBOARD(CFS)		
BARREL OUTLET ELEVATION (FT)		
MAX WATER SURFACE ELEVATION (@ 1.5 CFS/AC. DISCHARGE) (FT)		

OUTLET BASIN

LENGTH (6 Db) (FT)		
WIDTH (3 Db) (FT)		
DEPTH (Db) (FT)		
RIPRAP PROTECTION (R-Size, R-3 min.)		

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

LEIDY SOUTH PROJECT
36" HILLTOP LOOP

CHAPMAN TOWNSHIP,
CLINTON COUNTY, PENNSYLVANIA

SEPTEMBER 2019

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
2800 POST OAK BLVD. LEVEL 11
HOUSTON, TX. 77056
PH: (713) 215-3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

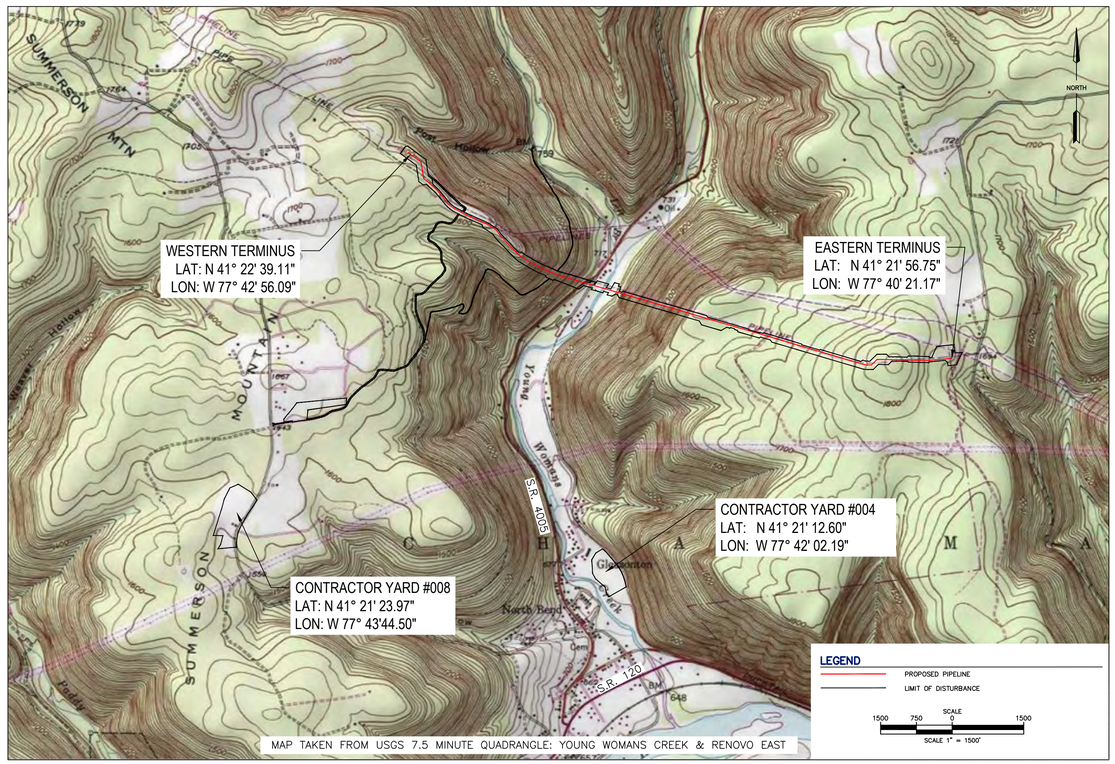
WHM CONSULTING, INC.
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
PH: (814) 689-1650
CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, INC
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
PH: (814) 238-2060
CONTACT: KEVIN C. CLARK, P.E.

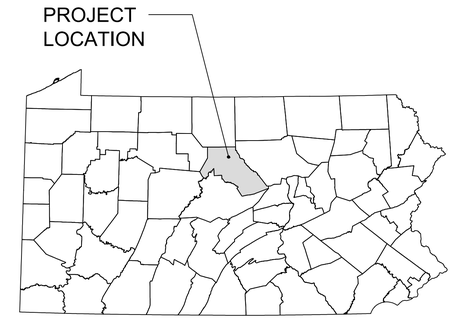
PROJECT INFORMATION

ESCGP-3 PERMIT BOUNDARY: 113.1 ACRES

LIMIT OF DISTURBANCE: 86.6 ACRES



LOCATION MAP



VICINITY MAP
N.T.S.

SHEET INDEX	
SHEET NUMBER	**DRAWING TITLE**
1 OF 22	EROSION & SEDIMENT CONTROL COVER SHEET
2 OF 22	EROSION & SEDIMENT CONTROL INDEX SHEET
3 - 9 OF 22	EROSION & SEDIMENT CONTROL SITE PLANS
10 - 12 OF 22	EROSION & SEDIMENT CONTROL NOTES
13 - 20 OF 22	EROSION & SEDIMENT CONTROL DETAILS
21 - 22 OF 22	GEOHAZARD MITIGATION DETAILS

RECEIVING WATERS			
NAME	**DESIGNATED USE**	**EXISTING USE**	**PFBC CLASSIFICATION**
YOUNG WOMANS CREEK	HQ-CWF, MF	-	NATURALLY REPRODUCING TROUT & STOCKED TROUT
PADDY RUN	EV, MF	-	NATURALLY REPRODUCING TROUT
LEFT BRANCH OF YOUNG WOMANS CREEK	EV, MF	-	NATURALLY REPRODUCING TROUT & STOCKED TROUT
SKUNK HOLLOW	HQ-CWF, MF	-	NATURALLY REPRODUCING TROUT
POST HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
DRY RUN	HQ-CWF	-	CLASS A WILD TROUT WILD TROUT

EV: EXCEPTIONAL VALUE, MF: MIGRATORY FISHES
HQ-CWF: HIGH QUALITY - COLD WATER FISHES

Call before you dig.
1-800-242-1776 or 811

PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

WHM consulting, INC. designs, permits, resolutions | BAI GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

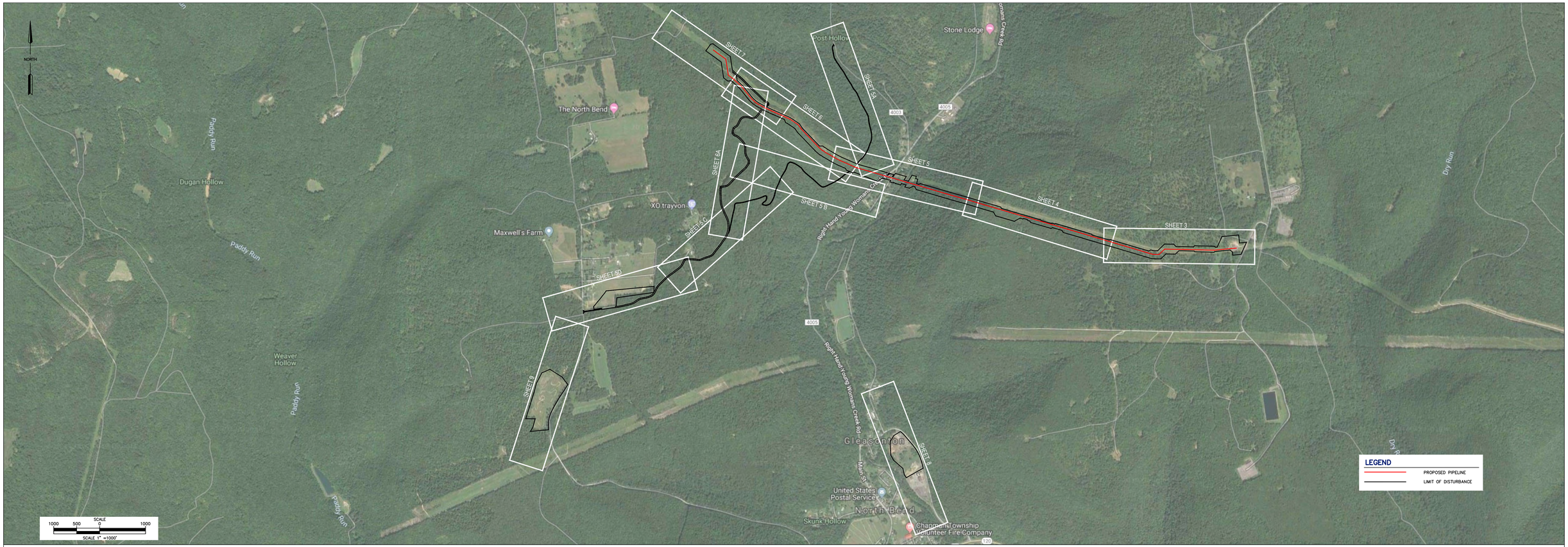
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

COVER SHEET

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 3/26/19	ISSUED FOR BID:	SCALE: 1" = 1500'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 1 OF 22



E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
CONSTRUCTION ENTRANCE	CE	13
TIMBER MATTING CONSTRUCTION	MAT.1	13
TIMBER MATTING WITH FILL OVER EXISTING PIPELINES	MAT.2	13
TIMBER MATTING AIR BRIDGE	MAT.3	13
BROAD-BASED DIP	BBD	13
BRIDGE EQUIPMENT CROSSING	BEC	14
CULVERT EQUIPMENT CROSSING	CEC	14
WETLAND EQUIPMENT CROSSING	WEC	14
PUMP WATER FILTER BAG	PWB	14
TRENCH DEWATERING	TD	14
TRENCH PLUG INSTALLATION	TP	14
SAFETY FENCE	SF	14
PERMANENT / TEMPORARY STONE ACCESS ROAD		14
WETLAND CROSSING CONFIGURATION	WCC	15
TYPE I "DRY WETLAND" INSTALLATION PROCEDURE	WCC.1	15
TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE	WCC.2	15
TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE	WCC.3	15
WATERBAR	WB	16
CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION	OS	16
BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS	BCC	16
TYPICAL SOIL STOCKPILE		16
SIDE SLOPE (TWO-TONE) CONSTRUCTION PROCEDURE	TTS	16
RIDGE TOP CONSTRUCTION PROCEDURE	RTC	16
COFFERDAM STREAM CROSSING	CD	17
FLUME STREAM CROSSING	FX	17
DAM AND PUMP STREAM CROSSING	DPX	17
HYDROSTATIC DEWATERING STRUCTURE	DS.2	17
EROSION CONTROL BLANKET	ECB	17
HYDRAULICALLY APPLIED BLANKETS		17
TOPSOIL SEGREGATION (1)	TS.1	18
TOPSOIL SEGREGATION (2)	TS.2	18
TOPSOIL SEGREGATION (3)	TS.3	18
SURFACE ROUGHENING	SR	18
TRENCHED ROAD CROSSING	TRC	18
ROCK BENCH PROTECTION		18
TYPICAL CHANNEL & VEGETATION RESTORATION - 1		18
TYPICAL CHANNEL & VEGETATION RESTORATION - 2		18
ROCK FILTER OUTLET	RFO	19
COMPOST FILTER SOCK	CFS	19
SILTRON POLLUTION PREVENTION FENCE	SPF	19

E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
CLEAN WATER CROSSING (TEMP. LEVEL SPREADER)	CWC-LS	20
CLEAN WATER CROSSING (RIP RAP OUTLET BASIN)	CWC-OB	20
DIVERSION CHANNEL	DC	20
COMPOST SOCK SEDIMENT TRAP	CST	20
GEOHAZARD MITIGATION DETAILS & SCHEDULE		21
GEOHAZARD MITIGATION DETAILS & SCHEDULE		22

(XXX) INDICATES SOIL EROSION CONTROL MEASURE DETAIL

GENERAL SITE NOTES

1. THE STAGING OF EARTHMOVING ACTIVITIES FOR THIS PROJECT IS A GENERAL DESCRIPTION OF THE WORK REQUIRED. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH PROJECT OWNER STANDARDS, THE PADEP REGULATIONS, AND ALL OTHER APPLICABLE FEDERAL, STATE, OR LOCAL REQUIREMENTS.
2. PIPELINE CONSTRUCTION IS ACCOMPLISHED THROUGH A SET OF SEQUENTIAL OPERATIONS: SURVEYING; INSTALLATION OF BMPS; CLEARING AND GRUBBING; GRADING; TRENCHING; PIPE STRINGING, ASSEMBLY AND WELDING; LOWERING-IN; TRENCH BACKFILL; HYDROSTATIC TESTING AND FINAL TIE-IN; FINAL GRADING; AND PERMANENT STABILIZATION. THE CONSTRUCTION SPREAD SHALL PROCEED ALONG THE PIPELINE ROW TO COMPLETE THESE ACTIVITIES AS ONE CONTINUOUS OPERATION IN ORDER TO MINIMIZE THE DURATION OF EARTH DISTURBANCE.
3. SCHEDULE WORK TO BE PERFORMED IN A MANNER THAT MINIMIZES THE LENGTH OF TIME THAT BARE SOIL WILL BE EXPOSED TO THE ELEMENTS.
4. THE AMOUNT AND DURATION OF OPEN TRENCH SHALL BE MINIMIZED DURING THE PROJECT.
5. CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SOIL EROSION AND SEDIMENT CONTROL NARRATIVE AND ENVIRONMENTAL CONSTRUCTION PLAN AND MINIMIZE THE TOTAL AREA OF DISTURBANCE, WHEN PRACTICAL.
6. DISCHARGING SEDIMENT LADEN WATER WHICH WILL CAUSE OR CONTRIBUTE TO THE DEGRADATION OF A BENEFICIAL USE OF A WATER OF THE STATE FROM THE CONSTRUCTION SITE, A DEWATERING SITE, OR SEDIMENT BASIN/TRAP INTO ANY WATER BODY OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.
7. DISCHARGES ORIGINATING FROM OFF-SITE SOURCES, WHICH FLOW THROUGH OR ACROSS THE AREAS DISTURBED BY CONSTRUCTION, SHALL BE DIVERTED AROUND THE ACTIVE CONSTRUCTION AREA WHENEVER POSSIBLE.
8. ALL EXCAVATED MATERIALS THAT WILL NOT BE USED ON THE SITE CANNOT BE STORED IN THE FLOODPLAIN AND MUST BE HAULED TO A DISPOSAL SITE LOCATED OUTSIDE OF THE FLOODPLAIN.
9. NO EROSION CONTROL BLANKET SHALL BE INSTALLED IN AGRICULTURAL AREAS EXCEPT AS REQUIRED TO CONSTRUCT THE TEMPORARY FLUME CROSSINGS.
10. HYDRAULICALLY APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF EROSION CONTROL BLANKETS WITH PRIOR APPROVAL FROM THE LOCAL COUNTY CONSERVATION DISTRICT.
11. LOCATION AND SPACING OF THE WATERBARS ARE SHOWN ON THE PLAN. WATERBARS MAY BE ADJUSTED IN THE FIELD DUE TO ACTUAL SITE CONDITIONS. HOWEVER, INSTALLATION AND SPACING MUST CONFORM TO THE DETAILS PROVIDED AND APPROVAL MUST BE OBTAINED FROM THE LOCAL COUNTY CONSERVATION DISTRICT OR PA DEP.
12. THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN, INCLUDING THE SOIL EROSION CONTROL DRAWINGS AND NARRATIVE, SHALL BE AVAILABLE ON SITE AT ALL TIMES DURING EARTH DISTURBANCE.

EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

PROJECT DESCRIPTION

THE HILLTOP LOOP WILL CONSIST OF APPROXIMATELY 2.4 MILES OF 36-INCH PIPELINE CO-LOCATED WITH THE EXISTING TRANSCO LEIDY LINES BETWEEN APPROXIMATE MILE POSTS (MPS) 183.55 AND 186.01 IN CLINTON COUNTY, PENNSYLVANIA. THE HILLTOP LOOP WILL BE OFFSET FROM THE EXISTING LEIDY LINE A AND LEIDY LINE C BY 25 FEET. ONCE PLACED INTO OPERATION, TRANSCO WILL REFER TO THE HILLTOP LOOP AS THE LEIDY LINE D. TRANSCO WILL BE REMOVING A MAIN LINE VALVE AT THE EASTERN TERMINUS OF THE HILLTOP LOOP THAT IS NO LONGER NEEDED. CATHODIC PROTECTION CABLE WILL BE INSTALLED FROM APPROXIMATE MP 188.05 TO MP 185.37. THE CATHODIC PROTECTION CABLE WILL BE INSTALLED IN THE SAME TRENCH AS THE PIPELINE WITHIN WETLAND, STREAM AND FLOODWAY CROSSINGS. THREE OFFLINE CONTRACTOR YARDS ARE ALSO PROPOSED AS PART OF THIS PROJECT.

THE EROSION AND SEDIMENTATION CONTROL PLAN (ENVIRONMENTAL PLAN OR PLANS) HAS BEEN DEVELOPED FOR THE PROJECT, AS DEPICTED ON THE DRAWINGS. THE E&S PLAN SHALL BE PLANNED, DESIGNED, AND IMPLEMENTED TO BE CONSISTENT WITH THE POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN UNDER 25 PA. CODE § 102.8 (RELATING TO PCSM REQUIREMENTS). TRANSCO WILL USE AND IMPLEMENT THE PRACTICES, MEASURES AND DETAILS OUTLINED HEREIN TO CONTROL SOIL EROSION AND OFF-SITE SEDIMENTATION. ALL WORK AND DISTURBED AREAS ARE LOCATED WITHIN TRANSCO PROPERTY, EXISTING EASEMENTS OR LEGALLY OBTAINED WORKSPACE. THE LIMIT OF DISTURBANCE WILL BE 86.6 ACRES. CONSTRUCTION IS SCHEDULED TO BEGIN IN 2021. THE PROJECT WILL TAKE PLACE WITHIN AN EXISTING AND MAINTAINED PIPELINE ROW.

CONTRACTOR NOTES

1. ALL EXISTING UTILITY DATA IS PROVIDED FOR INFORMATIONAL USE ONLY. ALTHOUGH THE DATA IS SHOWN AS ACCURATELY AS POSSIBLE, THE CONTRACTOR IS CAUTIONED THAT THE OWNER AND THE ENGINEER NEITHER ASSUME NOR IMPLY ANY RESPONSIBILITY FOR THE ACCURACY OF THIS DATA.
2. THE CONTRACTOR IS TO VERIFY LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. ALL CONTRACTORS/SUBCONTRACTORS PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE THEMSELVES WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM THEIR OPERATIONS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTORS AT THEIR EXPENSE AND SHALL BE APPROVED BY THE OWNER/REP. SAID EXISTING IMPROVEMENTS INCLUDE BUT ARE NOT LIMITED TO BERMS, DITCHES, FENCES, AND PLANTS.
4. CONTRACTORS MUST CONFINE THEIR ACTIVITIES TO THE WORK AREA. NO ENCROACHMENTS ONTO DEVELOPED AREAS WILL BE ALLOWED. ANY DAMAGE RESULTING THEREFROM SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR.
5. IT WILL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND PRIVATE UTILITIES THROUGHOUT THE CONSTRUCTION OF THIS PROJECT. CONTRACTORS SHALL CONTACT THE APPROPRIATE UTILITY COMPANIES FOR LINE LOCATES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL ASSUME FULL UABILITY FOR ANY DAMAGES CAUSED TO THOSE COMPANIES' FACILITIES.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRENCH SAFETY REQUIREMENTS IN ACCORDANCE WITH STANDARD WILLIAMS' TRENCH SAFETY GUIDELINES.
7. CONTRACTOR MAY ELECT TO USE DIVERSION CHANNEL OR IF CONDITIONS ALLOW WILL PLACE AN EARTHEN BERM OF APPROXIMATE SIZE THAT WILL CONVEY FLOW TO THE RESPECTIVE DESIGNATED CLEAN WATER CROSSING.

SCALE
1000 500 0 1000
SCALE 1" =1000'

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

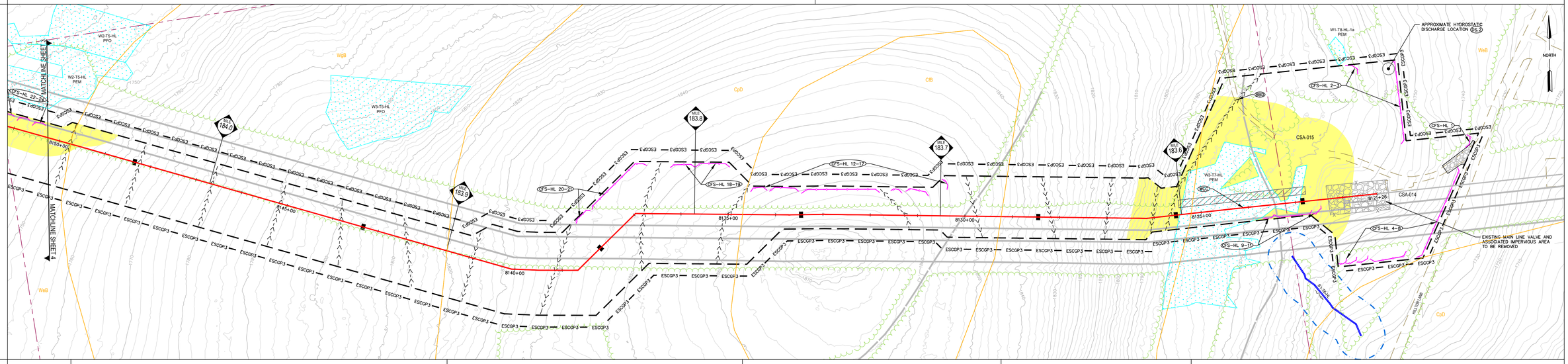
INDEX SHEET

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 3/25/19	ISSUED FOR BID:	SCALE: 1" = 1000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 2 OF 22
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	PA ROD AND GUN CLUB HL-PA-CL-0003		DEPARTMENT OF ENVIRONMENTAL RESOURCES HL-PA-CL-0001
PROFILE (MIN. PIPE DEPTH)	3'		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	WETLAND	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)	DRY RUN (HQ-CWF, MF)	

ALIGNMENT



SOIL TYPE	WeB	WgB	CpD	CfB	CpD	WeB
AVERAGE % SLOPE	6%	8%	5%	2%	6%	12%	20%	6%	16%	8%	16%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES
WgB	WHARTON-COOKPORT COMPLEX, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
042214-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

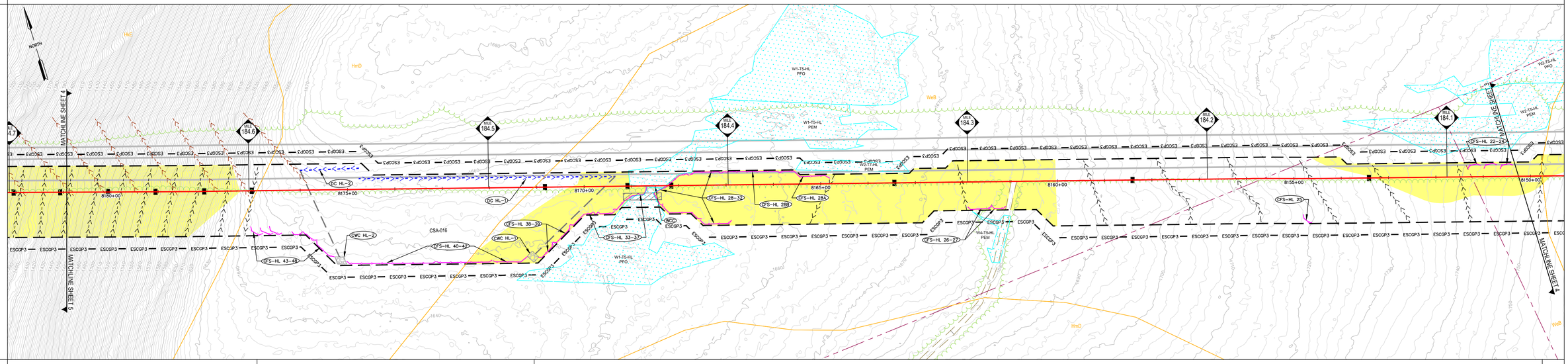
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 6/19/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 3
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

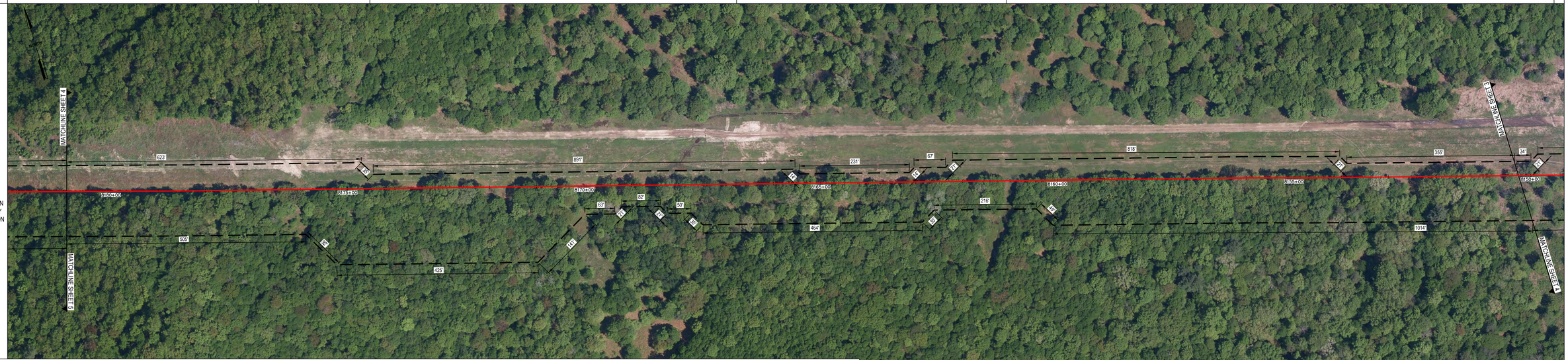
OWNERSHIP & TRACT NUMBER	ESTATE OF ROBERT J. GLEICHERT HL-PA-CL-0004	MICHAEL R. LONG HL-PA-CL-0002	PA ROD AND GUN CLUB HL-PA-CL-0003
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	WETLAND	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)		

ALIGNMENT



SOIL TYPE	HkE	HmD	WeB	WgB
AVERAGE % SLOPE	55%	5%	<2%	4%	7%	8%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES
WgB	WHARTON-COOKPORT COMPLEX, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, inc.
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

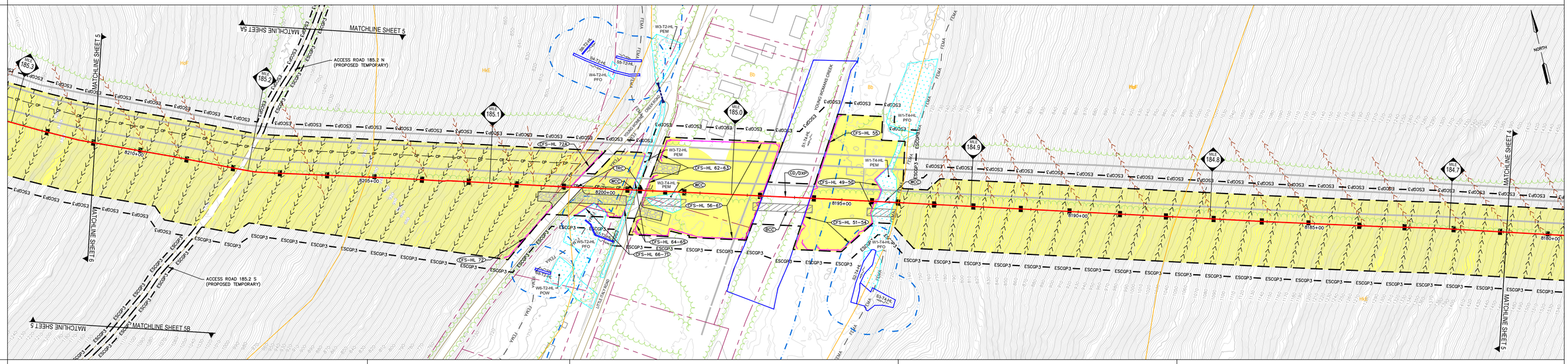
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/2019	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 4 OF 22

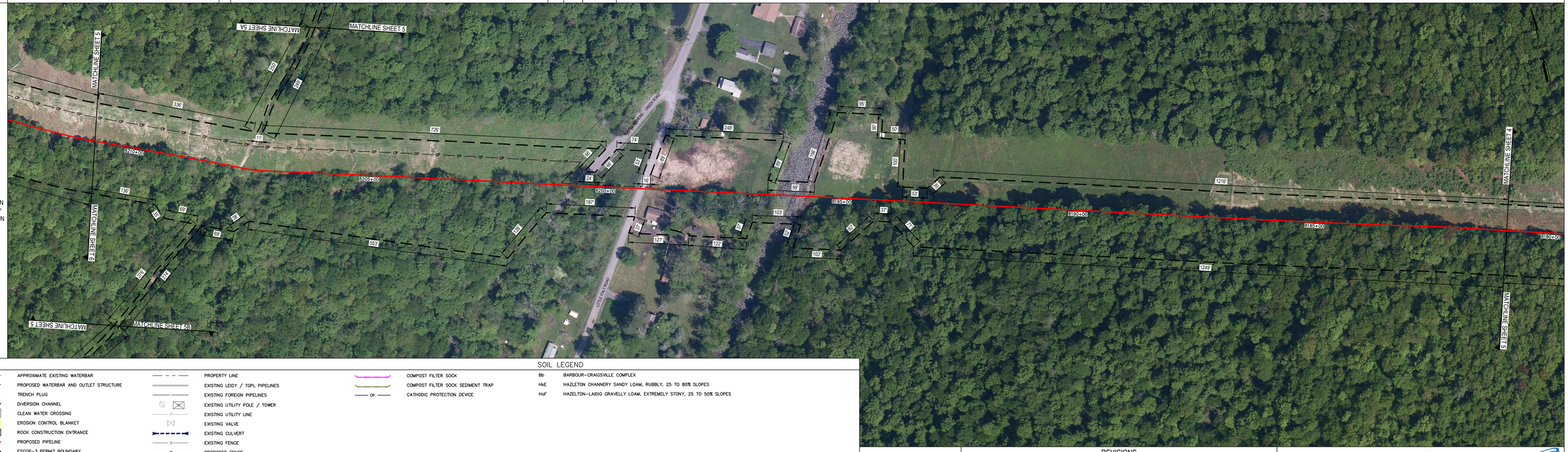
OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS HL-PA-CL-0009	YOUNG WOMANS CREEK RD	MARK A. JONES HL-PA-CL-0007	LITTLE ITALY RD	THOMAS WILSON HL-PA-CL-0008	YOUNG WOMANS CREEK	ESTATE OF ROBERT J. GLEICHERT HL-PA-CL-0004		
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	5'	3'	4'	3'		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW			WETLAND	WETLAND/RESIDENTIAL AREA/MAINTAINED ROW	STREAM	MIXED FOREST LAND/ MAINTAINED ROW	WETLAND	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)								

ALIGNMENT



SOIL TYPE	HoF	HkE	Bb	HoF	HkE
AVERAGE % SLOPE	60%	21% 53%	<2%	55%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 — EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE

SOIL LEGEND

- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

Bb	BARBOUR-CRAIGSVILLE COMPLEX
HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80% SLOPES
HoF	HAZELTON-LAIDIG GRAVELLY LOAM, EXTREMELY STONY, 25 TO 50% SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER DATE: 11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

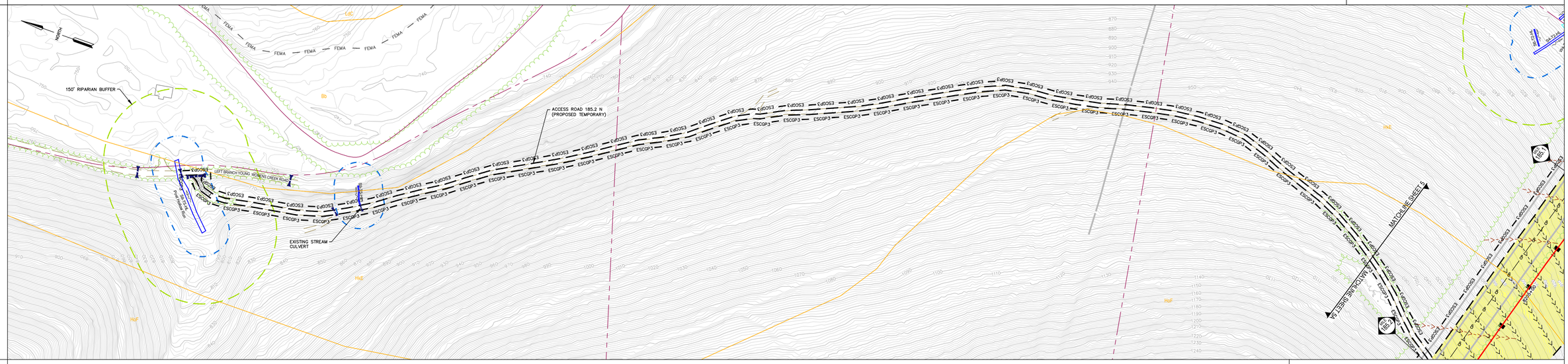
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	POST HOLLOW LLC HL-PA-CL-0017	MARK D. MCALANIS HL-PA-CL-0015	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	MIXED FOREST LAND		
RECEIVING WATERS	LEFT BRANCH YOUNG WOMANS CREEK (EV, MF)		YOUNG WOMANS CREEK (HQ-CWF, MF)

ALIGNMENT



SOIL TYPE	HkE	HoF
AVERAGE % SLOPE		

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE: 11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

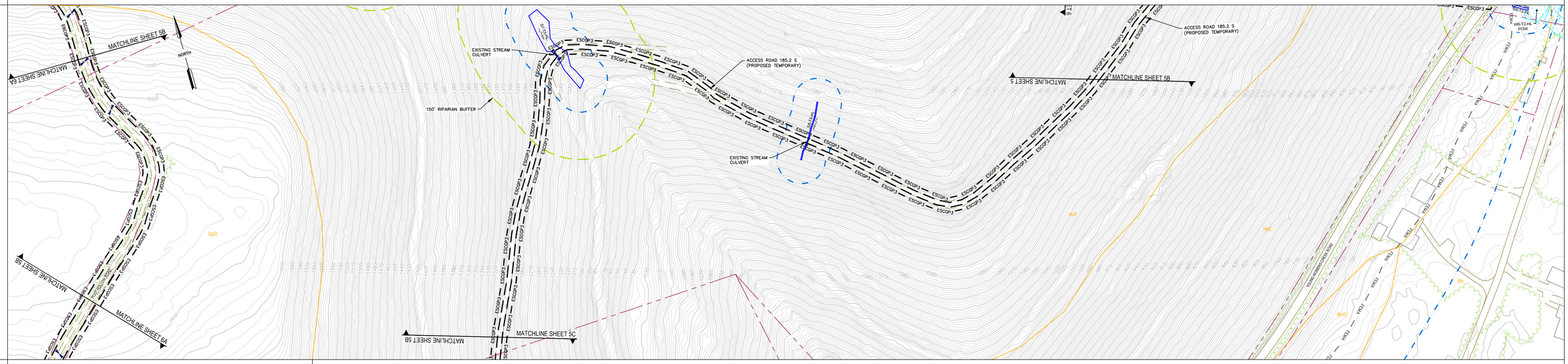
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5A OF 22
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS HL-PA-CL-0015	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	N/A	
COVER TYPE	MIXED FOREST LAND	STREAM / MIXED FOREST LAND / STREAM / MIXED FOREST LAND
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)	

ALIGNMENT



SOIL TYPE	CpD	HoF
AVERAGE % SLOPE		

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
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- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
CpD	COOKPORT CHANNERRY LOAM, EXTREMELY STONEY, 8 TO 25 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM designs, permits, resolutions consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

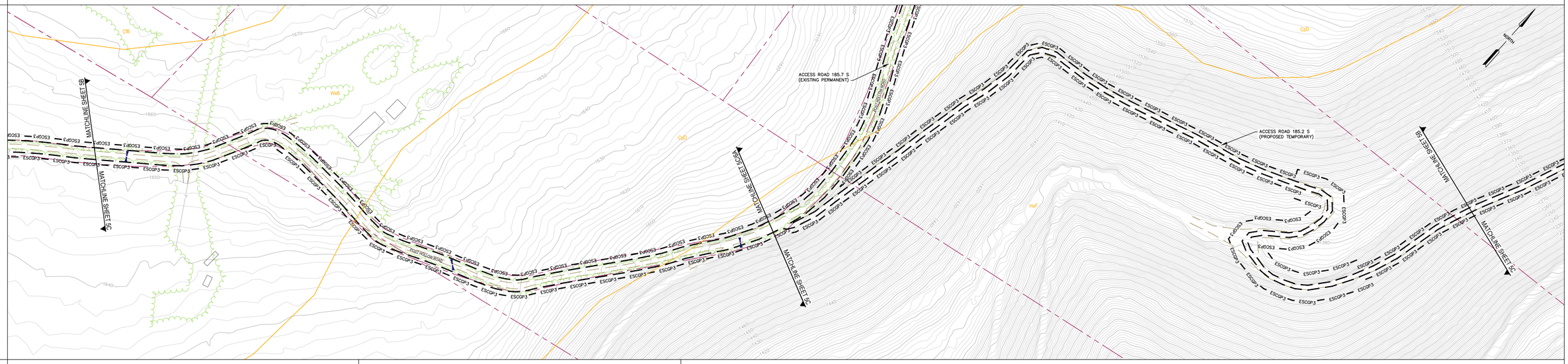
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5B
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

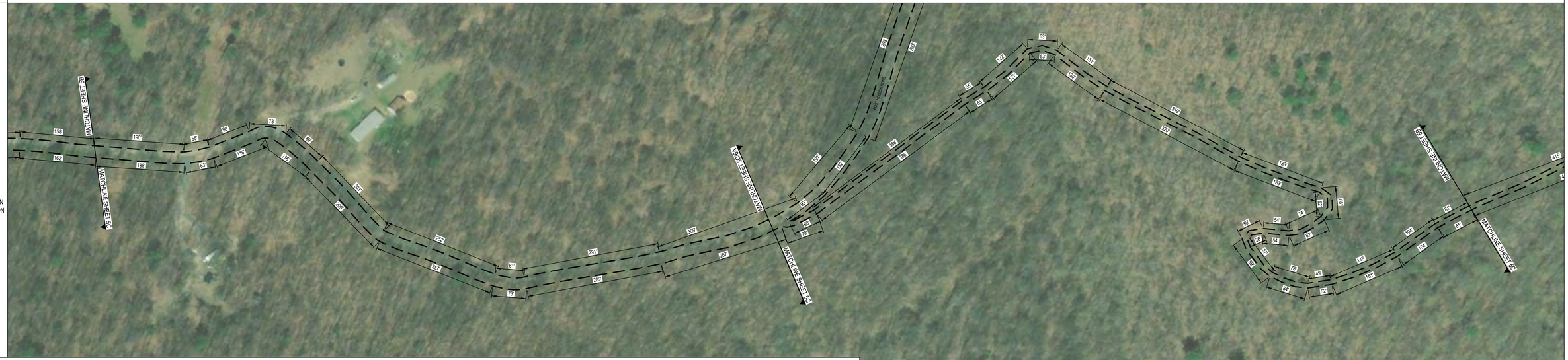
OWNERSHIP & TRACT NUMBER	DAVID L. GUIZAR HL-PA-CL-0009.003	ROBERT A. BINGAMAN HL-PA-CL-0009.002	GEORGE M. MCALANIS HL-PA-CL-0009.001	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	N/A			
COVER TYPE	MIXED FOREST LAND			
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)			

ALIGNMENT



SOIL TYPE	WeB	CpD	HoF
AVERAGE % SLOPE			

CONSTRUCTION CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- DELINEATED WATERWAY / STREAM (TOP OF BANK)
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- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
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- EXISTING VALVE
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- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
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- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE: 11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

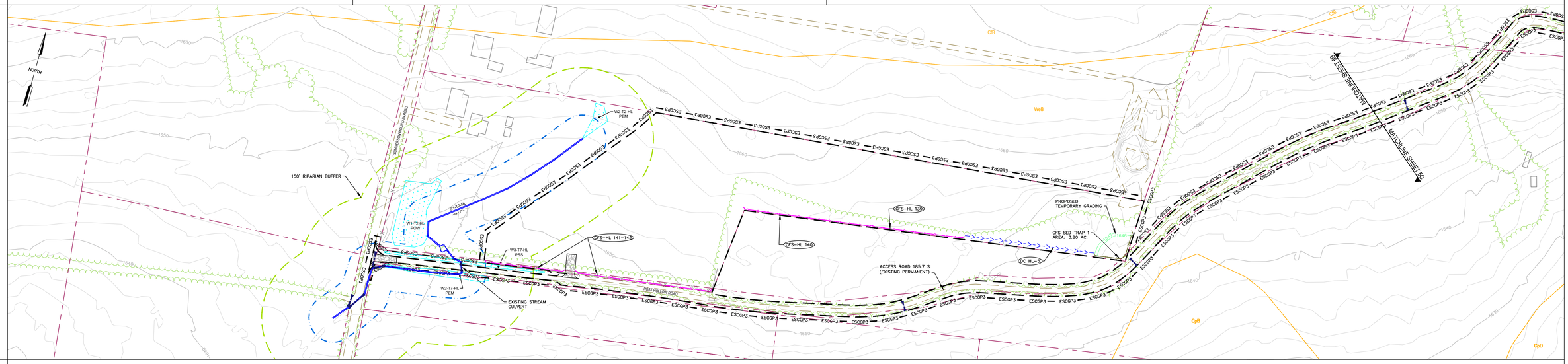
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5C
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	THOMAS F. CHARLES HL-PA-CL-0009.012	JOHN A. GREEN HL-PA-CL-0009.006	DAVID L. GUIZAR HL-PA-CL-0009.003	ROBERT A. BINGAMAN HL-PA-CL-0009.002
PROFILE (MIN. PIPE DEPTH)	N/A			
COVER TYPE	MIXED FOREST LAND	PASTURELAND / STREAM / PASTURELAND	MIXED FOREST LAND/PASTURELAND	MIXED FOREST LAND
RECEIVING WATERS	PADDY RUN (EV, MF)	SKUNK HOLLOW (HQ-CWF, MF)	YOUNG WOMANS CREEK (HQ-CWF, MF)	

ALIGNMENT



SOIL TYPE	WeB		
AVERAGE % SLOPE		5.1%	7.5%

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- EXISTING ROAD (PAVED)
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- PROPOSED GRAVEL
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- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

SOIL LEGEND

WeB WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER — PENNSYLVANIA

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

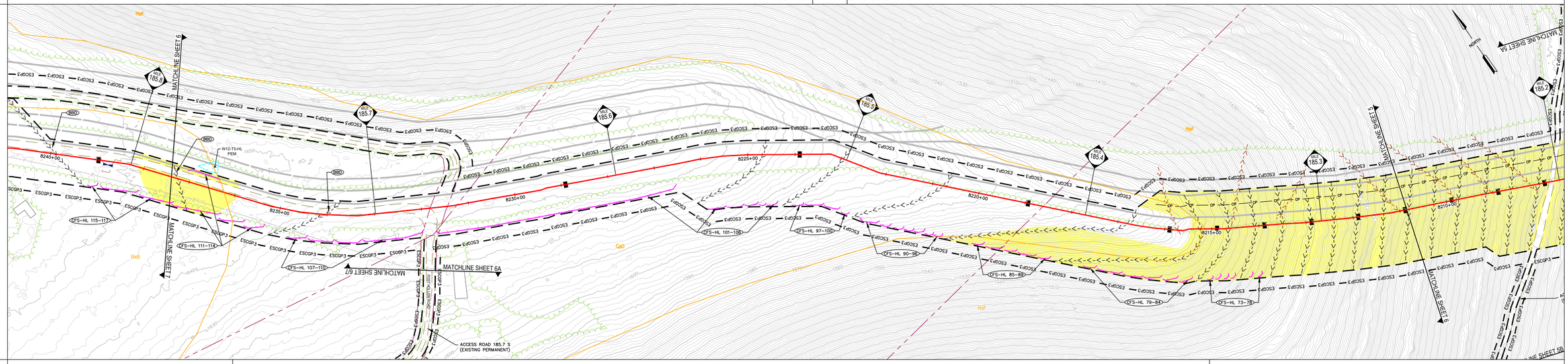
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5D
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	POST HOLLOW, LLC HL-PA-CL-0017	MARK D. MCALANIS HL-PA-CL-0015	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	5'	3'	
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)	LEFT BRANCH YOUNG WOMANS CREEK (EV, MP) YOUNG WOMANS CREEK (HQ-CWF, MF)	
ALIGNMENT			
SOIL TYPE	WeB	CpD	HoF
AVERAGE % SLOPE			
CONSTRUCTION RIGHT-OF-WAY CONFIGURATION			

LEGEND

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- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

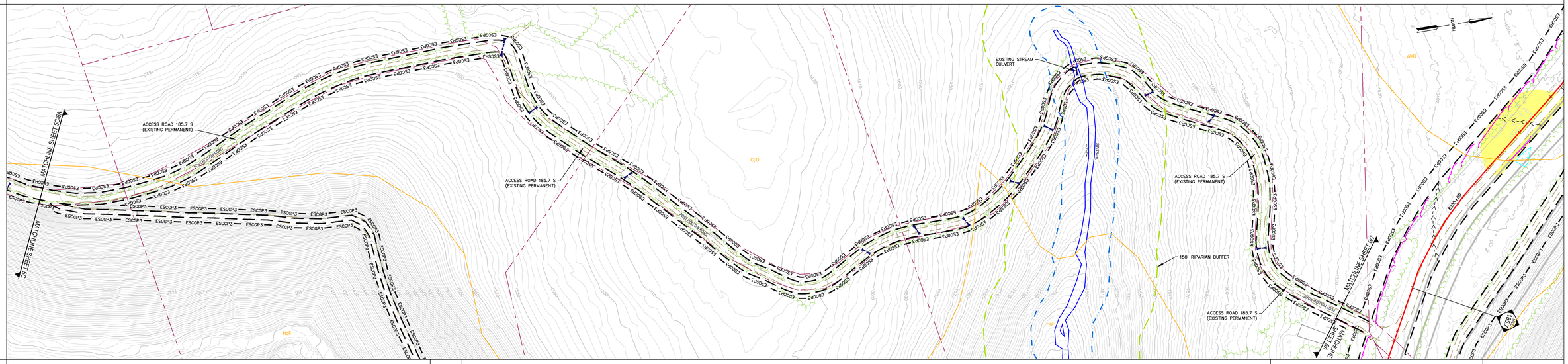
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 6
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	ROBERT A. BINGAMAN HL-PA-CL-0009.002	GEORGE M.. MCALANIS HL-PA-CL-0009.001	MARK D. M CALANIS HL-PA-CL-0009	MARK D. M CALANIS HL-PA-CL-0015	POST HOLLOW LLC HL-PA-CL-0017
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	MIXED FOREST LAND			STREAM	
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)				

ALIGNMENT



SOIL TYPE	CpD	HoF	CpD	HoF	CpD
AVERAGE % SLOPE					

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

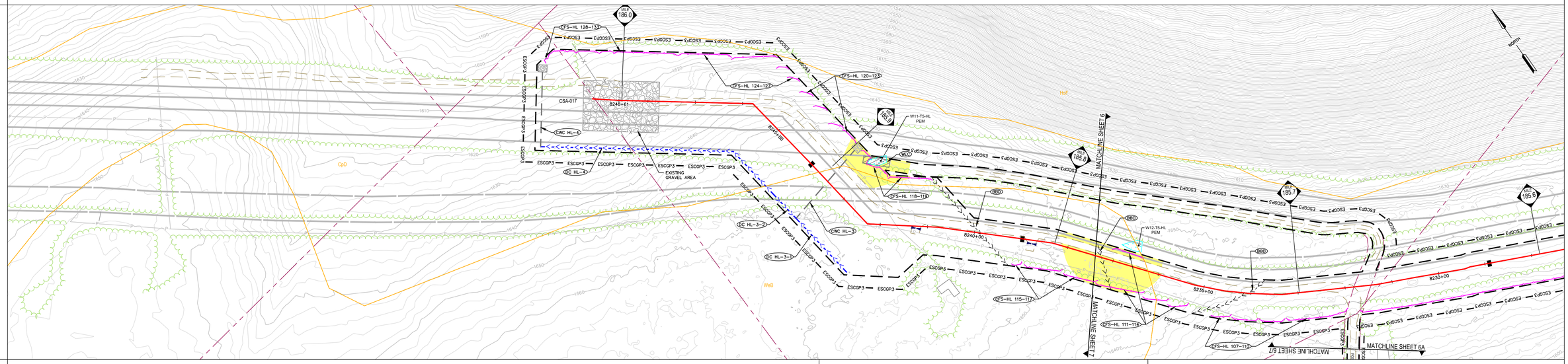
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 6A OF 22

OWNERSHIP & TRACT NUMBER	JEFFREY MORGAN HL-PA-CL-0016	POST HOLLOW LLC HL-PA-CL-0017	MARK D. MCALANIS HL-PA-CL-0015
PROFILE (MIN. PIPE DEPTH)	N/A	5'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	POST HOLLOW (EV, MF)		

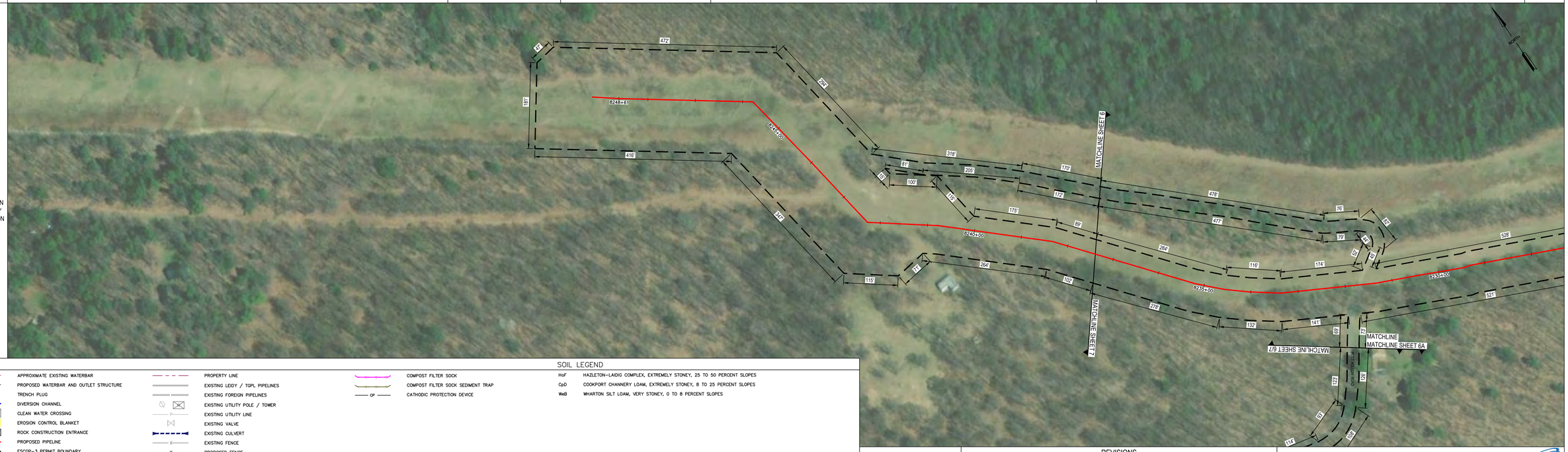
ALIGNMENT



SOIL TYPE	CpD	WeB	CpD

AVERAGE % SLOPE	9%	10%	3%	2%	8%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
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- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE

SOIL LEGEND

HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONEY, 25 TO 50 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONEY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONEY, 0 TO 8 PERCENT SLOPES

- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SCALE 1" =100'

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
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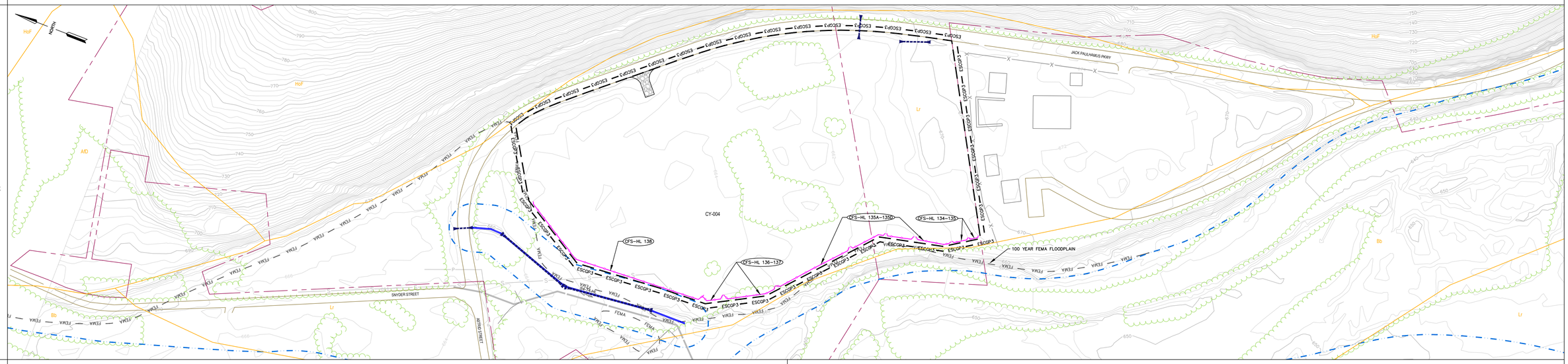
APPROVED BY: KCC	DATE: 9/20/19		SHEET 7
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	FARWELL REAL ESTATE LLC HL-PA-CL-0022	FARWELL REAL ESTATE LLC HL-PA-CL-0023	DEPT. OF TRANSPORTATION
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	TRANSITIONAL AREAS		
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)		
CONTRACTOR YARD			
SOIL TYPE	Lr	Bb/Lr	
AVERAGE % SLOPE			
CONSTRUCTION CONFIGURATION			

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
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- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
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- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FORDIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
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- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 — EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

SOIL LEGEND

Bb	BARBOUR-CRAIGSVILLE COMPLEX
Lr	LINDEN SILT LOAM, RARELY FLOODED
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONEY, 25 TO 50 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
044311-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

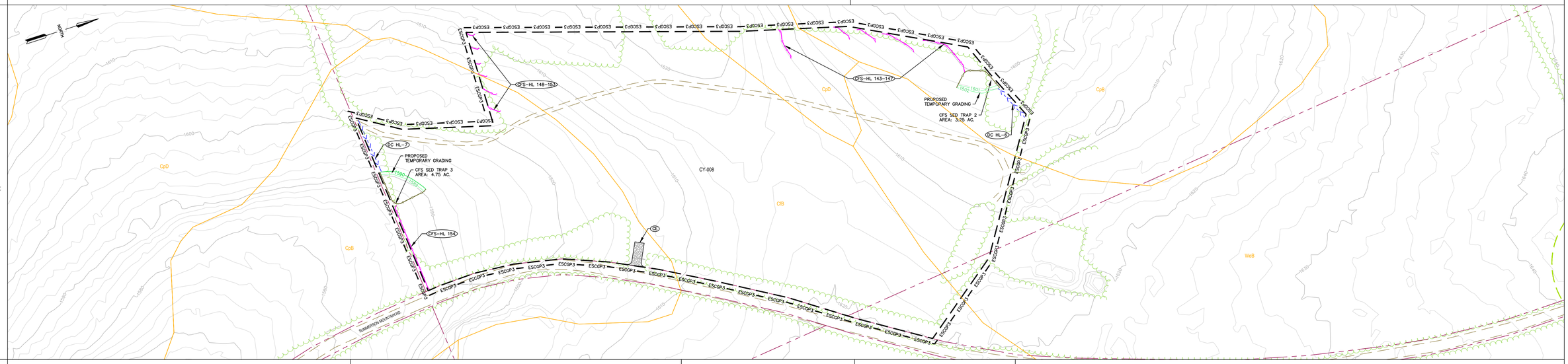
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 8 OF 22
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	THOMAS F. CHARLES HL-PA-CL-0009.011	THOMAS F. CHARLES HL-PA-CL-0025	THOMAS F. CHARLES HL-PA-CL-009.012
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	TRANSITIONAL AREAS		
RECEIVING WATERS	SKUNK HOLLOW (HQ-CWF, MF)	PADDY RUN (EV, MF)	

CONTRACTOR YARD



SOIL TYPE	CpB/CfB	CfB/CpD	CfB/CpB/WeB
AVERAGE % SLOPE			

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
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- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CfB	CYLMER CHANNERY LOAM, EXTREMELY STONEY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONEY 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONEY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONEY, 0 TO 8 PERCENT SLOPES

SCALE 100 50 0 100
SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 2/1/2019	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 9
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

Transcontinental Gas Pipe Line Company, LLC

Section 2-1 E&SC/SR Plan Narrative and Drawings

Leidy South Project – Hensel Replacement

September 2019

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Sections

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2.0 Topographic Features of the Area (NOI Checklist Item 3.a, 7.a)

3.0 Receiving Surface Waters (NOI Checklist Item 3.e, 7.e)

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

- 4.1 Resolutions to Soil Limitations
- 4.2 Geologic Formations

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

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10.0 Riparian Buffers (NOI Checklist Item 3.o, 7.n)

11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

- 11.1 Eastern Terminus Main Line Valve and Access Road
- 11.2 Western Terminus Main Line Valve

12.0 The Erosion and Sediment Control Plan Shall be Prepared by a Person Trained and Experienced in Erosion Control Methods and Techniques

Attachments

1 Project Location Map

2 Soils Map and Report

3 E&SC and SR Plan BMP Design Worksheets and Calculations

Drawings (NOI Checklist Item 3.i, 7.i)

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38 - 39 of 39 Geohazard Mitigation Details

1.0 Project Description (NOI Checklist Item 3.n)

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Hensel Replacement. The Hensel Replacement consists of installing approximately 6.3 miles of 36-inch pipeline loop along Transco's Leidy Line in Leidy and Chapman Townships, Clinton County. This pipeline will replace the capacity of a segment of Transco's existing 23.375-inch Leidy Line A pipeline, and this segment of the Leidy Line A pipeline totaling 5.8 miles will be abandoned and removed with the exception of 0.8 mile under the Tamarack Swamp Natural Area, which is proposed to be grouted in-place. Once placed into operation, Transco will refer to the Hensel Replacement as the Leidy Line D. Transco will be relocating and installing a Mainline Valve (MLV) near the eastern terminus of the Hensel Replacement as a means to isolate gas flows along sections of a pipeline. At the western terminus of the Hensel Replacement at an existing MLV, pig traps and block valves will be added. Cathodic protection cable will be installed from proposed MLV near the eastern terminus to MP 190.5, and from the western terminus of Hensel Replacement to the Tamarack Swamp Natural Area and associated wetlands on the Leidy Line "A" and "B" existing right-of-way. The cathodic protection cable will be installed in the same trench as the pipeline within wetland, stream and floodway crossings. The Hensel Replacement will include the construction of one temporary offline contractor yard and five temporary contractor staging areas.

The Hensel Replacement is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

The E&SC and SR Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). Transco will use and implement the practices, measures and details outlined herein to control soil erosion and off-site sedimentation. All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Hensel Replacement will be approximately 135.2 acres. Subject to

receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 3.a, 7.a)

A Project Location Map for the Hensel Replacement is included in Attachment 1. This map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Tamarack, Young Womans Creek and Renovo East, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 3.e, 7.e)

The following table (Table 1) list each watershed located Hensel Replacement Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters

Watershed Name	Designated Use	Existing Use	PFBC Classification
Turtle Point Hollow	EV, MF	-	Naturally Reproducing Trout
Drury Run	EV, MF	-	Naturally Reproducing Trout
Austin Hollow	EV, MF	-	Naturally Reproducing Trout
Hensel Fork	EV, MF	-	Naturally Reproducing Trout
Paddy Run	EV, MF	-	Naturally Reproducing Trout
Dark Hollow	EV, MF	-	Naturally Reproducing Trout
Shingle Branch	EV, MF	-	Class A Wild Trout
Mudlick Run	EV, MF	-	Class A Wild Trout
Sandy Run	HQ-CWF, MF	-	Naturally Reproducing Trout
West Branch Susquehanna River	WWF, MF	-	-

EV: Exceptional Value, MF: Migratory Fishes, WWF: Warm Water Fishes
HQ-CWF: High Quality- Cold Water fishes

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 18 soil mapping units located within the LOD, see Table 2 below:

Table 2 – Soils mapping units within the LOD	
Soil Mapping Unit	**Soil Series**
At	Atkins silt loam, 0 to 3 percent slopes, frequently flooded
Bb	Barbour-Craigsville complex
CaB	Calvin channery silt loam, 3 to 8 percent slopes
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony
Fr	Freetown mucky peat
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony
HuB	Hustontown silt loam, 3 to 8 percent slopes
HuD	Hustontown silt loam, 15 to 25 percent slopes
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony
Lr	Linden silt loam, rarely flooded
MhD	Meckesville channery loam, 8 to 25 percent slopes, very stony
UnB	Ungers loam, 3 to 8 percent slopes
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony
WgB	Wharton-Cookport complex, 0 to 8 percent slopes, very stony

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the Hensel Replacement and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Atkins	At	X	C/S			X	X	X	X	X	X	X	X				X
Barbour	Bb	X	C	X		X	X	X				X	X				X

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Calvin	CaB	X	C	X	X			X			X		X				
Cookport	CpB, CpB	X	C/S	X	X		X	X	X	X	X	X	X				X
Freetown	Fr	X	C/S				X	X	X				X			X	
Hazleton	HmD , HoF	X	C	X	X			X	X	X	X	X	X				
Hustontown	HuB, HuD	X	C/S	X			X	X		X	X		X				
Laidig	LdC	X	C/S	X	X		X	X	X	X	X	X	X				
Linden	Lr	X	C			X	X	X	X	X	X		X				
Meckesville	MhD	X	C/S				X		X	X	X	X	X				X
Ungers	UnB, UpF	X	C		X				X	X			X				
Wharton	WeB , WgB	X	C/S		X		X	X	X	X	X	X	X	X			X

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.

3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Hensel Replacement does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Hensel Replacement lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the

vicinity of the Hensel Replacement Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

The Hensel Replacement will be primarily co-located with the existing Transco Leidy Lines in Clinton County, Pennsylvania. The existing Leidy Line A pipeline totaling 5.8 miles will be abandoned and removed with the exception of 0.8 mile under the Tamarack Swamp Natural Area; which is proposed to be grouted in place. Transco will be relocating and installing a Mainline Valve (MLV) near the eastern terminus as a means to isolate gas flows. Pig launchers/receivers will be located at this MLV facility. At the western terminus, at an existing MLV, pig traps and block valves will be added. All work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. Along the edges of the ROW land use is primarily forested. The proposed contractor yard and staging areas will be used temporarily and subsequently removed after the completion of the Project. Staging areas will be used for parking, equipment turn-arounds, and temporary storage of equipment. Transco will use a contractor yard for parking, contractor offices, and the storage of construction equipment and pipes. This contactor yard consists of an agricultural field. All disturbed areas within these temporary workspaces will be restored to the original contours. Transco will use and implement the practices, measures, and details to control soil erosion and off-site sedimentation during construction. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that the Hensel Replacement site has been an existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years likely would have been either forested land or meadow.

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

Various erosion and sediment control measures will be used during the construction of the Hensel Replacement. BMPs proposed to be used at the Site to control soil erosion and sediment pollution are listed below. Details of BMPs proposed to be used at the Project location is included

in the Erosion and Sedimentation Control Plan sheets. BMP's listed will be used at the Project location at the discretion of the environmental inspector, when found necessary to comply with 25 PA Code Chapter 102 and to adequately address potential erosion and sediment control issues.

Rock Construction Entrances

Rock construction entrances shall be installed whenever sediment tracking onto road surfaces is a potential or if required by the county conservation district or other agency. Soil erosion control measures shall be installed, if required and as needed. In special protection watersheds, either a 100' long rock construction entrance or a standard 50' rock construction entrance with a wash rack will be used at the construction entrance to wash construction vehicle wheels before they enter the public roadway. The wash rack will discharge to a 24" compost filter sock (min.). Rock construction entrance thickness shall be constantly maintained to the specified dimensions by adding rock. All sediment deposited on roadways shall be removed and returned to the construction site immediately.

Compost Filter Sock

Compost filter sock shall be placed downslope of disturbed areas to serve as a sediment barrier and filter. Filter sock shall be placed at existing level grade, parallel to contours, with both ends of the sock extended up slope at a 45 degree angle. Socks can be used on both steep and rocky slopes. Socks can range in size from 12 inch to 32 inch diameter depending on the site conditions. The Maximum Permissible Slope Lengths Above Compost Filter Socks will be used to determine the sizes of compost filter.

Compost Filter Sock Sediment Trap

Runoff may be directed into the Compost Filter Sock Sediment Traps of sheet flow into the trap. Compost sock sediment traps shall not exceed three socks in height and shall be stacked in pyramidal form. Minimum trap height is one 24" diameter sock. Additional storage may be provided by means of an excavated sump 12" deep extending 1 to 3 feet upslope of the socks along the lower side of the trap. The maximum tributary drainage area is 5.0 acres. Since compost socks are "flow-through," no spillway is required. Installation of an excavated sump immediately above the socks may increase trap efficiency where soil conditions permit their construction.

Broad Based Dips

Broad-based dips may be used to direct runoff from access roads to well-vegetated areas. In HQ/EV watersheds, sump with compost filter sock should be utilized at the discharge end of the broad-based dip.

Waterbars

Waterbars will be aligned along the pipeline ROW to direct runoff towards the downslope side of the disturbed area and to avoid backflow into the ROW. Compost filter sock shall be installed along the edge of the limit of disturbance to slow run off. Compost filter sock hooks shall be installed at an upslope angle and shall discharge to a well-vegetated area. Upslope of the CFS, a sump shall be constructed to reduce velocity and provide a sheet flow condition to the CFS. Permanent waterbars within the ROW shall be left in place after permanent stabilization has been achieved.

Compost Filter Sock Waterbar Discharge / Waterbar Sump

An 18" Compost Filter Sock shall be installed at the edge of the LOD where waterbar cross the LOD. Upslope of the CFS a 24" x 24" sump shall be constructed to reduce velocity and provide a sheet flow condition to the CFS. The sump shall be filled and stabilized when the CFS is removed after site stabilization.

Diversion Channels / Mountable Berms

Diversion channels or mountable berms shall be used to divert runoff from disturbed areas and convey it to appropriate BMPs such as a sedimentation basin sediment trap or clean water crossing.

Trench Plug

These will be placed at the banks of waterbodies in order to maintain stable working conditions and keep sediment from entering the waterways. Earth filled sacks will be used to secure the plug. The spacing of these structures varies based on the site and the slope of the dig location, as indicated in the plan drawings.

Erosion Control Blankets

A suitable erosion control blanket or soil stabilizer shall be used wherever earth disturbance occurs in close proximity (within 50 feet) of surface waters especially if site conditions make use of conventional E&S BMPs difficult. Erosion control blankets should be used on finished slopes greater than 3:1.

Timber Mats

Timber mats can be used for temporary wetland crossings. The timber mats are placed over the wetland to allow equipment to cross and then are removed.

Temporary Equipment Bridges

A temporary bridge equipment crossing will be built in order to cross any streams along the pipeline installation. The bridge equipment crossing will utilize geotextile material, timber mats, and a timber or metal bridge with side rails any may include instream supports (where necessary). Culvert Equipment crossings may be used in areas where equipment must cross stream channels. Culverts shall be placed in the stream channel sized appropriately to convey the flow within the channel and shall be placed at least one-half their diameter apart. Coarse aggregate may be used for fill surrounding the culverts. Upon completion, all material placed in the stream channel shall be completely removed.

Flumed Crossing/ Dam and Pump Crossing

These may be used when work is to be completed in a waterway. A flumed crossing involves the placement of a flume pipe within the waterway and using diversion structures up and down gradient to divert flow through the flume pipe and out of the work area. A dam and pump crossing involves placing sandbag barriers on the upstream and downstream sides of the work space to prevent water from entering the maintenance area. A pump shall be placed to move any water from the upstream side, around the workspace and back to the downstream side of the work area. Trench plugs may be used on the banks of the stream to keep water from leaving the bed and banks limit of the waterway.

Pumped Water Filter Bag

Filter bags shall be placed in well-vegetated grassy areas and discharge onto stable, erosion resistant areas, and staked if the slope is greater than 5 percent. In the event that this is not possible, a geotextile path will be provided. A compost filter sock shall be placed below the filter bag when placed within 50 of streams or wetlands located within a HQ/EV watershed.

Trench Dewatering

Trench dewatering may be required, depending on the site conditions during the excavation. Water shall be pumped out and discharged into a filter bag or a dewatering structure when deemed necessary.

Safety Fence

Safety fence shall be installed to protect sensitive environmental features as depicted on the plan drawings. The fencing shall remain in place during all phases of construction.

Siltron Pollution Prevention Fence

Siltron Pollution Prevention Fence may be used throughout the project where environmental features make it necessary in lieu of Compost Filter Sock (CFS). The site specific sediment barriers will be selected by the environmental inspector on a site by site basis. These barriers will be placed at existing level grade, with both ends of the barrier extending at least 8' upslope at a 45 degree angle. Sediment must be removed when accumulations reach ½ the above ground height of the fence. The size and type of fence will be selected based on slope lengths as determined in the maximum slope length for Multi-Layer Geotextile Filter Fence figures. The 16-inch filter fence is equivalent to an 18-inch compost filter sock, the 21-inch filter fence is equivalent to a 24-inch compost filter sock, and a 28-inch filter fence is equivalent to a 32-inch compost filter sock. Approved for use as an Alternative E&S and PCSM BMP by PA DEP on 8/22/18.

Rock Filter Outlet

Rock filter outlets may be used to address areas where concentrated flows intersect sediment barriers. They may also be used in instances where sediment barriers such as silt fence or compost filter socks have failed due to concentrated flow.

Wetland Installation Procedures

During the course of pipeline maintenance and replacement within wetland areas, BMP's including slope breakers, equipment mats, sediment barriers, and trench plugs may be used to prevent altering the hydrology of the wetland and to prevent sediment from entering the wetland. Work within the wetland boundaries shall be limited to the extent possible. Upon completion of work the wetland area shall be restored to pre-construction grades and seeded with an appropriate wetland seed mixture.

Hydrostatic Dewatering Structure

A hydrostatic dewatering structure will be placed on a level, well vegetated site such that water will flow away from the structure and work areas. Flow rates through discharge and diverter pipes will be such that structures will not overflow. Contractor will properly remove and dispose of the dewatering structure immediately upon completion of dewatering operations.

Bored Road Crossing/Trenched Road Crossing

These may be used where pipeline installation or maintenance under a bored road is necessary. Sediment barriers shall be used around the work area. Culverts will be placed where required to maintain water flow for stormwater ditches.

Clean Water Crossings

Temporary diversion channels or mountable berms shall be used to divert runoff from undisturbed upslope areas and convey the runoff around areas of earth disturbance within the pipeline ROW corridor. From the diversion, the flow will outlet to a temporary pipe(s) crossing, which is installed across the right-of-way, and discharge to an outlet basin. Clean water leaving the outlet basin will return to sheet flow downslope of the disturbed ROW.

Revegetation Plan and Procedures

The construction site should be stabilized as soon as possible after completion. Establishment of final cover must be initiated no later than 7 days after reaching final grade. Temporary erosion and sedimentation control BMPs can be removed when the site meets final stabilization. Final stabilization means that all soil-disturbing activities are completed, and that either a permanent vegetative cover with a density of 70% or greater has been established or that the surface has been stabilized by hard cover such as pavement or buildings. It should be noted that the 70% requirement refers to the total area vegetated and not just a percent of the site.

Surface Roughening

Surface roughening is the practice of providing a rough 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.

Typical Topsoil Stockpile

The maximum stockpile height shall not exceed 35 feet. Stockpile slopes shall be no steeper than 2H:1V. Stockpiles shall be stabilized in accordance with temporary seeding specifications and mulch is to be maintained until the stockpile is stabilized. Stockpile location shown on the plans are illustrative and may vary in location as construction proceeds.

Typical Channel and Vegetation Restoration

The impacted riparian zone will be restored for a minimum of 15 feet landward of the top of bank. If the pre-impact riparian buffer of native herbaceous and shrub vegetation exceeds 15 feet beyond the top of bank, the area to be seeded should be as follows: 150 feet in High-Quality waters, 100 feet in other waters, or existing width of the riparian zone if it is less than the minimum requirements. Ernst Seed Mix 178 (Riparian Buffer Mix) or similar shall be applied on restored banks and riparian zones. In addition, where existing forested buffers are impacted these shall be replanted outside of the existing maintained ROW, as indicated in forest replanting plans for the Project outlined in the Chapter 105 permit.

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

8.0 Thermal Impacts (NOI Checklist Item 3.m, 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The pipeline installation activities will primarily take place within an existing cleared and maintained pipeline right-of-way. There will be no increase in stormwater discharge. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and the Sequence of Construction outline disturbed areas being immediately revegetated.

Stormwater runoff associated with the installation of the MLV's will be routed through the stormwater BMP's designed to retain and infiltrate the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool as the storm event progresses. The BMPs are designed to capture and infiltrate this warmest surge of stormwater. Based on routing calculations, stormwater is not discharged from the BMPs for the first 12 hours during a 100-year/24-hour storm event. The retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

9.0 Antidegradation Requirements (NOI Checklist Item 3.p, 7.o)

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the eastern and western terminus of the Hensel Replacement. In order for the Project to meet the required purpose and need, siting the Hensel Replacement outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian

buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the Hensel Replacement because there are no viable non-discharge alternatives. The Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

Pipeline installation activities along the pipeline ROW and at the contractor yards/staging areas will not result in increase in discharge of stormwater to surface waters. The existing / designated use of the streams within the Project area are to be protected through E&S and PCSM measures taken by Transco.

The eastern and western terminus MLV sites will result in increased discharge of stormwater to surface waters which will be mitigated by the implementation of post-construction stormwater management (PCSM) BMP's. Proposed PCSM BMPs are designed with stormwater volume reduction and water quality treatment maximized to the extent practicable within the site constraints to maintain and protect existing water quality and existing and designated uses.

10.0 Riparian Buffers (NOI Checklist Item 3.o, 7.n)

Pipeline installation will take place within an existing cleared and maintained pipeline ROW and forested areas. Due to the linear nature of the project, temporary impacts within riparian buffers are unavoidable. At locations where it was impossible to avoid riparian impacts due to safety issues, Transco will implement BMPs to minimize the impacts. After completing the construction activities, all areas used for pipeline installation and as contractor yards/staging areas will be restored back to pre-existing contours and reseeded with a riparian seed mix in areas where slopes are less than 10%. At the eastern and western terminus sites where permanent increase in impervious area is proposed, no riparian buffers were identified. Tree and shrub plantings will occur in forested riparian buffers outside of the maintained ROW as outlined in riparian reforestation plans outlined in the Chapter 105 permit.

Linear projects including pipelines are eligible for the Riparian Buffer Waiver under 25 PA Code §102.14(d)(2)(ii) if riparian buffers are undisturbed to the extent practicable. As such, a Riparian Buffer Waiver has been requested along with this ESCGP-3 application (Section 1-7).

11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

Changes in Project site runoff are not anticipated for the Project except at the eastern and western terminus MLV sites where increase in impervious areas are proposed. The Project site is primarily existing and maintained pipeline right-of-way in meadow condition with a forested fringe. The ROW will be restored to meadow condition upon the completion of construction. Proposed BMPs were sized based on the maximum tributary drainage area anticipated during construction. An analysis of pre- and post-development stormwater runoff was performed for the MLV sites. The installation of the valves and associated access road will increase the volume of stormwater runoff due to the increase in the type and size of the impervious area. The contractor will construct stormwater BMPs to mitigate the increase in volume and peak rates associated with construction. Refer to the Post-Construction Stormwater Management (PCSM) Plan for additional information (Section 3 of this ESCGP-3 Application). Changes in stormwater runoff between pre- and post-development conditions for 2-year rainfall event and changes in peak discharge rates for 1,2,10,25,50 and 100-yr storms are given in the tables below.

11.1 Eastern Terminus Main Line Valve and Access Road

Pre- and Post-Development Stormwater Volume for 2-yr Rainfall (cf)		
Pre-development	**Post-development before BMPs**	**Net**
1,761	4,118	2,357

Pre-Construction Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.03	0.16	1.20	2.30	3.41	4.75

Post-Construction without BMPs Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.36	0.98	3.33	5.23	7.05	9.12

11.2 Western Terminus Main Line Valve

Pre- and Post-Development Stormwater Volume for 2-yr Rainfall (cf)		
Pre-development	**Post-development before BMPs**	**Net**
5,532	6,229	697

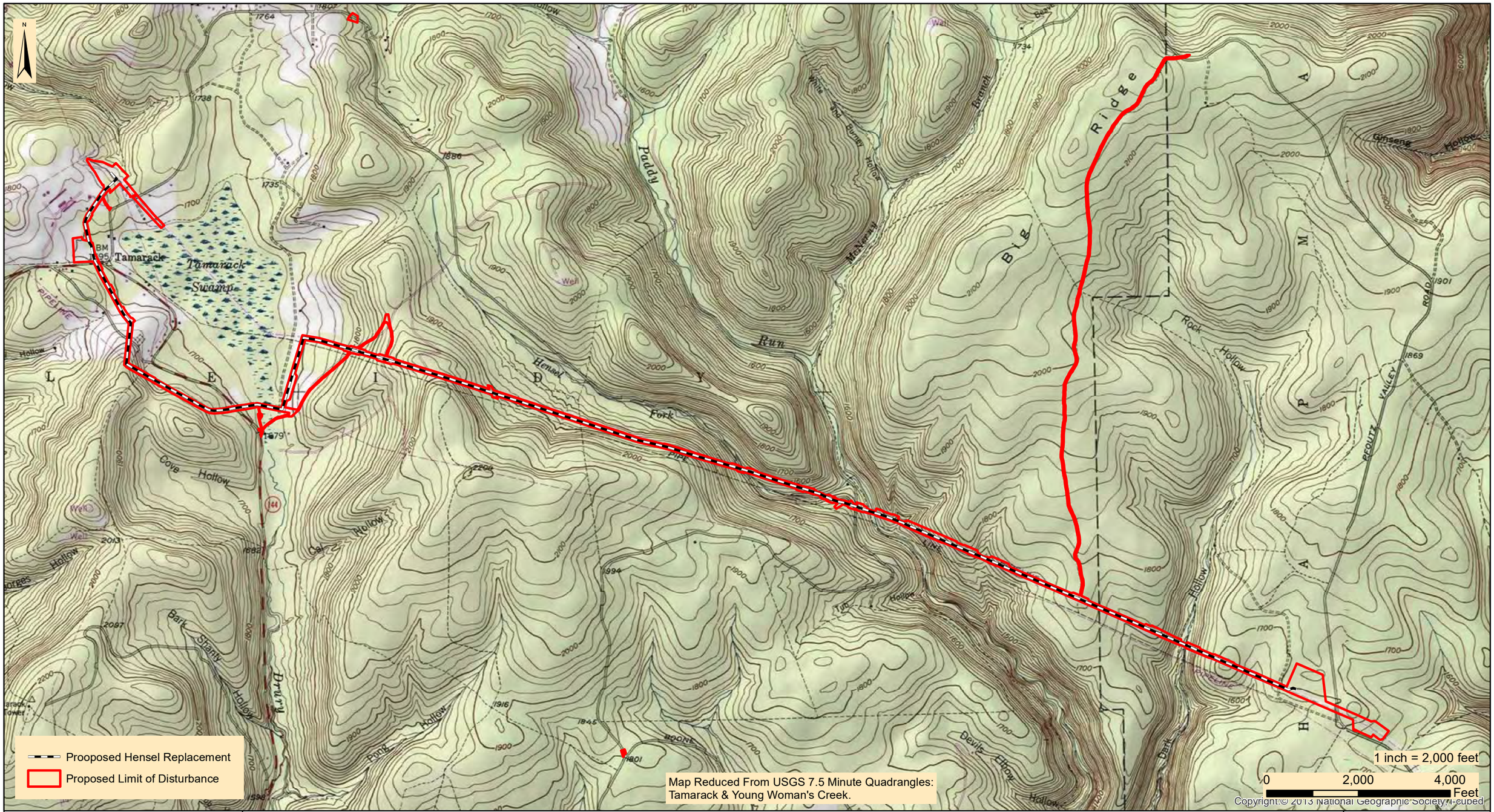
Pre-Construction Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.17	1.09	5.67	9.63	13.34	17.88

Post-Construction Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.42	1.77	7.36	11.97	16.35	21.44

12.0 The Erosion and Sediment Control Plan Shall be Prepared By a Person Trained and Experienced in Erosion Control Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual, March 2012. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



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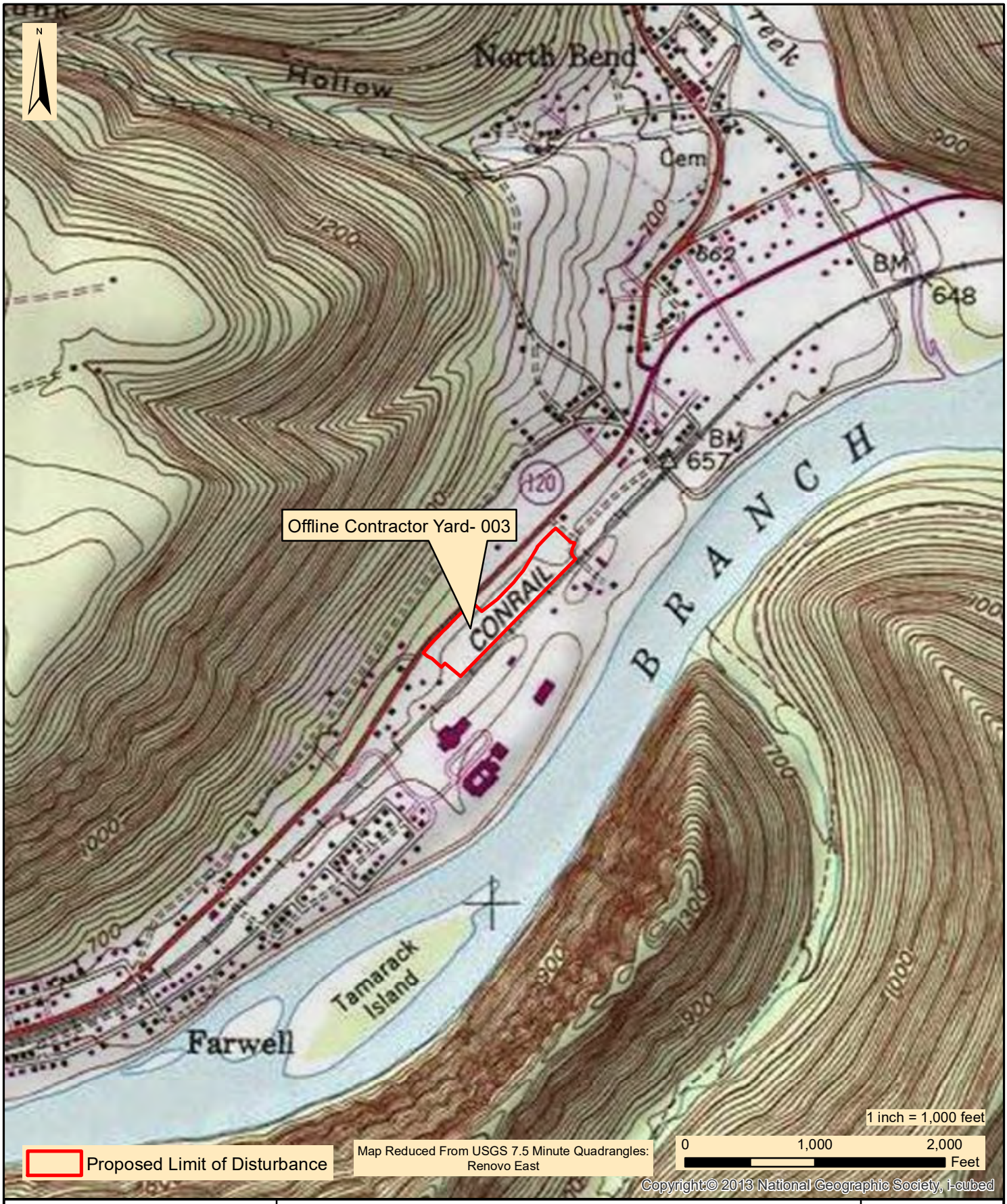
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HENSEL REPLACEMENT
PROJECT LOCATION MAP

LEIDY & CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	8/21/2019
WHM DRAWING NUMBER:	WILLIAMS202B001
Drawn By:	FTN
Figure Number:	1-1



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LEIDY SOUTH PROJECT

LEIDY LINE D 36" HENSEL REPLACEMENT
PROJECT LOCATION MAP

CHAPMAN TOWNSHIP CLINTON COUNTY PENNSYLVANIA

Date:	8/21/2019
WHM Drawing Number:	WILLIAMS200A001-1
Drawn By:	FTN
Figure Number:	1-2

ATTACHMENT 2
SOILS MAP AND REPORT

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Clinton County, Pennsylvania

Hensel Replacement

July 2, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

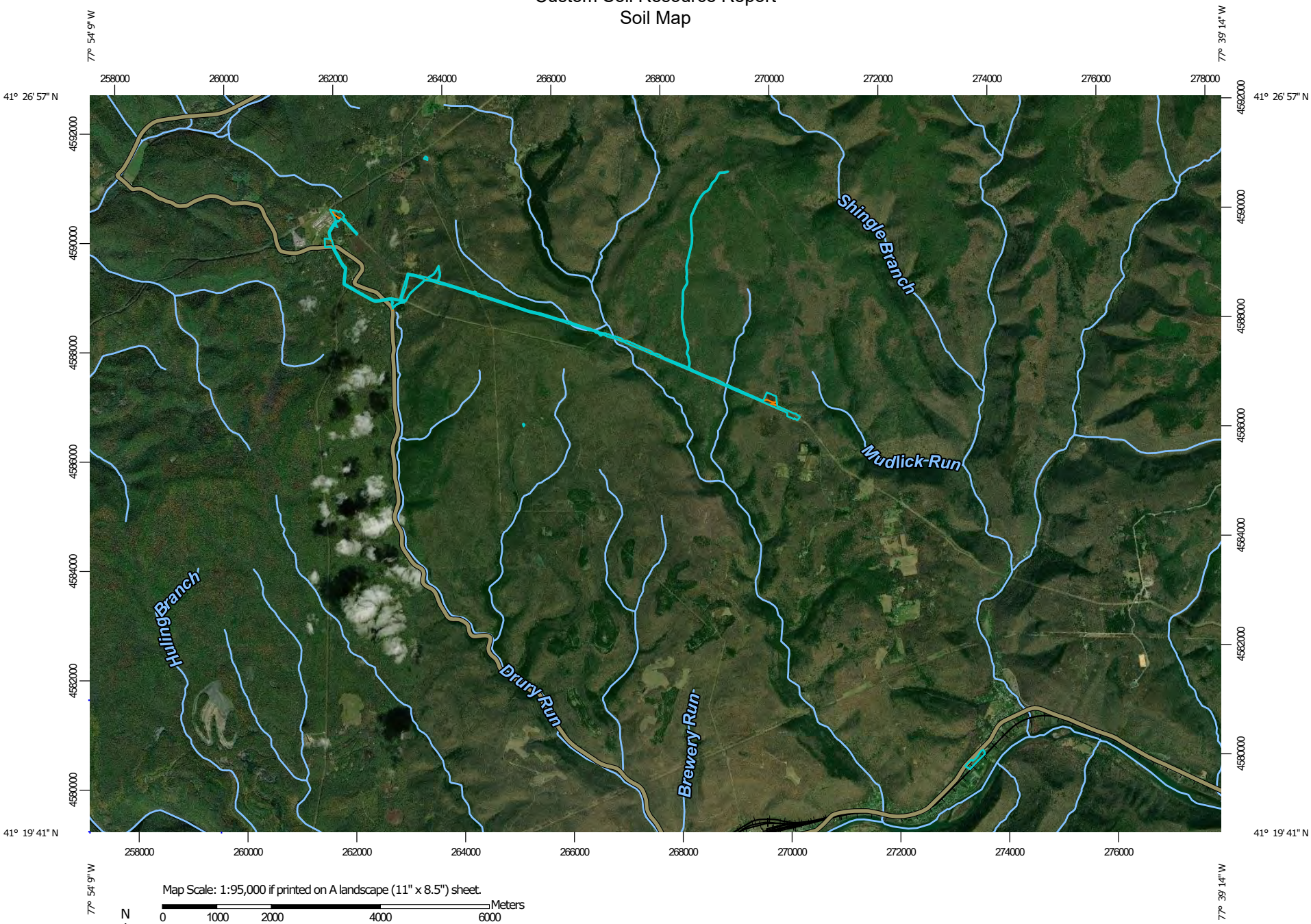
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:95,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 1000 2000 4000 6000

Feet: 0 4500 9000 18000 27000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clinton County, Pennsylvania
Survey Area Data: Version 14, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 4, 2012—Sep 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
At	Atkins silt loam, 0 to 3 percent slopes, frequently flooded	2.4	1.7%
CaB	Calvin channery silt loam, 3 to 8 percent slopes	1.0	0.7%
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony	11.6	8.5%
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony	12.5	9.2%
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony	11.1	8.2%
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony	13.4	9.9%
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony	10.7	7.9%
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony	36.6	27.0%
HuB	Hustontown silt loam, 3 to 8 percent slopes	6.4	4.7%
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony	0.3	0.2%
Lr	Linden silt loam, rarely flooded	8.6	6.3%
MhD	Meckesville channery loam, 8 to 25 percent slopes, very stony	2.5	1.8%
UnB	Ungers loam, 3 to 8 percent slopes	9.4	6.9%
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony	5.0	3.7%
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony	4.1	3.0%
Totals for Area of Interest		**135.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.

The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Pennsylvania

At—Atkins silt loam, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2sfsp
Elevation: 550 to 2,790 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Atkins and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atkins

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Acid fine-loamy alluvium derived from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 8 inches: silt loam
Bg - 8 to 26 inches: loam
BCg - 26 to 38 inches: silt loam
Cg - 38 to 80 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Philo

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Basher

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Linden

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

CaB—Calvin channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l801
Elevation: 300 to 2,800 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Calvin and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calvin

Setting

Landform: Ridges on valleys
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest

Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid reddish brown residuum weathered from shale and siltstone

Typical profile

A - 0 to 1 inches: channery silt loam
BE - 1 to 3 inches: very channery silt loam
Bw - 3 to 30 inches: very channery silt loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 10 percent
Landform: Ridges, valleys
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Meckesville

Percent of map unit: 5 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hustontown

Percent of map unit: 5 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

CfB—Clymer channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80f
Elevation: 1,000 to 4,000 feet
Mean annual precipitation: 32 to 60 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Hartleton

Percent of map unit: 5 percent
Landform: — error in exists on —
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

CgB—Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80g
Elevation: 1,000 to 2,500 feet
Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 101 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 40 percent
Cookport and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: channery loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A - 0 to 8 inches: channery loam

Bt - 8 to 22 inches: loam
Btx - 22 to 46 inches: loam
C - 46 to 54 inches: channery loam
R - 54 to 64 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Dekalb

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Buchanan

Percent of map unit: 5 percent

Hydric soil rating: No

CpB—Cookport channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshh
Elevation: 910 to 2,620 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

CpD—Cookport channery loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshq
Elevation: 610 to 2,450 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: Yes

Hazleton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

HmD—Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82t
Elevation: 800 to 4,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 50 percent
Clymer and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Laidig
Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Wharton
Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Leetonia
Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

HoF—Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: l82w
Elevation: 800 to 2,900 feet
Mean annual precipitation: 34 to 60 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Hazleton and similar soils: 35 percent
Laidig and similar soils: 35 percent

Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Laidig

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sandstone and shale

Typical profile

A - 0 to 3 inches: extremely stony loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock

Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clymer
Percent of map unit: 10 percent
Hydric soil rating: No

Hapludults, nonstony
Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 10 percent
Hydric soil rating: No

HuB—Hustontown silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: l835
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Hustontown and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hustontown

Setting
Landform: Valley sides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase

Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Red residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 24 inches: silt loam
Bt - 24 to 30 inches: channery silt loam
Btx - 30 to 65 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 32 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 12 to 26 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ungers

Percent of map unit: 5 percent

Unnamed

Percent of map unit: 5 percent

Leck kill

Percent of map unit: 5 percent

LdC—Laidig gravelly loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l83s

Elevation: 900 to 1,400 feet
Mean annual precipitation: 34 to 55 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 110 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Laidig and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laidig

Setting

Landform: Mountain slopes, valley sides
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sedimentary rock

Typical profile

A - 0 to 3 inches: gravelly loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Buchanan

Percent of map unit: 10 percent
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Clymer
Percent of map unit: 5 percent
Hydric soil rating: No

Murrill
Percent of map unit: 5 percent
Hydric soil rating: No

Lr—Linden silt loam, rarely flooded

Map Unit Setting
National map unit symbol: l84b
Elevation: 520 to 1,000 feet
Mean annual precipitation: 32 to 45 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 140 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Linden and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Linden

Setting
Landform: Flood plains on river valleys
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
Ap - 0 to 12 inches: silt loam
B - 12 to 48 inches: gravelly silt loam
C - 48 to 70 inches: sandy loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 36 to 72 inches

Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Philo
Percent of map unit: 10 percent
Hydric soil rating: No

Barbour
Percent of map unit: 5 percent
Hydric soil rating: No

Basher
Percent of map unit: 5 percent
Hydric soil rating: No

MhD—Meckesville channery loam, 8 to 25 percent slopes, very stony

Map Unit Setting
National map unit symbol: l84q
Elevation: 700 to 1,100 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Meckesville and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile
A - 0 to 4 inches: channery loam

Bt - 4 to 35 inches: channery silt loam
Btx - 35 to 66 inches: channery silt loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 3.0 percent
Depth to restrictive feature: 30 to 48 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 27 to 45 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Ungers

Percent of map unit: 10 percent
Hydric soil rating: No

Laidig

Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

UnB—Ungers loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l863
Elevation: 900 to 2,200 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 110 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ungers and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Ap - 0 to 9 inches: loam
Bt - 9 to 33 inches: channery clay loam
BC - 33 to 48 inches: very channery clay loam
R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

Hustontown

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

UpF—Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l869
Elevation: 900 to 2,200 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Ungers and similar soils: 50 percent
Meckesville and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and siltstone

Typical profile

A - 0 to 6 inches: very stony loam
Bt - 6 to 33 inches: very channery clay loam
BC - 33 to 48 inches: very channery clay loam
R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Hydric soil rating: No

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 35 inches: channery silt loam
Btx - 35 to 66 inches: channery silt loam

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 48 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 30 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Leck kill

Percent of map unit: 10 percent
Hydric soil rating: No

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

WeB—Wharton silt loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86l
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave, convex
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

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ATTACHMENT 3

E&SC AND SR PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

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Attachment

3.1 Compost Filter Sock Worksheets (Standard E&S Worksheet #1)

3.2 Channel Design Worksheets (Standard E&S Worksheet #11)

3.3 Level Spreader Design Worksheet

3.4 Riprap Apron Worksheet (Standard E&S Worksheet #20)

ATTACHMENT 3.1
COMPOST FILTER SOCK WORKSHEETS

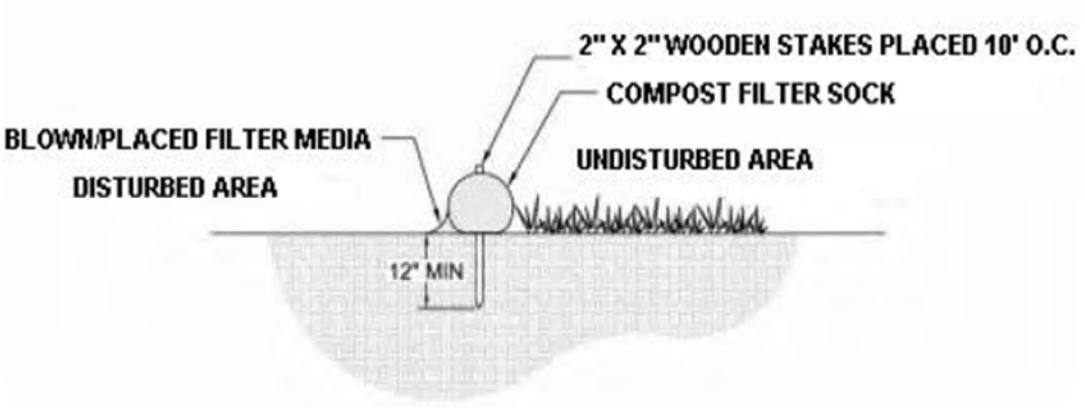
STANDARD E&S WORKSHEET #1
Compost Filter Socks

PROJECT NAME: Leidy South – Hensel Replacement

LOCATION: Hensel Replacement-ROW

PREPARED BY: FJ DATE: 7/26/2019

CHECKED BY: KCC DATE: 8/8/2019



SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 1	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 2	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 3	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 4	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 5	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 6	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 7	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 8	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 9	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 10	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 11	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 12	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 13	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 14	18	see map	4	384
CFS-HR 15	18	see map	4	384
CFS-HR 16	18	see map	4	384
CFS-HR 17	18	see map	4	384
CFS-HR 18	18	see map	4	384
CFS-HR 19	18	see map	4	384

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 20	18	see map	4	384
CFS-HR 21	18	see map	4	384
CFS-HR 22	18	see map	4	384
CFS-HR 23	18	see map	4	384
CFS-HR 24	18	see map	4	384
CFS-HR 25	18	see map	4	384
CFS-HR 26	18	see map	3	459
CFS-HR 27	18	see map	3	459
CFS-HR 28	18	see map	3	459
CFS-HR 29	18	see map	3	459
CFS-HR 30	18	see map	3	459
CFS-HR 31	18	see map	3	459
CFS-HR 32	18	see map	3	459
CFS-HR 33	18	see map	3	459
CFS-HR 34	12	see map	12	100
CFS-HR 35	12	see map	12	100
CFS-HR 36	12	see map	12	100
CFS-HR 37	12	see map	12	100
CFS-HR 38	12	see map	12	100
CFS-HR 39	12	see map	12	100
CFS-HR 40	12	see map	12	100
CFS-HR 41	12	see map	12	100
CFS-HR 42	32	see map, CSA018	6	566
CFS-HR 43	32	see map, CSA019	6	567
CFS-HR 44	32	see map, CSA019	6	567
CFS-HR 45	32	see map, CSA019	6	567
CFS-HR 46	32	see map, CSA019	6	567
CFS-HR 47	32	see map, CSA019	6	567
CFS-HR 48	32	see map, CSA019	6	567
CFS-HR 49	12	see map	12	100
CFS-HR 50	12	see map	12	100
CFS-HR 51	24	see map	6	376
CFS-HR 52	24	see map	6	376
CFS-HR 53	24	see map	6	376
CFS-HR 54	24	see map	6	376
CFS-HR 55	24	see map	6	376
CFS-HR 56	12	see map	9	127
CFS-HR 57	12	see map	9	127
CFS-HR 58	12	see map	9	127

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 59	12	see map	9	127
CFS-HR 60	12	see map	9	127
CFS-HR 61	12	see map	9	127
CFS-HR 62	12	see map	9	127
CFS-HR 63	12	see map	9	127
CFS-HR 64	18	see map	16	104
CFS-HR 65	18	see map	16	104
CFS-HR 66	18	see map	16	104
CFS-HR 67	18	see map	16	104
CFS-HR 68	18	see map	16	104
CFS-HR 69	18	see map	16	104
CFS-HR 70	18	see map	16	104
CFS-HR 71	12	see map	7	88
CFS-HR 72	18	see map	16	104
CFS-HR 73	18	see map	22	72
CFS-HR 74	18	see map	22	72
CFS-HR 75	18	see map	22	72
CFS-HR 76	18	see map	22	72
CFS-HR 77	18	see map	22	72
CFS-HR 78	12	see map	27	37
CFS-HR 79	12	see map	27	37
CFS-HR 79A	12	see map	17	30
CFS-HR 79B	18	see map	16	93
CFS-HR 79C	18	see map	16	93
CFS-HR 79D	18	see map	16	39
CFS-HR 80	18	see map	30	43
CFS-HR 81	18	see map	30	43
CFS-HR 82	12	see map	7	140
CFS-HR 83	12	see map	7	140
CFS-HR 84	12	see map	7	140
CFS-HR 85	12	see map	7	140
CFS-HR 86	12	see map	7	140
CFS-HR 87	12	see map	7	140
CFS-HR 88	12	see map	7	140
CFS-HR 89	12	see map	7	140
CFS-HR 90	12	see map	7	140
CFS-HR 91	12	see map	7	140
CFS-HR 92	12	see map	7	140
CFS-HR 93	12	see map	7	140

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 94	12	see map	6	131
CFS-HR 95	12	see map	6	131
CFS-HR 96	12	see map	6	131
CFS-HR 97	12	see map	6	131
CFS-HR 98	12	see map	6	131
CFS-HR 99	12	see map	3	126
CFS-HR 100	12	see map	3	126
CFS-HR 101	12	see map	3	126
CFS-HR 102	12	see map	9	89
CFS-HR 103	12	see map	9	89
CFS-HR 104	12	see map	9	89
CFS-HR 105	12	see map	9	89
CFS-HR 106	12	see map	9	89
CFS-HR 107	12	see map	9	89
CFS-HR 108	12	see map	9	89
CFS-HR 109	12	see map	9	89
CFS-HR 110	12	see map	9	89
CFS-HR 111	12	see map	9	89
CFS-HR 112	12	see map	9	89
CFS-HR 113	12	see map	9	89
CFS-HR 114	12	see map	9	89
CFS-HR 115	12	see map	10	135
CFS-HR 116	12	see map	10	135
CFS-HR 117	12	see map	10	135
CFS-HR 118	12	see map	3	126
CFS-HR 119	12	see map	3	126
CFS-HR 120	12	see map	3	126
CFS-HR 121	12	see map	9	89
CFS-HR 122	12	see map	9	89
CFS-HR 123	12	see map	9	89
CFS-HR 124	12	see map	9	89
CFS-HR 125	12	see map	9	89
CFS-HR 126	12	see map	9	89
CFS-HR 127	12	see map	9	89
CFS-HR 128	12	see map	9	89
CFS-HR 129	12	see map	9	89
CFS-HR 130	12	see map	9	89
CFS-HR 131	12	see map	9	89
CFS-HR 132	12	see map	12	121

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 133	12	see map	12	121
CFS-HR 134	12	see map	12	121
CFS-HR 135	12	see map	12	121
CFS-HR 136	12	see map	12	121
CFS-HR 137	12	see map	12	121
CFS-HR 138	12	see map	12	121
CFS-HR 139	12	see map	12	121
CFS-HR 140	12	see map	12	121
CFS-HR 141	12	see map	12	121
CFS-HR 142	12	see map	11	85
CFS-HR 143	12	see map	11	85
CFS-HR 144	12	see map	11	85
CFS-HR 145	12	see map	11	85
CFS-HR 145A	24	see map	24	143
CFS-HR 145B	24	see map	24	143
CFS-HR 145C	24	see map	24	143
CFS-HR 145D	12	see map	20	41
CFS-HR 145E	12	see map	20	41
CFS-HR 146	12	see map	11	85
CFS-HR 147	12	see map	11	85
CFS-HR 148	12	see map	11	85
CFS-HR 149	24	see map	24	143
CFS-HR 150	24	see map	24	143
CFS-HR 151	24	see map	24	143
CFS-HR 152	24	see map	24	143
CFS-HR 153	24	see map	24	143
CFS-HR 154	24	see map	24	143
CFS-HR 155	24	see map	24	143
CFS-HR 156	24	see map	24	143
CFS-HR 157	24	see map	24	143
CFS-HR 158	24	see map	24	143
CFS-HR 159	18	see map	20	137
CFS-HR 160	18	see map	20	137
CFS-HR 161	18	see map	20	137
CFS-HR 162	18	see map	20	137
CFS-HR 163	24	see map	37	65
CFS-HR 164	24	see map	37	65
CFS-HR 165	24	see map	37	65
CFS-HR 166	24	see map	37	65

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 167	24	see map	37	65
CFS-HR 168	24	see map	37	65
CFS-HR 169	24	see map	37	65
CFS-HR 170	24	see map	37	65
CFS-HR 171	24	see map	37	65
CFS-HR 172	24	see map	37	65
CFS-HR 173	24	see map	37	65
CFS-HR 174	24	see map	37	65
CFS-HR 175	24	see map	37	65
CFS-HR 176	24	see map	37	65
CFS-HR 177	24	see map	37	65
CFS-HR 178	24	see map	37	65
CFS-HR 179	24	see map	37	65
CFS-HR 180	24	see map	37	65
CFS-HR 181	24	see map	37	65
CFS-HR 182	24	see map	37	65
CFS-HR 183	24	see map	37	65
CFS-HR 184	24	see map	37	65
CFS-HR 185	24	see map	37	65
CFS-HR 186	24	see map	37	65
CFS-HR 187	24	see map	37	65
CFS-HR 188	24	see map	37	65
CFS-HR 189	24	see map	37	65
CFS-HR 190	24	see map	37	65
CFS-HR 191	24	see map	37	65
CFS-HR 192	24	see map	37	65
CFS-HR 193	24	see map	37	65
CFS-HR 194	24	see map	37	65
CFS-HR 195	24	see map	37	65
CFS-HR 196	24	see map	37	65
CFS-HR 197	24	see map	37	65
CFS-HR 198	24	see map	37	65
CFS-HR 199	24	see map	37	65
CFS-HR 200	24	see map	37	65
CFS-HR 201	24	see map	37	65
CFS-HR 202	24	see map	37	65
CFS-HR 203	24	see map	37	65
CFS-HR 204	24	see map	37	65
CFS-HR 205	24	see map	37	65

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 206	24	see map	37	65
CFS-HR 206A	24	see map	37	73
CFS-HR 206B	24	see map	37	73
CFS-HR 206C	24	see map	37	73
CFS-HR 206D	24	see map	37	73
CFS-HR 207	12	see map	34	35
CFS-HR 208	12	see map	34	35
CFS-HR 209	12	see map	34	35
CFS-HR 210	12	see map	34	35
CFS-HR 211	12	see map	34	35
CFS-HR 212	12	see map	34	35
CFS-HR 213	12	see map	34	35
CFS-HR 214	24	see map	36	84
CFS-HR 215	24	see map	36	84
CFS-HR 216	24	see map	36	84
CFS-HR 217	24	see map	36	84
CFS-HR 218	24	see map	44	66
CFS-HR 219	24	see map	44	66
CFS-HR 220	24	see map	44	66
CFS-HR 221	24	see map	44	66
CFS-HR 222	24	see map	44	66
CFS-HR 223	24	see map	33	90
CFS-HR 224	24	see map	33	90
CFS-HR 224A	24	see map	22	88
CFS-HR 224B	24	see map	22	88
CFS-HR 225	24	see map	33	90
CFS-HR 226	24	see map	33	90
CFS-HR 227	24	see map	33	90
CFS-HR 228	24	see map	33	90
CFS-HR 229	24	see map	33	90
CFS-HR 230	24	see map	33	90
CFS-HR 231	24	see map	33	90
CFS-HR 232	24	see map	33	90
CFS-HR 233	18	see map	20	118
CFS-HR 234	18	see map	20	118
CFS-HR 235	18	see map	20	118
CFS-HR 236	18	see map	20	118
CFS-HR 237	18	see map	20	118
CFS-HR 238	18	see map	18	111

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 239	18	see map	18	111
CFS-HR 240	18	see map	18	111
CFS-HR 241	18	see map	18	111
CFS-HR 242	18	see map	18	111
CFS-HR 243	18	see map	18	111
CFS-HR 244	18	see map	18	111
CFS-HR 245	18	see map	18	111
CFS-HR 246	18	see map	18	111
CFS-HR 247	18	see map	18	111
CFS-HR 248	18	see map	18	111
CFS-HR 249	18	see map	18	111
CFS-HR 250	18	see map	18	111
CFS-HR 251	32	see map, CSA020	18	120
CFS-HR 252	32	see map, CSA020	18	120
CFS-HR 253	18	see map	18	111
CFS-HR 254	18	see map	18	111
CFS-HR 255	18	see map	18	111
CFS-HR 256	18	see map	18	111
CFS-HR 257	18	see map	18	111
CFS-HR 257A	12	see map	30	30
CFS-HR 257B	12	see map	30	30
CFS-HR 257C	24	see map	wetland protection	
CFS-HR 257D	24	see map	wetland protection	
CFS-HR 257E	24	see map	wetland protection	
CFS-HR 258	24	see map	41	64
CFS-HR 259	24	see map	41	64
CFS-HR 260	24	see map	41	64
CFS-HR 261	24	see map	41	64
CFS-HR 262	24	see map	41	64
CFS-HR 263	24	see map	41	64
CFS-HR 264	24	see map	41	64
CFS-HR 265	24	see map	41	64
CFS-HR 266	24	see map	41	64
CFS-HR 267	24	see map	41	64
CFS-HR 268	18	see map	36	50
CFS-HR 269	18	see map	36	50
CFS-HR 270	18	see map	36	50
CFS-HR 271	18	see map	36	50
CFS-HR 272	18	see map	36	50

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 273	18	see map	36	50
CFS-HR 274	18	see map	36	50
CFS-HR 275	18	see map	36	50
CFS-HR 276	18	see map	36	50
CFS-HR 277	18	see map	36	50
CFS-HR 278	18	see map	33	72
CFS-HR 279	18	see map	33	72
CFS-HR 280	18	see map	33	72
CFS-HR 281	18	see map	33	72
CFS-HR 282	18	see map	33	72
CFS-HR 283	18	see map	33	72
CFS-HR 284	18	see map	33	72
CFS-HR 285	18	see map	33	72
CFS-HR 286	18	see map	33	72
CFS-HR 287	18	see map	33	72
CFS-HR 288	18	see map	33	72
CFS-HR 289	18	see map	33	72
CFS-HR 290	18	see map	33	72
CFS-HR 291	18	see map	33	72
CFS-HR 292	18	see map	33	72
CFS-HR 293	18	see map	33	72
CFS-HR 294	18	see map	33	72
CFS-HR 295	18	see map	33	72
CFS-HR 296	18	see map	33	72
CFS-HR 297	18	see map	33	72
CFS-HR 298	18	see map	33	72
CFS-HR 299	18	see map	33	72
CFS-HR 300	24	see map	33	86
CFS-HR 301	18	see map	41	58
CFS-HR 302	18	see map	41	58
CFS-HR 303	18	see map	41	58
CFS-HR 304	18	see map	41	58
CFS-HR 305	18	see map	41	58
CFS-HR 306	12	see map	11	79
CFS-HR 307	12	see map	11	79
CFS-HR 308	12	see map	11	79
CFS-HR 309	12	see map	11	79
CFS-HR 310	12	see map	11	79
CFS-HR 311	12	see map	11	79

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 312	12	see map	11	79
CFS-HR 313	12	see map	11	79
CFS-HR 314	12	see map	11	79
CFS-HR 315	12	see map	11	79
CFS-HR 316	12	see map	11	79
CFS-HR 317	18	see map	35	60
CFS-HR 318	18	see map	35	60
CFS-HR 319	18	see map	35	60
CFS-HR 320	18	see map	35	60
CFS-HR 321	18	see map	35	60
CFS-HR 322	18	see map	35	60
CFS-HR 323	18	see map	35	60
CFS-HR 324	18	see map	35	60
CFS-HR 325	18	see map	35	60
CFS-HR 326	24	see map	29	90
CFS-HR 327	24	see map	29	90
CFS-HR 328	24	see map	29	90
CFS-HR 329	24	see map	29	90
CFS-HR 330	24	see map	29	90
CFS-HR 331	24	see map	29	90
CFS-HR 332	24	see map	29	90
CFS-HR 333	24	see map	29	90
CFS-HR 334	24	see map	29	90
CFS-HR 335	24	see map	29	90
CFS-HR 336	24	see map	29	90
CFS-HR 337	24	see map	29	90
CFS-HR 338	24	see map	29	90
CFS-HR 339	24	see map	29	90
CFS-HR 340	24	see map	29	90
CFS-HR 341	24	see map	29	90
CFS-HR 342	24	see map	29	90
CFS-HR 343	24	see map	29	90
CFS-HR 344	24	see map	29	90
CFS-HR 345	24	see map	29	90
CFS-HR 346	24	see map	29	90
CFS-HR 347	24	see map	29	90
CFS-HR 348	24	see map	29	90
CFS-HR 349	24	see map	29	90
CFS-HR 350	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 351	24	see map	29	90
CFS-HR 352	24	see map	29	90
CFS-HR 353	24	see map	29	90
CFS-HR 354	24	see map	29	90
CFS-HR 355	24	see map	29	90
CFS-HR 356	24	see map	29	90
CFS-HR 357	24	see map	29	90
CFS-HR 358	24	see map	29	90
CFS-HR 359	24	see map	29	90
CFS-HR 360	24	see map	29	90
CFS-HR 361	24	see map	29	90
CFS-HR 362	24	see map	29	90
CFS-HR 363	24	see map	29	90
CFS-HR 364	24	see map	29	90
CFS-HR 365	24	see map	29	90
CFS-HR 366	24	see map	29	90
CFS-HR 367	24	see map	29	90
CFS-HR 368	24	see map	29	90
CFS-HR 369	24	see map	29	90
CFS-HR 370	24	see map	29	90
CFS-HR 371	24	see map	29	90
CFS-HR 372	24	see map	29	90
CFS-HR 373	24	see map	29	90
CFS-HR 374	24	see map	29	90
CFS-HR 375	24	see map	29	90
CFS-HR 376	24	see map	29	90
CFS-HR 377	24	see map	29	90
CFS-HR 378	24	see map	29	90
CFS-HR 379	24	see map	29	90
CFS-HR 380	24	see map	29	90
CFS-HR 381	24	see map	29	90
CFS-HR 382	24	see map	29	90
CFS-HR 383	24	see map	29	90
CFS-HR 384	24	see map	29	90
CFS-HR 385	24	see map	29	90
CFS-HR 386	24	see map	29	90
CFS-HR 387	24	see map	29	90
CFS-HR 388	24	see map	29	90
CFS-HR 389	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 390	24	see map	29	90
CFS-HR 391	32	see map	34	99
CFS-HR 392	32	see map	34	99
CFS-HR 393	32	see map	34	99
CFS-HR 394	32	see map	34	99
CFS-HR 395	32	see map	34	99
CFS-HR 396	32	see map	34	99
CFS-HR 397	32	see map	34	99
CFS-HR 398	32	see map	34	99
CFS-HR 399	32	see map	34	99
CFS-HR 400	32	see map	34	99
CFS-HR 401	32	see map	34	99
CFS-HR 402	32	see map	34	99
CFS-HR 403	32	see map	34	99
CFS-HR 404	32	see map	34	99
CFS-HR 405	32	see map	34	99
CFS-HR 406	32	see map	34	99
CFS-HR 407	32	see map	34	99
CFS-HR 408	32	see map	34	99
CFS-HR 409	32	see map	34	99
CFS-HR 410	32	see map	34	99
CFS-HR 411	32	see map	34	99
CFS-HR 412	32	see map	34	99
CFS-HR 413	32	see map	34	99
CFS-HR 414	32	see map	34	99
CFS-HR 415	32	see map	34	99
CFS-HR 416	32	see map	34	99
CFS-HR 417	32	see map	34	99
CFS-HR 418	32	see map	34	99
CFS-HR 419	32	see map	34	99
CFS-HR 420	32	see map	34	99
CFS-HR 421	32	see map	34	99
CFS-HR 422	32	see map	34	99
CFS-HR 423	32	see map	34	99
CFS-HR 424	32	see map	34	99
CFS-HR 425	32	see map	34	99
CFS-HR 426	32	see map	34	99
CFS-HR 427	32	see map	34	99
CFS-HR 428	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 429	18	see map	15	98
CFS-HR 430	18	see map	15	98
CFS-HR 431	18	see map	15	98
CFS-HR 432	18	see map	15	98
CFS-HR 433	18	see map	15	98
CFS-HR 434	18	see map	25	97
CFS-HR 435	18	see map	25	97
CFS-HR 436	18	see map	25	97
CFS-HR 437	18	see map	25	97
CFS-HR 438	18	see map	25	97
CFS-HR 439	18	see map	25	97
CFS-HR 440	18	see map	25	97
CFS-HR 441	18	see map	25	97
CFS-HR 442	18	see map	25	97
CFS-HR 443	18	see map	25	97
CFS-HR 444	18	see map	25	97
CFS-HR 445	18	see map	25	97
CFS-HR 446	18	see map	25	97
CFS-HR 447	18	see map	25	97
CFS-HR 448	18	see map	25	97
CFS-HR 449	18	see map	25	97
CFS-HR 450	18	see map	25	97
CFS-HR 451	18	see map	25	97
CFS-HR 452	18	see map	25	97
CFS-HR 453	18	see map	25	97
CFS-HR 454	18	see map	25	97
CFS-HR 455	18	see map	25	97
CFS-HR 456	18	see map	25	97
CFS-HR 457	18	see map	25	97
CFS-HR 458	18	see map	25	97
CFS-HR 459	18	see map	25	97
CFS-HR 460	18	see map	25	97
CFS-HR 461	18	see map	25	97
CFS-HR 462	18	see map	25	97
CFS-HR 463	18	see map	25	97
CFS-HR 464	18	see map	25	97
CFS-HR 465	24	see map	42	66
CFS-HR 466	24	see map	42	66
CFS-HR 467	24	see map	42	66

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 468	24	see map	42	66
CFS-HR 469	24	see map	42	66
CFS-HR 470	24	see map	42	66
CFS-HR 471	24	see map	42	66
CFS-HR 472	24	see map	42	66
CFS-HR 473	24	see map	42	66
CFS-HR 474	24	see map	42	66
CFS-HR 475	24	see map	42	66
CFS-HR 476	24	see map	42	66
CFS-HR 477	24	see map	42	66
CFS-HR 478	24	see map	42	66
CFS-HR 479	24	see map	42	66
CFS-HR 480	24	see map	42	66
CFS-HR 481	24	see map	42	66
CFS-HR 482	24	see map	42	66
CFS-HR 483	24	see map	42	66
CFS-HR 484	24	see map	42	66
CFS-HR 485	24	see map	42	66
CFS-HR 486	24	see map	42	66
CFS-HR 487	24	see map	42	66
CFS-HR 488	24	see map	42	66
CFS-HR 489	24	see map	42	66
CFS-HR 490	24	see map	42	66
CFS-HR 491	24	see map	42	66
CFS-HR 492	24	see map	42	66
CFS-HR 493	24	see map	42	66
CFS-HR 494	24	see map	42	66
CFS-HR 495	24	see map	42	66
CFS-HR 496	24	see map	42	66
CFS-HR 497	24	see map	42	66
CFS-HR 498	24	see map	42	66
CFS-HR 499	24	see map	42	66
CFS-HR 500	24	see map	42	66
CFS-HR 501	24	see map	42	66
CFS-HR 502	24	see map	42	66
CFS-HR 503	24	see map	42	66
CFS-HR 504	24	see map	42	66
CFS-HR 505	24	see map	42	66
CFS-HR 506	24	see map	42	66

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 507	24	see map	42	66
CFS-HR 508	24	see map	42	66
CFS-HR 509	24	see map	42	66
CFS-HR 510	24	see map	26	109
CFS-HR 511	24	see map	26	109
CFS-HR 512	24	see map	26	109
CFS-HR 513	24	see map	26	109
CFS-HR 514	24	see map	26	109
CFS-HR 515	24	see map	26	109
CFS-HR 516	24	see map	26	109
CFS-HR 517	24	see map	26	109
CFS-HR 518	24	see map	26	109
CFS-HR 519	24	see map	26	109
CFS-HR 520	24	see map	26	109
CFS-HR 521	24	see map	26	109
CFS-HR 522	24	see map	26	109
CFS-HR 523	24	see map	26	109
CFS-HR 524	24	see map	26	109
CFS-HR 525	24	see map	26	109
CFS-HR 526	24	see map	26	109
CFS-HR 527	24	see map	26	109
CFS-HR 528	24	see map	26	109
CFS-HR 529	24	see map	26	109
CFS-HR 530	24	see map	26	109
CFS-HR 531	24	see map	26	109
CFS-HR 532	24	see map	26	109
CFS-HR 533	18	see map	5	256
CFS-HR 534	18	see map	5	256
CFS-HR 535	18	see map	5	256
CFS-HR 536	18	see map	5	256
CFS-HR 537	18	see map	5	256
CFS-HR 538	18	see map	5	256
CFS-HR 539	18	see map	5	256
CFS-HR 540	18	see map	17	132
CFS-HR 541	18	see map	17	132
CFS-HR 542	18	see map	17	132
CFS-HR 543	18	see map	17	132
CFS-HR 544	18	see map	17	132
CFS-HR 545	18	see map	17	132

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 546	18	see map	17	132
CFS-HR 547	18	see map	17	132
CFS-HR 548	18	see map	17	132
CFS-HR 549	18	see map	17	132
CFS-HR 550	18	see map	17	132
CFS-HR 551	18	see map	17	132
CFS-HR 552	18	see map	17	132
CFS-HR 553	18	see map	17	132
CFS-HR 554	18	see map	17	132
CFS-HR 555	18	see map	17	132
CFS-HR 556	18	see map	17	132
CFS-HR 557	18	see map	17	132
CFS-HR 558	18	see map	17	132
CFS-HR 559	18	see map	17	132
CFS-HR 560	18	see map	17	132
CFS-HR 560A	18	see map	25	32
CFS-HR 560B	18	see map	25	32
CFS-HR 560C	18	see map	25	32
CFS-HR 561	18	see map	26	69
CFS-HR 562	18	see map	26	69
CFS-HR 563	18	see map	26	69
CFS-HR 564	18	see map	26	69
CFS-HR 564A	18	see map	25	56
CFS-HR 564B	18	see map	25	56
CFS-HR 564C	18	see map	25	56
CFS-HR 564D	18	see map	25	56
CFS-HR 565	18	see map	26	69
CFS-HR 566	18	see map	26	69
CFS-HR 567	18	see map	26	69
CFS-HR 568	18	see map	26	69
CFS-HR 569	18	see map	26	69
CFS-HR 570	18	see map	26	69
CFS-HR 571	18	see map	26	69
CFS-HR 572	18	see map	26	69
CFS-HR 573	18	see map	26	69
CFS-HR 574	12	see map	5	111
CFS-HR 575	12	see map	5	111
CFS-HR 576	12	see map	5	111
CFS-HR 577	12	see map	5	111

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 578	12	see map	5	111
CFS-HR 579	12	see map	5	111
CFS-HR 580	12	see map	5	111
CFS-HR 581	12	see map	7	98
CFS-HR 582	12	see map	7	98
CFS-HR 583	12	see map	7	98
CFS-HR 584	12	see map	7	98
CFS-HR 585	12	see map	7	98
CFS-HR 586	12	see map	7	98
CFS-HR 587	12	see map	7	98
CFS-HR 587A	12	see map	wetland protection	
CFS-HR 587B	12	see map	wetland protection	
CFS-HR 587C	24	see map	wetland protection	
CFS-HR 587D	24	see map	wetland protection	
CFS-HR 587E	24	see map	wetland protection	
CFS-HR 587F	12	see map	wetland protection	
CFS-HR 588	12	see map	7	98
CFS-HR 589	12	see map	7	99
CFS-HR 590	12	see map	7	90
CFS-HR 591	12	see map	12	117
CFS-HR 592	12	see map	12	117
CFS-HR 593	12	see map	12	117
CFS-HR 594	12	see map	12	117
CFS-HR 595	12	see map	12	117
CFS-HR 596	12	see map	12	117
CFS-HR 597	12	see map	12	117
CFS-HR 598	12	see map	12	117
CFS-HR 599	12	see map	12	117
CFS-HR 600	12	see map	12	117
CFS-HR 601	12	see map	12	117
CFS-HR 602	12	see map	12	117
CFS-HR 603	12	see map	12	117
CFS-HR 604	12	see map	12	117
CFS-HR 605	12	see map	12	117
CFS-HR 606	12	see map	12	117
CFS-HR 607	12	see map	12	117
CFS-HR 608	12	see map	12	117
CFS-HR 609	12	see map	12	117
CFS-HR 610	12	see map	12	117

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 611	12	see map	12	117
CFS-HR 612	12	see map	12	117
CFS-HR 613	12	see map	12	117
CFS-HR 614	12	see map	12	117
CFS-HR 615	18	see map	34	47
CFS-HR 616	18	see map	34	47
CFS-HR 617	18	see map	34	47
CFS-HR 618	18	see map	34	47
CFS-HR 619	18	see map	34	47
CFS-HR 620	18	see map	42	52
CFS-HR 621	18	see map	42	52
CFS-HR 622	18	see map	42	52
CFS-HR 623	18	see map	42	52
CFS-HR 624	18	see map	42	52
CFS-HR 625	18	see map	42	52
CFS-HR 626	18	see map	42	52
CFS-HR 627	18	see map	42	52
CFS-HR 628	18	see map	42	52
CFS-HR 629	18	see map	42	52
CFS-HR 630	18	see map	42	52
CFS-HR 631	18	see map	42	52
CFS-HR 632	18	see map	42	52
CFS-HR 633	18	see map	42	52
CFS-HR 634	18	see map	28	71
CFS-HR 635	18	see map	28	71
CFS-HR 636	18	see map	28	71
CFS-HR 637	18	see map	28	71
CFS-HR 638	18	see map	28	71
CFS-HR 639	18	see map	28	71
CFS-HR 640	18	see map	28	71
CFS-HR 641	18	see map	28	71
CFS-HR 642	18	see map	28	71
CFS-HR 643	18	see map	28	71
CFS-HR 644	18	see map	28	71
CFS-HR 645	18	see map	28	71
CFS-HR 646	18	see map	28	71
CFS-HR 647	18	see map	28	71
CFS-HR 648	24	see map	29	90
CFS-HR 649	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 650	24	see map	29	90
CFS-HR 651	24	see map	29	90
CFS-HR 652	24	see map	29	90
CFS-HR 653	24	see map	29	90
CFS-HR 654	24	see map	29	90
CFS-HR 655	24	see map	29	90
CFS-HR 656	24	see map	29	90
CFS-HR 657	24	see map	29	90
CFS-HR 658	24	see map	29	90
CFS-HR 659	24	see map	29	90
CFS-HR 660	24	see map	29	90
CFS-HR 661	24	see map	29	90
CFS-HR 662	24	see map	29	90
CFS-HR 663	24	see map	29	90
CFS-HR 664	24	see map	29	90
CFS-HR 665	24	see map	29	90
CFS-HR 666	24	see map	29	90
CFS-HR 667	18	see map	41	54
CFS-HR 668	18	see map	41	54
CFS-HR 669	18	see map	41	54
CFS-HR 670	18	see map	41	54
CFS-HR 671	18	see map	41	54
CFS-HR 672	18	see map	41	54
CFS-HR 673	18	see map	41	54
CFS-HR 674	18	see map	41	54
CFS-HR 675	18	see map	41	54
CFS-HR 676	18	see map	41	54
CFS-HR 677	18	see map	41	54
CFS-HR 678	18	see map	41	54
CFS-HR 679	18	see map	41	54
CFS-HR 680	18	see map	41	54
CFS-HR 681	18	see map	41	54
CFS-HR 682	18	see map	41	54
CFS-HR 683	18	see map	41	54
CFS-HR 684	18	see map	41	54
CFS-HR 685	18	see map	41	54
CFS-HR 686	18	see map	41	54
CFS-HR 687	18	see map	41	54
CFS-HR 688	18	see map	41	54

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 689	18	see map	41	54
CFS-HR 690	18	see map	41	54
CFS-HR 691	18	see map	41	54
CFS-HR 692	18	see map	41	54
CFS-HR 693	18	see map	41	54
CFS-HR 694	18	see map	41	54
CFS-HR 695	18	see map	41	54
CFS-HR 696	18	see map	41	54
CFS-HR 697	18	see map	41	54
CFS-HR 698	18	see map	41	54
CFS-HR 699	18	see map	41	54
CFS-HR 700	18	see map	41	54
CFS-HR 701	18	see map	41	54
CFS-HR 702	18	see map	41	54
CFS-HR 703	18	see map	41	54
CFS-HR 704	18	see map	41	54
CFS-HR 705	18	see map	41	54
CFS-HR 706	18	see map	41	54
CFS-HR 707	18	see map	41	54
CFS-HR 708	18	see map	41	54
CFS-HR 709	18	see map	41	54
CFS-HR 710	18	see map	41	54
CFS-HR 711	18	see map	41	54
CFS-HR 712	18	see map	41	54
CFS-HR 713	18	see map	41	54
CFS-HR 714	18	see map	41	54
CFS-HR 715	18	see map	41	54
CFS-HR 716	18	see map	41	54
CFS-HR 717	18	see map	41	54
CFS-HR 718	18	see map	41	54
CFS-HR 719	18	see map	41	54
CFS-HR 720	18	see map	41	54
CFS-HR 721	18	see map	16	137
CFS-HR 722	18	see map	16	137
CFS-HR 723	18	see map	16	137
CFS-HR 724	18	see map	16	137
CFS-HR 725	18	see map	16	137
CFS-HR 726	18	see map	16	137
CFS-HR 727	18	see map	16	137

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 728	18	see map	16	137
CFS-HR 729	18	see map	16	137
CFS-HR 730	18	see map	16	137
CFS-HR 731	18	see map	16	137
CFS-HR 732	18	see map	16	137
CFS-HR 733	18	see map	16	137
CFS-HR 734	18	see map	16	137
CFS-HR 735	18	see map	16	137
CFS-HR 736	18	see map	16	137
CFS-HR 737	18	see map	16	137
CFS-HR 738	18	see map	16	137
CFS-HR 739	18	see map	16	137
CFS-HR 740	18	see map	16	137
CFS-HR 741	18	see map	16	137
CFS-HR 742	18	see map	16	137
CFS-HR 743	18	see map	16	137
CFS-HR 744	18	see map	16	137
CFS-HR 745	18	see map	16	137
CFS-HR 746	18	see map	16	137
CFS-HR 747	18	see map	16	137
CFS-HR 748	18	see map	16	137
CFS-HR 749	18	see map	16	137
CFS-HR 750	18	see map	16	137
CFS-HR 751	18	see map	16	137
CFS-HR 752	18	see map	16	137
CFS-HR 753	18	see map	16	137
CFS-HR 754	18	see map	16	137
CFS-HR 755	18	see map	16	137
CFS-HR 756	18	see map	16	137
CFS-HR 757	18	see map	16	137
CFS-HR 758	18	see map	16	137
CFS-HR 759	18	see map	16	137
CFS-HR 760	32	see map	16	281
CFS-HR 761	32	see map	16	281
CFS-HR 762	32	see map	16	281
CFS-HR 763	32	see map	16	281
CFS-HR 764	32	see map	16	281
CFS-HR 765	32	see map	16	281
CFS-HR 766	32	see map	16	281

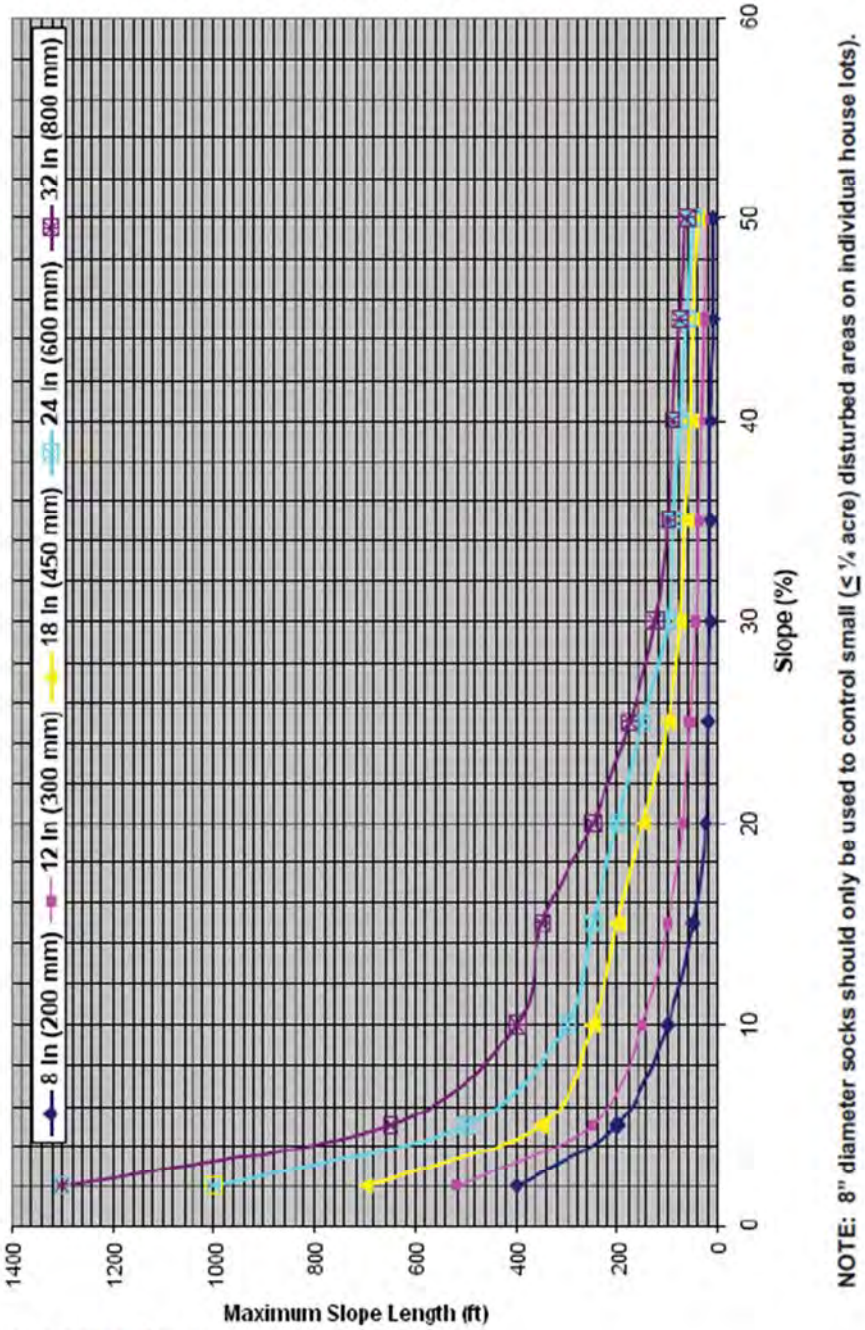
STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 767	32	see map	16	281
CFS-HR 768	32	see map	16	281
CFS-HR 769	32	see map	16	281
CFS-HR 770	32	see map	16	281
CFS-HR 771	32	see map	16	281
CFS-HR 772	32	see map	16	281
CFS-HR 773	32	see map	16	281
CFS-HR 774	32	see map	16	281
CFS-HR 775	32	see map	16	281
CFS-HR 776	32	see map	16	281
CFS-HR 777	32	see map	16	281
CFS-HR 778	32	see map	16	281
CFS-HR 779	32	see map, CSA021	5	546
CFS-HR 780	32	see map, CSA021	5	546
CFS-HR 781	32	see map, CSA021	5	546
CFS-HR 782	32	see map, CSA021	5	546
CFS-HR 783	32	see map, CSA021	5	546
CFS-HR 784	32	see map, CSA021	5	546
CFS-HR 785	18	see map	wetland protection	
CFS-HR 786	18	see map	wetland protection	
CFS-HR 787	32	see map	5	546
CFS-HR 788	32	see map	5	546
CFS-HR 789	32	see map	5	546
CFS-HR 790	32	see map	5	546
CFS-HR 791	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 792	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 793	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 794	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 795	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 796	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 797	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 798	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 799	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 800	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 801	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 802	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 803	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 804	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 805	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 806	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 807	18	see map, Western Terminus Valve Yard	15	119

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 808	12	see map	2	45
CFS-HR 809	12	see map	6	152
CFS-HR 810	24	see map	8	340
CFS-HR 811	24	see map	8	340
CFS-HR 812	24	see map	8	340
CFS-HR 813	24	Along the west of Paddy Run Road	6	226
CFS-HR 814	24	Along the east of Paddy Run Road	4	486
CFS-HR 815	24	See map, CY003	1	983
CFS-HR 816	24	See map, CY003	1	983

FIGURE 4.2
MAXIMUM PERMISSIBLE SLOPE LENGTH ABOVE COMPOST FILTER SOCKS



NOTE: 8" diameter socks should only be used to control small (≤ ¼ acre) disturbed areas on individual house lots).

Adapted from Filtrexx

ATTACHMENT 3.2
CHANNEL DESIGN WORKSHEETS

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Hensel Replacement Pipeline Clean Water Crossing Prepared by: FJ, 7/2019
LOCATION: Clinton County, Pennsylvania Checked by: KCC, 7/2019

CHANNEL OR CHANNEL SECTION		HR1-1	HR1-2	HR2	HR3-1	HR3-2
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	61.287	61.133	0.239	7.484	7.24
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	59.43	59.28	0.16	2.68	5
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	61.5	60.7	1.5	3.89	6.30
PROTECTIVE LINING[2]		R-6 Riprap	R-6 Riprap	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.0594	0.0601	0.036	0.036	0.025
V_a (ALLOWABLE VELOCITY)	(FPS)	13.0	13.0	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.6	4.8	3.1	3.0	3.3
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	4.0	4.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	3.4	3.7	0.8	0.7	0.4
CHANNEL BOTTOM WIDTH	(FT)	4	4	2	2	2
CHANNEL SIDE SLOPES	(H:V)	3	3	2	2	2
D (TOTAL DEPTH)	(FT)	2.25	2.25	0.75	1	1.25
CHANNEL TOP WIDTH @ D	(FT)	17.5	17.5	5	6	7
d (CALCULATED FLOW DEPTH)	(FT)	1.55	1.5	0.2	0.45	0.6
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	13.3	13.0	2.8	3.8	4.4
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	2.58	2.67	10	4.4	3.3
d_{50} STONE SIZE	(IN)	12	12	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	13.41	12.75	0.48	1.305	1.92
R (HYDRAULIC RADIUS)		0.971	0.945	0.17	0.325	0.41
S (BED SLOPE)[3]	(FT/FT)	0.035	0.040	0.062	0.023	0.01
S_c (CRITICAL SLOPE)	(FT/FT)	0.054	0.056	0.035	0.029	0.013
$.7S_c$	(FT/FT)	0.038	0.039	0.025	0.0203	0.0091
$1.3S_c$	(FT/FT)	0.070	0.072	0.046	0.0377	0.0169
STABLE FLOW?	(Y/N)	Y	N	Y	N	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	0.5	--	0.1	0.15
FREEBOARD BASED ON STABLE FLOW	(FT)	0.4	--	0.1	--	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5]		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR4	HR5-1	HR5-2	HR6	HR7
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	7.42	13.032	15.936	7.551	2.794
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	4.08	5.27	4.52	2.39	1.29
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	6.73	8.05	6.64	4.16	3.04
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.025	0.025	0.025	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.9	4.7	3.9	3.7	2.7
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.5	0.8	0.5	1.0	0.5
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.25	1.25	1.25	1	1
CHANNEL TOP WIDTH @ D	(FT)	7	7	7	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.55	0.55	0.55	0.4	0.4
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.2	4.2	4.2	3.6	3.6
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	3.6	3.6	3.6	5.0	5.0
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.705	1.705	1.705	1.12	1.12
R (HYDRAULIC RADIUS)		0.382	0.382	0.382	0.296	0.296
S (BED SLOPE)[3]	(FT/FT)	0.016	0.023	0.015	0.041	0.022
S_c (CRITICAL SLOPE)	(FT/FT)	0.013	0.013	0.013	0.03	0.03
$.7S_c$	(FT/FT)	0.0091	0.0091	0.0091	0.021	0.021
$1.3S_c$	(FT/FT)	0.0169	0.0169	0.0169	0.039	0.039
STABLE FLOW?	(Y/N)	N	Y	N	Y	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.2	--	0.2	--	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	--	0.1	--	0.1	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR8	HR9	HR10	HR11	HR12
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	0.454	0.56	8.121	1.629	0.92
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.22	0.29	12.99	3.14	0.54
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.07	2.07	13.1	3.30	1.8
PROTECTIVE LINING[2]		ECM	ECM	R-6 Riprap	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.097	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	13.0	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.3	4.3	2.9	5.1	3.7
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	4.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.5	1.5	3.4	1.98	1.1
CHANNEL BOTTOM WIDTH	(FT)	2	2	6	2.5	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	0.75	0.75	1.25	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	5	5	11	5.5	5
d (CALCULATED FLOW DEPTH)	(FT)	0.2	0.2	0.62	0.22	0.2
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.8	2.8	8.5	3.4	2.8
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	10	10	9.7	11.4	10
d_{50} STONE SIZE	(IN)	--	--	12.0	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.48	0.48	4.49	0.65	0.48
R (HYDRAULIC RADIUS)		0.166	0.166	0.512	0.186	0.166
S (BED SLOPE)[3]	(FT/FT)	0.12	0.12	0.089	0.144	0.088
S_c (CRITICAL SLOPE)	(FT/FT)	0.035	0.035	0.177	0.034	0.035
$.7S_c$	(FT/FT)	0.0245	0.0245	0.124	0.0238	0.025
$1.3S_c$	(FT/FT)	0.0455	0.0455	0.230	0.0442	0.046
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.2	0.1	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S	S	S	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR13	HR14	HR15	HR16-1	HR16-2
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	9.901	14.022	14.309	14.756	11.13
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	4.49	6.59	5.43	8.52	4.13
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	7.5	7.3	6.8	10.7	4.6
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.025	0.025	0.036	0.025	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.8	4.8	4.6	4.5	5.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.8	0.8	1.5	0.7	1.95
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.25	1.25	1	1.25	1
CHANNEL TOP WIDTH @ D	(FT)	7	7	6	7	6
d (CALCULATED FLOW DEPTH)	(FT)	0.51	0.51	0.5	0.7	0.34
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.0	4.0	4	4.8	3.4
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	3.9	3.9	4	2.9	5.9
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.54	1.54	1.5	2.38	0.91
R (HYDRAULIC RADIUS)		0.36	0.36	0.354	0.464	0.259
S (BED SLOPE)[3]	(FT/FT)	0.026	0.025	0.049	0.016	0.092
S_c (CRITICAL SLOPE)	(FT/FT)	0.014	0.014	0.028	0.013	0.031
$.7S_c$	(FT/FT)	0.010	0.010	0.020	0.0091	0.022
$1.3S_c$	(FT/FT)	0.018	0.018	0.036	0.0169	0.0403
STABLE FLOW?	(Y/N)	Y	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	0.2	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.1	--	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR17	HR18-1	HR18-2	HR19	H20
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	19.175	14.089	14.089	2.994	0.97
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	11.1	10.4	10.4	1.07	0.53
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	12.1	12.4	12.4	1.72	1.59
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	5.9	4.6	4.6	3.6	3.3
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.9	1.5	1.6	1.0	1.0
CHANNEL BOTTOM WIDTH	(FT)	5	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.00	1.0	1.0	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	9	6	6	5	5
d (CALCULATED FLOW DEPTH)	(FT)	0.42	0.5	0.5	0.2	0.2
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	6.7	4.0	4.0	2.8	2.8
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	11.9	4.0	4.0	10	10
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.45	1.5	1.5	0.48	0.48
R (HYDRAULIC RADIUS)		0.357	0.354	0.354	0.166	0.166
S (BED SLOPE)[3]	(FT/FT)	0.073	0.049	0.049	0.083	0.071
S_c (CRITICAL SLOPE)	(FT/FT)	0.027	0.028	0.028	0.035	0.035
$.7S_c$	(FT/FT)	0.019	0.020	0.020	0.0245	0.0245
$1.3S_c$	(FT/FT)	0.035	0.037	0.037	0.0455	0.0455
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.1	0.1	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR21-1	HR21-2	HR22	HR23	HR24
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	14.5	0.40	3.55	4.22	1.20
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	14.5	0.82	4.60	1.74	0.52
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	17.3	1.6	5.3	3.0	1.3
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.025	0.036	0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.3	3.4	3.1	3.0	1.6
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6	0.9	0.3	0.7	0.2
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.5	0.75	1.25	1.0	1.0
CHANNEL TOP WIDTH @ D	(FT)	8	5	7	6	6
d (CALCULATED FLOW DEPTH)	(FT)	1.0	0.2	0.55	0.35	0.30
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	6	2.8	4.2	3.4	3.2
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	2.0	10	3.64	5.7	6.7
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	4.0	0.48	1.71	0.945	0.78
R (HYDRAULIC RADIUS)		0.618	0.166	0.382	0.265	0.233
S (BED SLOPE)[3]	(FT/FT)	0.010	0.071	0.01	0.034	0.011
S_c (CRITICAL SLOPE)	(FT/FT)	0.012	0.035	0.013	0.031	0.032
$.7S_c$	(FT/FT)	0.008	0.0245	0.009	0.022	0.022
$1.3S_c$	(FT/FT)	0.016	0.0455	0.055	0.040	0.042
STABLE FLOW?	(Y/N)	N	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.3	--	--	0.1	--
FREEBOARD BASED ON STABLE FLOW	(FT)	--	0.1	0.1	--	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR25	HR26	HR27
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr
ACRES	(AC)	3.97	2.38	1.14
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	2.62	0.93	0.46
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.8	1.6	1.4
PROTECTIVE LINING[2]		ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.9	1.6	2.2
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.8	0.5	0.4
CHANNEL BOTTOM WIDTH	(FT)	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2
D (TOTAL DEPTH)	(FT)	1.0	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	6	5	5
d (CALCULATED FLOW DEPTH)	(FT)	0.30	0.25	0.25
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.2	3.0	3.0
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	6.7	8.0	8.0
d_{50} STONE SIZE	(IN)	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.78	0.625	0.625
R (HYDRAULIC RADIUS)		0.233	0.200	0.200
S (BED SLOPE)[3]	(FT/FT)	0.097	0.034	0.025
S_c (CRITICAL SLOPE)	(FT/FT)	0.032	0.033	0.033
$.7S_c$	(FT/FT)	0.022	0.023	0.0231
$1.3S_c$	(FT/FT)	0.042	0.043	0.043
STABLE FLOW?	(Y/N)	Y	N	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	0.1	0.04
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	--	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data for Mountable Berms**

PROJECT NAME: Leidy South-Hensel Replacement Western Terminus Main Line Valve
Prepared by: FPV, 8/2019
LOCATION: Clinton County, Pennsylvania Checked by: KCC, 8/2019

CHANNEL OR CHANNEL SECTION		MB-2
TEMPORARY OR PERMANENT?	(T OR P)	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr
ACRES	(AC)	1.37
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.88
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.2
PROTECTIVE LINING[2]		Grass
n (MANNING'S COEFFICIENT)[2]		0.15
V_a (ALLOWABLE VELOCITY)	(FPS)	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	0.6
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	--
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6
CHANNEL BOTTOM WIDTH	(FT)	--
CHANNEL SIDE SLOPES	(H:V)	2 and 10
D (TOTAL DEPTH)	(FT)	0.6
CHANNEL TOP WIDTH @ D	(FT)	4.4
d (CALCULATED FLOW DEPTH)	(FT)	1.10
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.40
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	--
d_{50} STONE SIZE	(IN)	N/A
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.160
R (HYDRAULIC RADIUS)		0.293
S (BED SLOPE)[3]	(FT/FT)	0.016
S_c (CRITICAL SLOPE)	(FT/FT)	0.505
$.7S_c$	(FT/FT)	0.353
$1.3S_c$	(FT/FT)	0.656
STABLE FLOW?	(Y/N)	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

** Mountable Berms are designed as V-channels with zero bottom width

ATTACHMENT 3.3
LEVEL SPREADER DESIGN WORKSHEET

LEIDY SOUTH PROJECT

HENSEL REPLACEMENT WESTERN TERMINUS MAIN LINE VALVE

LEVEL SPREADER DESIGN

NUMBER OF SLOPE PIPES	SLOPE PIPE DIAMETER (IN)	FLOW, Q (CFS)	STATIC HEAD (FT)	MAJOR LOSSES (DUE TO FRICTION) AND MINOR LOSSES	EFFECTIVE HEAD (FT)	LEVEL SPREADER PIPE DIAMETER (IN)	PERFORATION DIAMETER (IN)	NUMBER OF PERFORATIONS PER LINERAR FOOT OF PIPE	ORIFICE AREA (FT^2)	ORIFICE COEFFICIENT (C_d)	Q_O (PERFORATION FLOW RATE, CFS)	Q_L, DISCHARGE PER LINEAR FOOT (CFS/FT)	REQUIRED LENGTH (FT)	ACTUAL LENGTH (FT)	OVERALL LEVEL SPREADER CAPACITY (CFS)
1	12	1.27	10	4.538	5.462	12	0.375	36	7.7E-04	0.60	0.0086	0.311	4.08951	10	3.1

The Hazen-Williams formula was used to determine friction loss in the piping system under various flow conditions.

Hazen-Williams Formula:

$f = 0.2083\ ((100^* G)/C)^{1.852}(1/d)^{4.8655}$

f = Friction head in feet of water per 100 feet.

d = Inside diameter of pipe in inches.

G = Flow in gallons per minute

C = Constant for inside roughness of pipe (Use C = 60)

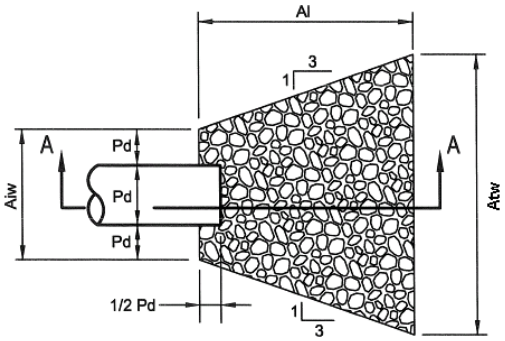
L_1 = 196 ft

Flow GPM	**C Roughness Coefficient**	**d Inside Pipe Diameter**	**Constant**	**$(100G)/C)^{1.852}$**	**$(1/d)^{4.8655}$**	**f Friction Loss per 100 ft**	**Length 100 ft**	**Minor Losses Equivalent Length 100 ft**	**Total Length 100 ft**	**Friction Loss ft**	**Velocity check**
3000	140	12	0.2083	1475704.636	5.6136E-06	1.7256	1.96	0.6700	2.6300	4.538	8.510959524

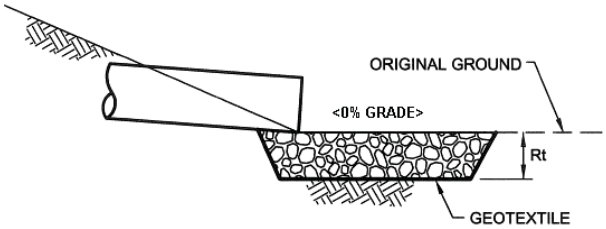
ATTACHMENT 3.4
RIPRAP APRON WORKSHEET

STANDARD E&S WORKSHEET # 20
Riprap Apron Outlet Protection

PROJECT NAME: Leidy South – Hensel Replacement
LOCATION: Hensel Replacement – Western Terminus Main Line Valve
PREPARED BY: LSD DATE: 6/17/2019
CHECKED BY: KCC DATE: 6/17/2019



PLAN VIEW

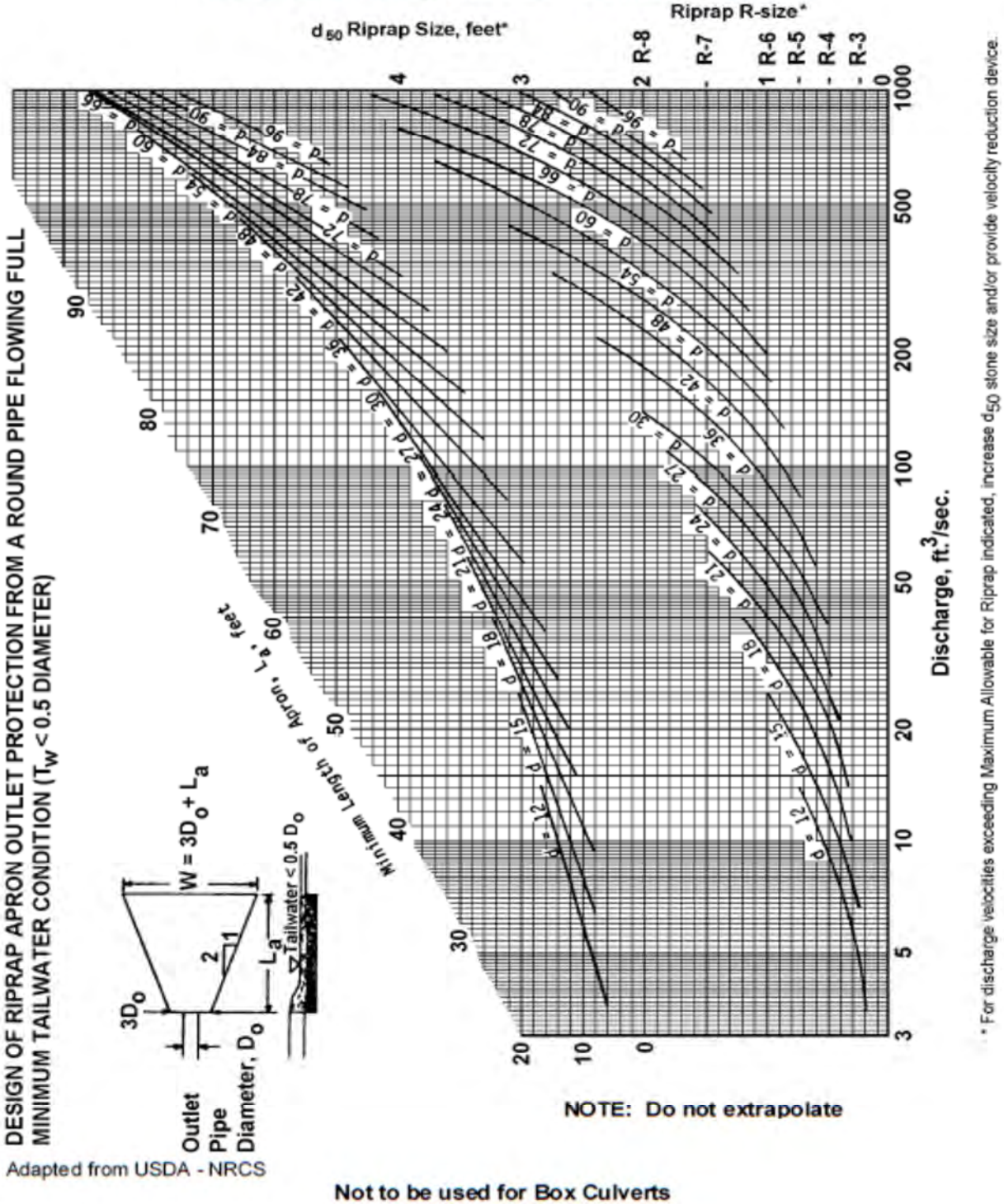


SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
HR31-pipe	12	Min	0.015	0.077	2.2	8.0	R-4	18	8	6	14

***:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.**

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Adapted from USDA - NRCS

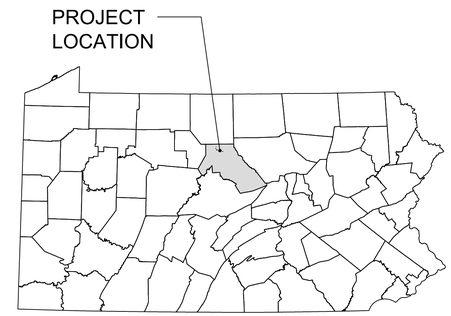
Not to be used for Box Culverts

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

LEIDY SOUTH PROJECT
36" HENSEL REPLACEMENT

LEIDY AND CHAPMAN TOWNSHIPS,
CLINTON COUNTY, PENNSYLVANIA

SEPTEMBER 2019



VICINITY MAP
N.T.S.

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
2800 POST OAK BLVD. LEVEL 11
HOUSTON, TX. 77056
PH: (713) 215-3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

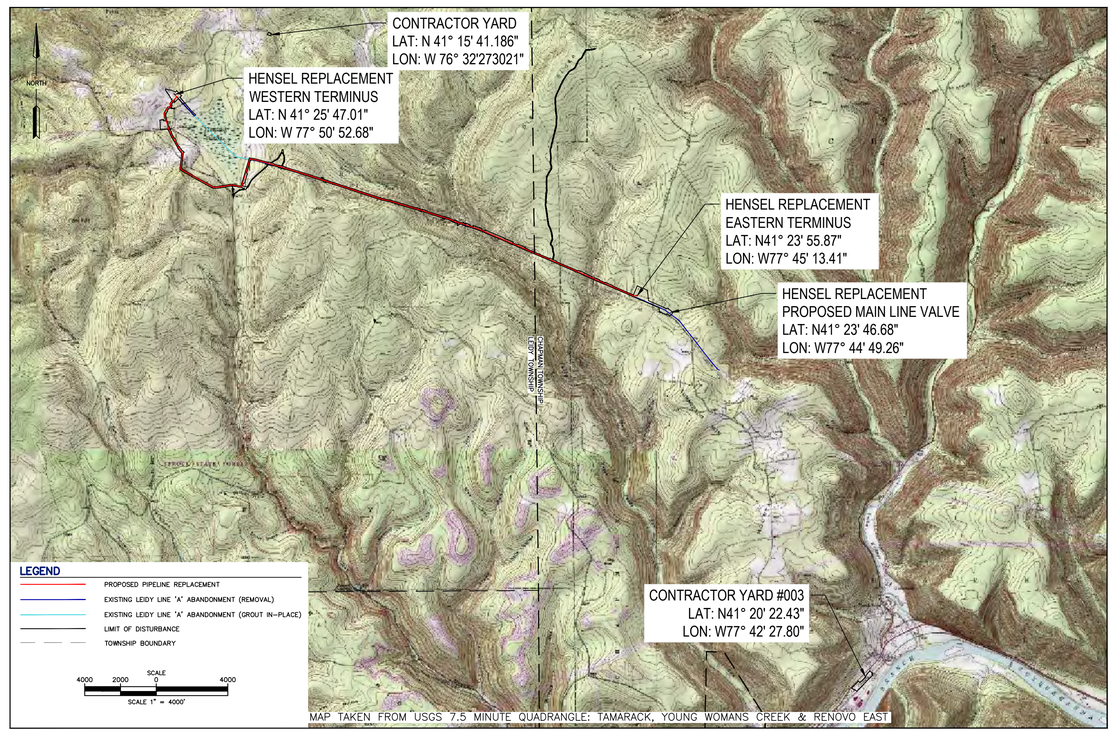
WHM CONSULTING, INC
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
PH: (814) 689-1650
CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, LLC.
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
PH: (814) 238-2060
CONTACT: KEVIN C. CLARK, P.E.

PROJECT INFORMATION

ESCGP-3 PERMIT BOUNDARY: 186.5 ACRES

LIMIT OF DISTURBANCE: 135.2 ACRES



LOCATION MAP

SHEET INDEX	
SHEET NUMBER	DRAWING TITLE
1 OF 39	EROSION & SEDIMENT CONTROL COVER SHEET
2 OF 39	EROSION & SEDIMENT CONTROL INDEX SHEET
3 - 23 OF 39	EROSION & SEDIMENT CONTROL SITE PLAN
24 - 25 OF 39	EROSION & SEDIMENT CONTROL NOTES
26 - 35 OF 39	EROSION & SEDIMENT CONTROL DETAILS
36 - 39 OF 39	GEOHAZARD MITIGATION MEASURES

RECEIVING WATERS			
NAME	DESIGNATED USE	EXISTING USE	PFBC CLASSIFICATION
TURTLE POINT HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
DRURY RUN	EV, MF	-	NATURALLY REPRODUCING TROUT
AUSTIN HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
HENSEL FORK	EV, MF	-	NATURALLY REPRODUCING TROUT
PADDY RUN	EV, MF	-	NATURALLY REPRODUCING TROUT
DARK HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
SHINGLE BRANCH	EV, MF	-	CLASS A WILD TROUT
MUDLICK RUN	EV, MF	-	CLASS A WILD TROUT
SANDY RUN	HQ-CWF, MF	-	NATURALLY REPRODUCING TROUT
WEST BRANCH SUSQUEHANNA RIVER	WWF, MF	-	-

EV: EXCEPTIONAL VALUE, MF: MIGRATORY FISHES, WWF: WARM WATER FISHES
HQ-CWF: HIGH QUALITY - COLD WATER FISHES

Call before you dig.
1-800-242-1776 or 811

PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

WHM consulting, INC. designs, permits, resolutions
BAI GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
DATE
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

COVER SHEET

LEIDY & CHAPMAN TOWNSHIPS, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 3/22/19	ISSUED FOR BID:	SCALE: 1" = 4000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 1 OF 39

E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
CONSTRUCTION ENTRANCE	CE	28
TIMBER MATTING CONSTRUCTION	MAT.1	28
TIMBER MATTING WITH FILL OVER EXISTING PIPELINES	MAT.2	28
TIMBER MATTING AIR BRIDGE	MAT.3	28
BROAD-BASED DIP	BBD	28
BRIDGE EQUIPMENT CROSSING	BEC	29
CULVERT EQUIPMENT CROSSING	CEC	29
WETLAND EQUIPMENT CROSSING	WEC	29
PUMP WATER FILTER BAG	PWB	29
TRENCH DEWATERING	TD	29
TRENCH PLUG INSTALLATION	TP	29
SAFETY FENCE	SF	29
PERMANENT / TEMPORARY STONE ACCESS ROAD		29
WETLAND CROSSING CONFIGURATION	WCC	30
TYPE I "DRY WETLAND" INSTALLATION PROCEDURE	WCC.1	30
TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE	WCC.2	30
TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE	WCC.3	30
FLUME STREAM CROSSING	FX	30
DAM AND PUMP STREAM CROSSING	DPX	30
WATERBAR	WB	31
CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION	OS	31
BORED WATERBODY/WETLAND CROSSING	WBX	31
BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS	BCC	31
TYPICAL CHANNEL & VEGETATION RESTORATION – 1		31
TYPICAL CHANNEL & VEGETATION RESTORATION – 2		31
TYPICAL SOIL STOCKPILE		31
HYDROSTATIC DEWATERING STRUCTURE	DS.2	32
ROCK FILTER OUTLET	RFO	32
SIDE SLOPE (TWO-TONE) CONSTRUCTION PROCEDURE		32
EROSION CONTROL BLANKET	ECB	32
HYDRAULICALLY APPLIED BLANKETS		32
TOPSOIL SEGREGATION (1)	TS.1	33
TOPSOIL SEGREGATION (2)	TS.2	33
TOPSOIL SEGREGATION (3)	TS.3	33
SURFACE ROUGHENING	SR	33
TRENCHED ROAD CROSSING	TRC	33
BORED ROAD CROSSING	BRC	33
COMPOST FILTER SOCK	CFS	34
SILTRON POLLUTION PREVENTION FENCE	SPF	34
FRENCH MATTRESS		34

E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
TYPICAL DIVERSION CHANNEL	DC	35
COMPOST SOCK SEDIMENT TRAP	CST	35
CLEAN WATER CROSSING (TEMP. LEVEL SPREADER)	CWC-LS	35
CLEAN WATER CROSSING (RIP RAP OUTLET BASIN)	CWC-OB	35
GEOHAZARD MITIGATION MEASURES SHEET 1		36
GEOHAZARD MITIGATION MEASURES SHEET 2		39

(XXX) INDICATES SOIL EROSION CONTROL MEASURE DETAIL

GENERAL SITE NOTES

1. THE STAGING OF EARTHMOVING ACTIVITIES FOR THIS PROJECT IS A GENERAL DESCRIPTION OF THE WORK REQUIRED. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH PROJECT OWNER STANDARDS, THE PADEP REGULATIONS, AND ALL OTHER APPLICABLE FEDERAL, STATE, OR LOCAL REQUIREMENTS.
2. PIPELINE CONSTRUCTION IS ACCOMPLISHED THROUGH A SET OF SEQUENTIAL OPERATIONS: SURVEYING; INSTALLATION OF BMPS; CLEARING AND GRUBBING; GRADING; TRENCHING; PIPE STRINGING, ASSEMBLY AND WELDING; LOWERING-IN; TRENCH BACKFILL; HYDROSTATIC TESTING AND FINAL TIE-IN; FINAL GRADING; AND PERMANENT STABILIZATION. THE CONSTRUCTION SPREAD SHALL PROCEED ALONG THE PIPELINE ROW TO COMPLETE THESE ACTIVITIES AS ONE CONTINUOUS OPERATION IN ORDER TO MINIMIZE THE DURATION OF EARTH DISTURBANCE.
3. SCHEDULE WORK TO BE PERFORMED IN A MANNER THAT MINIMIZES THE LENGTH OF TIME THAT BARE SOIL WILL BE EXPOSED TO THE ELEMENTS.
4. THE AMOUNT AND DURATION OF OPEN TRENCH SHALL BE MINIMIZED DURING THE PROJECT.
5. CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SOIL EROSION AND SEDIMENT CONTROL NARRATIVE AND ENVIRONMENTAL CONSTRUCTION PLAN AND MINIMIZE THE TOTAL AREA OF DISTURBANCE, WHEN PRACTICAL.
6. DISCHARGING SEDIMENT LADEN WATER WHICH WILL CAUSE OR CONTRIBUTE TO THE DEGRADATION OF A BENEFICIAL USE OF A WATER OF THE STATE FROM THE CONSTRUCTION SITE, A DEWATERING SITE, OR SEDIMENT BASIN/TRAP INTO ANY WATER BODY OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.
7. DISCHARGES ORIGINATING FROM OFF-SITE SOURCES, WHICH FLOW THROUGH OR ACROSS THE AREAS DISTURBED BY CONSTRUCTION, SHALL BE DIVERTED AROUND THE ACTIVE CONSTRUCTION AREA WHENEVER POSSIBLE.
8. ALL EXCAVATED MATERIALS THAT WILL NOT BE USED ON THE SITE CANNOT BE STORED IN THE FLOODPLAIN AND MUST BE HAULED TO A DISPOSAL SITE LOCATED OUTSIDE OF THE FLOODPLAIN.
9. NO EROSION CONTROL BLANKET SHALL BE INSTALLED IN AGRICULTURAL AREAS EXCEPT AS REQUIRED TO CONSTRUCT THE TEMPORARY FLUME CROSSINGS.
10. HYDRAULICALLY APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF EROSION CONTROL BLANKETS WITH PRIOR APPROVAL FROM THE LOCAL COUNTY CONSERVATION DISTRICT.
11. LOCATION AND SPACING OF THE WATERBARS ARE SHOWN ON THE PLAN. WATERBARS MAY BE ADJUSTED IN THE FIELD DUE TO ACTUAL SITE CONDITIONS. HOWEVER, INSTALLATION AND SPACING MUST CONFORM TO THE DETAILS PROVIDED AND APPROVAL MUST BE OBTAINED FROM THE LOCAL COUNTY CONSERVATION DISTRICT OR PA DEP.
12. THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN, INCLUDING THE SOIL EROSION CONTROL DRAWINGS AND NARRATIVE, SHALL BE AVAILABLE ON SITE AT ALL TIMES DURING EARTH DISTURBANCE.
13. PLACEMENT OF BRIDGE EQUIPMENT CROSSING SHOWN ON DRAWING IS NOT FINAL AND ADJUSTMENT OF LOCATION MAY BE NECESSARY FOR THE REMOVAL OF THE LEIDY A LINE AND INSTALLATION OF LEIDY LINE D.

EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

PROJECT DESCRIPTION

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC (TRANSCO), A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC. IS PROPOSING THE LEIDY SOUTH PROJECT – HENSEL REPLACEMENT. THE HENSEL REPLACEMENT CONSISTS OF INSTALLING APPROXIMATELY 6.3 MILES OF 36-INCH PIPELINE LOOP ALONG TRANSCO'S LEIDY LINE IN LEIDY AND CHAPMAN TOWNSHIPS, CLINTON COUNTY. THIS PIPELINE WILL REPLACE THE CAPACITY OF A SEGMENT OF TRANSCO'S EXISTING 23.375-INCH LEIDY LINE A PIPELINE, AND THIS SEGMENT OF THE LEIDY LINE A PIPELINE TOTALING 5.8 MILES WILL BE ABANDONED AND REMOVED WITH THE EXCEPTION OF 0.8 MILE UNDER THE TAMARACK SWAMP NATURAL AREA, WHICH IS PROPOSED TO BE GROUTED IN-PLACE. ONCE PLACED INTO OPERATION, TRANSCO WILL REFER TO THE HENSEL REPLACEMENT AS THE LEIDY LINE D. TRANSCO WILL BE RELOCATING AND INSTALLING A MAINLINE VALVE (MLV) NEAR THE EASTERN TERMINUS OF THE HENSEL REPLACEMENT AS A MEANS TO ISOLATE GAS FLOWS ALONG SECTIONS OF A PIPELINE. AT THE WESTERN TERMINUS OF THE HENSEL REPLACEMENT AT AN EXISTING MLV, PIG TRAPS AND BLOCK VALVES WILL BE ADDED. CATHODIC PROTECTION CABLE WILL BE INSTALLED FROM PROPOSED MLV NEAR THE EASTERN TERMINUS TO MP 190.5, AND FROM THE WESTERN TERMINUS OF HENSEL REPLACEMENT TO THE TAMARACK SWAMP NATURAL AREA AND ASSOCIATED WETLANDS ON THE LEIDY LINE "A" AND "B" EXISTING RIGHT-OF-WAY. THE CATHODIC PROTECTION CABLE WILL BE INSTALLED IN THE SAME TRENCH AS THE PIPELINE WITHIN WETLAND, STREAM AND FLOODWAY CROSSINGS. THE HENSEL REPLACEMENT WILL INCLUDE THE CONSTRUCTION OF ONE TEMPORARY OFFLINE CONTRACTOR YARD.

THE EROSION AND SEDIMENTATION CONTROL PLAN (ENVIRONMENTAL PLAN OR PLANS) HAS BEEN DEVELOPED FOR THE PROJECT, AS DEPICTED ON THE DRAWINGS. THE E&S PLAN SHALL BE PLANNED, DESIGNED, AND IMPLEMENTED TO BE CONSISTENT WITH THE POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN UNDER 25 PA. CODE § 102.8 (RELATING TO PCSM REQUIREMENTS). TRANSCO WILL USE AND IMPLEMENT THE PRACTICES, MEASURES AND DETAILS OUTLINED HEREIN TO CONTROL SOIL EROSION AND OFF-SITE SEDIMENTATION. ALL WORK AND DISTURBED AREAS ARE LOCATED WITHIN TRANSCO PROPERTY, EXISTING EASEMENTS OR LEGALLY OBTAINED WORKSPACE. THE LIMIT OF DISTURBANCE WILL BE 135.2 ACRES. CONSTRUCTION IS SCHEDULED TO BEGIN IN 2021. THE PROJECT WILL TAKE PLACE PRIMARILY WITHIN AN EXISTING AND MAINTAINED PIPELINE ROW.

CONTRACTOR NOTES

1. ALL EXISTING UTILITY DATA IS PROVIDED FOR INFORMATIONAL USE ONLY. ALTHOUGH THE DATA IS SHOWN AS ACCURATELY AS POSSIBLE, THE CONTRACTOR IS CAUTIONED THAT THE OWNER AND THE ENGINEER NEITHER ASSUME NOR IMPLY ANY RESPONSIBILITY FOR THE ACCURACY OF THIS DATA.
2. THE CONTRACTOR IS TO VERIFY LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. ALL CONTRACTORS/SUBCONTRACTORS PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE THEMSELVES WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM THEIR OPERATIONS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTORS AT THEIR EXPENSE AND SHALL BE APPROVED BY THE OWNER/REP. SAID EXISTING IMPROVEMENTS INCLUDE BUT ARE NOT LIMITED TO BERMS, DITCHES, FENCES, AND PLANTS.
4. CONTRACTORS MUST CONFINE THEIR ACTIVITIES TO THE WORK AREA. NO ENCROACHMENTS ONTO DEVELOPED AREAS WILL BE ALLOWED. ANY DAMAGE RESULTING THEREFROM SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR.
5. IT WILL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND PRIVATE UTILITIES THROUGHOUT THE CONSTRUCTION OF THIS PROJECT. CONTRACTORS SHALL CONTACT THE APPROPRIATE UTILITY COMPANIES FOR LINE LOCATES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL ASSUME FULL LIABILITY FOR ANY DAMAGES CAUSED TO THOSE COMPANIES' FACILITIES.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRENCH SAFETY REQUIREMENTS IN ACCORDANCE WITH STANDARD WILLIAMS' TRENCH SAFETY GUIDELINES.

WHM consulting, INC. designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047271-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

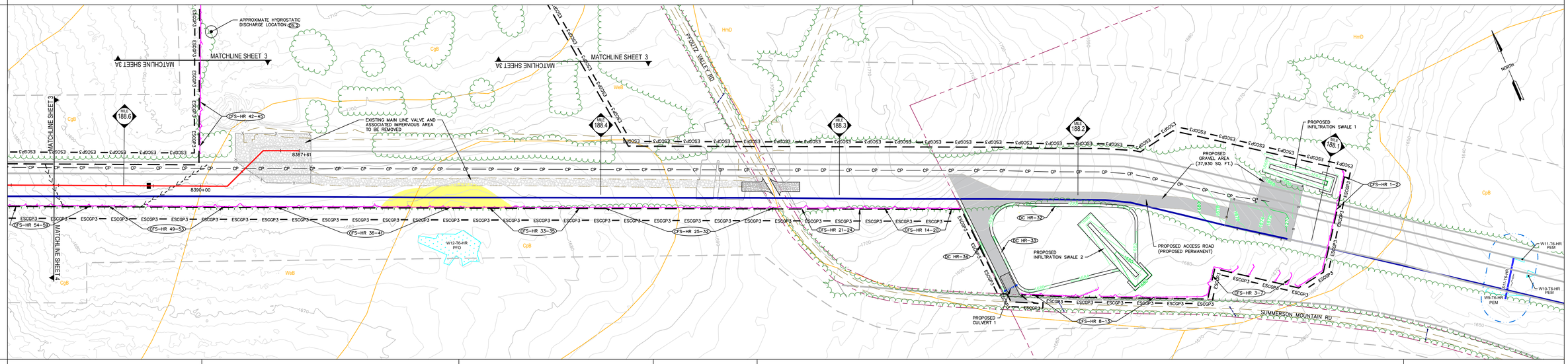
INDEX SHEET

LEIDY & CHAPMAN TOWNSHIPS, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 2 OF 39
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001			SUMMERSON MOUNTAIN RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001	LUCKY LEAP GUN CLUB HE-PA-CL-0001.001	
PROFILE (MIN. PIPE DEPTH)	3'	N/A					
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND	SHRUB AND BRUSH RANGELANDMIXED FOREST LAND/MAINTAINED ROW	MAINTAINED ROW/MIXED FOREST LAND	TRANSPORTATION/COMMUNICATION/MIXED FOREST LAND/MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	DARK HOLLOW (EV, MF)				MUDLICK RUN (EV, MF)		

ALIGNMENT



SOIL TYPE	CgB	WeB	CpB	WeB	HmD			CpB
AVERAGE % SLOPE	3%	1%	3%		9%	5%	5%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 042214-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

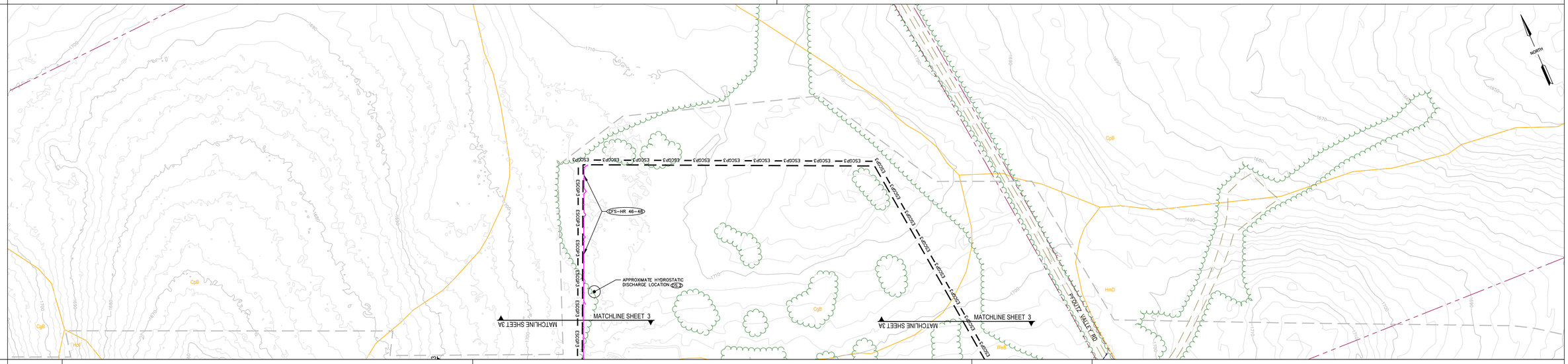
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001				
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND	SHRUB AND BRUSH RANGELANDMIXED FOREST LAND/MAINTAINED ROW	MAINTAINED ROW/MIXED FOREST LAND	TRANSPORTATION/COMMUNICATION/MIXED FOREST LAND/MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV, MF)				MUDLICK RUN (EV, MF)

ALIGNMENT



SOIL TYPE	CgB	CpB	CgB	WeB	HmD
AVERAGE % SLOPE	13%	23%	8%	3%	3%	1%	3%	9%	5%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
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- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
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- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
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WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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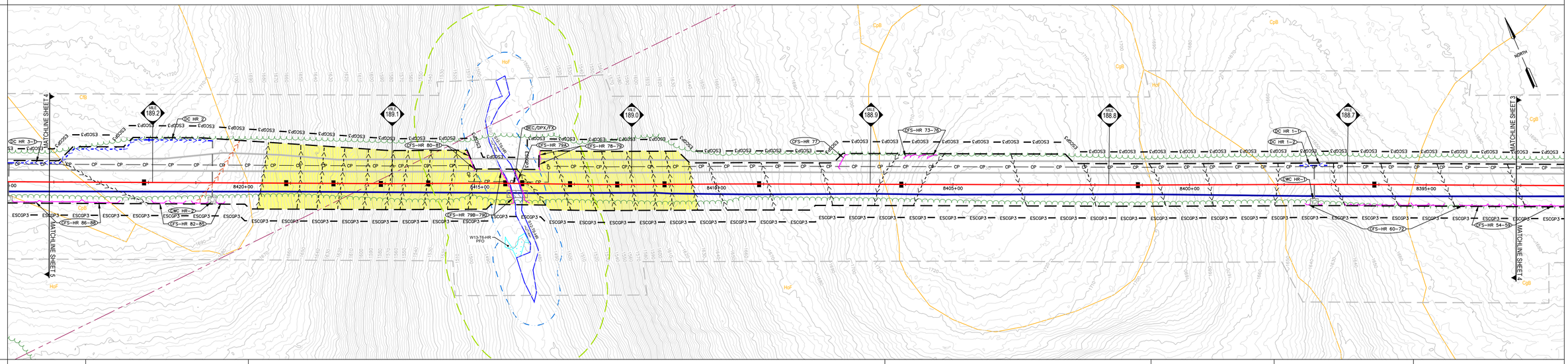
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3A OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002		DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001
PROFILE (MIN. PIPE DEPTH)	3'	4'	3'
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND		
RECEIVING WATERS	DARK HOLLOW (EV, MF)		

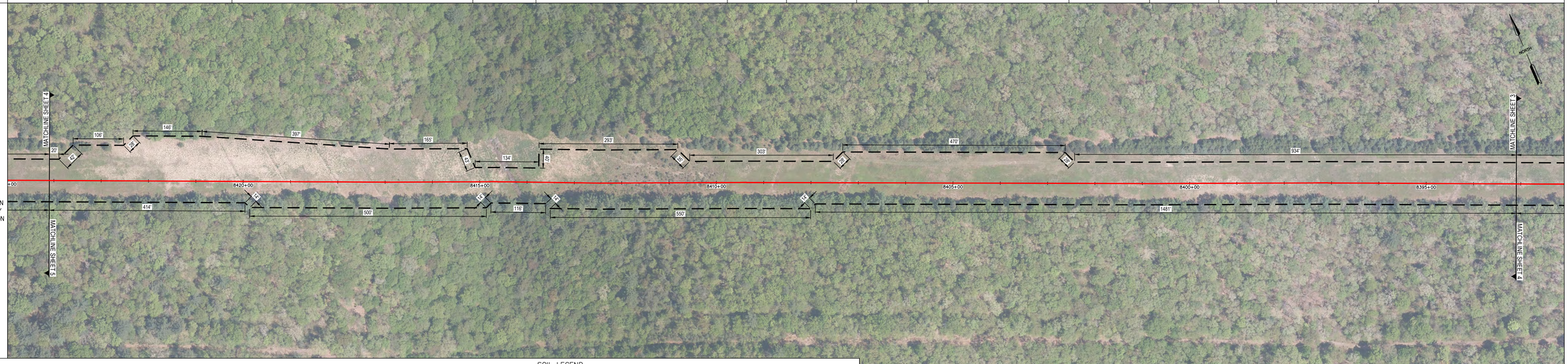
ALIGNMENT



SOIL TYPE	CpB	CfB	HoF	CgB	HoF	CpB	CgB
AVERAGE % SLOPE	1%	38%	5%	41%	19%	13%	13%

SOIL TYPE	13%	13%	23%	8%	3%	3%
AVERAGE % SLOPE	13%	13%				

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
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- LIMITS OF DISTURBANCE
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- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

designs, permits, resolutions WHM consulting, INC. BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
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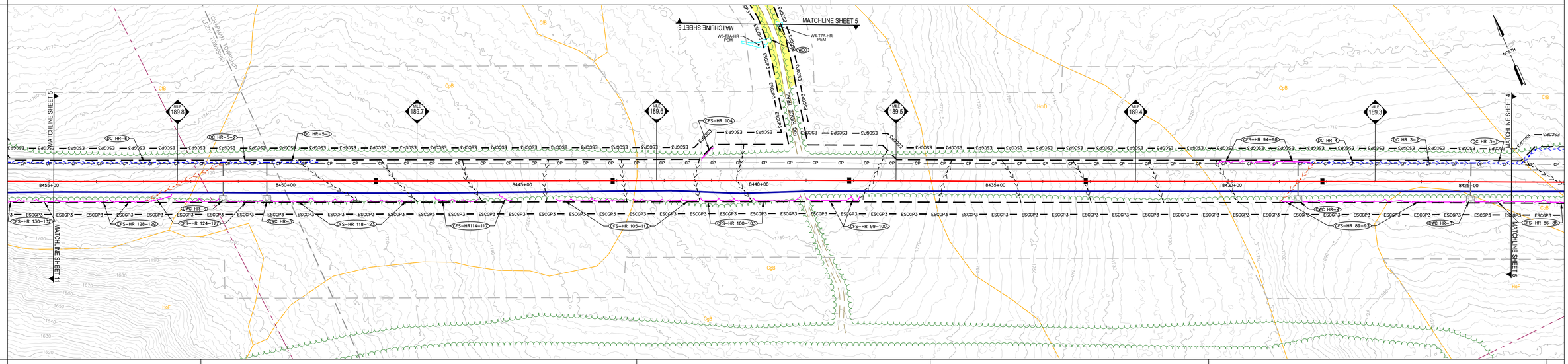
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 4 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002	
PROFILE (MIN. PIPE DEPTH)	3'		
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND	TRANSPORTATION/COMMUNICATION	MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	PADDY RUN (EV, MF)		DARK HOLLOW (EV, MF)

ALIGNMENT



SOIL TYPE	CfB	CpB	CgB	HmD	CpB	CfB
AVERAGE % SLOPE	5%	3% 7%	2%	10%	4%	1%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
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- COMPOST FILTER SOCK SEDIMENT TRAP
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- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC Williams.
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
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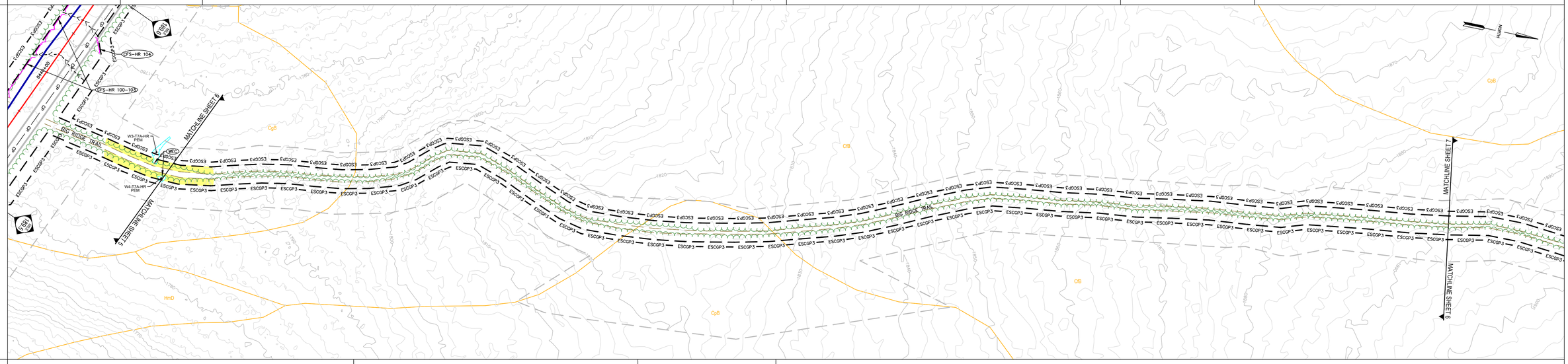
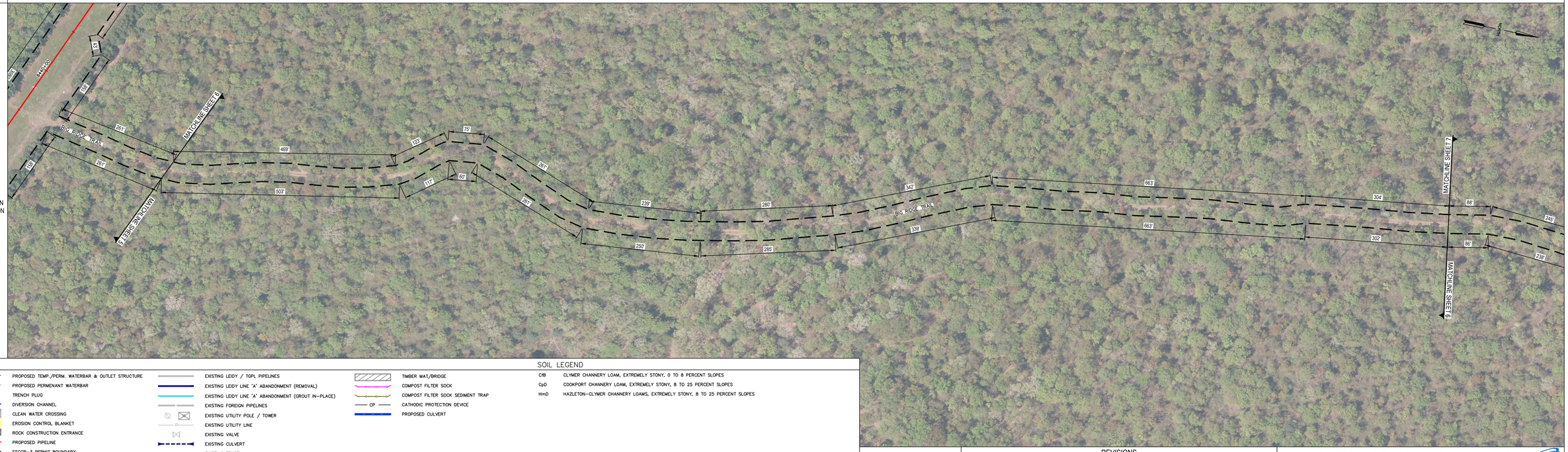
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002
PROFILE (MIN. PIPE DEPTH)	N/A
COVER TYPE	MIXED FOREST LAND
RECEIVING WATERS	PADDY RUN (EV, MF) | DARK HOLLOW (EV, MF) | PADDY RUN (EV, MF) | DARK HOLLOW (EV, MF) | PADDY RUN (EV, MF) | DARK HOLLOW (EV, MF) | PADDY RUN (EV, MF)
ALIGNMENT	



SOIL TYPE	CgB	CfB	CpB	CfB
AVERAGE % SLOPE				

CONSTRUCTION CONFIGURATION



LEGEND

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- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
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SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
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SCALE
100 50 0 100
SCALE 1" =100'

designs, permits, resolutions | consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

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LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
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SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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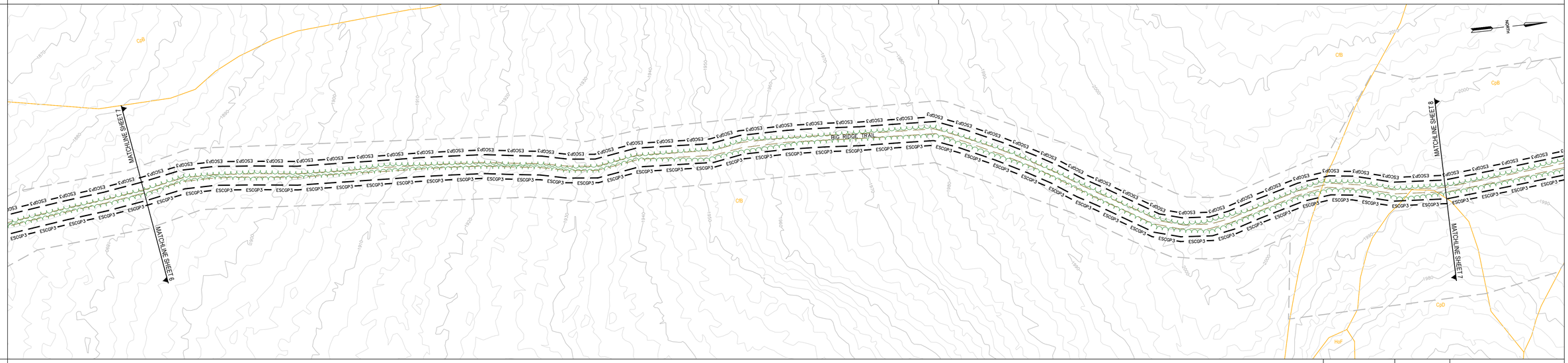
OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002				
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	MIXED FOREST LAND				
RECEIVING WATERS	PADDY RUN (EV, MF)	DARK HOLLOW (EV, MF)			
SOIL TYPE	CfB		CpB	CpD	CpB
AVERAGE % SLOPE	3%	6%	3%	3%	1%

ALIGNMENT



CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
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- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM consulting, INC. designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 047231-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

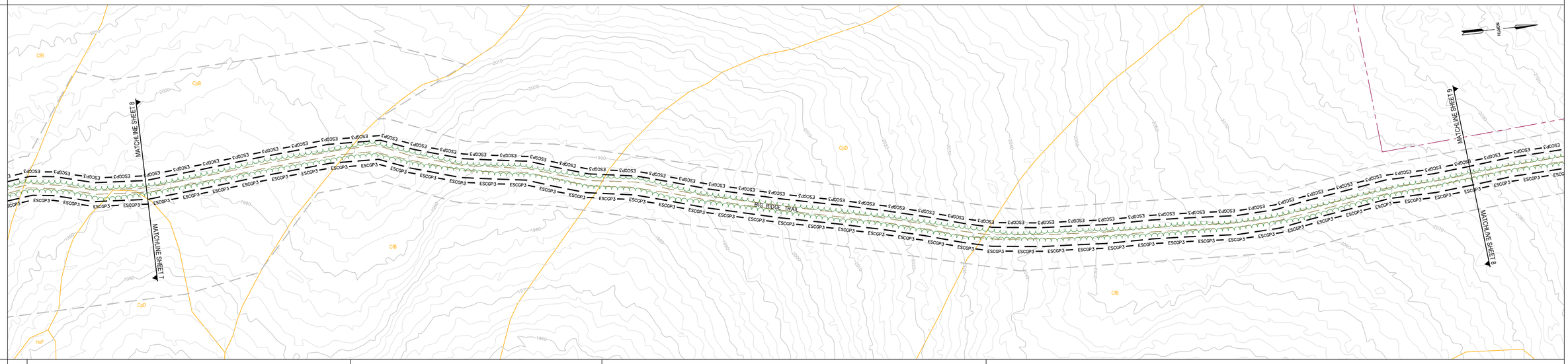
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 7 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002
PROFILE (MIN. PIPE DEPTH)	N/A
COVER TYPE	TRANSPORTATION/COMMUNICATION/MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV ,MF)

ALIGNMENT



SOIL TYPE	CfB	CpB/CpD	CfB	CpD	CfB
AVERAGE % SLOPE	3%	3%	3%	7%	3%	5%

CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
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- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES

SCALE 0
100 50 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

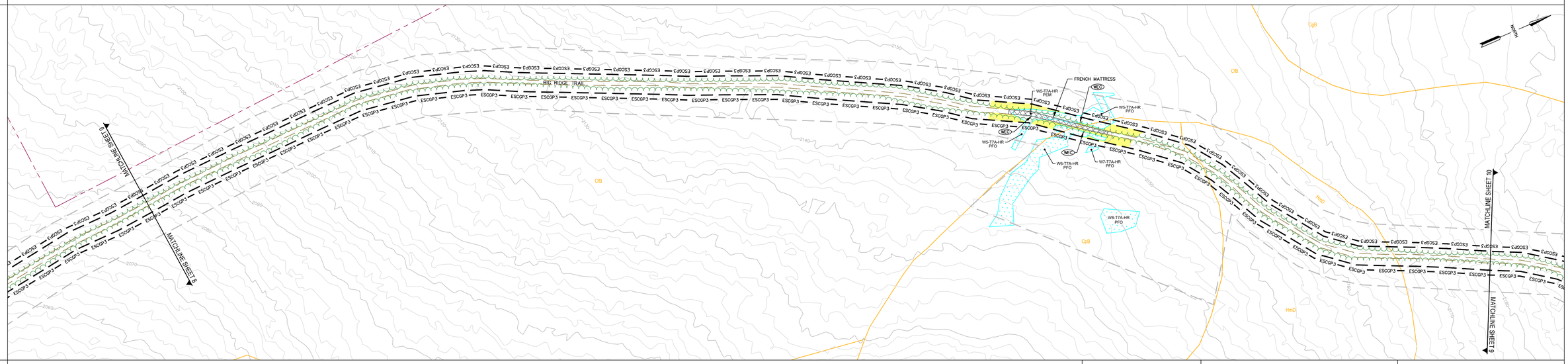
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 8
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002		
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV, MF)		

ALIGNMENT



SOIL TYPE	CfB	CpB	HmD	CfB
AVERAGE % SLOPE	6%	4%	1%	2%	6%

CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, inc.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

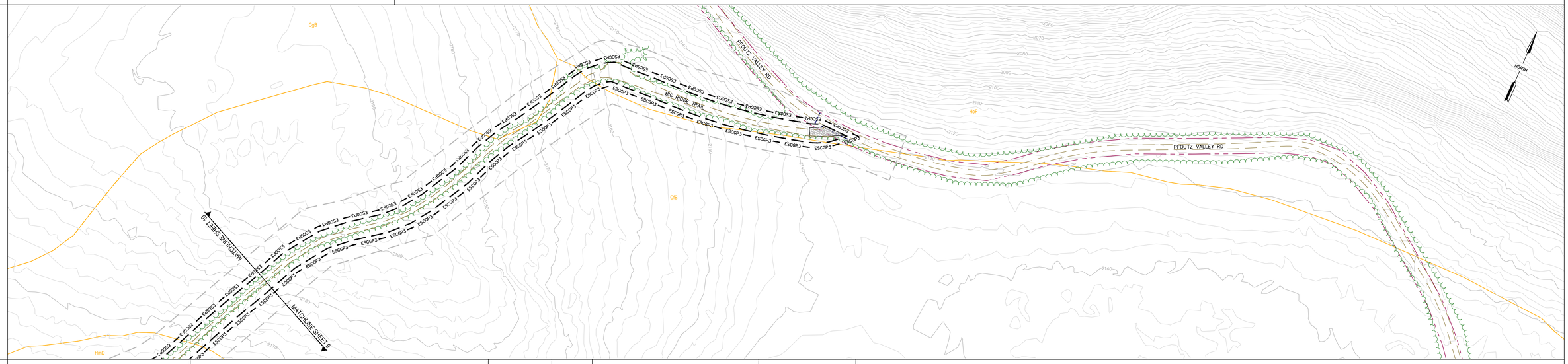
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 9 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002		
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW/TRANSPORTATION/COMMUNICATION	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV, MF)	SHINGLE BRANCH (EV, MF)	

ALIGNMENT



SOIL TYPE	HmD	CfB	CgB/CfB	CfB	HoF	HoF/CfB	HoF
AVERAGE % SLOPE	7%	6%					

CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
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- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
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- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CgB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 0 100 50 100
SCALE 1" =100'

WHM consulting, inc. designs, permits, resolutions | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATCH-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

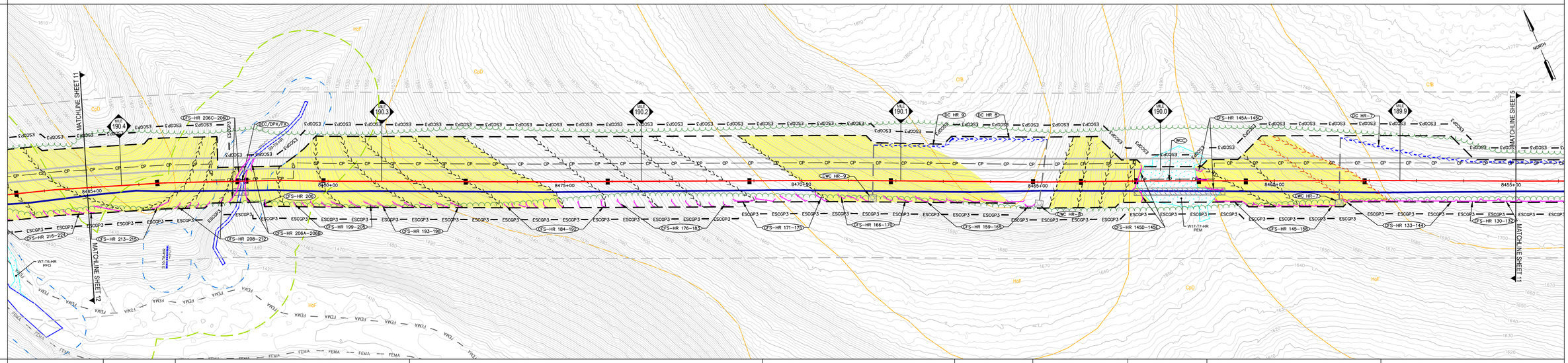
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 10 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004										
PROFILE (MIN. PIPE DEPTH)	3'	4'	3'								
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		MIXED FOREST LAND/MAINTAINED ROW/TRANSPORTATION/COMMUNICATION						MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	PADDY RUN (EV, MF)										
ALIGNMENT											
SOIL TYPE	HoF	CpD	HoF	CpD			HoF	CfB	HoF	CpD	HoF	CfB
AVERAGE % SLOPE	8%	24%	21%			8%	1%			4%	5%
CONSTRUCTION RIGHT-OF-WAY CONFIGURATION											

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATZIT-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

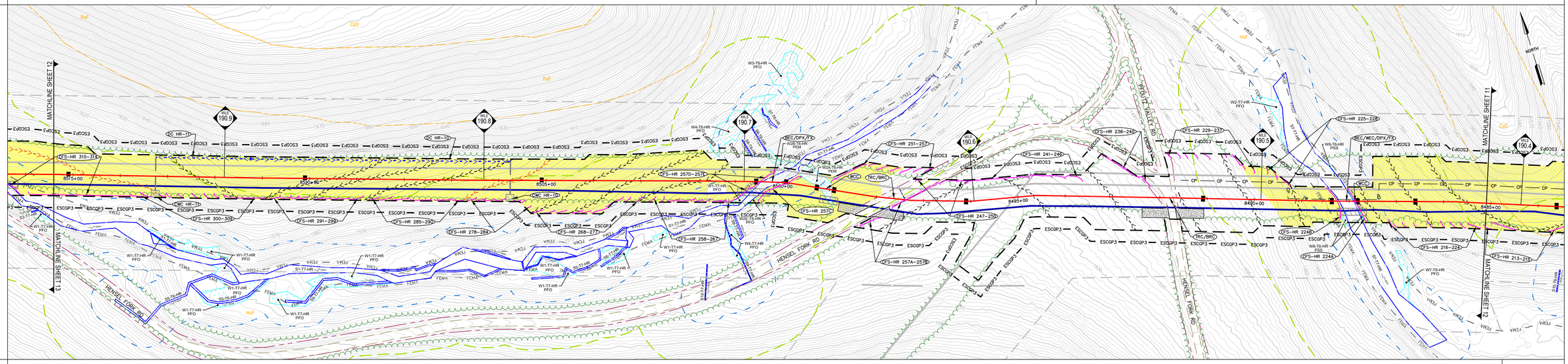
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 11 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0007				HENSEL FORK RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004		PADDY RUN RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004			
PROFILE (MIN. PIPE DEPTH)	3'		4'	3'	5'	3'		5'	3'		4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW			MIXED FOREST LAND/MAINTAINED ROW/TRANSPORTATION/COMMUNICATION					MIXED FOREST LAND/MAINTAINED ROW			
RECEIVING WATERS	HENSEL FORK (EV, MF)								PADDY RUN (EV, MF)			

ALIGNMENT



SOIL TYPE: HoF | CpD

AVERAGE % SLOPE: 2% | 5% | 13% | 8% | 15% | 31% | 10% | 8%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
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- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
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- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

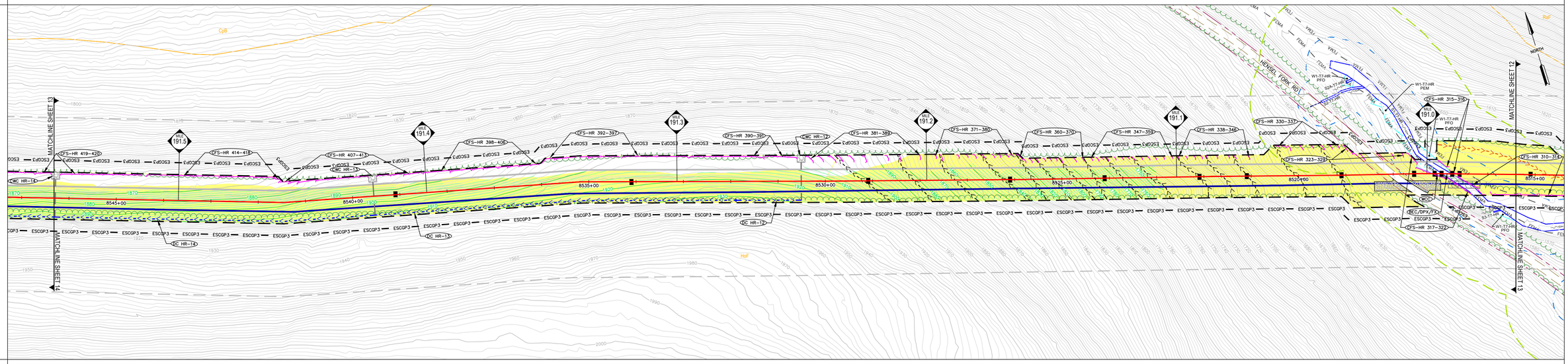
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 12 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004	HENSEL FORK RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0007		
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW/DECIDUOUS FOREST LAND				
RECEIVING WATERS	HENSEL FORK (EV, MF)				

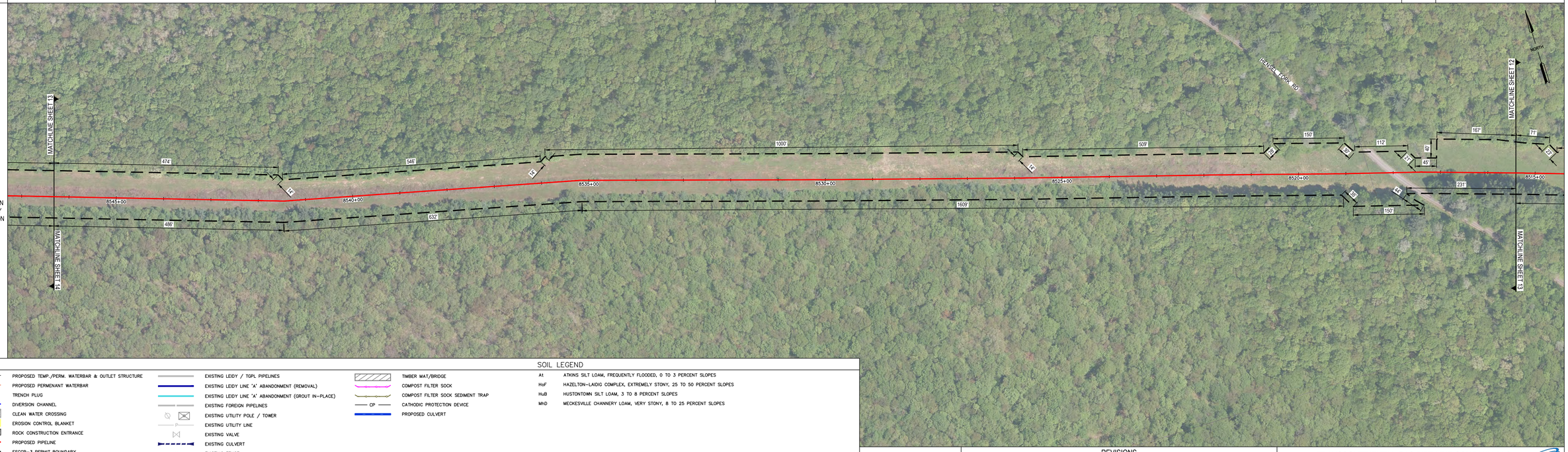
ALIGNMENT



SOIL TYPE: HoF

AVERAGE % SLOPE	3%	23%	25%	2%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
MhD	MECKESVILLE CHANNERY LOAM, VERY STONY, 8 TO 25 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM designs, permits, resolutions consulting, INC. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

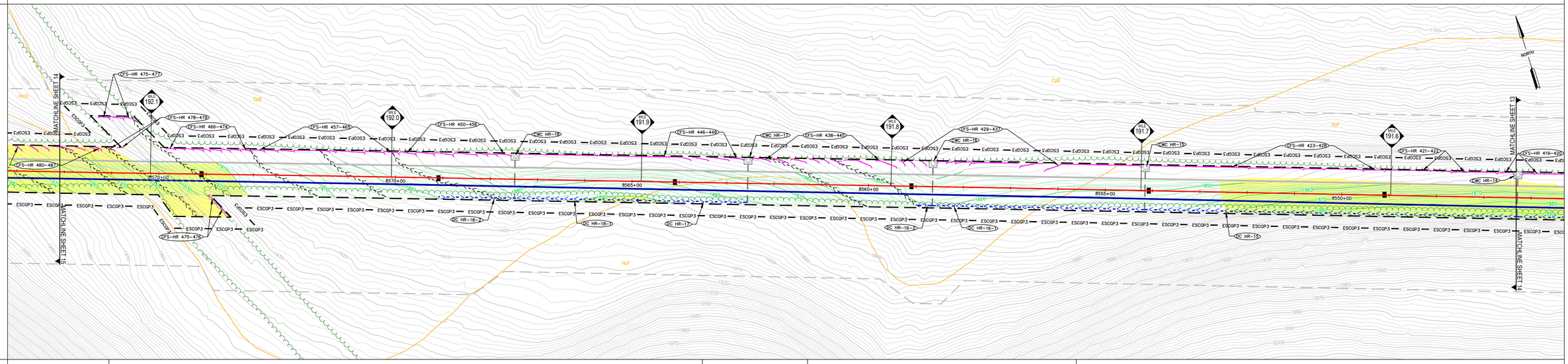
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 13 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004				
PROFILE (MIN. PIPE DEPTH)	3'				
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	HENSEL FORK (EV, MF)				

ALIGNMENT



SOIL TYPE	HoF	CpB	HoF	CpB	HoF
AVERAGE % SLOPE	18%	3%			3%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
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- PROPOSED FENCE
- EXISTING STRUCTURE
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- EXISTING ROAD (PAVED)
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- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 0
100 50 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

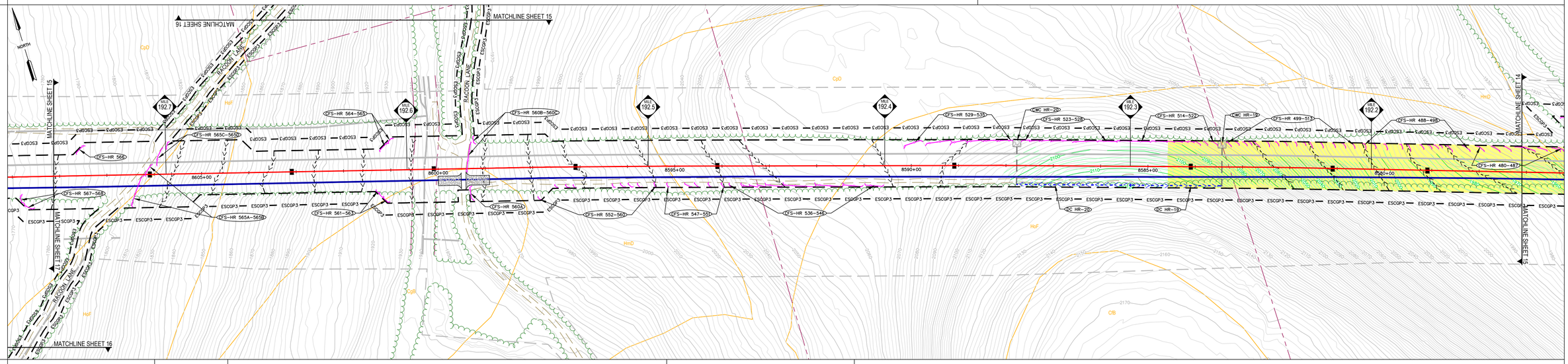
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 14 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0011					DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0010		DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'		5'	3'		
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/ COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS			MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)					HENSEL FORK (EV, MF)		

ALIGNMENT



SOIL TYPE	CpD	HoF	HmD	CpD	HoF
AVERAGE % SLOPE	14%	20%		5%	7%	18%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
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- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
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- PROPOSED FENCE
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- EXISTING ROAD (PAVED)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 0 50 100 / 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.
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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE:11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

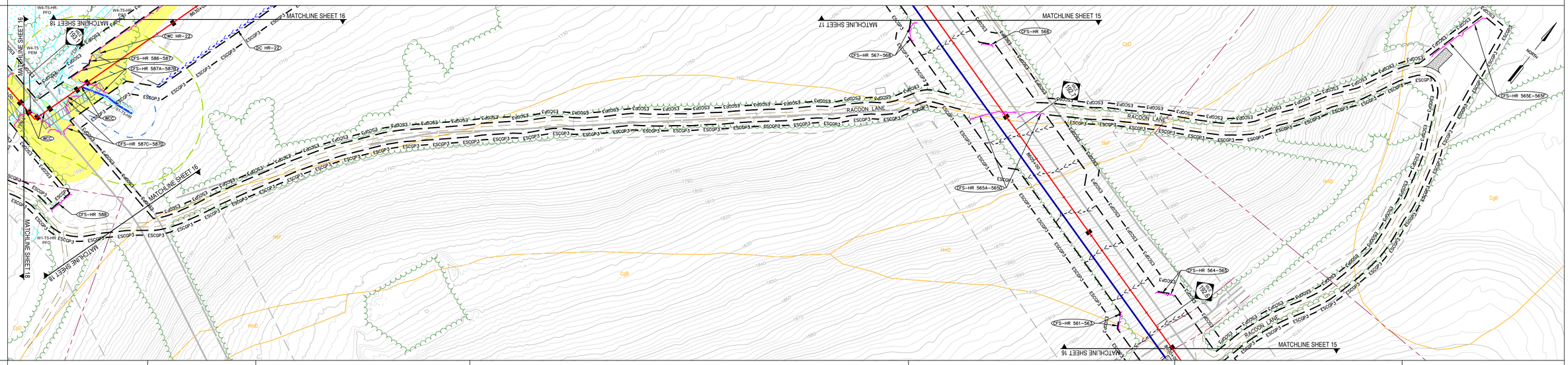
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 15 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0011						
PROFILE (MIN. PIPE DEPTH)	N/A			3'	5'	3'	N/A
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)						

ALIGNMENT



SOIL TYPE	CpD	HoF	CpD	HoF	CpD	HmD	CgB
AVERAGE % SLOPE	7%	7%	4%		12%		6%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
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- EXISTING VALVE
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- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

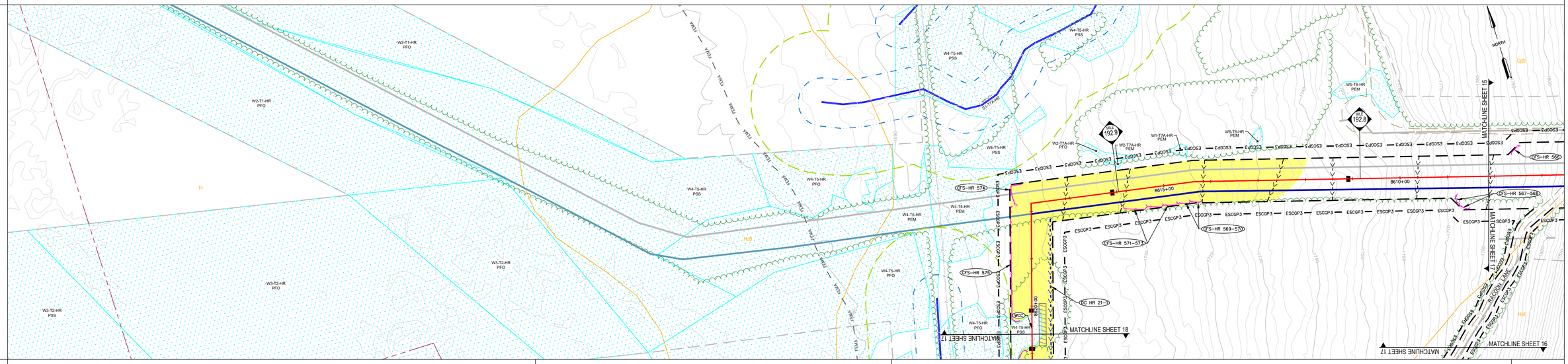
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 16 OF 39

OWNERSHIP & TRACT NUMBER	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0011				
PROFILE (MIN. PIPE DEPTH)	N/A			3'	
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW / TRANSITIONAL AREAS / TRANSPORTATION / COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)				

ALIGNMENT



SOIL TYPE	Fr	HuB	CpD	HoF
AVERAGE % SLOPE			7%	14%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
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- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
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- EXISTING TREELINE / TREE/SHRUB
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE 0
100 50 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
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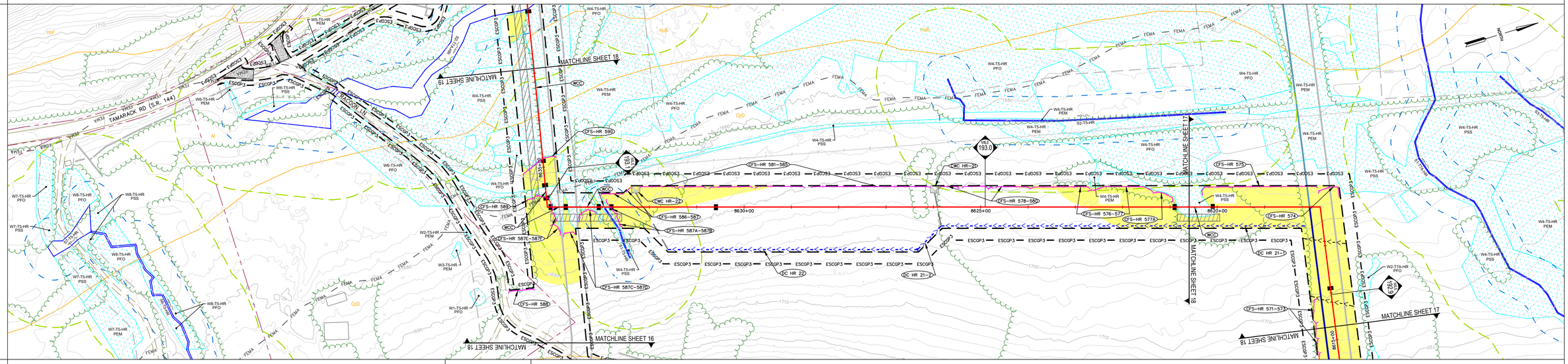
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 17 OF 39

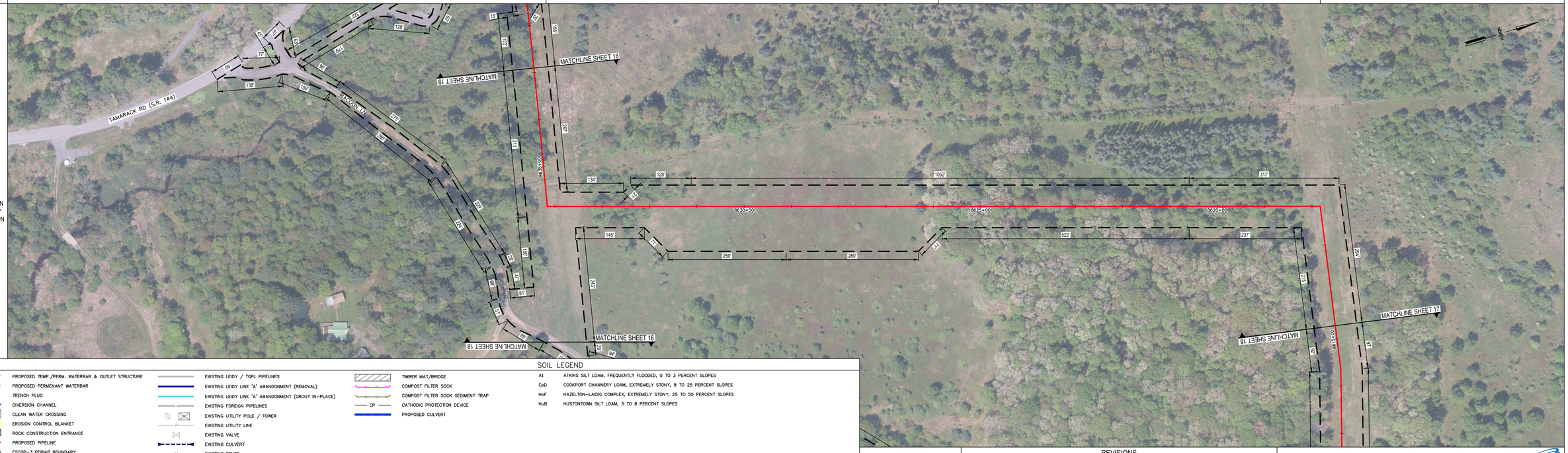
OWNERSHIP & TRACT NUMBER	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0011				
PROFILE (MIN. PIPE DEPTH)	N/A		3'		N/A
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/ COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)				

ALIGNMENT



SOIL TYPE	At	HuB	CpD		
AVERAGE % SLOPE	1%	2%	1%		7%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
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- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATZIT-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

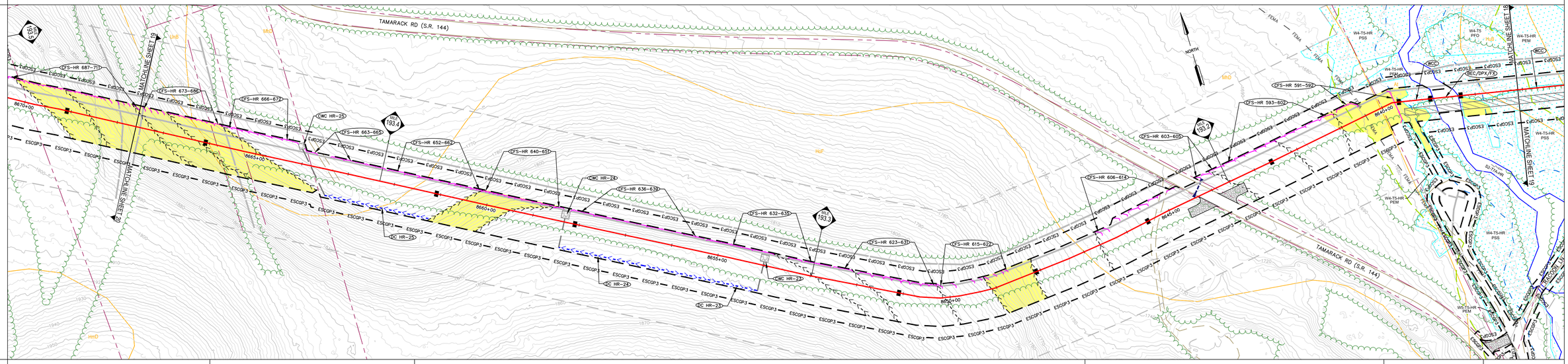
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 18 OF 39

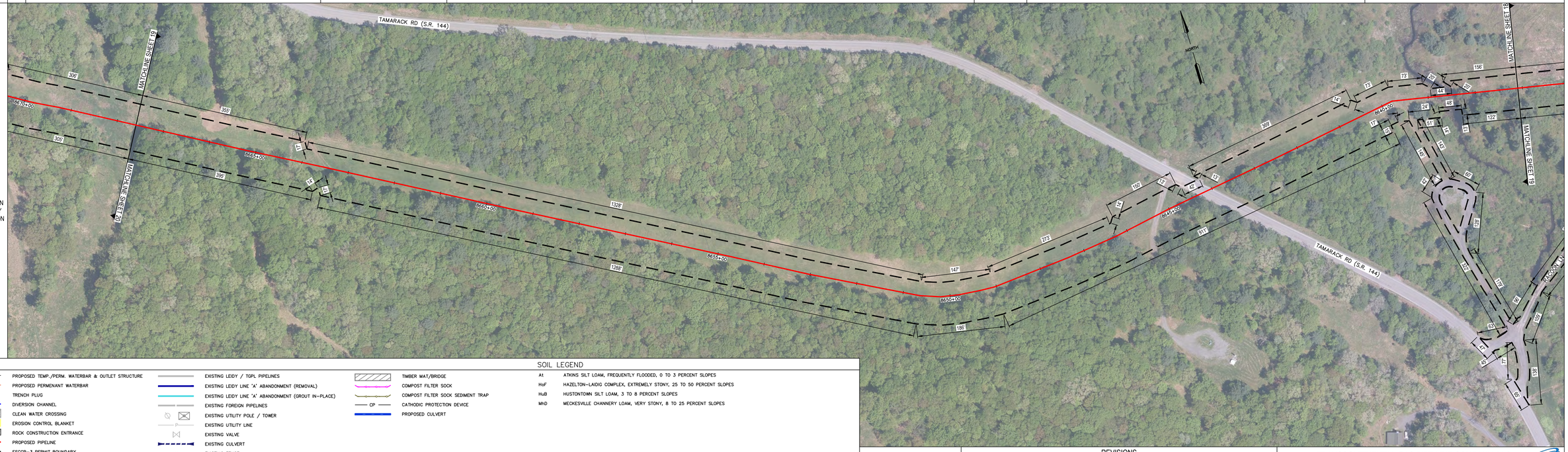
OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0005.010	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0005.007	TAMARACK RD (S.R. 144) ROW	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0005.0007	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0011	
PROFILE (MIN. PIPE DEPTH)	3'			5'	3'	4'	3'
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND	
RECEIVING WATERS	DRURY RUN (EV, MF)						

ALIGNMENT



SOIL TYPE	HoF	MhD	HoF	MhD	At	HuB		
AVERAGE % SLOPE	1%	2%	4%	9%	7%	29%	10%	1%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
MhD	MECKESVILLE CHANNERY LOAM, VERY STONY, 8 TO 25 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM designs, permits, resolutions consulting, INC.

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 19 OF 39

OWNERSHIP & TRACT NUMBER	DOMINION TRANSMISSION INC. HE-PA-CL-0005.030	TAMARACK RD (S.R. 144) ROW	RAYMOND D. WOLFE HE-PA-CL-0005.016	RED HILL RD (S.R. 144) ROW	KERRY B. WILSON HE-PA-CL-0005.013	DANIEL M. LUCAS HE-PA-CL-0005.012	JOHN C. SMITH HE-PA-CL-0005.011	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0005.010	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004

PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	5'	3'

COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND

RECEIVING WATERS	DRURY RUN (EV, MF)

ALIGNMENT

SOIL TYPE	At	HuB	UnB	HoF	MhD

AVERAGE % SLOPE	1%	1%	1%	6%	3%	6%	1%	2%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

—>—>—>—	PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
—>—>—>—	PROPOSED PERMENANT WATERBAR
■	TRENCH PLUG
—>—>—>—	DIVERSION CHANNEL
	CLEAN WATER CROSSING
	EROSION CONTROL BLANKET
	ROCK CONSTRUCTION ENTRANCE
	PROPOSED PIPELINE
— ESCGP3 —	ESCGP-3 PERMIT BOUNDARY
	LIMITS OF DISTURBANCE
	APPROX. ENVIRONMENTAL STUDY LIMITS
	DELINEATED WETLAND
	DELINEATED WATERWAY / STREAM (TOP OF BANK)
	STREAM FLOW DIRECTION
	RIPARIAN BUFFER
	50'/FEMA FLOODWAY
— FEMA —	FEMA 100-YEAR FLOODPLAIN
—MrB2	SOIL BOUNDARY / TYPE
	EXISTING TREELINE / TREE/SHRUB
	PROPERTY LINE
	EXISTING LEIDY / TGPL PIPELINES
	EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
	EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
	EXISTING FOREIGN PIPELINES
	EXISTING UTILITY POLE / TOWER
—P—	EXISTING UTILITY LINE
	EXISTING VALVE
	EXISTING CULVERT
—X—	EXISTING FENCE
—X—	PROPOSED FENCE
	EXISTING STRUCTURE
	EXISTING ROAD (GRAVEL)
	EXISTING ROAD (PAVED)
	EXISTING GRAVEL AREAS
	PROPOSED GRAVEL
—1250—	EXISTING GRADE MAJOR CONTOURS (2' C.I.)
—1244—	EXISTING GRADE MINOR CONTOURS (10' C.I.)
—1250—	PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
—1244—	PROPOSED GRADE MINOR CONTOURS (10' C.I.)
	TIMBER MAT/BRIDGE
	COMPOST FILTER SOCK
	COMPOST FILTER SOCK SEDIMENT TRAP
— CP —	CATHODIC PROTECTION DEVICE
	PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HoF	HAZELTON–LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
MhD	MECKESVILLE CHANNERY LOAM, VERY STONY, 8 TO 25 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES

SCALE 100 50 0 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 041211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

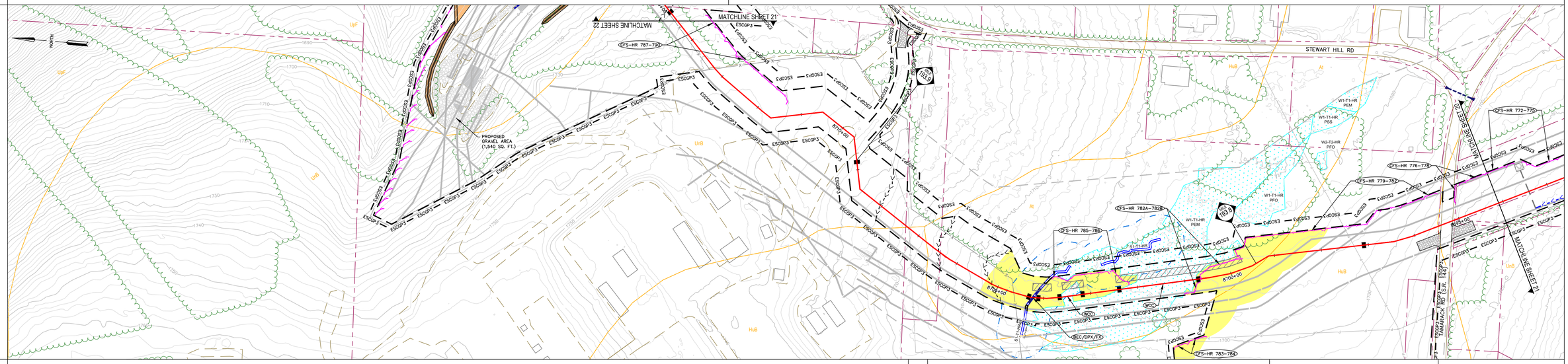
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 20 OF 39
WO: 1211227	RID:		

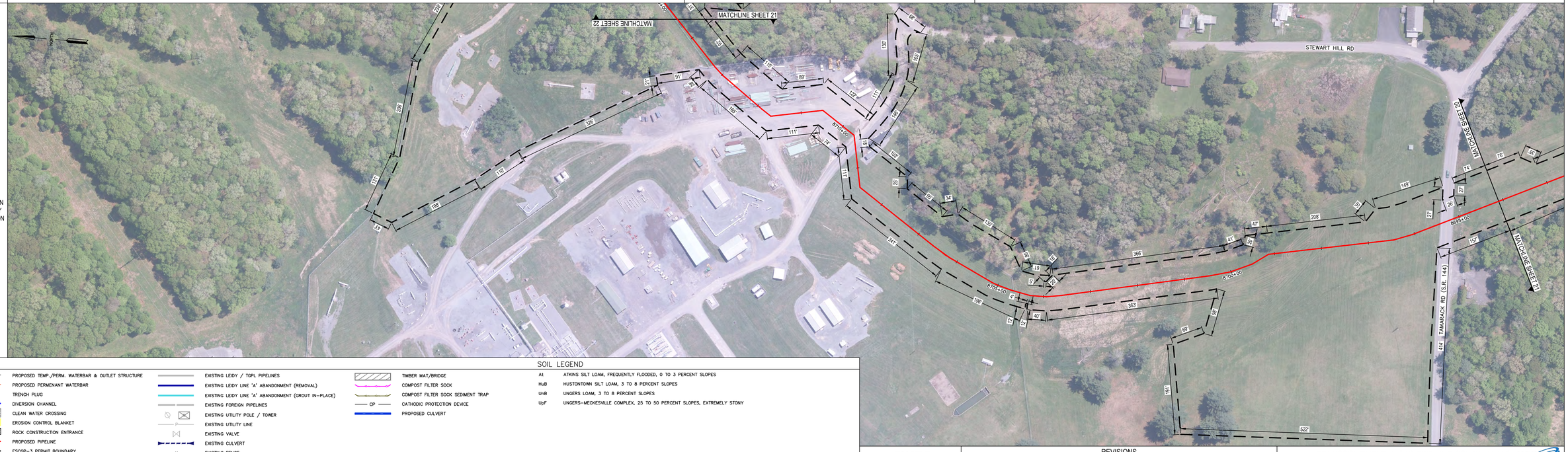
OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0024		DOMINION TRANSMISSION INC. HE-PA-CL-0025	DOMINION TRANSMISSION INC. HE-PA-CL-0005.032	DOMINION TRANSMISSION INC. HE-PA-CL-0005.027		TAMARACK RD (S.R. 144) ROW	RAYMOND D. WOLFE HE-PA-CL-0005.016
PROFILE (MIN. PIPE DEPTH)	N/A		3'		4'	3'	5'	3'
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND	
RECEIVING WATERS	TURTLE POINT HOLLOW (EV, MF)				DRURY RUN (EV, MF)			

ALIGNMENT



SOIL TYPE	UnB/UpF	HuB	At	HuB	UnB	
AVERAGE % SLOPE	13%	1%	7%	1%	11%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES
UpF	UNGERS-MECKESVILLE COMPLEX, 25 TO 50 PERCENT SLOPES, EXTREMELY STONY

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

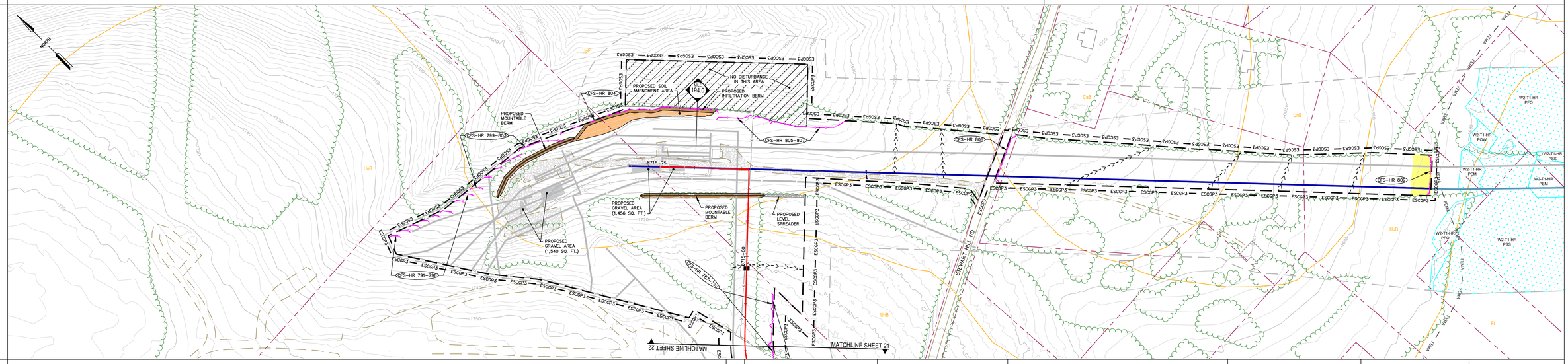
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 21 OF 39

OWNERSHIP & TRACT NUMBER	DOMINION TRANSMISSION INC. HE-PA-CL-0024					DOMINION TRANSMISSION INC. HE-PA-CL-0025		
PROFILE (MIN. PIPE DEPTH)	N/A			3'		N/A		
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS			MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	TURTLE POINT HOLLOW (EV, MF)						DRURY RUN (EV, MF)	

ALIGNMENT



SOIL TYPE	UpF	HuB	UnB	HuB	CaB	UnB	HuB	
AVERAGE % SLOPE		2%						

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CaB	CALVIN CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES
UpF	UNGERS-MECKESVILLE COMPLEX, 25 TO 50 PERCENT SLOPES, EXTREMELY STONY

SCALE 0 100 50 100
SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATA-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

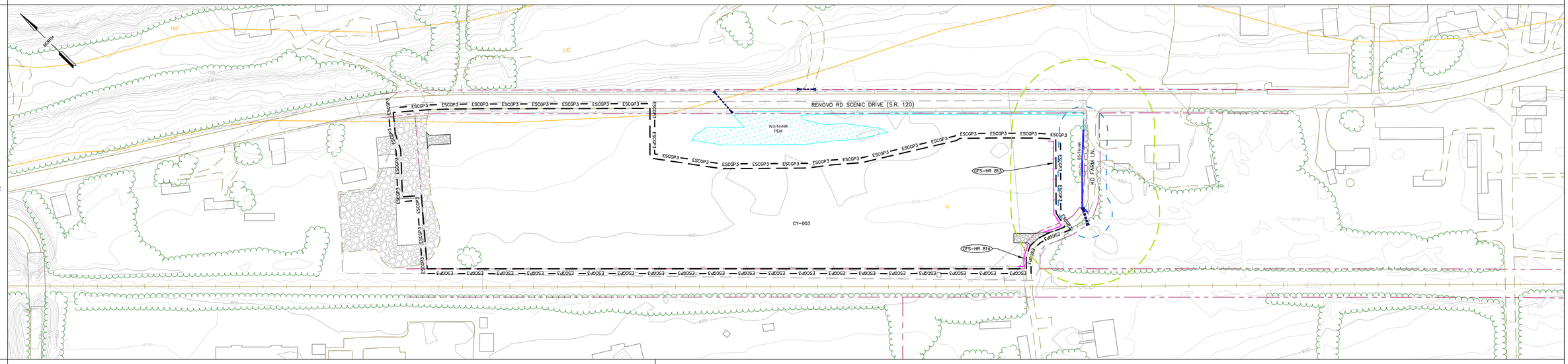
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 22 OF 39

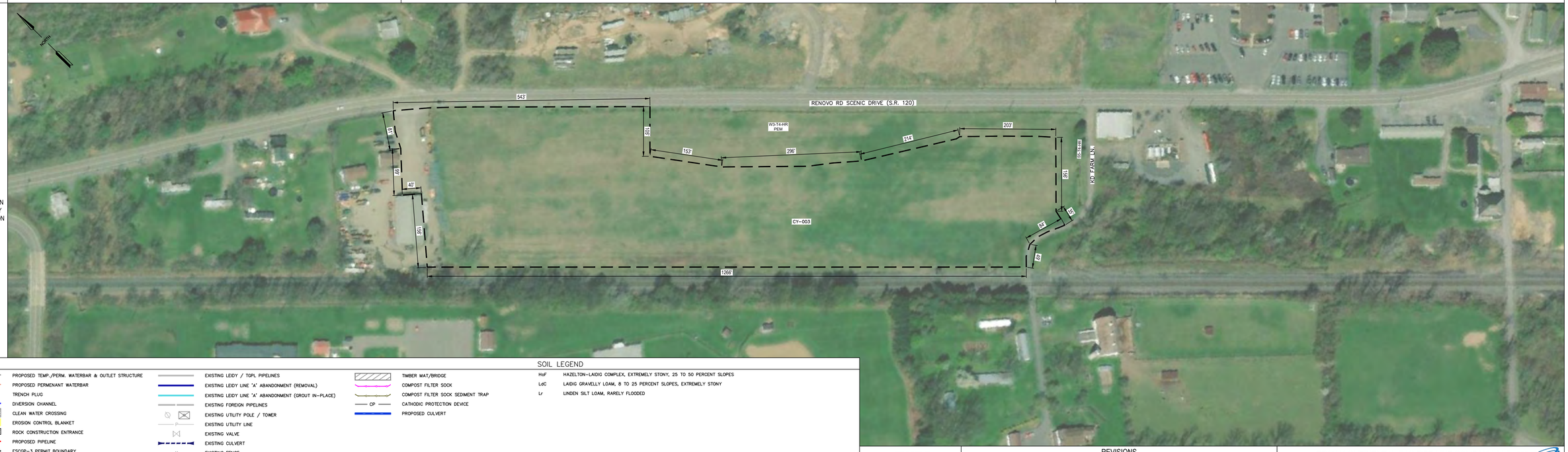
OWNERSHIP & TRACT NUMBER	THOMPSON LOGGING & TRUCKING		LEE E. JR. & TAMERLIE J. THOMPSON HE-PA-CL-0024	KD FARM LN. ROW	VITO A. JR. & WENDY D. JANERELLA
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	WEST BRANCH SUSQUEHANNA RIVER (WWF,MF)				

CONTRACTOR YARD



SOIL TYPE	LdC/Lr	Lr
AVERAGE % SLOPE	1%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
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- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
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- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
LdC	LAIDIG GRAVELLY LOAM, 8 TO 25 PERCENT SLOPES, EXTREMELY STONY
Lr	LINDEN SILT LOAM, RARELY FLOODED

SCALE 0 — 100 50 100
SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER — 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

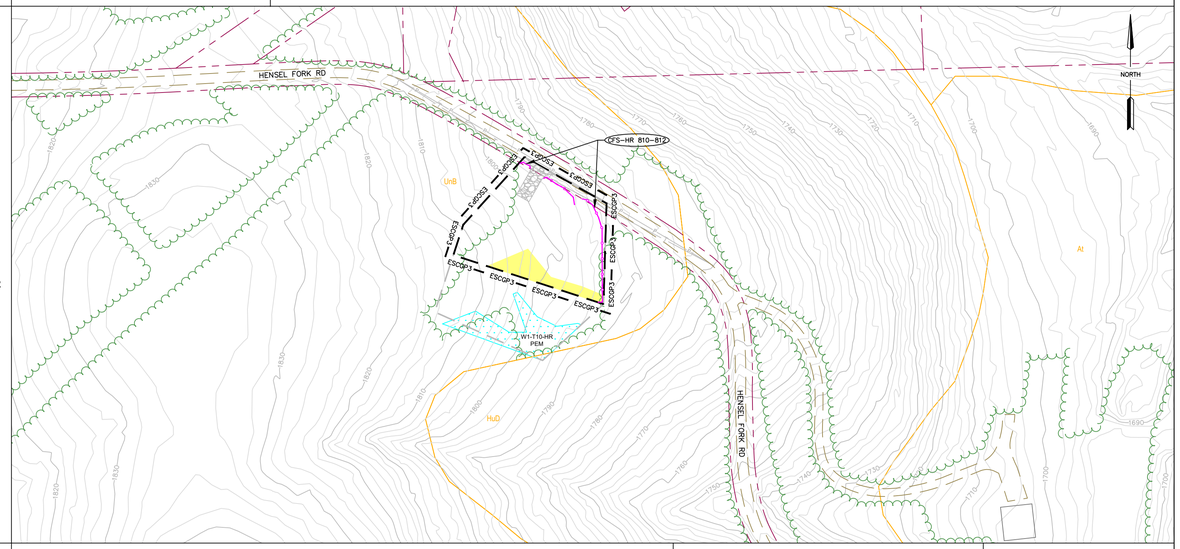
SITE PLAN

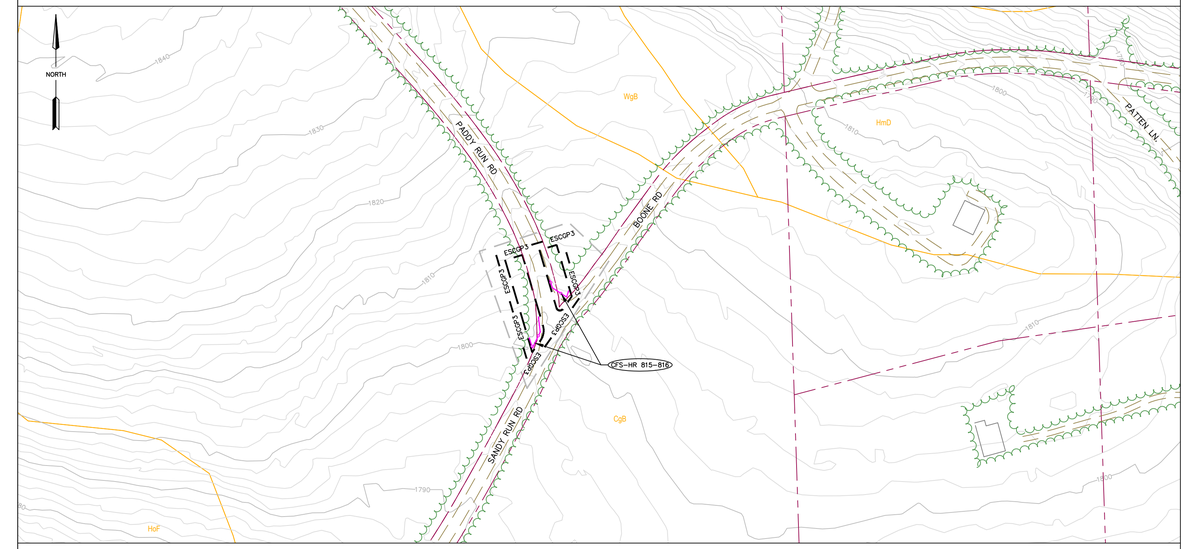
LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 23 OF 39

OWNERSHIP & TRACT NUMBER	JACOB & LAURIE CLEVENGER			DEPARTMENT OF ENVIRONMENTAL RESOURCES	PADDY RUN RD. ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES	BOONE RD. ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES	DAN L. & MARCIA K. ARNOLD
PROFILE (MIN. PIPE DEPTH)	N/A			N/A					
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND / MAINTAINED ROW / TRANSITIONAL AREAS / TRANSPORTATION / COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS			DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND		
RECEIVING WATERS	DRURY RUN (EV, MF)	AUSTIN HOLLOW (EV, MF)		SANDY RUN (HQ, CWF, MF)					

CONTRACTOR YARD





SOIL TYPE	UnB		HuD	At	CgB	
AVERAGE % SLOPE		9%			3%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
CgB	CLYMER-COOKPORT CHANNERY LOAMS, 0 TO 8 PERCENT SLOPES, EXTREMELY STONY
HuD	HUSTONTOWN SILT LOAM, 15 TO 25 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

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STANDARD EROSION AND SEDIMENT POLLUTION CONTROL NOTES

1. ALL EARTH DISTURBANCES, INCLUDING CLEARING AND GRUBBING AS WELL AS CUTS AND FILLS SHALL BE DONE IN ACCORDANCE WITH THE APPROVED E&S PLAN. A COPY OF THE APPROVED DRAWINGS (STAMPED, SIGNED AND DATED BY THE REVIEWING AGENCY) MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES. THE REVIEWING AGENCY SHALL BE NOTIFIED OF ANY CHANGES TO THE APPROVED PLAN PRIOR TO IMPLEMENTATION OF THOSE CHANGES. THE REVIEWING AGENCY MAY REQUIRE A WRITTEN SUBMITTAL OF THOSE CHANGES FOR REVIEW AND APPROVAL AT ITS DISCRETION.
2. AT LEAST 7 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, INCLUDING CLEARING AND GRUBBING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS, THE LANDOWNER, APPROPRIATE MUNICIPAL OFFICIALS, THE E&S PLAN PREPARER, THE PCSM PLAN PREPARER, THE LICENSED PROFESSIONAL RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE PCSM PLAN, AND A REPRESENTATIVE FROM THE LOCAL CONSERVATION DISTRICT TO AN ON–SITE PRECONSTRUCTION MEETING.
3. AT LEAST 3 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE PENNSYLVANIA ONE CALL SYSTEM INC. SHALL BE NOTIFIED AT 1–800–242–1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
4. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE SEQUENCE PROVIDED ON THE PLAN DRAWINGS. DEVIATION FROM THAT SEQUENCE MUST BE APPROVED IN WRITING FROM THE LOCAL COUNTY CONSERVATION DISTRICT OR BY THE DEPARTMENT PRIOR TO IMPLEMENTATION.
5. AREAS TO BE FILLED ARE TO BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL.
6. CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE. GENERAL SITE CLEARING, GRUBBING AND TOPSOIL STRIPPING MAY NOT COMMENCE IN ANY STAGE OR PHASE OF THE PROJECT UNTIL THE E&S BMPS SPECIFIED BY THE BMP SEQUENCE FOR THAT STAGE OR PHASE HAVE BEEN INSTALLED AND ARE FUNCTIONING AS DESCRIBED IN THIS E&S PLAN.
7. AT NO TIME SHALL CONSTRUCTION VEHICLES BE ALLOWED TO ENTER AREAS OUTSIDE THE LIMIT OF DISTURBANCE BOUNDARIES SHOWN ON THE PLAN MAPS. THESE AREAS MUST BE CLEARLY MARKED AND FENCED OFF BEFORE CLEARING AND GRUBBING OPERATIONS BEGIN.
8. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED AT THE LOCATION(S) SHOWN ON THE PLAN MAPS IN THE AMOUNT NECESSARY TO COMPLETE THE FINISHED GRADING OF ALL EXPOSED AREAS THAT ARE TO BE STABILIZED BY VEGETATION. EACH STOCKPILE SHALL BE PROTECTED IN THE MANNER SHOWN ON THE PLAN DRAWINGS. STOCKPILE HEIGHTS SHALL NOT EXCEED 35 FEET. STOCKPILE SLOPES SHALL BE 2H:1V OR FLATTER. STOCKPILES SHALL BE LOCATED WITHIN THE LIMIT OF DISTURBANCE (LOD). FILTER SOCK OR SILT FENCE SHALL BE PLACED DOWNGRADIENT OF STOCKPILES.
9. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE LOCAL CONSERVATION DISTRICT AND/OR THE REGIONAL OFFICE OF THE DEPARTMENT.
10. ALL BUILDING MATERIALS AND WASTES SHALL BE REMOVED FROM THE SITE AND RECYCLED OR DISPOSED OF IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1, AND 287.1 ET. SEQ. NO BUILDING MATERIALS OR WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED, OR DISCHARGED AT THE SITE.
11. ALL OFF–SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL COUNTY CONSERVATION DISTRICT OR THE DEPARTMENT FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED.
12. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ANY MATERIAL BROUGHT ON SITE IS CLEAN FILL. FORM FP–001 MUST BE RETAINED BY THE PROPERTY OWNER FOR ANY FILL MATERIAL AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE BUT QUALIFYING AS CLEAN FILL DUE TO ANALYTICAL TESTING.
13. ALL PUMPING OF WATER FROM ANY WORK AREA SHALL BE DONE ACCORDING TO THE PROCEDURE DESCRIBED IN THIS PLAN, OVER UNDISTURBED VEGETATED AREAS.
14. VEHICLES AND EQUIPMENT MAY NEITHER ENTER DIRECTLY NOR EXIT DIRECTLY FROM LOTS AND ONTO ROADS AS IDENTIFIED ON THE PLANS.
15. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPS SHALL BE MAINTAINED PROPERLY. MAINTENANCE SHALL INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGARDING, RESEEDING, REMULCHING AND RENETTING MUST BE PERFORMED IMMEDIATELY. IF THE E&S BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.
16. A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION.
17. SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.
18. ALL SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS.
19. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 3 TO 5 INCHES 6 TO 12 INCHES ON COMPACTED SOILS PRIOR TO PLACEMENT OF TOPSOIL. AREAS TO BE VEGETATED SHALL HAVE A MINIMUM 4 INCHES OF TOPSOIL IN PLACE PRIOR TO SEEDING AND MULCHING. FILL OUTSLOPES SHALL HAVE A MINIMUM OF 2 INCHES OF TOPSOIL.
20. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
21. ALL EARTHEN FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
22. FILL MATERIALS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
23. FROZEN MATERIALS OR SOFT, MUCKY, OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED INTO FILLS.
24. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
25. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
26. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY UPON REACHING FINISHED GRADE. CUT SLOPES IN COMPETENT BEDROCK AND ROCK FILLS NEED NOT BE VEGETATED. SEEDED AREAS WITHIN 50 FEET OF A SURFACE WATER, OR AS OTHERWISE SHOWN ON THE PLAN DRAWINGS, SHALL BE BLANKETED ACCORDING TO THE STANDARDS OF THIS PLAN.
27. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE IN ANY AREA OR SUBAREA OF THE PROJECT, THE OPERATOR SHALL STABILIZE ALL DISTURBED AREAS. DURING NON–GERMINATING MONTHS, MULCH OR PROTECTIVE BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.
28. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM, PERENNIAL 70% VEGETATIVE COVER OR OTHER PERMANENT NON–VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION. CUT AND FILL SLOPES SHALL BE CAPABLE OF RESISTING FAILURE DUE TO SLUMPING, SLIDING, OR OTHER MOVEMENTS.
29. E&S BMPS SHALL REMAIN FUNCTIONAL AS SUCH UNTIL ALL AREAS TRIBUTARY TO THEM ARE PERMANENTLY STABILIZED OR UNTIL THEY ARE REPLACED BY ANOTHER BMP APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT.
30. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT FOR AN INSPECTION PRIOR TO REMOVAL/CONVERSION OF THE E&S BMPS.
31. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT BMPS MUST BE REMOVED OR CONVERTED TO PERMANENT POST CONSTRUCTION STORMWATER MANAGEMENT BMPS. AREAS DISTURBED DURING REMOVAL OR CONVERSION OF THE BMPS SHALL BE STABILIZED IMMEDIATELY. IN ORDER TO ENSURE RAPID REVEGETATION OF DISTURBED AREAS, SUCH REMOVAL/CONVERSIONS ARE TO BE DONE ONLY DURING THE GERMINATING SEASON.
32. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT TO SCHEDULE A FINAL INSPECTION.
33. FAILURE TO CORRECTLY INSTALL E&S BMPS, FAILURE TO PREVENT SEDIMENT–LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE, OR FAILURE TO TAKE IMMEDIATE CORRECTIVE ACTION TO RESOLVE FAILURE OF E&S BMPS MAY RESULT IN ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES BEING INSTITUTED BY THE DEPARTMENT AS DEFINED IN SECTION 602 OF THE PENNSYLVANIA CLEAN STREAMS LAW. THE CLEAN STREAMS LAW PROVIDES FOR UP TO $10,000 PER DAY IN CIVIL PENALTIES, UP TO $10,000 IN SUMMARY CRIMINAL PENALTIES, AND UP TO $25,000 IN MISDEMEANOR CRIMINAL PENALTIES FOR EACH VIOLATION.
34. CONCRETE WASH WATER SHALL BE HANDLED IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS. IN NO CASE SHALL IT BE ALLOWED TO ENTER ANY SURFACE WATERS OR GROUNDWATER SYSTEMS.
35. ALL E&S CONVEYANCE CHANNELS SHALL BE KEPT FREE OF OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO FILL, ROCKS, LEAVES, WOODY DEBRIS, ACCUMULATED SEDIMENT, EXCESS VEGETATION, AND CONSTRUCTION MATERIAL/WASTES.
36. UNDERGROUND UTILITIES CUTTING THROUGH ANY ACTIVE E&S CONVEYANCE CHANNELS SHALL BE IMMEDIATELY BACKFILLED AND THE CHANNEL RESTORED TO ITS ORIGINAL CROSS–SECTION AND PROTECTIVE LINING. ANY BASE FLOW WITHIN THE CHANNEL SHALL BE CONVEYED PAST THE WORK AREA IN THE MANNER DESCRIBED IN THIS PLAN UNTIL SUCH RESTORATION IS COMPLETE.
37. E&S CONVEYANCE CHANNELS HAVING RIPRAP, RENO MATTRESS, OR GABION LININGS MUST BE SUFFICIENTLY OVER–EXCAVATED SO THAT THE DESIGN DIMENSIONS WILL BE PROVIDED AFTER PLACEMENT OF THE PROTECTIVE LINING.
38. SEDIMENT BASINS AND/OR TRAPS SHALL BE KEPT FREE OF ALL CONSTRUCTION WASTE, WASH WATER, AND OTHER DEBRIS HAVING POTENTIAL TO CLOG THE BASIN/TRAP OUTLET STRUCTURES AND/OR POLLUTE THE SURFACE WATERS.
39. SEDIMENT BASINS SHALL BE PROTECTED FROM UNAUTHORIZED ACTS BY THIRD PARTIES.
40. ANY DAMAGE THAT OCCURS IN WHOLE OR IN PART AS A RESULT OF BASIN OR TRAP DISCHARGE SHALL BE IMMEDIATELY REPAIRED BY THE PERMITTEE IN A PERMANENT MANNER SATISFACTORY TO THE MUNICIPALITY, LOCAL CONSERVATION DISTRICT, AND THE OWNER OF THE DAMAGED PROPERTY.
41. UPON REQUEST, THE APPLICANT OR HIS CONTRACTOR SHALL PROVIDE AN AS–BUILT (RECORD DRAWING) FOR ANY SEDIMENT BASIN OR TRAP TO THE MUNICIPAL INSPECTOR, LOCAL COUNTY CONSERVATION DISTRICT OR THE DEPARTMENT.
42. EROSION CONTROL BLANKETING SHALL BE INSTALLED ON ALL SLOPES 3H:1V OR STEEPER, WITHIN 100' OF A STREAM OR WETLAND IN A HIGH QUALITY OR EXCEPTIONAL VALUE WATERSHED, WITHIN 50' OF A STREAM OR WETLAND IN A NON–HIGH QUALITY OR EXCEPTIONAL VALUE WATERSHED, AND ON ALL OTHER DISTURBED AREAS SPECIFIED ON THE PLAN MAPS AND/OR DETAIL SHEETS.
43. FILL MATERIAL FOR EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS.

PIPELINE BMP INSTALLATION SEQUENCE

1. AT LEAST 10 WORKING DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE PENNSYLVANIA ONE CALL SYSTEM INC. SHALL BE NOTIFIED AT 1–800–242–1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
2. AT LEAST 7 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, INCLUDING CLEARING AND GRUBBING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS, ENVIRONMENTAL INSPECTORS, APPROPRIATE MUNICIPAL OFFICIALS, THE E&S PLAN PREPARER, THE PCSM PLAN PREPARER, THE LICENSED PROFESSIONAL RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE PCSM PLAN, AND A REPRESENTATIVE FROM THE LOCAL CONSERVATION DISTRICT TO AN ON–SITE PRECONSTRUCTION MEETING.
3. HOLD PRE–CONSTRUCTION CONFERENCE WITH THE ENVIRONMENTAL INSPECTORS, LOCAL COUNTY CONSERVATION DISTRICT (CCD), PADEP, CONSTRUCTION CHIEF, AND DESIGN ENGINEER.
4. WILLIAMS SURVEY WILL FIELD LOCATE AND STAKE THE LOD.
5. LOCATE PROJECT ACCESS POINTS INCLUDING CONSTRUCTION ENTRANCES.
6. FLAG AND/OR STAKE WETLANDS, STREAMS AND OTHER SENSITIVE RESOURCES THAT WILL BE IMPACTED BY THE PROJECT.
7. INSTALL ORANGE CONSTRUCTION FENCE ALONG LIMITS OF DISTURBANCE IN AREAS ADJACENT TO STREAMS, WETLANDS, OR OTHER SENSITIVE RESOURCE, AS DESIGNATED ON THE PLANS.
8. INSTALL CONSTRUCTION ENTRANCES.
9. REMOVE FELLED TREES, CLEAR AND GRUB AS NECESSARY TO EFFECTIVELY INSTALL PERMANENT AND TEMPORARY ACCESS ROADS AND ASSOCIATED BMPS (VEGETATED ROADSIDE DITCHES, DITCH RELIEF CULVERTS, AND RIPRAP OUTLET PROTECTION, AND SEDIMENT BARRIER).
10. REMOVE FELLED TREES, CLEAR AND GRUB AS NECESSARY TO INSTALL BRIDGE EQUIPMENT CROSSINGS, WETLAND TIMBER MATTING, TIMBER MATTING AIR BRIDGES, AND SEDIMENT BARRIERS AT WETLAND AND WATERBODY CROSSINGS AS INDICATED ON THE PLANS.
11. REMOVE FELLED TREES FOR THE REMAINDER OF THE SITE.
12. CLEAR AND GRUB AS NECESSARY TO EFFECTIVELY INSTALL THE REMAINDER OF PERIMETER CONTROLS.
13. INSTALL PERIMETER CONTROLS.
14. COMPLETE SITE CLEARING AND GRUBBING.
15. AS THE GRUBBING OPERATION CONTINUES, INSTALL THE APPROPRIATE BMPS ASSOCIATED PER THE APPROVED PLANS FOR ITEMS INCLUDING BUT NOT LIMITED TO: ROCK FILTER OUTLETS, WATERBARS, DIVERSIONS, OUTLET STRUCTURES, VEGETATED ROADSIDE DITCHES, DITCH RELIEF CULVERTS, AND RIPRAP OUTLET PROTECTION.
16. STRIP AND STOCKPILE TOPSOIL.
17.
   A. CONTINUE EXCAVATION TO FACILITATE REMOVAL OF LEIDY A LINE
   B. CONTINUE EXCAVATION TO FACILITATE INSTALLATION OF PIPELINE
18. CONTRACTOR SHALL INSTALL TRENCH PLUGS DURING CONSTRUCTION AS IDENTIFIED ON THE APPROVED PLANS.
19. BACKFILL PIPE TRENCH WITHIN 30 DAYS OF EXCAVATING, REPAIR PERMANENT WATERBARS, REMOVE TEMPORARY WATERBARS, RETURN TEMPORARILY GRADED AREAS TO PRE–DEVELOPMENT GRADE, REPAIR/INSTALL EROSION CONTROL BLANKET AS NEEDED, REPLACE TOPSOIL AND SEED AND STABILIZE DISTURBED AREAS (SLOPES, DITCHES AND CHANNELS) AS THEY ARE RETURNED TO FINAL GRADE.
20. CONTRACTOR WILL COMPLETE UPLAND FINAL GRADING, TOPSOIL REPLACEMENT, INSTALLATION OF PERMANENT E&S MEASURES WITHIN 20 DAYS AFTER BACKFILLING THE TRENCH IN ALL AREAS EXCEPT RESIDENTIAL AREAS, WHICH WILL BE COMPLETED WITHIN 10 DAYS.
21. PERFORM HYDROSTATIC PRESSURE TEST OF PIPELINE.
22. DEWATER PIPELINE UTILIZING APPROPRIATE BMPS, COMPLETE FINAL TIE–INS.
23. AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A MINIMUM UNIFORM 70% PERENNIAL VEGETATIVE COVER OR OTHER PERMANENT NON–VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SUBSURFACE CHARACTERISTICS SUFFICIENT TO RESIST SLIDING AND OTHER MOVEMENTS. WHEN CONTROLS ARE TO BE REMOVED IN AGRICULTURAL NON–SENSITIVE AREAS (STREAMS/WETLANDS), AGRICULTURAL LANDOWNERS SHALL MAINTAIN AGRICULTURAL BMPS PER PADEP REGULATIONS.
24. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE PERMITTEE AND/OR OPERATORS SHALL CONTACT THE LOCAL CCD AND/OR PADEP FOR AN INSPECTION PRIOR TO THE REMOVAL OF THE E&SC BMPS.
25. REMOVE AND PROPERLY DISPOSE OF/RECYCLE E&SC BMPS. REMOVE STAKES AND ORANGE CONSTRUCTION FENCE. REPAIR AND PERMANENTLY STABILIZE AREAS DISTURBED DURING E&SC BMP REMOVAL.

THERMAL IMPACTS

DUE TO THE OVERALL NATURE OF THE PROJECT, THERMAL IMPACTS TO SURFACE WATERS ARE NOT ANTICIPATED. THE PIPELINE INSTALLATION ACTIVITIES WILL PRIMARILY TAKE PLACE WITHIN AN EXISTING CLEARED AND MAINTAINED PIPELINE RIGHT–OF–WAY. THERE WILL BE NO INCREASE IN STORMWATER DISCHARGE. THE PRIMARY MEANS TO ADDRESS THERMAL IMPACTS ON THIS PROJECT IS TO LIMIT THE SIZE AND DURATION OF EXPOSED EARTH. REVEGETATION PROCEDURES AND THE SEQUENCE OF CONSTRUCTION OUTLINE DISTURBED AREAS BEING IMMEDIATELY REVEGETATED.

STORMWATER RUNOFF ASSOCIATED WITH THE INSTALLATION OF THE MLV'S WILL BE ROUTED THROUGH THE STORMWATER BMP'S DESIGNED TO RETAIN AND INFILTRATE THE FIRST SURGE OF WATER FROM THE SITE. THE FIRST SURGE OF WATER WILL BE THE WARMEST WATER FOR THE DURATION OF THE STORM EVENT AND WILL QUICKLY COOL AS THE STORM EVENT PROGRESSES. THE BMPS ARE DESIGNED TO CAPTURE AND INFILTRATE THIS WARMEST SURGE OF STORMWATER. BASED ON ROUTING CALCULATIONS, STORMWATER IS NOT DISCHARGED FROM THE BMPS FOR THE FIRST 12 HOURS DURING A 100–YEAR/24–HOUR STORM EVENT. THE RETENTION PERIOD IS LONGER FOR LESS INTENSE STORMS. THEREFORE, THROUGH THESE MEASURES, THERE IS NO SIGNIFICANT THERMAL IMPACT TO THE RECEIVING WATERS ANTICIPATED.

TREE CLEARING NOTES

1. TREE FELLING IS TO BEGIN NO EARLIER THAN NOVEMBER 16TH AND END NO LATER THAN MARCH 31 [IF THERE IS A RESTRICTION].
2. THE LOCAL COUNTY CONSERVATION DISTRICT IS TO BE NOTIFIED PRIOR TO ACCESSING THE SITE AND UPON COMPLETION OF TREE FELLING ACTIVITIES.
3. TREES ARE TO BE FELLED BY WORKERS ON FOOT USING CHAIN SAWS.
4. TREE STUMPS WILL NOT BE REMOVED FROM THE RIGHT OF WAY UNTIL FULL SCALE CONSTRUCTION BEGINS.
5. DURING THE TREE FELLING PROCESS THERE WILL BE NO REMOVAL OR GRINDING OF TREE STUMPS.
6. TREES ARE NOT BE HAULED OFF SITE, EXCEPT IN CASES WHERE STEEP SLOPES PRESENT A SAFETY CONCERN, OR IN RESIDENTIAL AREAS WHERE A LANDOWNER INSISTS THAT THE TREES BE MOVED.
7. NO CLEARING OR GRUBBING WILL OCCUR.
8. THE USE OF EQUIPMENT (RUBBER TIRED AND / OR TRACKED) IS TO BE MINIMIZED.
9. IF PASSAGE OF LIGHT–DUTY TRUCKS AND SIMILAR EQUIPMENT IN EXISTING CLEARED PIPELINE RIGHT OF WAY LEADS TO THE CREATION OF ANY RUTS, THEY WILL BE SMOOTHED OVER AND GRASS SEED AND MULCH WILL BE SPREAD AT THE COMPLETION OF TREE FELLING, AS REQUIRED.
10. IF ANY RUTS OR LAND DISTURBANCE RESULTS IN AN EROSIVE CONDITION, THE RUTS WILL BE SMOOTHED OVER IMMEDIATELY AND IF NECESSARY, SEDIMENT BARRIER WILL BE INSTALLED IN THE LOCALIZED AREA OF THE DISTURBANCE.
11. FOLLOWING THE COMPLETION OF TREE FELLING OPERATIONS, DISTURBED AREAS WILL BE SMOOTHED, SEEDED AND MULCHED.
12. IF VEGETATION ALONG THE RIGHT OF WAY IS DISTURBED AND REQUIRES REMEDIAL ACTION, THE DISTURBED AREA(S) ARE TO BE SEEDED AND MULCHED AT THE COMPLETION OF TREE FELLING ACTIVITIES.

RESPONSIBILITIES FOR FILL MATERIALS

IF THE SITE WILL NEED TO HAVE FILL IMPORTED FROM AN OFF SITE LOCATION, THE RESPONSIBILITY FOR PERFORMING ENVIRONMENTAL DUE DILIGENCE AND THE DETERMINATION OF CLEAN FILL WILL IN MOST CASES RESIDE WITH THE OPERATOR.

IF THE SITE WILL HAVE EXCESS FILL THAT WILL NEED TO BE EXPORTED TO AN OFF SITE LOCATION, THE RESPONSIBILITY OF CLEAN FILL DETERMINATION AND ENVIRONMENTAL DUE DILIGENCE RESTS ON THE APPLICANT.

IF ALL CUT AND FILL MATERIALS WILL BE USED ON THE SITE, A CLEAN FILL DETERMINATION IS NOT REQUIRED BY THE OPERATOR UNLESS THERE IS A BELIEF THAT A SPILL OR RELEASE OF A REGULATED SUBSTANCE OCCURRED ON SITE.

APPLICANTS AND/OR OPERATORS MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT THE FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. DEFINITIONS OF CLEAN FILL AND ENVIRONMENTAL DUE DILIGENCE ARE PROVIDED BELOW. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL," DOCUMENT NUMBER 258 2182 773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US.

CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON–WATER SOLUBLE, NON–DECOMPOSABLE, INERT, SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED. (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE–USE.)

ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL."

FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE DEPARTMENT'S MUNICIPAL OR RESIDUAL WASTE REGULATIONS BASED ON 25 PA. CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.

PIPELINE WORK SEQUENCE IN WETLANDS

FOR WORK IN WETLANDS, THE FOLLOWING STEPS SHALL BE INSERTED IN THE GENERAL PIPELINE CONSTRUCTION SEQUENCE ABOVE:

1. INSTALL ORANGE SAFETY FENCE AND PERIMETER BMPS AS DESIGNATED ON PLANS.
2. MATS, PADS, OR SIMILAR DEVICES SHALL BE USED DURING THE CROSSINGS OF WETLANDS.
3. DEWATER WORK AREA; WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT TRAP OR A FILTER BAG.
4. SOIL EXCAVATED FROM WETLAND AREAS SHALL BE PROPERLY SEGREGATED WITH UPPER SOIL PROFILE BEING REMOVED WITH THE ROOTS INTACT. THE SEGREGATED SOIL LAYERS SHOULD BE PLACED IN A SEPARATE STOCKPILE TO BE REUSED DURING THE WETLAND SURFACE RESTORATION.
5.
   A.REMOVE LEIDY LINE A (WHERE NECESSARY).
   B.INSTALL PIPE WITH BUOYANCY CONTROL (IF APPLICABLE).
6. INSTALL TRENCH PLUGS AS DESIGNATED ON PLANS TO PREVENT THE TRENCH FROM DRAINING THE WETLAND OR CHANGING ITS HYDROLOGY.
7. BACKFILL PIPE TRENCH WITH PROPERLY SEGREGATE SOILS TO MATCH ORIGINAL SURFACE GRADES. ORIGINAL GRADES THROUGH WETLANDS MUST BE RESTORED AFTER TRENCHING AND BACKFILLING. ANY EXCESS FILL MATERIALS GENERATED BY PIPE INSTALLATION MUST BE REMOVED FROM THE WETLAND.
8. MAINTAIN ALL E&SC DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM UNIFORM 70 PERCENT PERENNIAL VEGETATIVE COVER IS ESTABLISHED.
9. REMOVE ALL SOIL AND E&SC MEASURES UPON ESTABLISHMENT OF A MINIMUM UNIFORM 70 PERCENT PERENNIAL VEGETATIVE COVER OF THE DISTURBED AREA. REGRADE AND REVEGATE AREAS DISTURBED DURING THE REMOVAL OF THE SOIL E&SCS.

PIPELINE WORK SEQUENCE AT STREAM CROSSINGS

FOR STREAM CROSSINGS, THE FOLLOWING STEPS SHALL BE INSERTED IN THE GENERAL PIPELINE CONSTRUCTION SEQUENCE ABOVE:

1. PRIOR TO INITIATING CONSTRUCTION OF A STREAM CHANNEL LARGER THAN 10 FEET CONTRACTORS AND ENVIRONMENTAL INSPECTOR SHALL EVALUATE WEATHER FORECASTS FOR ANTICIPATED INCLEMENT WEATHER WHICH MAY RESULT IN FLOW CONDITIONS UNSUITABLE FOR CONSTRUCTION. BEFORE CONSTRUCTION OF A STREAM CROSSING GREATER THAN 10 FEET, ENVIRONMENTAL INSPECTOR, FOREMAN, AND ANY OTHER RESPONSIBLE INDIVIDUAL SHOULD SIGN–OFF THAT THE CROSSING CAN BE CONSTRUCTED DURING THE SPECIFIC TIME FRAME.
2. IF INCLEMENT WEATHER IS ANTICIPATED, A CONTINGENCY PLAN WILL BE DISCUSSED TO AVOID THE STREAM CROSSING DURING THE POTENTIALLY UNSUITABLE CONDITIONS.
3. AFTER INSTALLATION OF APPROPRIATE E&S BMPS, INSTALL TEMPORARY EQUIPMENT BRIDGE IN ACCORDANCE WITH DETAILS.
4. FOR DRY OPEN CUT CROSSINGS, INSTALL DAM AND PUMP, OR FLUME AS DESCRIBED IN STREAM CROSSING DETAILS.
5. DEWATER WORK AREA. WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT FILTER BAG. WHERE POSSIBLE, EXCAVATION SHALL BE FROM THE TOP OF THE STREAM BANK.
6.
   A. REMOVE LEIDY A LINE (WHERE NECESSARY).
   B. INSTALL PIPE
7. A UTILITY LINE CROSSING OF A STREAM CHANNEL (DITCHING AND STABILIZATION FROM TOP OF BANK TO TOP OF BANK) SHALL BE COMPLETED WITHIN 24 HOURS FOR STREAM CHANNELS 10 FEET OR LESS AND 48 HOURS FOR STREAM CHANNELS BETWEEN 10 – 100 FEET UNLESS SPECIFICALLY OUTLINED IN THE APPROVED PERMIT OR AUTHORIZED BY PADEP.
8. STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 041211–E

PENNSYLVANIA PROFESSIONAL ENGINEER

designs, permits, resolutions WHM consulting, INC. BA GROUP

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC Williams.
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

NOTES SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 3/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 25
WO: 1211227	RID:		OF 39

MEASURES OF RECYCLING & DISPOSAL OF MATERIALS FROM THE PROJECT AREA

THE RESTORATION OF THE PIPELINE RIGHT-OF-WAY WILL REQUIRED THE REMOVAL OF THE TEMPORARY MATERIALS. THE TEMPORARY MATERIALS INCLUDE, BUT MAY NOT BE LIMITED TO, STONE SURFACES AND ASSOCIATED GEOTEXTILES. THE CONTRACTORS ARE REQUIRED TO DISPOSE OF THE MATERIALS AT SUITABLE DISPOSALS OR RECYCLING SITES AND IN COMPLIANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

CONTRACTORS ARE REQUIRED TO INVENTORY AND MANAGE THEIR CONSTRUCTION SITE MATERIALS. THE GOAL IS TO BE AWARE OF THE MATERIALS ON-SITE, ENSURE THEY ARE PROPERLY MAINTAINED, USED, AND DISPOSED OF, AND TO MAKE SURE THE MATERIALS ARE NOT EXPOSED TO STORMWATER.

MATERIALS COVERED

THE FOLLOWING MATERIALS OR SUBSTANCES ARE EXPECTED TO BE PRESENT ON-SITE DURING CONSTRUCTION (NOTE: THIS LIST IS NOT AN ALL-INCLUSIVE LIST AND THE MATERIALS MANAGEMENT PLAN CAN BE MODIFIED TO ADDRESS ADDITIONAL MATERIALS USED ON-SITE):

- ACIDS
- DETERGENTS
- FERTILIZERS (NITROGEN/PHOSPHORUS)
- HYDROSEEDING MIXTURES
- PETROLEUM BASED PRODUCTS
- SANITARY WASTES
- SOIL STABILIZATION ADDITIVES
- SOLDER
- SOLVENTS
- OTHER (LIST HERE):

THESE MATERIALS MUST BE STORED AS APPROPRIATE AND SHALL NOT CONTACT STORM OR NON-STORMWATER DISCHARGES. CONTRACTOR SHALL PROVIDE A WEATHER PROOF CONTAINER TO STORE CHEMICALS OR ERODIBLE SUBSTANCES THAT MUST BE KEPT ON THE SITE. CONTRACTOR IS RESPONSIBLE FOR READING, MAINTAINING, AND MAKING EMPLOYEES AND SUBCONTRACTORS AWARE OF MATERIAL SAFETY DATA SHEETS (MSDSs).

MATERIAL MANAGEMENT PRACTICES

THE FOLLOWING ARE MATERIAL MANAGEMENT PRACTICES THAT WILL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES TO STORMWATER RUNOFF.

1. GOOD HOUSEKEEPING PRACTICES

   THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ON SITE DURING CONSTRUCTION:
   STORE ONLY ENOUGH MATERIAL REQUIRED TO DO THE JOB.
   STORE MATERIALS IN A NEAT, ORDERLY MANNER.
   STORE CHEMICALS IN WATERTIGHT CONTAINERS OR IN A STORAGE SHED, UNDER A ROOF, COMPLETELY ENCLOSED, WITH APPROPRIATE SECONDARY CONTAINMENT TO PREVENT SPILL OR LEAKAGE. DRIP PANS SHALL BE PROVIDED UNDER DISPENSERS.
   SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER.
   MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.
   INSPECTIONS WILL BE PERFORMED TO ENSURE PROPER USE AND DISPOSAL OF MATERIALS.
   COVER AND BERM LOOSE STOCKPILED CONSTRUCTION MATERIALS THAT ARE NOT ACTIVELY BEING USED (I.E. SOIL, SPOILS, AGGREGATE, ETC.).
   MINIMIZE EXPOSURE OF CONSTRUCTION MATERIALS TO PRECIPITATION.
   MINIMIZE THE POTENTIAL FOR OFF-SITE TRACKING OF LOOSE CONSTRUCTION AND LANDSCAPE MATERIALS.

2. HAZARDOUS PRODUCTS
   THESE PRACTICES WILL BE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS. MSDSS FOR EACH SUBSTANCE WITH HAZARDOUS PROPERTIES THAT IS USED ON THE JOB SITE(S) WILL BE OBTAINED AND USED FOR THE PROPER MANAGEMENT OF POTENTIAL WASTES THAT MAY RESULT FROM THESE PRODUCTS. A MSDS WILL BE POSTED IN THE IMMEDIATE AREA WHERE SUCH PRODUCT IS STORED AND/OR USED AND ANOTHER COPY OF EACH MSDS WILL BE MAINTAINED IN A FILE AT THE JOB SITE CONSTRUCTION TRAILER OFFICE. EACH EMPLOYEE WHO MUST HANDLE A SUBSTANCE WITH HAZARDOUS PROPERTIES WILL BE INSTRUCTED ON THE USE OF MSDS AND THE SPECIFIC INFORMATION IN THE APPLICABLE MSDS FOR THE PRODUCT HE/SHE IS USING, PARTICULARLY REGARDING SPILL CONTROL TECHNIQUES.
   - PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS WITH THE ORIGINAL LABELS IN LEGIBLE CONDITION.
   - ORIGINAL LABELS AND MSDS WILL BE PRODUCED AND USED FOR EACH MATERIAL.
   - IF SURPLUS PRODUCT MUST BE DISPOSED OF, MANUFACTURER'S OR LOCAL/STATE/FEDERAL RECOMMENDED METHODS FOR PROPER DISPOSAL WILL BE FOLLOWED.

3. HAZARDOUS WASTES
   ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF BY THE CONTRACTOR IN THE MANNER SPECIFIED BY LOCAL, STATE, AND/OR FEDERAL REGULATIONS AND BY THE MANUFACTURER OF SUCH PRODUCTS. SITE PERSONNEL WILL BE INSTRUCTED.

4. CONCRETE AND OTHER WASH WATERS
   PREVENT DISPOSAL OF RINSE, WASH WATERS, OR MATERIALS ON IMPERVIOUS OR PERVIOUS SURFACES, INTO STREAMS, WETLANDS OR OTHER WATER BODIES.

   CONCRETE TRUCKS WILL BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER ON THE SITE, BUT ONLY EITHER (1) SPECIFICALLY DESIGNATED DIKED AREAS WHICH HAVE BEEN PREPARED TO PREVENT CONTACT BETWEEN THE CONCRETE AND/OR WASHOUT AND SOIL AND STORMWATER HAVING THE POTENTIAL TO BE DISCHARGED FROM THE SITE OR (2) IN LOCATIONS WHERE WASTE CONCRETE CAN BE POURED INTO FORMS TO MAKE RIPRAP OR OTHER USEFUL CONCRETE PRODUCTS.

   THE HARDENED RESIDUE FROM THE CONCRETE WASHOUT DIKED AREAS WILL BE DISPOSED OF IN THE SAME MANNER AS OTHER NON-HAZARDOUS CONSTRUCTION WASTE MATERIALS OR MAY BE BROKEN UP AND USED ON THE SITE AS DEEMED APPROPRIATE BY THE CONTRACTOR AND GEOTECHNICAL ENGINEER. THE CONTRACTOR WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED.

   ALL CONCRETE WASHOUT AREAS WILL BE LOCATED IN AN AREA WHERE THE LIKELIHOOD OF THE AREA CONTRIBUTING TO STORMWATER DISCHARGE IS NEGLIGIBLE. IF REQUIRED, ADDITIONAL BMPS MUST BE IMPLEMENTED TO PREVENT CONCRETE WASTES FROM CONTRIBUTING TO STORMWATER DISCHARGES. THE LOCATION OF THE CONCRETE WASHOUT AREA(S) MUST BE IDENTIFIED, BY THE CONTRACTOR/JOB SITE SUPERINTENDENT, ON THE JOB SITE COPY OF THE EROSION AND SEDIMENT CONTROL PLAN(S) IN THIS ESCP.

5. SANITARY WASTES
   ALL SANITARY WASTE UNITS WILL BE LOCATED IN AN AREA WHERE THE LIKELIHOOD OF THE UNIT CONTRIBUTING TO STORMWATER DISCHARGES IS NEGLIGIBLE. ADDITIONAL BMPS MUST BE IMPLEMENTED, SUCH AS CONTAINMENT TRAYS (PROVIDED BY THE RENTAL COMPANY) OR SPECIAL CONTAINMENT CREATED WITH 2"X4" LUMBER, IMPERVIOUS PLASTIC, AND GRAVEL. THE LOCATION OF THE SANITARY WASTE UNITS MUST BE IDENTIFIED ON THE JOB SITE COPY OF THE EROSION AND SEDIMENT CONTROL PLAN(S), IN THIS ESCP, BY THE CONTRACTOR/JOB SITE SUPERINTENDENT.

6. SOLID AND CONSTRUCTION WASTES
   ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL COMPLY WITH ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS. THE DUMPSTER/CONTAINER LIDS SHALL BE CLOSED AT THE END OF EVERY BUSINESS DAY AND DURING RAIN EVENTS. APPROPRIATE MEASURES SHALL BE TAKEN TO PREVENT DISCHARGES FROM WASTE DISPOSAL CONTAINERS TO THE RECEIVING WATER.

7. CONSTRUCTION ACCESS
   A STABILIZED CONSTRUCTION ENTRANCE WILL BE PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS, THE PAVED ROADS ADJACENT TO THE SITE ENTRANCE WILL BE INSPECTED DAILY AND SWEPT AS NECESSARY TO REMOVE ANY EXCESS MUD, DIRT, OR ROCK TRACKED FROM THE SITE. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARPAULIN AS NECESSARY.

8. PETROLEUM PRODUCTS
   ON-SITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. PETROLEUM STORAGE TANKS ON SITE WILL HAVE A DIKE OR BERM CONTAINMENT STRUCTURE CONSTRUCTED AROUND IT TO CONTAIN SPILLS WHICH MAY OCCUR (CONTAINMENT VOLUME TO BE 110% OF VOLUME STORED). THE DIKE OR BERMED AREA SHALL BE LINED WITH AN IMPERVIOUS MATERIAL SUCH AS A HEAVY DUTY PLASTIC SHEET. DRIP PANS SHALL BE PROVIDED FOR ALL DISPENSERS. ANY ASPHALT SUBSTANCES USED ON THE SITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

9. FERTILIZERS AND LANDSCAPE MATERIALS
   FERTILIZERS WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED INTO THE SOIL TO MINIMIZE THE POTENTIAL FOR EXPOSURE TO STORMWATER. STORAGE WILL BE UNDER COVER. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER WILL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO MINIMIZE THE POTENTIAL FOR SPILLS. THE BIN SHALL BE LABELED APPROPRIATELY.

   CONTAIN STOCKPILED MATERIALS, SUCH AS BUT NOT LIMITED TO, MULCHES, TOP SOIL, ROCKS AND GRAVEL, AND DECOMPOSED GRANITE, WHEN THEY ARE NOT ACTIVELY BEING USED.

   APPLY ERODIBLE LANDSCAPE MATERIAL AT QUANTITIES AND APPLICATION RATES ACCORDING TO MANUFACTURER RECOMMENDATIONS OR BASED ON WRITTEN SPECIFICATIONS BY KNOWLEDGEABLE AND EXPERIENCE FIELD PERSONNEL. DISCONTINUE THE APPLICATION OF ANY ERODIBLE LANDSCAPE MATERIAL WITHIN TWO DAYS PRIOR TO A FORECASTED RAIN EVENT OR DURING PERIODS OF PRECIPITATION.

10. PAINTS, PAINT SOLVENTS AND CLEANING SOLVENTS
    CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT IN USE. EXCESS PAINT AND SOLVENTS WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR LOCAL/STATE/FEDERAL REGULATIONS.

11. CONTAMINATED SOILS
    ANY CONTAMINATED SOILS (RESULTING FROM SPILLS OF MATERIALS WITH HAZARDOUS PROPERTIES) WHICH MAY RESULT FROM CONSTRUCTION ACTIVITIES WILL BE CONTAINED AND CLEANED UP IMMEDIATELY IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

12. OFF-SITE WASTE AND BORROW AREAS
    ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL COUNTY CONSERVATION DISTRICT OF PADEP FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REMOVAL OF ANY EXCESS MATERIAL AND TO DEVELOP A PLAN THAT MEETS THE CONDITIONS OF CHAPTER 102, NPDES PERMIT CONDITIONS, AND/OR OTHER STATE AND FEDERAL REGULATIONS.

GENERAL MAINTENANCE NOTES FOR ALL BMPs:

ROUTINE MAINTENANCE INSPECTIONS WILL BE REQUIRED TO ENSURE THE PERFORMANCE OF ALL THE SEDIMENT CONTROL BMP DEVICES. AT A MINIMUM, ALL STRUCTURES AND DEVICES SHALL BE INSPECTED ONCE EVERY SEVEN (7) CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT. THIS INSPECTION SHALL BE FOLLOWED WITH A REPAIR SCHEDULE OF ALL NOTED DEFICIENCIES. VEGETATION PROGRESS SHALL ALSO BE INCLUDED IN THIS INSPECTION. VOID AREAS SHALL PROMPTLY BE RESEEDED AND MULCHED TO ESTABLISH PROTECTION.

UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPs MUST BE MAINTAINED PROPERLY. MAINTENANCE MUST INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT CONTROL BMPs AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGRADING, RESEEDING, REMULCHING, AND RENETTING, MUST BE DONE IMMEDIATELY. IF EROSION AND SEDIMENT CONTROL BMPs FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPs, OR MODIFICATIONS TO THOSE INSTALLED, WILL BE REQUIRED.

SEDIMENT REMOVED FROM BMPs SHALL BE DISPOSED OF WITHIN THE LIMIT OF DISTURBANCE IN LANDSCAPE AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR DRAINAGE SWALES AND IMMEDIATELY STABILIZED, OR PLACED IN STOCKPILES AREAS.

ALL CHANNELS MUST BE KEPT FREE OF OBSTRUCTIONS SUCH AS FILL, FALLEN LEAVES & WOODY DEBRIS, ACCUMULATED SEDIMENT, AND CONSTRUCTION MATERIALS/WASTES WITH EXCEPTION TO OTHER REQUIRED BMPs (I.E., CHECK DAMS). CHANNELS SHOULD BE KEPT MOWED AND/OR FREE OF ALL WEEDY, BRUSHY OR WOODY GROWTH. ANY UNDERGROUND UTILITIES RUNNING ACROSS/ THROUGH THE CHANNEL(S) SHALL BE IMMEDIATELY BACKFILLED AND THE CHANNEL(S) REPAIRED AND STABILIZED PER THE CHANNEL SECTION DETAIL.

SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.

ALL NECESSARY REPAIRS WILL BE MADE IMMEDIATELY.

MAINTENANCE SCHEDULE

CONTROL MEASURE	INSPECT	PROBLEMS TO LOOK FOR	POSSIBLE REMEDIES
BROAD BASED DIP	DAILY	SEDIMENT/DEBRIS BLOCKING THE NORMAL FLOW OF WATER. WASHOUTS, BULGES, OR SLUMPS.	REPAIR DAMAGED OR NON-FUNCTIONING DIPS.
COMPOST FILTER SOCK	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	BARRIER HAS BEEN UNDERMINED OR TORPED SEDIMENT AT 1/2 HEIGHT OF BARRIER TORN OR DAMAGED FABRIC SOCK IS OLDER THAN PERMITTED RUNOFF ESCAPING AROUND BARRIER	REPLACE WITH A ROCK FILTER OUTLET. INCREASE NUMBER OF STAKES AT AFFECTED AREA. REMOVE SEDIMENT, PLACE ACROSS SITE AS FILL. REPAIR ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACE. EXTEND BARRIER.
CLEAN WATER CROSSING	CONTINUOUSLY. ONCE A WEEK AND AFTER EVERY RUNOFF EVENT. MONTHLY/AS NEEDED	CHANNEL THICKNESS NOT MAINTAINED. EROSION AROUND TRENCH INLETS AND WATERSHEDS. DAMAGED CHANNEL LINING. SEDIMENT/DEBRIS BLOCKING NORMAL FLOW OF WATER. TRASH AND DEBRIS.	RECONSTRUCT CHANNEL. REGRADE AND REPAIR ANY UNDERMINED OR WASHED OUT AREAS. REPLACE CHANNEL LINING. REMOVE SEDIMENT WHEN TOTAL CHANNEL DEPTH IS REDUCED BY 25%. REMOVE TRASH AND DEBRIS.
DIVERSION BERM / DIVERSION TERRACE	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	SEDIMENT/DEBRIS BLOCKING THE NORMAL FLOW OF WATER. WASH OUTS, BULGES OR SLUMPS. UNSTABLE SIDE SLOPES. DAMAGED CHANNEL LINING. REDUCED CAPACITY DUE TO DECREASE IN CHANNEL DIMENSIONS. VEGETATION GROWTH.	REMOVE SEDIMENT/DEBRIS, SPREAD SEDIMENT ACROSS SITE. REPAIR OR REPLACE IMMEDIATELY UPON DISCOVERY. RECONSTRUCT CHANNEL. REPLACE CHANNEL LINING. RE-SEED.
EROSION CONTROL BLANKET	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	TORN OR LOOSE STAPLED AREAS. VEGETATION GROWTH. BLANKET DESTROYED OR DAMAGED.	REMOVE AND REPLACE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. REGRADE AND REPAIR ANY UNDERMINED OR WASHED OUT AREAS. RE-SEED.
HYDROSTATIC DEWATERING STRUCTURE	DURING DEWATERING ACTIVITIES.	ACCUMULATIONS REACH ½ THE ABOVEGROUND HEIGHT OF THE BARRIER. DAMAGED OR DETERIORATED STRAW BALES.	REMOVE SEDIMENT/DEBRIS. REPLACE STRAW BALES.
PUMPED WATER FILTER BAG	BEFORE AND AFTER EACH USE	TORN FABRIC, TEARS OR BREACHES. SEDIMENT ESCAPING WITH PURGE WATER. MORE THAN 50% FILLED WITH SEDIMENT.	REPLACE FILTER BAG. REMOVE SEDIMENT, SPREAD OVER SITE.
ROCK CONSTRUCTION ENTRANCE	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	STONE THICKNESS NOT CONSTANTLY MAINTAINED. SEDIMENT ON PUBLIC ROADWAY.	ADD ROCK TO BRING TO SPECIFIED DIMENSIONS. SWEEP MATERIAL BACK TO PROJECT SITE. DO NOT WASH ROADWAY WITH WATER.
ROCK FILTER OUTLET	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	LINING WASHED AWAY. SEDIMENT AT 1/3 HEIGHT OF BARRIER. RUNOFF ESCAPING AROUND BARRIER. CLOGGING.	RESHAPE AS NECESSARY AND REPLACE TOP LAYER WITH CLEAN STONE. REPLACE RIPRAP WITH LARGER SIZE RIPRAP. REBUILD/EXTEND BARRIER. WASH OR REPLACE SEDIMENT LADEN STONE.
TRENCH PLUG	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	STORMWATER POOLING WITHIN THE EXCAVATION BEHIND A TRENCH PLUG	PUMP WATER THROUGH A PUMPED WATER FILTER BAG OVER STABLE, UNDISTURBED EARTH.
VEGETATION	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	SEDIMENT AT TOE-OF-SLOPE. RILLS & GULLIES FORMING. BARE SOIL PATCHES.	CHECK FOR TOE-OF-SLOPE DIVERSION & INSTALL, IF NEEDED. FILL RILLS AND RE-GRADE GULLIED SLOPES. RE-SEED, FERTILIZE, LIME AND RE-MULCH.
SEDIMENT TRAP	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	TRASH AND OTHER DEBRIS. SEDIMENT AT CLEAN-OUT ELEVATION. DAMAGED OR CLOGGED COMPOST FILTER SOCK. EROSION. VEGETATION GROWTH. STANDING WATER MORE THAN 7 DAYS AFTER RAINFALL EVENT.	DISPOSE OF TRASH PROPERLY. REMOVE SEDIMENT, PLACE ACROSS SITE AS FILL. REMOVE CLOGGED MATERIAL. RESTORE TO DESIGN SPECIFICATIONS. PUMP WATER THROUGH A PUMPED WATER FILTER BAG OVER STABLE, UNDISTURBED EARTH.

* REFER TO BMP DETAIL FOR ADDITIONAL MAINTENANCE REQUIREMENTS AND REMEDIES.

RESOLUTIONS TO LIMITING SOIL CHARACTERISTICS

LIMITATION	RESOLUTION
ERODIBLE	PROTECTIVE LINING, SEEDING AND MULCHING, EROSION CONTROL BLANKETS (ROLLS OF HYDRAULICALLY APPLIED), TRACKING SLOPES, UPSTREAM DIVERSIONS, WATERBARS, ETC, TO MINIMIZE EROSION OF THE SOILS.
CUT BANKS CAVE	TO OFFSET THE CAVING OF CUTBANKS, TRENCHING OPERATIONS WILL BE CONDUCTED IN ACCORDANCE WITH THE OSHA TECHNICAL MANUAL FOR TRENCHING (OR "TRENCHES SHALL BE EXCAVATED WITH APPROPRIATE LAYBACK BANKS TO PREVENT CAVE-INS. STOCKPILES SHALL BE LOCATED AT A SUFFICIENT DISTANCE AWAY FROM THE TRENCH."
CORROSIVE TO CONCRETE OR STEEL	PREVENTATIVE COATINGS SHALL BE USED TO PREVENT CORROSION OF CONCRETE AND/OR STEEL.
DROUGHTY	SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
PRONE TO FLOODING, SLOW PERCOLATION, PONDING, WETNESS, HIGH WATER TABLE, OR HYDRIC	DEWATER WITH APPROPRIATE MEANS SUCH AS PUMP WATER FILTER BAGS, SEDIMENT TRAPS, ETC. AS EXCAVATIONS IN SOILS THAT HAVE THESE CHARACTERISTICS WILL LIKELY ENCOUNTER WATER.
HIGH WATER TABLE	PUMPS AND WATER FILTER BAGS SHALL BE UTILIZED IF GROUNDWATER IS ENCOUNTERED.
LOW STRENGTH	PRECAUTIONS WILL BE TAKEN TO PREVENT SLOPE FAILURE WHEN WORKING WITHIN LOW STRENGTH SOILS BY FLATTENING CUT/FILL SLOPES, NOT OVERLOADING, MAINTAINING LATERAL SUPPORT, AND PREVENTING SATURATION OF SOILS. USE OF THESE SOILS WILL BE AVOIDED FOR ROADWAY CONSTRUCTION.
PIPING	TRENCH PLUGS SHALL BE UTILIZED IN ACCORDANCE WITH THE STANDARD DETAIL. WATER SHALL BE DIVERTED AWAY FROM OPEN TRENCHES.
POOR TOPSOIL	SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
FROST ACTION	SOILS THAT HAVE THE POTENTIAL TO HEAVE DUE TO FROST ACTION MAY CAUSE DAMAGE TO ROADWAYS OR PADS WHERE FOUNDATIONS ARE CRITICAL REMOVAL AND REPLACEMENT SOILS WITH SUITABLE MATERIAL MAY BE REQUIRED.
WETNESS	SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.

Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Atkins	At	X	C/S			X	X	X	X	X	X	X	X				X
Barbour	Bb	X	C	X		X	X	X				X	X				X
Calvin	CaB	X	C	X	X			X			X		X				
Cookport	CpB, CpB	X	C/S	X	X		X	X	X	X	X	X	X				X
Freetown	Fr	X	C/S				X	X	X				X			X	
Hazleton	HmD, HoF	X	C	X	X			X	X	X	X	X	X				
Hustonto wn	HuB, HuD	X	C/S	X			X	X		X	X		X				
Laidig	LdC	X	C/S	X	X		X	X	X	X	X	X	X				
Linden	Lr	X	C			X	X	X	X	X	X		X				
Meckesvill e	MhD	X	C/S				X		X	X	X	X	X				X
Ungers	UnB, UpF	X	C		X				X	X			X				
Wharton	WeB, WgB	X	C/S		X		X	X	X	X	X	X	X	X			X

ACID-PRODUCING SOILS AND BEDROCK CONTROL PLAN

THE FOLLOWING ACID PRODUCING SOILS CONTROL PLAN WAS DEVELOPED TO IDENTIFY BMPS AND PROCEDURES FOR MINIMIZING THE POTENTIAL FOR POLLUTION ASSOCIATED WITH THE DISTURBANCE OF THE AREAS WITHIN THE PROPOSED RIGHT-OF-WAY THAT CONTAIN ACID-PRODUCING SOILS WITH A pH LESS THAN 4.0.

ACID-PRODUCING SOILS AND BEDROCK CONTROL PLAN:

1. CONTRACTOR SHALL LIMIT THE EXCAVATION AREA AND EXPOSURE TIME WHEN HIGH ACID-PRODUCING SOILS ARE ENCOUNTERED. LOCATIONS WHERE ACIDIC SOILS ARE ANTICIPATED TO BE PRESENT ALONG THE PIPELINE CORRIDOR ARE PROVIDED IN THE COUNTY-SPECIFIC TABLE INCLUDED AT THE END OF THIS PLAN SET.
2. CONTRACTOR SHALL SEPARATELY STORE TOPSOIL STRIPPED FROM THE SITE AWAY FROM TEMPORARILY STOCKPILED HIGH ACID-PRODUCING SOILS AND BEDROCKS.
3. CONTRACTOR SHALL STOCKPILE HIGH ACID-PRODUCING SOILS AND BEDROCK MATERIAL ON LEVEL GROUND TO MINIMIZE ITS MOVEMENT, ESPECIALLY WHEN THESE MATERIALS HAVE A HIGH CLAY CONTENT.
4. CONTRACTOR SHALL COVER TEMPORARILY STOCKPILED HIGH ACID-PRODUCING SOIL AND BEDROCK MATERIAL TO BE EXPOSED MORE THAN 30 DAYS WITH PROPERLY ANCHORED, HEAVY-GRATE SHEETS OF POLYETHYLENE, WHERE POSSIBLE. IF NOT POSSIBLE, STOCKPILES SHALL BE COVERED WITH A MINIMUM OF THREE TO SIX INCHES OF WOOD CHIPS TO MINIMIZE EROSION OF THE STOCKPILE. IN ADDITION, THE CONTRACTOR SHALL INSTALL SILT FENCE AT THE TOE OF THE STOCKPILE SLOPE TO CONTAIN MOVEMENT OF MATERIAL. CONTRACTOR SHALL NOT APPLY TOPSOIL TO THE HIGH ACID-PRODUCING SOIL OR BEDROCK STOCKPILES TO PREVENT TOPSOIL CONTAMINATION.
5. CONTRACTOR SHALL ULTIMATELY DISPOSE OF HIGH ACID-PRODUCING SOILS OR BEDROCK WITH A pH OF OUR OR LESS, OR CONTAINING IRON SULFIDE (INCLUDING BORROW FROM CUTS) BY PLACING THE MATERIAL COMBINED WITH LIMESTONE AT THE RATE OF 6 TONS PER ACRE (OR 275 POUNDS PER 1,000 SQUARE FEET OF SURFACE AREA) AND COVERING THE MIXTURE WITH A MINIMUM OF 12 INCHES OF SETTLED SOILS WITH A pH OF FIVE OR MORE EXCEPT AS FOLLOWS:
   a. IN THE AREAS WHERE TREES OR SHRUBS ARE TO BE PLANTED, THE CONTRACTOR SHALL COVER THE LIMESTONE/SOIL MIXTURE WITH A MINIMUM OF 24 INCHES OF SOILS WITH A pH OF 5 OR MORE.
   b. CONTRACTOR SHALL NOT LOCATE ANY DISPOSAL AREA WITHIN 24 INCHES OR ANY SURFACE OF A SLOPE OR BANK, SUCH AS BERMS, STREAM BANKS, DITCHES, AND OTHER SURFACE WATERS TO PREVENT POTENTIAL LATERAL LEACHING DAMAGES.
6. AT THE END OF EACH DAY, CONTRACTOR SHALL CLEAN ALL EQUIPMENT USED TO HANDLE HIGH ACID-PRODUCING SOILS OR BEDROCK TO PREVENT SPREADING OF HIGH-ACID MATERIALS TO OTHER PARTS OF THE PROPOSED RIGHT-OF-WAY, INTO STREAMS, OR STORMWATER CONVEYANCES, AND TO PROTECT MACHINERY FROM ACCELERATED CORROSION.
7. CONTRACTOR SHALL PROVIDE AND INSTALL NON-VEGETATIVE EROSION CONTROLS (STONE TRACKING PADS, STRATEGICALLY-PLACED LIMESTONE CHECK DAMS, SILT FENCES, WOOD CHIPS) TO LIMIT THE MOVEMENT OF HIGH ACID-PRODUCING SOILS FROM, AROUND, OR OFF OF THE PROPOSED RIGHT-OF-WAY.
8. FOLLOWING THE BURIAL OR REMOVAL OF HIGH ACID-PRODUCING SOILS AND BEDROCK, TOP SOILING, AND SEEDING OF THE PROPOSED RIGHT-OF-WAY, TRANSCO SHALL MONITOR THE SITE FOR APPROXIMATELY SIX TO 12 MONTHS TO ASSURE THERE IS ADEQUATE STABILIZATION AND THAT NO HIGH-ACID SOIL OR BEDROCK PROBLEMS EMERGE. CONTRACTOR SHALL CORRECT ANY PROBLEMS THAT ARE DISCOVERED WITHIN THIS TIME PERIOD.
9. IF PROBLEMS OCCUR WHERE HIGH ACID-PRODUCING SOILS OR BEDROCK HAVE BEEN PLACED OR BURIED, THE APPLICANT SHALL MONITOR THESE AREAS FOR AT LEAST TWO YEARS TO ASSURE THERE IS NO MIGRATION OF POTENTIAL ACID LEACHATE.

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

NOTES SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 3/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 26
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39

TABLE 11.3
Plant Tolerances of Soil Limitation Factors

Species	Growth Habit[1]	Tolerates: Wet Soil	Dry Site	Low Fertility	Acid Soil (pH 5-5.5)[2]	Minimum Seed Specifications[3]: Purity (%)	Ready Germ (%)	Hard Seed (%)	Total Germ (%)	Seeds/lb (1,000s)
Warm-Season Grasses										
Deertongue	bunch	yes	yes	yes	yes	95	75		75	250
Weeping lovegrass	bunch	no	yes	yes	yes	97	75		75	1,500
Switchgrass[4]	bunch	yes	yes	yes	yes		(60 PLS)			390
Big bluestem	bunch	no	yes	yes	yes		(60 PLS)			150
Cool-Season Grasses										
Tall Fescue	bunch	yes	no	yes	no	95	80		80	227
Redtop	sod	yes	yes	yes	yes	92	80		80	5,000
Fine fescues	sod	no	no	yes	no	95	80		80	400
Perennial ryegrass	bunch	yes	no	no	no	95	85		85	227
Annual ryegrass	bunch	yes	no	yes	no	95	85		85	227
Kentucky bluegrass	sod	no	no	no	no	85	75		75	2,200
Reed canarygrass	sod	yes	yes	yes	no	95	70		70	520
Orchardgrass	bunch	yes	yes	yes	yes	95	80		80	654
Timothy	bunch	yes	no	yes	yes	95	80		80	1,230
Smooth bromegrass	sod	no	yes	yes	no	95	80		80	136
Legumes[5]										
Crownvetch	sod	no	yes	yes	no	98	40	30	65	120
Birdsfoot trefoil[6]	bunch	yes	no	yes	yes	98	60	20	80	400
Flatpea	sod	no	no	yes	yes	98	55	20	75	10
Serecia lespedeza	bunch	no	yes	yes	yes	98	60	20	80	335
Cereals										
Winter wheat	bunch	no	no	no	no	98	85		85	15
Winter rye	bunch	no	no	yes	yes	98	85		85	18
Spring oats	bunch	no	no	no	no	98	85		85	13
Sundangrass	bunch	no	yes	no	no	98	85		85	55
Japanese millet	bunch	yes	no	yes	yes	98	80		80	155

[1] Growth habit refers to the ability of the species to either form a dense sod by vegetative means (stolons, rhizomes, or roots) or remain in a bunch or single plant form. If seeded heavily enough, even bunch formers can produce a very dense stand. This is sometimes called a sod, but not in the sense of a sod formed by vegetative means.

[2] Once established, plants may grow at a somewhat lower pH, but cover generally is only adequate at pH 6.0 or above.

[3] *Minimum seed lots are truly minimum, and seed lots to be used for revegetation purposes should equal or exceed these standards.* Thus, deertongue grass should germinate 75% or better. Crownvetch should have at least 40% readily germinable seed and 30% hard seed. Commonly, seed lots are available that equal or exceed minimum specifications. Remember that disturbed sites are adverse for plant establishment. Ready germination refers to seed that germinates during the period of the germination test and that would be expected, if conditions are favorable, to germinate rapidly when planted. The opposite of ready germination is dormant seed, of which hard seed is one type.

[4] Switchgrass seed is sold only on the basis of PLS.

[5] Need specific legume inoculant. Inoculant suitable for garden peas and sweetpeas usually is satisfactory for flatpea.

[6] Birdsfoot trefoil is adapted over the entire state, except in the extreme southeast where crown and root rots may injure stands.

Penn State, "Erosion Control and Conservation Plantings on Noncropland,"

TABLE 11.4
Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate - Pure Live Seed[1]: Most Sites	Adverse Sites
1[2]	Spring oats (spring), or	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	60	75
	Fine fescue, or	35	40
	Kentucky bluegrass, plus	25	30
	Redtop[4], or	3	3
	Perennial ryegrass	15	20
3	Birdsfoot trefoil, plus	6	10
	Tall fescue	30	35
4	Birdsfoot trefoil, plus	6	10
	Reed canarygrass	10	15
8	Flatpea, plus	20	30
	Tall fescue, or	20	30
	Perennial ryegrass	20	25
9[6]	Serecia lespedeza, plus	10	20
	Tall fescue, plus	20	25
	Redtop[4]	3	3
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

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. 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%, 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 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, 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. Use for highway slopes and similar sites where the desired species after establishment is crownvetch.
6. Use only in extreme southeastern or extreme southwestern Pennsylvania. *Serecia lespedeza* is not well adapted to most of PA.
7. Do not mov shorter than 9 to 10 inches.
8. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

TABLE 11.5
Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	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)		
Well-drained	1 plus	2 or 10
Slopes and Banks (grazed/hay)		
Well-drained	1 plus	2, 3, or 13
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 3 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[2]		
Non-mowed areas		
Well-drained	1 plus	5, 7, 8, 9, or 10
Variable drained	1 plus	3 or 7
Poorly drained	1 plus	3 or 4
Areas mowed several times per year	1 plus	2, 3, or 10
Utility Right-of-way		
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, 9, 11[1], or 12[1]
Severely disturbed areas for grazing/hay	1 plus	3 or 13

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.
2. Contact the Pennsylvania Department of Transportation district roadside specialist for specific suggestions on treatment techniques and management practices.
3. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

TEMPORARY AND PERMANENT STABILIZATION:

1. PERMANENT STABILIZATION: UPON FINAL COMPLETION OF AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY, THE SITE SHALL IMMEDIATELY HAVE TOPSOIL RESTORED, REPLACED, OR AMENDED, SEEDED, MULCHED OR OTHERWISE PERMANENTLY STABILIZED AND PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION.

   E&S BMPS SHALL BE IMPLEMENTED AND MAINTAINED UNTIL THE PERMANENT STABILIZATION IS COMPLETED. ONCE PERMANENT STABILIZATION HAS BEEN ESTABLISHED, THE TEMPORARY E&S BMPS SHALL BE REMOVED. ANY AREAS DISTURBED IN THE ACT OF REMOVING TEMPORARY E&S BMPS SHALL BE PERMANENTLY STABILIZED UPON COMPLETION OF THE TEMPORARY E&S BMP REMOVAL ACTIVITY.

   FOR AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY TO BE CONSIDERED PERMANENTLY STABILIZED, THE DISTURBED AREAS SHALL BE COVERED WITH ONE OF THE FOLLOWING:

   - A MINIMUM UNIFORM 70% PERENNIAL VEGETATIVE COVER, WITH A DENSITY CAPABLE OF RESISTING ACCELERATED EROSION AND SEDIMENTATION.
   - AN ACCEPTABLE BMP WHICH PERMANENTLY MINIMIZES ACCELERATED EROSION AND SEDIMENTATION.

   WHEN EROSION AND SEDIMENTATION CONTROLS ARE TO BE REMOVED IN AGRICULTURAL NON–SENSITIVE AREAS (STREAMS/WETLANDS), AGRICULTURAL LANDOWNERS SHALL MAINTAIN AGRICULTURAL BMPS PER PADEP REGULATIONS.

2. TEMPORARY STABILIZATION: UPON TEMPORARY CESSATION OF AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY WHERE A CESSATION OF EARTH DISTURBANCE ACTIVITIES WILL EXCEED 4 DAYS (INCLUDING AGRICULTURAL AREAS), THE SITE SHALL BE IMMEDIATELY SEEDED, MULCHED, OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION PENDING FUTURE EARTH DISTURBANCE ACTIVITIES.

   FOR AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY TO BE CONSIDERED TEMPORARILY STABILIZED, THE DISTURBED AREAS SHALL BE COVERED WITH ONE OF THE FOLLOWING:

   - A MINIMUM UNIFORM COVERAGE OF MULCH AND SEED, WITH A DENSITY CAPABLE OF RESISTING ACCELERATED EROSION AND SEDIMENTATION.
   - AN ACCEPTABLE BMP WHICH TEMPORARILY MINIMIZES ACCELERATED EROSION AND SEDIMENTATION.

3. STABILIZATION DURING NON–GROWING SEASONS

   WHEN UTILITY CONSTRUCTION MUST BE DONE AND IS COMPLETED DURING A NON–GROWING SEASON, INTERIM STABILIZATION BMPS MUST BE IMPLEMENTED AND ADEQUATELY MAINTAINED. THE APPLICATION OF STRAW MULCH AND THE RATE OF 3.0 TONS PER ACRE IS REQUIRED. THE BMPS SHOULD BE INSPECTED WEEKLY (UNLESS SNOW COVERED) AND AFTER EACH RUNOFF EVENT TO IDENTIFY AREAS THAT BECOME BARE.

   BARE AREAS SHALL BE COVERED WITH A PROPERLY INSTALLED EROSION CONTROL BLANKET. ALL TEMPORARY EROSION AND SEDIMENT POLLUTION CONTROLS MUST BE MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED.

4. WETLAND STABILIZATION. TEMPORARY COVER FOR WETLANDS AREAS WILL INCLUDE ANNUAL RYEGRASS AT 40LBS/ACRE. DO NOT LIME, FERTILIZE OR MULCH WETLAND AREAS. PERMANENT WETLAND MIX IS ERNST 122 FACW MEADOW MIX AT 20 LB/ACRE.

5. RIPARIAN BUFFER STABILIZATION – TEMPORARY COVER FOR RIPARIAN AREAS TO INCLUDE SEE FROM MIXTURE 1 FROM TABLE 11.3, AT THE OUTLINED SEEDING RATE. PERMANENT COVER FOR RIPARIAN AREAS WILL INCLUDE 30LBS/ACRE OF A SEED MIX FROM MIXTURE 1 PLUS 20 LBS/ACRE OF ERNST 178 RIPARIAN BUFFER MIX. WHERE SLOPES EXCEED 10% THE PERMANENT MIX SHALL BE SELECTED FROM TABLE 11.5. EROSION CONTROL BLANKET IS TO BE UTILIZED ALONG STREAM BANKS, AS OUTLINED IN THE ECB DETAIL. ADD LIME AND FERTILIZER AS OUTLINED IN TABLE 11.2.

ERNST - FACW MEADOW MIX (ENST-122)
(Application Rate - 20 pounds per acre)

Percent	*Scientific Name*	*Common Name*
33.20%	*Carex vulpinoidea*	Fox Sedge
20.00%	*Elymus virginicus*	Virginia Wildrye
8.00%	*Carex lupulina*	Hop Sedge
8.00%	*Carex lurida*	Lurid Sedge
8.00%	*Carex scoparia*	Blunt Broom sedge
4.00%	*Verbena hastata*	Blue Vertain
3.00%	*Cinna arundinacea*	Wood Reedgrass
3.00%	*Juncus effusus*	Soft Rush
2.50%	*Asclepias incarnata*	Swamp Milkweed
2.00%	*Heliopsis helianthoides*	Oxeye Sunflower
1.20%	*Aster puniceus*	Purplestem Aster
1.20%	*Aster umbellatus*	Flap Topped White Aster
1.00%	*Eupatorium perfoliatum*	Boneset
1.00%	*Helenium autumnale*	Common Sneezeweed
0.60%	*Aster novae-angliae*	New England Aster
0.50%	*Alisma Subcordatum*	Mud Plantain
0.50%	*Lobelia siphilitica*	Great Blue Lobelia
0.50%	*Penthorum sedoides*	Ditch Stonecrop
0.50%	*Scirpus atrovirens*	Green Bulrush
0.50%	*Scirpus cyperinus*	Woolgrass
0.30%	*Eupatorium fistulosum*	Joe Pye Weed
0.30%	*Onoclea sensibilis*	Sensitive Fern
0.10%	*Chelone glabra*	Turtlehead
0.10%	*Mimulus ringens*	Square Stemmed Monkeyflower

ERNST RIPARIAN BUFFER MIX - ERNMX 178

PERCENTAGE OF MIX COMPOSITION	SCIENTIFIC NAME	COMMON NAME
30.0%	*PANICUM CLANDESTINUM*	DEERTONGUE
20.0%	*ELYMUS VIRGINICUS*	VIRGINIA WILDRYE
11.8%	*ANDROPOGON GERARDII*	BIG BLUESTEM
10.5%	*SORGHASTRUM NUTANS*	INDIANAGRASS
5.0%	*PANICUM VIRGATUM*	SWTCHGRASS
4.0%	*CHAMAECRISTA FASCICULATA*	PARTRIDGE PEA
4.0%	*VERBENA HASTATA*	BLUE VERVAIN
3.0%	*JUNCUS EFFUSUS*	SOFT RUSH
3.0%	*RUDBECKIA HIRTA*	BLACKEYED SUSAN
2.0%	*HELIOPSIS HELIANTHOIDES*	OXEYE SUNFLOWER
1.0%	*ASCLEPIAS INCARNATA*	SWAMP MILKWEED
0.7%	*ASTER NOVAE-ANGLIAE*	NEW ENGLAND ASTER
0.7%	*ASTER UMBELLATUS*	FLAT TOPPED WHITE ASTER
0.7%	*EUPATORIUM PERFOLIATUM*	BONESET
0.5%	*AGROSTIS PERENNANS*	AUTUMN BENTGRASS
0.5%	*HELENIUM AUTUMNALE*	COMMON SNEEZEWEED
0.5%	*MONARDA FISTULOSA*	WILD BERGAMOT
0.5%	*VERNONIA NOVEBORACENSIS*	NEW YORK IRONWEED
0.4%	*PYCNANTHEMUM TENUIFOLIUM*	NARROWLEAF MOUNTAINMINT
0.4%	*SOLIDAGO PATULA*	ROUGHLEAF GOLDENROD
0.3%	*EUPATORIUM FISTULOSUM*	JOE PYE WEED
0.3%	*LOBELIA SIPHILITICA*	GREAT BLUE LOBELIA
0.2%	*ASTER PUNICEUS*	PURPLESTEM ASTER

1. SEEDING RATE: 20 LBS/ACRE WITH A COVER CROP AT 30 LBS/ACRE
2. THIS SEED MIX IS TO BE USED TO REVEGETATE WORKSPACE WITHIN THE DESIGNATED 150' RIPARIAN BUFFER AREA WHERE SLOPES ARE LESS THAN 10% . IF THE SLOPE EXCEEDS 10% , A STANDARD UPLAND ROW MIX SHOULD BE USED.
3. AN ALTERNATIVE SEED MIXTURE THAT CONTAINS SIMILAR SPECIES IS ACCEPTABLE.

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate: Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	Notes
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-10-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the soil amendments shown in Table 11.2.

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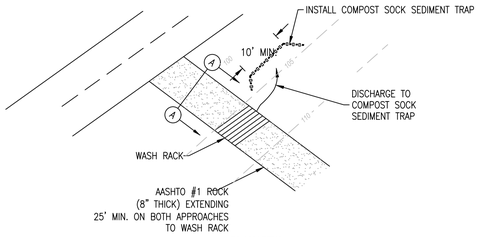
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

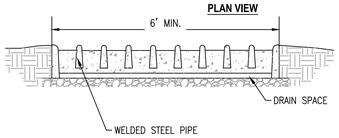
NOTES SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

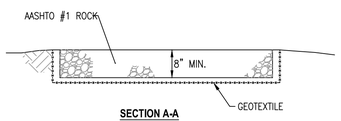
DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 27
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



PLAN VIEW



WASH RACK

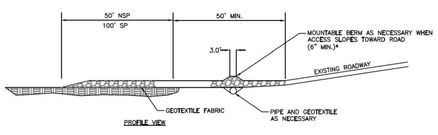


SECTION A-A

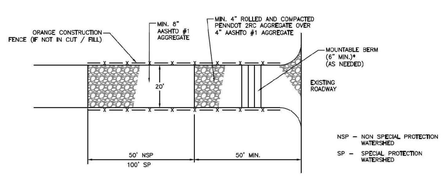
NOTE:
1) WASH RACK SHALL BE 20 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS, WHICHEVER IS GREATER.
2) WASH RACK SHALL BE CONSTRUCTED TO ACCOMMODATE ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.
3) A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL VEHICLES EXITING THE SITE.
4) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE DRAIN SPACE UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. WASHING THE ROADWAYS OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

CONSTRUCTION ENTRANCE
TEMPORARY EROSION CONTROL MEASURE

Example Alternative Rock Construction Entrance



PROFILE VIEW



PLAN VIEW

NOTES:

1) REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2) MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
3) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
4) STREET SWEEPING ON PAVED ROADS
   a. USE A VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT.
   b. AT A MINIMUM – ANY DAY IN WHICH CONSTRUCTION TRAFFIC IS EXITING THE ROCK CONSTRUCTION ENTRANCE, THE VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT SHALL CLEAN THE ROAD WAY AT THE END OF THE WORK DAY AND PRIOR TO ANY FORECASTED RAIN EVENT.
5) STREET SWEEPING ON DIRT OR GRAVEL SURFACE PUBLIC ROADS
   a. RIGOROUS MANUAL REMOVAL OF MUD/DIRT FROM VEHICLE/EQUIPMENT TIRES PRIOR TO EXITING CONSTRUCTION SITE, SUPPLEMENTED BY IMMEDIATE RECOVERY, BY MANUAL OR MECHANICAL MEANS, OF SOIL WHICH MAY BECOME DISCHARGED ONTO PUBLIC ROADWAYS. DUST CONTROL AND/OR COMPACTION VIA ROLLING OF THE DIRT PUBLIC ROAD SURFACE WILL BE IMPLEMENTED AS NEEDED.

CONSTRUCTION ENTRANCE (ALTERNATIVE)
TEMPORARY EROSION CONTROL MEASURE

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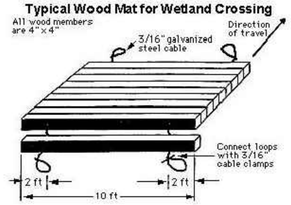
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CE CONSTRUCTION ENTRANCE

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP FIGURE 3.07.

FIGURE 3.7
Typical Wood Mat for Wetland Crossing



University of Minnesota FS 07009
A geotextile underlayment shall be used under the wood mat.

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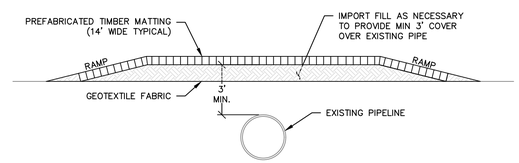
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MAT.1 TIMBER MATTING CONSTRUCTION



NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER TO DETERMINE THE NUMBER OF EQUIPMENT MATS REQUIRED.

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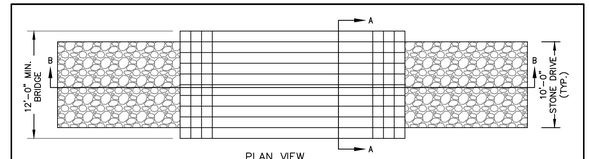
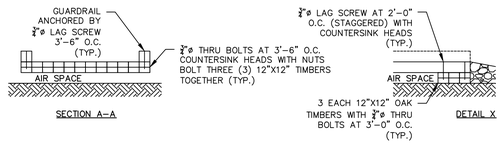
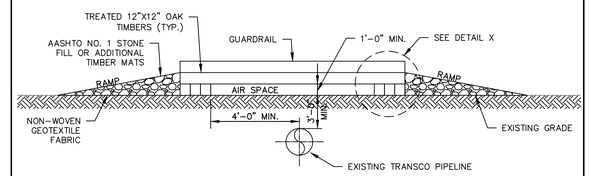
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MAT.2 TIMBER MATTING WITH FILL OVER EXISTING PIPELINES



PLAN VIEW



SECTION A–A DETAIL X



SECTION B–B

NOTES:

1. IF STONE USED FOR RAMP, INSTALL 1 (ONE) LAYER OF NON–WOVEN GEOTEXTILE FABRIC PRIOR TO INSTALLING THE STONE.
2. MINIMUM WIDTH OF BRIDGE IS 12'–0" WITH A 10'–0" WIDE STONE DRIVE.

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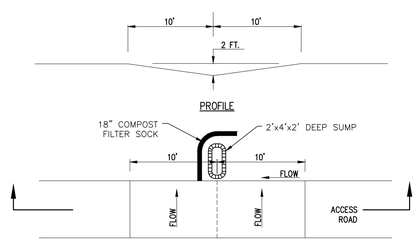
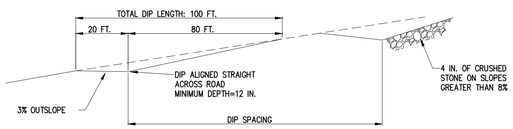
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MAT.3 TIMBER MATTING AIR BRIDGE



PLAN

BROAD–BASED DIP – LOW GRADIENT (< 5%) ROADWAYS



PROFILE VIEW

BROAD–BASED DIP – HIGH GRADIENT (5% – 10%) ROADWAYS

NOTES:

1. BROAD–BASED DIPS SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN AND AT THE LOCATIONS SHOWN ON THE PLAN DRAWINGS.
2. DIPS SHALL BE ORIENTED SO AS TO DISCHARGE TO THE LOW SIDE OF THE ROADWAY.
3. DIPS SHALL BE INSPECTED DAILY. DAMAGED OR NON–FUNCTIONING DIPS SHALL BE REPAIRED BY THE END OF THE WORKDAY.
4. MAXIMUM SPACING OF BROAD–BASED DIPS SHALL BE AS SHOWN IN TABLE 3.2.
5. *INSTALL A 2' WIDE BY 4' LONG BY 2' DEEP SUMP AND 18" COMPOST FILTER SOCK ON THE DOWNHILL SIDE OF THE BROAD BASED DIP. THE ORIENTATION OF THE COMPOST FILTER SOCK WILL VARY BASED ON EXISTING GROUND ELEVATIONS. INSTALL THE COMPOST PARALLEL TO EXISTING CONTOURS.*

TABLE 3.2 – MAXIMUM SPACING OF BROAD–BASED DIPS

PERCENT SLOPE	SPACING BETWEEN BROAD–BASED DIPS (FT)
<2	300
3	235
4	200
5	180
6	165
7	155
8	150
9	145
10	140

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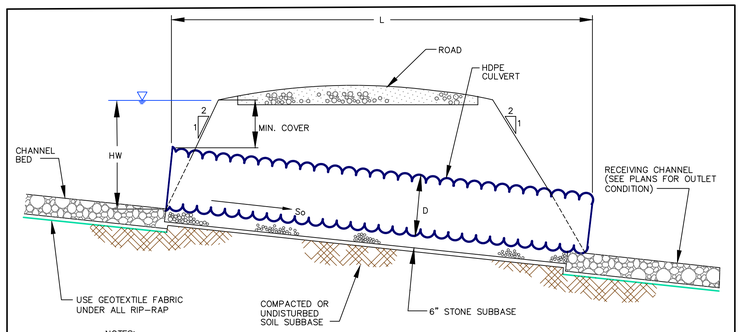
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BBD BROAD–BASED DIP



NOTES:

1. BARRELS SHALL BE PLACED AT THE MINIMUM SLOPE INDICATED FOR THE CHANNEL.
2. AN ADDITIONAL 0.5 OF FREEBOARD SHALL BE PROVIDED IN THE CHANNEL ON THE INVERT SIDE OF THE CULVERT.
3. IF MULTIPLE BARRELS ARE USED, THEY SHALL BE PLACED SUCH THAT THERE IS A MINIMUM OF 1 BARREL WIDTH BETWEEN.
4. CORRUGATED METAL OR HDPE MAY BE USED UPON EVALUATION BY AN ENGINEER.

ID	DRAINAGE AREA (AC)	REQ'D FLOW (CFS)	LENGTH (FT)	SLOPE (FT/FT)	NO. OF PIPES	PIPE DIAMETER (IN)
CULVERT #1	0.14	0.67	37.00	0.048	1	12
CULVERT #2	1.24	0.16	20.00	0.005	1	12
CULVERT #3	0.53	0.04	36.00	0.017	1	12

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
RC TYPICAL ACCESS ROAD CULVERT

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REVISIONS

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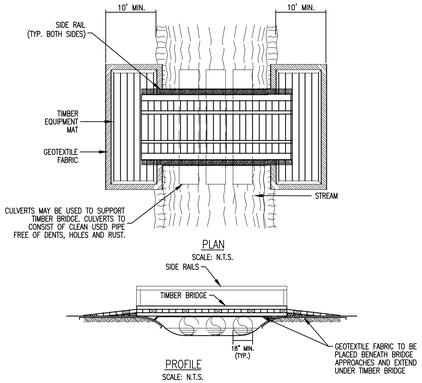
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 28 OF 39

designs, permits, resolutions WHM consulting, INC. BA GROUP



NOTES:

1. TIMBER BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
2. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
3. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
4. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN-UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
5. CULVERTS MAY BE USED TO SUPPORT THE TIMBER BRIDGE TO PREVENT SETTLEMENT OF THE BRIDGE. IF THE GEOMETRY OF THE STREAM ALLOWS FOR SUCH INSTALLATION. THE TIMBER BRIDGE AND GEOTEXTILE FABRIC SHALL REMAIN ABOVE THE WATER SURFACE ELEVATION AT ALL TIMES.
6. SIDE RAILS SHALL BE INSTALLED ON BOTH SIDES OF THE BRIDGE EQUIPMENT CROSSING IN ORDER TO PREVENT SEDIMENT FROM ENTERING THE WATERBODY. SIDE RAILS TO BE CONSTRUCTED OF PLYWOOD NAILED TO THE OUTER EDGES OF THE TIMBER EQUIPMENT MATS.
7. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WATERBODY OR WETLAND BOUNDARIES.
8. PIPES SHALL EXTEND BEYOND THE TOE OF THE ROADWAY.
9. RUNOFF FROM THE ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
10. SUITABLE OUTLET PROTECTION SHOULD BE PROVIDED TO BE PREVENT SCOUR AT THE PIPE OUTLET. WHEREVER SOFT CHANNEL BED CONDITIONS EXIST, RIPRAP PROTECTION SHOULD ALSO BE PROVIDED AT THE CULVERT ENTRANCE.
11. AS SOON AS THE TEMPORARY CROSSING IS NO LONGER NEEDED IT SHALL BE REMOVED. ALL MATERIALS SHOULD BE DISPOSED OF PROPERLY AND DISTURBED AREAS STABILIZED.

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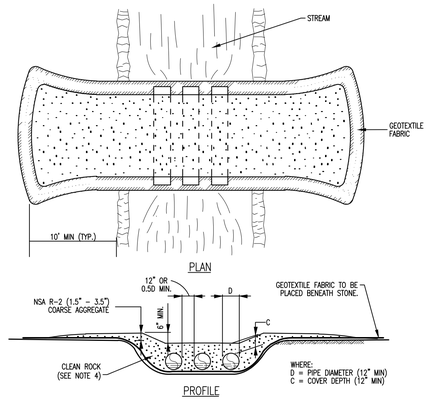
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BEC — BRIDGE EQUIPMENT CROSSING (TIMBER MAT BRIDGE)
Williams

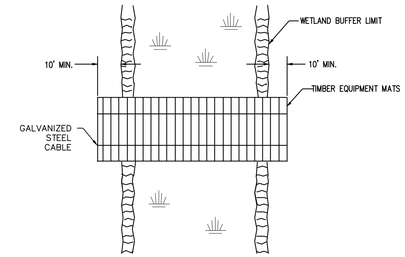


NOTES:

1. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
2. CULVERTS SHALL BE PLACED AT LEAST ONE-HALF (1/2) THEIR DIAMETER APART.
3. MATERIALS PLACED IN STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP-UP. REMOVAL OF THIS ITEM IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
4. RIPRAP (OR ROCK) TO 10" AVERAGE DIAMETER CAN BE USED FOR ALL BUT THE TOP 6" OF STONE FILL. THE TOP 6" MUST CONSIST OF NSA R-2 (1.5" - 3.5") COARSE AGGREGATE.
5. PROVIDE 50' STABILIZED ACCESS TO CROSSING ON BOTH SIDES OF STREAM (SEE DETAIL CE).
6. PIPES SHALL EXTEND BEYOND THE TOE OF THE ROADWAY.
7. RUNOFF FROM THE ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
8. SUITABLE OUTLET PROTECTION SHOULD BE PROVIDED TO BE PREVENT SCOUR AT THE PIPE OUTLET. WHEREVER SOFT CHANNEL BED CONDITIONS EXIST, RIPRAP PROTECTION SHOULD ALSO BE PROVIDED AT THE CULVERT ENTRANCE.
9. AS SOON AS THE TEMPORARY CROSSING IS NO LONGER NEEDED IT SHALL BE REMOVED. ALL MATERIALS SHOULD BE DISPOSED OF PROPERLY AND DISTURBED AREAS STABILIZED.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
CEC — CULVERT EQUIPMENT CROSSING
Williams

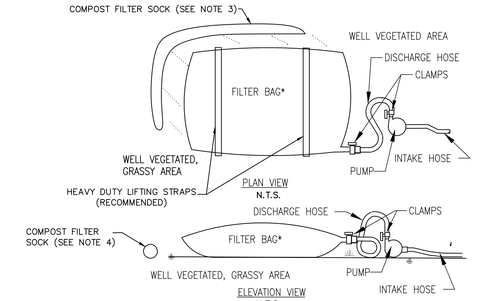


NOTES:

1. PERIODICALLY CHECK INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS.
2. MATERIALS PLACED IN WETLANDS SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN-UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
3. IF A WATERBODY IS LOCATED WITHIN A WETLAND SYSTEM, EXTEND TIMBER EQUIPMENT MATS TO THE BRIDGE EQUIPMENT CROSSING (BEC) USED TO CROSS THE WATERBODY IN ORDER TO ALLOW FOR CONTINUOUS TIMBER EQUIPMENT MAT COVERAGE THROUGH THE WETLAND AND WATERBODY AREA.
4. USE ADDITIONAL TIMBER MAT LAYERS TO RAISE CROSSING ABOVE GRADE WHERE POOR SOIL CONDITIONS EXIST.
5. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WETLAND BOUNDARIES.
6. INSTALL EARTHEN RAMP APPROACHES TO TIMBER EQUIPMENT MATS. EARTHEN RAMPS TO BE CONSTRUCTED OF UPLAND MATERIAL, TOP SOIL SHALL NOT BE USED TO CONSTRUCT EARTHEN RAMPS.
7. A GEOTEXTILE UNDERLAYMENT SHALL BE USED UNDER THE WOOD MAT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WEC — WETLAND EQUIPMENT CROSSING
Williams



LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS MAY BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

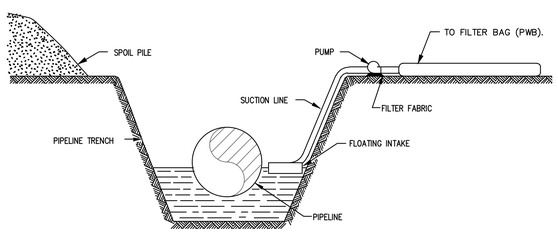
PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D-4884	60 LB/IN
GRAB TENSILE	ASTM D-4632	205 LB
PUNCTURE	ASTM D-4833	110 LB
MULLEN BURST	ASTM D-3786	350 PSI
UV RESISTANCE	ASTM D-4355	70%
AOS % RETAINED	ASTM D-4751	80 SIEVE

NOTES:

1) A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME ½ FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS TO BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.
2) BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON-ERODIBLE AND NON-POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.
3) NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.
4) THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.
5) THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR ½ THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.
6) FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.
7) CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF USED FILTER BAGS UPON COMPLETION OF DEWATERING OPERATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
PWB — PUMP WATER FILTER BAG
Williams



NOTES:

1. WATER PUMPED OUT OF TRENCH SHALL NOT BE DISCHARGED INTO WATERWAYS. WATER SHALL BE DISCHARGED INTO A FILTER BAG OR DEWATERING STRUCTURE.
2. PUMP SHALL BE CONTROLLED SO THAT DISCHARGE DOES NOT OVERFLOW DEWATERING STRUCTURE.
3. PUMP SUCTION HOSE MUST NOT BE ALLOWED TO COME IN CONTACT WITH TRENCH BOTTOM. PROVISIONS MUST BE MADE TO ELEVATE THE SUCTION HOSE TO AT LEAST ONE FOOT ABOVE THE BOTTOM OF THE PIPE TRENCH UNTIL BOTTOM DEWATERING IS NECESSARY.
4. DEWATERING SHALL NOT OCCUR DURING TIMES OF HEAVY RAINFALL EXCEPT AS REQUIRED TO PREVENT FLOODING OF CONSTRUCTION EQUIPMENT LOCATED IN BORE PITS AND TRENCHES.
5. PUMP WATER FILTER BAG (PWB) SHALL BE PLACED ON A WELL VEGETATED AREA AWAY FROM CONSTRUCTION SO THAT FILTERED WATER IS NOT RETURNED TO THE TRENCH.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TD — TRENCH DEWATERING
Williams

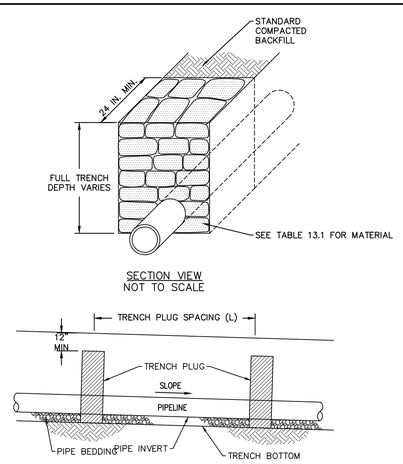


TABLE 13.1
MAXIMUM SPACING AND MATERIALS FOR TRENCH PLUGS

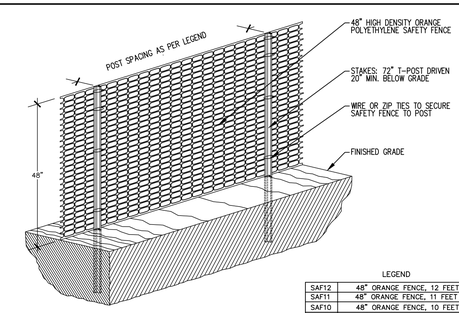
TRENCH SLOPE (%)	SPACING L (FT)	TRENCH PLUG MATERIAL FOR FILLED SACKS
<5	1,000	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
5 – 15	500	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
15 – 25	300	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
25 – 35	200	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
35 – 100	100	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
>100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

*TOPSOIL MAY NOT BE USED TO FILL SACKS.

IMPERVIOUS TRENCH PLUGS ARE REQUIRED FOR ALL STREAM, RIVER, WETLAND, OR OTHER WATER BODY CROSSINGS. FOAM TRENCH PLUGS ARE AN APPROVED ALTERNATE E&S BMP.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TP — TRENCH PLUG INSTALLATION
Williams



LEGEND

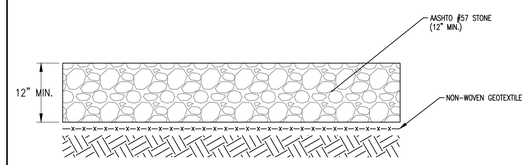
SAF12	48" ORANGE FENCE, 12 FEET O.C.
SAF11	48" ORANGE FENCE, 11 FEET O.C..
SAF10	48" ORANGE FENCE, 10 FEET O.C.
SAF9	48" ORANGE FENCE, 9 FEET O.C.
SAF8	48" ORANGE FENCE, 8 FEET O.C..
SAF7	48" ORANGE FENCE, 7 FEET O.C.
SAF6	48" ORANGE FENCE, 6 FEET O.C.

NOTES:

1. ALL SENSITIVE AREAS SHALL BE PROTECTED AS PER PLAN.
2. SAFETY FENCE SHOULD BE FASTENED SECURELY TO THE T-POSTS.
3. THE FENCING MUST REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION; ANY CHANGE OF THE PROTECTIVE FENCING MUST BE APPROVED.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
SF — SAFETY FENCE
Williams



NOTES:

1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
AR — PERMANENT/TEMPORARY STONE ACCESS ROAD
Williams

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
041201-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

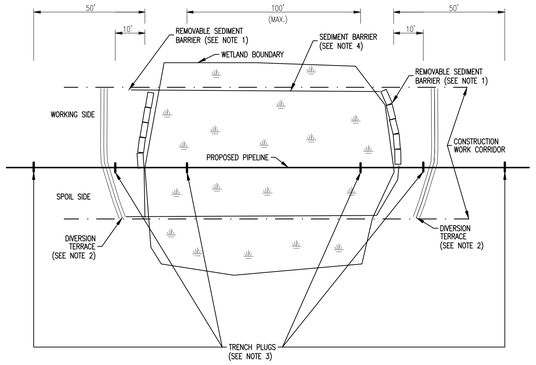
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 29
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39

WHM consulting, inc. — designs, permits, resolutions
BA GROUP

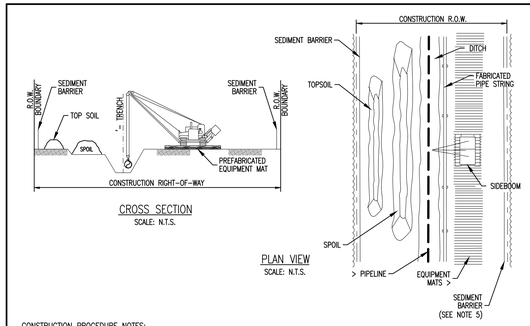


NOTES:

1. INSTALL REMOVABLE SEDIMENT BARRIERS (COMPOST FILTER SOCK) OR DRIVABLE BERMS ACROSS THE TRAVEL LANE AT BOTH WETLAND BOUNDARIES. THE REMOVABLE SEDIMENT BARRIERS CAN BE REMOVED DURING THE CONSTRUCTION DAY, BUT MUST BE RE-INSTALLED AFTER CONSTRUCTION HAS STOPPED FOR THE DAY AND/OR WHEN HEAVY PRECIPITATION IS IMMINENT.
2. INSTALL DIVERSION TERRACES IMMEDIATELY UPSLOPE OF BOTH WETLAND BOUNDARIES TO PREVENT SEDIMENT FROM ENTERING THE WETLAND.
3. INSTALL TRENCH PLUGS TEN (10) FEET FROM THE EDGE OF A WETLAND; FIFTY (50) FEET FROM THE EDGE OF A WETLAND; PLACE A MINIMUM OF ONE (1) TRENCH PLUG AT A MAXIMUM SPACING OF 100 FEET BETWEEN TRENCH PLUGS WITHIN A WETLAND TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED UPLAND TRENCH WATER OUT OF WETLAND. WETLAND CROSSINGS LESS THAN FIFTY (50) FEET DO NOT REQUIRE AN INTERNAL TRENCH PLUG.
4. FOR TYPE II ("SATURATED") AND TYPE III ("FLOODED") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES AND ALONG BOTH WETLAND EDGES. FOR TYPE I ("DRY") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES, ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC WETLAND CROSSING CONFIGURATION TYPE I, II AND III WETLANDS

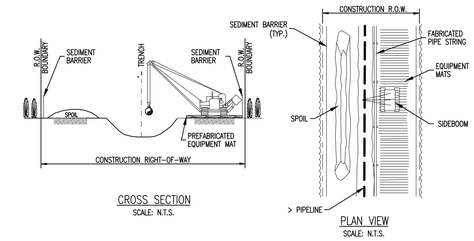


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF THE WETLAND. INSTALL SEDIMENT BARRIERS ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR THROUGH THE WETLAND AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY-RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE SATURATED TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE COMPANY ENVIRONMENTAL INSPECTOR. TOPSOIL AND SATURATED TOPSOIL SHALL BE STOCKPILED SEPARATELY. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEED CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING TRENCH, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE SATURATED TOPSOIL AND TOPSOIL (IF NOT SATURATED) AND INSTALL PERMANENT EROSION CONTROL.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLANDS AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.1 TYPE I "DRY WETLAND" INSTALLATION PROCEDURE

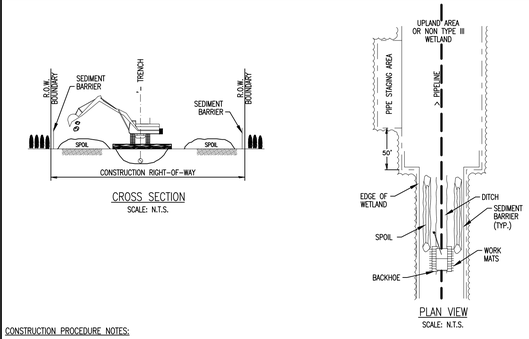


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEED CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION. SEED DISTURBED WETLAND AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.2 TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE



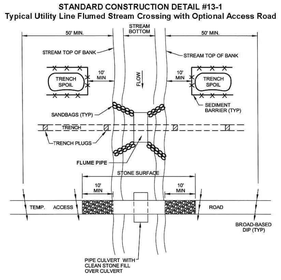
CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL WETLAND BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
5. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
6. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
7. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY PREFABRICATED EQUIPMENT MATS OR FLOATS, TO EXCAVATE TRENCH. IF PREFABRICATED EQUIPMENT MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MATS FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
8. FABRICATE PIPE IN A STAGING AREA OUTSIDE THE TYPE III WETLAND AS INDICATED ON THE CONSTRUCTION DRAWINGS. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
9. LEAVE HARD PLUGS AT THE EDGE OF TYPE III WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER-IN, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, AND BACKFILL.
11. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.
12. REMOVE ANY MATS UTILIZED TO SUPPORT AMPHIBIOUS EQUIPMENT FROM WETLANDS UPON COMPLETION.
13. WETLANDS CROSSED USING PUSH/PULL METHOD TEND TO BE TOO WET FOR EFFECTIVE SEEDING. HOWEVER, IF THE SITE IS DRY ENOUGH AND IF DIRECTED BY THE ENVIRONMENTAL INSPECTOR, THE RIGHT-OF-WAY SHALL BE SEEDED IN ACCORDANCE WITH DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.3 TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE

STANDARD CONSTRUCTION DETAIL #13-1
Typical Utility Line Flumed Stream Crossing with Optional Access Road



PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Pipe culvert for access road and flume pipe may be one continuous pipe.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #13-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized. Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

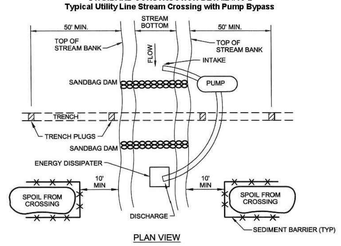
WILLIAMS STANDARD NOTES:

1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIME FRAMES WHERE SPECIFIED.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
FX FLUME STREAM CROSSING

STANDARD CONSTRUCTION DETAIL #13-2
Typical Utility Line Stream Crossing with Pump Bypass



PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Bypass pump intake shall be maintained a sufficient distance from the bottom to prevent pumping of channel bottom materials.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #13-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any receiving surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized.

Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIME FRAMES WHERE SPECIFIED.
4. DAM-AND-PUMPS MAY ONLY BE IN THE STREAM FOR TWO WEEKS.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
DPX DAM AND PUMP STREAM CROSSING

Hensel Replacement - Instream Crossing Duration

Waterway ID	Waterway Name	Milepost	Crossing Length (Linear Ft.)[1]	Crossing Method	Secondary Crossing Method (if trenchless methodology is proposed)	Instream Crossing Duration[2] (hours)	Justification for Exceeding Standard Crossing Window
S12-T6-HR	UNT to Dark Hollow	189.05	20.6	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S9-T6-HR	UNT to Paddy Run	190.36	6	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S7-T7-HR	Paddy Run	190.47	30.6	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S1-T7-HR	Hensel Fork	190.69	39.3	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S1-T7-HR	Hensel Fork	190.99	20.4	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"

Notes:

1. Measured from top of bank to top of bank
2. Crossing Window is designated as time within or below top of bank. Duration is determined by length of crossing:
   a. For crossings less than 10 feet in length, the standard crossing window is 24 hours
   b. For crossings that are 10 - 100 feet in length, the standard crossing window is 48 hours
   c. Crossings not referenced in table will meet standard crossing windows

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REVISIONS

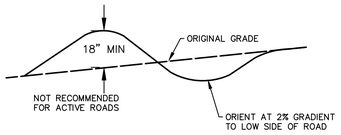
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

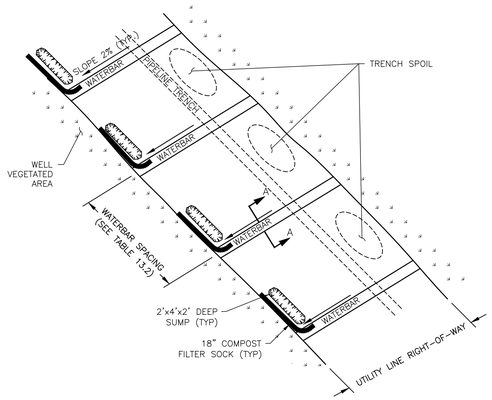
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 30
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



PLAN VIEW
N.T.S.



LAYOUT VIEW
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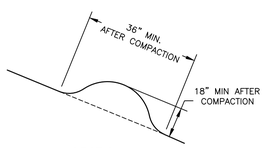

SECTION A–A

NOTES:

1. DURING CONSTRUCTION, WATERBARS SHALL BE PREPARED AT THE END OF EACH WORK DAY AND PRIOR TO STORM EVENTS.
2. AFTER EARTH DISTURBING WORK HAS BEGUN, WATERBARS SHALL BE INSTALLED AT THE SPACING SHOWN IN THE ABOVE TABLE OR AS SHOWN ON THE DRAWINGS. WATERBARS SHALL BE IMMEDIATELY STABILIZED WITH EROSION CONTROL BLANKET.
3. TEMPORARY AND PERMANENT WATERBARS ARE REQUIRED AT ALL WATERBODY CROSSINGS AND UPSLOPE FROM ALL WETLAND BOUNDARIES.
4. THE WATERBAR OUTLET SHALL BE LOCATED WHERE RUNOFF WILL BE RELEASED ONTO AN EXISTING WELL–VEGETATED AREA. AN OUTLET STRUCTURE (OS) MUST BE INSTALLED AT THE WATERBAR OUTLET.
5. WHEREVER EDIBLE SOILS ARE PRESENT, OR WHERE THERE IS NOT A SUFFICIENT VEGETATIVE FILTER STRIP BETWEEN THE WATERBAR AND A RECEIVING SURFACE WATER, THE WATERBAR SHOULD BE PROVIDED WITH A TEMPORARY PROTECTIVE LINER.

TABLE 3.1 – MAXIMUM WATERBAR SPACING

PERCENT SLOPE	SPACING (FT)
<5	250
5–15	150
>15–30	100
>30	50

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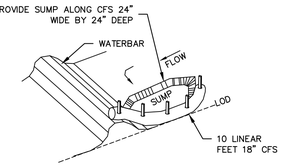
TRANSCONTINENTAL GAS PIPE LINE, LLC
STANDARD ENVIRONMENTAL DETAIL
WB WATERBAR

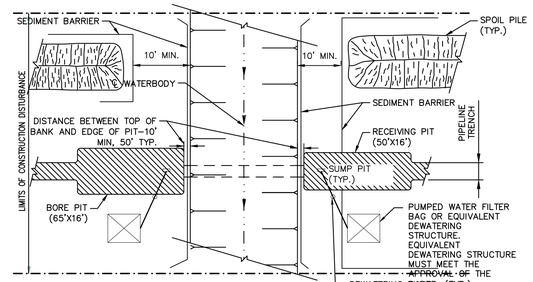


NOTES:

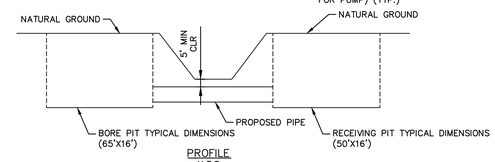
1. 10 LINEAR FEET OF 18 INCH COMPOST FILTER SOCK (CFS) SHALL BE INSTALLED WITH ONE END RESTING ON THE WATERBAR AS PER DETAIL CFS, ALLOWING FOR 8 FEET OF EFFECTIVE LENGTH AND A SPECIFIED FLOW THROUGH RATE OF 15 GALLONS PER MINUTE PER LINEAR FOOT. A PASS THROUGH FLOW OF 0.26 CUBIC FEET PER SECOND CAN BE ACCOMMODATED THROUGH THE FILTER SOCK. THIS FLOW RATE IS ADEQUATE FOR 20,000 SQUARE FEET OF DRAINAGE AREA FOR THE 2–YEAR, 24–HOUR STORM, 5 MINUTE TIME OF CONCENTRATION (RATIONAL METHOD).
2. CONSTRUCTION OF A 24" WIDE AND 24" DEEP SUMP AT THE DISCHARGE END OF THE WATERBAR WILL REDUCE VELOCITY AND PROVIDE A SHEET FLOW CONDITION TO THE CFS. THE SUMP SHALL BE MAINTAINED AND CLEAN OUT WHEN IT BECOMES A MINIMUM OF 12" DEEP. THE SUMP SHALL BE FILLED AND STABILIZED WHEN THE CFS IS REMOVED AFTER SITE STABILIZATION.
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN ACCORDANCE WITH WILLIAMS STANDARDS. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
OS CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION



PLAN
N.T.S



PROFILE
N.T.S

NOTES:

1. SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO ROAD CROSSINGS WHERE VEGETATION IS DISTURBED, TO INTERCEPT SURFACE RUNOFF.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL REMAIN IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. WATER REMOVED FROM BORE PIT AND RECEIVING PIT SHALL BE FILTERED THROUGH A DEWATERING STRUCTURE OR FILTER BAG.
5. IF WELL POINTING IS REQUIRED PRIOR TO EXCAVATING BORE PITS, CONTRACTOR SHALL CONSULT WITH THE ENVIRONMENTAL INSPECTOR PRIOR TO COMMENCEMENT OF WORK IN ORDER TO DETERMINE PROPER DEWATERING LOCATION.
6. CONTRACTOR SHALL BE REQUIRED TO KEEP THE AREA CLEAN OF DEBRIS AT ALL TIMES.
7. CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE BORE PITS.
8. DEPENDING ON TOPOGRAPHY AND STATE REQUIREMENTS, SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY AT THE EDGE OF ROAD. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.

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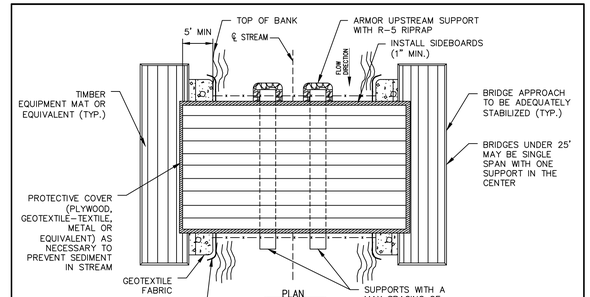
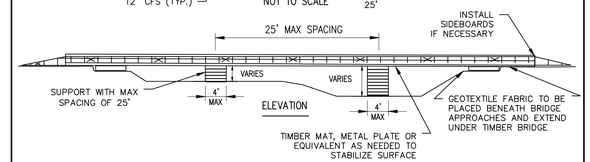
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WBX BORED WATERBODY CROSSING



PLAN
NOT TO SCALE



ELEVATION

NOTES:

1. THIS TYPE OF BRIDGE IS GENERALLY USED FOR INTERMEDIATE TO LARGE STREAM CROSSINGS GREATER THAN 20' IN WIDTH IN COMBINATION WITH A PROPER STREAM BANK CONFIGURATION.
2. BOTTOM CHORD OF BRIDGE STRUCTURE SHALL BE CONSTRUCTED ABOVE ORDINARY HIGH WATER MARK/TOP OF BANK.
3. BRIDGE TO REMAIN IN PLACE UNTIL THE COMPLETION OF FINAL RESTORATION.
4. A "SKIRT" FORMED OF GEOTEXTILE FABRIC OR EQUIVALENT SHALL BE PLACED ON THE SIDES AND BOTTOM OF THE BRIDGE TO TRAP SEDIMENT.
5. INDIVIDUAL MATS SHALL BE ANCHORED AND BUTTED TIGHTLY TO MINIMIZE THE INTRODUCTION OF SEDIMENT TO THE WATER BODY.
6. COMPOST FILTER SOCK WILL BE PLACED AT THE EDGE OF EQUIPMENT BRIDGE AT THE END OF THE WORK DAY TO PREVENT EROSION BUT WILL BE REMOVED DURING CONSTRUCTION ACTIVITY.
7. CONTRACTOR SHALL EXTEND TIMBER MAT BRIDGE A MINIMUM OF 10' BEYOND TOP OF STREAM BANK. ABUTMENTS MAY BE KEYED INTO BANK WHERE NEEDED TO INSURE SAFETY.
8. BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
9. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD–UP OF SEDIMENT OR DEBRIS ON BRIDGE.
10. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
11. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
12. RUNOFF FROM ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
13. INSTALLATION AND REMOVAL OF INSTREAM SUPPORT SHALL ADHERE TO TIME OF YEAR RESTRICTIONS.

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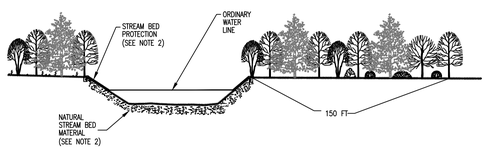
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BCC BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS



NOTES:

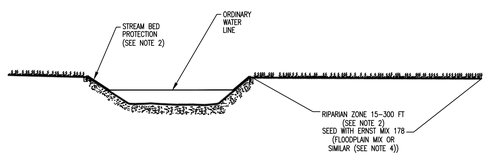
1. RESTORE IMPACTED FOREST BUFFER:
   100 FT (OTHER WATERS – PA)
   150 FT (HIGH QUALITY WATERS – PA)

   OR EXISTING WIDTH OF FOREST BUFFER IF LESS THAN THESE MINIMUM REQUIREMENTS.
2. ZONE 1 AND ZONE 2 PLANTING AREAS ARE RECOMMENDED FROM PADEP RIPARIAN FOREST BUFFER GUIDANCE (DOCUMENT NUMBER 394–5600–001, NOVEMBER 27, 2010).
3. NATIVE TREES AND/OR SHRUBS IN ZONE 1 AND ZONE 2 SHOULD BE PLACED 12' APART.
4. EROSION CONTROL BLANKETS SHALL BE PLACED ON RESTORED BANKS TO THE ORDINARY WATER LINE AND IN UPLAND AREAS SHOULD BE INSTALLED A MINIMUM OF 100 FT BEYOND THE TOP OF BANK (MORE AS NEEDED DEPENDING ON SLOPES). EROSION CONTROL BLANKETS SHALL NOT BE PLACED IN WETLANDS. IF STREAMS HAVE EXISTING ROCK BANK PROTECTING GRID PAVERS THESE FEATURES SHOULD BE RESTORED TO PRE–EXISTING CONDITIONS.
5. ERNST MIX 178 (RIPARIAN BUFFER MIX) OR SIMILAR TO BE APPLIED AT 20 LBS PER ACRE OR 1/2 LB PER 1,000 SQ. FT. WITHIN RIPARIAN ZONES UNLESS SLOPE EXCEEDS 10% OR WITHIN WETLANDS.
6. FOR DETAILS REGARDING RECOMMENDED TREES, SHRUBS, LIVE STAKES AND SEED MIX SHOULD BE PLANTED IN ACCORDANCE WITH ONSITE WETLAND AND RIPARIAN RESTORATION PLAN OUTLINED IN CHAPTER 105 PERMIT
7. NO TREES OR SHRUBS ARE TO BE PLANTED IN AN AREA 15 FEET WIDE CENTERED OVER THE PIPE LINE.
8. CONTRACTOR SHALL REPLACE NATURAL SEED BED MATERIAL WITHIN STREAM BED ONLY. CONTRACTOR SHALL ASSUME NO SIGNIFICANT CHANGES IN BED GRADE AND THALWAG ALIGNMENT MEETS PRE–CONSTRUCTION ALIGNMENT.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TYPICAL CHANNEL & VEGETATION RESTORATION – 1
WATER BODIES WITH EXISTING FORESTED RIPARIAN BUFFER



NOTES:

1. RESTORE IMPACTED RIPARIAN ZONE FOR:
   100 FT (OTHER WATERS – PA)
   150 FT (HIGH QUALITY WATERS – PA)

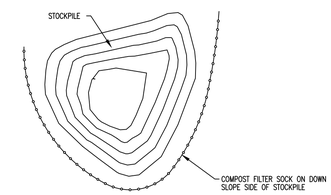
   OR EXISTING WIDTH OF RIPARIAN ZONE IF LESS THAN MINIMUM REQUIREMENTS.
2. EROSION CONTROL BLANKETS SHALL BE PLACED ON RESTORED BANKS TO THE ORDINARY WATER LINE AND IN UPLAND AREAS SHOULD BE INSTALLED A MINIMUM OF 50 FT BEYOND THE TOP OF BANK (MORE AS NEEDED DEPENDING ON SLOPES). EROSION CONTROL BLANKETS SHALL NOT BE PLACED IN WETLANDS. SEE DETAIL ON SHEET 22.

   ERNST MIX 178 (RIPARIAN BUFFER) OR SIMILAR TO BE APPLIED AT 15 LBS PER ACRE OR 1/3–1/2 LB PER 1,000 SQ. FT. ON RESTORED BANKS AND IN RIPARIAN ZONE.
3. EROSION CONTROL BLANKETS SHALL BE PLACED ON RESTORED BANKS TO THE ORDINARY WATER LINE AND IN UPLAND AREAS SHOULD BE INSTALLED A MINIMUM OF 100 FT BEYOND THE TOP OF BANK (MORE AS NEEDED DEPENDING ON SLOPES). EROSION CONTROL BLANKETS SHALL NOT BE PLACED IN WETLANDS. IF STREAMS HAVE EXISTING ROCK BANK PROTECTING GRID PAVERS THESE FEATURES SHOULD BE RESTORED TO PRE–EXISTING CONDITIONS.
4. CONTRACTOR SHALL REPLACE NATURAL SEED BED MATERIAL WITHIN STREAM BED ONLY. CONTRACTOR SHALL ASSUME NO SIGNIFICANT CHANGES IN BED GRADE AND THALWAG ALIGNMENT MEETS PRE–CONSTRUCTION ALIGNMENT.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TYPICAL CHANNEL & VEGETATION RESTORATION – 2
WATER BODIES WITH NON–FORESTED RIPARIAN BUFFER



NOTES:

1. MAXIMUM STOCKPILE HEIGHT IS 35 FEET.
2. STOCKPILE SLOPES MUST BE NO STEEPER THAN 2H:1V.
3. STOCKPILE LOCATIONS SHOWN ON THE PLANS ARE ILLUSTRATIVE AND MAY VARY IN LOCATION AS CONSTRUCTION PROCEEDS.
4. STOCKPILE IS TO BE STABILIZED IN ACCORDANCE WITH TEMPORARY SEEDING SPECIFICATIONS AND MULCH IS TO BE MAINTAINED UNTIL THE STOCKPILE IS STABILIZED.
5. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TYPICAL TOPSOIL STOCKPILE

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REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 31 OF 39
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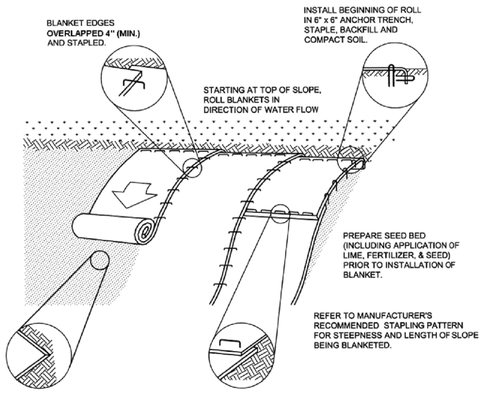

NOT TO SCALE

NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
5. STAPLING OF THE BLANKET SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.
7. BIODEGRADABLE STAPLES SHALL BE USED.

WILLIAMS SUPPLEMENTAL NOTES:

1. CONTRACTOR SHALL USE SINGLE MAT STRAW FOR SLOPES FLATTER THAN 3:1.
2. HYDRAULIC APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF ECB.
3. EROSION CONTROL MATS SHOULD CONSIST OF NATURAL MATERIALS. NO PLASTIC OR SYNTHETIC MATERIALS SHALL BE USED. MATTING SUCH AS NORTH AMERICAN GREEN S150BN OR EQUIVALENT SHALL BE USED.

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP STANDARD CONSTRUCTION DETAIL #11-1.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

ECB — EROSION CONTROL BLANKET

Williams.

HYDRAULICALLY APPLIED BLANKETS

Hydraulically applied blankets should not be used in areas of concentrated flow (e.g. channels).

A **Bonded Fiber Matrix (BFM)** can be an effective method of stabilizing steep slopes when used properly. BFMs make use of a cross-linked hydrocolloid tackifier to bond thermally processed wood fibers. Application rates vary according to site conditions. For slopes up to 3H:1V the BFM should be applied at a rate of 3,000 lb/acre. Steeper slopes may need as much as 4,000 lb/acre. In any case, manufacturer's recommendations should be followed.

BFMs should only be used when no rain is forecast for at least 48 hours following the application. This is to allow the tackifier sufficient time to cure properly. Once properly applied, a BFM is typically 90% effective in preventing accelerated erosion. **Bonded Fiber Matrix should not be applied between September 30 and April 1.**

Other fiber matrices that have been shown to be effective in preventing erosion on disturbed surfaces may be used in accordance with manufacturer's recommendations if sufficient supporting documentation is provided.

A **Flexible Growth Medium (FGM)** has the added component of ½ inch long, crimped organic or manmade fibers which add a mechanical bond to the chemical bond provided by BFMs. This increases the blanket's resistance to both raindrop impact and erosion due to runoff. Unlike BFMs, a flexible growth medium typically does not require a curing time to be effective. Properly applied, an FGM may be as much as 99% effective.

A **Polymer Stabilized Fiber Matrix (PSFM)** can also be an effective method of stabilizing steep slopes when used properly. PSFMs make use of a linear soil stabilizing tackifier that works directly on soil to maintain soil structure, maintain pore space capacity and flocculate dislodged sediment that will significantly reduce runoff turbidity. Properly applied, a PSFM may be as much as 99% effective.

PSFMs can be used in re-vegetation applications and for site winterization and/or dormant seeding — fall planting for spring germination — applications. Application rates vary according to site conditions

and the following application rates are suggested. In any case, manufacturer's recommendations should be followed. The following are typical application rates:

TABLE 11.7
Typical Polymer Stabilized Fiber Matrix Application Rates

Maximum Rainfall of ≤ 20"							
SLOPE	6:1	5:1	4:1	3:1	2:1	1.5:1	1:1
Soil Stabilizer (gals/acre)	4	5	6	7	8	9	10
Fiber (lb/acre)	1,500	1,500	1,500	1,800	2,000	2,500	3,000

Maximum Rainfall of > 20" and for Site Winterization			
SLOPE	≤5:1	4:1	≥3:1
Soil Stabilizer (gals/acre)	6	8	10
Fiber (lb/acre)	2,000	2,500	3,000

Unlike rolled blankets, there is no need to smooth the slope prior to application of hydraulically applied blankets. In fact some roughening of the surface, either natural or mechanically induced, is preferable. However, large rocks, those ≥ 9 inches, and existing rills should be removed prior to application. Tracking or grooving of slopes should be considered to slow water flows during a storm event. Slope interruption devices such as stair step grading or benching should be applied prior to the application. Mixing and application rates should follow manufacturer's recommendations.

Hydraulically applied blankets are typically applied in two stages. Unless specifically recommended to be applied in one application by the manufacturer, the seed mixture and soil amendments should be applied first. If the seed is applied at the same time as the hydraulically applied blanket, the bonded fibers may keep the seed from making sufficient contact with the soil to germinate. After the seed mixture is applied, the BFM, FGM, or PSFM should be sprayed over the area at the required application rate.

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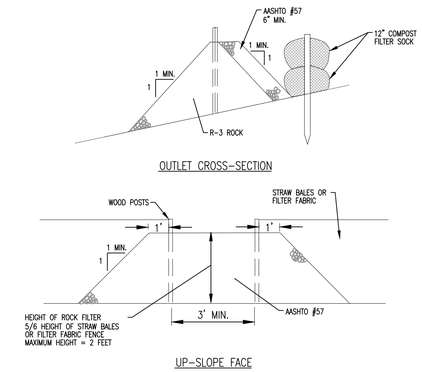
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

HYDRAULICALLY APPLIED BLANKETS

Williams.



NOTES:

1. ROCK FILTER OUTLETS SHALL BE PLACED ALONG SEDIMENT BARRIERS AS SHOWN ON THE PLAN. THE ROCK FILTER OUTLET IS NOT INTENDED TO BE PLACED IN STREAMS, RIVERS, CREEKS OR DITCHES THAT NORMALLY HAVE FLOWING WATER.
2. ONCE THE DISTURBED AREA IS STABILIZED, THE ROCK FILTER OUTLET SHALL BE REMOVED AND ANY DISTURBED AREAS CAUSED BY REMOVAL SHALL BE RETURNED TO ORIGINAL CONDITION AND REVEGETATED.
3. SEDIMENT MUST BE REMOVED FROM THE ROCK FILTER OUTLET WHEN ACCUMULATIONS REACH 1/3 THE HEIGHT OF THE OUTLET.
4. INSTALL NSA-R3 ROCK AT THE OUTLET SIDE OF THE SEDIMENT BARRIER AS SHOWN IN THE DETAIL. AFTER INSTALLING NSA-R3 ROCK, INSTALL AASHTO #57 ROCK AT THE INLET SIDE OF THE SEDIMENT BARRIER TO CREATE AN ADEQUATE FILTER STONE FACE FOR THE OUTLET STRUCTURE.

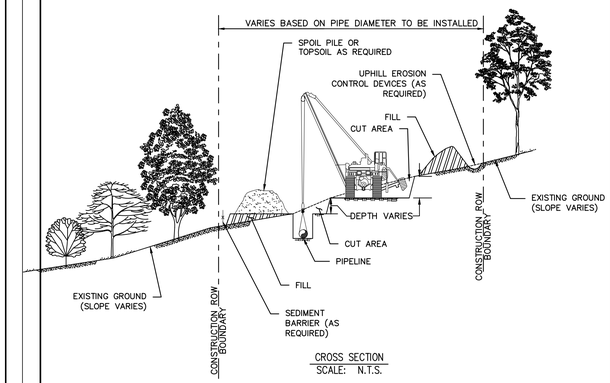
PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

RFO — ROCK FILTER OUTLET

Williams.



CROSS SECTION
SCALE: N.T.S.

NOTES:

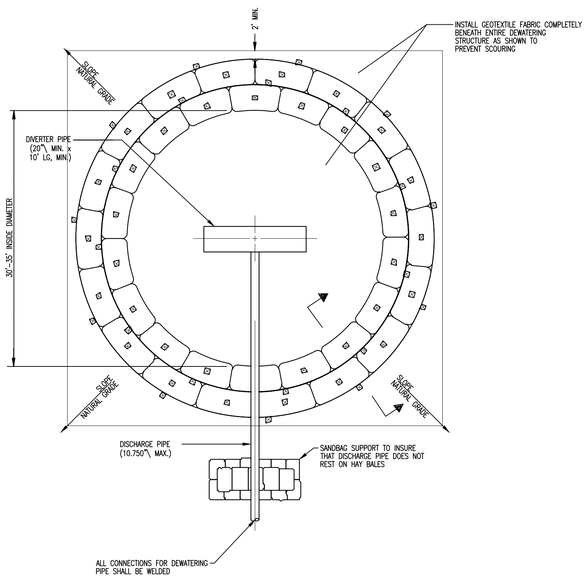
1. TWO-TONE THE RIGHT-OF-WAY TO LIMIT THE NEED FOR DEEP CUTS AND ADDITIONAL RIGHT-OF-WAY ON STEEP SLOPES. THE MINIMUM WORKSPACE WIDTH ALONG STEEP SIDE SLOPES WILL VARY DEPENDING ON THE DIAMETER OF PIPE TO BE INSTALLED. ADDITIONAL TEMPORARY WORKSPACE MAY BE REQUIRED FOR WORKER SAFETY DEPENDING ON THE SEVERITY OF THE GRADE.
2. EMPLOY EROSION CONTROL MEASURES SUCH AS WATERBARS, CROSS DITCHES, TEMPORARY DRAINAGE PIPES, TEMPORARY SWALES, TEMPORARY OUTLET PROTECTION, ETC. AS REQUIRED TO PREVENT EROSION AND SEDIMENTATION OUTSIDE OF THE CONSTRUCTION RIGHT-OF-WAY. CLEAR AND STAKE ATWS TO ALLOW FOR EXTRA SPOIL.
3. ENSURE SIDE BOOM TRACTORS ARE EQUIPPED WITH BOOM EXTENDERS AND COUNTERWEIGHTS IF REQUIRED.
4. USE BACKHOE TO ASSIST BULLDOZERS WITH REPLACING CUTS.
5. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL MEASURES AS REQUIRED.
6. REVEGETATE / SEED DISTURBED AREAS AS NOTED IN THE CONSTRUCTION DOCUMENTS OR AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR.

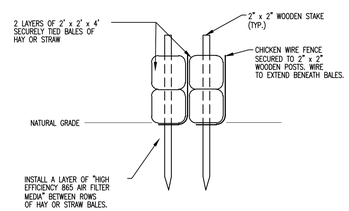
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

TTS — SIDE SLOPE (TWO-TONE) CONSTRUCTION PROCEDURE

Williams.





SECTION

NOTE:

STAKES SECURING "HIGH EFFICIENCY 865 AIR FILTER MEDIA" AND CHICKEN WIRE FENCE ARE NOT SHOWN FOR CLARITY PURPOSES.

NOTES:

1. STRUCTURE SHALL BE PLACED ON A LEVEL WELL VEGETATED SITE SUCH THAT WATER WILL FLOW AWAY FROM STRUCTURE AND ANY WORK AREAS.
2. FLOW RATES THROUGH DISCHARGE AND DIVERTER PIPES SHALL BE SUCH THAT STRUCTURE WILL NOT OVERFLOW.
3. WHERE CONDITIONS WARRANT A 30' x 30' RECTANGULAR STRUCTURE MAY BE SUBSTITUTED FOR THE CIRCULAR CONFIGURATION SHOWN.
4. DIMENSIONS SHOWN ARE THE MINIMUM ACCEPTABLE VALUES AND MAY BE VARIED DEPENDING UPON SPECIFIC LOCATION.
5. CONTRACTOR SHALL PROPERLY REMOVE AND DISPOSE OF DEWATERING STRUCTURE IMMEDIATELY UPON COMPLETION OF DEWATERING OPERATIONS. UNDER NO CIRCUMSTANCES SHALL USED DEWATERING STRUCTURES BE LEFT IN PLACE FOR A PERIOD OF TIME GREATER THAN 48 HOURS AFTER DEWATERING OPERATIONS ARE COMPLETE.
6. "HIGH EFFICIENCY 865 AIR FILTER MEDIA" CAN BE PURCHASED FROM THE FOLLOWING:
   UNITED AIR FILTER COMPANY
   1000 WEST PALMER STREET
   CHARLOTTE, NORTH CAROLINA 28234
   (704) 334-5311

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

DS.2 — HYDROSTATIC DEWATERING STRUCTURE

Williams.

WHM consulting, INC. — designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

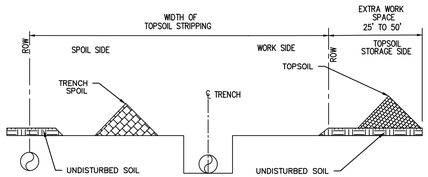
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

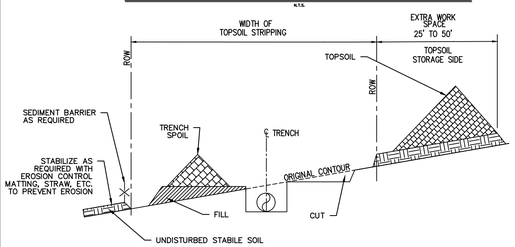
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 32 OF 39
WO: 121227	RID:		



FULL RIGHT-OF-WAY TOPSOIL STRIPPING ADJACENT EXISTING PIPELINE
N.T.S.



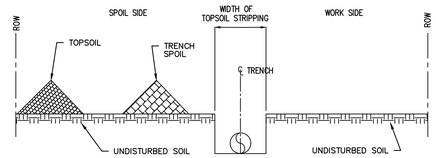
FULL RIGHT-OF-WAY TOPSOIL STRIPPING-SIDE SLOPES
N.T.S.

NOTES:

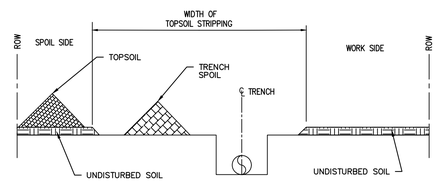
1. ALLOW FOR A SEPARATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT-OF-WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS SHOWN ON PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TS.1 TOPSOIL SEGREGATION (1)



DITCH LINE TOPSOIL STRIPPING
N.T.S.
ALSO USED IN NON-SATURATED WETLANDS



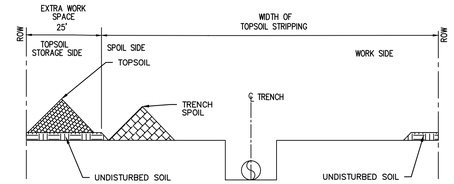
DITCH PLUS SPOIL SIDE SEGREGATION
N.T.S.

NOTES:

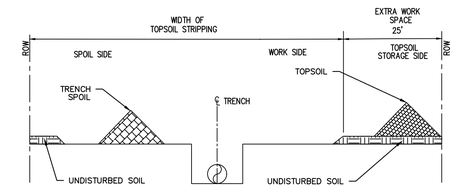
1. ALLOW FOR A SEPARATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED.
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT-OF-WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS SHOWN ON PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TS.2 TOPSOIL SEGREGATION (2)



FULL RIGHT-OF-WAY TOPSOIL STRIPPING - A
N.T.S.



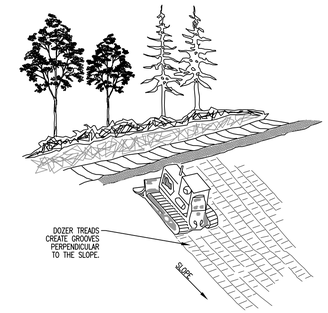
FULL RIGHT-OF-WAY TOPSOIL STRIPPING - B
N.T.S.

NOTES:

1. ALLOW FOR A SEPARATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED.
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT-OF-WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS SHOWN ON PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TS.3 TOPSOIL SEGREGATION (3)



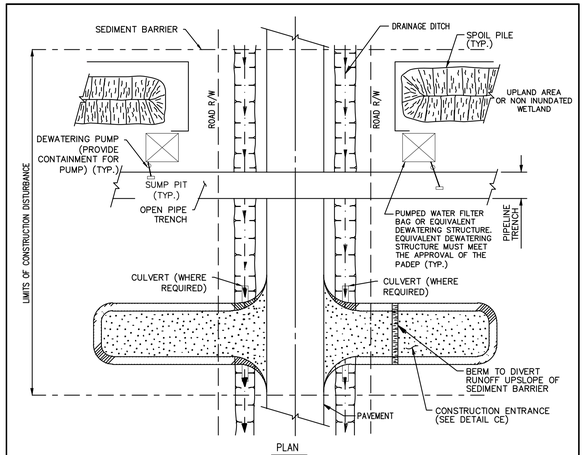
NOTES:

1. SURFACE ROUGHENING SHOULD BE APPLIED TO ALL SLOPES STEEPER THAN 3:1 UNLESS A STABLE ROCK FACE IS PROVIDED.
2. TRACKING SLOPES IS DONE BY RUNNING TRACKED MACHINERY UP AND DOWN THE SLOPE, LEAVING TREAD MARKS PARALLEL TO THE CONTOUR. CARE SHOULD BE EXERCISED ON SOILS HAVING A HIGH CLAY CONTENT TO AVOID OVER-COMPACTION.
3. IF A BULLDOZER IS USED, THE BLADE SHOULD BE UP.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
SR SURFACE ROUGHENING
TEMPORARY EROSION CONTROL MEASURE



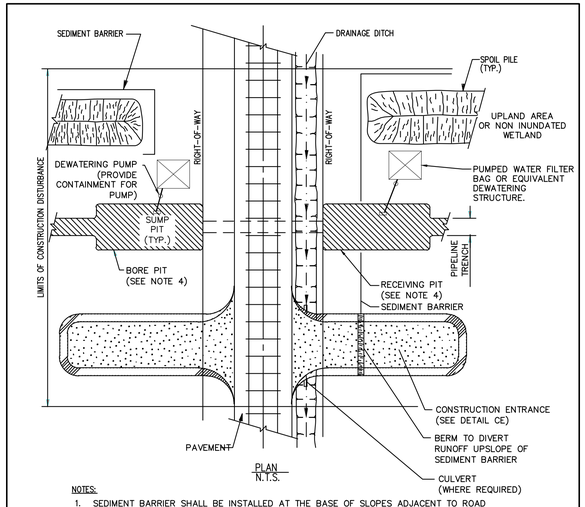
PLAN
N.T.S.

NOTES:

1. SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO ROAD CROSSINGS WHERE VEGETATION IS DISTURBED, TO INTERCEPT SURFACE RUNOFF. TEMPORARILY RELOCATE SEDIMENT BARRIERS WITHIN LIMITS OF TRENCH OPENING AS NEEDED TO INSTALL PIPE. IMMEDIATELY REPLACE BARRIERS AFTER BACKFILLING TRENCH.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL REMAIN IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. CULVERTS TO BE SIZED AND PLACED WHERE REQUIRED TO MAINTAIN WATER FLOW.
5. CONTRACTOR SHALL BE REQUIRED TO KEEP THE ROAD CLEAN OF DEBRIS AT ALL TIMES.
6. CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE PIPE TRENCH.
7. CONTRACTOR MAY ELECT TO UTILIZE WELL-POINTS IN ORDER TO REDUCE THE WATER TABLE PRIOR TO COMMENCING EXCAVATION.
8. DEPENDING ON TOPOGRAPHY AND STATE REQUIREMENTS, SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT-OF-WAY AT THE EDGE OF ROAD. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.
9. CONSTRUCTION ENTRANCE NEEDED AS SHOWN ON SPECIFIC PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TRC TRENCHED ROAD CROSSING



PLAN
N.T.S.

NOTES:

1. SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO ROAD CROSSINGS WHERE VEGETATION IS DISTURBED, TO INTERCEPT SURFACE RUNOFF.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL REMAIN IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. WATER REMOVED FROM BORE PIT AND RECEIVING PIT SHALL BE FILTERED THROUGH A DEWATERING STRUCTURE OR FILTER BAG.
5. IF WELL POINTING IS REQUIRED PRIOR TO EXCAVATING BORE PITS, CONTRACTOR SHALL CONSULT WITH COMPANY'S ENVIRONMENTAL INSPECTOR PRIOR TO COMMENCEMENT OF WORK IN ORDER TO DETERMINE PROPER DEWATERING LOCATION.
6. CONTRACTOR SHALL BE REQUIRED TO KEEP THE CROSSING CLEAN OF DEBRIS AT ALL TIMES.
7. CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE BORE PITS.
8. DEPENDING ON TOPOGRAPHY AND STATE REQUIREMENTS, SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY AT THE EDGE OF ROAD. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BRC BORED ROAD CROSSING

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
041231-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

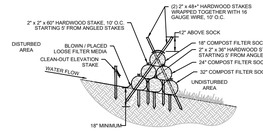
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

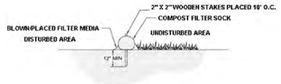
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

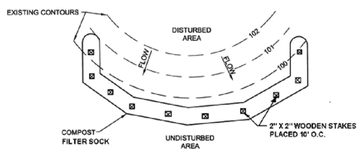
DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 33
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



TRIPLE STACK SOCK TRAP SECTION
N.T.S.



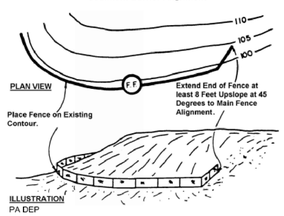
SECTION VIEW
NTS



PLAN VIEW

NOT TO SCALE

FIGURE 4.1
Sediment Barrier Alignment



NOT TO SCALE

NOTES:

1. ALL MATERIAL TO MEET MANUFACTURER SPECIFICATIONS.
2. COMPOST FILTER SOCK FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY CONSTRUCTION CONTRACTOR.
4. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.
5. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
6. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
7. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION WITH ADDITIONAL SOCK OR ROCK FILTER.
8. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
9. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

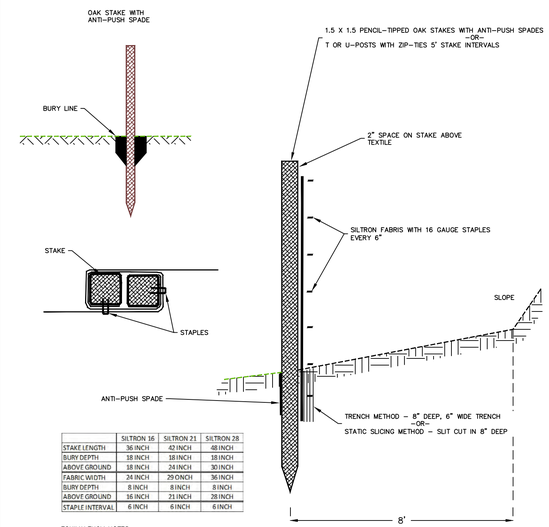
ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.5
MOISTURE CONTENT	30% – 60%
PARTICLE SIZE	30% – 50% PASS THROUGH 3/8" SIEVE
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

MATERIAL TYPE	3 mil HDPE	5 mil HDPE	5 mil HDPE	MULTI-FILAMENT POLYPROPYLENE (MFPP)	HEAVY-DUTY MULTI-FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE	BIO-DEGRADABLE	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 psi	26 psi	44 psi	202 psi
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS
TWO-PLY SYSTEMS					
INNER CONTAINMENT NETTING			HDPE BIAXIAL NET		
			CONTINUOUSLY WOUND		
			FUSION-WELDED JUNCTURES		
			3/4" x 3/4" MAX. APERTURE SIZE		
OUTER FILTRATION MESH			COMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON-WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH)		
			3/16" MAX. APERTURE SIZE		
SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.					

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

CFS COMPOST FILTER SOCK



	SILTRON 16	SILTRON 21	SILTRON 28
STAKE LENGTH	36 INCH	42 INCH	48 INCH
BURY DEPTH	18 INCH	18 INCH	18 INCH
ABOVE GROUND	18 INCH	24 INCH	30 INCH
FABRIC WIDTH	24 INCH	29 ONCH	36 INCH
BURY DEPTH	8 INCH	8 INCH	8 INCH
ABOVE GROUND	16 INCH	21 INCH	28 INCH
STAPLE INTERVAL	6 INCH	6 INCH	6 INCH

EQUIVALENCY NOTES:
THE 16" FILTER FENCE WILL USE SLOPE LENGTHS EQUIVALENT TO AND 18" COMPOST FILTER SOCK; THE 21" FILTER FENCE WILL USE SLOPE LENGTHS EQUIVALENT TO A 24" COMPOST FILTER SOCK; THE 28" FILTER FENCE WILL USE SLOPE LENGTHS EQUIVALENT TO A 32" COMPOST FILTER SOCK.

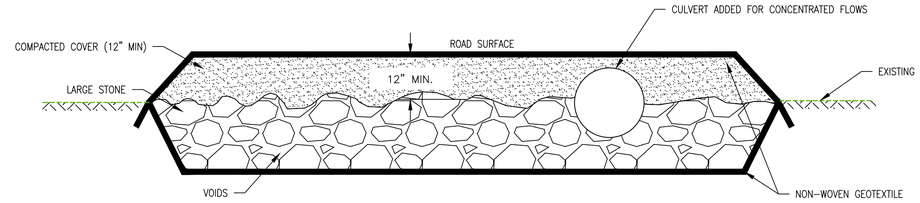
NOTES:
MAINTENANCE:
SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH HALF THE ABOVE GROUND HEIGHT OF THE FENCE.
ANY SECTION OF FENCE WHICH HAS BEEN COMPROMISED THROUGH PHYSICAL DAMAGE OR IS BLINDED WITH SEDIMENT OR HYDROCARBONS SHALL BE IMMEDIATELY REPLACED WITH EITHER A ROCK FILTER OUTLET CONFIGURATION, OR FILTER SOCK (COMPOST OR SWITCHGRASS).
IF UNDERCUTTING OCCURS, FILL MUST BE ADDED TO TRENCH AND AREA RE-COMPACTED.

REMOVAL:
FENCE SHALL BE REMOVED AND PROPERLY DISPOSED OF WHEN TRIBUTARY AREA IS PERMANENTLY STABILIZED.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

SPF SILTRON POLLUTION PREVENTION FENCE
TEMPORARY EROSION CONTROL MEASURE



CONSTRUCTION SEQUENCE:

1. EXCAVATE THE MATTRESS TO DESIRED DEPTH & SLOPE, ALLOWING FOR A MINIMUM OF 12 INCHES OF COMPACTED COVER OVER THE MATTRESS. PLACE THE GEOTEXTILE FABRIC IN THE TRENCH. ALLOW ENOUGH FABRIC ON THE ENDS TO OVERLAP THE TOP PIECE OF GEOTEXTILE IN THE FINISHED MATTRESS.
2. PLACE POROUS AASHTO 1 STONE ON TOP OF THE FABRIC AND SPREAD INTO A UNIFORM BED OF THE DESIRED DEPTH.
3. PLACE A PIECE OF FABRIC OVERTOP OF THE INSTALLED STONE. BE SURE TO OVERLAP ALL FABRIC JOINTS BY AT LEAST 12 INCHES. LEAVE THE STONE EXPOSED ALONG ANY ROAD EDGES.
4. SHAPE AND COMPACT FILL OVERTOP OF THE FINISHED MATTRESS. ESTABLISH THE DESIRED ROAD SURFACE SHAPE IN THE FILL. PLACE ENOUGH FILL TO ENSURE A MINIMUM OF 12" COMPACTED COVER ONCE THE FILL AND SURFACE AGGREGATE ARE INSTALLED.

IMPORTANT CONSIDERATIONS:

1. MATTRESSES ARE NOT SUITABLE REPLACEMENTS FOR ROAD DRAINAGE PIPES, OR ANYWHERE CONCENTRATED OVERLAND FLOW CARRIES SEDIMENT. THESE FLOWS WILL CLOG THE MATTRESS OVER TIME AND ARE TO BE HANDLED BY DRAINAGE PIPES.
2. MATTRESS SIZE IS FLEXIBLE. SMALLER MATTRESS ALLOWS ROADSIDE SPRINGS TO BLEED THROUGH THE ROAD BASE WHILE MAINTAINING ROAD STABILITY. THE LARGER MATTRESS CREATED A STABLE FOUNDATION FOR THE ROAD THROUGH AN AREA OF SOFT WET SOILS.
3. A FRENCH MATTRESS SHOULD BE COVERED BY A MINIMUM IF 12" OF COMPACTED FILL MATERIAL.
4. IN MOST SITUATIONS, THE MATTRESS SHOULD BE LEVEL END TO END (WITH ROAD ALIGNMENT).
5. A FRENCH MATTRESS SHOULD PROVIDE UNRESTRICTED FLOW THROUGH THE ROAD. IN WETLAND SITUATIONS, THE SIDE SLOPE MAY BE FLAT OR MINIMAL. IN SLOPED AREAS, A 1–2 PERCENT FALL FROM INLET TO OUTLET WILL AID IN DRAINAGE.
6. THE MATTRESS MUST BE FREE DRAINING AT THE OUTLET TO AVOID PONDING WATER BENEATH THE ROAD.

MATERIALS REQUIRED FOR CONSTRUCTION:

1. GEOTEXTILE FABRIC (CLASS 1 NON-WOVEN). SEPARATION FABRIC AROUND THE MATTRESS ALLOWS WATER TO PASS THROUGH WHILE BLOCKING FINE SILT AND CLAY, WHICH WOULD EVENTUALLY CLOG THE STRUCTURE.
2. CLEAN STONE. IT IS IMPORTANT TO USE CLEAN STONE. CLEAN STONE IS RELATIVELY UNIFORM IN SIZE WITH NO FINE MATERIAL. TYPICALLY 3 TO 4 INCH DIAMETER STONE IS USED. SMALLER STONE SHOULD BE AVOIDED AS IT REQUIRES LATERAL CONFINEMENT TO STABILIZE. ADDITIONALLY, LARGER STONE WILL INCREASE THE BRIDGING POTENTIAL AND THE FLOW CAPACITY OF THE MATTRESS.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

FRENCH MATTRESS

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

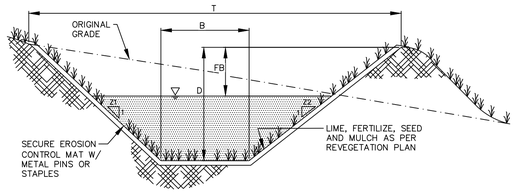
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

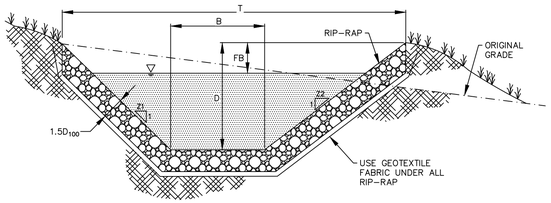
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 34 OF 39
WO: 121227	RID:		



GRASS LINED CHANNEL
NO SCALE



ROCK LINED CHANNEL
NO SCALE

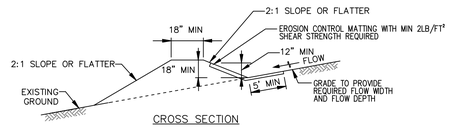
GENERAL NOTES:

AT THE DIRECTION OF THE OWNER OR THEIR DESIGNATED REPRESENTATIVE, A MOUNTABLE EARTHEN BERM AS SHOWN BELOW MAY BE UTILIZED IN PLACE OF A DIVERSION CHANNEL.

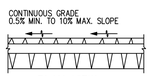
HENSEL REPLACEMENT CHANNEL SCHEDULE

Channel ID	LENGTH [FT]	SLOPE [%]	BASE WIDTH [FT]	DEPTH [FT]	SIDE SLOPES [Z1/Z2]	TOP WIDTH [FT]	LINING	OUTLET
HR1-1	21	3.5	4	2.25	3/1	17.50	R-6 Riprap	HR1-C1
HR1-2	18	4.0	4	2.25	3/1	17.50	R-6 Riprap	HR1-C1
HR2	134	6.2	2	0.75	2/1	5	ECB	HR2-C2
HR3-1	302	2.3	2	1	2/1	6	ECB	HR3-C3
HR3-2	300	1.0	2	1.25	2/1	7	ECB	HR3-C3
HR4	65	1.6	2	1.25	2/1	7	ECB	HR4-C4
HR5-1	108	2.3	2	1.25	2/1	7	ECB	HR5-C5
HR5-2	94	1.5	2	1.25	2/1	7	ECB	HR5-C5
HR6	368	4.1	2	1	2/1	6	ECB	HR6-C6
HR7	364	2.2	2	1	2/1	6	ECB	HR7-C7
HR8	186	12.0	2	0.75	2/1	5	ECB	HR8-C8
HR9	181	12.0	2	0.75	2/1	5	ECB	HR9-C9
HR10	548	8.9	6	1.25	2/1	11	R-6 Riprap	HR10-C10
HR11	201	14.4	2.5	0.75	2/1	5.5	ECB	HR11-C11
HR12	138	8.8	2	0.75	2/1	5	ECB	HR12-C12
HR13	759	2.6	2	1.25	2/1	7	ECB	HR13-C13
HR14	682	2.5	2	1.25	2/1	7	ECB	HR14-C14
HR15	787	4.9	2	1	2/1	6	ECB	HR15-C15
HR16-1	456	1.6	2	1.25	2/1	7	ECB	HR16-C16
HR16-2	13	9.2	2	1	2/1	6	ECB	HR16-C16
HR17	231	7.3	5	1	2/1	9	ECB	HR17-C17
HR18-1	260	4.9	2	1	2/1	6	ECB	HR18-C18
HR18-2	160	5.0	2	1	2/1	6	ECB	HR18-C18
HR19	193	8.3	2	0.75	2/1	5	ECB	HR19-C19
HR20	240	7.1	2	0.75	2/1	5	ECB	HR20-C20
HR21-1	762	1.0	2	0.75	2/1	5	ECB	HR21-C21
HR21-2	67	7.5	2	0.75	2/1	5	ECB	HR21-C21
HR22	528	1.3	2	1.25	2/1	7	ECB	HR22-C22
HR23	254	3.4	2	1	2/1	6	ECB	HR23-C23
HR24	189	1.1	2	1	2/1	6	ECB	HR24-C24
HR25	229	9.7	2	1	2/1	6	ECB	HR25-C25
HR26	370	3.4	2	0.75	2/1	5	ECB	HR26-C26
HR27	179	2.5	2	0.75	2/1	5	ECB	HR27-C27

TYPICAL MOUNTABLE EARTHEN BERM
NO SCALE



CROSS SECTION



PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. REMOVE AND DISPOSE OF ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SO AS NOT TO INTERFERE WITH PROPER FUNCTION OF EARTHDIKE.
2. EXCAVATE OR SHAPE EARTH DIKE TO LINE, GRADE, AND CROSS SECTION AS SPECIFIED. BANK PROJECTIONS OR OTHER IRREGULARITIES ARE NOT ALLOWED.
3. COMPACT FILL.
4. CONSTRUCT FLOW CHANNEL ON AN UNINTERRUPTED, CONTINUOUS GRADE, ADJUSTING THE LOCATION DUE TO FIELD CONDITIONS AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE.
5. PROVIDE OUTLET PROTECTION AS REQUIRED ON APPROVED PLAN.
6. STABILIZE EARTH DIKE WITHIN THREE DAYS OF INSTALLATION. STABILIZE FLOW CHANNEL FOR CLEAR WATER DIVERSION WITHIN 24 HOURS OF INSTALLATION.
7. MAINTAIN LINE, GRADE, AND CROSS SECTION. REMOVE ACCUMULATED SEDIMENT AND DEBRIS, AND MAINTAIN POSITIVE DRAINAGE. KEEP EARTH DIKE AND POINT OF DISCHARGE FREE OF EROSION, AND CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
8. UPON REMOVAL OF EARTH DIKE, GRADE AREA FLUSH WITH EXISTING GROUND. WITHIN 24 HOURS OF REMOVAL STABILIZE DISTURBED AREA WITH TOPSOIL, SEED, AND MULCH, OR AS SPECIFIED ON APPROVED PLAN.

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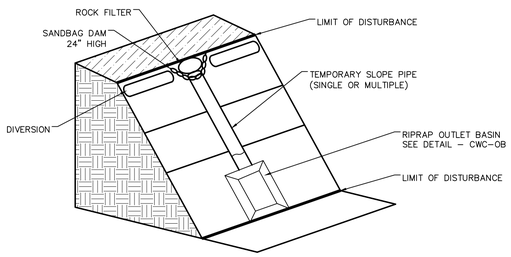
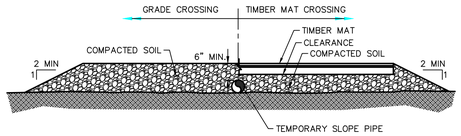
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
DC — TYPICAL DIVERSION CHANNEL (ROCK-LINED/GRASS-LINED)
Williams





TEMPORARY SLOPE PIPE CROSSING
NO SCALE

NOTES:

CLEARWATER CROSSING TO BE INSPECTED WEEKLY OR AFTER MEASURABLE RAINFALL EVENT AND SHALL BE MAINTAINED IN GOOD CONDITION AT ALL TIMES.

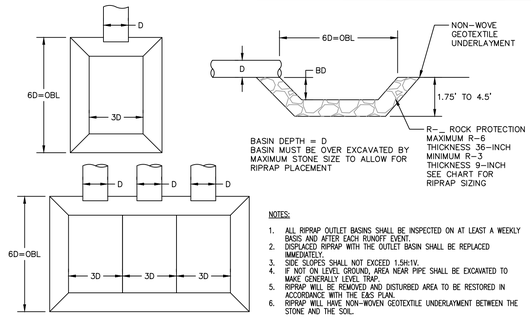
Hensel Replacement - CWC's Schedule

I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Slope [ft/ft]	No. of Pipes	Pipe Diameter [in]
HR1-C1	112.42	118.7	86.00	0.105	4	18
HR2-C2	0.24	0.2	138.0	0.085	1	12
HR3-C3	14.72	7.7	91.00	0.066	1	18
HR4-C4	7.42	4.1	86.0	0.047	1	12
HR5-C5	28.97	9.8	89.0	0.096	1	18
HR6-C6	7.55	2.4	88.0	0.125	1	12
HR7-C7	2.79	1.3	139.0	0.266	1	12
HR8-C8	0.45	0.2	139.0	0.130	1	12
HR9-C9	0.56	0.3	123.0	0.390	1	12
HR10-C10	8.12	13.0	93.0	0.247	1	18
HR11-C11	1.63	3.1	92.0	0.641	1	12
HR12-C12	0.92	0.54	74.0	0.197	1	12
HR13-C13	9.90	4.49	90.0	0.378	1	12
HR14-C14	14.02	6.60	100.0	0.374	1	12
HR15-C15	14.31	5.43	100.0	0.150	1	12
HR16-C16	25.89	14.94	100	0.170	1	12
HR17-C17	19.18	11.10	100	0.135	1	18
HR18-C18	14.09	10.36	85	0.148	1	18
HR19-C19	2.99	1.07	85	0.330	1	12
HR20-C20	0.97	0.5	85	0.160	1	12
HR21-C21	14.89	18.3	74	0.160	1	12
HR22-C22	3.56	4.6	135	0.045	1	18
HR23-C23	4.22	1.74	73	0.152	1	12
HR24-C24	1.2	0.52	72	0.155	1	12
HR25-C25	6.1	2.6	106	0.149	1	12
HR26-C26	2.38	0.93	98	0.051	1	12
HR27-C27	1.14	0.46	98	0.060	1	12

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CWC — CLEAN WATER CROSSING
Williams



NOTES:

1. ALL RIPRAP OUTLET BASINS SHALL BE INSPECTED ON AT LEAST A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT.
2. DISPLACED RIPRAP WITH THE OUTLET BASIN SHALL BE REPLACED IMMEDIATELY.
3. SIDE SLOPES SHALL NOT EXCEED 1.5H:1V.
4. IF NOT ON LEVEL GROUND, AREA NEAR PIPE SHALL BE EXCAVATED TO MAKE GENERALLY LEVEL TRAP.
5. RIPRAP WILL BE REMOVED AND DISTURBED AREA TO BE RESTORED IN ACCORDANCE WITH THE E&S PLAN.
6. RIPRAP WILL HAVE NON-WOVEN GEOTEXTILE UNDERLAYMENT BETWEEN THE STONE AND THE SOIL.

Clean Water Crossing Outlet Basin

Pipe Diameter (D)	Basin Length (6D)	Basin Inside Width (3D)	Basin Depth (BD)
12"	6'	3'	1'
18"	9'	4.5'	1.5'
24"	12'	6'	2'

PENNSYLVANIA

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CWC-OB — CLEAN WATER CROSSING (RIP RAP OUTLET BASIN)
STANDARD CONSTRUCTION DETAIL #8-6
Williams

WHM consulting, INC. — designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — DATE
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

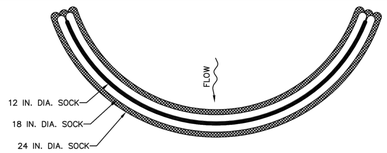
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

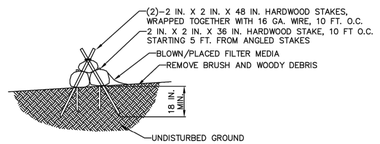
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 35 OF 39
WO: 121227	RID:		



PLAN VIEW



STAKING DETAIL

NOT TO SCALE

DESIGN NOTES:

1. COMPOST SOCK SEDIMENT TRAP SHALL BE SIZED TO PROVIDE 2000 CUBIC FEET OF STORAGE CAPACITY FOR EACH ACRE TRIBUTARY TO THE TRAP.
2. MINIMUM BASE WIDTH IS EQUAL TO THE HEIGHT.
3. SEDIMENT ACCUMULATION SHALL NOT EXCEED 1/3 THE TOTAL HEIGHT OF THE TRAP.
4. SOCKS SHALL BE OF LARGER DIAMETER AT THE BASE OF THE TRAP AND DECREASE IN DIAMETER FOR SUCCESSIVE LAYERS AS SHOWN ON THE PLAN VIEW.
5. ENDS OF THE TRAP SHALL BE A MINIMUM OF 1 FOOT HIGHER IN ELEVATION THAN THE MID–SECTION, WHICH SHALL BE LOCATED AT THE POINT OF DISCHARGE.

NOTES:

SOCK MATERIAL SHALL MEET THE STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.

COMPOST SOCK SEDIMENT TRAPS SHALL NOT EXCEED THREE SOCKS IN HEIGHT AND SHALL BE STACKED IN PYRAMIDAL FORM AS SHOWN ABOVE. MINIMUM TRAP HEIGHT IS ONE 24" DIAMETER SOCK. ADDITIONAL STORAGE MAY BE PROVIDED BY MEANS OF AN EXCAVATED SUMP 12" DEEP EXTENDING 1 TO 3 FEET UPSLOPE OF THE SOCKS ALONG THE LOWER SIDE OF THE TRAP.

COMPOST SOCK SEDIMENT TRAPS SHALL PROVIDE 2,000 CUBIC FEET STORAGE CAPACITY WITH 12" FREEBOARD FOR EACH TRIBUTARY DRAINAGE ACRE. (SEE MANUFACTURER FOR ANTICIPATED SETTLEMENT.)

THE MAXIMUM TRIBUTARY DRAINAGE AREA IS 5.0 ACRES. SINCE COMPOST SOCKS ARE "FLOW–THROUGH," NO SPILLWAY IS REQUIRED.

COMPOST SOCK SEDIMENT TRAPS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/3 THE HEIGHT OF THE SOCKS.

PHOTODEGRADABLE AND BIODEGRADABLE SOCKS SHALL NOT BE USED FOR MORE THAN 1 YEAR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

CST COMPOST SOCK SEDIMENT TRAP

Williams.

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 1	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 2	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 3	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 4	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 5	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 6	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 7	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 8	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 9	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 10	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 11	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 12	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 13	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 14	18	see map	4	384
CFS-HR 15	18	see map	4	384
CFS-HR 16	18	see map	4	384
CFS-HR 17	18	see map	4	384
CFS-HR 18	18	see map	4	384
CFS-HR 19	18	see map	4	384
CFS-HR 20	18	see map	4	384
CFS-HR 21	18	see map	4	384
CFS-HR 22	18	see map	4	384
CFS-HR 23	18	see map	4	384
CFS-HR 24	18	see map	4	384
CFS-HR 25	18	see map	4	384
CFS-HR 26	18	see map	3	459
CFS-HR 27	18	see map	3	459
CFS-HR 28	18	see map	3	459
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CFS-HR 31	18	see map	3	459
CFS-HR 32	18	see map	3	459
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CFS-HR 46	32	see map, CSA019	6	567
CFS-HR 47	32	see map, CSA019	6	567
CFS-HR 48	32	see map, CSA019	6	567
CFS-HR 49	12	see map	12	100
CFS-HR 50	12	see map	12	100
CFS-HR 51	24	see map	6	376
CFS-HR 52	24	see map	6	376
CFS-HR 53	24	see map	6	376
CFS-HR 54	24	see map	6	376
CFS-HR 55	24	see map	6	376
CFS-HR 56	12	see map	9	127
CFS-HR 57	12	see map	9	127
CFS-HR 58	12	see map	9	127
CFS-HR 59	12	see map	9	127
CFS-HR 60	12	see map	9	127
CFS-HR 61	12	see map	9	127
CFS-HR 62	12	see map	9	127
CFS-HR 63	12	see map	9	127
CFS-HR 64	18	see map	16	104
CFS-HR 65	18	see map	16	104
CFS-HR 66	18	see map	16	104
CFS-HR 67	18	see map	16	104
CFS-HR 68	18	see map	16	104
CFS-HR 69	18	see map	16	104
CFS-HR 70	18	see map	16	104
CFS-HR 71	12	see map	7	88
CFS-HR 72	18	see map	16	104
CFS-HR 73	18	see map	22	72
CFS-HR 74	18	see map	22	72
CFS-HR 75	18	see map	22	72
CFS-HR 76	18	see map	22	72
CFS-HR 77	18	see map	22	72
CFS-HR 78	12	see map	27	37
CFS-HR 79	12	see map	27	37
CFS-HR 79A	12	see map	17	30
CFS-HR 79B	18	see map	16	93
CFS-HR 79C	18	see map	16	93
CFS-HR 79D	18	see map	16	39
CFS-HR 80	18	see map	30	43
CFS-HR 81	18	see map	30	43
CFS-HR 82	12	see map	7	140
CFS-HR 83	12	see map	7	140
CFS-HR 84	12	see map	7	140
CFS-HR 85	12	see map	7	140
CFS-HR 86	12	see map	7	140
CFS-HR 87	12	see map	7	140
CFS-HR 88	12	see map	7	140
CFS-HR 89	12	see map	7	140
CFS-HR 90	12	see map	7	140
CFS-HR 91	12	see map	7	140
CFS-HR 92	12	see map	7	140
CFS-HR 93	12	see map	7	140
CFS-HR 94	12	see map	6	131
CFS-HR 95	12	see map	6	131
CFS-HR 96	12	see map	6	131
CFS-HR 97	12	see map	6	131
CFS-HR 98	12	see map	6	131
CFS-HR 99	12	see map	3	126
CFS-HR 100	12	see map	3	126
CFS-HR 101	12	see map	3	126
CFS-HR 102	12	see map	9	89
CFS-HR 103	12	see map	9	89
CFS-HR 104	12	see map	9	89
CFS-HR 105	12	see map	9	89
CFS-HR 106	12	see map	9	89
CFS-HR 107	12	see map	9	89
CFS-HR 108	12	see map	9	89
CFS-HR 109	12	see map	9	89
CFS-HR 110	12	see map	9	89
CFS-HR 111	12	see map	9	89
CFS-HR 112	12	see map	9	89
CFS-HR 113	12	see map	9	89
CFS-HR 114	12	see map	9	89
CFS-HR 115	12	see map	10	135
CFS-HR 116	12	see map	10	135
CFS-HR 117	12	see map	10	135
CFS-HR 118	12	see map	3	126
CFS-HR 119	12	see map	3	126
CFS-HR 120	12	see map	3	126
CFS-HR 121	12	see map	9	89
CFS-HR 122	12	see map	9	89
CFS-HR 123	12	see map	9	89
CFS-HR 124	12	see map	9	89
CFS-HR 125	12	see map	9	89
CFS-HR 126	12	see map	9	89
CFS-HR 127	12	see map	9	89
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CFS-HR 130	12	see map	9	89
CFS-HR 131	12	see map	9	89
CFS-HR 132	12	see map	12	121
CFS-HR 133	12	see map	12	121
CFS-HR 134	12	see map	12	121
CFS-HR 135	12	see map	12	121
CFS-HR 136	12	see map	12	121
CFS-HR 137	12	see map	12	121
CFS-HR 138	12	see map	12	121
CFS-HR 139	12	see map	12	121
CFS-HR 140	12	see map	12	121
CFS-HR 141	12	see map	12	121
CFS-HR 142	12	see map	11	85
CFS-HR 143	12	see map	11	85
CFS-HR 144	12	see map	11	85
CFS-HR 145	12	see map	11	85
CFS-HR 145A	24	see map	24	143
CFS-HR 145B	24	see map	24	143
CFS-HR 145C	24	see map	24	143
CFS-HR 145D	12	see map	20	41
CFS-HR 145E	12	see map	20	41
CFS-HR 146	12	see map	11	85
CFS-HR 147	12	see map	11	85
CFS-HR 148	12	see map	11	85
CFS-HR 149	24	see map	24	143
CFS-HR 150	24	see map	24	143
CFS-HR 145	12	see map	11	85
CFS-HR 145A	24	see map	24	143
CFS-HR 145B	24	see map	24	143
CFS-HR 145C	24	see map	24	143
CFS-HR 145D	12	see map	20	41
CFS-HR 145E	12	see map	20	41
CFS-HR 146	12	see map	11	85
CFS-HR 147	12	see map	11	85
CFS-HR 148	12	see map	11	85
CFS-HR 149	24	see map	24	143
CFS-HR 150	24	see map	24	143
CFS-HR 151	24	see map	24	143
CFS-HR 152	24	see map	24	143
CFS-HR 153	24	see map	24	143
CFS-HR 154	24	see map	24	143
CFS-HR 155	24	see map	24	143
CFS-HR 156	24	see map	24	143
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CFS-HR 158	24	see map	24	143
CFS-HR 159	18	see map	20	137
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CFS-HR 161	18	see map	20	137
CFS-HR 162	18	see map	20	137
CFS-HR 163	24	see map	37	65
CFS-HR 164	24	see map	37	65
CFS-HR 165	24	see map	37	65
CFS-HR 166	24	see map	37	65
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CFS-HR 178	24	see map	37	65
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CFS-HR 200	24	see map	37	65
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CFS-HR 202	24	see map	37	65
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CFS-HR 204	24	see map	37	65
CFS-HR 205	24	see map	37	65
CFS-HR 206	24	see map	37	65
CFS-HR 206A	24	see map	37	73
CFS-HR 206B	24	see map	37	73
CFS-HR 206C	24	see map	37	73
CFS-HR 206D	24	see map	37	73
CFS-HR 207	12	see map	34	35
CFS-HR 208	12	see map	34	35
CFS-HR 209	12	see map	34	35
CFS-HR 210	12	see map	34	35
CFS-HR 211	12	see map	34	35
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CFS-HR 213	12	see map	34	35
CFS-HR 214	24	see map	36	84
CFS-HR 215	24	see map	36	84
CFS-HR 216	24	see map	36	84
CFS-HR 217	24	see map	36	84
CFS-HR 218	24	see map	44	66
CFS-HR 219	24	see map	44	66
CFS-HR 220	24	see map	44	66
CFS-HR 221	24	see map	44	66
CFS-HR 222	24	see map	44	66
CFS-HR 223	24	see map	33	90
CFS-HR 224	24	see map	33	90
CFS-HR 224A	24	see map	22	88
CFS-HR 224B	24	see map	22	88
CFS-HR 225	24	see map	33	90
CFS-HR 226	24	see map	33	90
CFS-HR 227	24	see map	33	90
CFS-HR 228	24	see map	33	90
CFS-HR 229	24	see map	33	90
CFS-HR 230	24	see map	33	90
CFS-HR 231	24	see map	33	90
CFS-HR 232	24	see map	33	90
CFS-HR 233	18	see map	20	118
CFS-HR 234	18	see map	20	118
CFS-HR 235	18	see map	20	118
CFS-HR 236	18	see map	20	118
CFS-HR 237	18	see map	20	118
CFS-HR 238	18	see map	18	111
CFS-HR 239	18	see map	18	111
CFS-HR 240	18	see map	18	111
CFS-HR 241	18	see map	18	111
CFS-HR 242	18	see map	18	111
CFS-HR 243	18	see map	18	111
CFS-HR 244	18	see map	18	111
CFS-HR 245	18	see map	18	111
CFS-HR 246	18	see map	18	111
CFS-HR 247	18	see map	18	111
CFS-HR 248	18	see map	18	111
CFS-HR 249	18	see map	18	111
CFS-HR 250	18	see map	18	111
CFS-HR 251	32	see map, CSA020	18	120
CFS-HR 252	32	see map, CSA020	18	120
CFS-HR 253	18	see map	18	111
CFS-HR 254	18	see map	18	111
CFS-HR 255	18	see map	18	111
CFS-HR 256	18	see map	18	111
CFS-HR 257	18	see map	18	111
CFS-HR 257A	12	see map	30	30
CFS-HR 257B	12	see map	30	30
CFS-HR 257C	24	see map	wetland protection	
CFS-HR 257D	24	see map	wetland protection	
CFS-HR 257E	24	see map	wetland protection	
CFS-HR 258	24	see map	41	64
CFS-HR 259	24	see map	41	64
CFS-HR 260	24	see map	41	64
CFS-HR 261	24	see map	41	64
CFS-HR 262	24	see map	41	64
CFS-HR 263	24	see map	41	64
CFS-HR 264	24	see map	41	64
CFS-HR 265	24	see map	41	64
CFS-HR 266	24	see map	41	64
CFS-HR 267	24	see map	41	64
CFS-HR 268	18	see map	36	50
CFS-HR 269	18	see map	36	50
CFS-HR 270	18	see map	36	50
CFS-HR 271	18	see map	36	50
CFS-HR 272	18	see map	36	50
CFS-HR 273	18	see map	36	50
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CFS-HR 275	18	see map	36	50
CFS-HR 276	18	see map	36	50
CFS-HR 277	18	see map	36	50
CFS-HR 278	18	see map	33	72
CFS-HR 279	18	see map	33	72
CFS-HR 280	18	see map	33	72
CFS-HR 281	18	see map	33	72
CFS-HR 282	18	see map	33	72
CFS-HR 283	18	see map	33	72
CFS-HR 284	18	see map	33	72
CFS-HR 285	18	see map	33	72
CFS-HR 286	18	see map	33	72
CFS-HR 287	18	see map	33	72
CFS-HR 288	18	see map	33	72
CFS-HR 289	18	see map	33	72
CFS-HR 290	18	see map	33	72
CFS-HR 291	18	see map	33	72
CFS-HR 292	18	see map	33	72
CFS-HR 293	18	see map	33	72
CFS-HR 294	18	see map	33	72
CFS-HR 295	18	see map	33	72
CFS-HR 296	18	see map	33	72
CFS-HR 297	18	see map	33	72
CFS-HR 298	18	see map	33	72
CFS-HR 299	18	see map	33	72
CFS-HR 300	24	see map	33	86
CFS-HR 301	18	see map	41	58
CFS-HR 302	18	see map	41	58
CFS-HR 303	18	see map	41	58
CFS-HR 304	18	see map	41	58
CFS-HR 305	18	see map	41	58
CFS-HR 306	12	see map	11	79
CFS-HR 307	12	see map	11	79
CFS-HR 308	12	see map	11	79
CFS-HR 309	12	see map	11	79
CFS-HR 310	12	see map	11	79
CFS-HR 311	12	see map	11	79
CFS-HR 312	12	see map	11	79
CFS-HR 313	12	see map	11	79
CFS-HR 314	12	see map	11	79
CFS-HR 315	12	see map	11	79
CFS-HR 316	12	see map	11	79

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

WHM designs, permits, resolutions consulting, INC.

BA GROUP

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 36 OF 39

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 317	18	see map	35	60
CFS-HR 318	18	see map	35	60
CFS-HR 319	18	see map	35	60
CFS-HR 320	18	see map	35	60
CFS-HR 321	18	see map	35	60
CFS-HR 322	18	see map	35	60
CFS-HR 323	18	see map	35	60
CFS-HR 324	18	see map	35	60
CFS-HR 325	18	see map	35	60
CFS-HR 326	24	see map	29	90
CFS-HR 327	24	see map	29	90
CFS-HR 328	24	see map	29	90
CFS-HR 329	24	see map	29	90
CFS-HR 330	24	see map	29	90
CFS-HR 331	24	see map	29	90
CFS-HR 332	24	see map	29	90
CFS-HR 333	24	see map	29	90
CFS-HR 334	24	see map	29	90
CFS-HR 335	24	see map	29	90
CFS-HR 336	24	see map	29	90
CFS-HR 337	24	see map	29	90
CFS-HR 338	24	see map	29	90
CFS-HR 339	24	see map	29	90
CFS-HR 340	24	see map	29	90
CFS-HR 341	24	see map	29	90
CFS-HR 342	24	see map	29	90
CFS-HR 343	24	see map	29	90
CFS-HR 344	24	see map	29	90
CFS-HR 345	24	see map	29	90
CFS-HR 346	24	see map	29	90
CFS-HR 347	24	see map	29	90
CFS-HR 348	24	see map	29	90
CFS-HR 349	24	see map	29	90
CFS-HR 350	24	see map	29	90
CFS-HR 351	24	see map	29	90
CFS-HR 352	24	see map	29	90
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CFS-HR 354	24	see map	29	90
CFS-HR 355	24	see map	29	90
CFS-HR 356	24	see map	29	90
CFS-HR 357	24	see map	29	90
CFS-HR 358	24	see map	29	90
CFS-HR 359	24	see map	29	90
CFS-HR 360	24	see map	29	90
CFS-HR 361	24	see map	29	90
CFS-HR 362	24	see map	29	90
CFS-HR 363	24	see map	29	90
CFS-HR 364	24	see map	29	90
CFS-HR 365	24	see map	29	90
CFS-HR 366	24	see map	29	90
CFS-HR 367	24	see map	29	90
CFS-HR 368	24	see map	29	90
CFS-HR 369	24	see map	29	90
CFS-HR 370	24	see map	29	90
CFS-HR 371	24	see map	29	90
CFS-HR 372	24	see map	29	90
CFS-HR 373	24	see map	29	90
CFS-HR 374	24	see map	29	90
CFS-HR 375	24	see map	29	90
CFS-HR 376	24	see map	29	90
CFS-HR 377	24	see map	29	90
CFS-HR 378	24	see map	29	90
CFS-HR 379	24	see map	29	90
CFS-HR 380	24	see map	29	90
CFS-HR 381	24	see map	29	90
CFS-HR 382	24	see map	29	90
CFS-HR 383	24	see map	29	90
CFS-HR 384	24	see map	29	90
CFS-HR 385	24	see map	29	90
CFS-HR 386	24	see map	29	90
CFS-HR 387	24	see map	29	90
CFS-HR 388	24	see map	29	90
CFS-HR 389	24	see map	29	90
CFS-HR 390	24	see map	29	90
CFS-HR 391	32	see map	34	99
CFS-HR 392	32	see map	34	99
CFS-HR 393	32	see map	34	99
CFS-HR 394	32	see map	34	99
CFS-HR 395	32	see map	34	99
CFS-HR 396	32	see map	34	99
CFS-HR 397	32	see map	34	99
CFS-HR 398	32	see map	34	99
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CFS-HR 400	32	see map	34	99
CFS-HR 401	32	see map	34	99
CFS-HR 402	32	see map	34	99
CFS-HR 403	32	see map	34	99
CFS-HR 404	32	see map	34	99
CFS-HR 405	32	see map	34	99
CFS-HR 406	32	see map	34	99
CFS-HR 407	32	see map	34	99
CFS-HR 408	32	see map	34	99
CFS-HR 409	32	see map	34	99
CFS-HR 410	32	see map	34	99
CFS-HR 411	32	see map	34	99
CFS-HR 412	32	see map	34	99
CFS-HR 413	32	see map	34	99
CFS-HR 414	32	see map	34	99
CFS-HR 415	32	see map	34	99
CFS-HR 416	32	see map	34	99
CFS-HR 417	32	see map	34	99
CFS-HR 418	32	see map	34	99
CFS-HR 419	32	see map	34	99
CFS-HR 420	32	see map	34	99
CFS-HR 421	32	see map	34	99
CFS-HR 422	32	see map	34	99
CFS-HR 423	32	see map	34	99
CFS-HR 424	32	see map	34	99
CFS-HR 425	32	see map	34	99
CFS-HR 426	32	see map	34	99
CFS-HR 427	32	see map	34	99
CFS-HR 428	24	see map	29	90
CFS-HR 429	18	see map	15	98
CFS-HR 430	18	see map	15	98
CFS-HR 431	18	see map	15	98
CFS-HR 432	18	see map	15	98
CFS-HR 433	18	see map	15	98
CFS-HR 434	18	see map	25	97
CFS-HR 435	18	see map	25	97
CFS-HR 436	18	see map	25	97
CFS-HR 437	18	see map	25	97
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CFS-HR 439	18	see map	25	97
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CFS-HR 464	18	see map	25	97
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CFS-HR 468	24	see map	42	66
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CFS-HR 472	24	see map	42	66
CFS-HR 473	24	see map	42	66
CFS-HR 474	24	see map	42	66
CFS-HR 475	24	see map	42	66
CFS-HR 476	24	see map	42	66
CFS-HR 477	24	see map	42	66
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CFS-HR 479	24	see map	42	66
CFS-HR 480	24	see map	42	66
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CFS-HR 507	24	see map	42	66
CFS-HR 508	24	see map	42	66
CFS-HR 509	24	see map	42	66
CFS-HR 510	24	see map	26	109
CFS-HR 511	24	see map	26	109
CFS-HR 512	24	see map	26	109
CFS-HR 513	24	see map	26	109
CFS-HR 514	24	see map	26	109
CFS-HR 515	24	see map	26	109
CFS-HR 516	24	see map	26	109
CFS-HR 517	24	see map	26	109
CFS-HR 518	24	see map	26	109
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CFS-HR 523	24	see map	26	109
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CFS-HR 526	24	see map	26	109
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CFS-HR 532	24	see map	26	109
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CFS-HR 537	18	see map	5	256
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CFS-HR 546	18	see map	17	132
CFS-HR 547	18	see map	17	132
CFS-HR 548	18	see map	17	132
CFS-HR 549	18	see map	17	132
CFS-HR 550	18	see map	17	132
CFS-HR 551	18	see map	17	132
CFS-HR 552	18	see map	17	132
CFS-HR 553	18	see map	17	132
CFS-HR 554	18	see map	17	132
CFS-HR 555	18	see map	17	132
CFS-HR 556	18	see map	17	132
CFS-HR 557	18	see map	17	132
CFS-HR 558	18	see map	17	132
CFS-HR 559	18	see map	17	132
CFS-HR 560	18	see map	17	132
CFS-HR 560A	18	see map	25	32
CFS-HR 560B	18	see map	25	32
CFS-HR 560C	18	see map	25	32
CFS-HR 561	18	see map	26	69
CFS-HR 562	18	see map	26	69
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CFS-HR 587C	24	see map	wetland protection	
CFS-HR 587D	24	see map	wetland protection	
CFS-HR 587E	24	see map	wetland protection	
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CFS-HR 674	18	see map	41	54
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CFS-HR 680	18	see map	41	54
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CFS-HR 720	18	see map	41	54
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CFS-HR 775	32	see map	16	281
CFS-HR 776	32	see map	16	281
CFS-HR 777	32	see map	16	281
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CFS-HR 779	32	see map, CSA021	5	546
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CFS-HR 782	32	see map, CSA021	5	546
CFS-HR 783	32	see map, CSA021	5	546
CFS-HR 784	32	see map, CSA021	5	546
CFS-HR 785	18	see map	wetland protection	
CFS-HR 786	18	see map	wetland protection	
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CFS-HR 792	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 793	18	see map, Western Terminus Valve Yard	12	115
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CFS-HR 795	18	see map, Western Terminus Valve Yard	15	119
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CFS-HR 800	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 801	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 802	18	see map, Western Terminus Valve Yard	15	119
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CFS-HR 805	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 806	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 807	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 808	12	see map	2	45
CFS-HR 809	12	see map	6	152
CFS-HR 810	24	see map	8	340
CFS-HR 811	24	see map	8	340
CFS-HR 812	24	see map	8	340
CFS-HR 813	24	Along the west of Paddy Run Road	6	226
CFS-HR 814	24	Along the east of Paddy Run Road	4	486
CFS-HR 815	24	Along the eastern LOD	1	983
CFS-HR 816	24	Along the eastern LOD	1	983

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

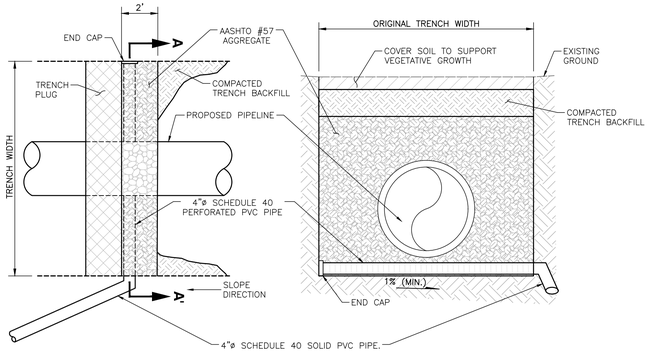
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

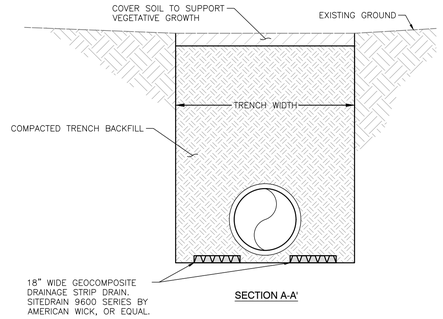
DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 37
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



NOTE:

1. DAYLIGHT DISCHARGE PIPE TO RIPRAP EMBEDMENT TERMINUS (SEE DETAIL 9).
2. SLOPE BASE OF PIPE TRENCH, AT THE UPSLOPE SIDE OF TRENCH PLUG TOWARDS THE OUTLET PIPE AT A MINIMUM 1% GRADE.

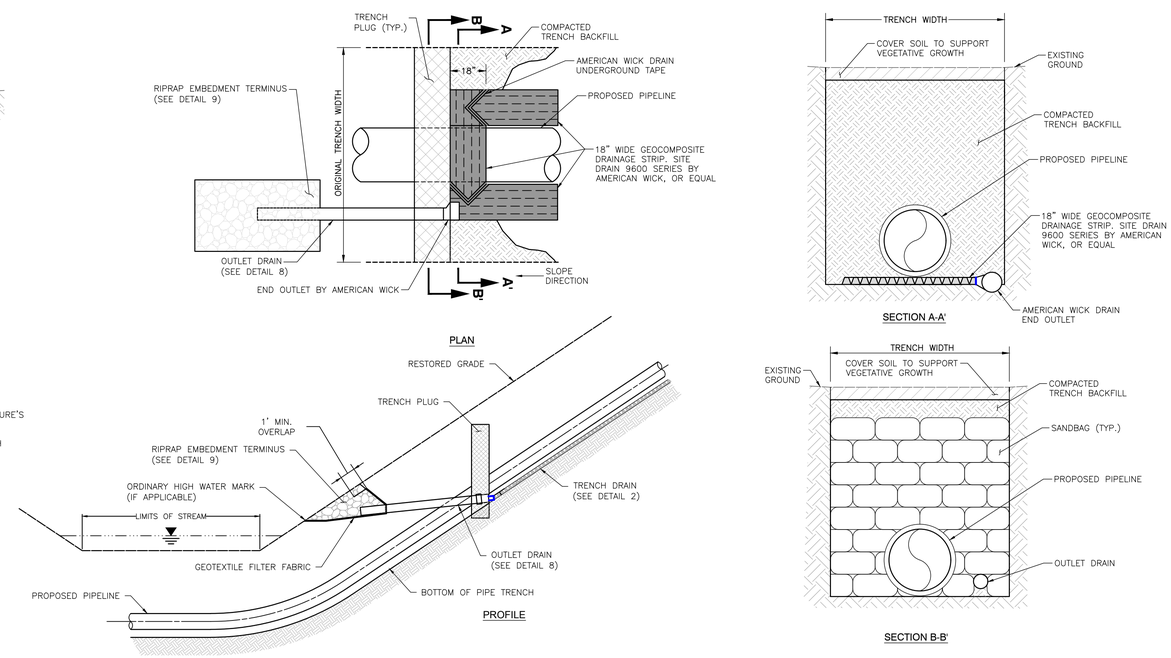
DETAIL 1
DRAINED TRENCH PLUG
NOT TO SCALE



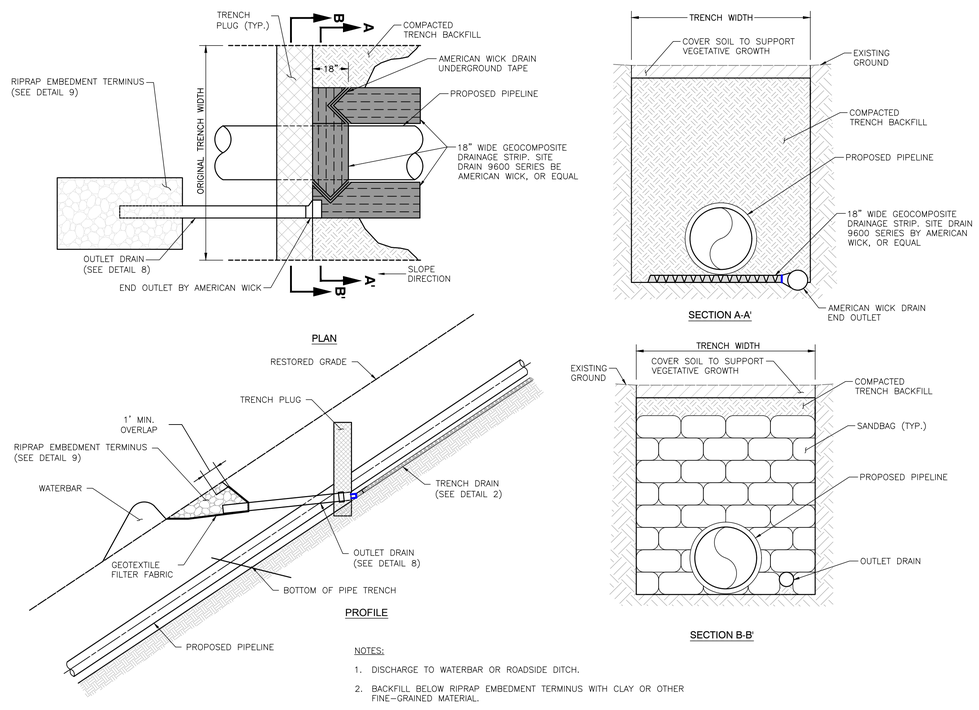
NOTES:

1. SPLICE GEOCOMPOSITE DRAINAGE STRIPS IN ACCORDANCE WITH THE MANUFACTURE'S RECOMMENDATIONS.
2. PLACE GEOCOMPOSITE DRAINAGE STRIPS AT THE BOTTOM OF THE PIPE TRENCH PRIOR TO BACKFILLING. DO NOT CRUSH DRAIN WITH CRIBBING.

DETAIL 2
TRENCH DRAIN
NOT TO SCALE



DETAIL 3
SLOPE TOE TRENCH DRAIN OUTLET
NOT TO SCALE



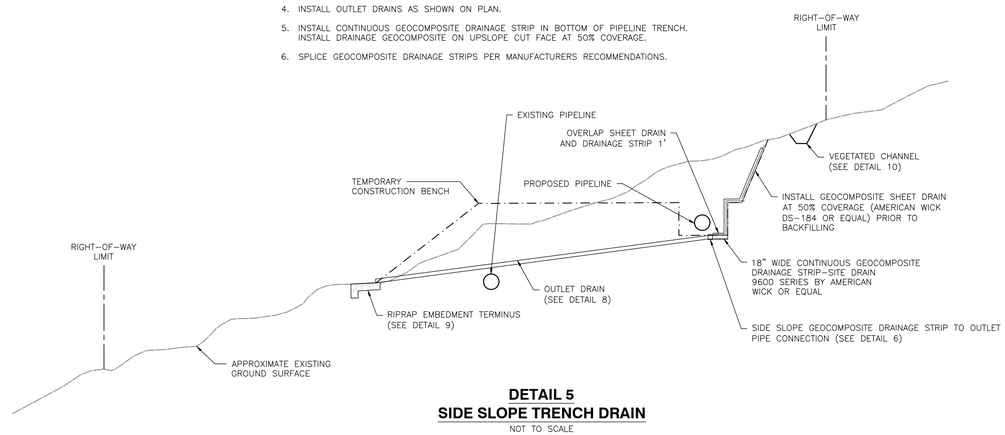
NOTES:

1. DISCHARGE TO WATERBAR OR ROADSIDE DITCH.
2. BACKFILL BELOW RIPRAP EMBEDMENT TERMINUS WITH CLAY OR OTHER FINE-GRAINED MATERIAL.

DETAIL 4
WATERBAR TRENCH DRAIN OUTLET
NOT TO SCALE

SIDE SLOPE DETAIL NOTES

1. INSTALL TOP OF PIPELINE AT 8' BELOW THE EXISTING GROUND SURFACE. EVALUATE ACTUAL LANDSLIDE/COLLUVIUM DEPTH PRIOR TO TRENCHING BY EXCAVATING TEST PITS UNDER THE DIRECTION OF A CEC GEOTECHNICAL REPRESENTATIVE. CONSIDER DEEPENING/SHALLOWING PIPELINE BASED ON FINDINGS.
2. MONITOR AREAS UPSLOPE AND DOWNSLOPE FROM TRENCH FOR MOVEMENT DURING PIPELINE TRENCHING AND INSTALLATION.
3. SLOPE TEMPORARY EXCAVATION AWAY FROM PIPELINE TRENCH.
4. INSTALL OUTLET DRAINS AS SHOWN ON PLAN.
5. INSTALL CONTINUOUS GEOCOMPOSITE DRAINAGE STRIP IN BOTTOM OF PIPELINE TRENCH. INSTALL DRAINAGE GEOCOMPOSITE ON UPSLOPE CUT FACE AT 50% COVERAGE.
6. SPLICE GEOCOMPOSITE DRAINAGE STRIPS PER MANUFACTURERS RECOMMENDATIONS.



DETAIL 5
SIDE SLOPE TRENCH DRAIN
NOT TO SCALE

KEVIN C. CLARK, P.E.

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ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

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NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

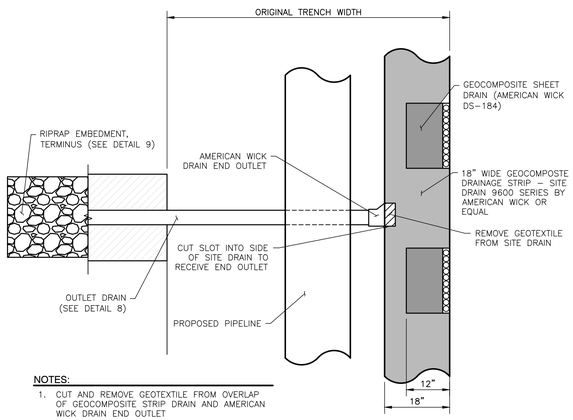
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

GEOHAZARD MITIGATION MEASURES - SHEET 1

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

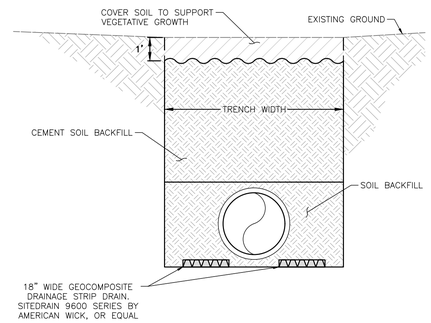
DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 38 OF 39
WO: 121227	RID:		



NOTES:

1. CUT AND REMOVE GEOTEXTILE FROM OVERLAP OF GEOCOMPOSITE STRIP DRAIN AND AMERICAN WICK DRAIN END OUTLET

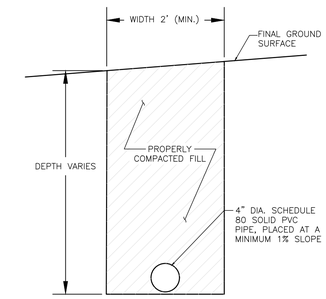
DETAIL 6
SIDE SLOPE GEOCOMPOSITE DRAINAGE STRIP TO OUTLET PIPE CONNECTION
NOT TO SCALE



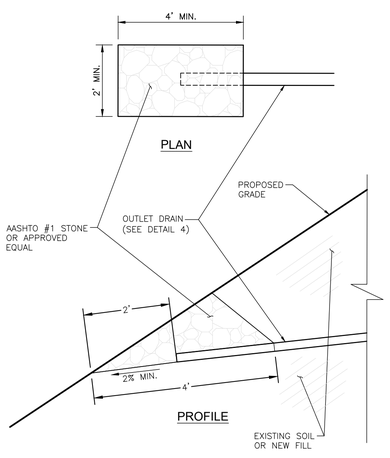
NOTES:

1. CEMENT SOIL BACKFILL SHALL BE THOROUGHLY MIXED WITH 8% CEMENT. BREAK ALL CLUMPS AND CLODS DURING MIXING. ADD WATER DURING MIXING AS NECESSARY TO PROPERLY HYDRATE.
2. LEAVE SURFACE OF BACKFILL ROUGHENED AND COVER WITH 1 FOOT OF SOIL FOR VEGETATION.

DETAIL 7
PIPELINE TRENCH CEMENT SOIL BACKFILL
NOT TO SCALE



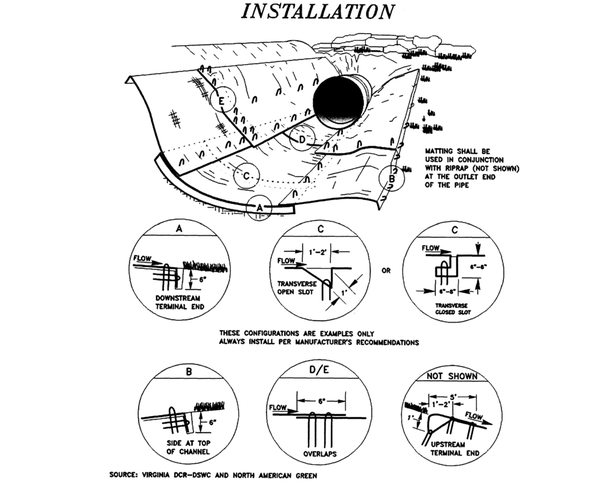
DETAIL 8
OUTLET DRAIN
NOT TO SCALE

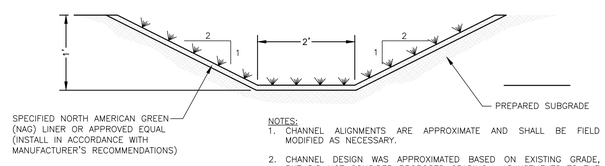


DETAIL 9
RIPRAP EMBEDMENT TERMINUS
NOT TO SCALE

FIGURE 3.13.1

TYPICAL RECP CHANNEL INSTALLATION





NOTES:

1. CHANNEL ALIGNMENTS ARE APPROXIMATE AND SHALL BE FIELD MODIFIED AS NECESSARY.
2. CHANNEL DESIGN WAS APPROXIMATED BASED ON EXISTING GRADE, BUT DID NOT CONSIDER PROPOSED GRADING. ADJUSTMENTS TO THE OVERALL DIMENSIONS OF THE CHANNEL MAY BE NECESSARY TO AVOID GRADING OUTSIDE OF THE LIMITS OF DISTURBANCE, AND CONFLICT WITH THE PROPOSED PIPELINE.
3. THE CONTRACTOR SHALL NOTIFY CEC OF ANY DEVIATION FROM THE DESIGNED CHANNELS AS INDICATED ON THE PLAN SHEETS AND IN THE STANDARD DETAIL FOR REVIEW BEFORE CONSTRUCTING.
4. CHANNEL LINER STAPLE PATTERN PER FIGURE 3.13.1 ABOVE.

DETAIL 10
VEGETATED CHANNEL
NOT TO SCALE

GEOHAZARD MITIGATION MEASURES

Area of Interest	Geohazard Identified	Mitigation Measure(s)
MP 188.9 to 189.04	Surface erosion through waterbar, Steep slope	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 189.09 to 189.15	Possible toe, Possible scarp, Surface erosion, Steep slope	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 190.2 to 190.31	Side slope alignment	Drained Trench Plug, Waterbar Trench Drain Outlet, Pipeline Trench Cement Soil Backfill
MP 190.37 to 190.39	Side slope alignment	Drained Trench Plug, Slope Toe Trench Drain Outlet
MP 190.44 to 190.48	Sandstone outcrop	Drained Trench Plug, Slope Toe Trench Drain Outlet
MP 190.83 to 190.91	Steep slope	Side Slope Trench Drain, Pipeline Trench Cement Soil Backfill
MP 191.05 to 191.96	Creep along travel lane berm, Existing travel lane/Steep fill slope	Side Slope Trench Drain
MP 192.09 to 192.15	Existing travel lane/Steep fill slope	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 192.2 to 192.3	Hummocky (Signs of movement)	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 193.45 to 193.48	Hummocky (Potential movement)	Side Slope Trench Drain

Note: Please refer to Attachment D of ESCGP-3 application for the detailed Geohazard Mitigation Plan

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

GEOHAZARD MITIGATION MEASURES - SHEET 2

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 39 OF 39
WO: 121227	RID:		

designs, permits, resolutions WHM consulting, INC. BA GROUP

REQUIREMENT N

HYDROLOGY AND HYDRAULICS ANALYSIS STATEMENT

Transcontinental Gas Pipe Line Company, LLC

Requirement N – Hydrologic and Hydraulic Analysis

Leidy South Project – Hensel Replacement and Hilltop Loop

September 2019

TABLE OF CONTENTS

1.0 Project Description

2.0 Basis of Hydrologic and Hydraulic Analysis

3.0 Hydrology

4.0 Hydraulic Analysis

5.0 Depiction of Proposed Conditions

6.0 Conclusion

Attachment

1 HECRAS Calculation

2 StreamStats Report

1. Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. proposes to install and maintain a 36-inch diameter natural gas pipeline (Hilltop Loop) under Young Womans Creek in Chapman Township, Clinton County. The proposed temporary stream crossing is located at Latitude 41°22'11.04"N, Longitude 77°42'1.85"W on the Renovo East, Pennsylvania USGS 7.5 Minute Topographic Quadrangles

In respect to the streams and/or floodways crossings, the crossings will result in temporary impacts due to dewatering best management practices (BMP's) being installed (i.e. dam and pump, flume, cofferdam) and temporary bridges for access during construction only. Crossings will be restored to pre-construction contours once construction is completed. Because construction impacts will be temporary in nature and crossings will be restored to pre-construction contours, there will be no changes will occur from pre to post construction conditions as a result of the Project.

The temporary equipment bridge has an approximate length of 150 feet across the stream and a width of 16 feet along the stream. The piers are approximately 5 feet in height and 4 feet wide and are located at a maximum spacing of 25 feet. Young Womans Creek is included in a Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Clinton County. In the vicinity of the project, the FIS has established floodway and floodplain limits. The proposed temporary bridge is currently in an FIS Zone AE floodway.

2. Basis of Hydrologic and Hydraulic Analysis

The proposed temporary bridge crossing is a temporary structure. This Hydrologic and Hydraulic Analysis (H&H) analysis focuses on the 1-, 2-, 5-, and 10-year, 24-hour storms were examined for this report. Site specific topographic data taken from LIDAR mapping was utilized to analyze the flow regime of the stream for existing and temporary conditions.

3. Hydrology

The USGS StreamStats website was utilized to calculate the flows in the stream at the project site. The website provided a baseflow of 55.5 cubic feet per second (cfs), the 1-year, 24-hour storm flow of 1,800 cfs, 2-year, 24-hour storm flow of 2,450 cfs, 5-year, 24-hour storm flow of 3,840 cfs, and 10-year 24-hour storm flow of 4,860 cfs for Young Womans Creek (StreamStats report attached). These computed flow rates were used in the HEC-RAS analysis of Young Womans Creek.

4. Hydraulic Analysis

The existing and temporary stream conditions were modeled with the USCOE HEC-RAS software. The software calculated the flood conditions before and after the proposed temporary bridge and instream support (piers) were installed and the impacts of pier scouring. In addition, the modeling data will be used to minimize impacts to water surface elevations and velocities in the stream channel. The following sections present the findings of the HEC-RAS analyses for the proposed temporary site conditions.

5. Depiction of Proposed Conditions

HEC-RAS analyses were performed for the flow of 55.5 cfs, 1,800 cfs, 2,450 cfs, 3,840 cfs, and 4,860 cfs. The results were then analyzed to determine depth of flow and the depth of scouring for the selected storm events. Figure 1 and Table 1 represent the water elevation in the bridge section under different flow conditions. Table 2 is the pier scour calculations under selected flow conditions. Detailed results for conditions with and without the bridge are given in the Appendix A.

Figure 1. Upstream bridge section review under selected flow conditions.

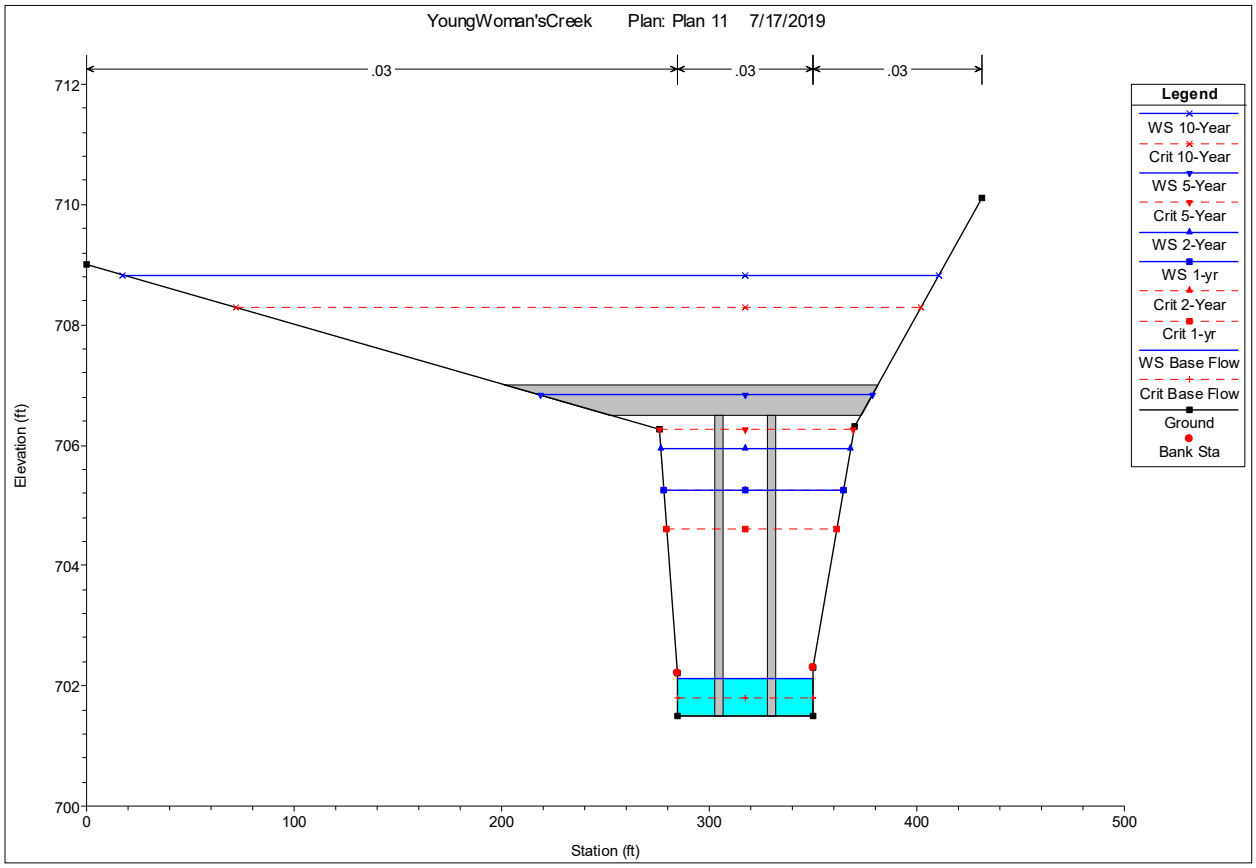


Table 1.
Surface water elevation and flow conditions of the proposed temporary bridge in Young Womans Creek.

Reach	River Station	Profile	Water Surface Elevation (ft)	Top Width (ft)	Q in Left overbank (cfs)	Q in Channel (cfs)	Q in Right overbank (cfs)	Velocity in Channel (ft/s)
CWC	197 BR U	Base Flow	702.12	57.75		55.5		1.57
CWC	197 BR U	1-year	705.28	78.71	44.06	1653.57	102.37	7.56
CWC	197 BR U	2-Year	705.98	83.55	77.7	2188.79	183.51	8.45
CWC	197 BR U	5-Year	706.88		75.08	3463.23	301.69	11.98
CWC	197 BR U	10-Year	708.89	400.73	1530.95	2721.08	607.97	6.58
CWC	197 BR D	Base Flow	702.07	57.69		55.5		1.69
CWC	197 BR D	1-year	704.99	76.71	38.86	1672.23	88.92	8.29
CWC	197 BR D	2-Year	705.62	81.08	68.88	2220.6	160.52	9.33
CWC	197 BR D	5-Year	706.55		80.47	3458.27	301.26	11.96
CWC	197 BR D	10-Year	708.25	329.86	1032.01	3276.6	551.39	8.81

Table 2.
Pier Scouring and Abutment Scouring under selected flow conditions

	Pier Scour		Abutment Scour Left		Abutment Scour Right	
	Ys (ft)	Froude #	Ys (ft)	Froude #	Ys (ft)	Froude #
Base Flow	1.1	0.3	N/A	N/A	N/A	N/A
1-year	6.81	0.54	N/A	N/A	N/A	N/A
2-Year	7.37	0.57	N/A	N/A	N/A	N/A
5-Year	7.21	0.39	9.90	0.23	11.12	0.33
10-Year	7.88	0.47	11.03	0.28	12.34	0.39

6. Conclusion

Based on the HEC-RAS analysis of proposed conditions, the temporary bridge equipment stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

References

FEMA Flood Map Service Center
https://msc.fema.gov/portal/search?AddressQuery=clinton#searchresultsanchor

ATTACHMENT 1
HECRAS CALCULATIONS

ATTACHMENT 1 – HECRAS CALCULATION

Table 1.
HECRAS results for existing conditions without the bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005655	10.01	272.95	76.18	0.83
CWC	700	5-Year	3840.00	703.50	708.84	708.84	711.00	0.007197	12.68	338.76	79.10	0.97
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005070	8.68	231.09	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.92		709.19	0.005236	9.68	284.62	80.68	0.80
CWC	675.00*	5-Year	3840.00	703.40	708.80	708.68	710.76	0.006502	12.14	356.62	84.03	0.92
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004812	8.47	238.68	78.46	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.03	0.004964	9.45	293.95	85.08	0.78
CWC	650.00*	5-Year	3840.00	703.30	708.75	708.54	710.56	0.005944	11.69	373.47	88.98	0.88
CWC	650.00*	10-Year	4860.00	703.30	709.27	709.26	711.55	0.006682	13.17	420.30	91.19	0.95
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004646	8.33	244.56	82.57	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.75		708.89	0.004721	9.24	302.94	89.50	0.76
CWC	625.00*	5-Year	3840.00	703.20	708.70	708.40	710.37	0.005461	11.28	390.17	93.99	0.85
CWC	625.00*	10-Year	4860.00	703.20	709.20	708.96	711.34	0.006258	12.79	437.97	98.73	0.92
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004501	8.20	249.94	86.66	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004565	9.09	309.90	93.84	0.75
CWC	600.00*	5-Year	3840.00	703.10	708.64	708.30	710.21	0.005105	10.96	404.77	99.00	0.82
CWC	600.00*	10-Year	4860.00	703.10	709.14	708.78	711.15	0.005888	12.46	455.56	107.46	0.89
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004432	8.14	253.39	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.56		708.64	0.004435	8.97	316.05	98.14	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.56	708.21	710.06	0.004902	10.76	416.45	105.23	0.81
CWC	575.00*	10-Year	4860.00	703.00	709.09	708.83	710.97	0.005470	12.08	475.27	115.55	0.86
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004387	8.09	255.90	94.50	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.46		708.52	0.004346	8.88	320.80	102.32	0.73

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.47	708.07	709.93	0.004746	10.60	427.22	112.49	0.79
CWC	550.00*	10-Year	4860.00	702.90	709.04	708.77	710.80	0.005079	11.71	495.29	122.99	0.83
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004376	8.06	257.10	98.20	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.36		708.41	0.004280	8.81	324.53	106.47	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.38	707.92	709.79	0.004579	10.43	438.17	119.25	0.78
CWC	525.00*	10-Year	4860.00	702.80	708.99	708.68	710.65	0.004748	11.39	514.76	130.97	0.81
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004407	8.07	256.74	101.79	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004234	8.76	327.15	110.51	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.29	707.88	709.66	0.004431	10.28	448.31	125.68	0.77
CWC	500.00*	10-Year	4860.00	702.70	708.91	708.60	710.51	0.004589	11.22	529.86	140.74	0.79
CWC	500.00*	1-yr	1800.00	702.70	706.57		707.51	0.004531	8.13	253.54	105.01	0.73
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.15		708.20	0.004226	8.74	327.99	114.38	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.20	707.84	709.54	0.004306	10.14	457.33	131.69	0.76
CWC	475.00*	10-Year	4860.00	702.60	708.81	708.50	710.39	0.004517	11.14	542.17	151.43	0.79
CWC	475.00*	1-yr	1800.00	702.60	706.35	706.05	707.39	0.005088	8.44	240.30	105.01	0.77
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.03		708.09	0.004254	8.75	327.50	118.81	0.73
CWC	450.00*	5-Year	3840.00	702.50	708.11	707.77	709.42	0.004176	10.01	466.30	137.52	0.75
CWC	450.00*	10-Year	4860.00	702.50	708.72	708.36	710.26	0.004431	11.04	554.48	162.31	0.78
CWC	450.00*	1-yr	1800.00	702.50	706.19	705.86	707.26	0.005349	8.55	232.68	100.08	0.79
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.89	706.60	707.99	0.004374	8.83	323.55	122.89	0.73
CWC	425.00*	5-Year	3840.00	702.40	708.03	707.68	709.30	0.004056	9.88	474.54	143.17	0.73
CWC	425.00*	10-Year	4860.00	702.40	708.63	708.23	710.15	0.004339	10.93	566.34	173.30	0.77
CWC	425.00*	1-yr	1800.00	702.40	706.04	705.47	707.13	0.005443	8.56	228.46	94.77	0.79
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004286	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.69	706.33	707.87	0.004792	9.09	310.11	125.22	0.77
CWC	400.00*	5-Year	3840.00	702.30	707.94	707.60	709.19	0.003946	9.76	482.14	149.02	0.73
CWC	400.00*	10-Year	4860.00	702.30	708.54	708.13	710.03	0.004234	10.81	578.42	184.66	0.76

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	705.91	705.43	706.99	0.005454	8.51	226.13	88.29	0.79
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004261	1.99	27.83	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.50	706.12	707.75	0.005121	9.27	298.13	121.99	0.79
CWC	375.00*	5-Year	3840.00	702.20	707.85	707.51	709.09	0.003874	9.68	488.10	156.00	0.72
CWC	375.00*	10-Year	4860.00	702.20	708.45	708.06	709.91	0.004115	10.68	591.01	196.68	0.75
CWC	375.00*	1-yr	1800.00	702.20	705.79	705.32	706.85	0.005339	8.39	226.70	80.89	0.78
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004226	1.97	28.14	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.37	705.64	707.62	0.005113	9.23	294.59	116.03	0.79
CWC	350.00*	5-Year	3840.00	702.10	707.76	707.39	708.99	0.003809	9.61	492.89	162.60	0.71
CWC	350.00*	10-Year	4860.00	702.10	708.37	707.96	709.80	0.003991	10.54	603.22	208.81	0.74
CWC	350.00*	1-yr	1800.00	702.10	705.71		706.70	0.004941	8.11	232.24	73.80	0.75
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004164	1.95	28.50	59.42	0.50
CWC	325.00*	2-Year	2450.00	702.00	706.25	705.65	707.49	0.005007	9.11	294.15	109.07	0.78
CWC	325.00*	5-Year	3840.00	702.00	707.66	707.25	708.89	0.003737	9.53	497.48	169.16	0.71
CWC	325.00*	10-Year	4860.00	702.00	708.30	707.89	709.68	0.003835	10.36	617.74	222.20	0.73
CWC	325.00*	1-yr	1800.00	702.00	705.62		706.56	0.004688	7.92	238.07	75.58	0.73
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.004025	1.91	29.03	60.65	0.49
CWC	300.00*	2-Year	2450.00	701.90	706.17	705.56	707.34	0.004766	8.91	297.99	102.19	0.76
CWC	300.00*	5-Year	3840.00	701.90	707.58	707.13	708.78	0.003638	9.42	503.13	176.02	0.70
CWC	300.00*	10-Year	4860.00	701.90	708.24	707.75	709.57	0.003635	10.13	636.16	237.32	0.71
CWC	300.00*	1-yr	1800.00	701.90	705.54		706.43	0.004429	7.72	244.61	77.94	0.71
CWC	275.00*	Base Flow	55.50	701.80	702.29		702.34	0.003637	1.84	30.17	61.90	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.11		707.21	0.004389	8.61	306.30	94.78	0.73
CWC	275.00*	5-Year	3840.00	701.80	707.50	706.97	708.69	0.003547	9.32	507.42	182.91	0.69
CWC	275.00*	10-Year	4860.00	701.80	708.20	707.56	709.46	0.003404	9.87	658.24	254.31	0.69
CWC	275.00*	1-yr	1800.00	701.80	705.47		706.31	0.004116	7.49	252.70	80.26	0.69
CWC	250.00*	Base Flow	55.50	701.70	702.21		702.26	0.003007	1.72	32.20	63.16	0.43
CWC	250.00*	2-Year	2450.00	701.70	706.08		707.07	0.003898	8.20	318.96	88.44	0.69
CWC	250.00*	5-Year	3840.00	701.70	707.42	706.66	708.59	0.003424	9.19	513.34	190.47	0.68
CWC	250.00*	10-Year	4860.00	701.70	708.17	707.49	709.36	0.003145	9.56	685.12	272.61	0.66
CWC	250.00*	1-yr	1800.00	701.70	705.41		706.19	0.003789	7.24	261.89	82.56	0.66

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.15		702.19	0.002234	1.56	35.50	64.44	0.37
CWC	225.00*	2-Year	2450.00	701.60	706.04		706.96	0.003533	7.88	331.75	89.70	0.66
CWC	225.00*	5-Year	3840.00	701.60	707.35	706.14	708.49	0.003297	9.05	519.11	199.51	0.67
CWC	225.00*	10-Year	4860.00	701.60	708.16	707.52	709.25	0.002877	9.22	716.40	292.72	0.64
CWC	225.00*	1-yr	1800.00	701.60	705.36		706.08	0.003460	6.98	272.10	84.79	0.63
CWC	200	Base Flow	55.50	701.50	702.11		702.14	0.001527	1.38	40.13	65.75	0.31
CWC	200	2-Year	2450.00	701.50	706.01		706.85	0.003213	7.59	344.88	91.72	0.63
CWC	200	5-Year	3840.00	701.50	707.30	706.11	708.40	0.003137	8.87	528.21	214.63	0.65
CWC	200	10-Year	4860.00	701.50	708.15	707.47	709.16	0.002604	8.86	753.42	314.30	0.61
CWC	200	1-yr	1800.00	701.50	705.31		705.98	0.003143	6.72	283.10	86.94	0.61
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.25	706.22	707.74	0.005327	10.81	587.88	211.94	0.83
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

Table 2
HECRAS results for proposed conditions with the temporary bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005645	10.00	273.10	76.18	0.83
CWC	700	5-Year	3840.00	703.50	709.07	708.84	711.01	0.006156	12.05	356.65	79.88	0.90
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005066	8.67	231.15	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.93		709.19	0.005226	9.67	284.79	80.69	0.80
CWC	675.00*	5-Year	3840.00	703.40	709.07	708.68	710.80	0.005373	11.41	379.88	85.09	0.85
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004807	8.47	238.75	78.47	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.04	0.004953	9.44	294.16	85.09	0.78
CWC	650.00*	5-Year	3840.00	703.30	709.06		710.62	0.004790	10.89	401.35	90.30	0.80
CWC	650.00*	10-Year	4860.00	703.30	709.38	709.26	711.55	0.006224	12.87	430.43	91.72	0.92
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004641	8.33	244.66	82.58	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.76		708.89	0.004709	9.23	303.21	89.52	0.76
CWC	625.00*	5-Year	3840.00	703.20	709.05		710.47	0.004297	10.42	422.89	95.62	0.76
CWC	625.00*	10-Year	4860.00	703.20	709.33	708.96	711.36	0.005791	12.48	450.74	101.76	0.89
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004495	8.20	250.06	86.67	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004550	9.08	310.24	93.86	0.75
CWC	600.00*	5-Year	3840.00	703.10	709.00		710.34	0.004008	10.13	441.35	104.63	0.74
CWC	600.00*	10-Year	4860.00	703.10	709.30	708.78	711.18	0.005298	12.04	473.56	110.95	0.85
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004425	8.13	253.53	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.57		708.64	0.004418	8.96	316.47	98.16	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.97		710.21	0.003687	9.79	462.11	113.33	0.71
CWC	575.00*	10-Year	4860.00	703.00	709.29	708.83	711.00	0.004810	11.57	498.30	119.35	0.81
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004378	8.08	256.08	94.51	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.47		708.52	0.004326	8.87	321.30	102.35	0.73

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.95		710.10	0.003380	9.46	483.75	121.28	0.68
CWC	550.00*	10-Year	4860.00	702.90	709.22	708.77	710.86	0.004625	11.38	516.78	130.62	0.80
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004364	8.06	257.34	98.22	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.37		708.41	0.004257	8.80	325.15	106.52	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.93		709.99	0.003097	9.13	506.08	128.83	0.65
CWC	525.00*	10-Year	4860.00	702.80	709.14	708.68	710.73	0.004488	11.24	534.30	143.48	0.79
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004389	8.06	257.11	101.82	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004207	8.74	327.92	110.56	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.90		709.90	0.002877	8.87	527.93	139.27	0.63
CWC	500.00*	10-Year	4860.00	702.70	709.06	708.60	710.61	0.004335	11.08	552.45	156.94	0.78
CWC	500.00*	1-yr	1800.00	702.70	706.59		707.52	0.004463	8.09	255.01	105.12	0.72
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.16		708.20	0.004192	8.72	328.98	114.46	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.84		709.82	0.002785	8.77	546.80	154.69	0.62
CWC	475.00*	10-Year	4860.00	702.60	708.99	708.50	710.49	0.004172	10.91	570.72	170.55	0.76
CWC	475.00*	1-yr	1800.00	702.60	706.40	706.05	707.40	0.004854	8.31	245.05	106.73	0.75
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.04		708.10	0.004210	8.72	328.85	119.01	0.72
CWC	450.00*	5-Year	3840.00	702.50	708.80		709.74	0.002660	8.63	567.88	171.05	0.61
CWC	450.00*	10-Year	4860.00	702.50	708.93	708.36	710.37	0.003979	10.70	591.08	185.22	0.74
CWC	450.00*	1-yr	1800.00	702.50	706.27	705.86	707.28	0.004898	8.31	241.35	103.64	0.76
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.93		708.00	0.004237	8.73	327.77	123.51	0.72
CWC	425.00*	5-Year	3840.00	702.40	708.76		709.66	0.002513	8.44	591.18	188.37	0.59
CWC	425.00*	10-Year	4860.00	702.40	708.88	708.23	710.25	0.003763	10.45	613.57	200.99	0.72
CWC	425.00*	1-yr	1800.00	702.40	706.15	705.47	707.16	0.004883	8.26	238.86	99.64	0.75
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004282	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.81	706.33	707.90	0.004243	8.72	326.37	127.63	0.72
CWC	400.00*	5-Year	3840.00	702.30	708.74		709.59	0.002345	8.22	617.56	206.79	0.57
CWC	400.00*	10-Year	4860.00	702.30	708.84	708.13	710.14	0.003519	10.17	639.49	218.20	0.70

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	706.03	705.43	707.03	0.004809	8.18	237.73	94.68	0.75
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004254	1.99	27.85	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.71	706.12	707.79	0.004216	8.69	325.05	131.16	0.72
CWC	375.00*	5-Year	3840.00	702.20	708.72		709.52	0.002164	7.96	647.42	226.39	0.55
CWC	375.00*	10-Year	4860.00	702.20	708.81	708.06	710.03	0.003252	9.85	669.58	237.05	0.68
CWC	375.00*	1-yr	1800.00	702.20	705.94		706.90	0.004637	8.04	239.22	88.96	0.73
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004208	1.97	28.17	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.61	705.64	707.68	0.004133	8.60	324.18	131.41	0.71
CWC	350.00*	5-Year	3840.00	702.10	708.71		709.45	0.001983	7.69	679.90	246.62	0.53
CWC	350.00*	10-Year	4860.00	702.10	708.80	707.96	709.92	0.002980	9.51	702.81	256.84	0.65
CWC	350.00*	1-yr	1800.00	702.10	705.85		706.77	0.004389	7.84	243.25	82.84	0.71
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004137	1.94	28.56	59.43	0.49
CWC	325.00*	2-Year	2450.00	702.00	706.53	705.65	707.57	0.003957	8.44	326.29	127.78	0.70
CWC	325.00*	5-Year	3840.00	702.00	708.70		709.38	0.001801	7.40	716.24	267.68	0.50
CWC	325.00*	10-Year	4860.00	702.00	708.79	707.89	709.83	0.002702	9.14	740.97	277.93	0.62
CWC	325.00*	1-yr	1800.00	702.00	705.80		706.65	0.003971	7.53	251.75	77.78	0.68
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.003936	1.90	29.22	60.66	0.48
CWC	300.00*	2-Year	2450.00	701.90	706.46	705.56	707.46	0.003723	8.23	331.26	124.19	0.68
CWC	300.00*	5-Year	3840.00	701.90	708.70		709.32	0.001624	7.10	756.72	289.44	0.48
CWC	300.00*	10-Year	4860.00	701.90	708.79		709.73	0.002428	8.75	784.25	300.07	0.59
CWC	300.00*	1-yr	1800.00	701.90	705.75		706.53	0.003635	7.26	261.20	79.67	0.65
CWC	275.00*	Base Flow	55.50	701.80	702.30		702.35	0.003511	1.82	30.50	61.91	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.41		707.35	0.003442	7.98	338.81	119.52	0.66
CWC	275.00*	5-Year	3840.00	701.80	708.70		709.27	0.001462	6.80	799.40	311.50	0.46
CWC	275.00*	10-Year	4860.00	701.80	708.79		709.65	0.002177	8.37	830.01	322.57	0.56
CWC	275.00*	1-yr	1800.00	701.80	705.70		706.43	0.003313	7.00	271.59	82.08	0.62
CWC	250.00*	Base Flow	55.50	701.70	702.22		702.27	0.002828	1.69	32.81	63.17	0.41
CWC	250.00*	2-Year	2450.00	701.70	706.38		707.25	0.003143	7.69	349.00	114.52	0.63
CWC	250.00*	5-Year	3840.00	701.70	708.70		709.22	0.001313	6.51	844.90	333.67	0.43
CWC	250.00*	10-Year	4860.00	701.70	708.80		709.57	0.001947	8.00	878.90	345.27	0.53
CWC	250.00*	1-yr	1800.00	701.70	705.66		706.33	0.003001	6.73	282.98	84.46	0.60

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

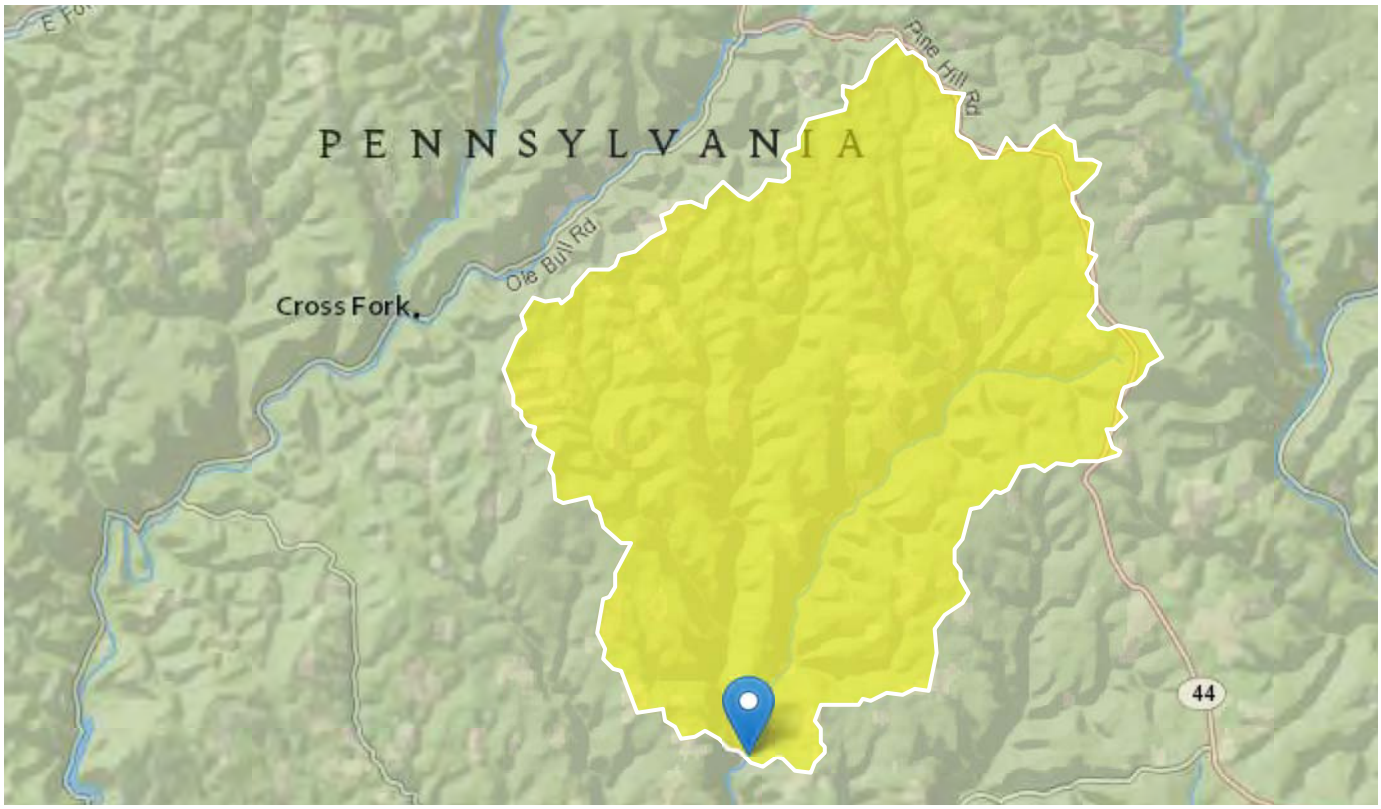
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.17		702.20	0.002052	1.52	36.43	64.46	0.36
CWC	225.00*	2-Year	2450.00	701.60	706.35		707.15	0.002840	7.39	361.13	108.03	0.60
CWC	225.00*	5-Year	3840.00	701.60	708.70		709.17	0.001176	6.22	893.69	356.38	0.41
CWC	225.00*	10-Year	4860.00	701.60	708.81		709.50	0.001738	7.63	931.41	368.50	0.50
CWC	225.00*	1-yr	1800.00	701.60	705.63		706.25	0.002704	6.46	295.27	86.73	0.57
CWC	200	Base Flow	55.50	701.50	702.13	701.78	702.16	0.001385	1.34	41.33	65.77	0.30
CWC	200	2-Year	2450.00	701.50	706.33	704.96	707.06	0.002543	7.07	375.41	101.49	0.57
CWC	200	5-Year	3840.00	701.50	708.71	706.11	709.13	0.001051	5.94	946.20	379.36	0.39
CWC	200	10-Year	4860.00	701.50	708.81	707.47	709.44	0.001547	7.27	988.01	392.04	0.47
CWC	200	1-yr	1800.00	701.50	705.60	704.34	706.17	0.002430	6.20	308.23	88.92	0.54
CWC	197		Bridge									
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.22	706.22	707.74	0.005454	10.90	581.93	210.49	0.84
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

ATTACHMENT 2
STREAMSTATS REPORT

StreamStats Report

Region ID: PA
Workspace ID: PA20190506151156786000
Clicked Point (Latitude, Longitude): 41.36948, -77.70108
Time: 2019-05-06 11:12:11 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	84.1	square miles
ELEV	Mean Basin Elevation	1765	feet
CARBON	Percentage of area of carbonate rock	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0	percent

Peak-Flow Statistics Parameters [100 Percent (83.9 square miles) Peak Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	84.1	square miles	1.44	1610
ELEV	Mean Basin Elevation	1765	feet	457	2150
CARBON	Percent Carbonate	0	percent	0	99
STORAGE	Percent Storage	0	percent	0	22.6

Peak-Flow Statistics Flow Report [100 Percent (83.9 square miles) Peak Flow Region 3]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	2450	ft^3/s	31	31	3
5 Year Peak Flood	3840	ft^3/s	28	28	5
10 Year Peak Flood	4860	ft^3/s	28	28	7
50 Year Peak Flood	7320	ft^3/s	31	31	11
100 Year Peak Flood	8460	ft^3/s	36	36	11
500 Year Peak Flood	11400	ft^3/s	43	43	11

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2008, Regression equations for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2008-5102, 57p. (http://pubs.usgs.gov/sir/2008/5102/)

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Application Version: 4.3.0

REQUIREMENT O

STORMWATER MANAGEMENT ANALYSIS STATEMENT

STORMWATER MANAGEMENT ANALYSIS

The proposed project is located within Chapman and Leidy Townships, Clinton County, Pennsylvania; which does not have an approved Act 167 Plan. Therefore, Stormwater Management Plan Analysis and an Act 167 Consistency Letter are not required.

REQUIREMENT P

FLOODPLAIN MANAGEMENT ANALYSIS

FLOODPLAIN MANAGEMENT ANALYSIS

The Hilltop Loop is located near the town of North Bend, with portions of the project being located within the FEMA Floodway of Young Womans Creek. The scope of the Hilltop Loop consists of installing approximately 2.4 miles of 36-inch pipeline loop. Of the overall disturbance area, 1.8 acres is located with the defined FEMA floodway.

All permanent aboveground facilities will be located outside of FEMA floodplains and floodways. Restoration of pre-construction contours along the FEMA floodplain and floodway associated with the Hilltop Loop will preserve the existing condition of the FEMA floodway and floodplain; therefore, no increases in 100-year flood elevation are anticipated as a result of the installation of the pipeline.

A Hydrologic and Hydraulic (H&H) analysis was performed for the proposed stream crossing (Requirement N). Due to the temporary nature of the bridge and pier proposed at the crossing, the H&H analysis focused on smaller storm events. Specifically, the low flow- 1-, 2-, 5-, and 10-year, 24-hour storms were examined for the H&H report. Based on the HEC-RAS analysis of proposed conditions, the temporary stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

September 19, 2019

<u>UPS TRACKING</u> (1Z8797VV0396509907)
Chapman Township Supervisors
196 Main Street
North Bend, PA 17760

RE: Transcontinental Gas Pipe Line Company, LLC
Leidy South Project –Hilltop Loop
Floodplain Management Analysis
Chapman Township, Clinton County, Pennsylvania

Dear Township Supervisors,

On behalf of Transcontinental Gas Pipe Line Company, LLC. (Transco), WHM Consulting, Inc. is requesting a Floodplain Management Analysis Consistency Letter for the Hilltop Loop (Project) located in Chapman Township, Clinton County, Pennsylvania. The scope of the Hilltop Loop consists of installing approximately 2.4 miles of 36-inch pipeline loop. The Project has been co-located with Transco's existing gas pipeline system. Of the overall disturbance area, 1.8 acres is located with the defined FEMA floodway of Young Womans Creek near the town of North Bend.

There will be no aboveground facilities located within FEMA floodplains and floodways. Restoration of pre-construction contours along the FEMA floodplain and floodway associated with the Hilltop Loop will preserve the existing condition of the FEMA floodway and floodplain; therefore, no increases in 100-year flood elevation are anticipated as a result of temporary impacts for construction activities to install the pipeline.

A Hydrologic and Hydraulic (H&H) analysis was performed for the proposed stream crossing. Due to the temporary nature of the bridge and supports proposed at the crossing, the H&H analysis focused on smaller storm events. Specifically, the low flow- 1-, 2-, 5-, and 10-year, 24-hour storms were examined for the H&H report. Based on the HEC-RAS analysis of proposed conditions, the temporary stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

Enclosed you will find a USGS Project Location Map, PADEP Chapter 105 Plan Drawings for the FEMA Floodway Crossing, and a Hydrologic & Hydraulic Analysis. Please review the provided plan drawings and above analysis with respect to your township's floodplain management ordinances and provide comments and/or a consistency letter. Should you have any questions or require additional information, please do not hesitate to contact me at 814-689-1650 or kevinc@whmgroup.com.

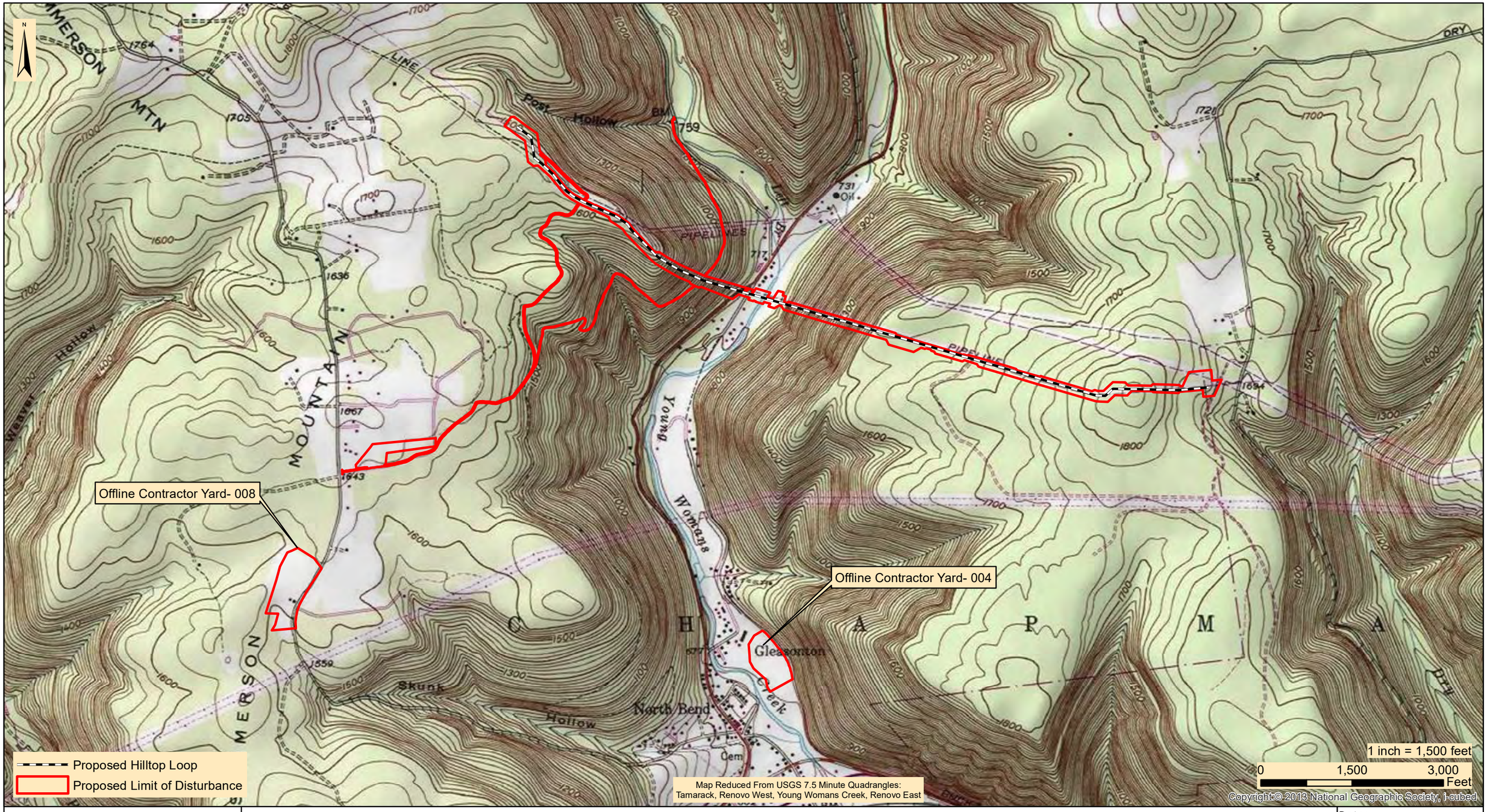
Sincerely,

WHM Consulting, Inc.

Kevin Clark, PWS
Project Manager

cc: Josh Henry, Transco
Enclosures

USGS PROJECT LOCATION MAP



designs, permits, resolutions | consulting, INC.
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

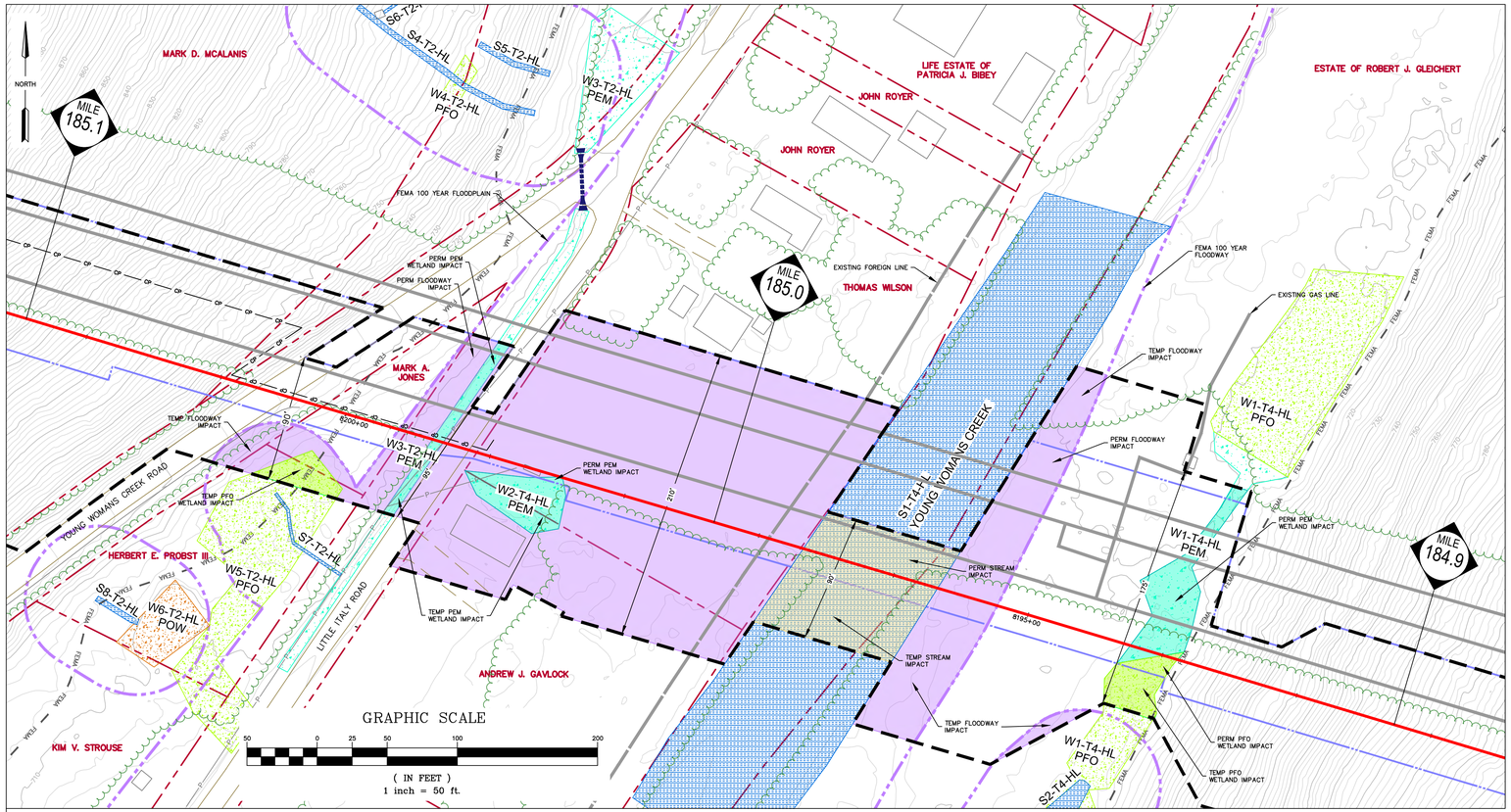
LEIDY SOUTH PROJECT

LEIDY LINE D 36" HILLTOP LOOP
PROJECT LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	8/21/2019
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	FTN
Figure Number:	2-1

PADEP CHAPTER 105 PLAN DRAWING FOR FEMA FLOODWAY CROSSING



Crossing Name [1]	Resource Name [2]	Resource Type [3]	Cowardin Classification [4]	Stream Type [5]	Impact Type [6]	Impact Area (ac) [7]
HL-3	S1-T4-HL	Floodway	-	-	Permanent	0.91
	S1-T4-HL	Floodway	-	-	Temporary	0.61
	S1-T4-HL	Stream	-	Perennial	Permanent	0.10
	S1-T4-HL	Stream	-	Perennial	Temporary	0.10
	S2-T4-HL	Floodway	-	-	Temporary	0.01
	S7-T2-HL	Floodway	-	-	Temporary	0.05
	W1-T4-HL	Wetland	PEM	-	Permanent	0.07
	W1-T4-HL	Wetland	PFO	-	Permanent	0.01
	W1-T4-HL	Wetland	PFO	-	Temporary	0.03
	W2-T4-HL	Wetland	PEM	-	Permanent	0.001
	W2-T4-HL	Wetland	PEM	-	Temporary	0.05
	W3-T2-HL	Wetland	PEM	-	Permanent	0.02
	W3-T2-HL	Wetland	PEM	-	Temporary	0.01
	W5-T2-HL	Wetland	PFO	-	Temporary	0.02

TABLE NOTES:

1) UNIQUE IDENTIFIER FOR THE SINGLE AND COMPLETE CROSSING
2) UNIQUE NAME FOR IMPACTED RESOURCE
3) TYPE OF IMPACTED RESOURCE (STREAM/WETLAND/FLOODWAY).
4) COWARDIN CLASSIFICATION OF IMPACTED WETLAND, APPLIES TO WETLANDS ONLY.
5) FLOW REGIME OF THE IMPACTED STREAM, APPLIES TO STREAMS ONLY.
6) IMPACT TYPE IS EITHER PERMANENT OR TEMPORARY.
TEMPORARY IMPACTS
PIPELINE IMPACTS - TEMPORARY IMPACTS INCLUDE AREAS MEASURED OUTSIDE THE PERMANENTLY MAINTAINED PIPELINE RIGHT-OF-WAY. THESE RESOURCES WILL BE RESTORED TO PRE-EXISTING CONTOURS. PSS AND PFO WETLANDS WILL BE REVEGETATED TO THEIR PRE-EXISTING COVER TYPE.

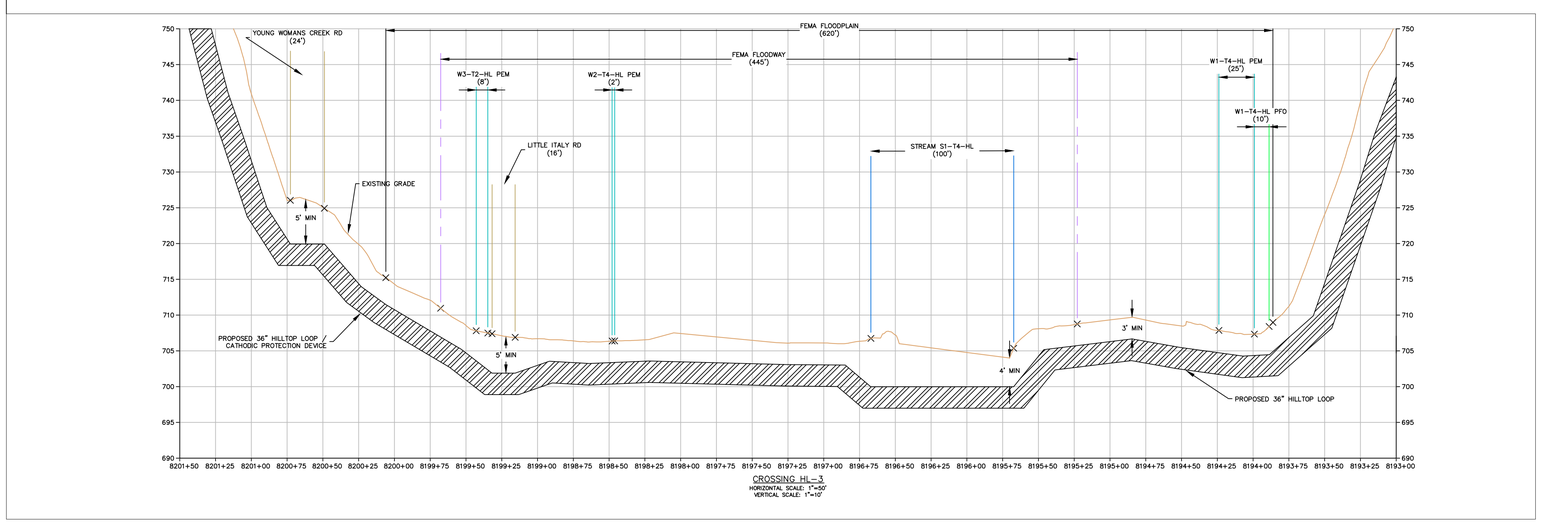
ACCESS ROAD IMPACTS - TEMPORARY IMPACTS INCLUDE AREAS WITHIN THE PROJECT LIMITS OF DISTURBANCE ON THE ACCESS ROADS. THESE RESOURCES WILL BE RESTORED TO PRE-EXISTING CONDITION.
PERMANENT IMPACTS
PIPELINE IMPACTS - PERMANENT IMPACTS INCLUDE THE AREA MEASURED WITHIN THE PERMANENTLY MAINTAINED PIPELINE RIGHT-OF-WAY (PROW), WHICH INCLUDES EXISTING AND PROPOSED ADDITIONAL PROW. THERE IS NO PERMANENT LOSS OF RESOURCES IN THE PROW AND THESE AREAS WILL BE RESTORED TO PRE-EXISTING CONTOURS. FOR PSS AND PFO WETLANDS WITHIN THE PROW, THE PERMANENT IMPACT VALUE REPRESENTS THE FUNCTIONAL CONVERSION AREA OF THESE RESOURCES.

ACCESS ROAD IMPACTS - PERMANENT IMPACTS INCLUDE AREAS ON THE ACCESS ROADS THAT WILL BE INDEFINITELY FILLED, RESULTING IN A PERMANENT LOSS OF THE RESOURCE AS THE AREA WILL NOT BE RESTORED TO PRE-EXISTING CONDITIONS.

7) THE AREA OF THE RESOURCE IMPACTED, IN ACRES. FOR AREAS WHERE THE WETLANDS AND FLOODWAY OVERLAP, FLOODWAY IMPACTS ARE INCLUDED WITHIN THE WETLAND IMPACT AREA (I.E. WETLAND AND FLOODWAY IMPACTS WERE NOT COUNTED IN DUPLICATE).

GENERAL NOTES:

1. STREAM CROSSING METHODS WILL BE COMPLETED VIA OPEN CUT CONSTRUCTION METHODS. EITHER COFFER DAM (CD) OR DAM AND PUMP (DPX) DRY-CROSSING METHOD WILL BE UTILIZED BASED ON FIELD CONDITIONS DURING TIME OF CONSTRUCTION. A BRIDGE EQUIPMENT CROSSING WITH INSTREAM SUPPORT WILL BE INSTALLED AT YOUNG WOMANS CREEK.
2. WETLAND CROSSING METHODS WILL COMPLETED VIA OPEN CUT CONSTRUCTION METHODS AS OUTLINED IN WETLAND CROSSING CONFIGURATION (WCC.1, WCC.2, WCC.3), BASED ON FIELD CONDITIONS DURING THE TIME OF CONSTRUCTION. WETLANDS WILL BE CROSSED FOR ACCESS UTILIZING TIMBER MATS AS OUTLINED IN THE WETLAND EQUIPMENT CROSSING (WEC) CONSTRUCTION DETAIL.
3. ALL TYPICAL CONSTRUCTION DETAILS FOR PROPOSED CROSSING METHODS ARE LOCATED WITHIN THE EROSION AND SEDIMENTATION CONTROL PLAN AND NARRATIVE.
4. THE PROPOSED PIPELINE WILL BE INSTALLED WITH 3-FEET MINIMUM COVER THROUGH WETLANDS AND 4-FEET MINIMUM COVER THROUGH STREAM CHANNELS.
8. CATHODIC PROTECTION CONSISTING OF 1.5" DIAMETER CABLE WILL BE INSTALLED BETWEEN THE LEIDY LINE A AND LEIDY LINE B FROM MP 185.03 TO MP 185.37. WHERE THE CABLE IS BEING INSTALLED THROUGH WETLANDS, STREAMS, AND FLOODWAYS THE CABLE WILL BE LOCATED IN THE SAME TRENCH AS THE PROPOSED HILLTOP LOOP.



Crossing Name	Latitude	Longitude	Location (Milepost/Access Road)
HL-3	41.369747	-77.700541	185

LEGEND

- EXISTING / PROPOSED PERMANENT MAINTAINED TGPL RIGHT OF WAY WITHIN PROPOSED LOD
- PROPOSED LIMITS OF DISTURBANCE (LOD)
- PROPOSED 36" HILLTOP LOOP
- EXISTING PIPELINE
- EXISTING ROADWAY (PAVED)
- EXISTING ROADWAY (UNPAVED)
- PARCEL BOUNDARY
- EXISTING CONTOUR (10' C.I.)
- EXISTING CONTOUR (2' C.I.)
- UTILITY LINE/POLE
- EXISTING FENCE
- TREELINE
- CP CATHODIC PROTECTION DEVICE
- EXISTING BUILDING
- EXISTING CULVERT
- EXISTING FOREIGN PIPELINE

WETLANDS
- EMERGENT WETLAND (PEM)
- SCRUB SHRUB WETLAND (PSS)
- FORESTED WETLAND (PFO)
- OPEN WATER WETLAND (POW)
- PROPOSED PEM WETLAND IMPACT
- PROPOSED PSS WETLAND IMPACT
- PROPOSED PFO WETLAND IMPACT

STREAMS
- STREAM CHANNEL
- PROPOSED STREAM CHANNEL IMPACT

FLOODWAY
- FLOODWAY
- PROPOSED FLOODWAY IMPACT
- FEMA FEMA FLOODPLAIN

SURVEY NOTES:

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). EXISTING CONTOURS FOR OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES.

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
WATER OBSTRUCTION AND ENCROACHMENT IMPACT MAPS

CROSSING HL-3

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: FTN	DATE: 08/07/2019	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY: RJN	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE:	DRAWING NUMBER: 26-1000-70-09-20-D	SHEET 5 OF 10
WO: 1211227	RID:		

HYDROLOGIC & HYDRAULIC ANALYSIS

Transcontinental Gas Pipe Line Company, LLC

Hydrologic and Hydraulic Analysis

Leidy South Project – Hilltop Loop

September 2019

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1 HECRAS Calculation

2 StreamStats Report

1. Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. proposes to install and maintain a 36-inch diameter natural gas pipeline (Hilltop Loop) under Young Womans Creek in Chapman Township, Clinton County. The proposed temporary stream crossing is located at Latitude 41°22'11.04"N, Longitude 77°42'1.85"W on the Renovo East, Pennsylvania USGS 7.5 Minute Topographic Quadrangles

In respect to the streams and/or floodways crossings, the crossings will result in temporary impacts due to dewatering best management practices (BMP's) being installed (i.e. dam and pump, flume, cofferdam) and temporary bridges for access during construction only. Crossings will be restored to pre-construction contours once construction is completed. Because construction impacts will be temporary in nature and crossings will be restored to pre-construction contours, there will be no changes will occur from pre to post construction conditions as a result of the Project.

The temporary equipment bridge has an approximate length of 150 feet across the stream and a width of 16 feet along the stream. The piers are approximately 5 feet in height and 4 feet wide and are located at a maximum spacing of 25 feet. Young Womans Creek is included in a Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Clinton County. In the vicinity of the project, the FIS has established floodway and floodplain limits. The proposed temporary bridge is currently in an FIS Zone AE floodway.

2. Basis of Hydrologic and Hydraulic Analysis

The proposed temporary bridge crossing is a temporary structure. This Hydrologic and Hydraulic Analysis (H&H) analysis focuses on the 1-, 2-, 5-, and 10-year, 24-hour storms were examined for this report. Site specific topographic data taken from LIDAR mapping was utilized to analyze the flow regime of the stream for existing and temporary conditions.

3. Hydrology

The USGS StreamStats website was utilized to calculate the flows in the stream at the project site. The website provided a baseflow of 55.5 cubic feet per second (cfs), the 1-year, 24-hour storm flow of 1,800 cfs, 2-year, 24-hour storm flow of 2,450 cfs, 5-year, 24-hour storm flow of 3,840 cfs, and 10-year 24-hour storm flow of 4,860 cfs for Young Womans Creek (StreamStats report attached). These computed flow rates were used in the HEC-RAS analysis of Young Womans Creek.

4. Hydraulic Analysis

The existing and temporary stream conditions were modeled with the USCOE HEC-RAS software. The software calculated the flood conditions before and after the proposed temporary bridge and instream support (piers) were installed and the impacts of pier scouring. In addition, the modeling data will be used to minimize impacts to water surface elevations and velocities in the stream channel. The following sections present the findings of the HEC-RAS analyses for the proposed temporary site conditions.

5. Depiction of Proposed Conditions

HEC-RAS analyses were performed for the flow of 55.5 cfs, 1,800 cfs, 2,450 cfs, 3,840 cfs, and 4,860 cfs. The results were then analyzed to determine depth of flow and the depth of scouring for the selected storm events. Figure 1 and Table 1 represent the water elevation in the bridge section under different flow conditions. Table 2 is the pier scour calculations under selected flow conditions. Detailed results for conditions with and without the bridge are given in the Appendix A.

Figure 1. Upstream bridge section review under selected flow conditions.

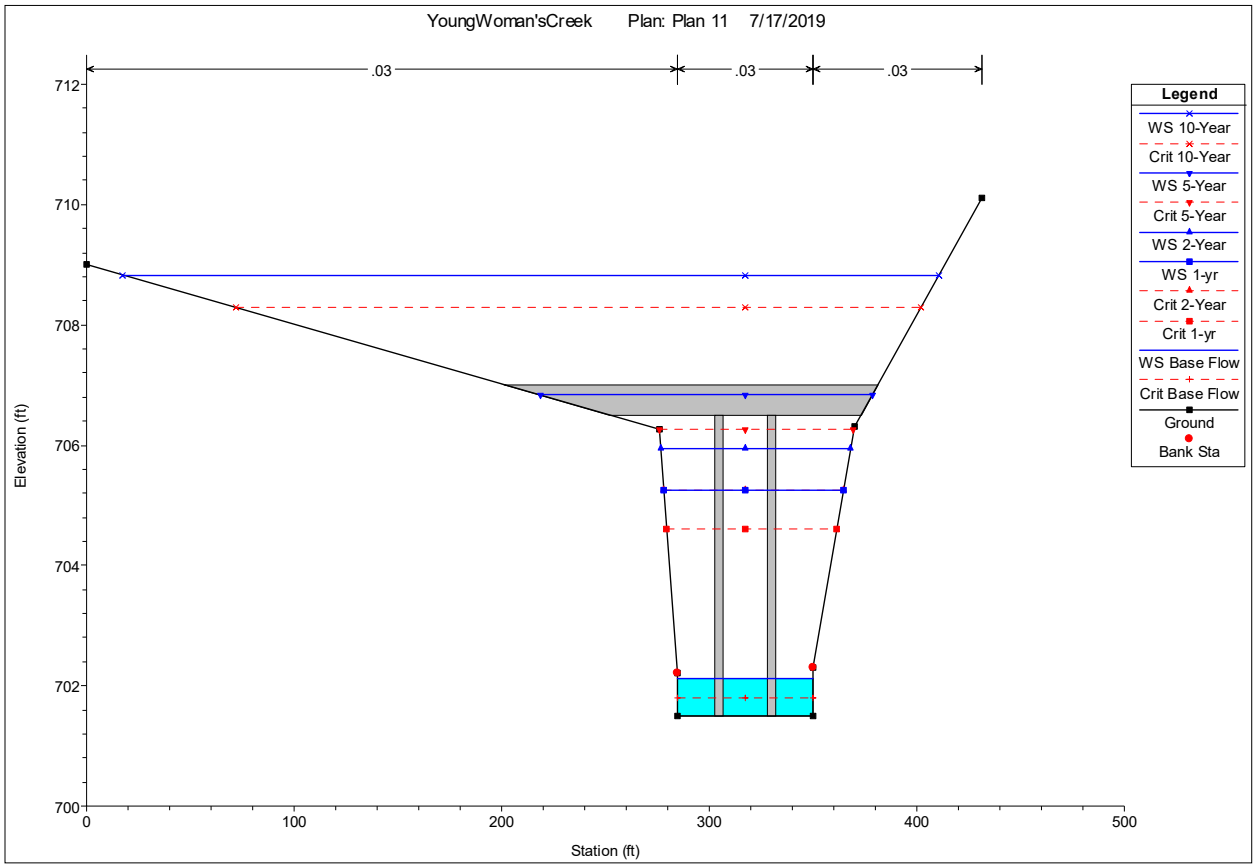


Table 1.
Surface water elevation and flow conditions of the proposed temporary bridge in Young Womans Creek.

Reach	River Station	Profile	Water Surface Elevation (ft)	Top Width (ft)	Q in Left overbank (cfs)	Q in Channel (cfs)	Q in Right overbank (cfs)	Velocity in Channel (ft/s)
CWC	197 BR U	Base Flow	702.12	57.75		55.5		1.57
CWC	197 BR U	1-year	705.28	78.71	44.06	1653.57	102.37	7.56
CWC	197 BR U	2-Year	705.98	83.55	77.7	2188.79	183.51	8.45
CWC	197 BR U	5-Year	706.88		75.08	3463.23	301.69	11.98
CWC	197 BR U	10-Year	708.89	400.73	1530.95	2721.08	607.97	6.58
CWC	197 BR D	Base Flow	702.07	57.69		55.5		1.69
CWC	197 BR D	1-year	704.99	76.71	38.86	1672.23	88.92	8.29
CWC	197 BR D	2-Year	705.62	81.08	68.88	2220.6	160.52	9.33
CWC	197 BR D	5-Year	706.55		80.47	3458.27	301.26	11.96
CWC	197 BR D	10-Year	708.25	329.86	1032.01	3276.6	551.39	8.81

Table 2.
Pier Scouring and Abutment Scouring under selected flow conditions

	Pier Scour		Abutment Scour Left		Abutment Scour Right	
	Ys (ft)	Froude #	Ys (ft)	Froude #	Ys (ft)	Froude #
Base Flow	1.1	0.3	N/A	N/A	N/A	N/A
1-year	6.81	0.54	N/A	N/A	N/A	N/A
2-Year	7.37	0.57	N/A	N/A	N/A	N/A
5-Year	7.21	0.39	9.90	0.23	11.12	0.33
10-Year	7.88	0.47	11.03	0.28	12.34	0.39

6. Conclusion

Based on the HEC-RAS analysis of proposed conditions, the temporary bridge equipment stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

References

FEMA Flood Map Service Center
https://msc.fema.gov/portal/search?AddressQuery=clinton#searchresultsanchor

ATTACHMENT 1
HECRAS CALCULATIONS

ATTACHMENT 1 – HECRAS CALCULATION

Table 1.
HECRAS results for existing conditions without the bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005655	10.01	272.95	76.18	0.83
CWC	700	5-Year	3840.00	703.50	708.84	708.84	711.00	0.007197	12.68	338.76	79.10	0.97
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005070	8.68	231.09	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.92		709.19	0.005236	9.68	284.62	80.68	0.80
CWC	675.00*	5-Year	3840.00	703.40	708.80	708.68	710.76	0.006502	12.14	356.62	84.03	0.92
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004812	8.47	238.68	78.46	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.03	0.004964	9.45	293.95	85.08	0.78
CWC	650.00*	5-Year	3840.00	703.30	708.75	708.54	710.56	0.005944	11.69	373.47	88.98	0.88
CWC	650.00*	10-Year	4860.00	703.30	709.27	709.26	711.55	0.006682	13.17	420.30	91.19	0.95
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004646	8.33	244.56	82.57	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.75		708.89	0.004721	9.24	302.94	89.50	0.76
CWC	625.00*	5-Year	3840.00	703.20	708.70	708.40	710.37	0.005461	11.28	390.17	93.99	0.85
CWC	625.00*	10-Year	4860.00	703.20	709.20	708.96	711.34	0.006258	12.79	437.97	98.73	0.92
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004501	8.20	249.94	86.66	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004565	9.09	309.90	93.84	0.75
CWC	600.00*	5-Year	3840.00	703.10	708.64	708.30	710.21	0.005105	10.96	404.77	99.00	0.82
CWC	600.00*	10-Year	4860.00	703.10	709.14	708.78	711.15	0.005888	12.46	455.56	107.46	0.89
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004432	8.14	253.39	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.56		708.64	0.004435	8.97	316.05	98.14	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.56	708.21	710.06	0.004902	10.76	416.45	105.23	0.81
CWC	575.00*	10-Year	4860.00	703.00	709.09	708.83	710.97	0.005470	12.08	475.27	115.55	0.86
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004387	8.09	255.90	94.50	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.46		708.52	0.004346	8.88	320.80	102.32	0.73

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.47	708.07	709.93	0.004746	10.60	427.22	112.49	0.79
CWC	550.00*	10-Year	4860.00	702.90	709.04	708.77	710.80	0.005079	11.71	495.29	122.99	0.83
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004376	8.06	257.10	98.20	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.36		708.41	0.004280	8.81	324.53	106.47	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.38	707.92	709.79	0.004579	10.43	438.17	119.25	0.78
CWC	525.00*	10-Year	4860.00	702.80	708.99	708.68	710.65	0.004748	11.39	514.76	130.97	0.81
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004407	8.07	256.74	101.79	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004234	8.76	327.15	110.51	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.29	707.88	709.66	0.004431	10.28	448.31	125.68	0.77
CWC	500.00*	10-Year	4860.00	702.70	708.91	708.60	710.51	0.004589	11.22	529.86	140.74	0.79
CWC	500.00*	1-yr	1800.00	702.70	706.57		707.51	0.004531	8.13	253.54	105.01	0.73
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.15		708.20	0.004226	8.74	327.99	114.38	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.20	707.84	709.54	0.004306	10.14	457.33	131.69	0.76
CWC	475.00*	10-Year	4860.00	702.60	708.81	708.50	710.39	0.004517	11.14	542.17	151.43	0.79
CWC	475.00*	1-yr	1800.00	702.60	706.35	706.05	707.39	0.005088	8.44	240.30	105.01	0.77
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.03		708.09	0.004254	8.75	327.50	118.81	0.73
CWC	450.00*	5-Year	3840.00	702.50	708.11	707.77	709.42	0.004176	10.01	466.30	137.52	0.75
CWC	450.00*	10-Year	4860.00	702.50	708.72	708.36	710.26	0.004431	11.04	554.48	162.31	0.78
CWC	450.00*	1-yr	1800.00	702.50	706.19	705.86	707.26	0.005349	8.55	232.68	100.08	0.79
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.89	706.60	707.99	0.004374	8.83	323.55	122.89	0.73
CWC	425.00*	5-Year	3840.00	702.40	708.03	707.68	709.30	0.004056	9.88	474.54	143.17	0.73
CWC	425.00*	10-Year	4860.00	702.40	708.63	708.23	710.15	0.004339	10.93	566.34	173.30	0.77
CWC	425.00*	1-yr	1800.00	702.40	706.04	705.47	707.13	0.005443	8.56	228.46	94.77	0.79
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004286	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.69	706.33	707.87	0.004792	9.09	310.11	125.22	0.77
CWC	400.00*	5-Year	3840.00	702.30	707.94	707.60	709.19	0.003946	9.76	482.14	149.02	0.73
CWC	400.00*	10-Year	4860.00	702.30	708.54	708.13	710.03	0.004234	10.81	578.42	184.66	0.76

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	705.91	705.43	706.99	0.005454	8.51	226.13	88.29	0.79
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004261	1.99	27.83	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.50	706.12	707.75	0.005121	9.27	298.13	121.99	0.79
CWC	375.00*	5-Year	3840.00	702.20	707.85	707.51	709.09	0.003874	9.68	488.10	156.00	0.72
CWC	375.00*	10-Year	4860.00	702.20	708.45	708.06	709.91	0.004115	10.68	591.01	196.68	0.75
CWC	375.00*	1-yr	1800.00	702.20	705.79	705.32	706.85	0.005339	8.39	226.70	80.89	0.78
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004226	1.97	28.14	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.37	705.64	707.62	0.005113	9.23	294.59	116.03	0.79
CWC	350.00*	5-Year	3840.00	702.10	707.76	707.39	708.99	0.003809	9.61	492.89	162.60	0.71
CWC	350.00*	10-Year	4860.00	702.10	708.37	707.96	709.80	0.003991	10.54	603.22	208.81	0.74
CWC	350.00*	1-yr	1800.00	702.10	705.71		706.70	0.004941	8.11	232.24	73.80	0.75
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004164	1.95	28.50	59.42	0.50
CWC	325.00*	2-Year	2450.00	702.00	706.25	705.65	707.49	0.005007	9.11	294.15	109.07	0.78
CWC	325.00*	5-Year	3840.00	702.00	707.66	707.25	708.89	0.003737	9.53	497.48	169.16	0.71
CWC	325.00*	10-Year	4860.00	702.00	708.30	707.89	709.68	0.003835	10.36	617.74	222.20	0.73
CWC	325.00*	1-yr	1800.00	702.00	705.62		706.56	0.004688	7.92	238.07	75.58	0.73
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.004025	1.91	29.03	60.65	0.49
CWC	300.00*	2-Year	2450.00	701.90	706.17	705.56	707.34	0.004766	8.91	297.99	102.19	0.76
CWC	300.00*	5-Year	3840.00	701.90	707.58	707.13	708.78	0.003638	9.42	503.13	176.02	0.70
CWC	300.00*	10-Year	4860.00	701.90	708.24	707.75	709.57	0.003635	10.13	636.16	237.32	0.71
CWC	300.00*	1-yr	1800.00	701.90	705.54		706.43	0.004429	7.72	244.61	77.94	0.71
CWC	275.00*	Base Flow	55.50	701.80	702.29		702.34	0.003637	1.84	30.17	61.90	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.11		707.21	0.004389	8.61	306.30	94.78	0.73
CWC	275.00*	5-Year	3840.00	701.80	707.50	706.97	708.69	0.003547	9.32	507.42	182.91	0.69
CWC	275.00*	10-Year	4860.00	701.80	708.20	707.56	709.46	0.003404	9.87	658.24	254.31	0.69
CWC	275.00*	1-yr	1800.00	701.80	705.47		706.31	0.004116	7.49	252.70	80.26	0.69
CWC	250.00*	Base Flow	55.50	701.70	702.21		702.26	0.003007	1.72	32.20	63.16	0.43
CWC	250.00*	2-Year	2450.00	701.70	706.08		707.07	0.003898	8.20	318.96	88.44	0.69
CWC	250.00*	5-Year	3840.00	701.70	707.42	706.66	708.59	0.003424	9.19	513.34	190.47	0.68
CWC	250.00*	10-Year	4860.00	701.70	708.17	707.49	709.36	0.003145	9.56	685.12	272.61	0.66
CWC	250.00*	1-yr	1800.00	701.70	705.41		706.19	0.003789	7.24	261.89	82.56	0.66

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.15		702.19	0.002234	1.56	35.50	64.44	0.37
CWC	225.00*	2-Year	2450.00	701.60	706.04		706.96	0.003533	7.88	331.75	89.70	0.66
CWC	225.00*	5-Year	3840.00	701.60	707.35	706.14	708.49	0.003297	9.05	519.11	199.51	0.67
CWC	225.00*	10-Year	4860.00	701.60	708.16	707.52	709.25	0.002877	9.22	716.40	292.72	0.64
CWC	225.00*	1-yr	1800.00	701.60	705.36		706.08	0.003460	6.98	272.10	84.79	0.63
CWC	200	Base Flow	55.50	701.50	702.11		702.14	0.001527	1.38	40.13	65.75	0.31
CWC	200	2-Year	2450.00	701.50	706.01		706.85	0.003213	7.59	344.88	91.72	0.63
CWC	200	5-Year	3840.00	701.50	707.30	706.11	708.40	0.003137	8.87	528.21	214.63	0.65
CWC	200	10-Year	4860.00	701.50	708.15	707.47	709.16	0.002604	8.86	753.42	314.30	0.61
CWC	200	1-yr	1800.00	701.50	705.31		705.98	0.003143	6.72	283.10	86.94	0.61
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.25	706.22	707.74	0.005327	10.81	587.88	211.94	0.83
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

Table 2
HECRAS results for proposed conditions with the temporary bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005645	10.00	273.10	76.18	0.83
CWC	700	5-Year	3840.00	703.50	709.07	708.84	711.01	0.006156	12.05	356.65	79.88	0.90
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005066	8.67	231.15	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.93		709.19	0.005226	9.67	284.79	80.69	0.80
CWC	675.00*	5-Year	3840.00	703.40	709.07	708.68	710.80	0.005373	11.41	379.88	85.09	0.85
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004807	8.47	238.75	78.47	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.04	0.004953	9.44	294.16	85.09	0.78
CWC	650.00*	5-Year	3840.00	703.30	709.06		710.62	0.004790	10.89	401.35	90.30	0.80
CWC	650.00*	10-Year	4860.00	703.30	709.38	709.26	711.55	0.006224	12.87	430.43	91.72	0.92
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004641	8.33	244.66	82.58	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.76		708.89	0.004709	9.23	303.21	89.52	0.76
CWC	625.00*	5-Year	3840.00	703.20	709.05		710.47	0.004297	10.42	422.89	95.62	0.76
CWC	625.00*	10-Year	4860.00	703.20	709.33	708.96	711.36	0.005791	12.48	450.74	101.76	0.89
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004495	8.20	250.06	86.67	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004550	9.08	310.24	93.86	0.75
CWC	600.00*	5-Year	3840.00	703.10	709.00		710.34	0.004008	10.13	441.35	104.63	0.74
CWC	600.00*	10-Year	4860.00	703.10	709.30	708.78	711.18	0.005298	12.04	473.56	110.95	0.85
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004425	8.13	253.53	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.57		708.64	0.004418	8.96	316.47	98.16	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.97		710.21	0.003687	9.79	462.11	113.33	0.71
CWC	575.00*	10-Year	4860.00	703.00	709.29	708.83	711.00	0.004810	11.57	498.30	119.35	0.81
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004378	8.08	256.08	94.51	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.47		708.52	0.004326	8.87	321.30	102.35	0.73

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.95		710.10	0.003380	9.46	483.75	121.28	0.68
CWC	550.00*	10-Year	4860.00	702.90	709.22	708.77	710.86	0.004625	11.38	516.78	130.62	0.80
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004364	8.06	257.34	98.22	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.37		708.41	0.004257	8.80	325.15	106.52	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.93		709.99	0.003097	9.13	506.08	128.83	0.65
CWC	525.00*	10-Year	4860.00	702.80	709.14	708.68	710.73	0.004488	11.24	534.30	143.48	0.79
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004389	8.06	257.11	101.82	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004207	8.74	327.92	110.56	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.90		709.90	0.002877	8.87	527.93	139.27	0.63
CWC	500.00*	10-Year	4860.00	702.70	709.06	708.60	710.61	0.004335	11.08	552.45	156.94	0.78
CWC	500.00*	1-yr	1800.00	702.70	706.59		707.52	0.004463	8.09	255.01	105.12	0.72
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.16		708.20	0.004192	8.72	328.98	114.46	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.84		709.82	0.002785	8.77	546.80	154.69	0.62
CWC	475.00*	10-Year	4860.00	702.60	708.99	708.50	710.49	0.004172	10.91	570.72	170.55	0.76
CWC	475.00*	1-yr	1800.00	702.60	706.40	706.05	707.40	0.004854	8.31	245.05	106.73	0.75
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.04		708.10	0.004210	8.72	328.85	119.01	0.72
CWC	450.00*	5-Year	3840.00	702.50	708.80		709.74	0.002660	8.63	567.88	171.05	0.61
CWC	450.00*	10-Year	4860.00	702.50	708.93	708.36	710.37	0.003979	10.70	591.08	185.22	0.74
CWC	450.00*	1-yr	1800.00	702.50	706.27	705.86	707.28	0.004898	8.31	241.35	103.64	0.76
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.93		708.00	0.004237	8.73	327.77	123.51	0.72
CWC	425.00*	5-Year	3840.00	702.40	708.76		709.66	0.002513	8.44	591.18	188.37	0.59
CWC	425.00*	10-Year	4860.00	702.40	708.88	708.23	710.25	0.003763	10.45	613.57	200.99	0.72
CWC	425.00*	1-yr	1800.00	702.40	706.15	705.47	707.16	0.004883	8.26	238.86	99.64	0.75
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004282	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.81	706.33	707.90	0.004243	8.72	326.37	127.63	0.72
CWC	400.00*	5-Year	3840.00	702.30	708.74		709.59	0.002345	8.22	617.56	206.79	0.57
CWC	400.00*	10-Year	4860.00	702.30	708.84	708.13	710.14	0.003519	10.17	639.49	218.20	0.70

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	706.03	705.43	707.03	0.004809	8.18	237.73	94.68	0.75
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004254	1.99	27.85	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.71	706.12	707.79	0.004216	8.69	325.05	131.16	0.72
CWC	375.00*	5-Year	3840.00	702.20	708.72		709.52	0.002164	7.96	647.42	226.39	0.55
CWC	375.00*	10-Year	4860.00	702.20	708.81	708.06	710.03	0.003252	9.85	669.58	237.05	0.68
CWC	375.00*	1-yr	1800.00	702.20	705.94		706.90	0.004637	8.04	239.22	88.96	0.73
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004208	1.97	28.17	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.61	705.64	707.68	0.004133	8.60	324.18	131.41	0.71
CWC	350.00*	5-Year	3840.00	702.10	708.71		709.45	0.001983	7.69	679.90	246.62	0.53
CWC	350.00*	10-Year	4860.00	702.10	708.80	707.96	709.92	0.002980	9.51	702.81	256.84	0.65
CWC	350.00*	1-yr	1800.00	702.10	705.85		706.77	0.004389	7.84	243.25	82.84	0.71
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004137	1.94	28.56	59.43	0.49
CWC	325.00*	2-Year	2450.00	702.00	706.53	705.65	707.57	0.003957	8.44	326.29	127.78	0.70
CWC	325.00*	5-Year	3840.00	702.00	708.70		709.38	0.001801	7.40	716.24	267.68	0.50
CWC	325.00*	10-Year	4860.00	702.00	708.79	707.89	709.83	0.002702	9.14	740.97	277.93	0.62
CWC	325.00*	1-yr	1800.00	702.00	705.80		706.65	0.003971	7.53	251.75	77.78	0.68
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.003936	1.90	29.22	60.66	0.48
CWC	300.00*	2-Year	2450.00	701.90	706.46	705.56	707.46	0.003723	8.23	331.26	124.19	0.68
CWC	300.00*	5-Year	3840.00	701.90	708.70		709.32	0.001624	7.10	756.72	289.44	0.48
CWC	300.00*	10-Year	4860.00	701.90	708.79		709.73	0.002428	8.75	784.25	300.07	0.59
CWC	300.00*	1-yr	1800.00	701.90	705.75		706.53	0.003635	7.26	261.20	79.67	0.65
CWC	275.00*	Base Flow	55.50	701.80	702.30		702.35	0.003511	1.82	30.50	61.91	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.41		707.35	0.003442	7.98	338.81	119.52	0.66
CWC	275.00*	5-Year	3840.00	701.80	708.70		709.27	0.001462	6.80	799.40	311.50	0.46
CWC	275.00*	10-Year	4860.00	701.80	708.79		709.65	0.002177	8.37	830.01	322.57	0.56
CWC	275.00*	1-yr	1800.00	701.80	705.70		706.43	0.003313	7.00	271.59	82.08	0.62
CWC	250.00*	Base Flow	55.50	701.70	702.22		702.27	0.002828	1.69	32.81	63.17	0.41
CWC	250.00*	2-Year	2450.00	701.70	706.38		707.25	0.003143	7.69	349.00	114.52	0.63
CWC	250.00*	5-Year	3840.00	701.70	708.70		709.22	0.001313	6.51	844.90	333.67	0.43
CWC	250.00*	10-Year	4860.00	701.70	708.80		709.57	0.001947	8.00	878.90	345.27	0.53
CWC	250.00*	1-yr	1800.00	701.70	705.66		706.33	0.003001	6.73	282.98	84.46	0.60

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

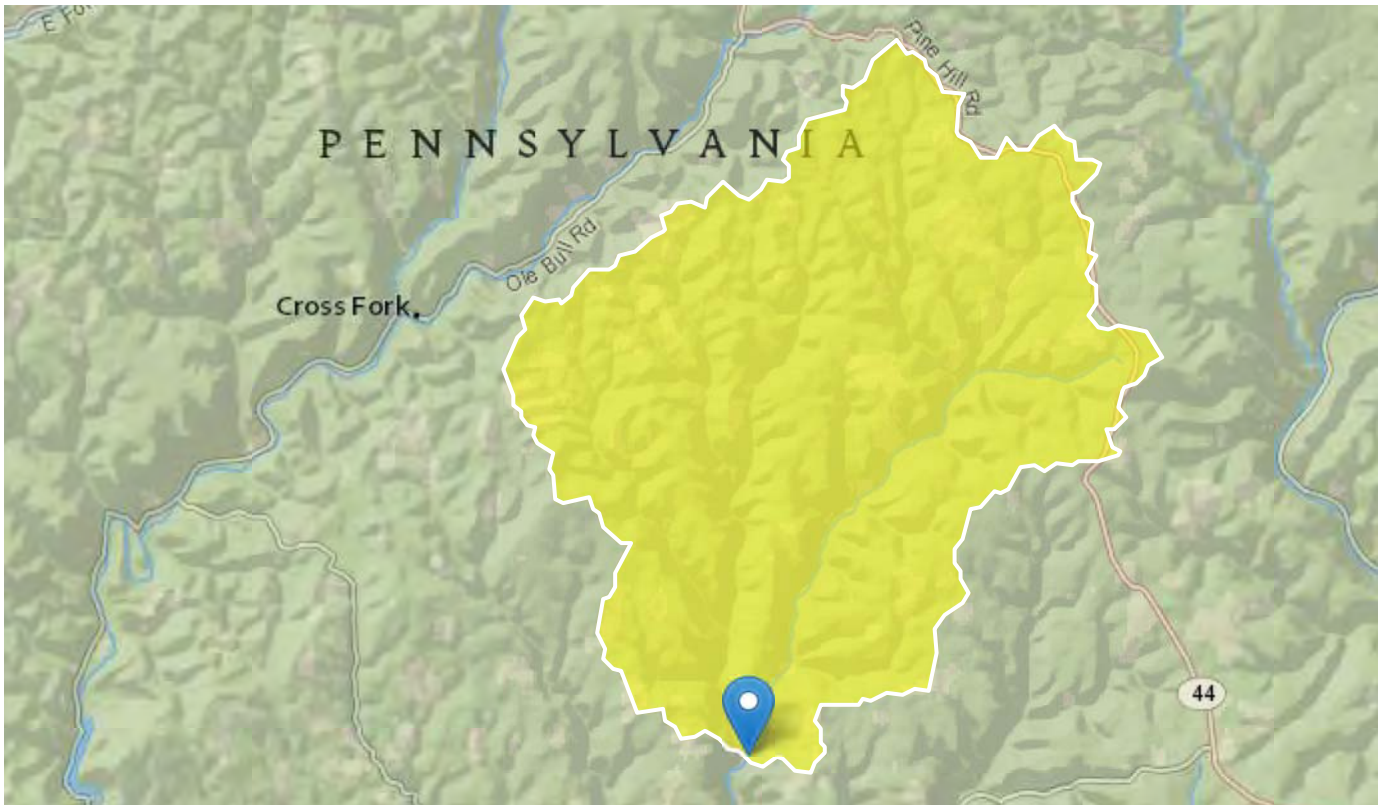
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.17		702.20	0.002052	1.52	36.43	64.46	0.36
CWC	225.00*	2-Year	2450.00	701.60	706.35		707.15	0.002840	7.39	361.13	108.03	0.60
CWC	225.00*	5-Year	3840.00	701.60	708.70		709.17	0.001176	6.22	893.69	356.38	0.41
CWC	225.00*	10-Year	4860.00	701.60	708.81		709.50	0.001738	7.63	931.41	368.50	0.50
CWC	225.00*	1-yr	1800.00	701.60	705.63		706.25	0.002704	6.46	295.27	86.73	0.57
CWC	200	Base Flow	55.50	701.50	702.13	701.78	702.16	0.001385	1.34	41.33	65.77	0.30
CWC	200	2-Year	2450.00	701.50	706.33	704.96	707.06	0.002543	7.07	375.41	101.49	0.57
CWC	200	5-Year	3840.00	701.50	708.71	706.11	709.13	0.001051	5.94	946.20	379.36	0.39
CWC	200	10-Year	4860.00	701.50	708.81	707.47	709.44	0.001547	7.27	988.01	392.04	0.47
CWC	200	1-yr	1800.00	701.50	705.60	704.34	706.17	0.002430	6.20	308.23	88.92	0.54
CWC	197		Bridge									
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.22	706.22	707.74	0.005454	10.90	581.93	210.49	0.84
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

ATTACHMENT 2
STREAMSTATS REPORT

StreamStats Report

Region ID: PA
Workspace ID: PA20190506151156786000
Clicked Point (Latitude, Longitude): 41.36948, -77.70108
Time: 2019-05-06 11:12:11 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	84.1	square miles
ELEV	Mean Basin Elevation	1765	feet
CARBON	Percentage of area of carbonate rock	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0	percent

Peak-Flow Statistics Parameters [100 Percent (83.9 square miles) Peak Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	84.1	square miles	1.44	1610
ELEV	Mean Basin Elevation	1765	feet	457	2150
CARBON	Percent Carbonate	0	percent	0	99
STORAGE	Percent Storage	0	percent	0	22.6

Peak-Flow Statistics Flow Report [100 Percent (83.9 square miles) Peak Flow Region 3]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	2450	ft^3/s	31	31	3
5 Year Peak Flood	3840	ft^3/s	28	28	5
10 Year Peak Flood	4860	ft^3/s	28	28	7
50 Year Peak Flood	7320	ft^3/s	31	31	11
100 Year Peak Flood	8460	ft^3/s	36	36	11
500 Year Peak Flood	11400	ft^3/s	43	43	11

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2008, Regression equations for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2008-5102, 57p. (http://pubs.usgs.gov/sir/2008/5102/)

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Application Version: 4.3.0

From: UPS Quantum View
To: Kevin Clark
Subject: UPS Delivery Notification, Tracking Number 1Z8797VV0396509907
Date: Friday, September 20, 2019 1:17:44 PM

Your package has been delivered.

Delivery Date: Friday, 09/20/2019
Delivery Time: 11:46 AM

At the request of WHM CONSULTING, INC this notice alerts you that the status of the shipment listed below has changed.

Shipment Detail

Tracking Number:	1Z8797VV0396509907
Ship To:	Township Supervisors Chapman Township Supervisors 196 MAIN ST NORTH BEND, PA 17760 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	1.0 LBS
Delivery Location:	RECEIVER ROWE
Reference Number 1:	Williams 202

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REQUIREMENT Q

RISK ASSESSMENT ANALYSIS

RISK ASSESSMENT

A Risk Assessment was conducted for the Hensel Replacement and Hilltop Loop, as part of Leidy South Project. The assessment has taken into consideration the Floodplain Management Analysis and Stormwater Management Analysis included within Requirements O and P of the Permit Application.

In respect to the Stormwater Management, no increase in peak rates of stormwater runoff is proposed. The Erosion and Sediment Plan and Post Construction Stormwater Management (PCSM) Plan are designed to mitigate against an increase in peak rates, as discussed in Requirement O of the permit application.

In respect to the streams and/or floodways crossings, the crossings will result in temporary impacts due to dewatering best management practices (BMP's) being installed (i.e. dam and pump, flume, cofferdam) and temporary bridges for access during construction only. Crossings will be restored to pre-construction contours once construction is completed. Because construction impacts will be temporary in nature and crossings will be restored to pre-construction contours, there will be no changes will occur from pre to post construction conditions as a result of the Project.

Based on the Hydrologic and Hydraulic Analysis in Requirement N, the proposed temporary bridge equipment stream crossing across Young Womans Creek will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

REQUIREMENT R

PROFESSIONAL'S SEAL

The professional engineer's seal has been included on the cover of the Chapter 105 Impact drawings included in Requirement H.

REQUIREMENT S

ALTERNATIVE ANALYSIS

Transcontinental Gas Pipe Line Company, LLC

Requirement S – Alternatives Analysis

Leidy South Project – Hensel Replacement and Hilltop Loop

September 2019

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ALTERNATIVE ANALYSIS

1.0 Introduction

Transco is proposing the Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland. The Project consists of the following components:

- 6.3 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hensel Replacement) and the related abandonment of 5.8 miles of existing 23.375-inch pipeline on Leidy Line A;
- 2.4 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hilltop Loop);
- 3.5 miles of 42-inch pipeline loop along Transco's Leidy Line in Lycoming County, Pennsylvania (Benton Loop);
- Existing Compressor Station 605 (Wyoming County, Pennsylvania);
    - Increase the total certificated horsepower of the two electric motor-driven units from 30,000 horsepower (HP) to 42,000 HP and modifications to existing coolers;
- New Compressor Station 607 (Luzerne County, Pennsylvania);
    - Install two gas turbine-driven compressor units (23,465 nominal HP at International Organization for Standardization [ISO] conditions each, 46,930 HP total) and gas coolers;
- Existing Compressor Station 610 (Columbia County, Pennsylvania);
    - Add one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions) and gas cooling;

  - Increase the total certificated horsepower of the two electric motor-driven units from 40,000 HP to 42,000 HP and re-wheel the existing compressors;
- New Compressor Station 620 (Schuylkill County, Pennsylvania);
  - Install one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions);
- Ancillary facilities, such as mainline valves (MLVs), communication facilities, cathodic protection and pig launchers and receivers in Pennsylvania.

Subject to FERC approval of the Project and receipt of the necessary permits and authorizations, Transco anticipates that construction of the Project will commence in winter 2020/2021 to meet a target in-service date of December 1, 2021.

This alternatives analysis is consistent with the Federal Energy Regulatory Commission's (FERC) regulatory requirements as set forth in 18 Code of Federal Regulations 380.15 and 25 PA. Code § 105.13(e)(viii). Thus, it contains a detailed analysis of alternatives to the proposed action, including alternative locations, routings or designs to avoid or minimize environmental impacts.

2.0 No-Action Alternative

Under the No-Action Alternative, the Project would not be constructed or operated. The potential environmental impacts of construction and operation of the Project would not occur; however, this alternative would not meet the purpose and need for the Project.

The No-Action Alternative would prevent Transco from providing 582,400 Dth/d of incremental firm transportation capacity to Transco's River Road Regulator Station in Lancaster County, Pennsylvania. In addition, this alternative would prevent Transco from providing additional takeaway capacity from the Marcellus and Utica Shale production areas to support future gas production, and from supporting the overall reliability and diversification of energy infrastructure along the Atlantic seaboard.

The No-Action Alternative would not meet the purpose of the Project, which is to alleviate the constrained takeaway capacity from the Marcellus and Utica Shale production areas and support the overall reliability and diversification of energy infrastructure along the Atlantic seaboard. This assessment is based, in part, on an analysis of existing Transco facilities in or

near the Project area, which do not provide adequate pipeline takeaway capacity for transportation of natural gas to meet current transportation demand (see Section 10.4).

If the No-Action Alternative is selected, Transco's customers will need to:

- Seek other transportation services;
- Forgo meeting their natural gas demand until energy conservation measures stabilize or decrease demand, possibly limiting their growth and the growth of the local economies they serve; and
- Depend on other future development projects with unpredictable schedules and undetermined environmental impacts.

Because existing alternative sources of energy, conservation, and other projects are currently impractical, not available, and/or insufficient to meet the transportation demand addressed by the Project, the No-Action Alternative cannot be the proposed alternative. The No-Action Alternative does not meet the Project objectives of providing the additional transportation capacity of natural gas requested by its customers within the required time frame.

3.0 Design Alternatives

Transco's Precedent Agreements with Seneca Resources Corporation, Cabot Oil & Gas Corporation and UGI Utilities require Transco to provide the requested incremental capacity from the existing Leidy Hub and Zick Receipt Point to Transco's River Road Regulator Station in Lancaster County, Pennsylvania. Transco completed hydraulic modeling to identify the scope of facilities and facility modifications required to meet the Project's purpose and need. Then, as outlined in the following sections, evaluated these alternatives to determine which set of facilities provided the best opportunity to avoid and minimize environmental impacts while still meeting the contractual obligations of the project.

3.1 System Alternatives

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the purpose and need of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Project, although some modifications or additions to another existing pipeline system may be required to increase its capacity, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impacts that could be less than, similar to, or potentially greater than those associated with the proposed Project.

In order to be a viable system alternative to the proposed Project, potential system alternatives must meet three criteria:

- The system must be capable of transporting up to 582,400 Dth/d of natural gas to growing markets in Transco's Zone 6;
- The system alternative must be capable of transporting the required volumes within the same schedule as the proposed Project;
- Use of an alternative system must be able to meet the criteria above and at the same time result in reduced environmental impacts when compared to the proposed Project.

3.1.1 Existing Pipeline Systems

Transco operates the Transco Leidy Line system, Central Penn Line (CPL) system, and the Mainline system within the Project area. Transco's existing systems do not have any available unsubscribed capacity to service the volume under contract for the Project. Therefore, Transco's systems currently are not capable of providing an incremental 582,400 Dth/d of year-round firm transportation capacity from the Marcellus and Utica Shale production areas in northern and western Pennsylvania to Transco's Mainline at the River Road Regulator Station in Lancaster County, Pennsylvania.

Transco has identified four other existing interstate natural gas transmission pipeline systems in the Project area: Columbia Gas Transmission, LLC; Dominion Energy Transmission, Inc.; Tennessee Gas Pipeline; and Texas Eastern Transmission, LP. Based on review of unsubscribed capacity, none of these existing pipeline systems are presently capable of transporting the 582,400 Dth/d without expansion of their existing systems or construction of new systems (Columbia Gas Transmission, LLC 2019; Dominion Energy, Inc. 2019; Tennessee Gas Pipeline Company L.L.C. 2019; Texas Eastern Transmission, LP 2019).

Transco does not have access to the proprietary design criteria and operational data of other pipeline operators' respective systems; however, enough public information is available to estimate the systems capabilities. Using this information, Transco concludes that these existing pipeline systems are not presently capable of transporting the required volumes without expansion of their existing system or construction of a new system to meet the Project objective of providing an incremental 582,400 Dth/d of year-round firm transportation capacity from the Marcellus and Utica Shale production areas in northern and western Pennsylvania to Transco's

Mainline at the River Road Regulator Station in Lancaster County, Pennsylvania. Furthermore, modifications to any other company's pipeline system would likely require an interconnect with, and expansion of, Transco's Mainline system to transport incremental volumes to Transco's existing market areas. Such modifications or additions would result in environmental impacts that could be equal to or greater than those associated with the proposed Project.

3.1.2 System Alternatives Analysis Conclusion

Without the expansion and modifications proposed for the Project, Transco's existing facilities lack the capacity to transport additional volumes needed while maintaining the delivery volume commitments to its existing customers. Transco's proposed Project can achieve its objectives and maintain the overall system integrity, safety, and reliability for both new and existing customers. Transco believes that its design is as efficient as, or more efficient than, system alternatives that could be proposed to provide the same service. Since Transco can construct its facilities with construction and mitigation measures that would minimize environmental impacts, likely comparable to or less than system alternatives, system alternatives were not considered to be preferable to this Project.

3.2 Route Alternatives

Transco's Precedent Agreements with Seneca Resources Corporation, Cabot Oil & Gas Corporation, and UGI Utilities require Transco to provide the requested incremental capacity from the existing Leidy Hub and Zick Receipt Point to Transco's River Road Regulator Station. Transco completed hydraulic modeling to identify the segments on its existing Leidy Line system that will require upgrades to achieve the Project's purpose and need:

- MP 183.55 to MP 186.01 (Proposed Hilltop Loop);
- MP 188.51 to Leidy Hub at MP 194.00 (Proposed Hensel Replacement); and
- MP 116.95 to MP 120.44 (Proposed Benton Loop).

The locations of the pipeline loops and replacements were selected in areas that will allow Transco to install the proposed Leidy Line D from the Leidy Hub to MP 116.95 while co-locating with Transco's existing right-of-way (ROW). Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. Based on the results, the proposed 36-inch and 42-inch diameter pipelines are required to meet the necessary Project demand. Further, the diameters of the proposed pipeline loops and replacement match the diameters of the existing

Leidy Line, thereby reducing the need for additional MLV facilities containing pig launchers/receivers and minimizing the need for further aboveground facilities.

3.2.1 Hilltop Loop

The Hilltop Loop is co-located with the existing Leidy Line ROW. Once constructed and in operation, Transco will refer to the Hilltop Loop as Leidy Line D. Typically, deviations from existing ROW result in additional construction impacts, additional installation costs, and additional operating procedures (e.g., two separate ROWs to maintain instead of one). Pipeline loops are usually shorter and more hydraulically efficient than deviations because of their placement adjacent to the existing pipeline. For these reasons, Transco has not developed any route alternatives for the Hilltop Loop.

3.2.2 Hensel Replacement

The Hensel Replacement involves replacement of the capacity of the existing 23.375-inch Leidy Line A with 6.3 miles of 36-inch pipe. Transco proposes to abandon and remove 5.8 miles of the existing 23.375-inch Leidy Line A except for the section within the Tamarack Swamp Natural Area and adjacent wetlands (approximately 0.8 mile), which will be abandoned in place and grouted to limit impacts to the Tamarack Swamp Natural Area and adjacent wetlands.

The Hensel Replacement crosses Sproul State Forest for 5.5 miles. Transco developed the proposed alignment of the Hensel Replacement to minimize overall impacts within the Sproul State Forest and based on input received from the DCNR during the pre-survey meeting held April 19, 2019. Beginning at MP 188.51, the proposed Hensel Replacement follows Transco's ROW for Leidy Lines A, B, and C to MP 190.59, where Leidy Line C crosses over Leidy Lines A and B and runs along its own ROW to the southwest. From here, the Hensel Replacement continues along the A and B Lines' ROW to MP 192.93. The Hensel Replacement exits the Leidy Lines A and B ROW at this location and follows an electric transmission line ROW to the south for approximately 0.3 mile, where it joins the Leidy Line C ROW at MP 193.10. The purpose of this deviation from the Leidy Lines A and B ROW is to avoid disturbance of the Tamarack Swamp Natural Area. Per the Clinton County Natural Heritage Inventory, maintenance or removal of the existing pipelines through this natural area is unadvised as doing so could lead to disruption of the biological community (Western Pennsylvania Conservancy 2019). The Hensel Replacement then follows the Leidy Line C ROW to its terminus at MP 194.00.

As part of the proposed Hensel Replacement, and as requested by the DCNR, Transco also plans to regrade, where necessary, the portion of the Leidy Line A and Leidy Line B ROW from MPs 190.60 to 192.93. The ROW in this area is "two-toned," with the grade over Leidy Line A ranging approximately 20 to 40 feet higher in elevation than the grade over the Leidy Line B. Transco will regrade the ROW in this area to restore approximate original contours.

Transco considered five alternative routes to the proposed Hensel Replacement to further minimize impacts on environmental resources within Sproul State Forest (see Figure 10A-6).

3.2.2.1 Hensel Replacement Alternative 1

Hensel Replacement Alternative 1 is a lift and lay alternative that would remove 5.8 miles of the existing Leidy Line A and replace it with 5.8 miles of a new 36-inch pipe within the existing Leidy Line A trench. This was Transco's initial planned alignment as it is the straightest and shortest route between the Hensel Replacement start and end points. Table 2-5 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 1. This alternative would require construction of 0.5 mile less pipeline than the proposed Hensel Replacement. In addition, the alternative would cross approximately 2.8 miles less forested land than the proposed route. However, Hensel Replacement Alternative 1 would involve surface disturbance (i.e., open cut) along 0.8 mile of the Tamarack Swamp Natural Area and adjacent wetlands. The surface disturbance associated with crossing the Tamarack Swamp Natural Area and adjacent wetlands would also require ATWS south of the existing Leidy Line B, resulting in additional tree clearing.

Table 2-5
Hensel Replacement Alternative 1 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 1	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	5.8	+0.5
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.8	+0.2
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.8	+0.5

Table 2-5
Hensel Replacement Alternative 1 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 1	Difference between Proposed Route and Alternative Route
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	55.9	+15.8
Pipeline Operation Requirements (acres)[b]	6.0	0.0	+6.0
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0	0.5	-0.5
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	3.3	-3.3
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	2.9	-2.9
Land Use			
Forested Land Crossed (miles)[c]	4.6	1.8	+2.8
Forested Land Construction Impacts (acres)[c]	52.3	20.9	+31.4
Forested Land Operation Impacts (acres)[c]	3.6	0.0	+3.6
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, i]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.6	-0.5
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	0.7	-0.6
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	0.2	-0.2
Sensitive Wetlands Crossed (number) [i]	3	1	+2

Table 2-5
Hensel Replacement Alternative 1 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 1	Difference between Proposed Route and Alternative Route
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	8	+3
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	0.0

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on a preliminary permanent ROW developed for comparison of alternatives.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

3.2.2.2 Hensel Replacement Alternative 2

Hensel Replacement Alternative 2 makes use of a horizontal directional drill (HDD) to avoid trenching through the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 2 includes replacement of approximately 4.7 miles of

the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximate MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 2, Transco would complete a 0.8-mile HDD installation of 36-inch pipe from MP 192.93 to MP 193.74 near the current alignment of Leidy Line A across the Tamarack Swamp Natural Area. From MP 193.74 to the Leidy Hub, Transco would replace the remaining 0.3 mile within the existing Leidy Line A ROW. Table 2-6 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 2.

Table 2-6
Hensel Replacement Alternative 2 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 2	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	5.9	+0.4
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.4	+0.6
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.4	+0.7
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	63.3	+8.4
Pipeline Operation Requirements (acres)[b]	6.0	35.6	-29.6
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.5	-0.5
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			
Forested Land Crossed (miles)[c]	4.6	2.2	+2.4
Forested Land Construction Impacts (acres)[c]	52.3	30.2	+22.1
Forested Land Operation Impacts (acres)[c]	3.6	13.8	-10.2
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0

Table 2-6
Hensel Replacement Alternative 2 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 2	Difference between Proposed Route and Alternative Route
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.3	-0.2
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	0.7	-0.6
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	0.5	-0.5
Sensitive Wetlands Crossed (number) [l]	5	4	+1
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	7	+4
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

Table 2-6
Hensel Replacement Alternative 2 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 2	Difference between Proposed Route and Alternative Route

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 2 would require construction of 0.4 mile less pipeline than the proposed Hensel Replacement. Additionally, Hensel Replacement Alternative 2 would avoid surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands. No tree clearing within the Tamarack Swamp Natural Area would be required for construction of Hensel Replacement Alternative 2. However, tree clearing and wetland impacts would be unavoidable to complete the geotechnical studies necessary to determine the feasibility of an HDD associated with this alternative. PADCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for this alternative; as such, Transco did not pursue additional analysis related to the impacts associated with the geotechnical studies.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 2 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the Tamarack Swamp Natural Area. In order to complete the HDD, ATWS would be required for staging of the HDD

equipment and a pullback area for the pipe. The workspaces would require tree clearing outside of Transco's existing ROW.

Transco performed a preliminary HDD feasibility analysis for the Hensel Replacement Alternative 2 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells., and a gas storage well facility operated by Dominion Energy, Inc. Transco typically avoids siting HDD alignments near existing water and gas storage wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered noise-sensitive areas (NSAs). Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The HDD feasibility analysis used desktop information from the Natural Resource Conservation Service (NRCS) and USGS to evaluate geologic conditions (NRCS 2018). The desktop analysis indicated that the likelihood of encountering challenging soils, such as glacial till, in the Project area is very high. Glacial till consists of variable soil types—specifically, interbedded gravel, cobbles, and boulders. The presence of glacial till deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns, ultimately putting the HDD at risk for failure.

3.2.2.3 Hensel Replacement Alternative 3

Hensel Replacement Alternative 3 makes use of an HDD to avoid trenching through the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 3 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximate MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 3, Transco would complete an HDD across the Tamarack Swamp Natural Area westward for approximately 0.7 mile from MP 192.93 to MP 193.55. From the end of the HDD, Alternative 3 would follow the alignment of the proposed Hensel Replacement for 0.7 mile to its terminus at the Leidy Hub. Table 2-7 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 3.

Table 2-7
Hensel Replacement Alternative 3 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 3	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	6.1	+0.2
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.5	+0.5
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.5	+0.8
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	60.1	+11.6
Pipeline Operation Requirements (acres)[b]	6.0	37.1	-31.1
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 4.8	0 / +0.7
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.3	-0.3
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			
Forested Land Crossed (miles)[c]	4.6	2.2	+2.4
Forested Land Construction Impacts (acres)[c]	52.3	26.6	+25.7
Forested Land Operation Impacts (acres)[c]	3.6	14.8	-11.2
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0

Table 2-7
Hensel Replacement Alternative 3 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 3	Difference between Proposed Route and Alternative Route
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	<0.1	0.0
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	1.9	-1.8
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	1.8	-1.8
Sensitive Wetlands Crossed (number) [l]	3	1	+2
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	9	+2
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

Table 2-7
Hensel Replacement Alternative 3 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 3	Difference between Proposed Route and Alternative Route

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 3 would require construction of 0.2 mile less pipeline than the proposed Hensel Replacement. Hensel Replacement Alternative 3 avoids pipeline trenching within the Tamarack Swamp Natural Area by utilizing an HDD through this area. However, Transco would need to collect geotechnical bores within the natural area and adjacent wetlands to further investigate the feasibility of an HDD crossing. The HDD alignment through the natural area is a mixture of Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS) and Palustrine Forested (PFO) wetlands. Consequently, in order to gain access to geotechnical bore locations, approximately 1.1 acres of wetlands within Tamarack Swamp Natural Area would be impacted. In comparison, the proposed Hensel Replacement would not require any geotechnical studies or tree clearing within the Tamarack Swamp Natural Area.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 3 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the swamp. In order to

complete the HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. Similar to Hensel Replacement Alternative 2 above, the workspace needed would require tree clearing outside of Transco's existing ROW. While no permanently cleared ROW would be needed through the Tamarack Swamp Natural Area, Transco would need to obtain a License for Right-of-Way on State Forest Land for the pipeline.

Due to the alignment of the HDD of Hensel Replacement Alternative 3, Transco could use the existing Leidy Lines A and B ROW for the HDD pullback area. The workspaces would require tree clearing outside of Transco's existing ROW. Hensel Replacement Alternative 3 would require new permanent ROW across the Tamarack Swamp Natural Area and adjacent wetlands, and within the natural area portion of the Foley Tract[1], a USFWS migratory bird habitat area.

Transco performed a preliminary HDD feasibility analysis for Alternative 3 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells. Transco typically avoids siting HDD alignments near existing water wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered NSAs. Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The desktop analysis of the HDD alternatives used information from NRCS and USGS to evaluate geologic conditions (NRCS 2018). Based on the information from NRCS and USGS, the likelihood of challenging soils, such as glacial till, is very high. Glacial till consists of variable soil types, specifically interbedded gravel, cobbles, and boulders. The presence of glacial till

[1] The Foley Tract was acquired by the DCNR in 2003, and portions of the tract are proposed for inclusion in the Tamarack Swamp Natural Area. Transco's existing easement across the Foley Tract is 75 feetwide, with rights for an additional 25 feet of temporary workspace for the construction of an additional line. Transco is not seeking modifications to its existing easement.

deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns; ultimately putting the HDD at risk for failure.

3.2.2.4 Hensel Replacement Alternative 4

Hensel Replacement Alternative 4 makes use of an HDD to avoid trenching through to the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 4 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximately MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 4, Transco would complete an HDD across the Tamarack Swamp Natural Area northwestward for approximately 0.7 mile from MP 192.93 to MP 193.78. From the end of the HDD, Alternative 4 would parallel Leidy Line A and Leidy Line B for 0.3 mile its terminus at the Leidy Hub. Table 2-8 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 4.

Table 2-8
Hensel Replacement Alternative 4 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 4	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	5.8	+0.5
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.2	+0.8
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.2	+1.1
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	62.8	+8.9
Pipeline Operation Requirements (acres)[b]	6.0	35.0	-29.0
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.5	-0.5
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			

Table 2-8
Hensel Replacement Alternative 4 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 4	Difference between Proposed Route and Alternative Route
Forested Land Crossed (miles)[c]	4.6	1.8	+2.8
Forested Land Construction Impacts (acres)[c]	52.3	23.7	+28.6
Forested Land Operation Impacts (acres)[c]	3.6	11.7	-8.1
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.6	-0.5
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	3.5	-3.4
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	3.3	-3.3
Sensitive Wetlands Crossed (number) [l]	3	1	+2
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	8	+3
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

Table 2-8
Hensel Replacement Alternative 4 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 4	Difference between Proposed Route and Alternative Route

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 4 would require construction of 0.5 mile less pipeline than the proposed Hensel Replacement. Additionally, Alternative 4 would avoid surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands. No tree clearing within the Tamarack Swamp Natural Area would be required for construction of Hensel Replacement Alternative 4. However, tree clearing and wetland impacts would be unavoidable to complete the geotechnical studies necessary to determine the feasibility of an HDD associated with this alternative. PADCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for this alternative. As such, Transco did not pursue additional analysis related to the impacts associated with the geotechnical studies.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 4 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the Tamarack Swamp Natural Area. Similar to Hensel Replacement Alternative 2 and 3 above, in order to complete the

HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. The workspaces would require tree clearing outside of Transco's existing ROW. Hensel Replacement Alternative 4 would create a new ROW across the Tamarack Swamp Natural Area and adjacent wetlands. While no permanently cleared ROW would be needed through the Tamarack Swamp Natural Area, Transco would need to obtain a License for Right-of-Way on State Forest Land for the pipeline.

Transco performed a preliminary HDD feasibility analysis for the Alternative 4 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells, and a gas storage well facility operated by Dominion Energy, Inc. Transco typically avoids siting HDD alignments near existing water wells and gas storage wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered NSAs. Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The HDD feasibility analysis used desktop information from the NRCS and USGS to evaluate geologic conditions (NRCS 2018). The desktop analysis indicated that the likelihood of encountering challenging soils, such as glacial till, in the Project area is very high. Glacial till consists of variable soil types, specifically interbedded gravel, cobbles, and boulders. The presence of glacial till deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns, ultimately putting the HDD at risk for failure.

3.2.2.5 Hensel Replacement Alternative 5

Hensel Replacement Alternative 5 is primarily located on the Sproul State Forest (see Table S3.F-9 and Figure 10A-6). Hensel Replacement Alternative 5 would follow Transco's Leidy Line A, Leidy Line B, and Leidy Line C ROW for approximately 3.1 miles, from MP 188.51 to 190.58. From here, Hensel Replacement Alternative 5 would deviate from the Leidy Line A and

Leidy Line B ROW and follow Transco's Leidy Line C ROW for approximately 3.0 miles before terminating at the Leidy Hub

Transco considered this alternative to avoid the Tamarack Swamp Natural Area, which crosses the Leidy Line A and Leidy Line B ROW from MP 192.93 to 193.74. This alternative would require construction of 0.2 mile less pipeline than the proposed Hensel Replacement. Both routes would have similar impacts to forested areas, wetlands and waterbodies.

Table 2-9
Hensel Replacement Alternative 5 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 5	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	6.1	+0.2
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	6.1	-0.1
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.6	-0.6
Total Length Co-located (miles)	6.3	6.1	+0.2
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	93.1	21.4
Pipeline Operation Requirements (acres)[b]	6.0	37.0	-31.0
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.0	0.0
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			
Forested Land Crossed (miles)[c]	4.6	2.8	+1.8
Forested Land Construction Impacts (acres)[c]	52.3	51.5	+0.8
Forested Land Operation Impacts (acres)[c]	3.6	17.5	-13.9
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	2.2	-0.3
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	1	-1

Table 2-9
Hensel Replacement Alternative 5 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 5	Difference between Proposed Route and Alternative Route
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	3	+2
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	3	+2
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.1	-0.1
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	0.2	-0.1
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	0.1	-0.1
Sensitive Wetlands Crossed (number) [l]	3	1	+2
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	8	+3
Railroad Crossings (number)	0	0	0

Table 2-9
Hensel Replacement Alternative 5 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 5	Difference between Proposed Route and Alternative Route
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	0.9	0.0
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement Alternative 5 includes potential workspace needed for abandonment of Leidy Line A.
[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.
[c] Forested land crossed and impacted based on USGS NLCD.
[d] Agricultural land crossed and impacted based on USGS NLCD.
[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.
[f] Waterbodies identified based on NHD.
[g] Major waterbodies identified based on review of aerial photographs.
[h] Wetlands identified using the NWI.
[i] National Registered sites were identified using desktop data.
[j] Length determined perpendicular to slope contour.
[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.
[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:
NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

The proposed Hensel Replacement was selected over Hensel Replacement Alternative 5 because it provides the opportunity to install the proposed Leidy Line D and remove a portion of the existing Leidy Line A within the same proposed workspaces, reducing overall impacts within Sproul State Forest. Transco is also able to meet DCNR's request to regrade a portion of the Leidy Line A and Leidy Line B ROW to approximate original contours within the workspace of the proposed alignment, which would not be possible under Hensel Replacement Alternative 5.

3.2.2.6 Hensel Replacement Conclusion

Transco used desktop analysis and identified the need to avoid disturbance to the Tamarack Swamp Natural Area, adjacent wetlands, and other resources including Sproul State Forest. Transco subsequently considered a number of route alternatives which avoided and/or

minimized impacts to these resources, both through the use of HDD technology (Alternatives 2, 3, and 4), and by deviating from the Leidy Line A ROW (Alternative 5). Transco coordinated with DCNR throughout the final route selection process and ultimately identified a proposed alignment that avoids the Tamarack Swamp Natural Area while also minimizing overall impacts to the Sproul State Forest. Additional discussion regarding Transco's final evaluation of each Hensel Replacement alternative is provided below

Hensel Replacement Alternative 1 was eliminated due to the required surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands.

Hensel Replacement Alternatives 2, 3, and 4, each of which include an HDD crossing of the Tamarack Swamp Natural Area and adjacent wetlands, were eliminated for a number of reasons. As previously discussed, desktop data indicate a risk of encountering problematic soils and bedrock along the HDD alignment of each alternative, which increases the risk of drill failure and/or inadvertent returns. Further investigation to determine drill feasibility would include geotechnical studies within the Tamarack Swamp Natural Area. These geotechnical studies would require surface disturbance and tree removal within the Tamarack Swamp Natural Area and adjacent wetlands. As such, Transco does not propose geotechnical studies to further investigate the HDD alternatives.

An HDD crossing of the Tamarack Swamp Natural Area would also result in greater impacts to residential areas compared to the proposed Hensel Replacement due to the HDD workspace requirements, while the HDD alignment itself would pose a risk to residential private water wells. Furthermore, the HDD alignments for Hensel Replacement Alternatives 2 and 4 would be in proximity to a gas storage well facility operated by Dominion Energy, Inc. Finally, the DCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for Alternatives 2 and 4. While the DCNR did not express concerns related to the length of the Alternative 3 HDD, Transco eliminated this alternative from further consideration based on the additional impacts associated with the required geotechnical studies.

In conclusion, based on the above analysis, Transco believes that the proposed Hensel Replacement provides the greatest opportunity to avoid and minimize environmental impacts to Sproul State Forest in comparison to any of the HDD alternatives.

3.2.3 Leidy A Line Abandonment Alternatives

Transco considered three methodologies for abandonment of the existing Leidy Line A associated with the Hensel Replacement. All options would be designed in accordance with USDOT regulations in 49 CFR Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards.* The three alternative methodologies are:

- **Removal** – physical removal of the abandoned portion of the pipeline;
- **Nitrogen Purge** – leave the pipeline in place, and purge the abandoned portion of pipeline of gas using nitrogen; and
- **Grouting** – filling the abandoned portion of the pipeline with grout.

Removal of the pipeline would require excavation along the entire abandonment. All environmental resources within the section of abandonment would be temporarily impacted, including the Tamarack Swamp Natural Area. If the pipeline was removed, a portion of the existing ROW could be reforested.

Nitrogen purging would require the least amount of disturbance initially during abandonment; however, purging would require Transco to continue maintaining the existing pipeline and associated cathodic protection system. In addition, the nitrogen purging reduces the ability for the existing ROW to be reforested.

Grouting the pipeline would require temporary excavation in various locations along the abandonment for installation of grout. The proposed locations for excavation would be selected following a field survey and would be sited to minimize impacts on environmentally sensitive resources to the extent practical. Once the pipeline is grouted, the pipeline would no longer require maintenance or cathodic protection. This alternative also provides the ability for a portion of the existing ROW to be reforested since the pipeline would no longer be maintained and would require less disturbance than a full pipeline removal.

3.2.3.1 Leidy A Line Abandonment Conclusion

In order to minimize impacts to the extent practicable and through coordination with PADCNR during the License for ROW on State Forest Land permitting process, Transco selected a combination of removal and grouting as the proposed methodology for the Leidy Line A abandonment. Prior to the abandonment, Leidy line A will be cleaned internally with cleaning pigs outfitted with magnets & brushes designed to scrub the inside of the pipe and collect lose ferrous

material. The cleaning process with be documented. Once the pipe has been cleaned, the line will be purged of natural gas and either removed in sections or abandoned in place. The sections of Leidy line A abandoned in place will be sealed on each end and purged with grout.

As requested by the DCNR, Transco plans to regrade the portion of the Leidy Lines A and B ROW from MP 191.10 to 192.55. The ROW in this area is "two-toned," with the grade over Leidy Line A ranging approximately 20 to 40 feet higher in elevation than the grade over Leidy Line B. Transco will regrade the ROW in this area to restore approximate original contours along this portion of the ROW. Because Transco will already be conducting ground-disturbing activities in this area to meet the DCNR's request, Transco is proposing to remove the existing Leidy Line A, with the exception of the portion of the Leidy Line A within the Tamarack Swamp Natural Area and adjacent wetlands (approximately 0.8 mile), which will be abandoned in place and grouted. In addition, the DCNR expressed a preference for pipeline removal or grouting during a pre-survey meeting and site visit with the DCNR on April 19, 2019.

4.0 Impact Minimization of the Proposed Alternative

4.1 Pipeline Workspace

Construction of the pipeline facilities will require the acquisition of temporary construction ROWs, additional temporary workspace (ATWS), and permanent (operational) easements along the entire length of each pipeline route. Transco proposes to utilize the following nominal ROWs during construction of the pipeline facilities:

- A 90-foot-wide construction ROW for installation of the 36-inch-diameter Hensel Replacement, including removal of a portion of Leidy Line A;
- A 90-foot-wide construction ROW for installation of the 36-inch-diameter Hilltop Loop; and

The Hilltop Loop is entirely co-located with the existing Transco Leidy Line System. The Hensel Replacement is co-located for 95 percent of its length. Transco proposes the construction ROWs to provide for safe and efficient construction of large diameter pipeline facilities in accordance with OSHA regulations (29 CFR 1926.650-1926.652, Subpart P) and Interstate Natural Gas Association of America's (INGAA's) workspace guidelines (INGAA 1999). Reductions or "neck-downs" of the construction ROW at resource crossings were employed to avoid and minimize resource impacts.

In wetlands, a 75-foot-wide construction ROW will be used, except where Transco has requested provided site-specific justification, as outlined in Table 3-1. During pipeline

construction, machinery operates on one side of the trench (working side), and excavated materials is stockpiled on the other side (non-working side). At most wetland crossings, this workspace has been necked down to 75 feet. In a reduced 75-foot-wide ROW, the proposed working side of the ROW is typically 45 feet wide.

Table 3-1
Site-Specific Justification for Exceeding 75-foot Nominal Workspace in Wetlands

Facility	Wetland Feature ID	Approximate Milepost	Feature Type	ROW Width	Justification
Hensel Replacement					
	W3-T1-HR	193.64	Wetland	90	This particular wetland crossing is at a location along the Hensel Replacement alignment where the proposed route is between two active pipelines, one being a foreign pipeline. Due to length of wetland crossing and being between the two active pipelines the full 90' nominal workspace is necessary to facilitate a safe and efficient wetland crossing.
Hilltop Loop					
	W3-T7a-HL	183.55	Wetland	315	This wetland crossing abuts an existing valve site which is proposed for removal located at the eastern terminus of Hilltop Loop. Due to limited access, the proximity of the wetland to the eastern terminus of the project, and the proposed removal of the location existing valve site, the wetland impact is unavoidable.
	W1-T4-HL	184.93	Wetland	175	Due to being located at toe of steep slope and adjacent to large stream crossings (Young Womans Creek) and associated foreign lines, additional workspace is required due to limited space between these restricting features.
	W3-T2-HL	185.05	Wetland	145	Due to the location of the roadside wetland swale feature associated with Little Italy Road, additional workspace is required due to limited usable workspace between steep slopes, including two road crossings, additional workspace is needed for stockpiling of excavated materials and installing BMPs to facilitate safe and efficient crossings at this location.

Within the top of bank (TOB) of streams, a 50-foot-wide construction ROW will be used, and a 75-foot-wide construction ROW will be used in floodways, except where Transco has provided site-specific justification, as outlined in Table 3-2. During pipeline construction, machinery operates on one side of the trench (working side), and excavated materials is stockpiled on the other side (non-working side). At most stream crossings, this workspace has been necked down to 50 feet within the TOB and 75 feet in the floodway. Within TOB, in a reduced 50-foot-wide ROW, the proposed working side of the ROW is typically 32 feet wide. Within floodways, in a reduced 75-foot-wide ROW, the proposed working side of the ROW is typically 45 feet wide.

Table 3-2
Site-Specific Justification for Exceeding 50-foot Nominal Workspace in the Top of Bank of Streams and 75-foot in Floodways

Facility	Watercourse Feature ID	Approximate Milepost	Feature Type	ROW Width	Justification
Hensel Replacement					
	S12-T6-HR	189.05	Stream	75	Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing.
	S9-T6-HR	190.36	Stream	75	Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing.
	S7-T7-HR	190.47	Stream	75	Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing.
	S1-T7-HR	190.69	Stream & Floodway	90	Due to steep terrain including side slope construction, associated wetlands crossing and associated BMPs, installation of Hensel Replacement, and removal of Leidy Line A, additional workspace is needed to facilitate a safe and efficient watercourse crossing.

Table 3-2
Site-Specific Justification for Exceeding 50-foot Nominal Workspace in the Top of Bank of Streams and 75-foot in Floodways

Facility	Watercourse Feature ID	Approximate Milepost	Feature Type	ROW Width	Justification
	S1-T7-HR	190.99	Stream & Floodway	75 (Stream) 115 (Floodway)	Due to steep terrain including side slope construction, associated wetlands crossing and associated BMPs, installation of Hensel Replacement, and removal of Leidy Line A, additional workspace is needed to facilitate a safe and efficient watercourse and floodway crossing.
	S1-T1-HR	193.88	Stream	75	This particular stream crossing is at a location along the Hensel Replacement alignment where the proposed route is adjacent to other active pipelines, and the crossing of associated large wetland complex (W1-T1-HR) to the south, additional workspace is needed to facilitate a safe and efficient watercourse crossing.
Hilltop Loop					
	S1-T4-HL	184.97	Stream & Floodway	90 (Stream) 300 (Floodway)	Due to steep terrain on either side of crossing location, existing infrastructure, foreign lines, two road crossings, size of Young Womans Creek, associated wetland crossings, and lack of available usable workspace, additional workspace is needed to facilitate a safe and efficient watercourse crossing.

These wetland, stream, and floodway workspace neck downs are the most reasonable neck downs for pipeline installation within these resources, as it will still allow for required workspace to complete the construction activities while minimizing environmental impacts. These reductions to the workspace are considered the maximum reductions for the safe operation and passage of equipment and personnel while minimizing the length of time required to cross the features.

4.1.1 Construction Technique Alternatives

Transco evaluated the feasibility of implementing trenchless construction techniques to cross sensitive areas. These techniques may be used in an attempt to reduce impacts associated with construction in comparison with using conventional (trenching) construction techniques.

While use of trenchless methods can reduce impacts on or avoid sensitive areas, these methods have limitations that must be considered before a method is selected as the proposed construction method for a given crossing. The following sections outline the factors that will be evaluated when selecting the proposed construction method for a given crossing.

4.1.1.1 Trenchless Analysis

A trenchless analysis was conducted for each wetland and watercourse crossing to determine if conventional bore (bore) or horizontal directional drill (HDD) would be feasible construction method. Each crossing was first assessed to determine if conventional bore would be the suitable construction method. The conventional bore is first reviewed since it is a lower cost and lower risk trenchless method than the HDD. If a conventional bore is feasible, a review for HDD suitability was not completed. If it was determined that conventional boring was not feasible, an assessment was then completed to determine if an HDD would be a feasible construction method. Should neither trenchless method has been found suitable, it was then determined that a dry-open cut methodology would be completed. Below is a summary of the trenchless analysis for both the conventional bore and HDD. Attachment 1 includes a flow chart that is utilized during the trenchless analysis.

<u>Conventional Bore Analysis</u>

Conventional bores are not practical for avoiding wetland resources. To complete a conventional bore, a significant amount of workspace required for the activity. Clearing within the permanent ROW is required during pipeline operation to ensure that root systems of trees do not compromise the pipe coating, and to allow for aerial inspection of the alignment, whether an open cut or conventional bore is used. Additionally, wetlands would need to be cleared during construction for a travel lane to facilitate movement of construction equipment along the ROW. Therefore, even if a conventional bore were completed, there would be minimal impact reductions to the resource by utilizing the conventional bore installation method versus an open-cut and there would be significant increases in impacts to resources outside of the wetlands to accommodate the workspace required for a conventional bore. Therefore, conventional bores are not practical for avoiding wetland resources and Transco did not select the conventional bore crossing technique for wetland crossings associated with this Project.

For streams, the conventional bore assessment occurred in phases, as shown in Attachment 1. Phase I of the stream assessment included a topography evaluation that considered the bore length and depth of each crossing, in addition to proximity to adjacent

infrastructure, such as roads. If the bore was less than 300 feet in length, it was considered potentially feasible. The typical maximum length that a conventional bore can be successfully completed is 300 feet. Should the length be longer than 300 feet, the crossing moved on to the HDD assessment. The 300 feet includes the stream, wetland, and floodway widths, with 20 feet offset, in addition to the bore pit dimensions, which are generally 40 feet by 60 feet in size.

The bore pit depth was evaluated, as special considerations must occur if a bore pit exceeds 20 feet. At depths greater than 20 feet, standard trench boxes are not tall enough to protect the integrity of the pit walls, and significant benching and spoil storage will be required, thereby necessitating a significantly larger footprint for workspace. Therefore, conventional bores were not considered for crossings where the depth of the bore pit would be greater than 20 feet.

If a feature is in the immediate vicinity of existing infrastructure, such as roadways that are proposed for boring, a conventional bore is considered appropriate. The construction method can be completed for both crossings (stream and/or wetland and infrastructure) as the boring can capture both features within the same bore, given their close proximity and that the adjacent roadway must be bored.

Streams and wetlands associated with the Hensel Replacement and Hilltop Loop were not deemed feasible for the conventional bore.

Horizontal Directional Drilling Analysis

Phase I of the wetland assessment involved feature characteristic review of the wetlands as well as the total acreage of PFO wetland impacted at the crossing. There were two qualifiers for HDD workspace to be developed related to wetland impacts: the wetlands are either to be located within a special protection watershed or classified as Exceptional Value (EV) in 25 PA Code Chapter 105.17. Due to the temporary nature of impacts, wetlands located outside of special protection watersheds or not classified as EV were not considered in Phase I of the wetland assessment. The qualifying wetlands were then reviewed for their acreage of PFO wetland impact. Crossings with PFO wetland impacts exceeding one acre, along with location in a special protection watershed or an EV wetland status move on to the Phase III of the assessment (there is no Phase II of the wetland assessment) and potential HDD workspace would be developed. Wetlands designated either PEM or PSS were not identified for potential HDD workspace development as no vegetative cover type change occurs in PEM wetlands and only minimal changes occur PSS wetlands due to the 10-foot corridor over the pipe being maintained as

emergent cover to allow for pipeline inspection. PFO wetland crossings with impacts of less than one acre were not identified for Phase III or Phase IV consideration because the risks and impacts (i.e. workspace requirements, noise, and inadvertent returns) associated with an HDD crossing categorically outweigh the benefits in these wetlands. Additionally, the ROW is allowed to revert to pre-existing condition within 15 feet of the pipeline and impacts to PFO wetlands have been minimized to the extent practicable with the workspace, as designed. No wetlands continued past Phase I of the HDD assessment as no wetlands had PFO impacts greater than one acre.

Phase I of the stream assessment involved a feature characteristic review of the streams. Streams located within special protection watersheds were identified for Phase II consideration. All streams crossed by the Project are located within special protection watersheds and were therefore included in the Phase II assessment.

Phase II of the stream assessment considered the width of the streams that passed the Phase I review. Streams greater than 30 feet in width were considered feasible for workspace development to complete an HDD and identified for Phase III and Phase IV consideration. Smaller streams were not identified for Phase III or Phase IV consideration because the risks and impacts (i.e. workspace requirements, noise) associated with an HDD crossing categorically outweigh the benefits in these smaller streams. The dry-open cut methodology is an effective construction methodology that minimizes crossing time and avoids the risk of an inadvertent return. Based on the Phase II review, Young Womans Creek (S1-T4-HL), Drury Run (S2 T7a-HR), Paddy Run (S1-T7-HR), and Hensel Fork (S1-T7-HR at MP.190.69) were identified for Phase III and Phase IV consideration.

Phase III-A of the analysis included a desktop analysis of the following items related to workspace required for the HDD:

- Impacted Wetland Acreage
  - PFO
  - PEM
  - PSS
- Impacted Upland Acreage
- Land Use
- Water Consumption
- Noise generated by construction equipment
- Air emissions generated by construction equipment

- Anticipated construction durations

Phase III-B included a risk assessment for the completion of the HDD. The assessment provides an analysis of the following risk factors:

- Site Constraints and Topographic Considerations
- Elevation Differential and Dry Hole
- Hole Stability
- Obstructions
- Pilot Hole Steering
- Drilling Fluid Loss, Hydraulic Fracture and Inadvertent Returns
- Poor Cuttings Removal
- Hole Obstructions and Flushing
- Downhole Tooling Failure/Loss
- Time of Installation

Based on the Phase III assessment, crossings were not considered infeasible and were not identified for Phase IV consideration, as outlined in Attachment 2 – Trenchless Analysis Feasibility Study. As a result of the HDD component of the Trenchless Analysis, all crossings qualified for the dry-open cut construction.

5.0 Summary

An alternatives analysis has been prepared for the proposed Project, consistent with the requirements of PA Code 105.13(e)(vii). The alternatives analysis has taken a multi-tier approach, first looking at the system alternatives for Project design options, and then taking the selected system design and evaluating the alternatives, avoidance and minimization measures, and construction techniques associated with the proposed alternative design. The Project as proposed has minimized impacts to environmental resources, while meeting the Project goals. Construction measures and methods were thoroughly evaluated to minimize effects to environmental resources, including streams and wetlands. The Project is considered water dependent, as it requires siting within water to fulfill the basic purposes of the Project, as defined by PA Code 105.13(e)(x)(C). Based upon the results of the analysis, the proposed Project meets the Project goals and is consistent with state antidegradation requirements.

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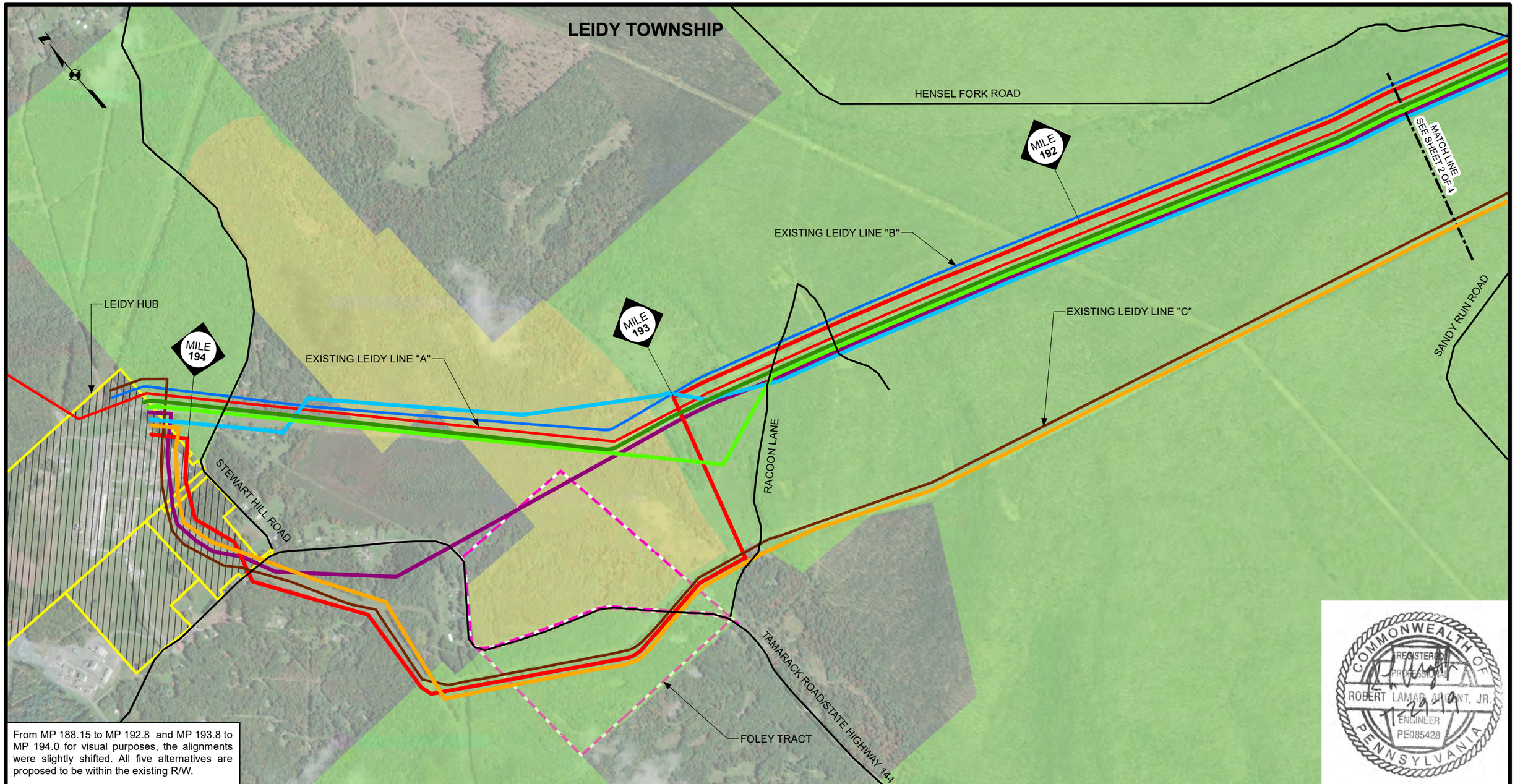
FIGURES



From MP 188.15 to MP 192.8 and MP 193.8 to MP 194.0 for visual purposes, the alignments were slightly shifted. All five alternatives are proposed to be within the existing R/W.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT LAMAR ARGANT, JR.
ENGINEER
PE085428
2-29-19

Legend

- PROPOSED 36" HENSEL REPLACEMENT
- HENSEL REPLACEMENT ALTERNATIVE 1
- HENSEL REPLACEMENT ALTERNATIVE 2
- HENSEL REPLACEMENT ALTERNATIVE 3
- HENSEL REPLACEMENT ALTERNATIVE 4
- HENSEL REPLACEMENT ALTERNATIVE 5
- LEIDY HUB
- TAMARACK SWAMP NATURAL AREA
- SPROUL STATE FOREST BOUNDARY
- EXISTING LEIDY LINE "A"
- EXISTING LEIDY LINE "B"
- EXISTING LEIDY LINE "C"
- EXISTING LEIDY LINE "D"
- FOLEY TRACT

0 500 1000 1,500 2,000
SCALE IN FEET

0 0.1 0.2 0.4
SCALE IN MILES

HGA
HUNT, GUILLOT & ASSOCIATES, LLC
ONE METROPLEX DRIVE, SUITE 100
BIRMINGHAM, AL 35209
PHONE: 205-970-4977

DRAWING NO.	REFERENCE TITLE
	Figure 10A-6

TRANSCONTINENTAL GAS PIPE LINE, LLC
ROUTE VARIATION MAP-AERIAL
LEIDY SOUTH PROJECT
PROPOSED 36" HENSEL REPLACEMENT
M.P 188.51 TO M.P 194.00
CLINTON COUNTY, PENNSYLVANIA

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	03/01/2019	HGA	ISSUED FOR REVIEW	1211223		
B	04/12/2019	HGA	ISSUED FOR FERC DRAFT	1211223		
C	04/12/2019	HGA	RE-ISSUED FOR FERC DRAFT	1211223		
D	07/02/2019	HGA	ISSUED FOR FERC FILING	1211223		
E	07/29/2019	HGA	RE-ISSUED FOR FERC FILING	1211223		

DRAWN BY: HGA	DATE: 01/03/2019	ISSUED FOR BID:	SCALE: 1" = 1000'
CHECKED BY: HGA	DATE: 01/03/2019	ISSUED FOR CONSTRUCTION:	REVISION: E
APPROVED BY: HGA	DATE: 01/03/2019	NUMBER: FP-HENS-D_EX	SHEET 1 OF 4
W.O 1211223	RID: 02/11/2019		

LEIDY TOWNSHIP

CHAPMAN TOWNSHIP

EXISTING LEIDY LINE "A"

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "D"

MILE 189

BIG RIDGE TRAIL

EXISTING LEIDY LINE "C"

MILE 190

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "B"

EXISTING LEIDY LINE "A"

MILE 191

CHAPMAN TOWNSHIP

LEIDY TOWNSHIP

HENSEL FORK ROAD

MATCH LINE SEE SHEET 1 OF 4

SANDY RUN ROAD

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT LAMAR ALLGANT, JR.
ENGINEER
PE085428

From MP 188.15 to MP 192.8 and MP 193.8 to MP 194.0 for visual purposes, the alignments were slightly shifted. All five alternatives are proposed to be within the existing R/W.

Legend

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- HENSEL REPLACEMENT ALTERNATIVE 1
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- EXISTING LEIDY LINE "D"
- FOLEY TRACT

0 500 1000 1,500 2,000
SCALE IN FEET

0 0.1 0.2 0.4
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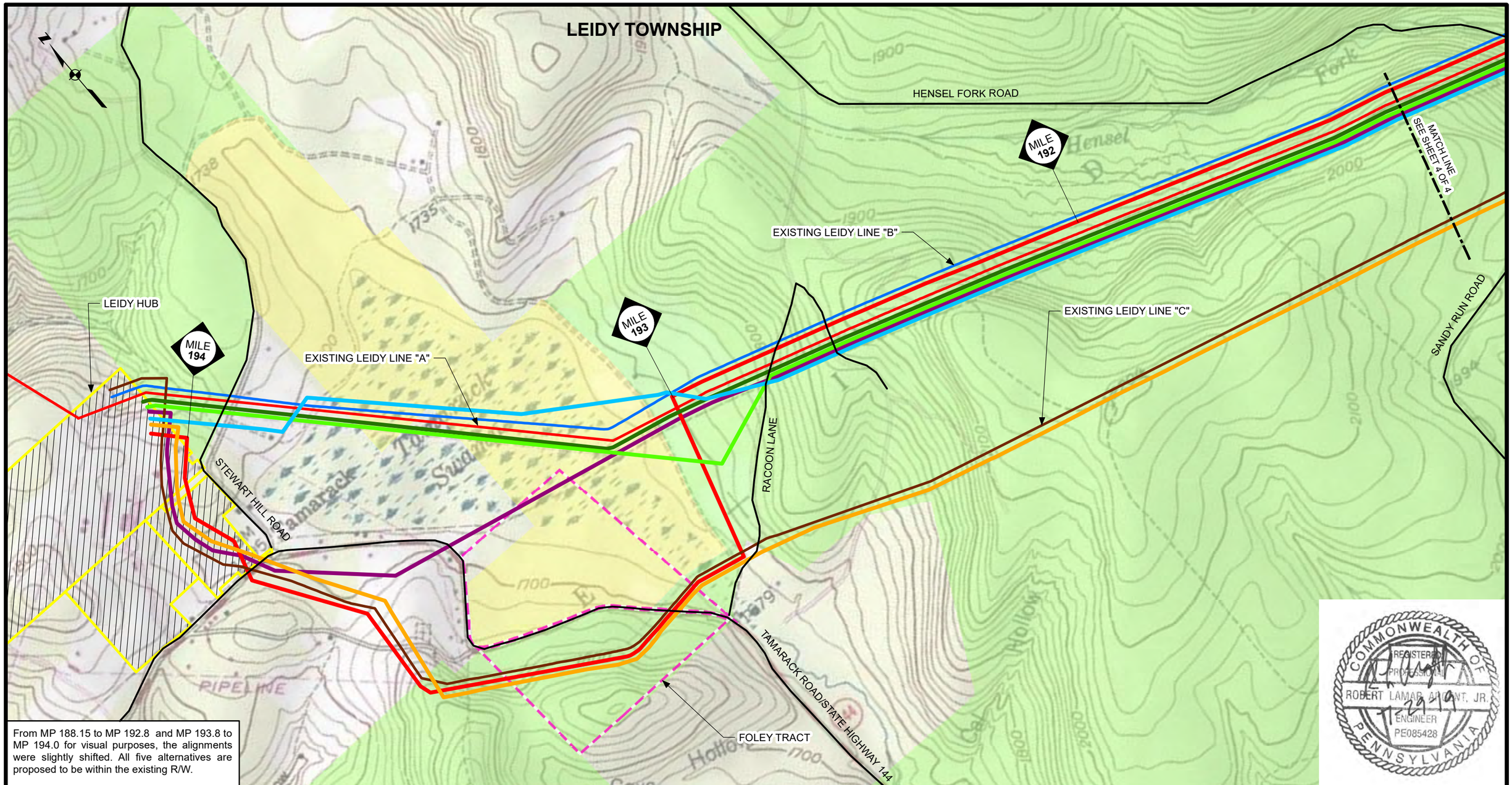
APPROVED BY: HGA	DATE: 01/03/2019	NUMBER: FP-HENS-D_EX	SHEET 2 OF 4
W.O 1211223	RID: 02/11/2019		



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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
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ENGINEER
PE085428
7-29-19

Legend

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TRANSCONTINENTAL GAS PIPE LINE, LLC
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LEIDY SOUTH PROJECT
PROPOSED 36" HENSEL REPLACEMENT
M.P 188.51 TO M.P 194.00
CLINTON COUNTY, PENNSYLVANIA

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LEIDY TOWNSHIP

CHAPMAN TOWNSHIP

EXISTING LEIDY LINE "A"

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "D"

MILE 189

BIG RIDGE TRAIL

EXISTING LEIDY LINE "C"

MILE 190

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "B"

EXISTING LEIDY LINE "A"

MILE 191

HENSEL FORK ROAD

CHAPMAN TOWNSHIP

LEIDY TOWNSHIP

MATCH LINE SEE SHEET 3 OF 4

SANDY RUN ROAD

Devils Elbow

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
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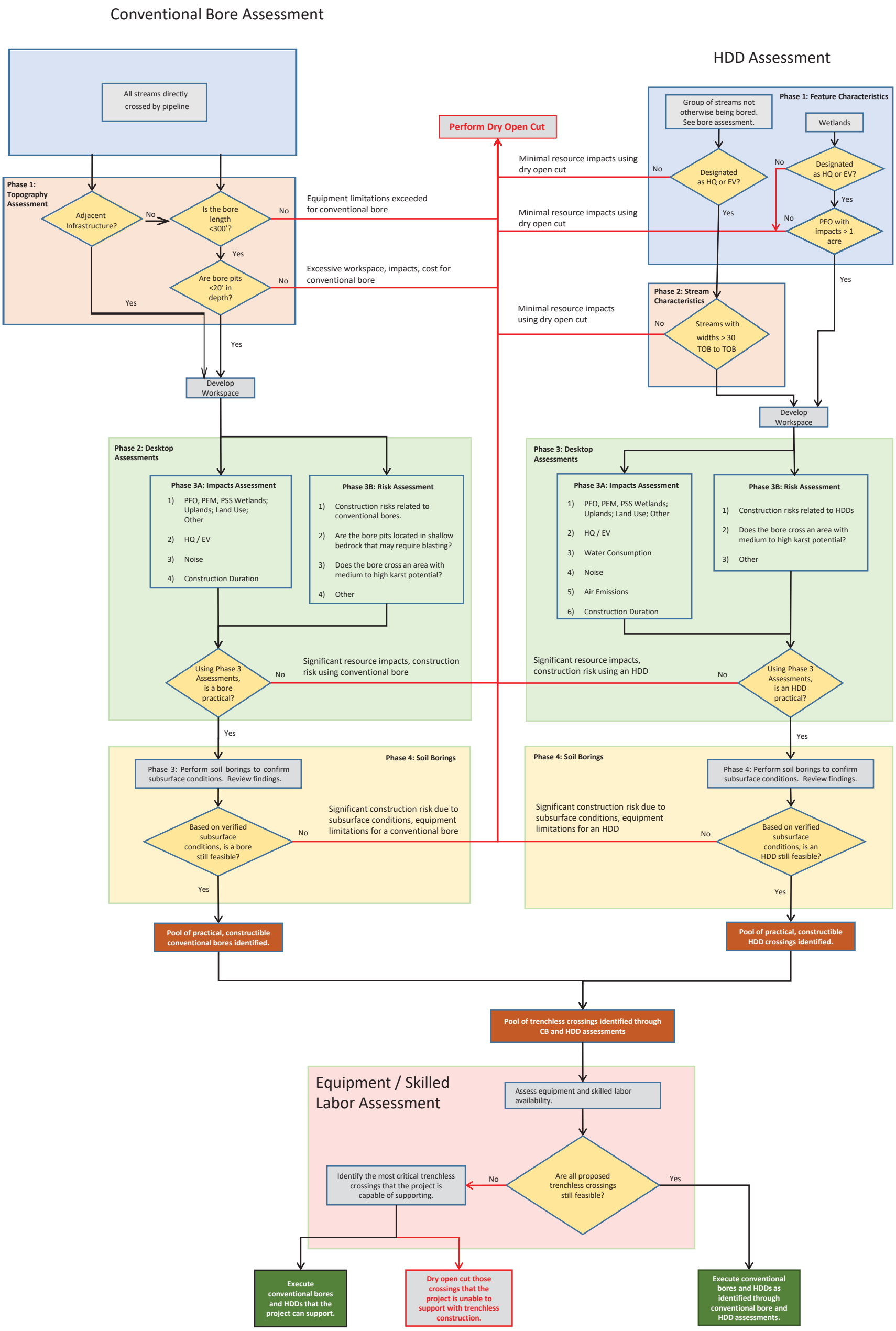
W.O 1211223	RID: 02/11/2019		

ATTACHMENT 1

TRENCHLESS ANALYSIS FLOWCHART

Leidy South Project - Trenchless Analysis Flow Chart



ATTACHMENT 2

TRENCHLESS ANALYSIS FEASIBILITY STUDY

Williams has requested that CCI perform a desktop study to evaluate the feasibility of using the HDD method of construction at three separate locations. The carrier pipe at each proposed crossing is specified to be 36-inch-diameter pipeline used to transport natural gas. A KMZ file has been provided to identify the approximate locations and surface constraints of each crossing.

Hensel Fork Rd HDD (MP 190.5 to MP 190.7) crosses beneath Hensel Fork Rd and multiple minor streams. In accordance with Williams' specifications and industry best management practices (BMPs), it is recommended that a design radius of 3,600 ft be utilized with the current pipe specifications. Taking into consideration the current proposed length along the alignment, the depth of cover would need to be sufficient to geometrically coincide with the design radius. It has not been determined where the rig will be placed but MP 190.5 is approximately 120 ft away from Hensel Fork Rd and appears to sit directly on top of a stream. MP 190.7 also appears to be on top of or near a stream. These conditions may create complications associated with the temporary workspace requirements for the contractor.

Drury Run Creek HDD crosses Drury Run Creek, associated wetland area and Tamarack Rd. it is recommended that a design radius of 3,600 ft be utilized with the current pipe specifications following standard industry BMPs. Taking into consideration the design radius, it appears that there is not sufficient ROW to accommodate the horizontal length that would be required to remain within geometrical tolerances. The HDD would encounter a terrain that slopes along the entry and exit angles required to achieve a recommended profile depth of cover beneath the creek. This scenario creates shallow cover and increases the likely hood of inadvertent fluid release to the surface near entry and exit as well as HDD equipment setup outside of typical industry practice. Conceptual design has the profile of that includes a horizontal curve that will likely overlap one or both vertical curves creating a combination curve.

The Young Woman Creek HDD crosses beneath Young Woman Creek, and due to the present constraints, would most likely cross beneath Young Woman Creek Rd and Little Italy Rd as well. As mentioned above, it is highly recommended that a design radius of 3,600 ft be utilized due to industry BMPs. Taking into consideration the design radius, it appears that there is not sufficient ROW to accommodate the horizontal length that would be required to remain within geometrical tolerances. The HDD could follow the alignment if the length to the west of Young Woman Creek was increased and a horizontal curve was introduced; however, this would increase the risk of steering outside of tolerances. Also, the alignment along this section is heavily wooded and would require clearing and grading.

These proposed crossings would most likely benefit environmentally, financially and have an increased chance of success using a open cut method of construction. The pipe strings for these HDDs would be placed along slopes ranging from 15 to 40%, increasing the installation risk. Due to these reasons listed above and unknown geotechnical conditions, HDDs (Drury Run Creek, Hensel Fork Rd HDD and Young Woman Creek HDD) are considered high risk and CCI has classified these locations as not feasible for the HDD method of construction.

REQUIREMENT T

MITIGATION PLAN

An onsite Wetland and Riparian Reforestation Plan has been provided in Requirement L-5, Module S4, Appendix S4-2. A Compensatory Offsite Mitigation Plan has been provided in Requirement L-5, Module S4, Appendix S4-3.

.

APPENDIX 1

PUBLIC WATER SUPPLY REPORT

Transcontinental Gas Pipe Line Company, LLC

Appendix 1 - Public Water Supply Report

Leidy South Project – Hensel Replacement and Hilltop Loop

August 2019

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2.0 METHODS USED TO IDENTIFY PUBLIC WATER SUPPLIES

3.0 RESULTS OF ANALYSIS

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1 GROUNDWATER WELLS EMAPPA REVIEW

2 SURFACE WATER INTAKES EMAPPA REVIEW

1. Introduction

The purpose of the Public Water Supplies Summary Report (Report) is to identify all public water supplies within one mile of waterbody or wetland crossings associated with the Leidy South Project – Hensel Replacement and Hilltop Loop (Project).

2. Methods Used to Identify Public Water Supplies

As part of the permit application, a review of the public water supplies located within one mile of a waterbody or wetland crossing was conducted. Groundwater wells and surface water intakes were identified for each crossing proposed as part of the Project using the PADEP eMapPA online tool. The buffer tool was used to create a one-mile buffer around each crossing. The surface water intakes and groundwater wells within that buffer were identified. The contact information for the official responsible for the water supply as well as the system name was obtained if a surface water intake or groundwater well is identified.

3. Summary of Findings

Groundwater wells and surface water intakes were identified for each Project crossing using eMapPA. The results, as generated by eMapPA, are included in Appendices 1 and 2. The location of the crossings proposed is provided in Figure 1. There were no surface water intakes identified within one mile of a proposed crossings associated with the Project. Groundwater wells were identified within one mile of three of the proposed crossings, as summarized in Table 3-1.

TABLE 3-1: GROUNDWATER WELLS WITHIN ONE MILE OF A CROSSING

Crossing	Public Water Supply ID	SYSTEM NAME	AREA CITY	RESPONSIBLE OFFICIER	PHONE	ID
HR-10	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134624
	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134623
HR-11	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134624
	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134623
HR-12	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134623

References

Pennsylvania Department of Environmental Protection. 2019. eMapPA. Accessed August 20, 2019. http://www.depgis.state.pa.us/emappa/

FIGURES

designs, permits, resolutions | consulting, INC.
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTINENTAL GAS PIPELINE COMPANY, LLC

LEIDY SOUTH PROJECT -HILLTOP LOOP

CROSSING LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/29/19
WHM DRAWING NUMBER:	WILLIAMS201B001
Drawn By:	PJF
Figure Number:	1

designs, permits, resolutions | consulting, INC.
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTINENTAL GAS PIPELINE COMPANY, LLC

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

CROSSING LOCATION MAP

LEIDY AND CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/29/19
WHM DRAWING NUMBER:	WILLIAMS200B001
Drawn By:	PJF
Figure Number:	2

APPENDIX 1

Groundwater Wells

Crossing HL-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

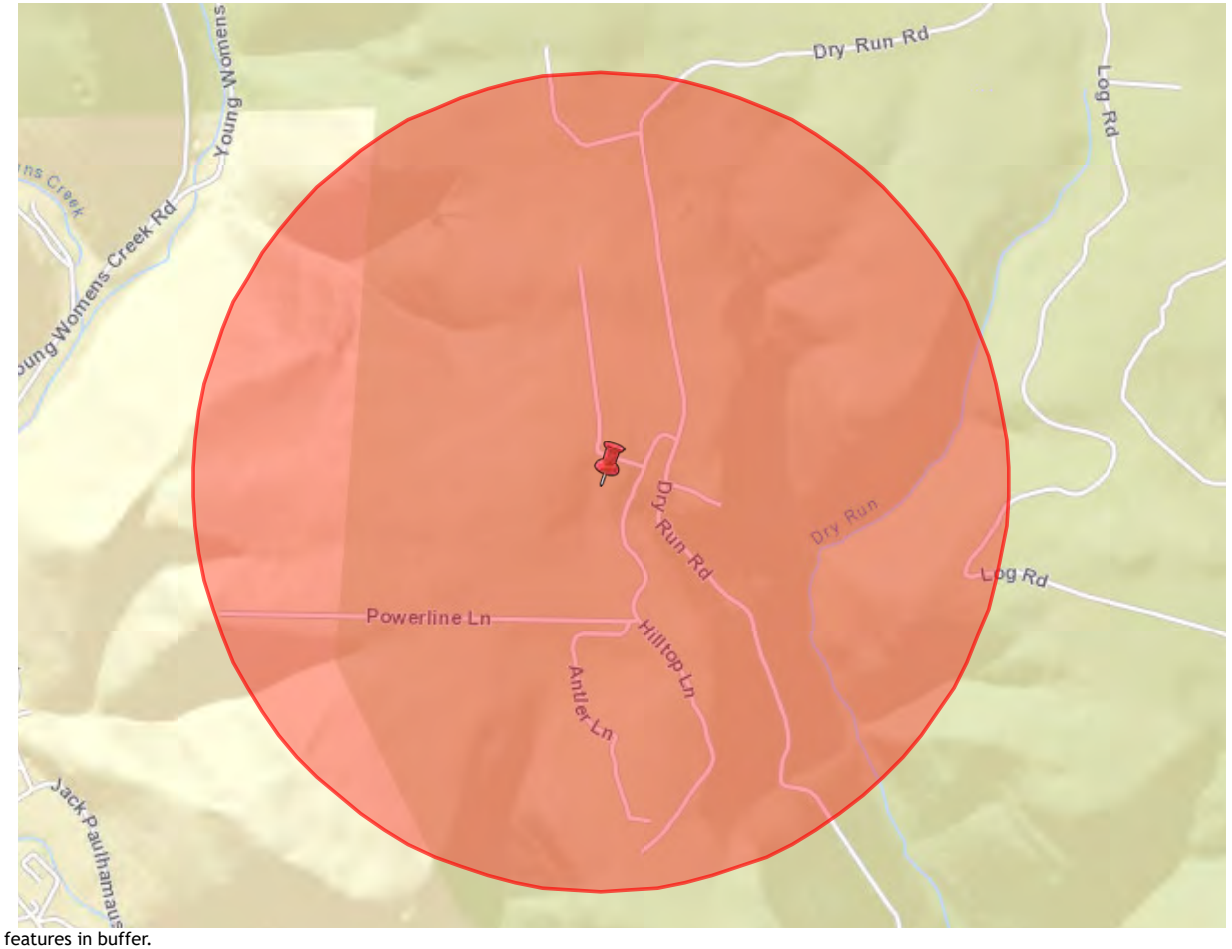
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

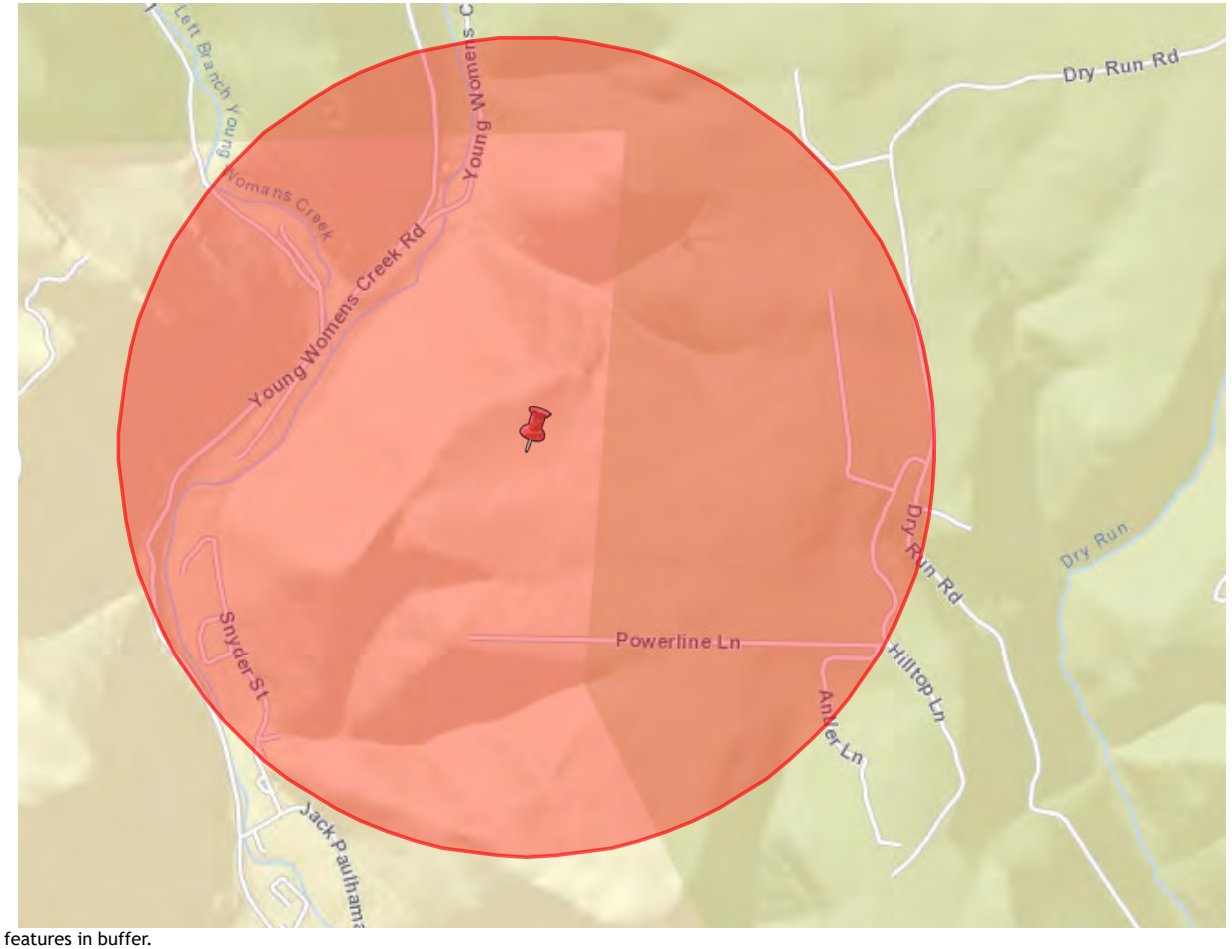
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

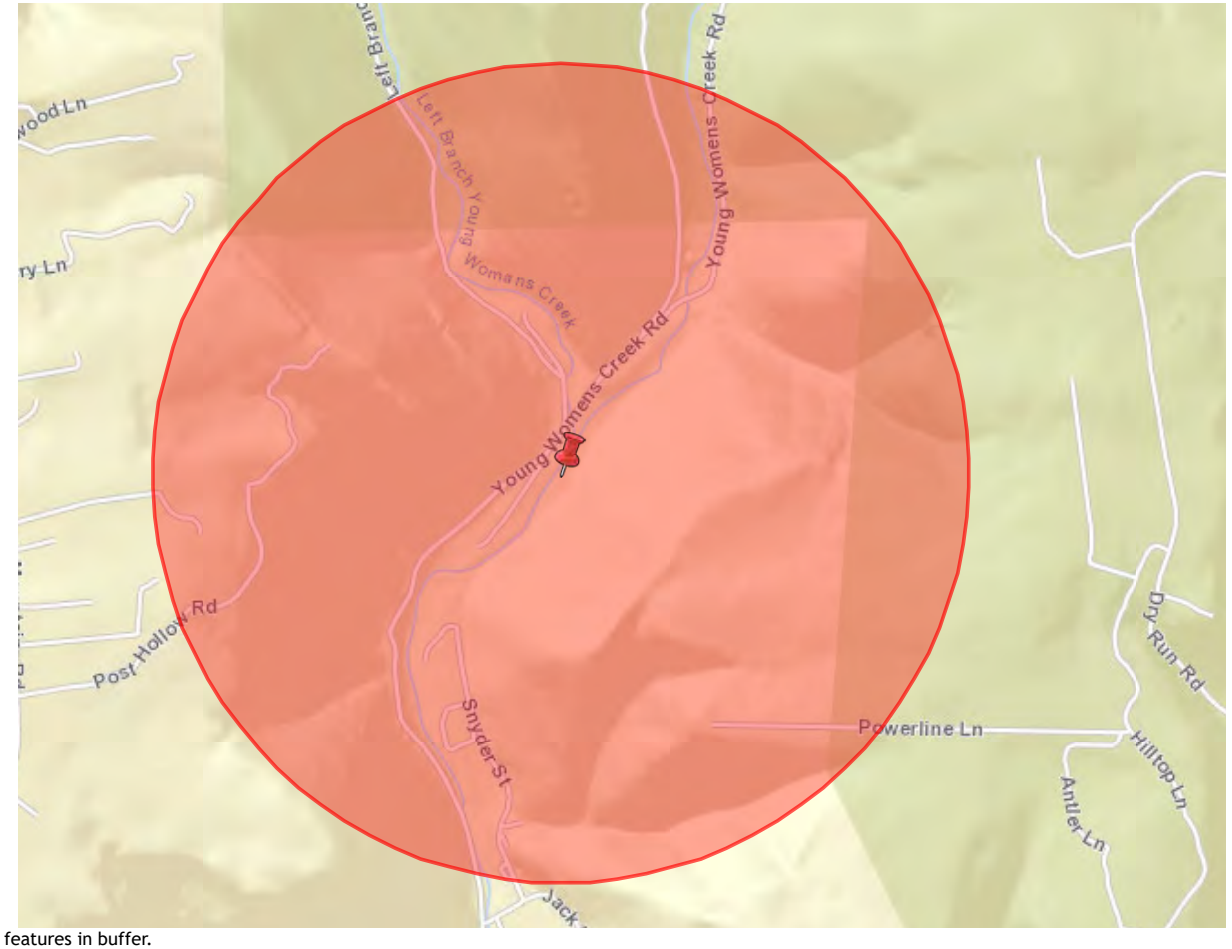
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

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Print

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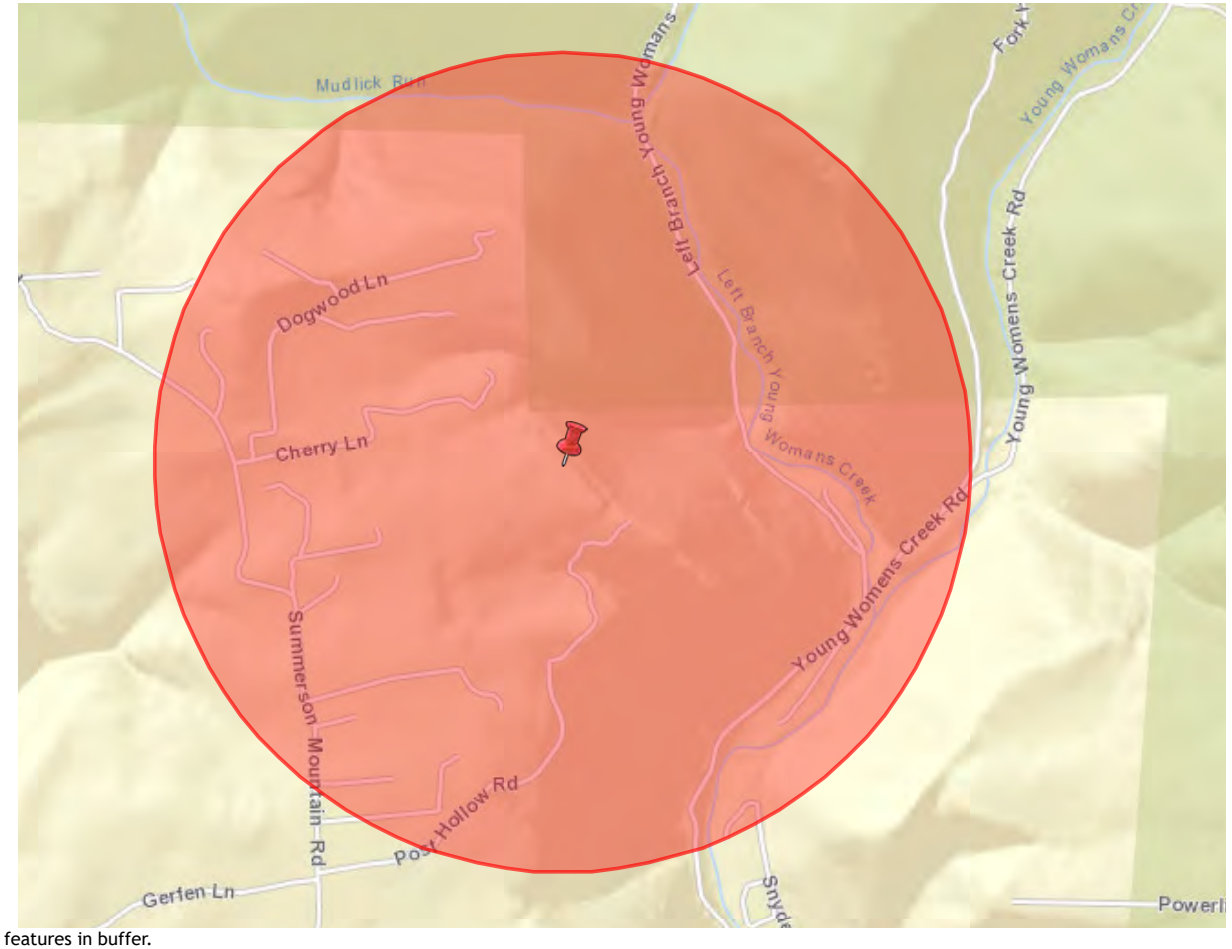
ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

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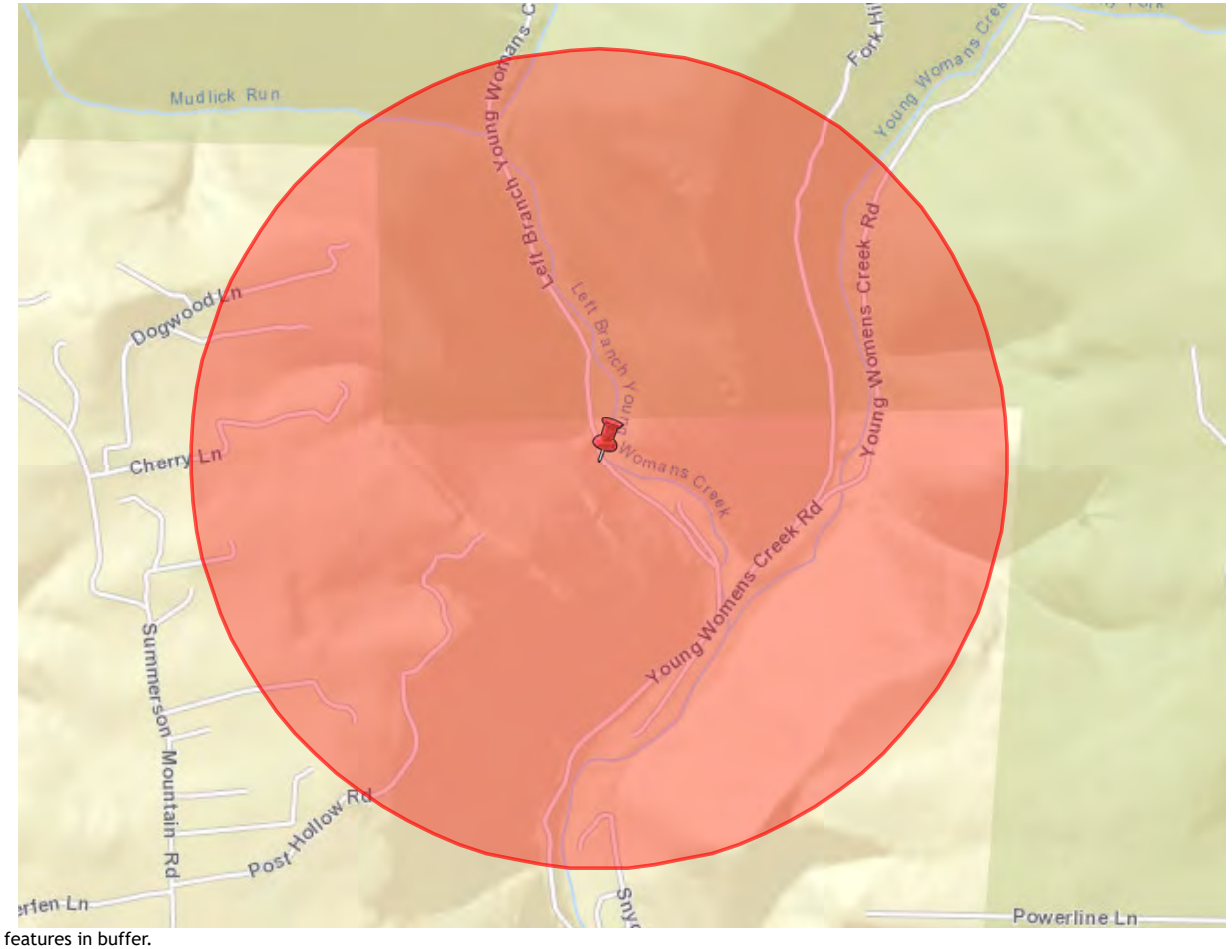
Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

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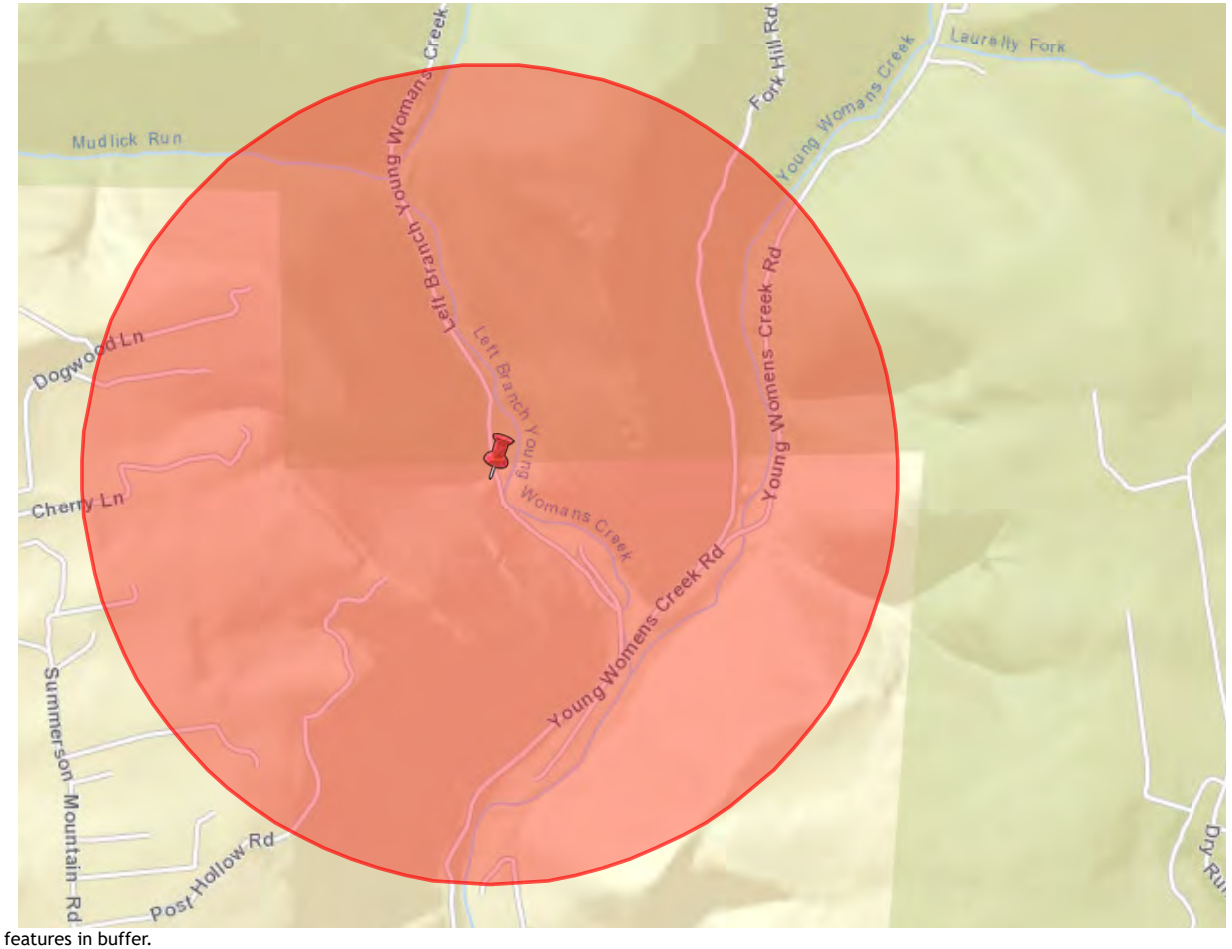
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

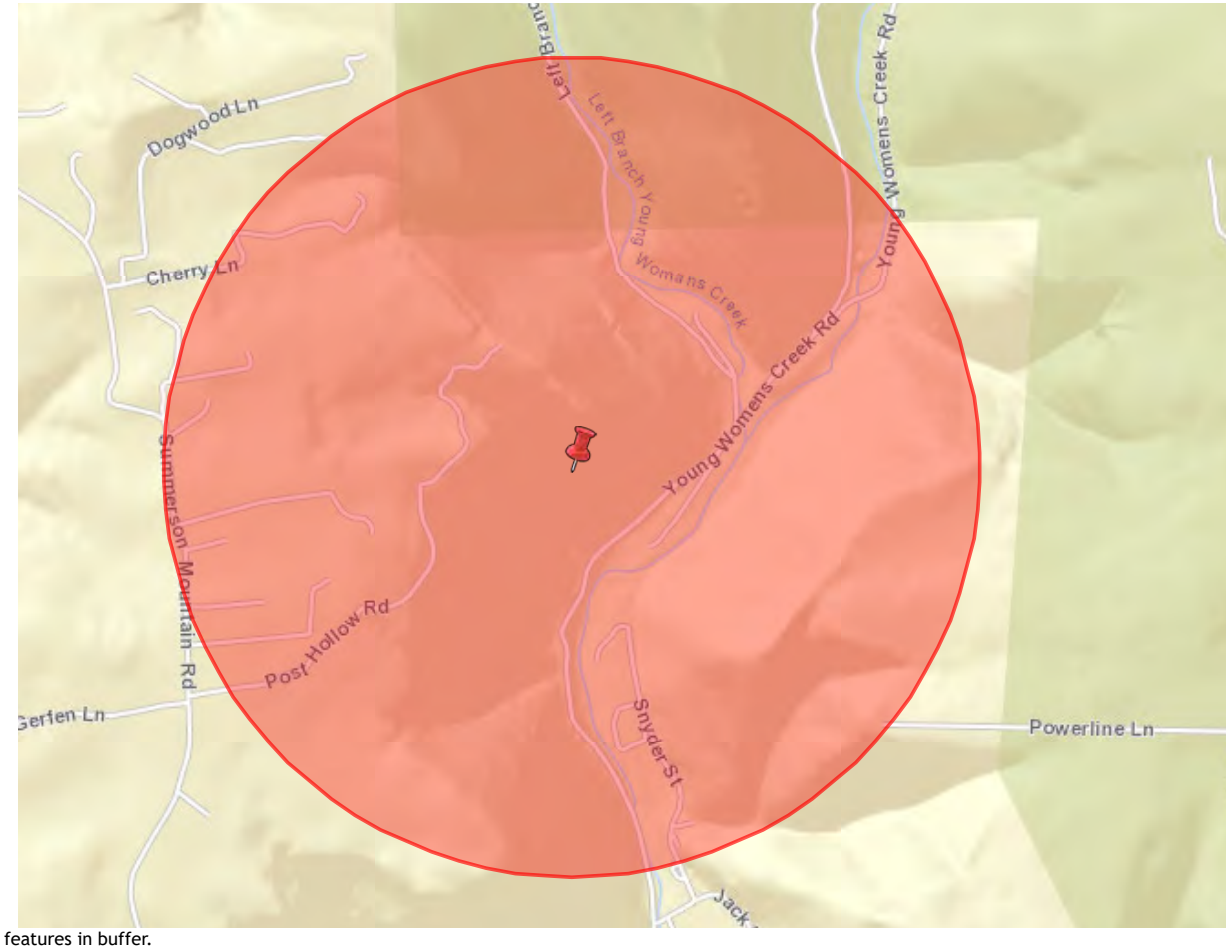
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

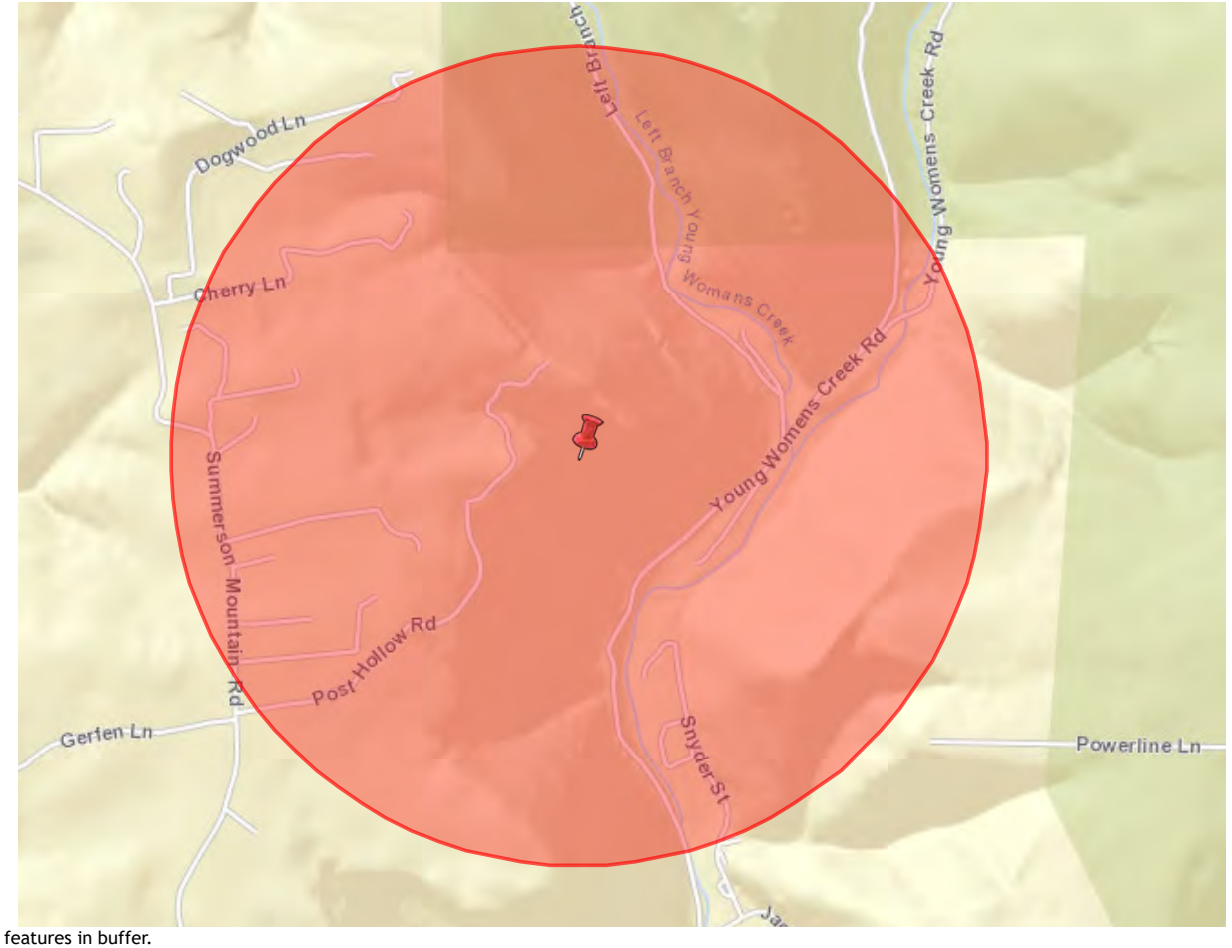
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-5

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

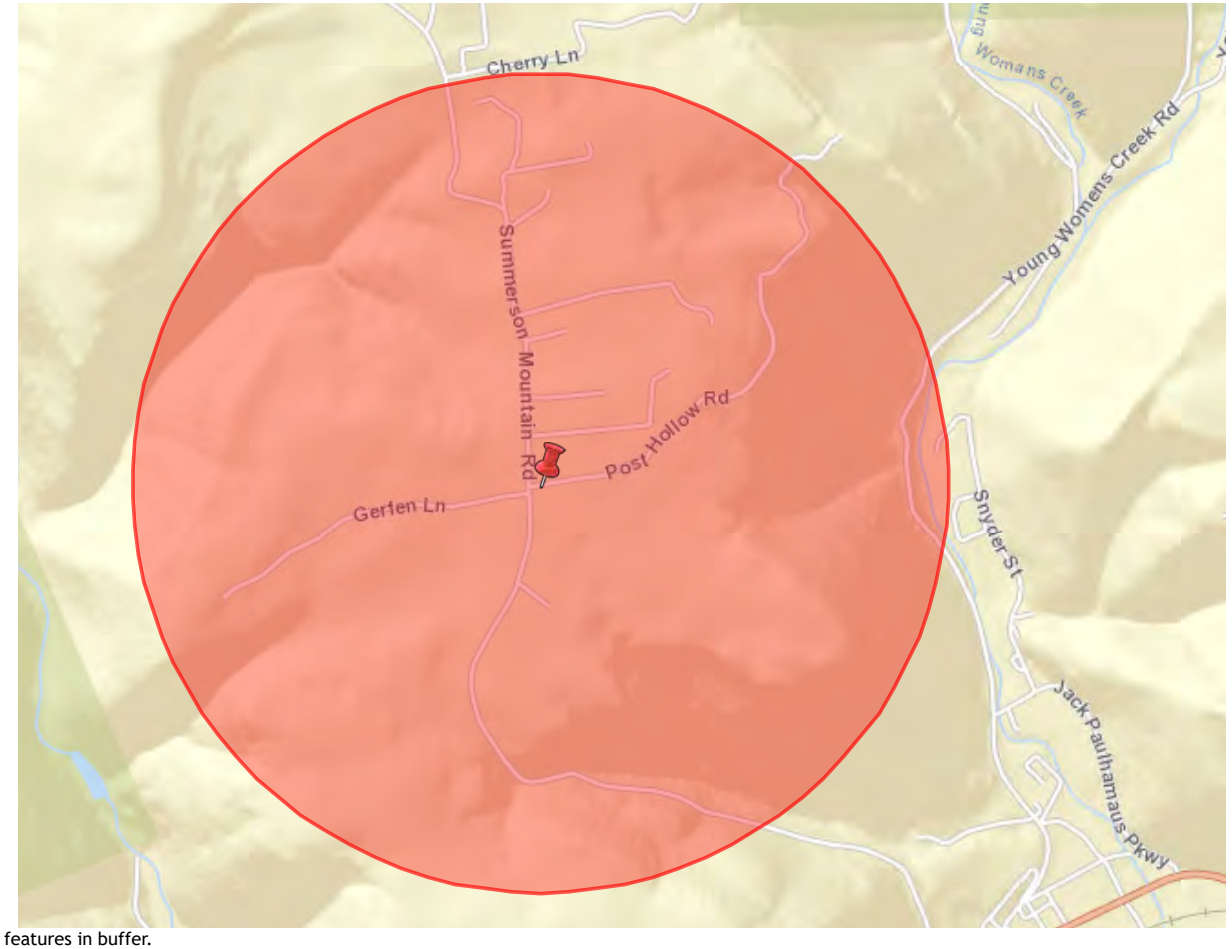
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-6

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

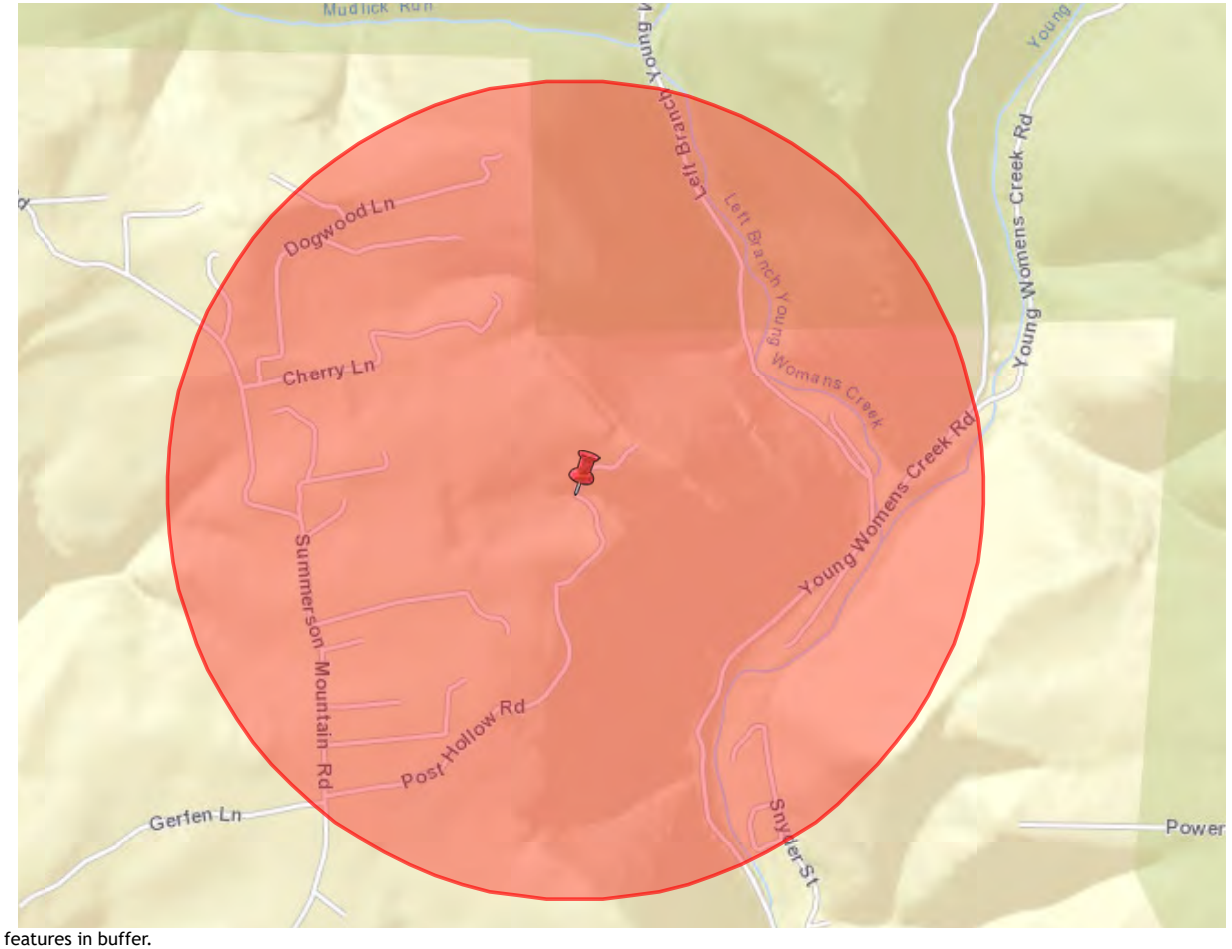
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

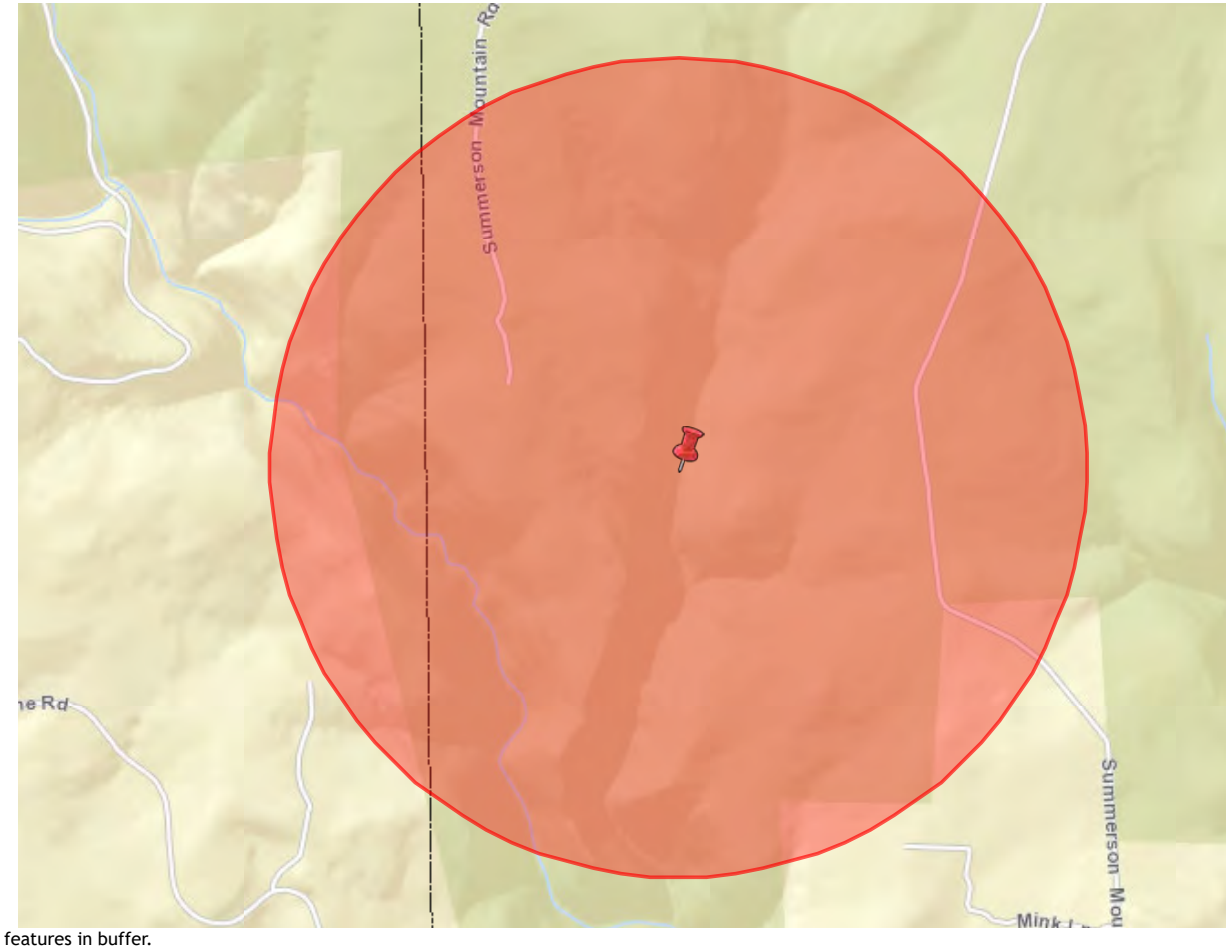
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

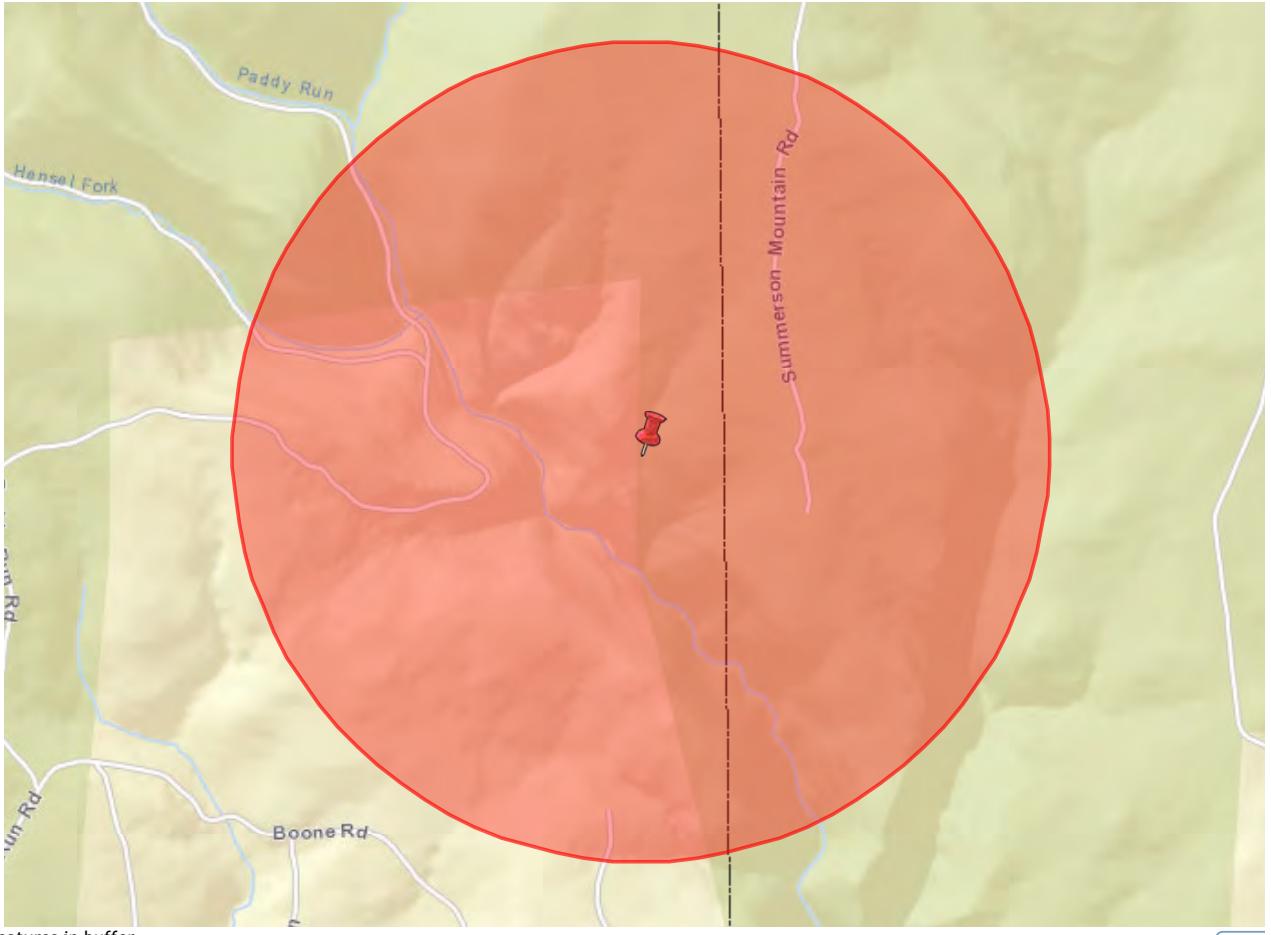
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

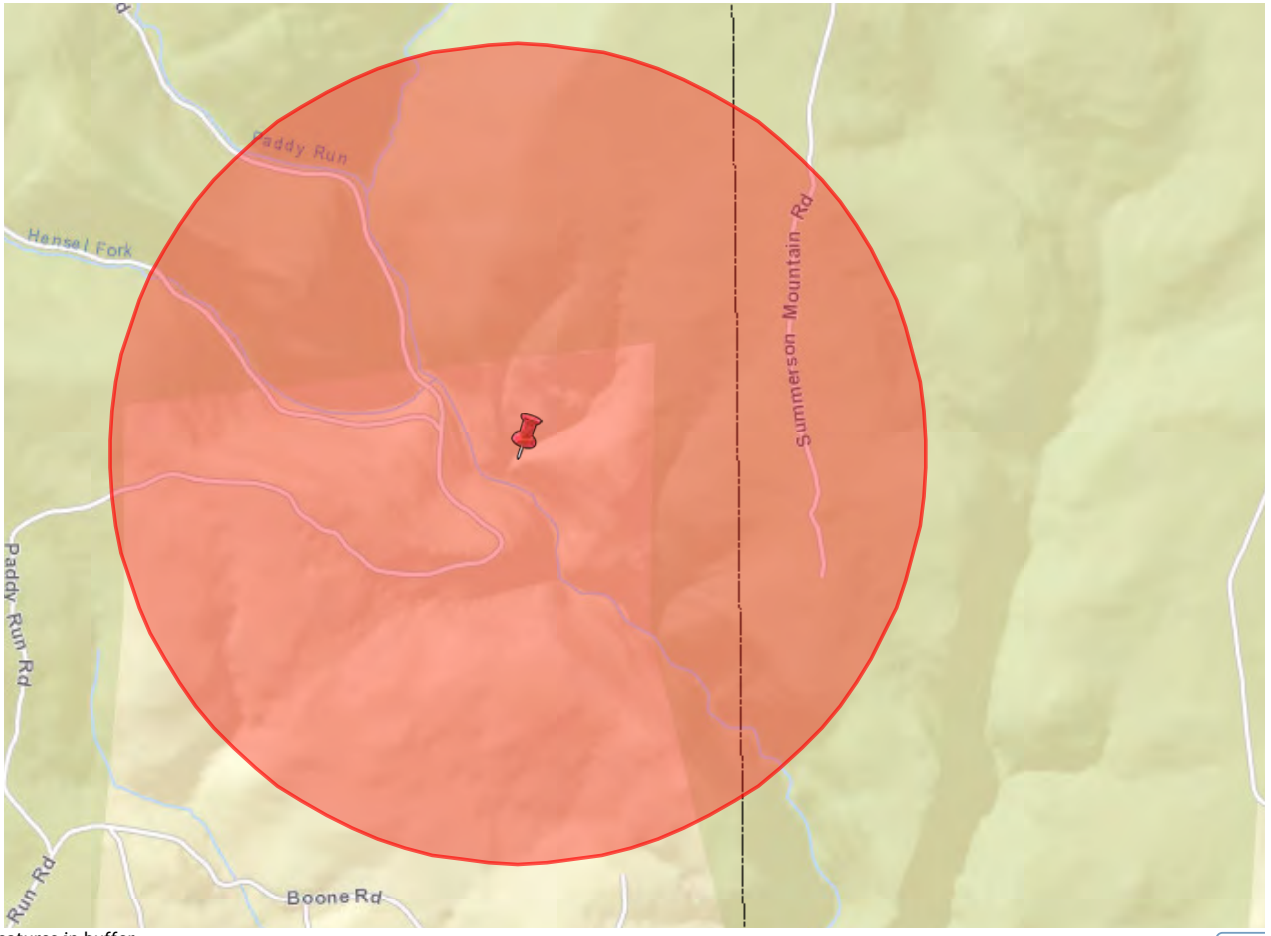
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

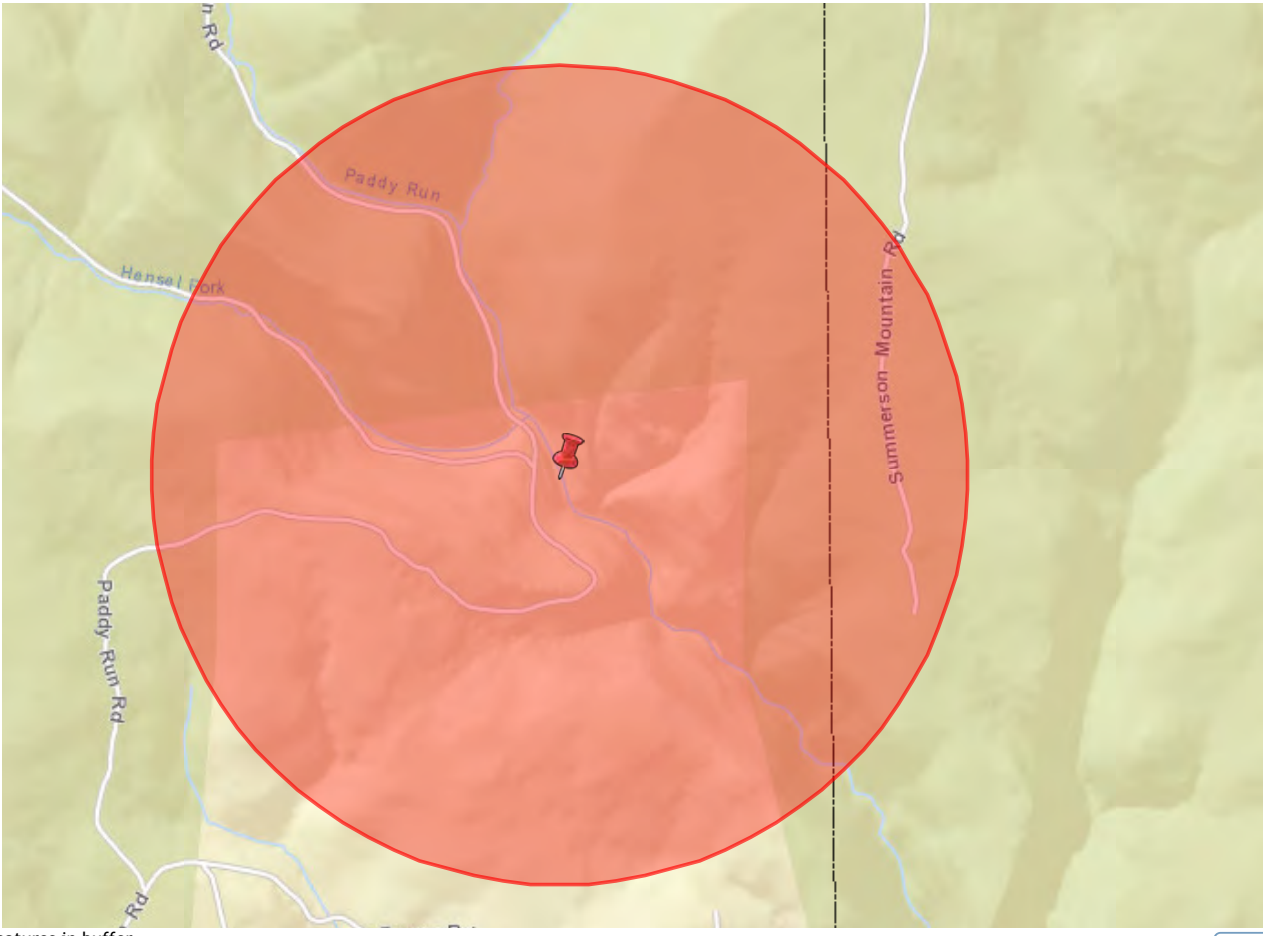
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-5

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

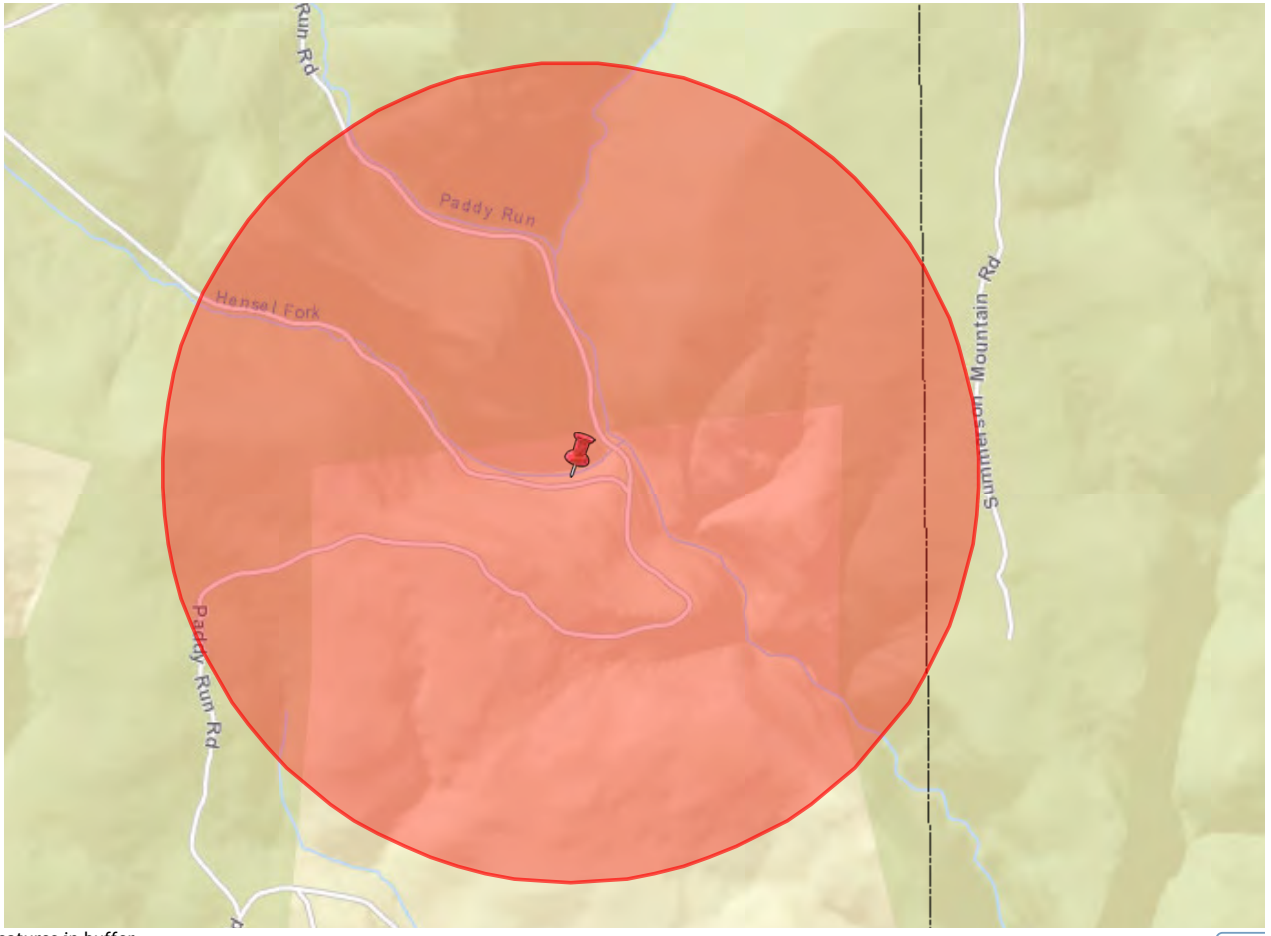
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-6

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

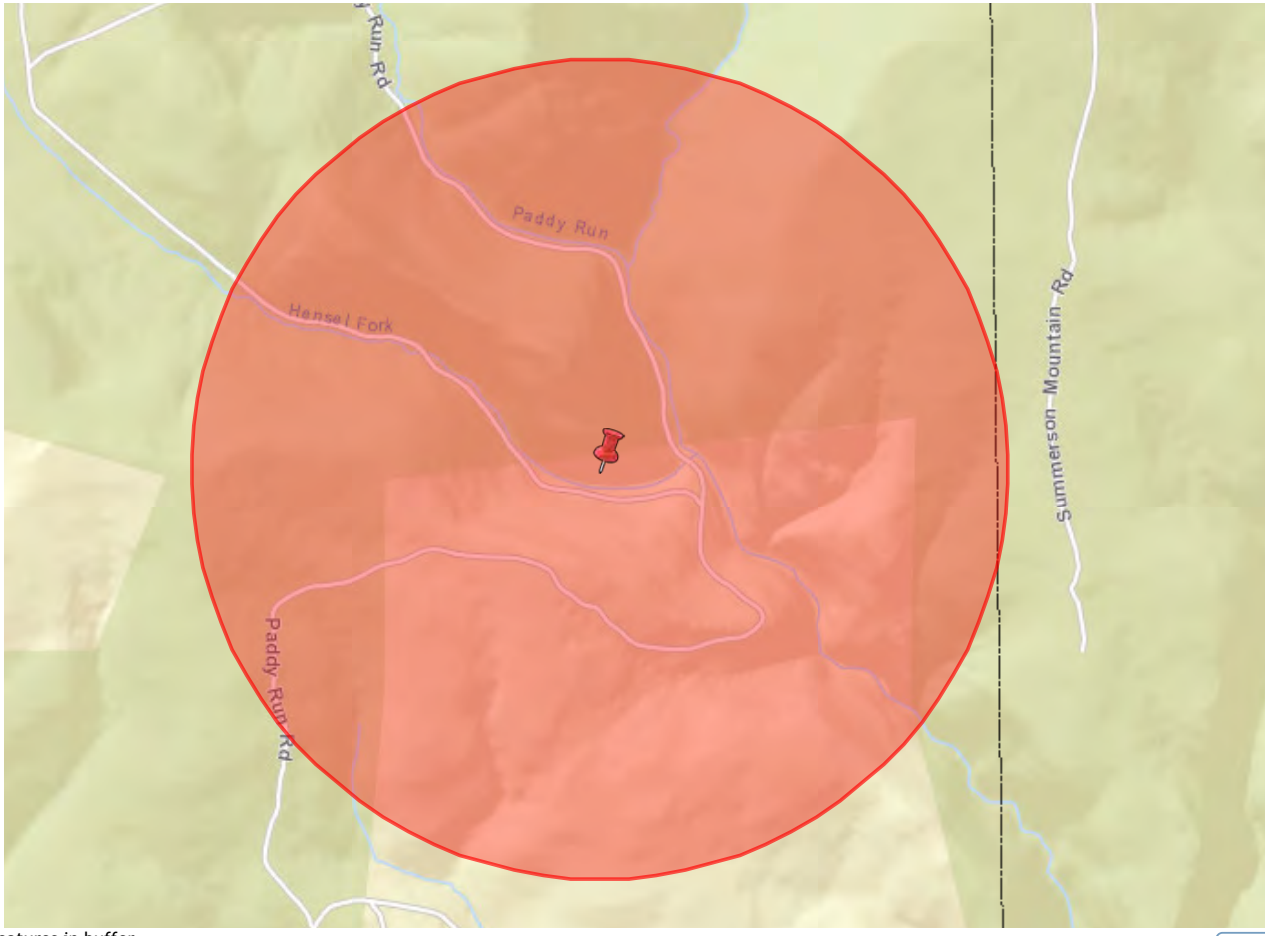
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-7

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

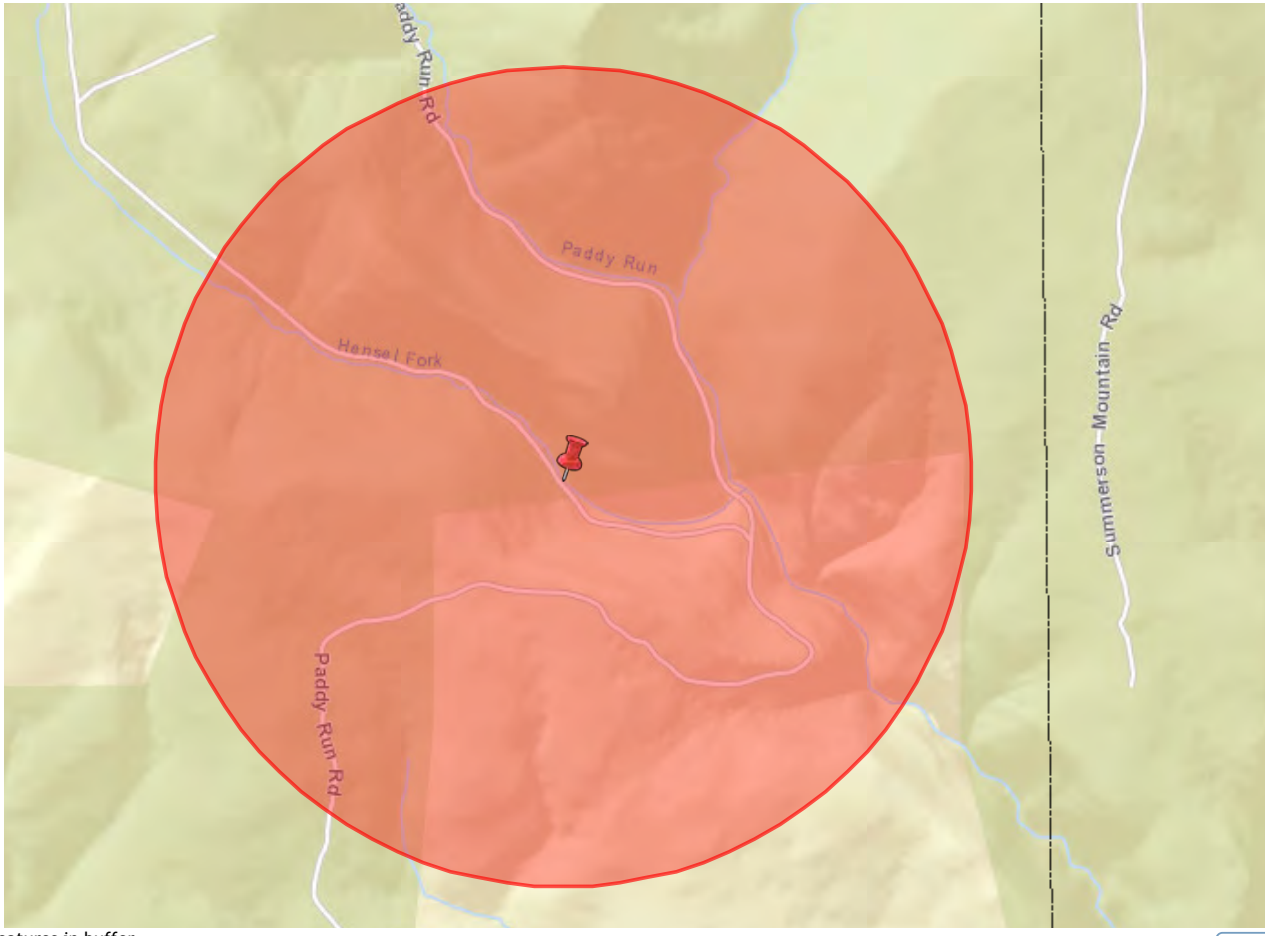
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-8

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

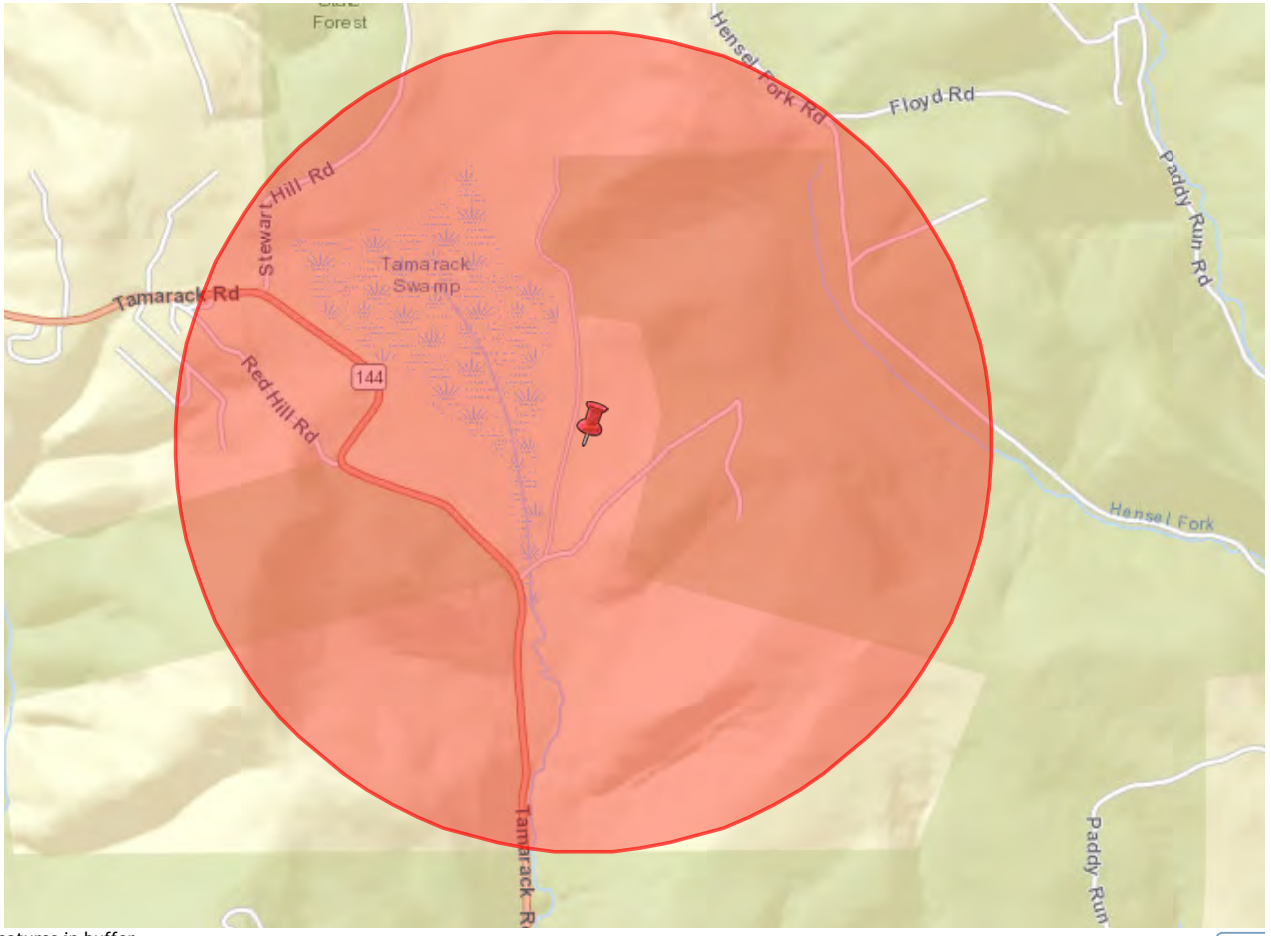
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-9

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

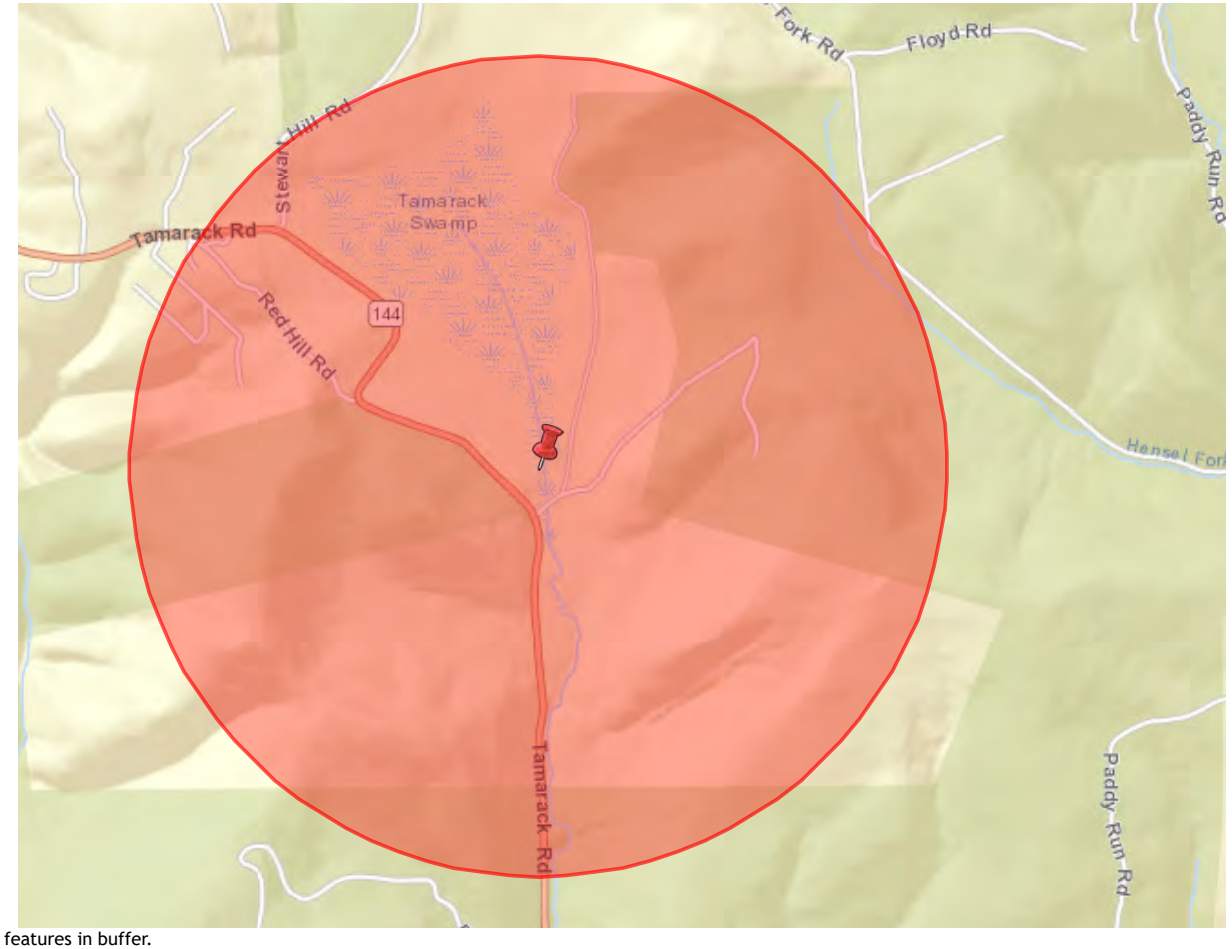
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-10

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

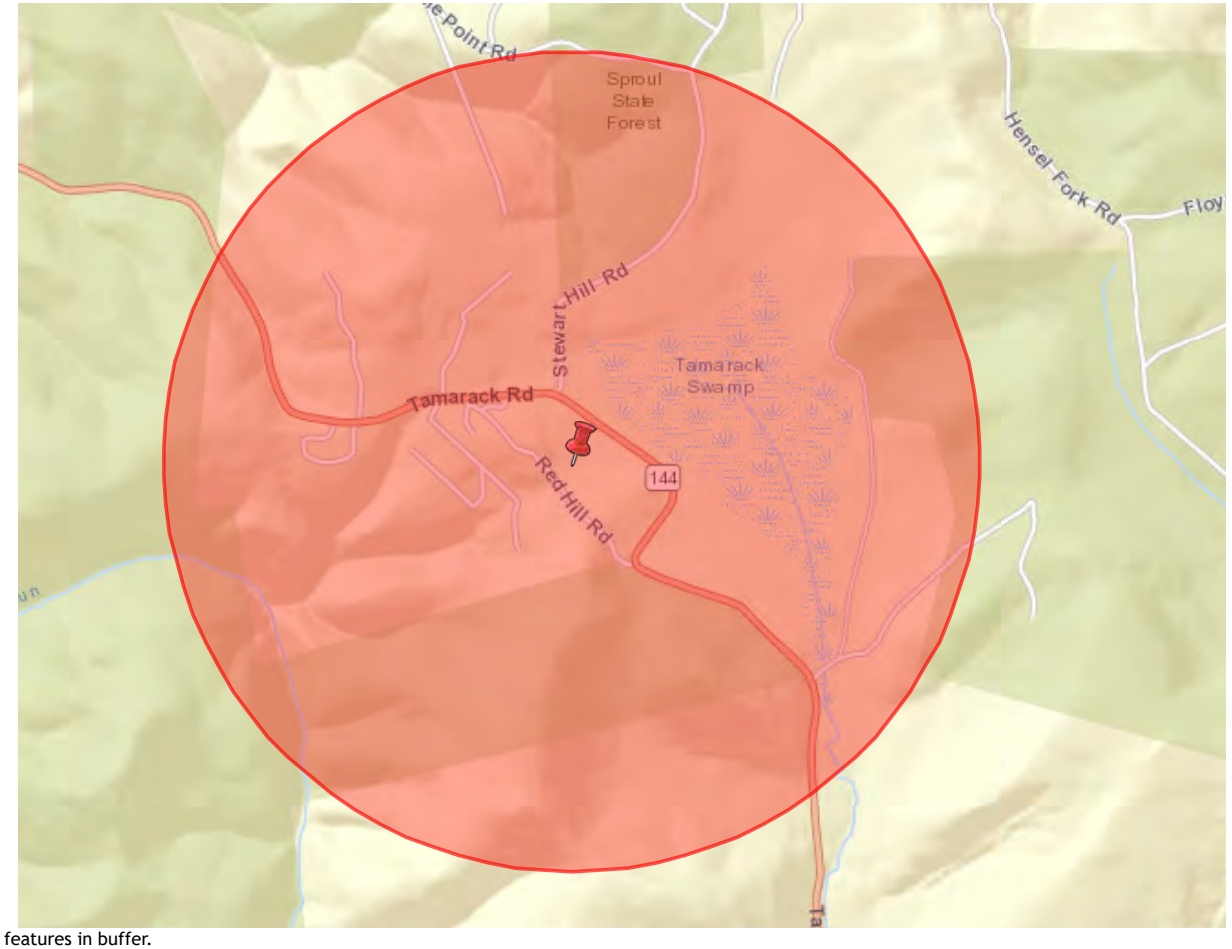
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



2 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN

Crossing HR-11

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

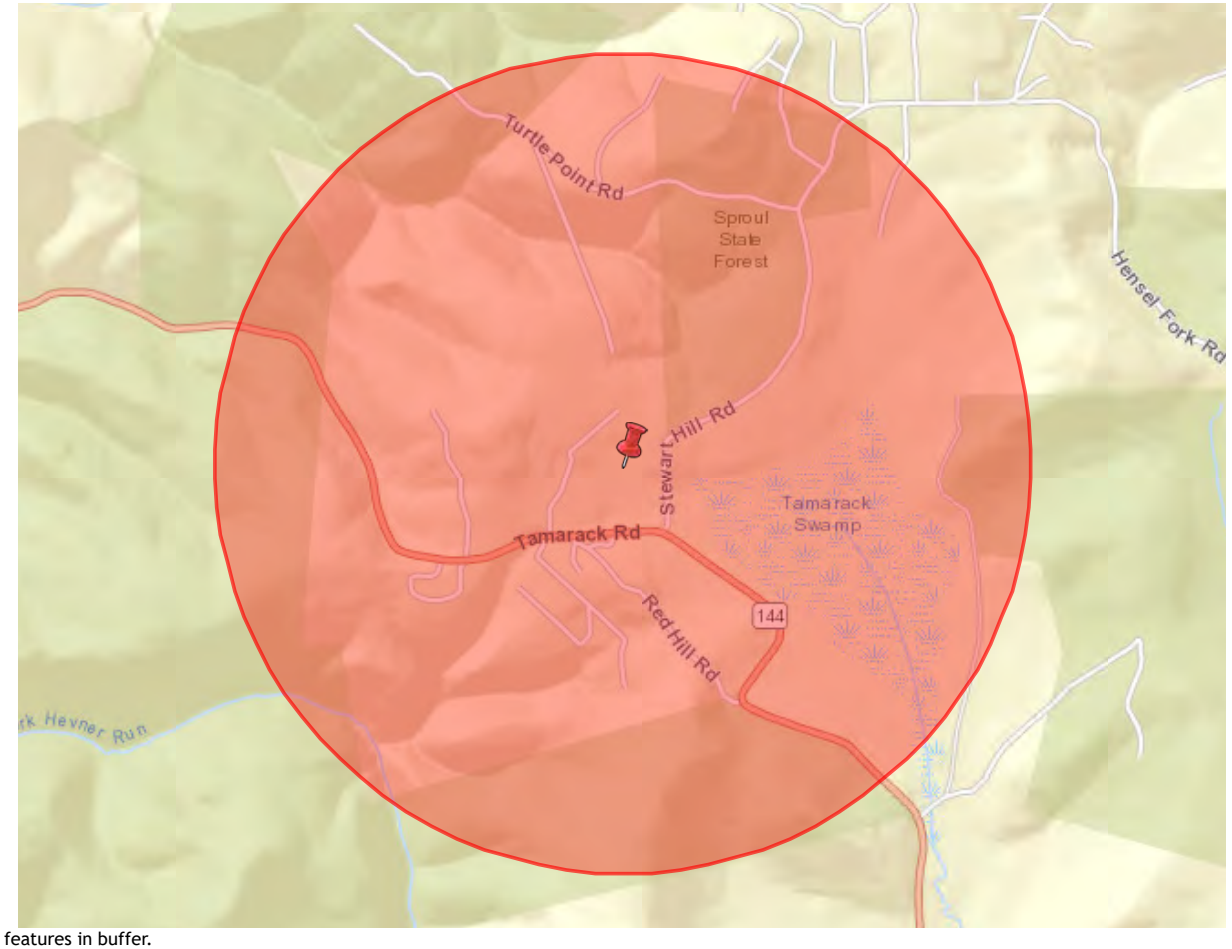
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



2 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN

Crossing HR-12

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

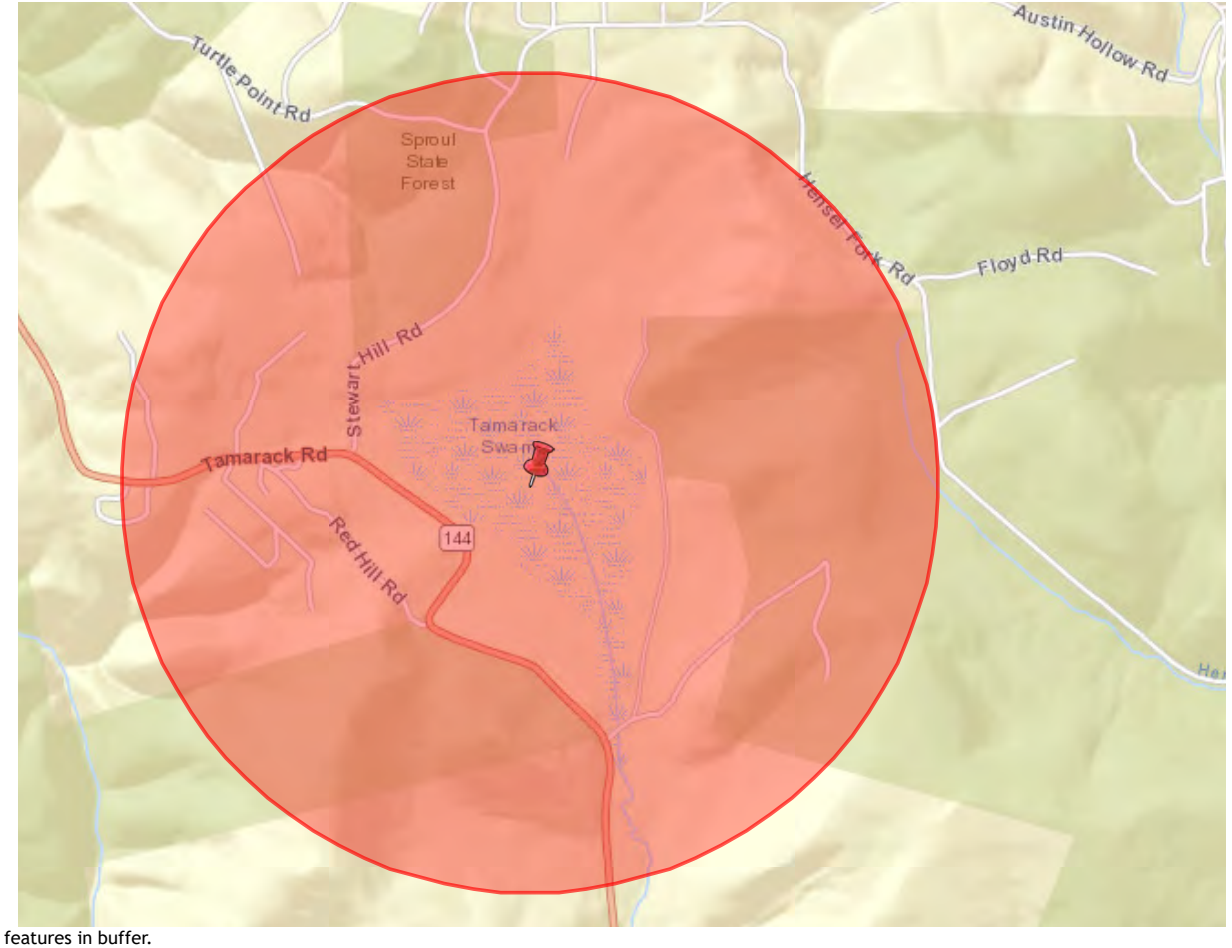
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



1 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN

Crossing HR-AR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

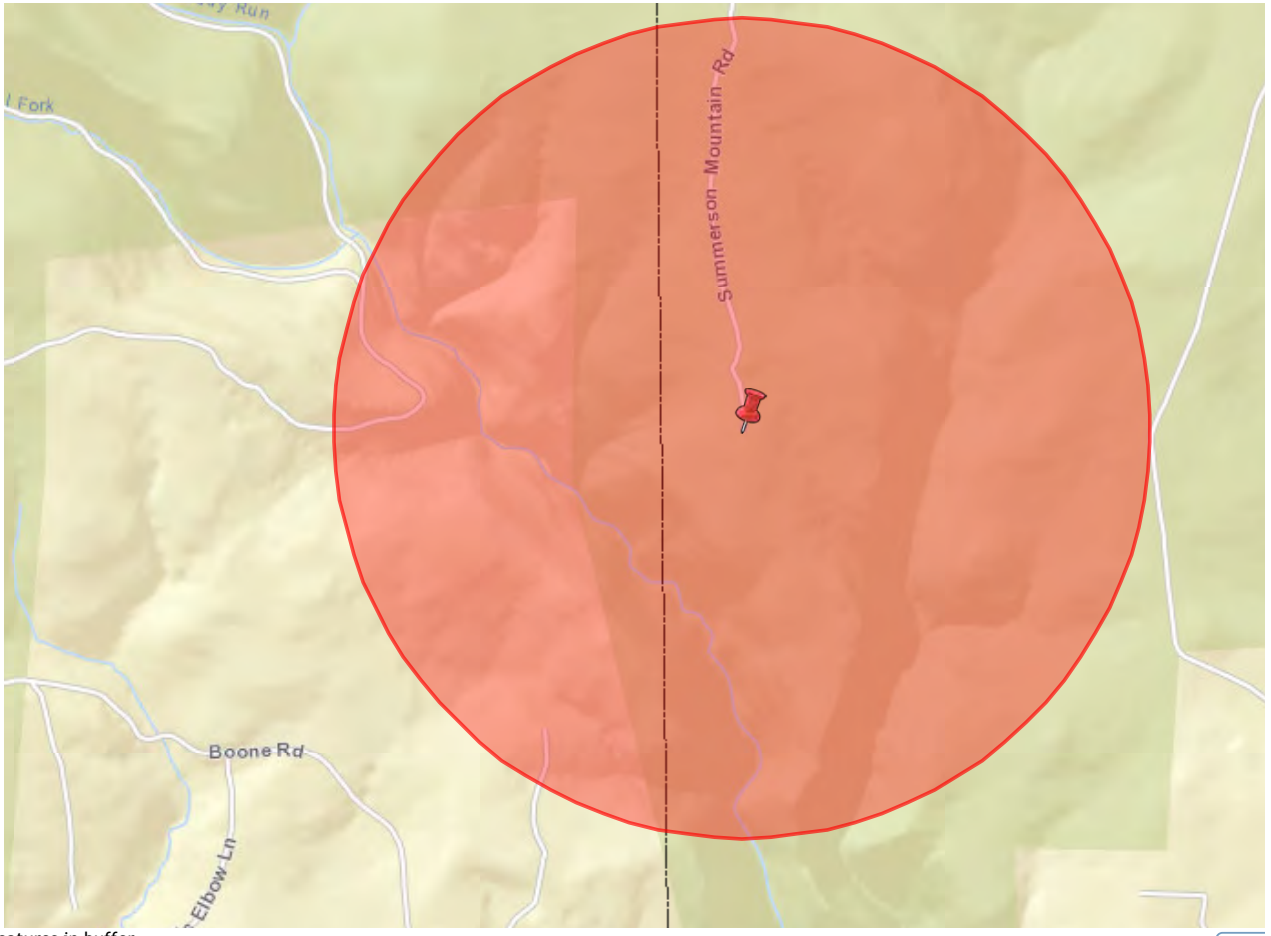
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-AR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

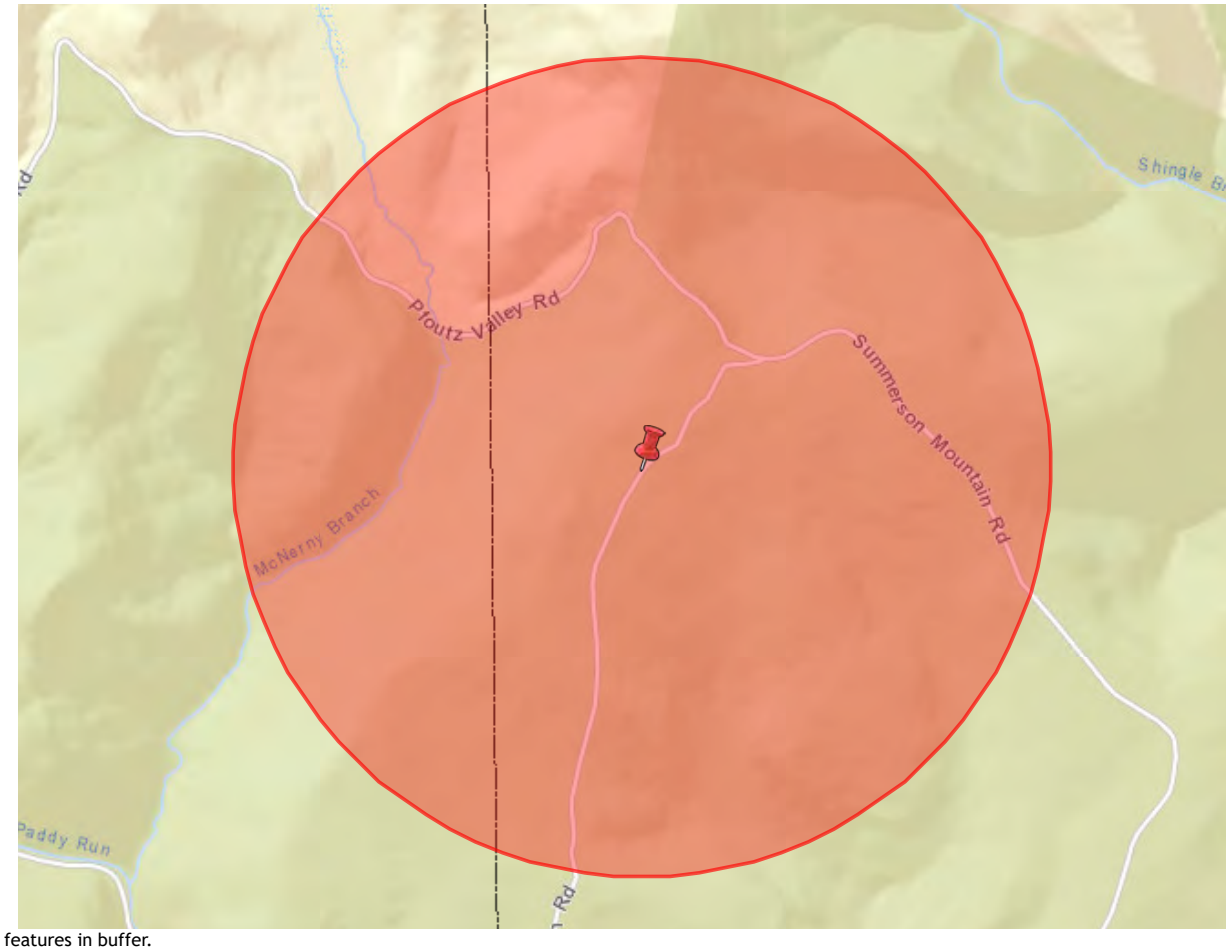
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-AR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

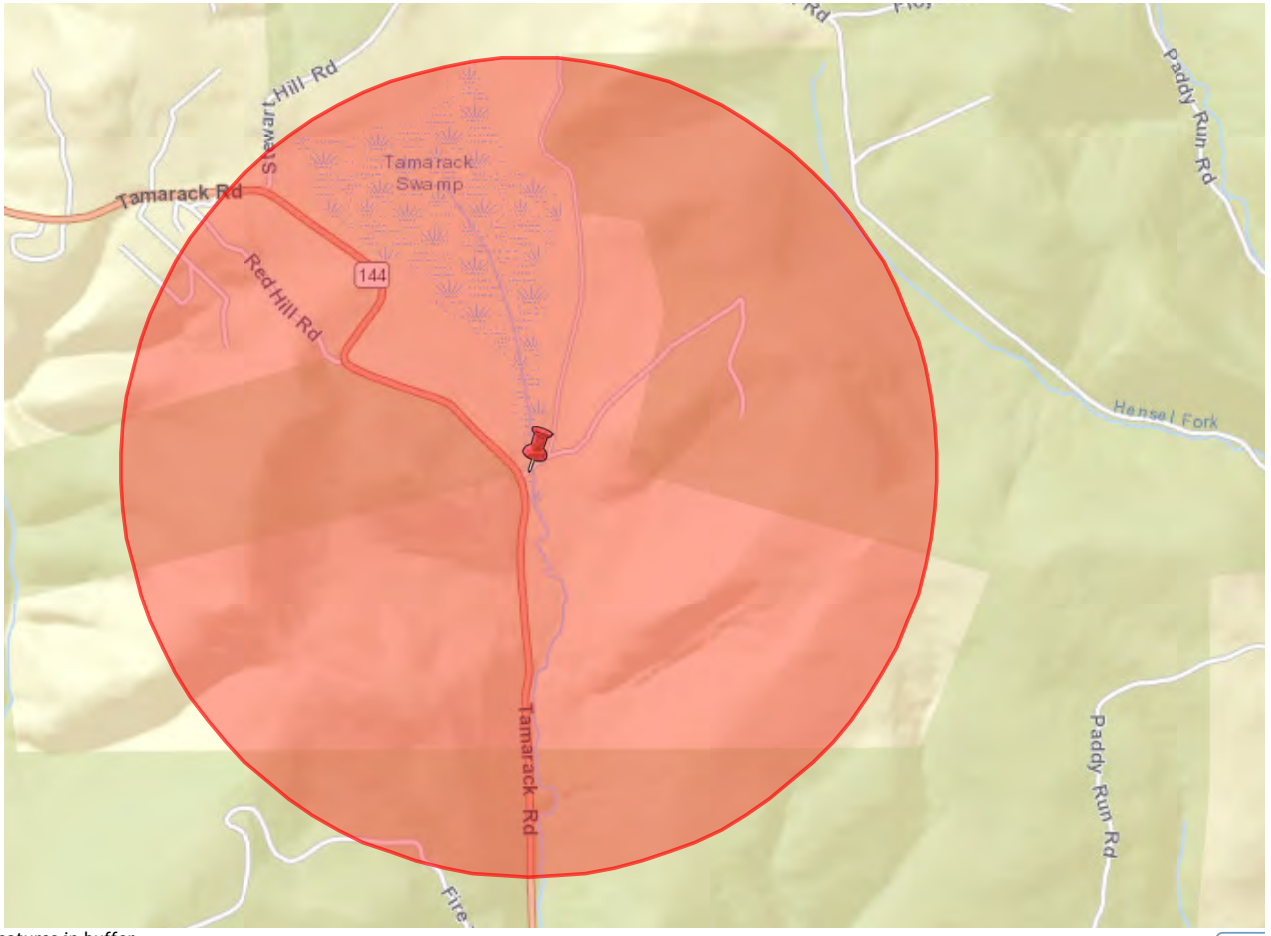
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-AR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

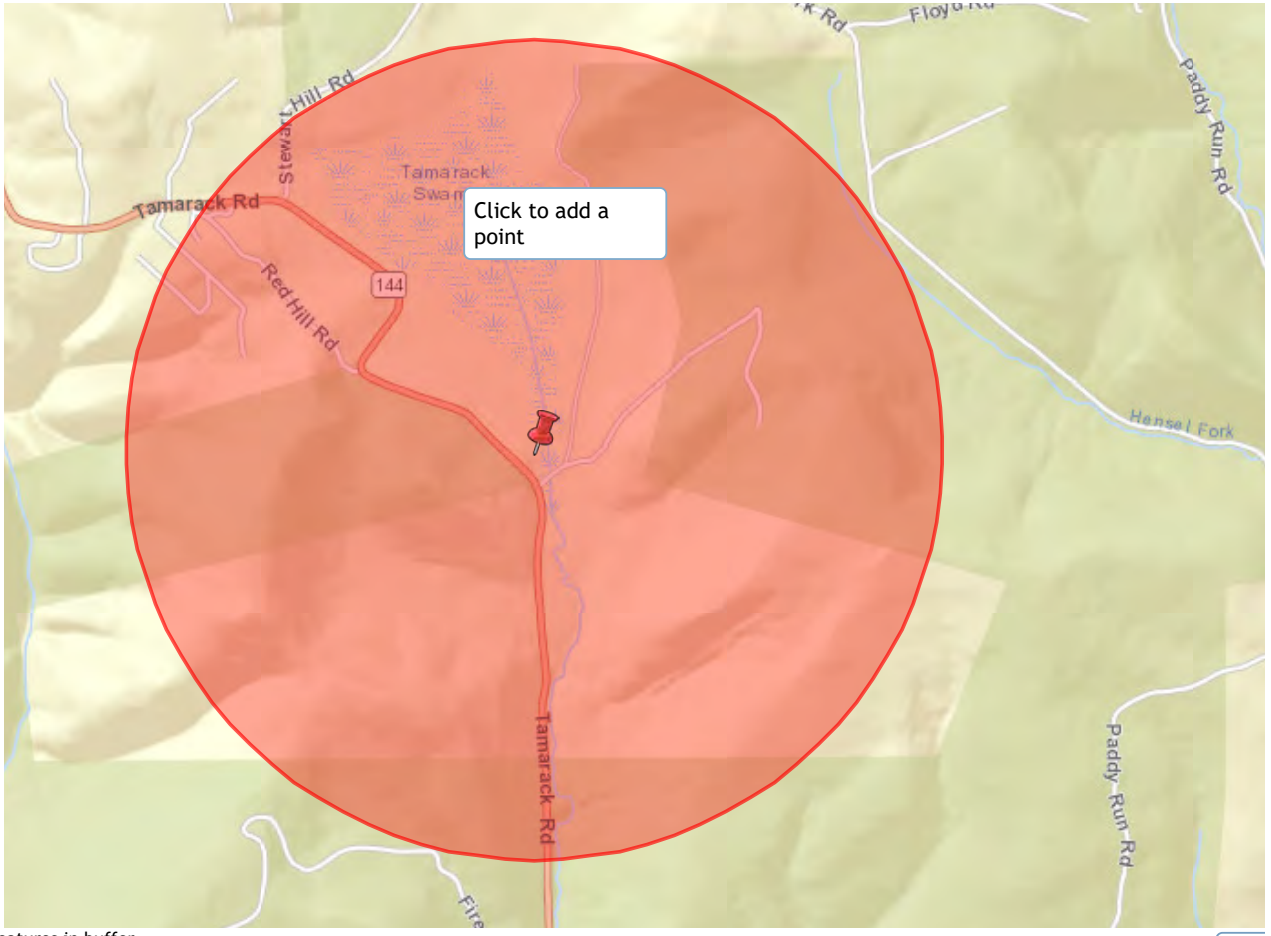
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HL-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

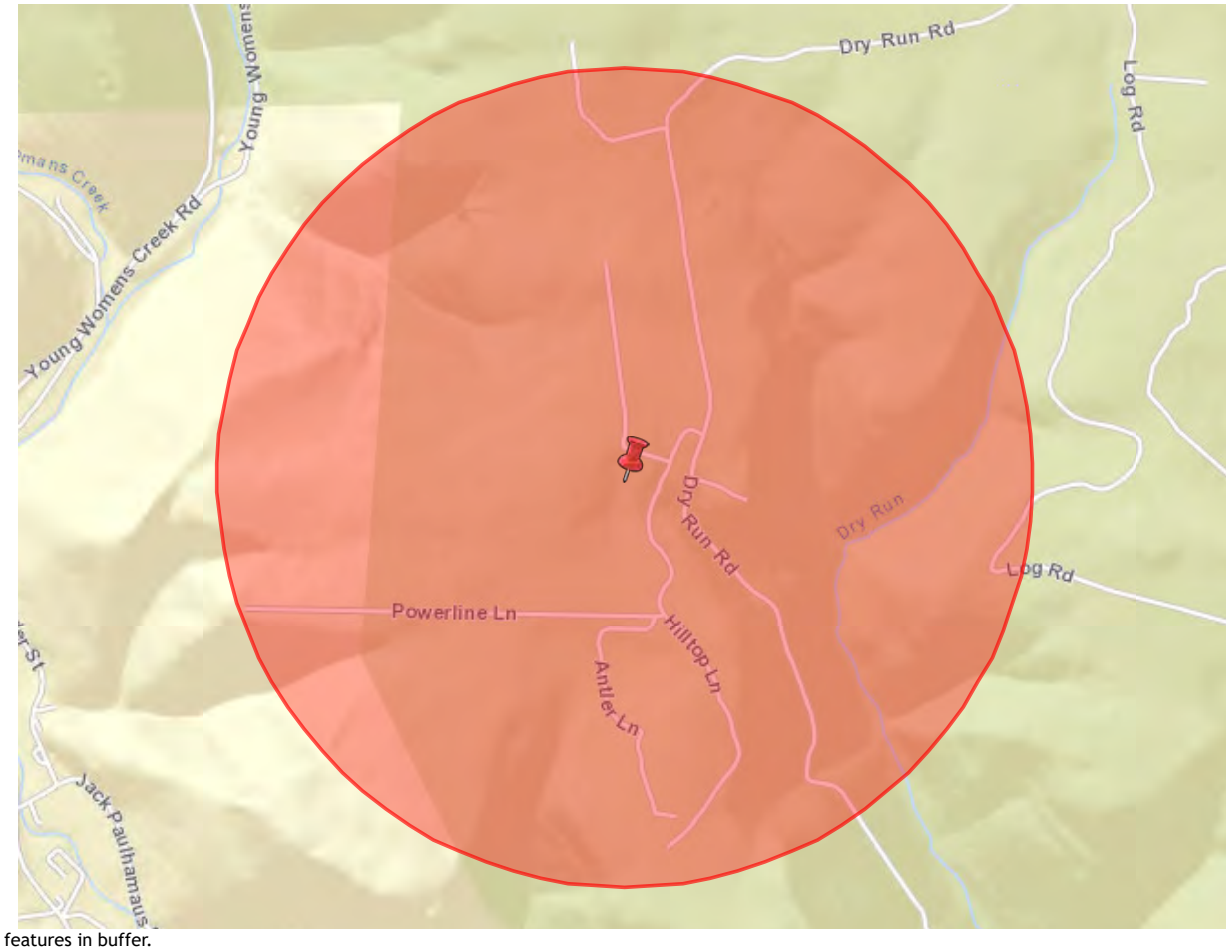
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

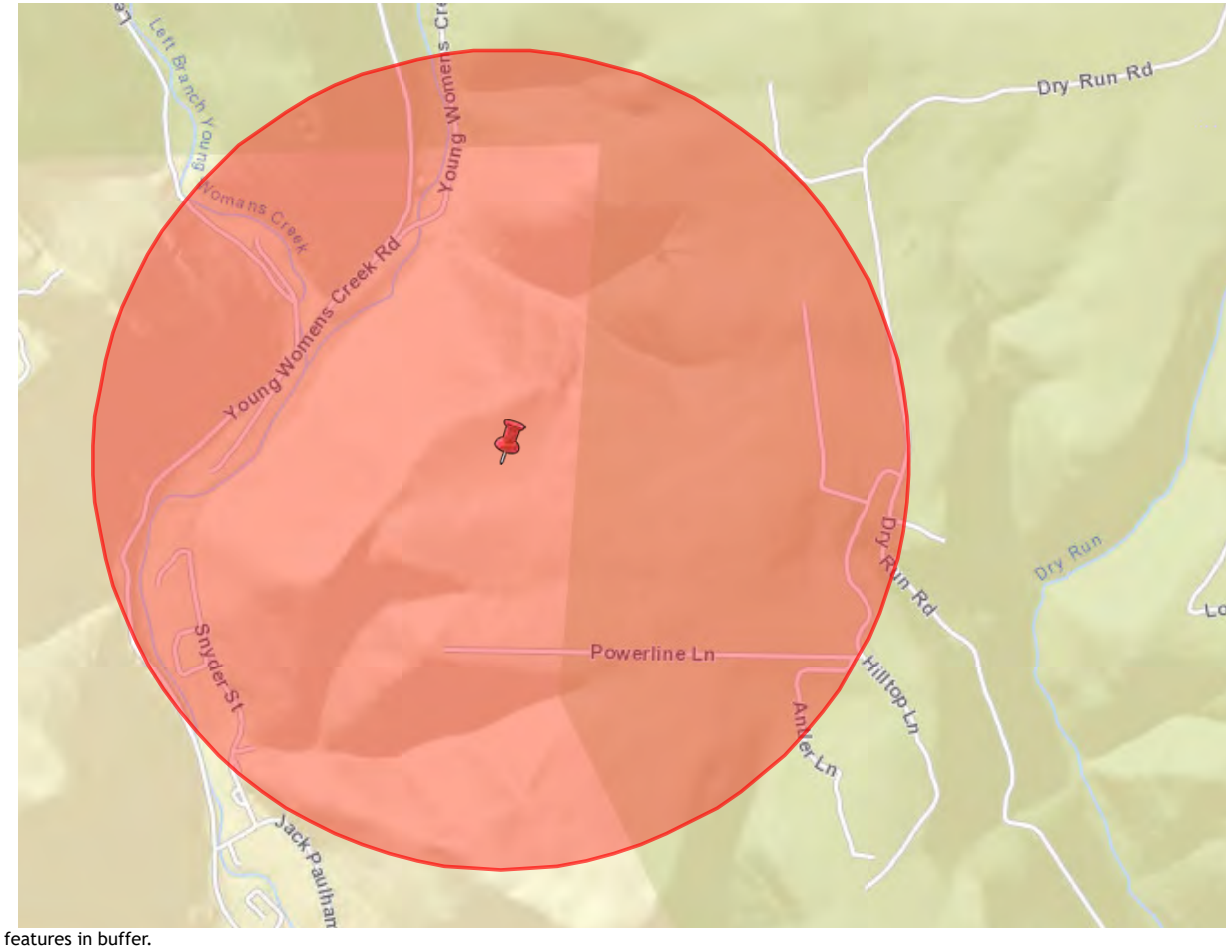
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

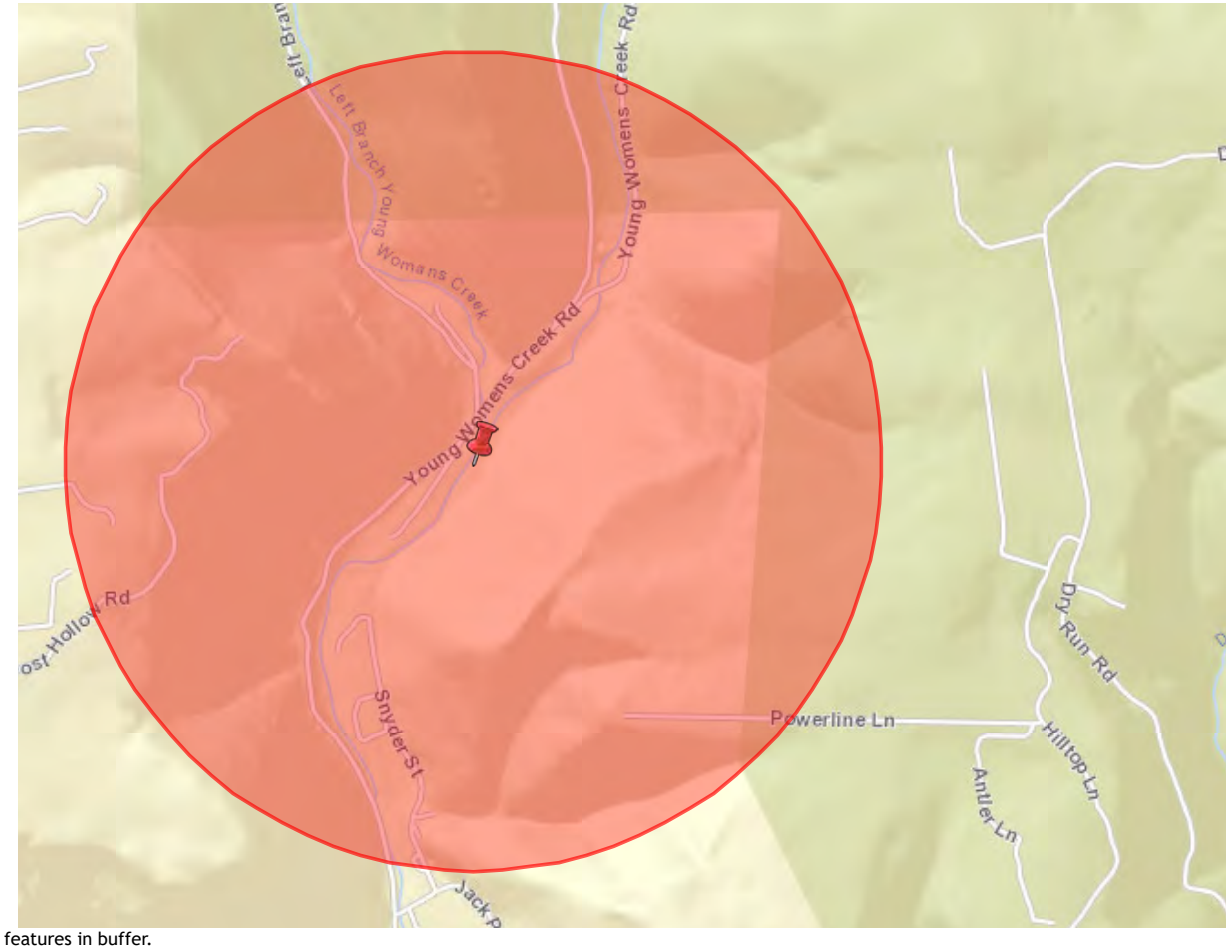
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

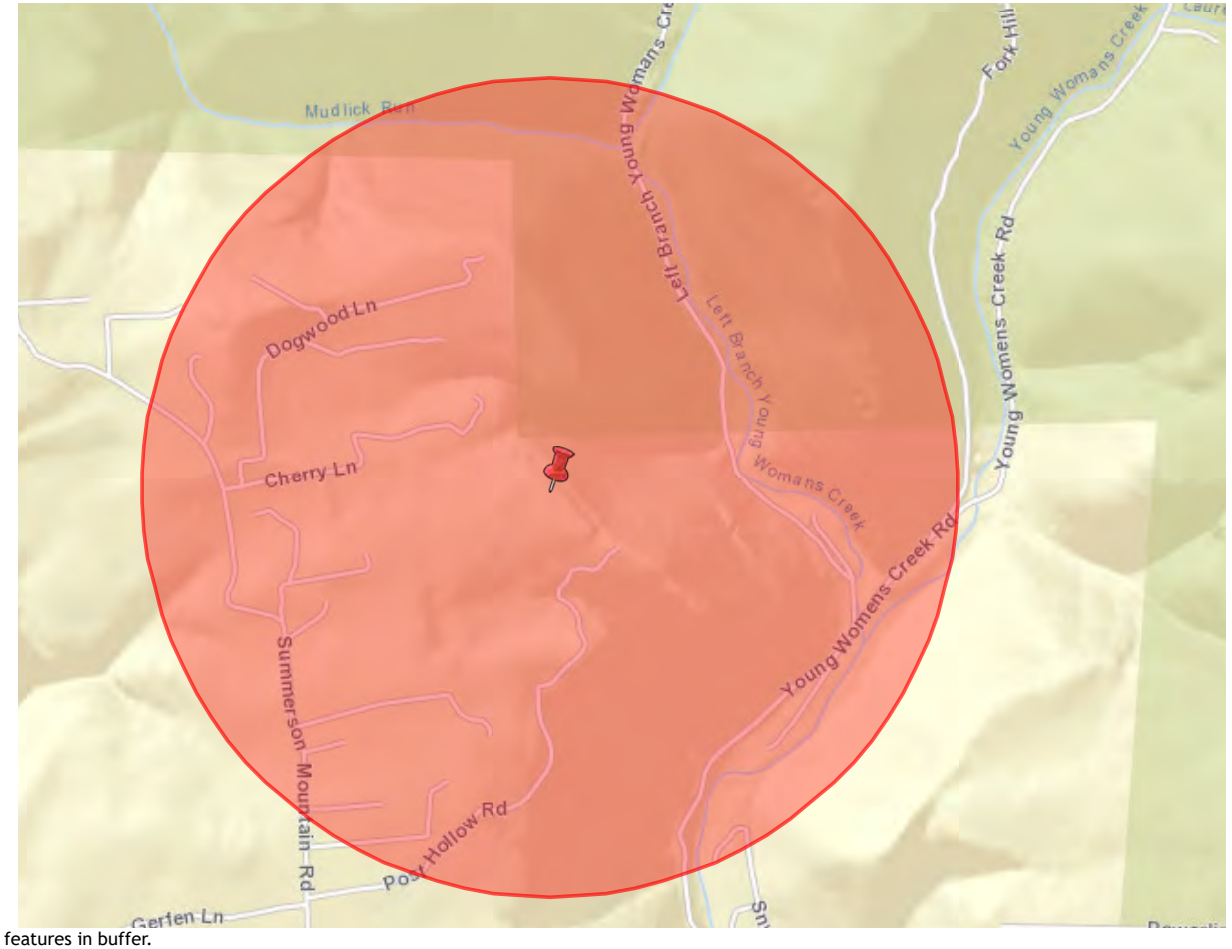
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

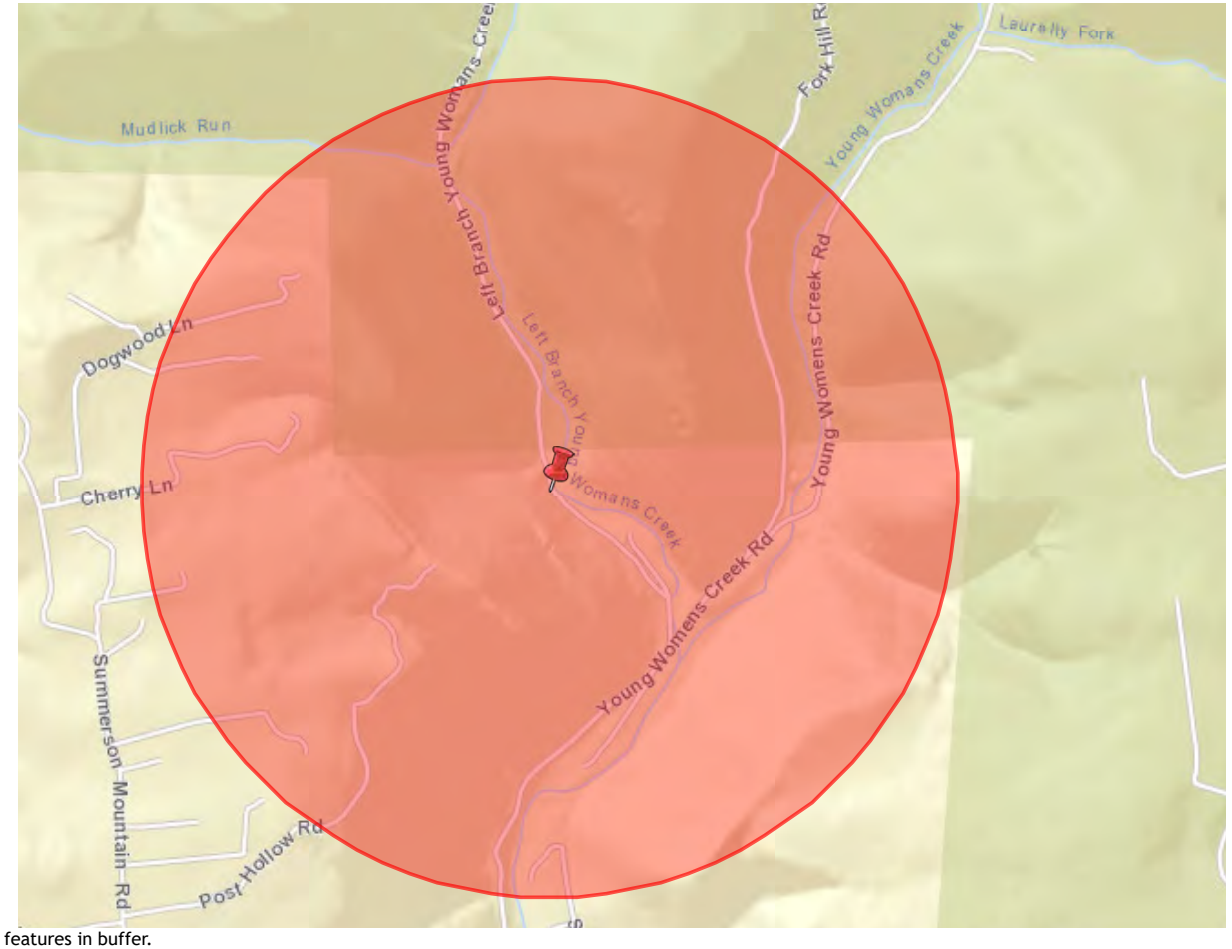
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

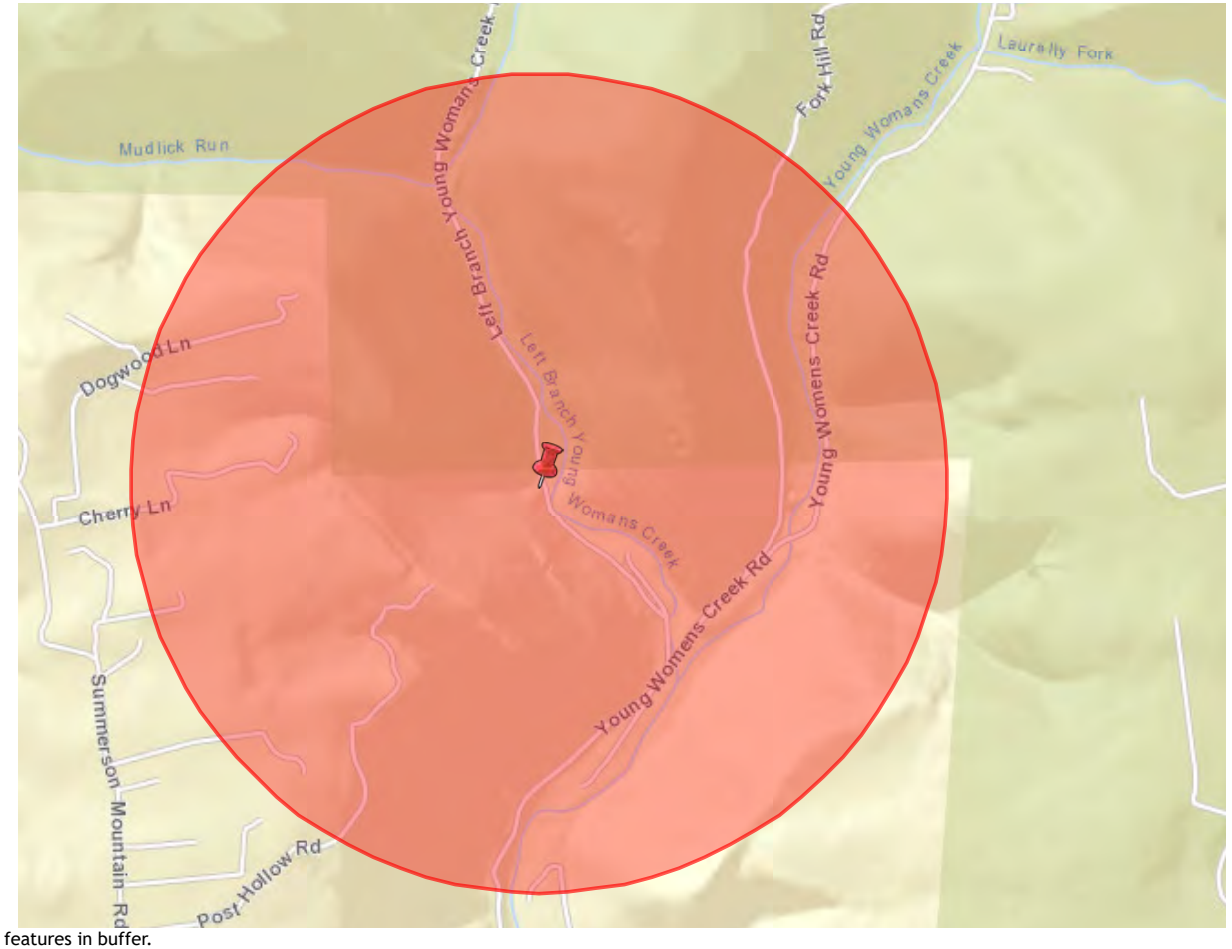
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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ESRI Streets & Imagery Topographic National Geographic

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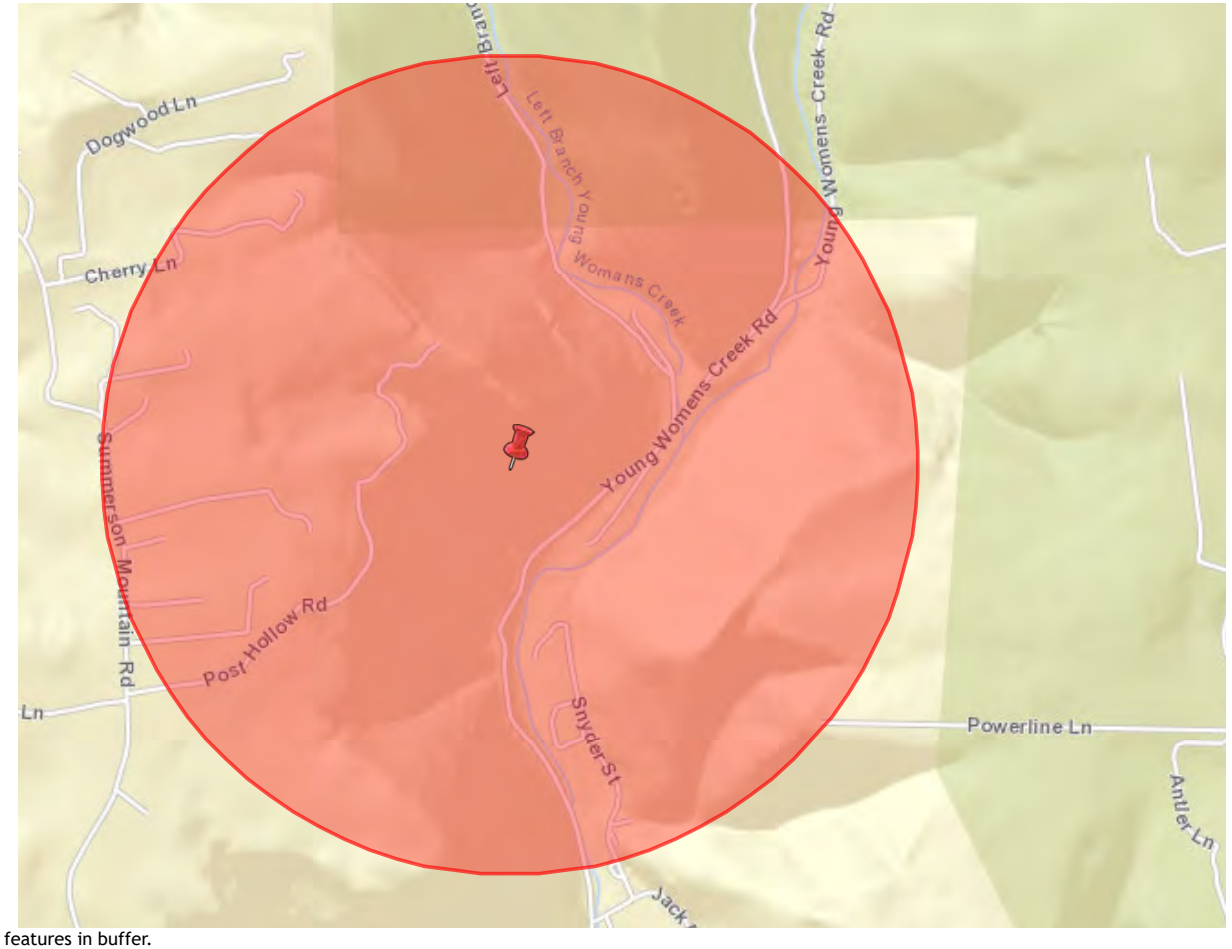

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ESRI Streets & Imagery Topographic National Geographic

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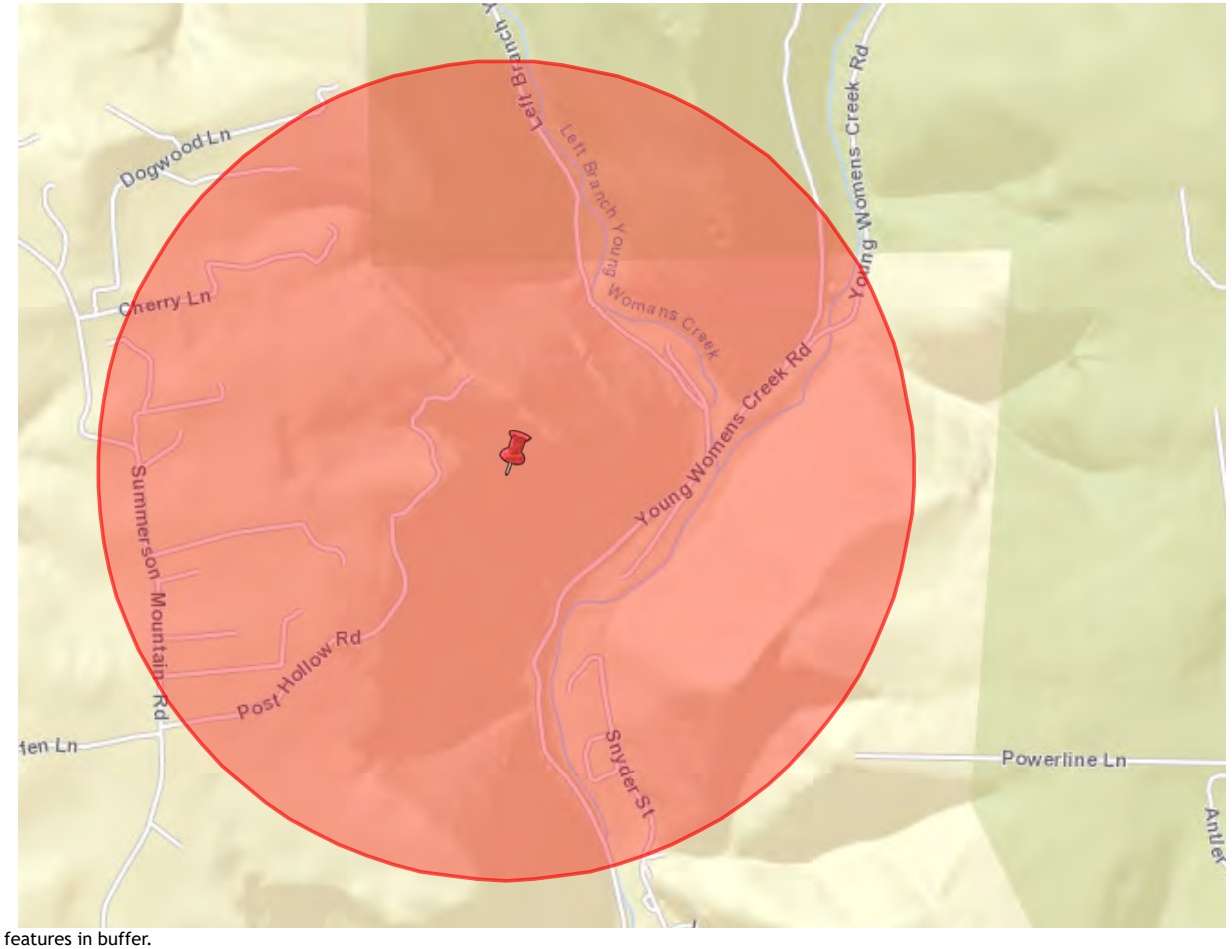

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ESRI Streets & Imagery Topographic National Geographic

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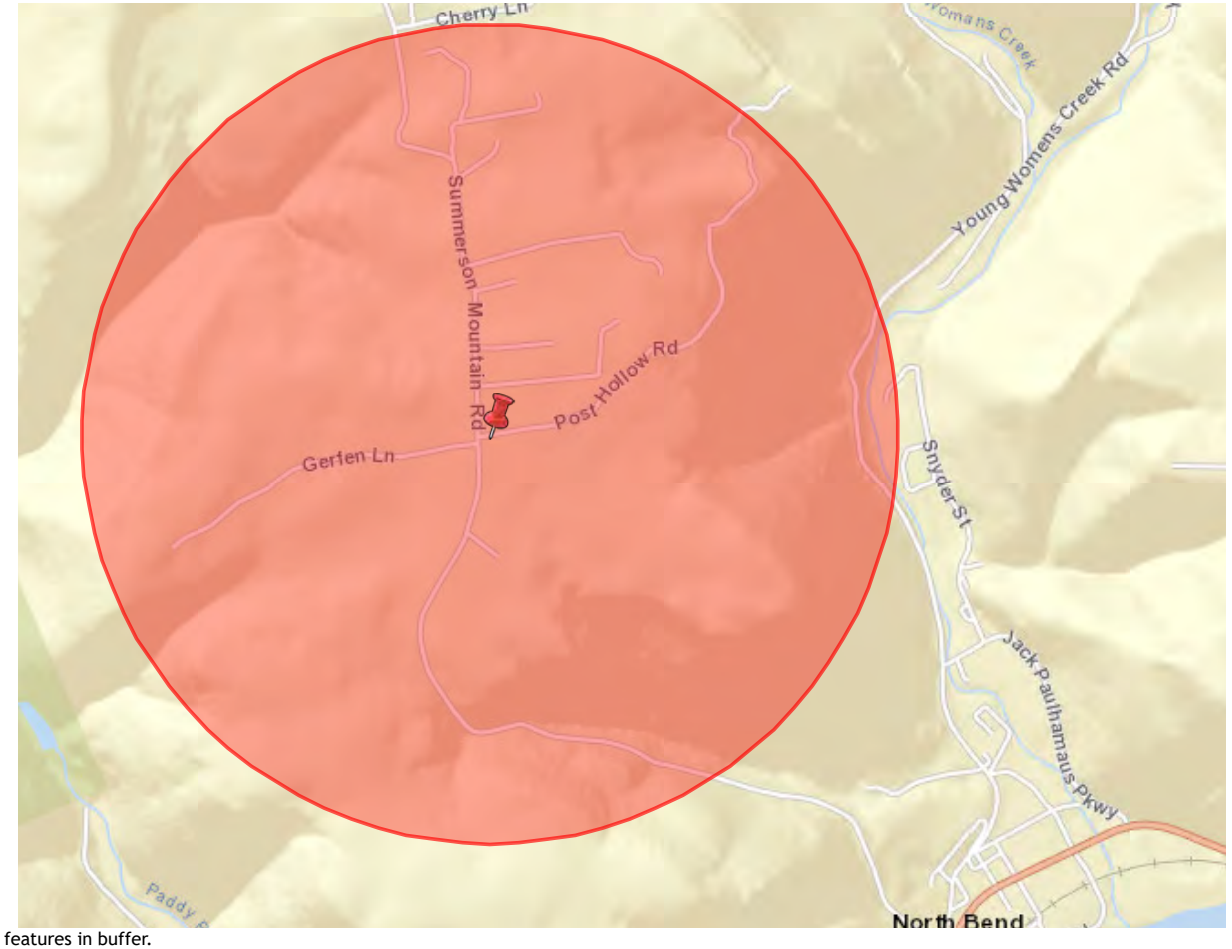

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ESRI Streets & Imagery Topographic National Geographic

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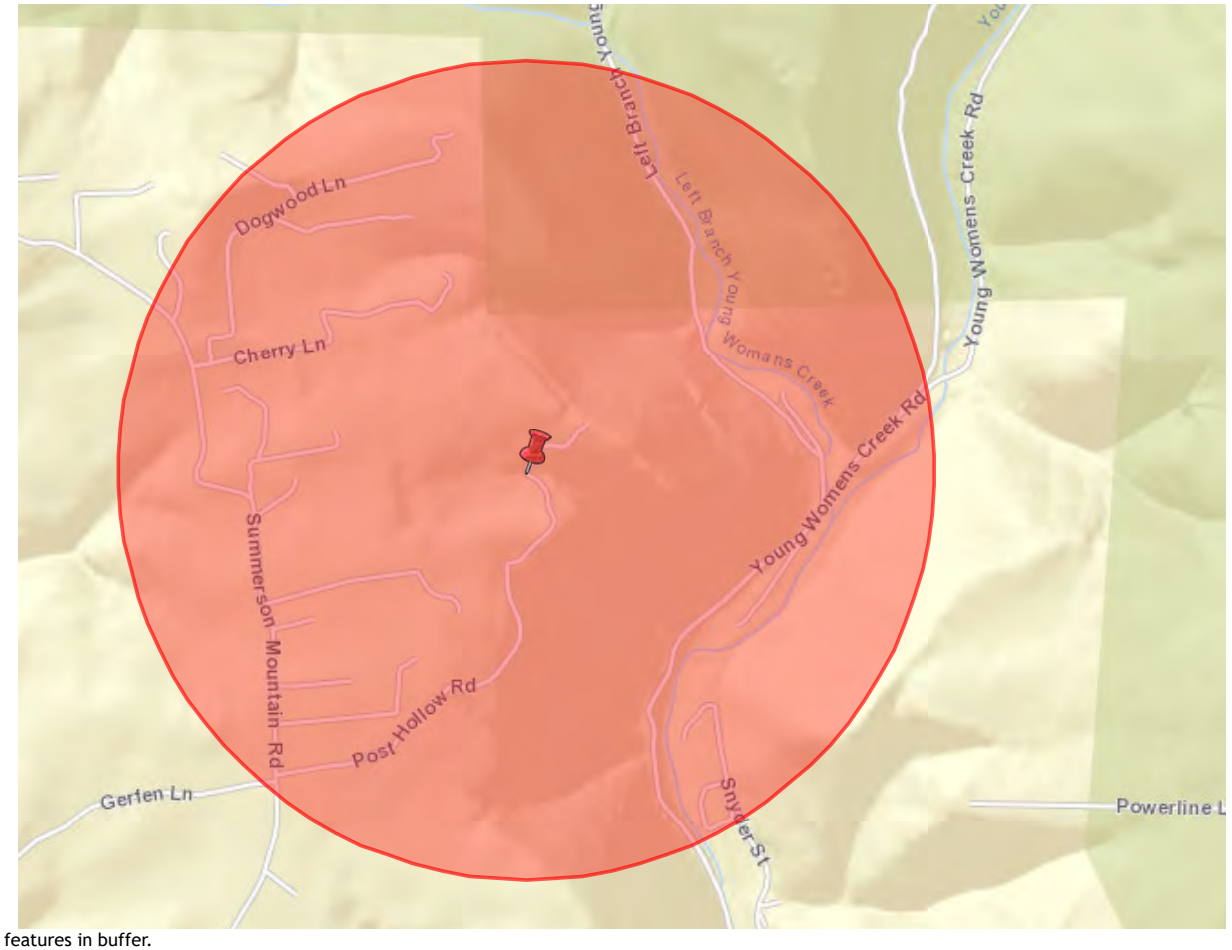

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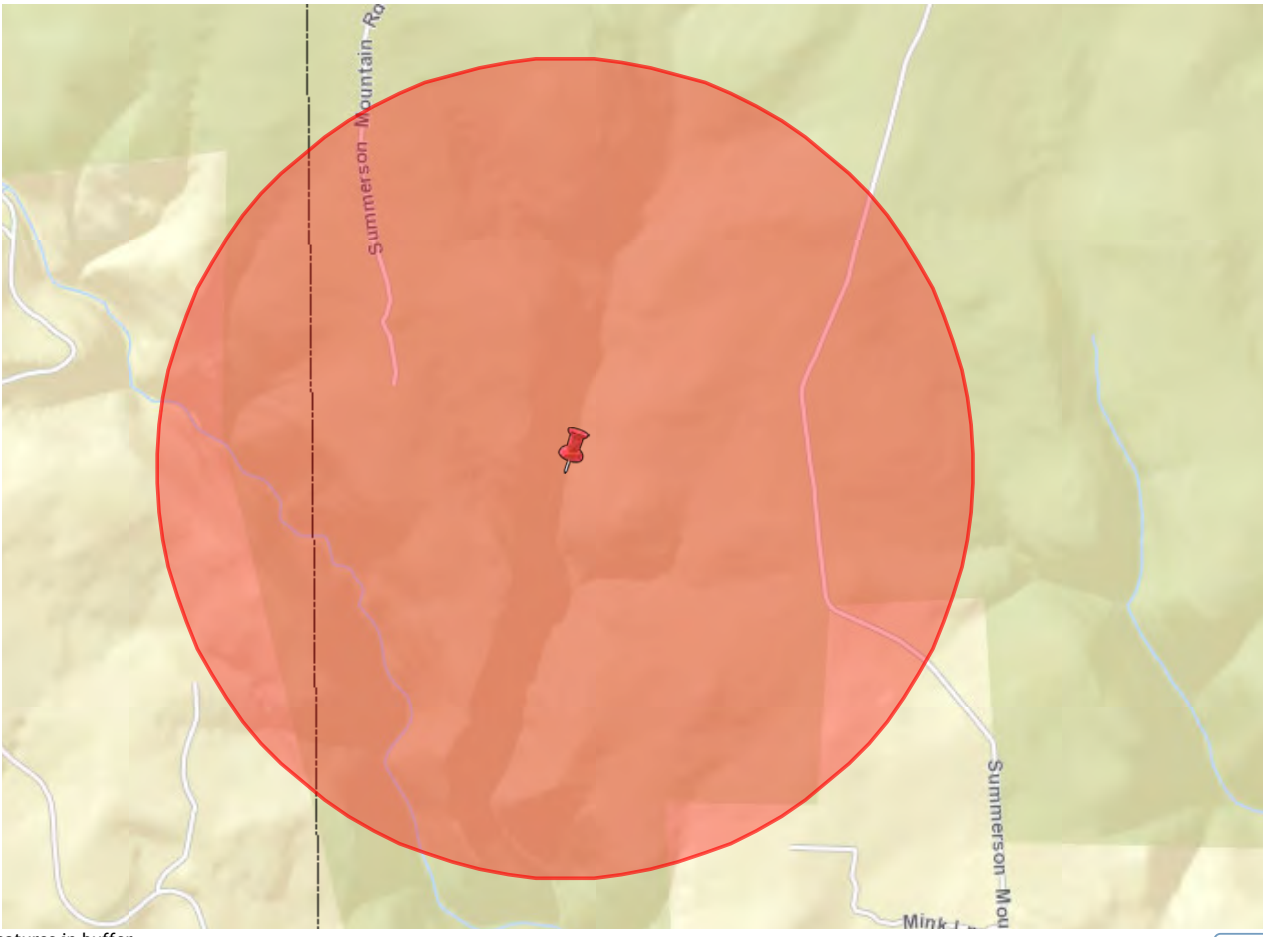

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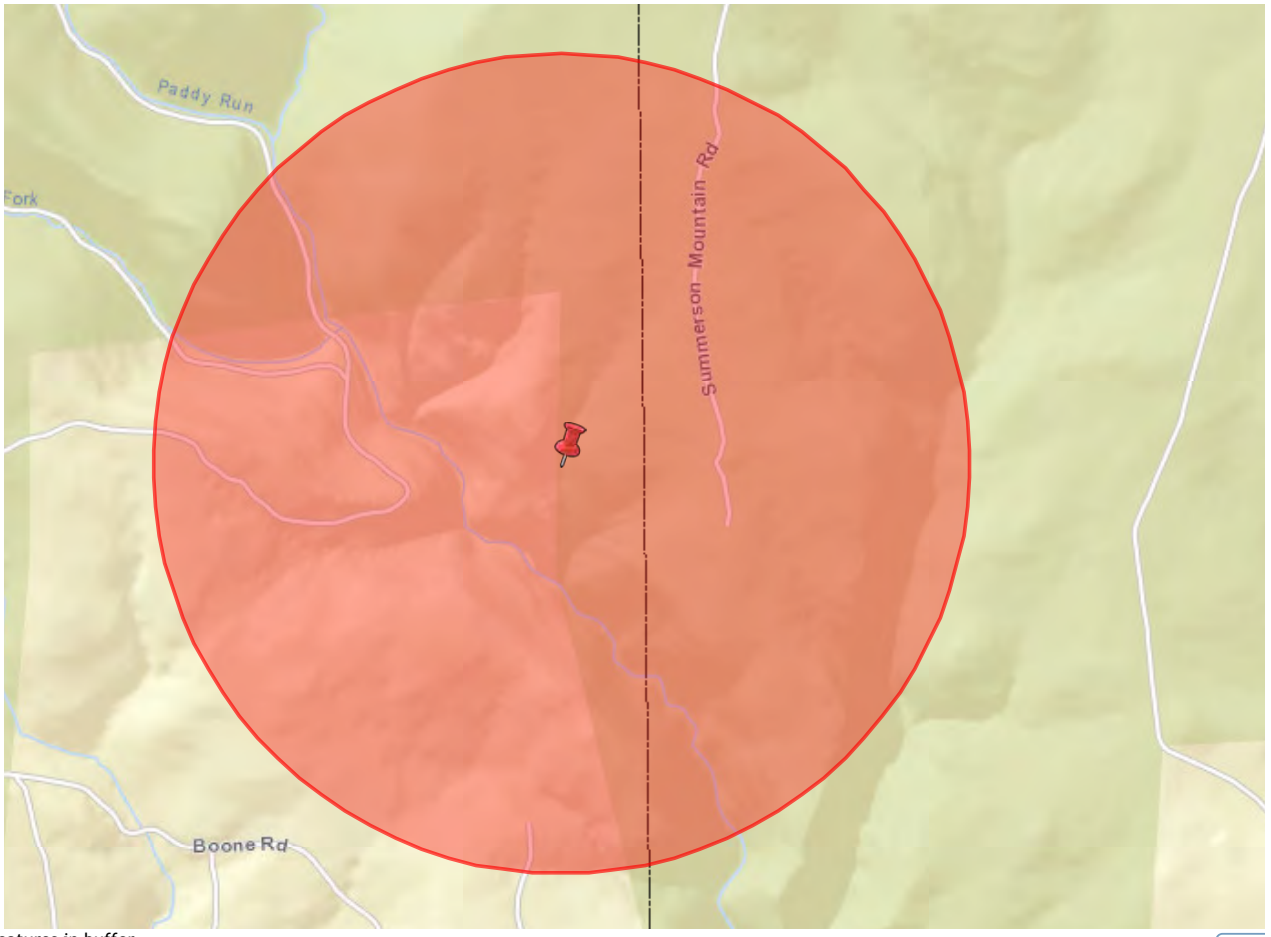
ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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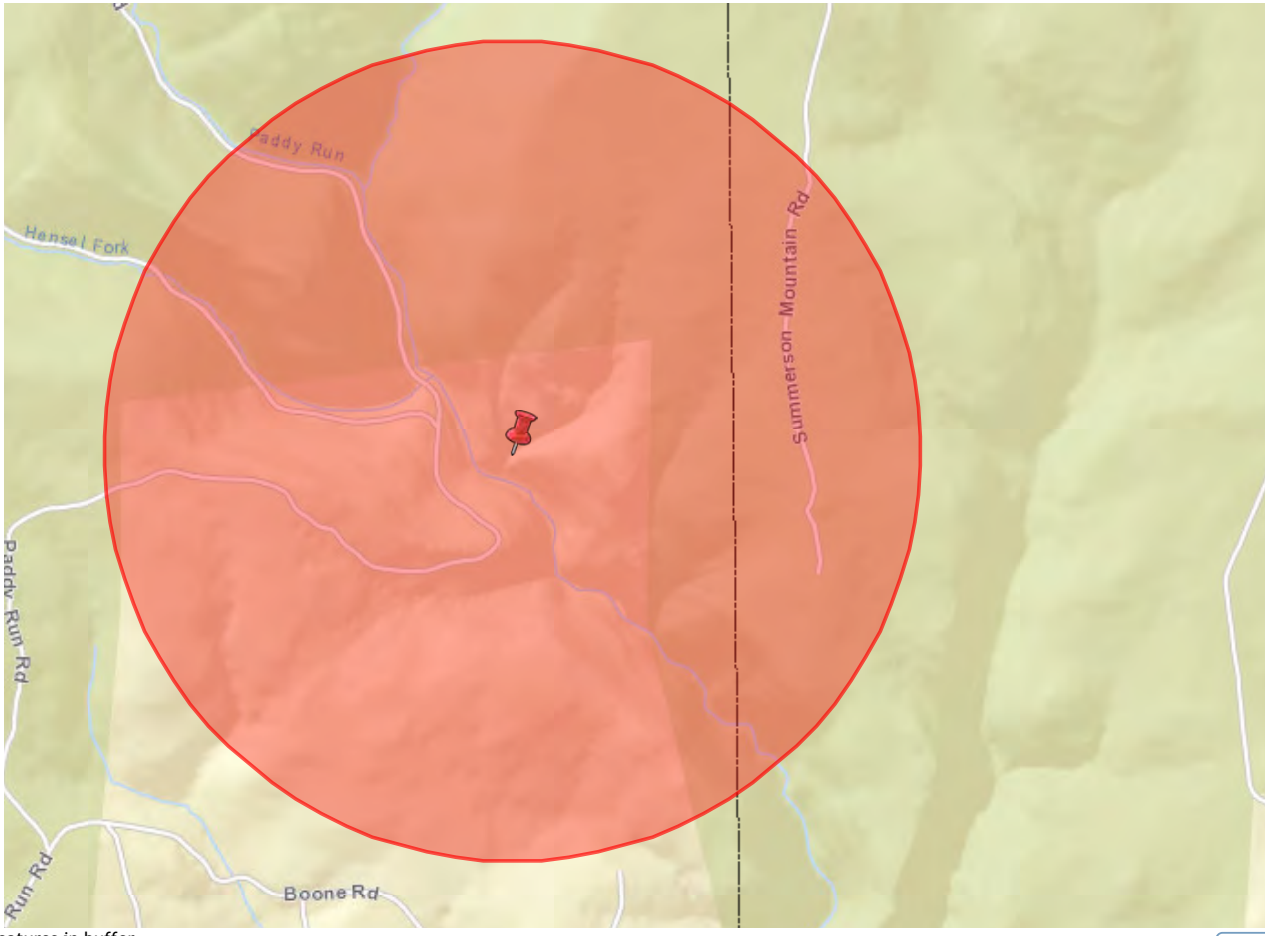

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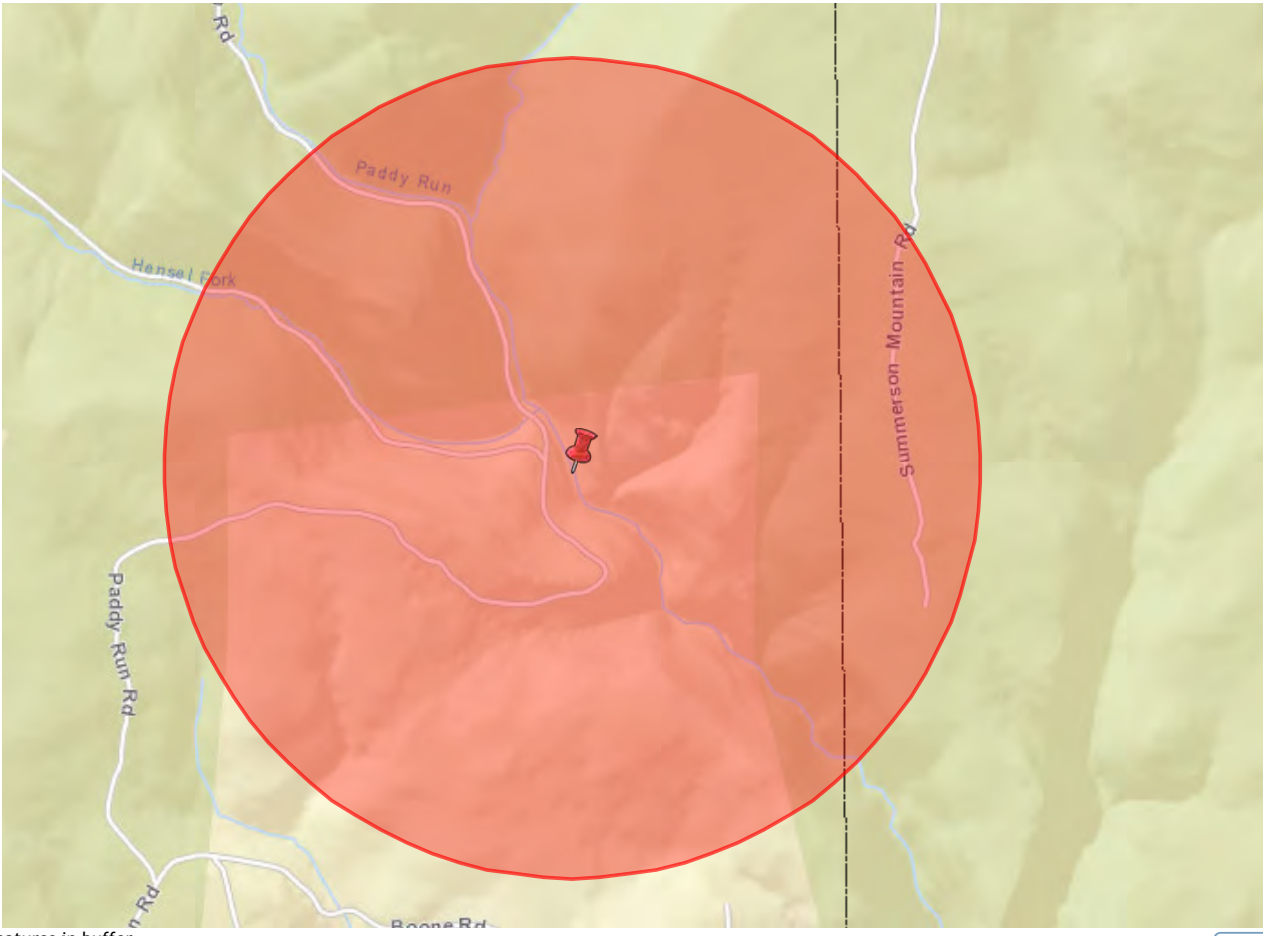

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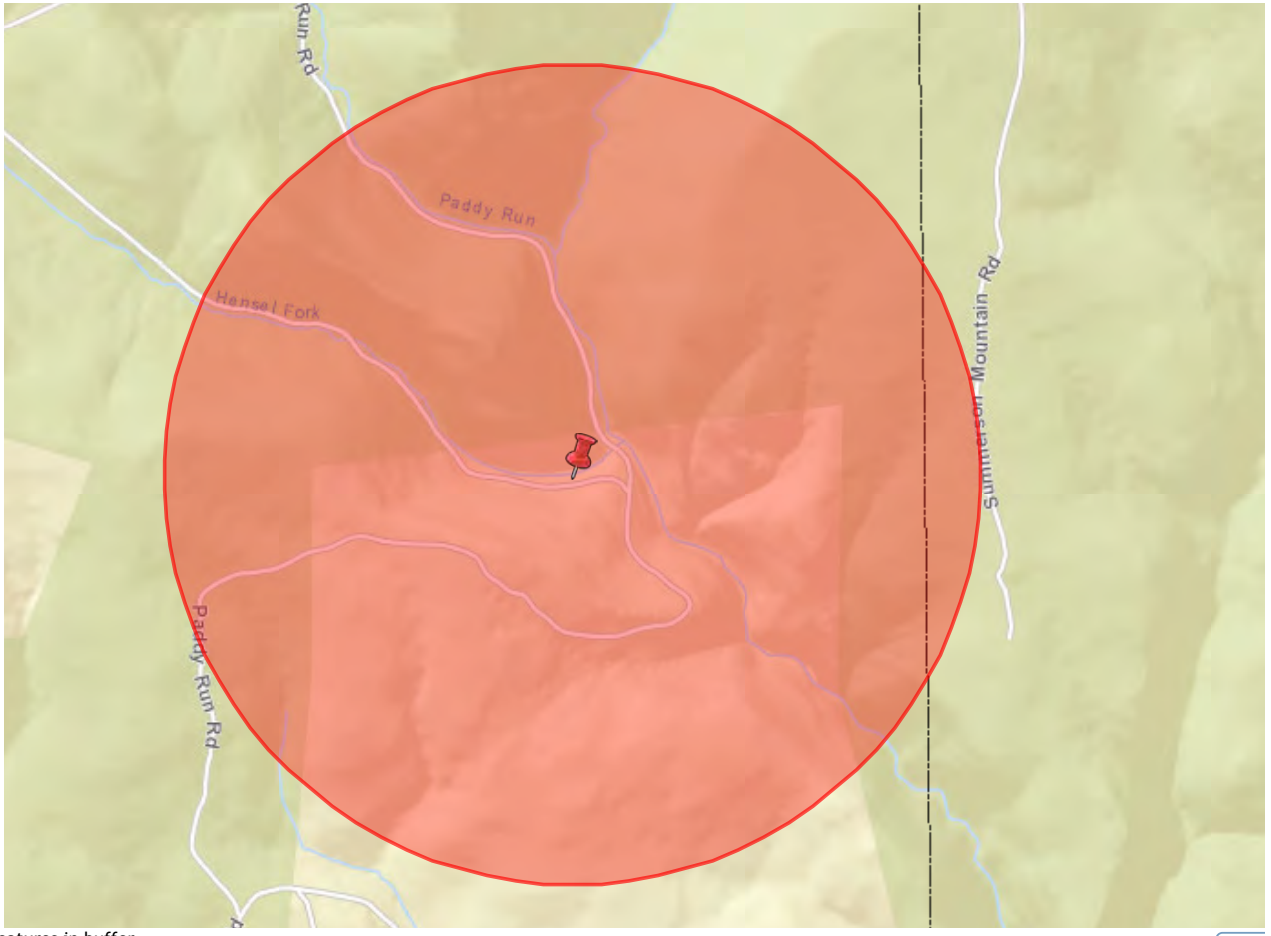
ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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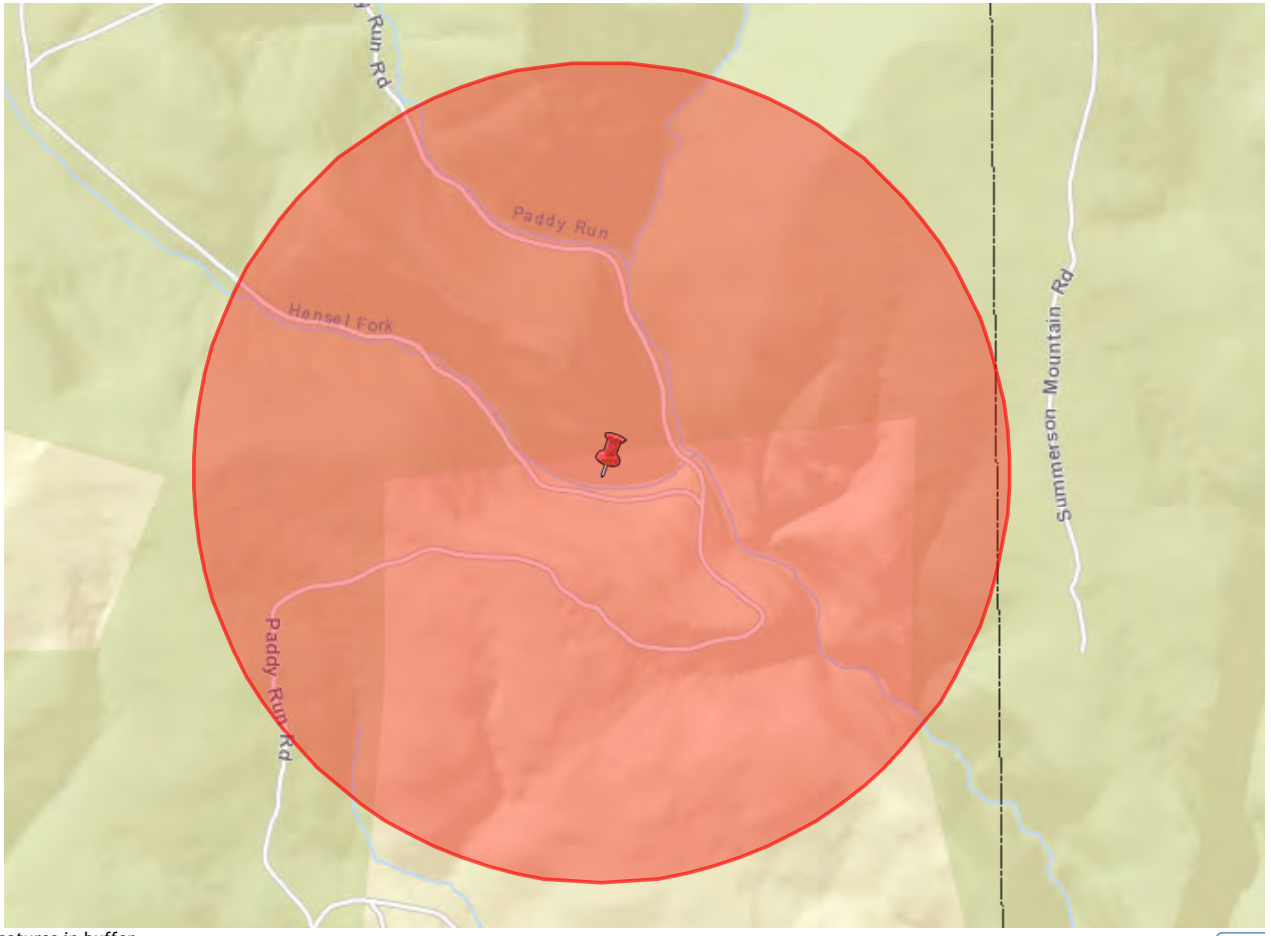

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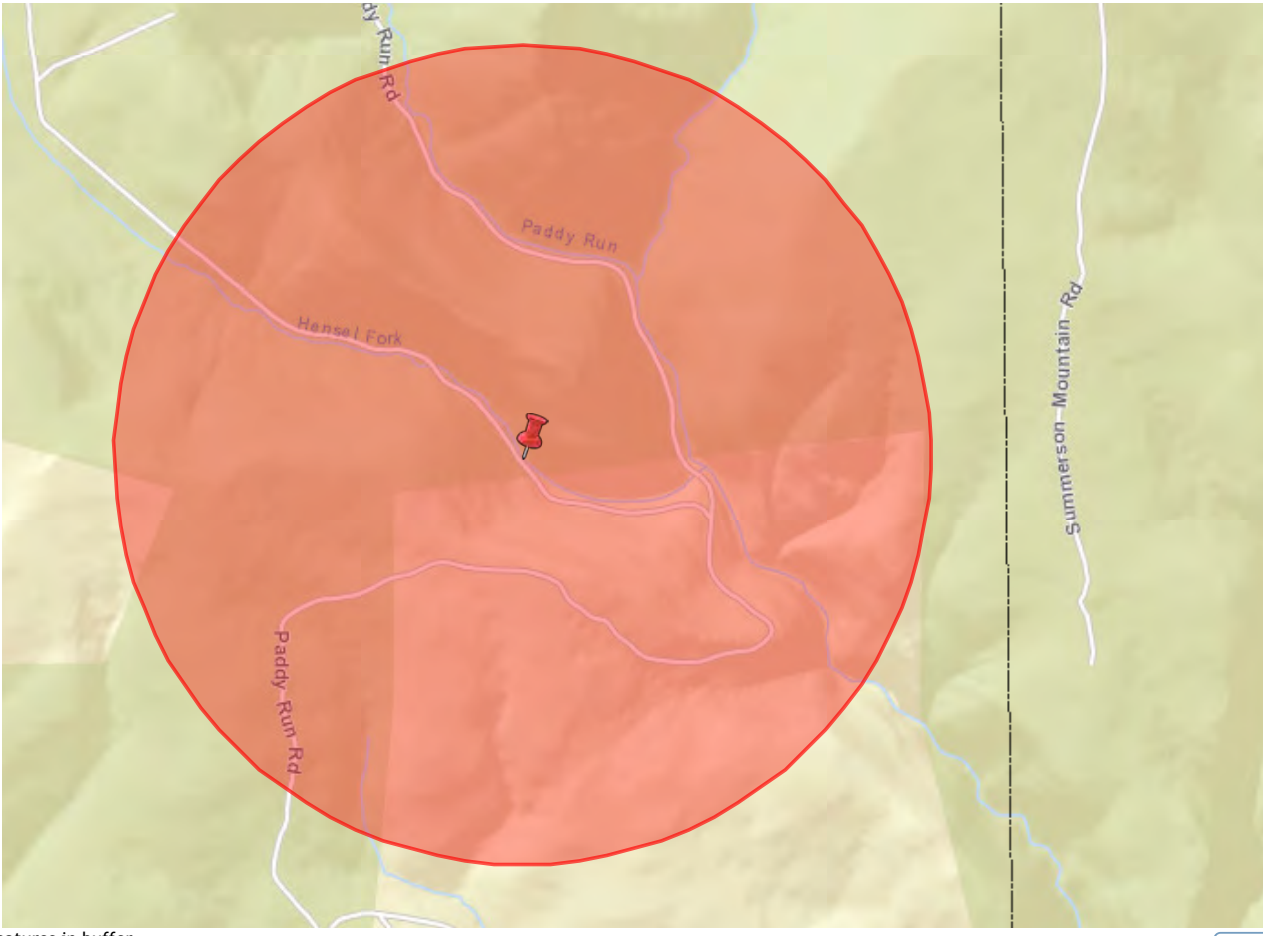
Streets Imagery



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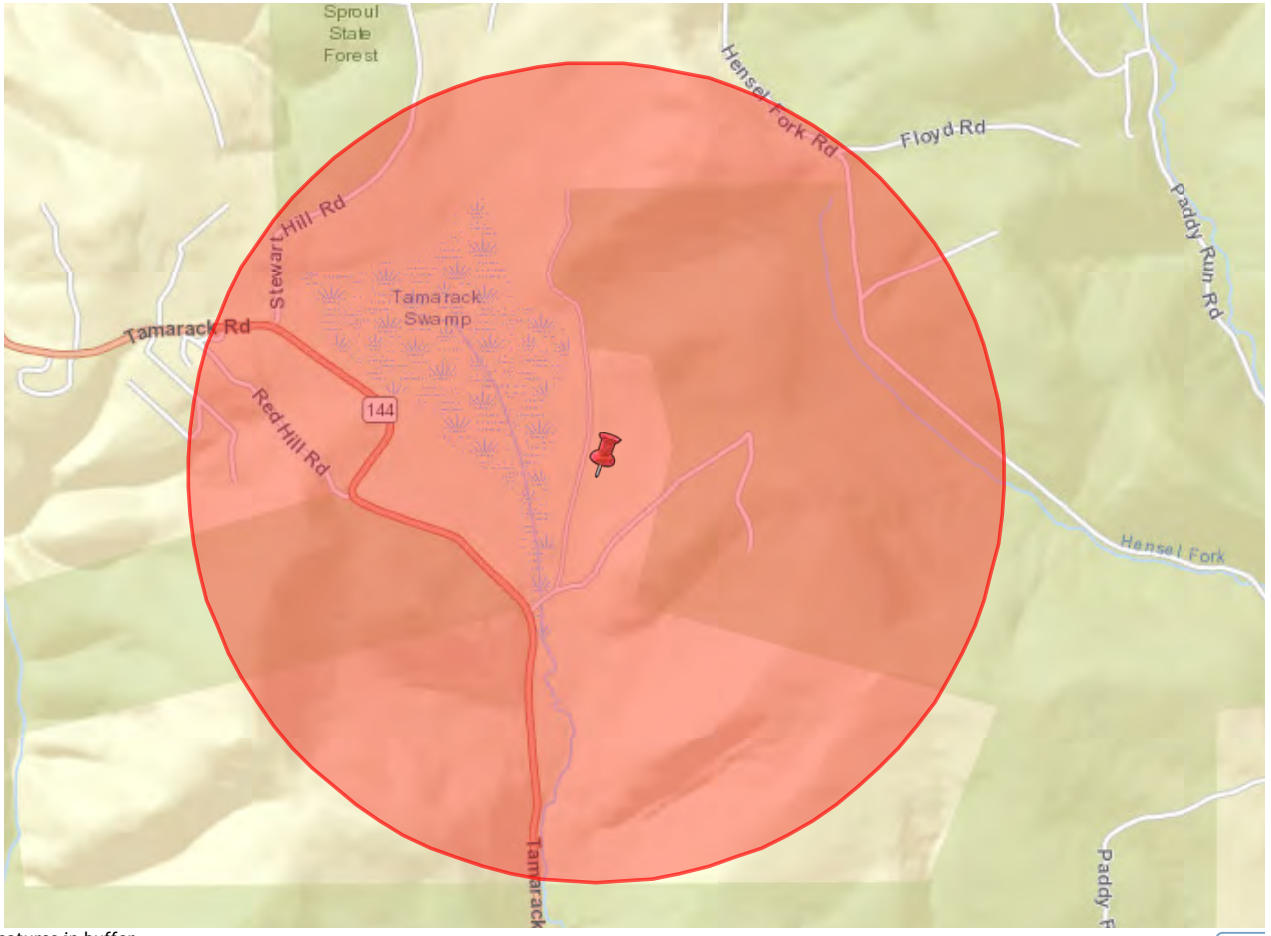

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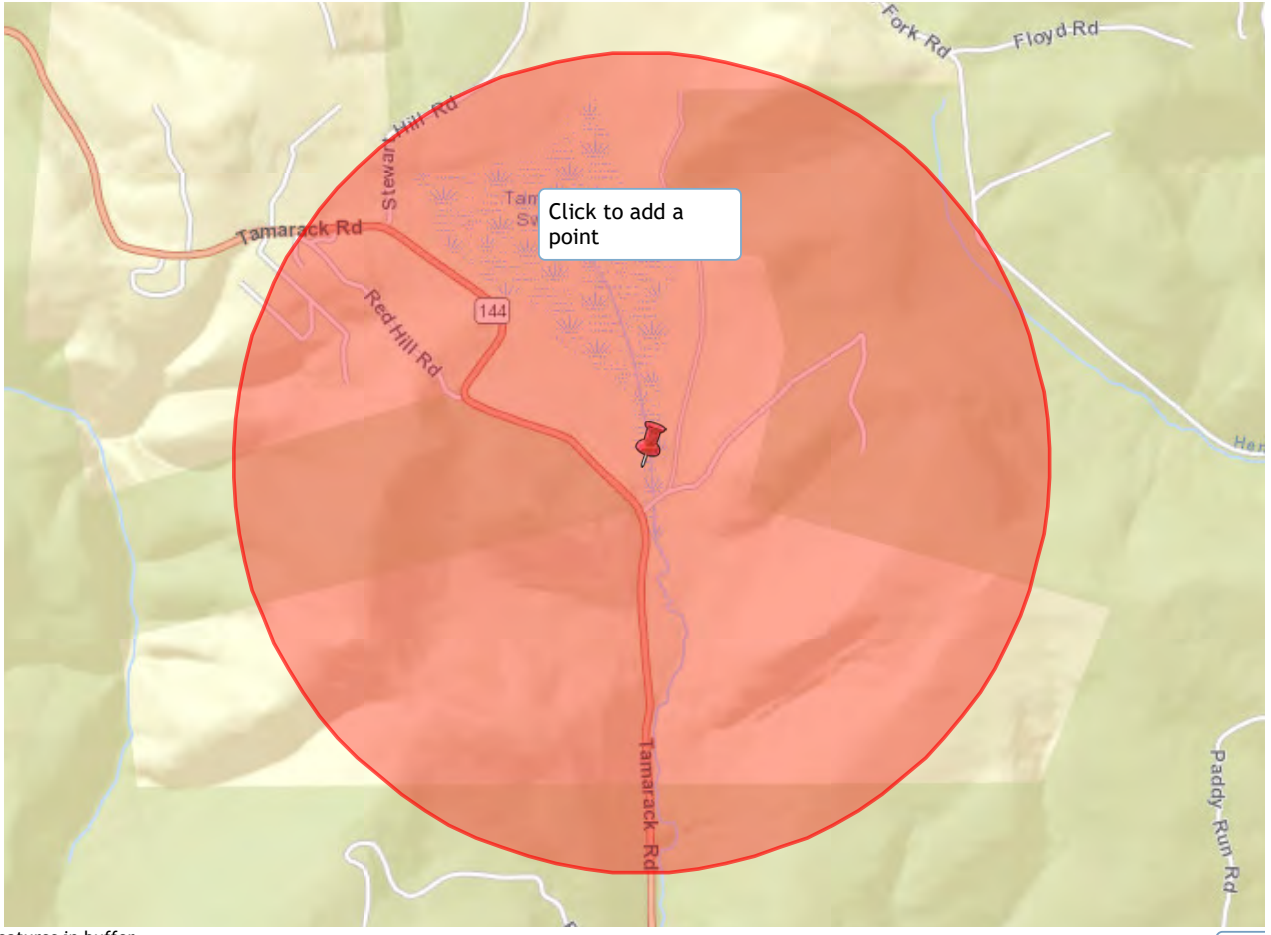

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ESRI Streets & Imagery Topographic National Geographic

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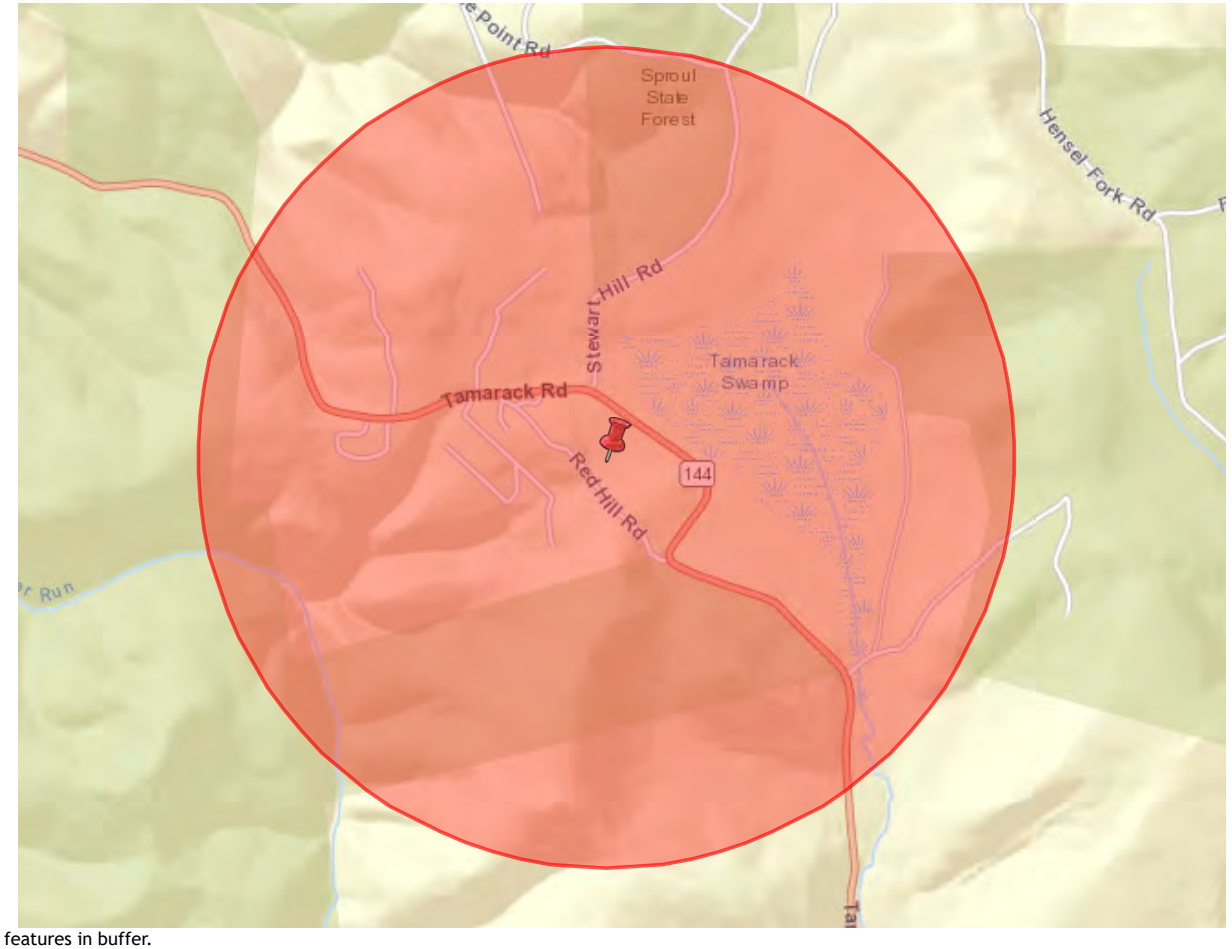

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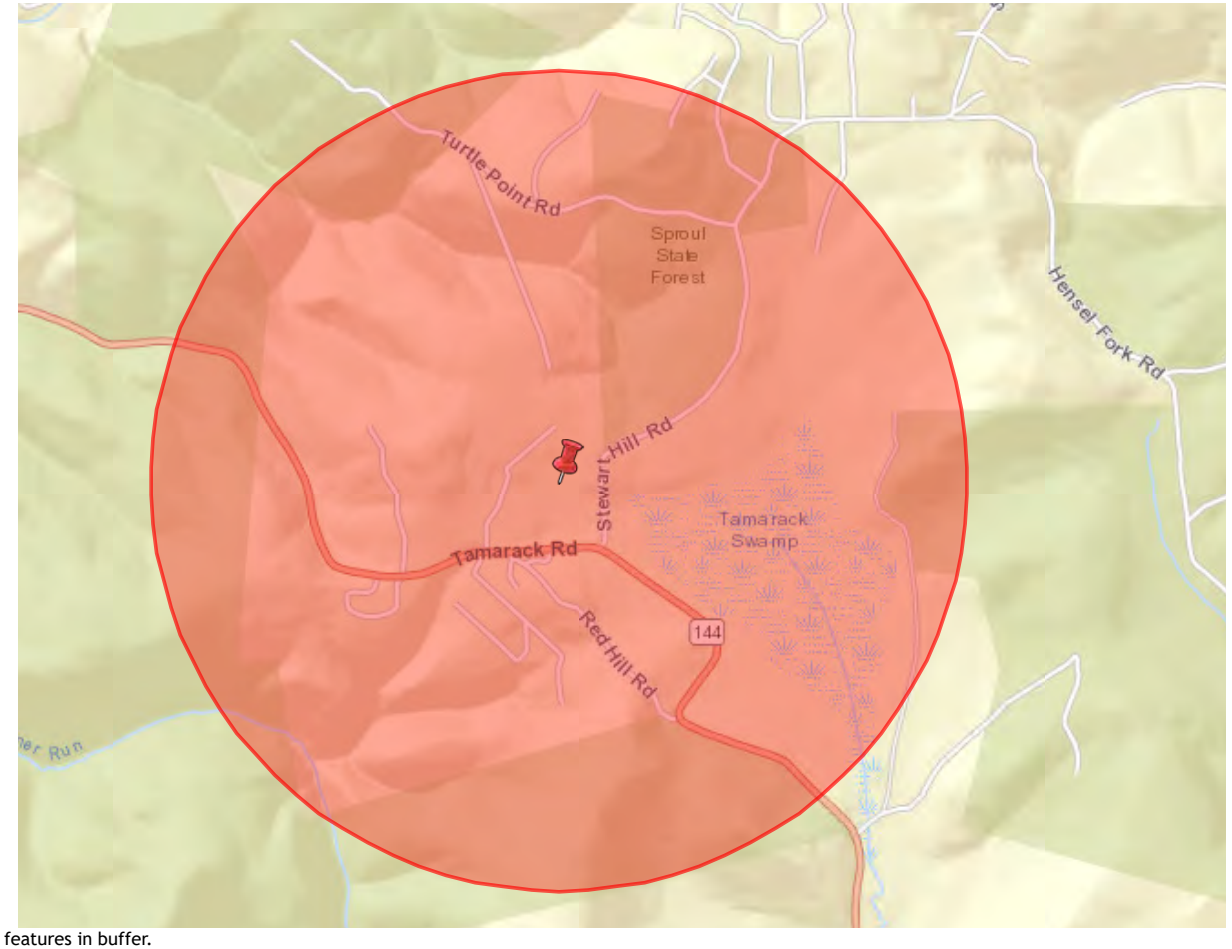

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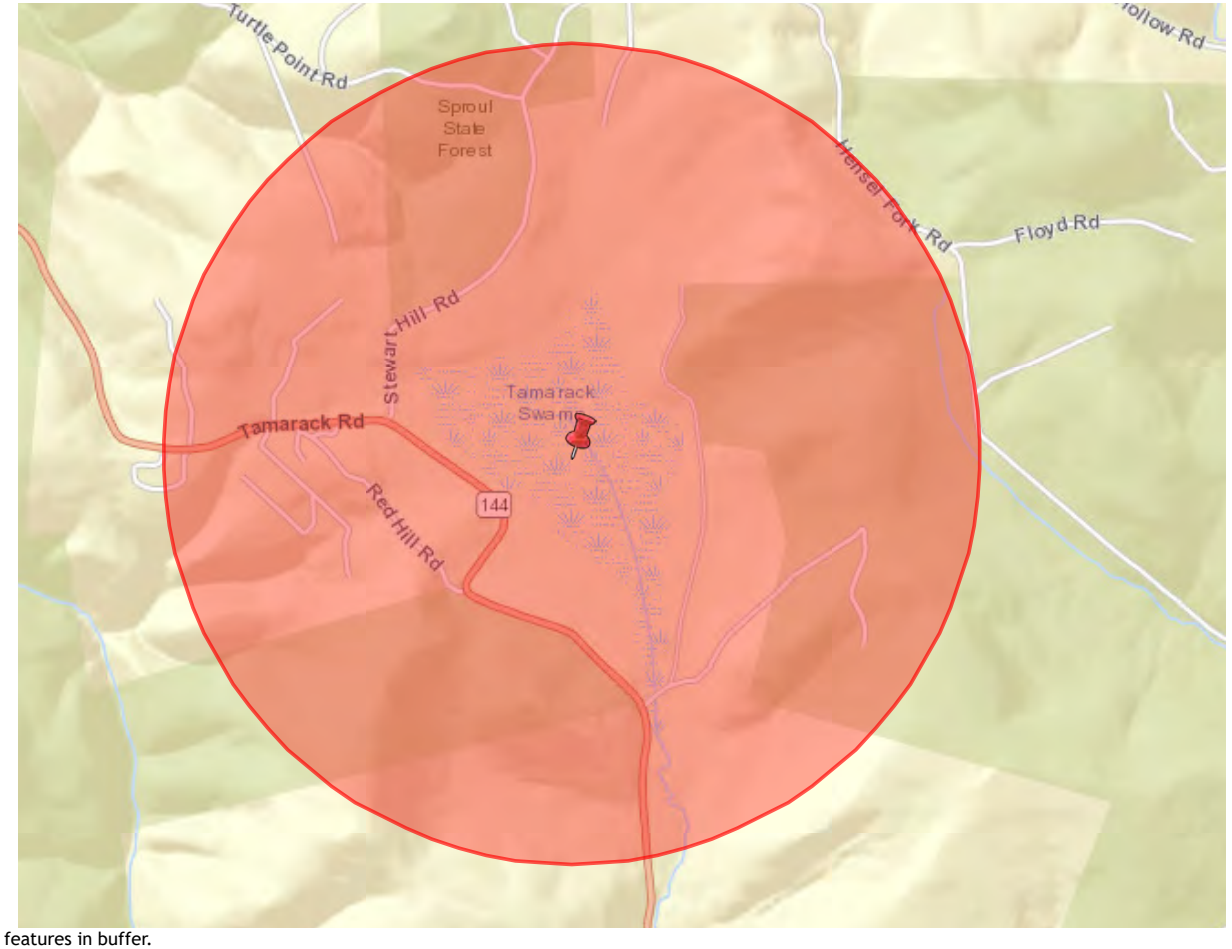

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ESRI Streets & Imagery Topographic National Geographic

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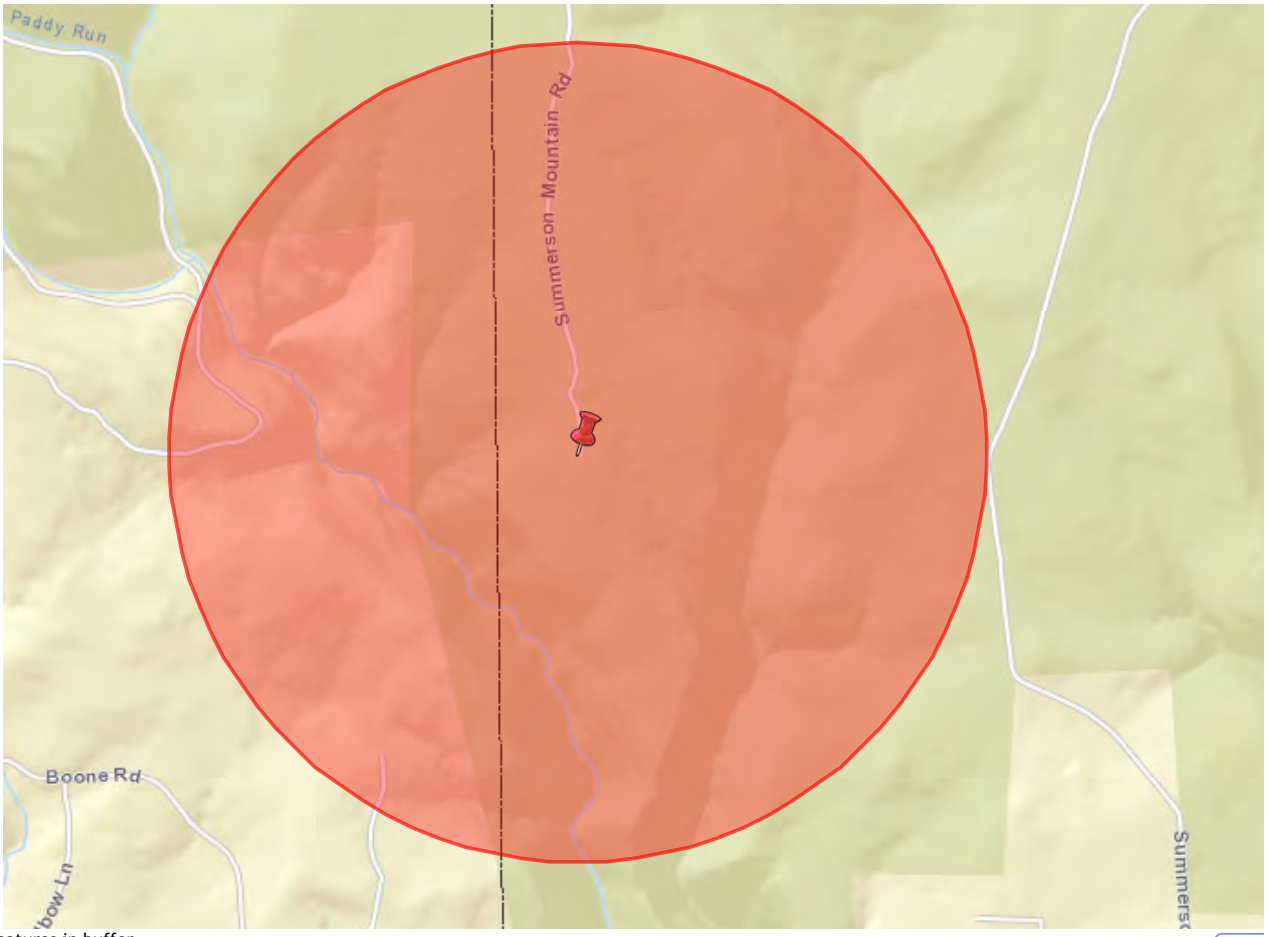

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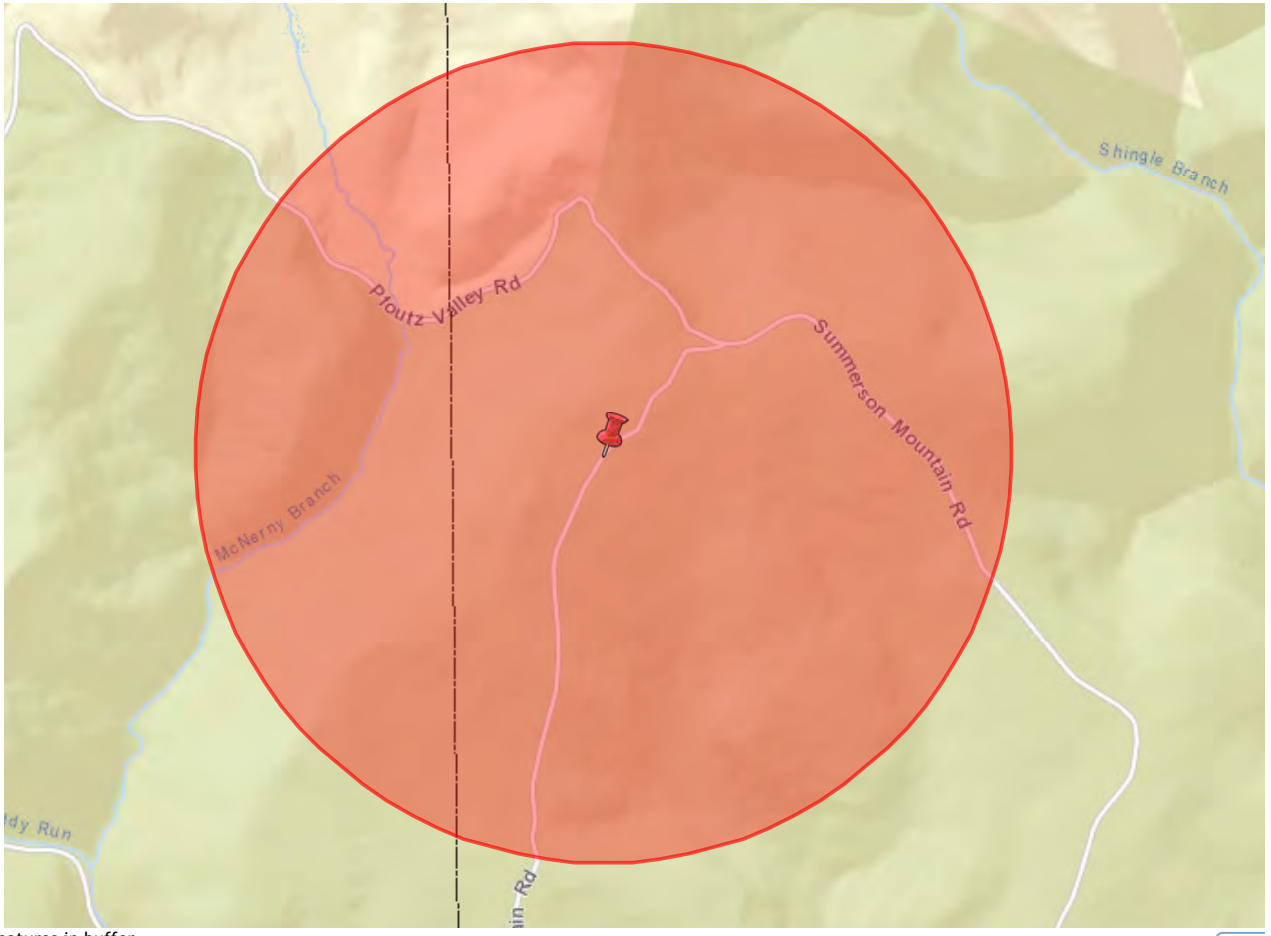

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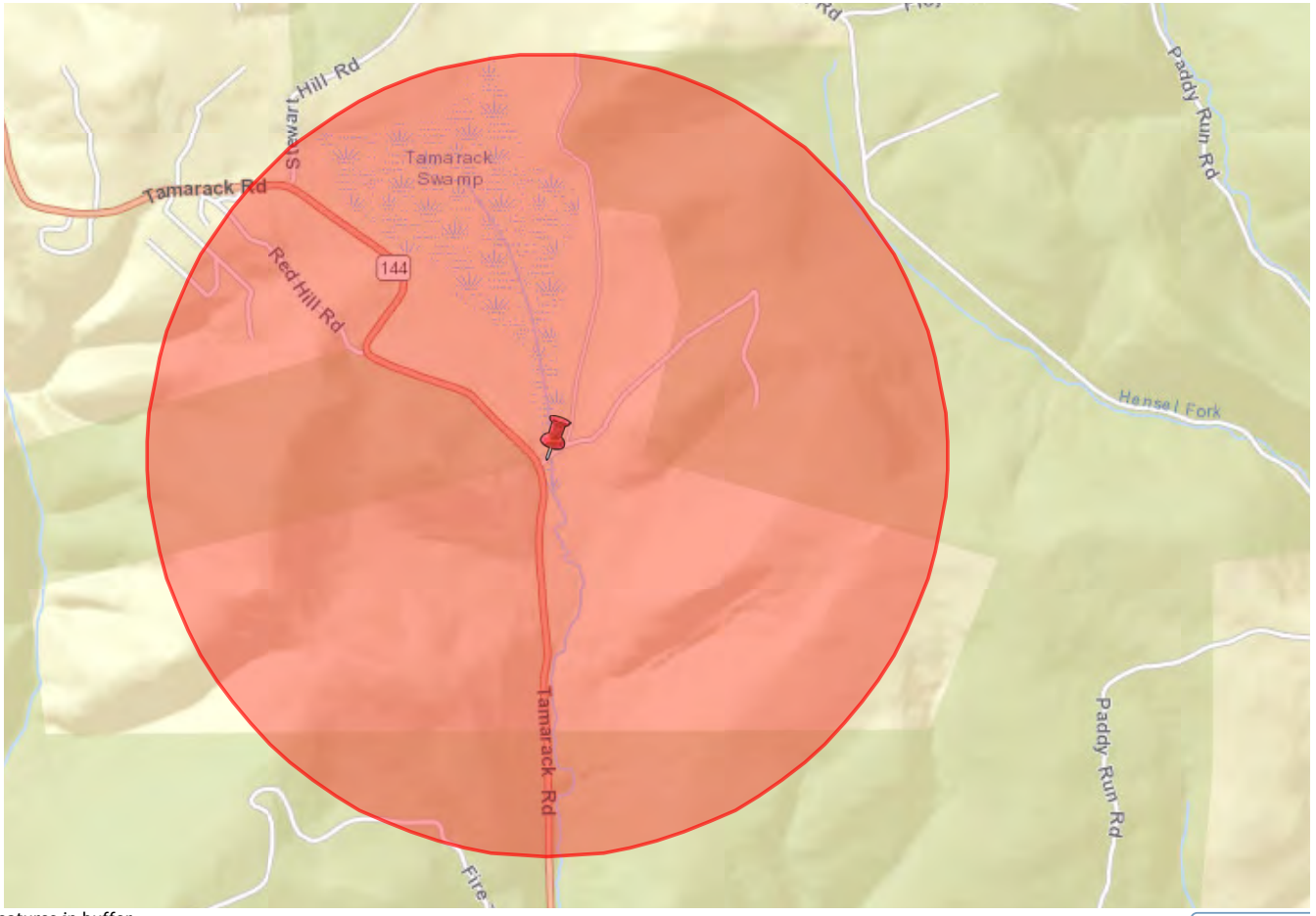

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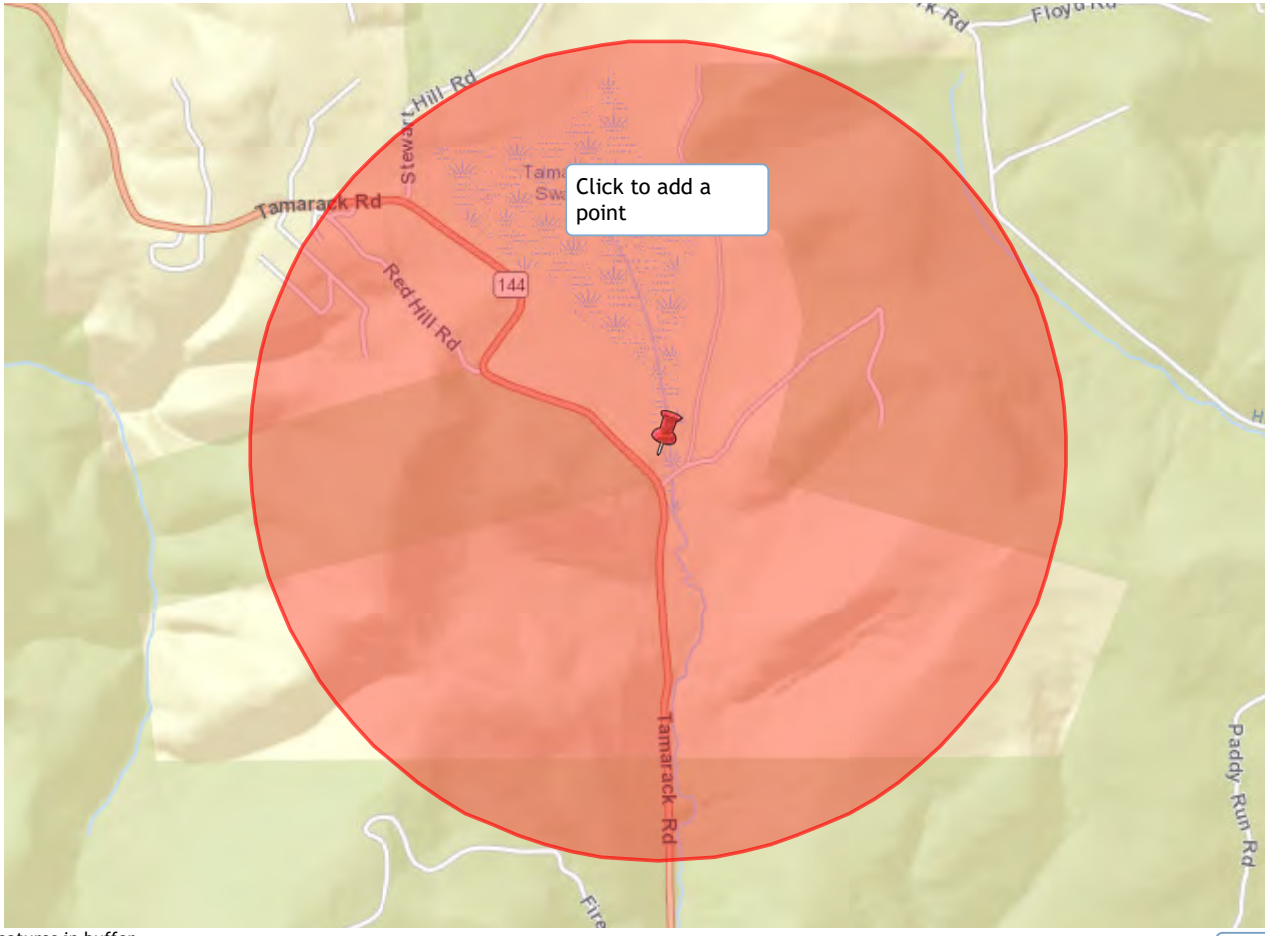
ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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APPENDIX 2

AIDS TO NAVIGATION PLAN

Pennsylvania Fish & Boat Commission

established 1866

August 6, 2019

WHM Consulting, Inc
ATTN Paul Fisher, PWS
2525 Green Tech Drive, Suite B
State College, PA 16803

I have reviewed the recently submitted Aids to Navigation Plan for the Leidy South Project, Young Woman's Creek, Chapman Twp., Clinton County. The Plan is acceptable as submitted and has been approved. All signage/buoys must be installed prior to construction and inspected frequently to ensure it is always visible to boaters. Any changes to this plan must be submitted directly to this office for further review. If buoys are to be utilized PFBC-277 Application to Install Floating Structures/Private Aids to Navigation must be submitted and approved prior to installation.

I will share the approved ATON plan with the PA Fish & Boat Commission Division of Environmental Services and the Regional Law Enforcement Office to ensure they are aware of the project. Please advise the contractor that the project site may be inspected at any time by Bureau of Law Enforcement personnel for compliance with this plan. A copy of the approved plan along with this letter should be available for inspection if requested.

Please feel free to contact me if you have any questions concerning this project or the PA Fish & Boat Commission Aids to Navigation program in general.

Sincerely,

Clyde Warner, Captain
Bureau of Law Enforcement

Cc: (electronic) SE Region BLE-DES

Transcontinental Gas Pipe Line Company, LLC

AIDS TO NAVIGATION PLAN
Young Womans Creek (S1-T4-HL)

LEIDY SOUTH PROJECT

Chapman Township

Clinton County, Pennsylvania

Submitted to:
Pennsylvania Fish and Boat Commission
P.O. Box 67000
Harrisburg PA 17106

August 2019

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ATTACHMENT A

PROJECT NARRATIVE

Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams) is proposing the Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6

Per Chapter 113.1 of the Pennsylvania Administrative Code (Title 58 Recreation), the Pennsylvania Fish and Boat Commission regulates the placement of aids to navigation (ATON) within waters not marked by the United States Coast Guard. The Pennsylvania Fish and Boat Commission requires, "persons, including clubs, individuals, State agencies, municipalities and other groups, wishing to establish an aid shall apply for permission from the Commission." To that end, Transco is submitting this application for the placement of aids to navigation within Young Womans Creek (S1-T4-HL) associated with the construction of the Project.

A component of the Project is the Hilltop Loop. The Hilltop Loop will cross S1-T4-HL between mile post 184.9 and 185.0 in Chapman Township, Clinton County. Attachment B includes a United States Geologic Survey 7.5-Minute topographic map depicting the location of the Project's crossing. S1-T4-HL is approximately 100 feet wide at the proposed crossing location. Photographs of the proposed crossing are shown in Attachment C. Construction activities include the installation of a 36-inch natural gas pipeline with a minimum of four feet of cover over the pipeline, below the streambed, unless in shallow bedrock.

Construction Schedule

Construction of the Project is anticipated to commence in winter 2020/2021. A final construction schedule for the Project has not been determined at this time. The Pennsylvania Fish and Boat Commission will be notified 60 days prior to the start of construction activities at the crossing of S1-T4-HL. Aid to Navigation Plan (ATON), Sign Details, and Timing

Construction Methods

Transco proposes to utilize a dry-crossing construction method (Dam-and-Pump or Cofferdam) at the S1-T4-HL crossing. Dry-crossing construction methods are described as follows:

Dam-and-Pump

The dam-and-pump construction method is employed to temporarily divert stream flow around the construction area and discharge the water downstream. This method allows downstream flow to be maintained at all times, while also creating a dry work area. Multiple discharge pumps may be required to keep the area dry and maintain adequate flow, to avoid flooding upstream. Pumps and hoses will be sized to accommodate flow, in accordance with the applicable regulations. After the pump or pumps are installed, damming structures such as concrete jersey barriers, water bladders, port-a-dams, steel plates, and/or sand bags, are installed upstream and downstream of the proposed pipeline trench. At the time of construction, the stream will be evaluated and depending on the stream's depth, flow velocity, channel width, streambed material, and flow type, one of the above damming structures will be used.

Once the dam-and-pump and damming structures are in place, the trench will be excavated, and the pipe installed in the dry ditch. Following the installation of the pipeline, the trench will be backfilled with natural streambed material to pre-existing elevations and the dam-and-pump will be removed to allow natural flow to resume within the stream channel.

Cofferdam

The cofferdam construction method involves the installation of temporary dam that extends from one stream bank to approximately the center of the stream channel, which allows for the diversion of stream flow to the opposite half of the stream channel; thereby, maintaining downstream flow at all times. Prior to excavation, sandbags, sandbag/plastic sheeting diversion structures, metal road plates or the equivalent, will be used to develop an effective seal, and to divert stream flow through to the opposite side of the stream channel.

During excavation, equipment will only work within the dry area behind the cofferdam, while regular flow is maintained outside of this area within the remaining portion of the stream channel. The pipeline will be place approximately halfway across the stream, and the trench will be

backfilled to pre-existing elevations with natural streambed material. The coffer dam will remain in place and be maintained until restoration of the waterbody is complete for that portion of the installation. Following restoration, the cofferdam will be removed and installed from the opposite bank for the remaining half of the pipeline installation, which will follow the above-referenced procedures.

The Young Womans Creek, at the project location, is not large enough for motorized boats, therefore the plan is developed to provide safety for non-motorized boats (canoes and kayaks) which will travel in a southwestern direction with flow. To enable navigation safely around the work area, signage will be placed as shown on the attached plan and will include warning, portage, and exit signs (as needed). Details for each sign are attached. Signs will be placed at least two weeks prior to commencement of the crossing and will remain in place for the duration of the construction. Upon completion of all work, the signs will be removed.

<u>Signage / Plan Routing Details</u>

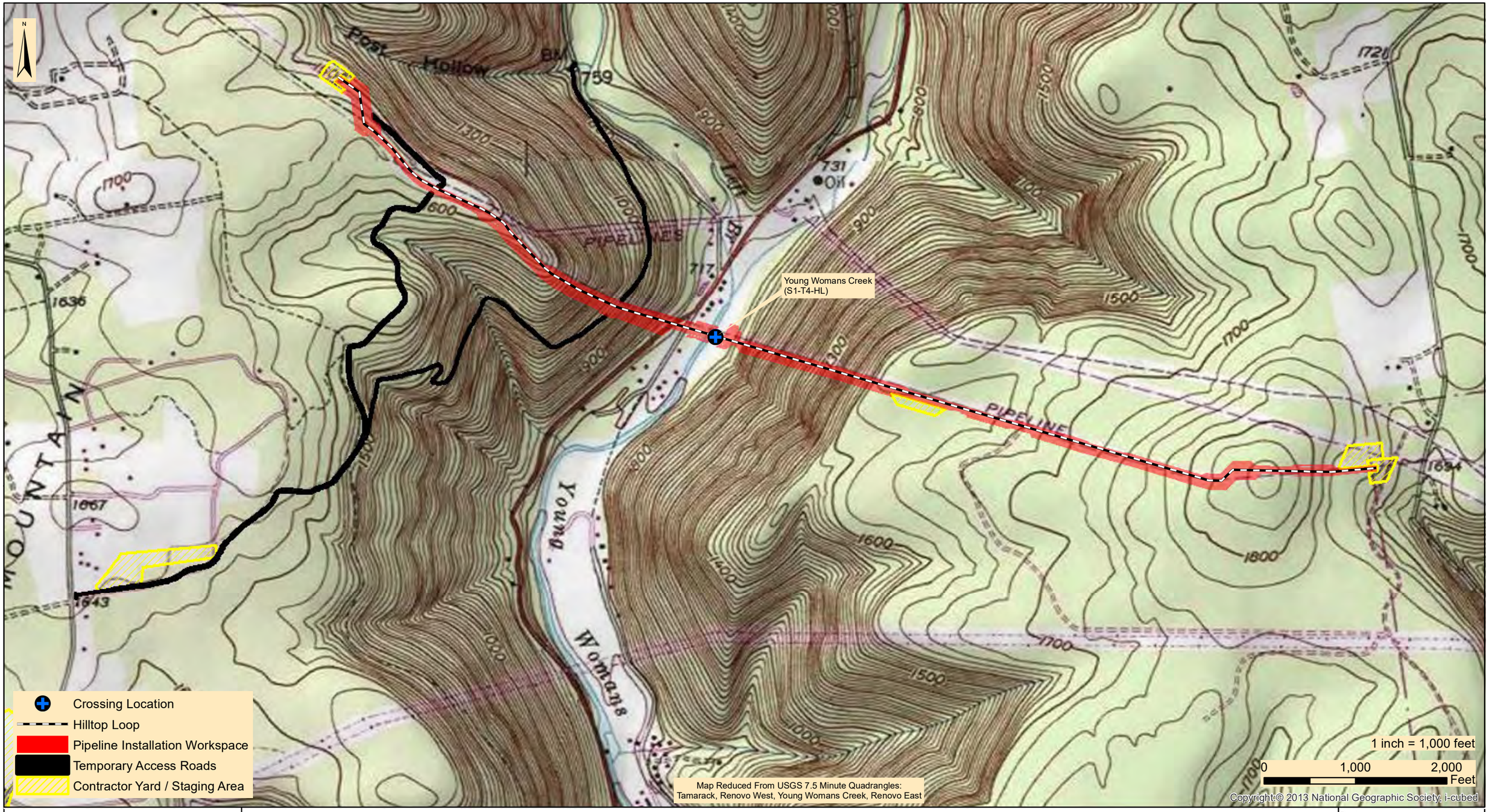
Proposed signage will be placed in accordance with U.S. Coast Guard and Pennsylvania Fish and Boat Commission specifications and will consist of rectangular information signs showing the location of the submerged pipeline and the portage area. Signage will be placed at least two weeks prior to the commencement of the crossing and will remain in place for the duration of construction. Canoers and kayakers will be instructed to exit on the right side facing downstream of the creek above and below the project area.

A plan view of the proposed signage locations are shown in Attachments D & E. Signs will be worded as follows:

1. WARNING – PIPELINE CONSTRUCTION USE EXTREME CAUTION WHEN BOATING IN THIS AREA.
2. PORTAGE 200 FEET AHEAD
3. PORTAGE – ALL BOATS EXIT HERE
4. BOATS KEEP OUT
5. PORTAGE – ALL BOATS RE-ENTER HERE

ATTACHMENT B

PROJECT CROSSING LOCATION MAP



WHM consulting, INC.
designs, permits, resolutions
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HILLTOP LOOP
AIDS TO NAVIGATION PLAN
PROJECT CROSSING LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	07/30/19
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	KMC
Figure Number:	1

ATTACHMENT C
PHOTOGRAPHS

ID: Photo 1

Date: 4/04/2019

Taken by: DW

Comments: This photo depicts a northwestern view looking across Young Womans Creek.

ID: Photo 2

Date: 4/04/2019

Taken by: DW

Comments: This photo shows a southwestern view looking downstream of Young Womans Creek

ID: Photo 3

Date: 4/04/2019

Taken by: DW

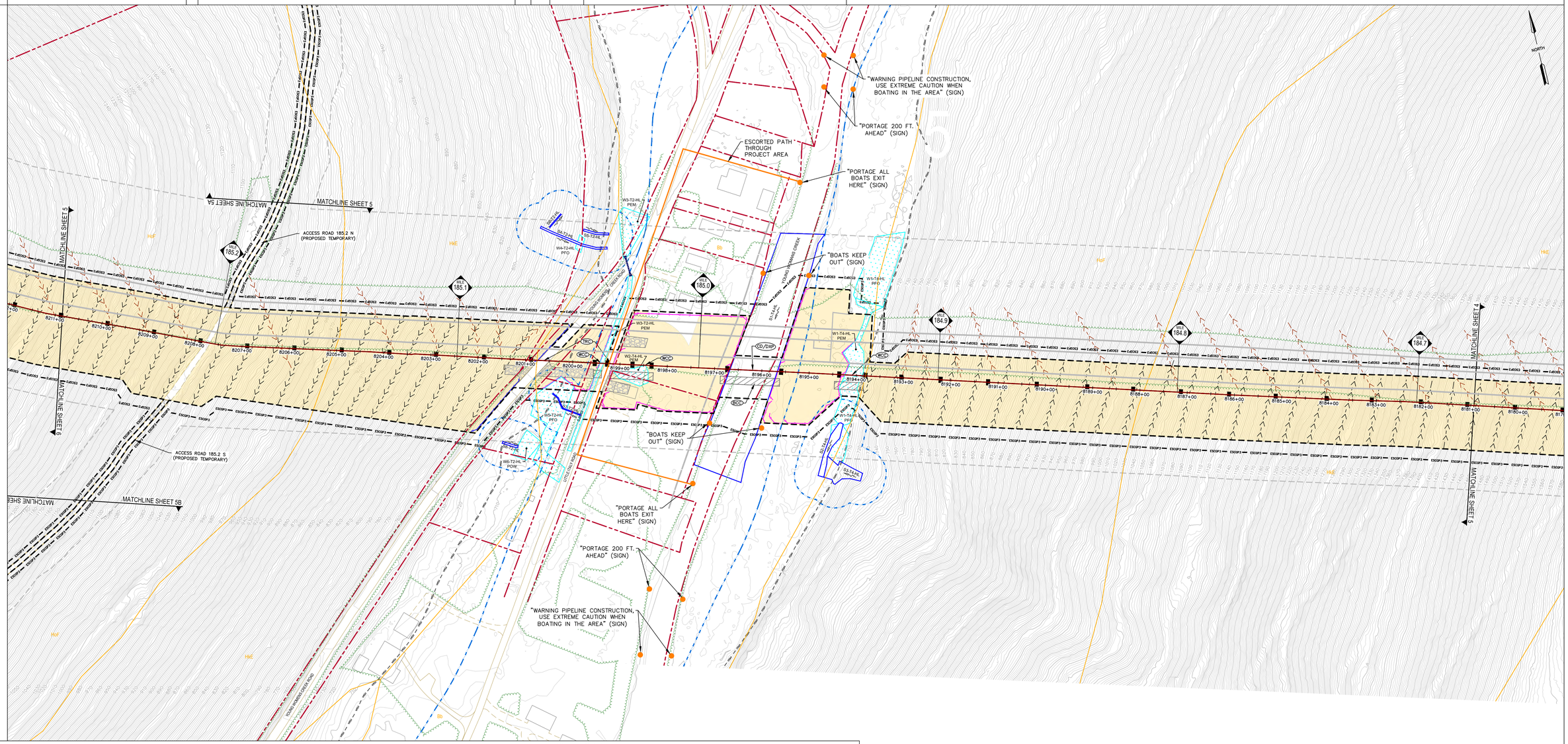
Comments: This photo depicts a northern view looking upstream of Young Womans Creek.

ATTACHMENT D

SITE SPECIFIC PLAN DRAWING

OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS 7-25915	MARK A. JONES 7-3928-33	MARK A. JONES 7-3928-33	THOMAS WILSON 7-3934	MUNICIPAL BOUNDARY	ESTATE OF ROBERT J. GLEICHERT 7-4063
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	5' 3'	4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW			WETLAND/RESIDENTIAL AREA/MAINTAINED ROW	OPEN WATER	MIXED FOREST LAND/MAINTAINED ROW
SOIL TYPE	HoF	HkE		Bb		HoF HkE
AVERAGE % SLOPE	60%	21% 53%		<2%		55%

ALIGNMENT



LEGEND

- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- RIPARIAN PLANTING AREAS
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- APPROXIMATE EXISTING WATERBAR
- TIMBER MAT/BRIDGE
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- EXISTING GRADE CONTOURS (10' C.I.)
- EXISTING GRADE CONTOURS (2' C.I.)
- 12" COMPOST FILTER SOCK
- 18" COMPOST FILTER SOCK
- 24" COMPOST FILTER SOCK
- 32" COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP

SOIL LEGEND

Bb	BARBOUR-CRAIGSVILLE COMPLEX
HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80% SLOPES
HoF	HAZELTON-LAIDIG GRAVELLY LOAM, EXTREMELY STONY, 25 TO 50% SLOPES

0 100 200 300
SCALE IN FEET
1" = 100'

WHM consulting, INC. — designs, permits, resolutions

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

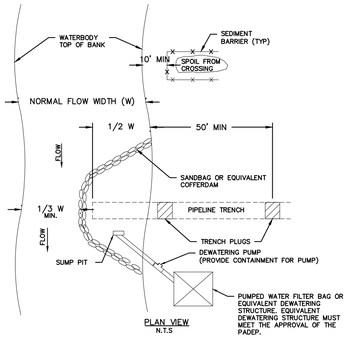
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 1 OF 5
WO: 1211227	RID:		

PIPELINE WORK SEQUENCE AT YOUNG WOMAN CREEK CROSSING

1. MAKE NOTIFICATIONS TO THE PA FISH AND BOAT COMMISSION A MINIMUM OF 10 DAYS PRIOR TO CONSTRUCTION.
2. INSTALL APPROPRIATE PFBC AID TO NAVIGATION SIGNAGE.
3. PRIOR TO INITIATING CONSTRUCTION OF A STREAM CHANNEL LARGER THAN 10 FEET CONTRACTORS AND ENVIRONMENTAL INSPECTOR SHALL EVALUATE WEATHER FORECASTS FOR ANTICIPATED INCLEMENT WEATHER WHICH MAY RESULT IN FLOW CONDITIONS UNSUITABLE FOR CONSTRUCTION. BEFORE CONSTRUCTION OF A STREAM CROSSING GREATER THAN 10 FEET, ENVIRONMENTAL INSPECTOR, FOREMAN, AND ANY OTHER RESPONSIBLE INDIVIDUAL SHOULD SIGN-OFF THAT THE CROSSING CAN BE CONSTRUCTED DURING THE SPECIFIC TIME FRAME.
4. IF INCLEMENT WEATHER IS ANTICIPATED, A CONTINGENCY PLAN WILL BE DISCUSSED TO AVOID THE STREAM CROSSING DURING THE POTENTIALLY UNSUITABLE CONDITIONS."
5. AFTER INSTALLATION OF APPROPRIATE E&S BMPS, INSTALL TEMPORARY EQUIPMENT BRIDGE IN ACCORDANCE WITH DETAILS.
6. FOR DRY OPEN CUT CROSSINGS, INSTALL DAM AND PUMP OR COFFERDAM AS DESCRIBED IN STREAM CROSSING DETAILS.
7. DEWATER WORK AREA. WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT FILTER BAG. WHERE POSSIBLE, EXCAVATION SHALL BE FROM THE TOP OF THE STREAM BANK.
8. INSTALL PIPE.
9. A UTILITY LINE CROSSING OF A STREAM CHANNEL (DITCHING AND STABILIZATION FROM TOP OF BANK TO TOP OF BANK) SHALL BE COMPLETED WITHIN 24 HOURS FOR STREAM CHANNELS 10 FEET OR LESS AND 48 HOURS FOR STREAM CHANNELS BETWEEN 10 – 100 FEET UNLESS SPECIFICALLY OUTLINED IN THE APPROVED PERMIT OR AUTHORIZED BY PADEP.
10. STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.



PLAN VIEW
N.T.S

PADEP STANDARD NOTES:

1. GRUBBING SHALL NOT TAKE PLACE WITHIN 50 FEET OF TOP-OF-BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE AN PIPE IS READY FOR INSTALLATION.
2. TRENCH PLUG SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE WATERBODY CHANNEL.
3. WATER ACCUMULATING WITHIN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.
4. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM THE TOP OF WATERBODY BANK.
5. ALL EXCESS EXCAVATED MATERIAL SHALL BE IMMEDIATELY REMOVED FROM THE WATERBODY CROSSING AREA.
6. ALL DISTURBED AREAS WITHIN 50 FEET OF TOP-OF-BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR WATERBODIES OR 48 HOURS OF INITIAL DISTURBANCE FOR INTERMEDIATE WATERBODIES UNLESS OTHERWISE AUTHORIZED (SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

1. THE WATERBODY CROSSING WILL GENERALLY BE COMPLETED IN 2 STAGES. THE DETAIL DEPICTS STAGE 1. STAGE 2 WILL GENERALLY BE COMPLETED USING THE SAME CONFIGURATION FROM THE OPPOSITE BANK;
2. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
3. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
4. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIMEFRAMES WHERE SPECIFIED.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

CD COFFERDAM STREAM CROSSING

Williams

WARNING

PIPELINE CONSTRUCTION
USE EXTREME CAUTION WHEN BOATING IN THIS AREA

PORTAGE
200 FEET AHEAD

PORTAGE
ALL BOATS EXIT HERE

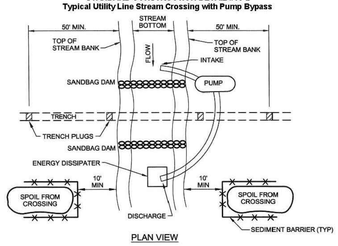
BOATS KEEP OUT

PORTAGE
ALL BOATS RE-ENTER HERE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

ATON AID TO NAVIGATION (ATON) SIGNAGE

STANDARD CONSTRUCTION DETAIL #13-2
Typical Utility Line Stream Crossing with Pump Bypass



PLAN VIEW

PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Bypass pump intake shall be maintained a sufficient distance from the bottom to prevent pumping of channel bottom materials.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #13-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any receiving surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized.

Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

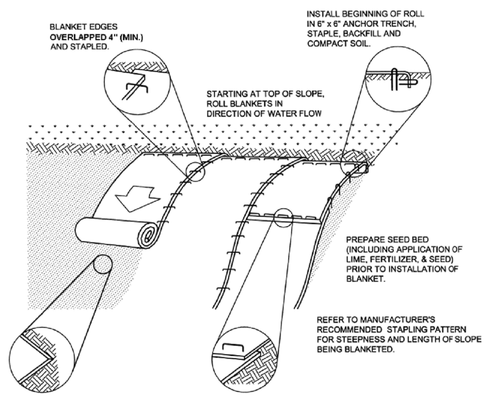
1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIMEFRAMES WHERE SPECIFIED.
4. DAM-AND-PUMPS MAY ONLY BE IN THE STREAM FOR TWO WEEKS.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

DPX DAM AND PUMP STREAM CROSSING

Williams



NOT TO SCALE

NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
5. STAPLING OF THE BLANKET SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.
7. BIODEGRADABLE STAPLES SHALL BE USED.

WILLIAMS SUPPLEMENTAL NOTES:

1. CONTRACTOR SHALL USE SINGLE MAT STRAW FOR SLOPES FLATTER THAN 3:1.
2. HYDRAULIC APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF ECB.
3. EROSION CONTROL MATS SHOULD CONSIST OF NATURAL MATERIALS. NO PLASTIC OR SYNTHETIC MATERIALS SHALL BE USED. MATTING SUCH AS NORTH AMERICAN GREEN S150BN OR EQUIVALENT SHALL BE USED.

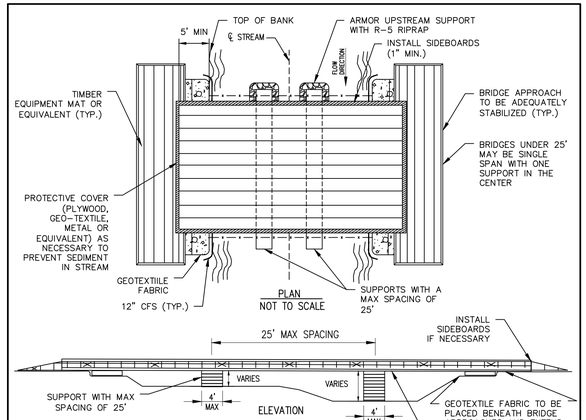
NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP STANDARD CONSTRUCTION DETAIL #11-1.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

ECB EROSION CONTROL BLANKET

Williams



PLAN
NOT TO SCALE

ELEVATION

NOTES:

1. THIS TYPE OF BRIDGE IS GENERALLY USED FOR INTERMEDIATE TO LARGE STREAM CROSSINGS GREATER THAN 20' IN WIDTH IN COMBINATION WITH A PROPER STREAM BANK CONFIGURATION.
2. BOTTOM CHORD OF BRIDGE STRUCTURE SHALL BE CONSTRUCTED ABOVE ORDINARY HIGH WATER MARK/TOP OF BANK.
3. BRIDGE TO REMAIN IN PLACE UNTIL THE COMPLETION OF FINAL RESTORATION.
4. A "SKIRT" FORMED OF GEOTEXTILE FABRIC OR EQUIVALENT SHALL BE PLACED ON THE SIDES AND BOTTOM OF THE BRIDGE TO TRAP SEDIMENT.
5. INDIVIDUAL MATS SHALL BE ANCHORED AND BUTTED TIGHTLY TO MINIMIZE THE INTRODUCTION OF SEDIMENT TO THE WATER BODY.
6. COMPOST FILTER SOCK WILL BE PLACED AT THE EDGE OF EQUIPMENT BRIDGE AT THE END OF THE WORK DAY TO PREVENT EROSION BUT WILL BE REMOVED DURING CONSTRUCTION ACTIVITY.
7. CONTRACTOR SHALL EXTEND TIMBER MAT BRIDGE A MINIMUM OF 10' BEYOND TOP OF STREAM BANK. ABUTMENTS MAY BE KEYED INTO BANK WHERE NEEDED TO INSURE SAFETY.
8. BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
9. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
10. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
11. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
12. RUNOFF FROM ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
13. INSTALLATION AND REMOVAL OF INSTREAM SUPPORT SHALL ADHERE TO TIME OF YEAR RESTRICTIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

BCC BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS

Williams

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

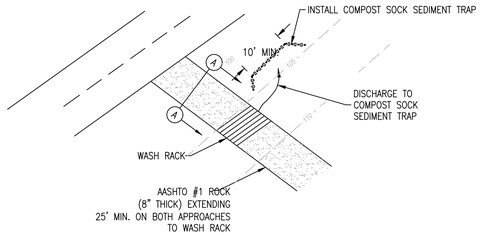
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

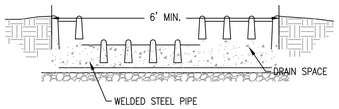
Williams

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 2 OF 5
WO: 1211227	RID:		

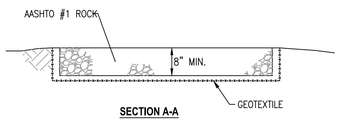
designs, permits, resolutions consulting, inc. | BA GROUP



PLAN VIEW



WASH RACK

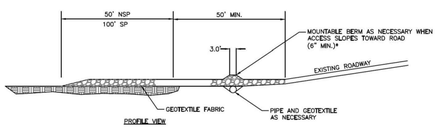


SECTION A-A

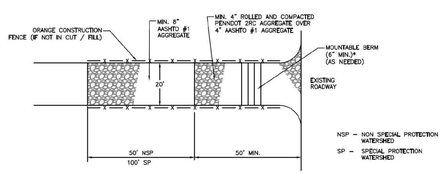
NOTE:
1) WASH RACK SHALL BE 20 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS, WHICHEVER IS GREATER.
2) WASH RACK SHALL BE CONSTRUCTED TO ACCOMMODATE ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.
3) A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL VEHICLES EXITING THE SITE.
4) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE DRAIN SPACE UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. WASHING THE ROADWAYS OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

CONSTRUCTION ENTRANCE (CE)
TEMPORARY EROSION CONTROL MEASURE

Example Alternative Rock Construction Entrance



PROFILE VIEW



*MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

PLAN VIEW

NOTES:

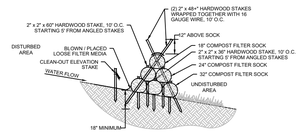
1) REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2) MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
3) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
4) STREET SWEEPING ON PAVED ROADS
   a. USE A VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT.
   b. AT A MINIMUM – ANY DAY IN WHICH CONSTRUCTION TRAFFIC IS EXITING THE ROCK CONSTRUCTION ENTRANCE, THE VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT SHALL CLEAN THE ROAD WAY AT THE END OF THE WORK DAY AND PRIOR TO ANY FORECASTED RAIN EVENT.
5) STREET SWEEPING ON DIRT OR GRAVEL SURFACE PUBLIC ROADS
   a. RIGOROUS MANUAL REMOVAL OF MUD/DIRT FROM VEHICLE/EQUIPMENT TIRES PRIOR TO EXITING CONSTRUCTION SITE, SUPPLEMENTED BY IMMEDIATE RECOVERY, BY MANUAL OR MECHANICAL MEANS, OF SOIL WHICH MAY BECOME DISCHARGED ONTO PUBLIC ROADWAYS. DUST CONTROL AND/OR COMPACTION VIA ROLLING OF THE DIRT PUBLIC ROAD SURFACE WILL BE IMPLEMENTED AS NEEDED.

CONSTRUCTION ENTRANCE (ALTERNATIVE) (CE)
TEMPORARY EROSION CONTROL MEASURE

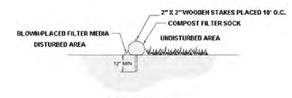
PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

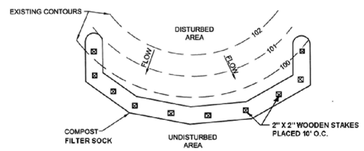
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(CE) CONSTRUCTION ENTRANCE
Williams GAS PIPELINE



TRIPLE STACK SOCK TRAP SECTION
N.T.S.

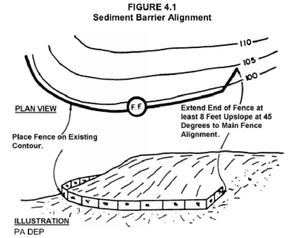


SECTION VIEW
NTS



PLAN VIEW
NOT TO SCALE

FIGURE 4.1
Sediment Barrier Alignment



NOT TO SCALE

NOTES:

1. ALL MATERIAL TO MEET MANUFACTURER SPECIFICATIONS.
2. COMPOST FILTER SOCK FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY CONSTRUCTION CONTRACTOR.
4. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.
5. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
6. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
7. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION WITH ADDITIONAL SOCK OR ROCK FILTER.
8. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
9. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.5
MOISTURE CONTENT	30% – 60%
PARTICLE SIZE	30% – 50% PASS THROUGH 3/8" SIEVE
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

MATERIAL TYPE	3 mil HDPE	5 mil HDPE	5 mil HDPE	MULTI-FILAMENT POLYPROPYLENE (MFPP)	HEAVY-DUTY MULTI-FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE	BIO-DEGRADABLE	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 psi	26 psi	44 psi	202 psi
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS
TWO-PLY SYSTEMS					
INNER CONTAINMENT NETTING				HDPE BIAXIAL NET CONTINUOUSLY WOUND FUSION-WELDED JUNCTURES 3/4" x 3/4" MAX. APERTURE SIZE	
OUTER FILTRATION MESH				COMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON-WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH) 3/16" MAX. APERTURE SIZE	
SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.					

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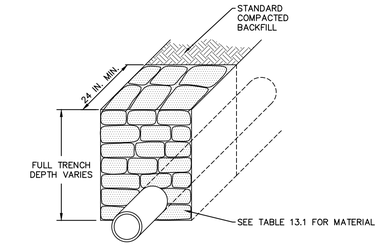
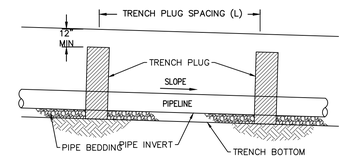
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(CFS) COMPOST FILTER SOCK
Williams GAS PIPELINE



SECTION VIEW
NOT TO SCALE



PROFILE VIEW
NOT TO SCALE

TABLE 13.1
MAXIMUM SPACING AND MATERIALS FOR TRENCH PLUGS

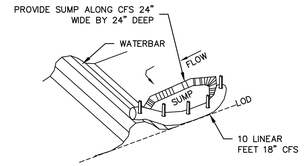
TRENCH SLOPE (%)	SPACING L (FT)	TRENCH PLUG MATERIAL FOR FILLED SACKS
<5	1,000	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
5 – 15	500	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
15 – 25	300	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
25 – 35	200	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
35 – 100	100	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
>100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

*TOPSOIL MAY NOT BE USED TO FILL SACKS.

IMPERVIOUS TRENCH PLUGS ARE REQUIRED FOR ALL STREAM, RIVER, WETLAND, OR OTHER WATER BODY CROSSINGS. FOAM TRENCH PLUGS ARE AN APPROVED ALTERNATE E&S BMP.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
(TP) TRENCH PLUG INSTALLATION
Williams



NOTES:

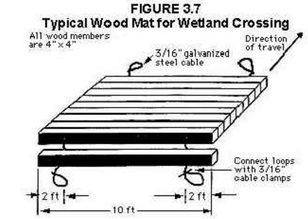
1. 10 LINEAR FEET OF 18 INCH COMPOST FILTER SOCK (CFS) SHALL BE INSTALLED WITH ONE END RESTING ON THE WATERBAR AS PER DETAIL CFS, ALLOWING FOR 8 FEET OF EFFECTIVE LENGTH AND A SPECIFIED FLOW THROUGH RATE OF 15 GALLONS PER MINUTE PER LINEAR FOOT. A PASS THROUGH FLOW OF 0.26 CUBIC FEET PER SECOND CAN BE ACCOMMODATED THROUGH THE FILTER SOCK. THIS FLOW RATE IS ADEQUATE FOR 20,000 SQUARE FEET OF DRAINAGE AREA FOR THE 2–YEAR, 24–HOUR STORM, 5 MINUTE TIME OF CONCENTRATION (RATIONAL METHOD).
2. CONSTRUCTION OF A 24" WIDE AND 24" DEEP SUMP AT THE DISCHARGE END OF THE WATERBAR WILL REDUCE VELOCITY AND PROVIDE A SHEET FLOW CONDITION TO THE CFS. THE SUMP SHALL BE MAINTAINED AND CLEANEDOUT WHEN IT BECOMES A MINIMUM OF 12" DEEP. THE SUMP SHALL BE FILLED AND STABILIZED WHEN THE CFS IS REMOVED AFTER SITE STABILIZATION.
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN ACCORDANCE WITH WILLIAMS STANDARDS. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
(OS) CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION
Williams

FIGURE 3.7
Typical Wood Mat for Wetland Crossing

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP FIGURE 3.07.



University of Minnesota FS 07009
A geotextile underlayment shall be used under the wood mat.

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(MAT.1) TIMBER MATTING CONSTRUCTION
Williams

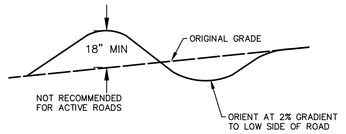
KEVIN CLARK, P.E.
PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E. NO. _____

REVISIONS

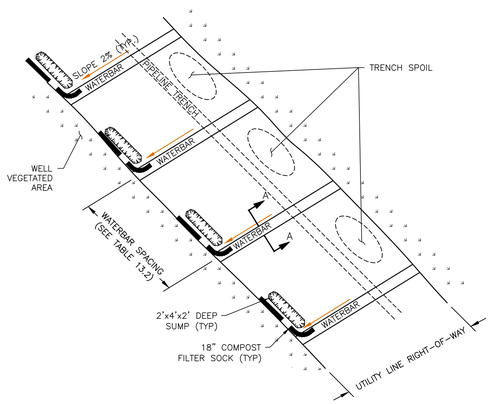
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

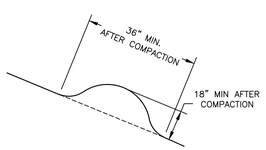
DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 3 OF 5
WO: 1211227	RID:		



PLAN VIEW
N.T.S.



LAYOUT VIEW
N.T.S.



SECTION A–A

NOTES:

1. DURING CONSTRUCTION, WATERBARS SHALL BE PREPARED AT THE END OF EACH WORK DAY AND PRIOR TO STORM EVENTS.
2. AFTER EARTH DISTURBING WORK HAS BEGUN, WATERBARS SHALL BE INSTALLED AT THE SPACING SHOWN IN THE ABOVE TABLE OR AS SHOWN ON THE DRAWINGS. WATERBARS SHALL BE IMMEDIATELY STABILIZED WITH EROSION CONTROL BLANKET.
3. TEMPORARY AND PERMANENT WATERBARS ARE REQUIRED AT ALL WATERBODY CROSSINGS AND UPSLOPE FROM ALL WETLAND BOUNDARIES.
4. THE WATERBAR OUTLET SHALL BE LOCATED WHERE RUNOFF WILL BE RELEASED ONTO AN EXISTING WELL–VEGETATED AREA. AN OUTLET STRUCTURE (OS) MUST BE INSTALLED AT THE WATERBAR OUTLET.
5. WHEREVER EDIBLE SOILS ARE PRESENT, OR WHERE THERE IS NOT A SUFFICIENT VEGETATIVE FILTER STRIP BETWEEN THE WATERBAR AND A RECEIVING SURFACE WATER, THE WATERBAR SHOULD BE PROVIDED WITH A TEMPORARY PROTECTIVE LINER.

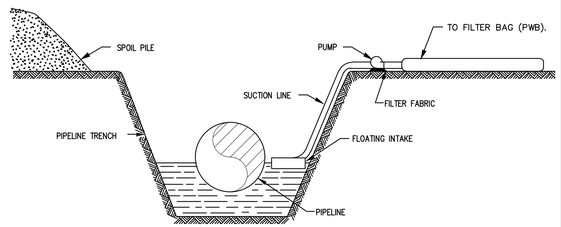
TABLE 3.1 – MAXIMUM WATERBAR SPACING

PERCENT SLOPE	SPACING (FT)
<5	250
5–15	150
>15–30	100
>30	50

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE, LLC
STANDARD ENVIRONMENTAL DETAIL
WB WATERBAR

Williams GAS PIPELINE



ELEVATION
N.T.S.

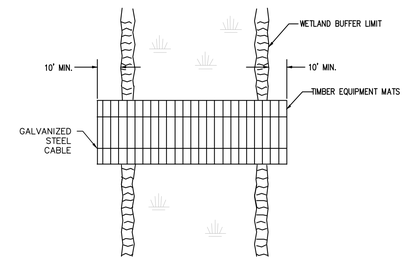
NOTES:

1. WATER PUMPED OUT OF TRENCH SHALL NOT BE DISCHARGED INTO WATERWAYS. WATER SHALL BE DISCHARGED INTO A FILTER BAG OR DEWATERING STRUCTURE.
2. PUMP SHALL BE CONTROLLED SO THAT DISCHARGE DOES NOT OVERFLOW DEWATERING STRUCTURE.
3. PUMP SUCTION HOSE MUST NOT BE ALLOWED TO COME IN CONTACT WITH TRENCH BOTTOM. PROVISIONS MUST BE MADE TO ELEVATE THE SUCTION HOSE TO AT LEAST ONE FOOT ABOVE THE BOTTOM OF THE PIPE TRENCH UNTIL BOTTOM DEWATERING IS NECESSARY.
4. DEWATERING SHALL NOT OCCUR DURING TIMES OF HEAVY RAINFALL EXCEPT AS REQUIRED TO PREVENT FLOODING OF CONSTRUCTION EQUIPMENT LOCATED IN BORE PITS AND TRENCHES.
5. PUMP WATER FILTER BAG (PWB) SHALL BE PLACED ON A WELL VEGETATED AREA AWAY FROM CONSTRUCTION SO THAT FILTERED WATER IS NOT RETURNED TO THE TRENCH.

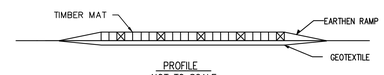
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TD TRENCH DEWATERING

Williams



PLAN
NOT TO SCALE



PROFILE
NOT TO SCALE

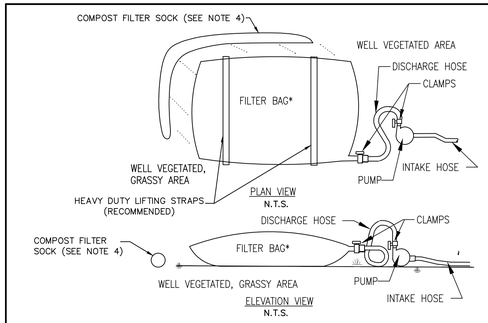
NOTES:

1. PERIODICALLY CHECK INSTALLATION AND REMOVE BUILD–UP OF SEDIMENT OR DEBRIS.
2. MATERIALS PLACED IN WETLANDS SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN–UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
3. IF A WATERBODY IS LOCATED WITHIN A WETLAND SYSTEM, EXTEND TIMBER EQUIPMENT MATS TO THE BRIDGE EQUIPMENT CROSSING (BEC) USED TO CROSS THE WATERBODY IN ORDER TO ALLOW FOR CONTINUOUS TIMBER EQUIPMENT MAT COVERAGE THROUGH THE WETLAND AND WATERBODY AREA.
4. USE ADDITIONAL TIMBER MAT LAYERS TO RAISE CROSSING ABOVE GRADE WHERE POOR SOIL CONDITIONS EXIST.
5. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WETLAND BOUNDARIES.
6. INSTALL EARTHEN RAMP APPROACHES TO TIMBER EQUIPMENT MATS. EARTHEN RAMPS TO BE CONSTRUCTED OF UPLAND MATERIAL, TOP SOIL SHALL NOT BE USED TO CONSTRUCT EARTHEN RAMPS.
7. A GEOTEXTILE UNDERLAYMENT SHALL BE USED UNDER THE WOOD MAT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WEC WETLAND EQUIPMENT CROSSING

Williams



LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON–WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED 'J' TYPE. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS MAY BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D–4884	60 LB/IN
GRAB TENSILE	ASTM D–4632	205 LB
PUNCTURE	ASTM D–4833	110 LB
MULLEN BURST	ASTM D–3786	350 PSI
UV RESISTANCE	ASTM D–4355	70%
AOS % RETAINED	ASTM D–4751	80 SIEVE

NOTES:

1) A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME ½ FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS TO BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.
2) BAGS SHALL BE LOCATED IN WELL–VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON–ERODIBLE AND NON–POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.
3) NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.
4) THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.
5) THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR ½ THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.
6) FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.
7) CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF USED FILTER BAGS UPON COMPLETION OF DEWATERING OPERATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
PWB PUMP WATER FILTER BAG

Williams

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

Williams

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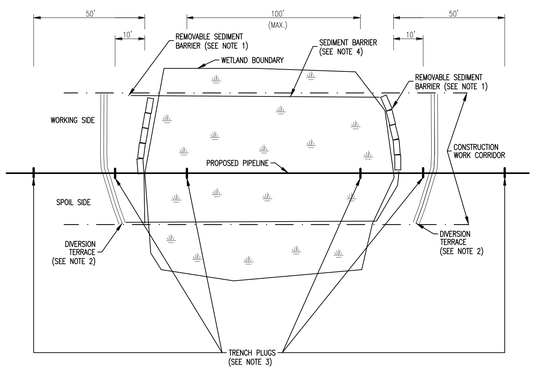
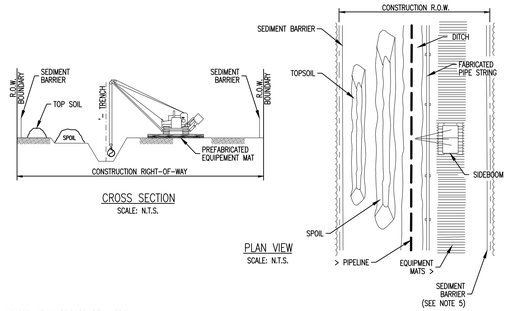


NOTES:

1. INSTALL REMOVABLE SEDIMENT BARRIERS (COMPOST FILTER SOCK) OR DRIVEABLE BERMS ACROSS THE TRAVEL LANE AT BOTH WETLAND BOUNDARIES. THE REMOVABLE SEDIMENT BARRIERS CAN BE REMOVED DURING THE CONSTRUCTION DAY, BUT MUST BE RE-INSTALLED AFTER CONSTRUCTION HAS STOPPED FOR THE DAY AND/OR WHEN HEAVY PRECIPITATION IS IMMINENT.
2. INSTALL DIVERSION TERRACES IMMEDIATELY UPSLOPE OF BOTH WETLAND BOUNDARIES TO PREVENT SEDIMENT FROM ENTERING THE WETLAND.
3. INSTALL TRENCH PLUGS TEN (10) FEET FROM THE EDGE OF A WETLAND; FIFTY (50) FEET FROM THE EDGE OF A WETLAND; PLACE A MINIMUM OF ONE (1) TRENCH PLUG AT A MAXIMUM SPACING OF 100 FEET BETWEEN TRENCH PLUGS WITHIN A WETLAND TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED UPLAND TRENCH WATER OUT OF WETLAND. WETLAND CROSSINGS LESS THAN FIFTY (50) FEET DO NOT REQUIRE AN INTERNAL TRENCH PLUG.
4. FOR TYPE II ("SATURATED") AND TYPE III ("FLOODED") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES AND ALONG BOTH WETLAND EDGES. FOR TYPE I ("DRY") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES, ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC — WETLAND CROSSING CONFIGURATION TYPE I, II AND III WETLANDS

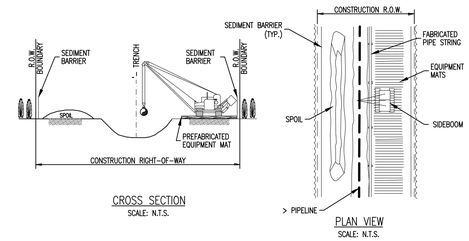


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF THE WETLAND. INSTALL SEDIMENT BARRIERS ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR THROUGH THE WETLAND AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFTY-RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE SATURATED TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE COMPANY ENVIRONMENTAL INSPECTOR. TOPSOIL AND SATURATED TOPSOIL SHALL BE STOCKPILED SEPARATELY. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEDE WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING TRENCH, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE SATURATED TOPSOIL AND TOPSOIL (IF NOT SATURATED) AND INSTALL PERMANENT EROSION CONTROL.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLANDS AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.1 — TYPE I "DRY WETLAND" INSTALLATION PROCEDURE

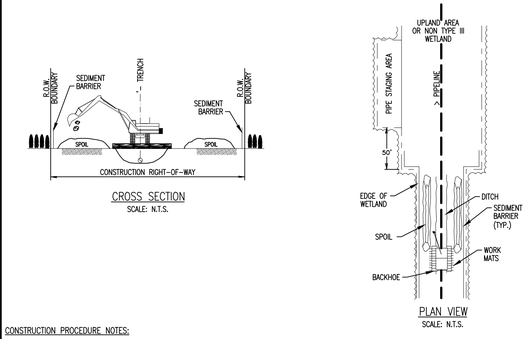


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEDE WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION. SEED DISTURBED WETLAND AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.2 — TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE



CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL WETLAND BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
5. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFTY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
6. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
7. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY PREFABRICATED EQUIPMENT MATS OR FLOATS, TO EXCAVATE TRENCH. IF PREFABRICATED EQUIPMENT MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MATS FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
8. FABRICATE PIPE IN A STAGING AREA OUTSIDE THE TYPE III WETLAND AS INDICATED ON THE CONSTRUCTION DRAWINGS. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
9. LEAVE HARD PLUGS AT THE EDGE OF TYPE III WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER-IN, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, AND BACKFILL.
11. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.
12. REMOVE ANY MATS UTILIZED TO SUPPORT AMPHIBIOUS EQUIPMENT FROM WETLANDS UPON COMPLETION.
13. WETLANDS CROSSED USING PUSH/PULL METHOD TEND TO BE TOO WET FOR EFFECTIVE SEEDING. HOWEVER, IF THE SITE IS DRY ENOUGH AND IF DIRECTED BY THE ENVIRONMENTAL INSPECTOR, THE RIGHT-OF-WAY SHALL BE SEEDED IN ACCORDANCE WITH DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.3 — TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E. NO. _____

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 5 OF 5
WO: 1211227	RID:		

ATTACHMENT E

SIGNAGE EXAMPLES

WARNING

PIPELINE CONSTRUCTION

USE EXTREME CAUTION WHEN BOATING IN THIS AREA

PORTAGE

200 FEET

AHEAD

PORTAGE

ALL BOATS EXIT HERE

PORTAGE

ALL BOATS RE-ENTER HERE

BOATS KEEP OUT

APPENDIX 3

SUBMERGED LAND LICENSE AGREEMENT

SUBMERGED LAND LICENSE AGREEMENT SUBMITTAL INFORMATION:

LEIDY SOUTH PROJECT – HILLTOP LOOP

1. **JPA #:**
2. **Legal Name of Client:** Transcontinental Gas Pipe Line Company, LLC, a subsidiary of The Williams Companies, Inc.

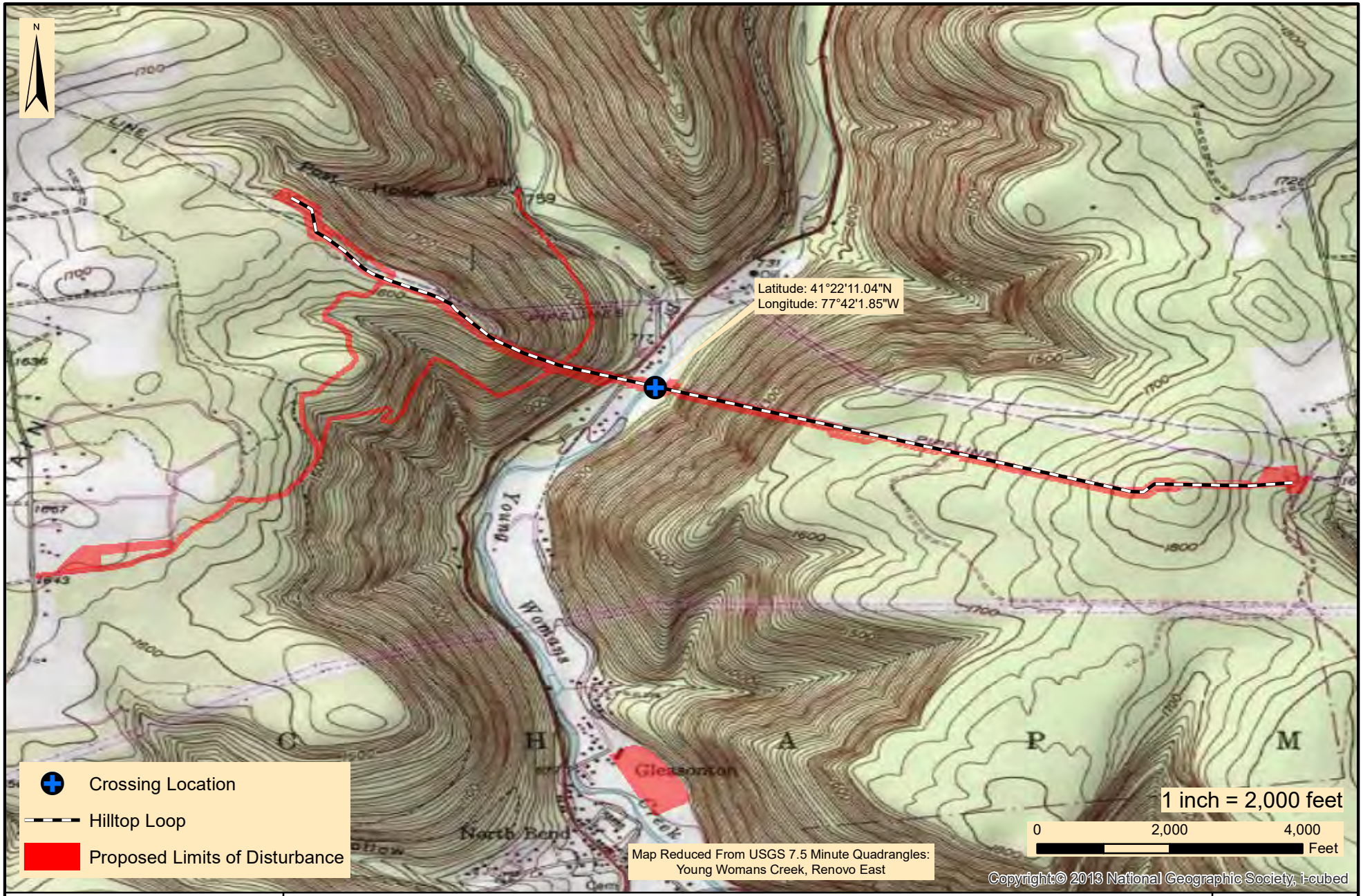
   State of Incorporation: Delaware
3. **Principal place of business:** 2800 Post Oak Blvd, Level 11; Houston, TX 77056

   Employer ID#: 74-1079400
4. **Client's contact person & contact info.**: Joseph Dean, Environmental Manager | (713) 215-3427 | Joseph.Dean@williams.com
5. **Company's Preferred Address for reoccurring Invoicing/billing of the annual SLLA fee:** 2800 Post Oak Blvd, Level 11; Houston, TX 77056
6. **Consultant's name & contact info:** Kevin M. Clark | WHM Consulting, Inc | (814)689-1650 | kevinc@whmgroup.com
7. **This IS NOT in conjunction with a PennDOT Project.**
8. **County (Counties) and Municipality (ties) projects, encroachments or crossings are located in.** Chapman Township, Clinton County
9. **Agreement Type:** Commercial
10. **Locational Mapping of the Facilities:** See Attachment I -
11. **Project Drawing:** See Attached Project Location Map
12. **Description:** To install and maintain a 36-inch diameter natural gas pipeline. The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

    Transco proposes to utilize a dry-crossing construction method (Dam-and-Pump or Cofferdam) to cross under Young Womans Creek (Latitude 41°22'11.04"N, Longitude 77°42'1.85"W), in Chapman Township, Clinton County.

ATTACHMENT 1

SLLA Location Map: Young Womans Creek



WHM consulting, INC.
designs, permits, resolutions
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT - LEIDY LINE D 36" HILLTOP LOOP

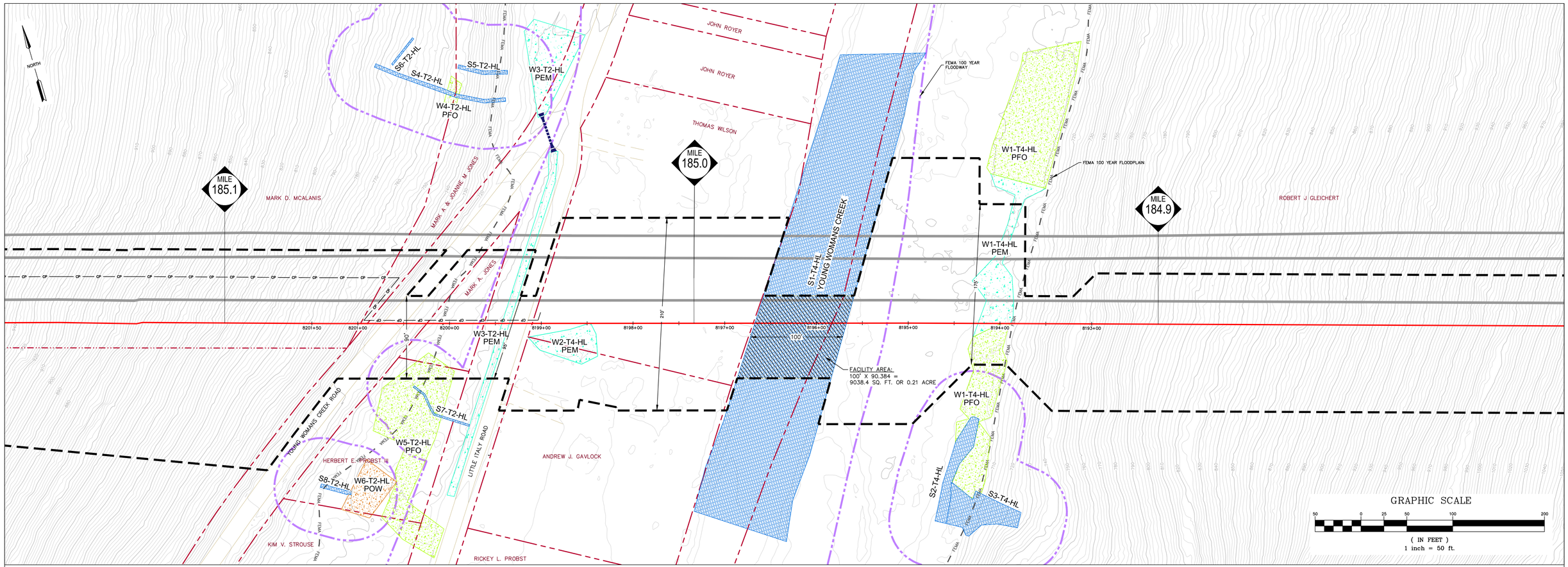
SUBMERGED LAND LICENSE AGREEMENT LOCATION MAP
YOUNG WOMANS CREEK

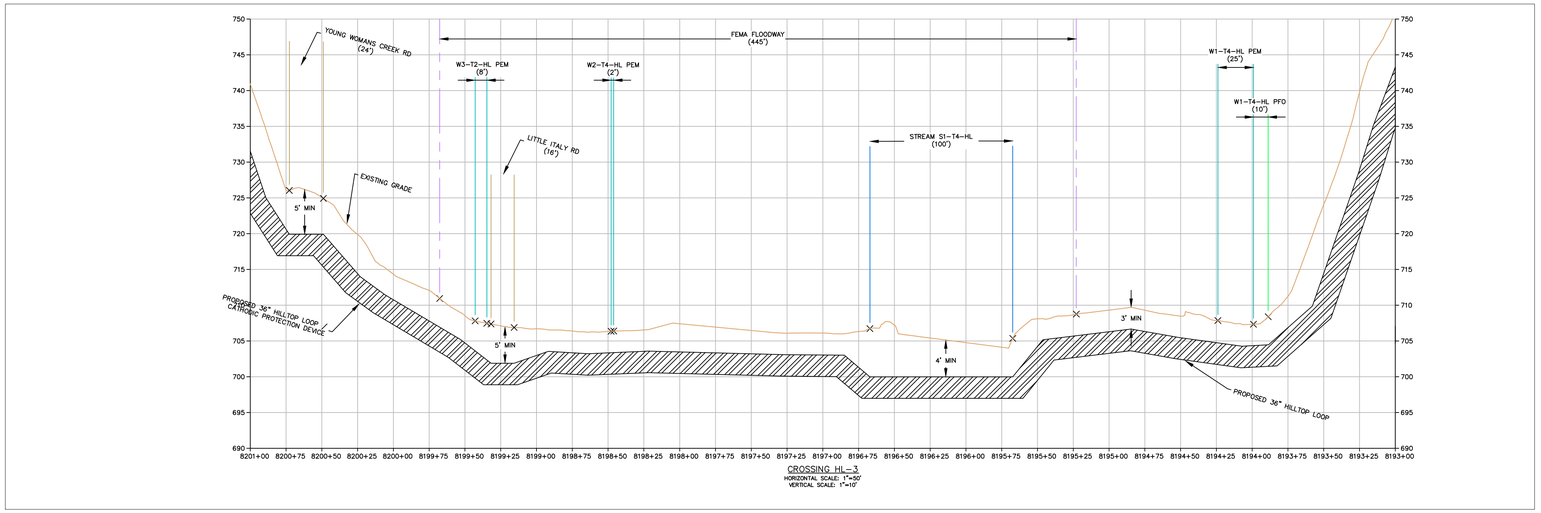
CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/30/19
WHM Drawing Number:	WILLIAMS201A001
Drawn By:	KMC
Attachment:	1

ATTACHMENT 2

SLLA Location Site Plan & Profile: Young Womans Creek





CROSSING HL-3
HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

SLLA NOTES:

1. TRANSCO HAS AN OPEN AND UNDEFINED EASEMENT ON PARCELS WITHIN AND ADJACENT TO YOUNG WOMANS CREEK.

LEGEND

- FACILITY AREA
- PROPOSED LIMITS OF DISTURBANCE
- PROPOSED 42" BENTON LOOP
- EXISTING ROADWAY (PAVED)
- EXISTING ROADWAY (UNPAVED)
- PARCEL BOUNDARY
- EXISTING CONTOUR (10' C.I.)
- EXISTING CONTOUR (2' C.I.)
- EXISTING LEIDY / TGPL PIPELINES
- CULVERT
- UTILITY LINE/POLE
- EXISTING FENCE
- TREELINE
- CP — CATHODIC PROTECTION DEVICE

WETLANDS

- EMERGENT WETLAND (PEM)
- SCRUB SHRUB WETLAND (PSS)
- FORESTED WETLAND (PFO)
- OPEN WATER WETLAND (POW)

STREAMS

- STREAM CHANNEL

FLOODWAY

- FLOODWAY
- FEMA — FEMA FLOODPLAIN

SURVEY NOTES:

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/19). EXISTING CONTOURS FOR OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HGA.

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SUBMERGED LAND LICENSE AGREEMENT
SITE PLAN AND PROFILE
YOUNG WOMANS CREEK
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 09/04/2019	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY: KMC	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE:		
WO: 1211227	RID:	DRAWING NUMBER:	ATTACHMENT 2

REQUIREMENT L-4

MODULE S3- IDENTIFICATION AND DESCRIPTION OF POTENTIAL PROJECT IMPACTS

Transcontinental Gas Pipe Line Company, LLC

Requirement L-4, Environmental Assessment
Module S3 – Identification and Description of Potential Project Impacts

Leidy South Project – Hensel Replacement and Hilltop Loop

September 2019

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S3.B.2 National Natural Landmark

S3.B.3 National Wildlife Refuge, or Federal, State, or Private Wildlife or Plant Sanctuaries

S3.B.4 State Game Lands

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Appendix S3 – 4 Construction Spill Prevention and Response Procedures for Oil and Hazardous Materials

Appendix S3 – 5 Aids to Navigation Plan

MODULE S3

IDENTIFICATION AND DESCRIPTION OF POTENTIAL PROJECT IMPACTS

According to Module 3 of the EA Form Instructions, permanent impacts are defined as areas that are affected by a water obstruction or encroachment that consist of both direct and indirect impacts that result from the placement or construction of a water obstruction or encroachment and include areas necessary for the operation and maintenance of the water obstruction or encroachment located in, along or across, or projecting into a watercourse, floodway or body of water. Temporary impacts are defined as areas affected during the construction of a water obstruction or encroachment that consist of both direct and indirect impacts located in, along or across, or projecting into a watercourse, floodway or body of water that are restored upon completion of construction. This area does not include areas that will be maintained as a result of the operation and maintenance of the water obstruction or encroachment located in, along or across, or projecting into a watercourse, floodway or body of water. A summary of permanent and temporary, and direct and indirect impacts is provided in Table S3.A-1.

S3.A Summary of the Proposed Temporary and Permanent, Direct and Indirect Impacts

As part of the Hensel Replacement and Hilltop Loop (Project) unavoidable resource impacts are proposed. Table S3.A-1 below outlines the overall impacts as it relates to the Hensel Replacement and Hilltop Loop. Detailed impacts by resource are provided in subfacility summary tables found in Appendix S3-1.

Table S3.A-1
Aquatic Resource Impact Summary Table

Project Component[1]	Impact Type	Resource[1]	Direct (Acres)	Indirect (Acres)
Hilltop Loop	Permanent	Wetland	-	0.36
		Watercourse	-	1.05
	Temporary	Wetland	-	0.57
		Watercourse	-	1.00
Hensel Replacement	Permanent	Wetland	0.02	1.34
		Watercourse	-	1.72
	Temporary	Wetland	-	1.07

Table S3.A-1
Aquatic Resource Impact Summary Table

Project Component[1]	Impact Type	Resource[1]	Direct (Acres)	Indirect (Acres)
		Watercourse	-	0.42

Notes:

1. Watercourse impacts include floodway impacts

Permanent direct impacts would include 0.02 acres. These impacts would be associated with improvements to an existing access road (Hensel Replacement) that will result in permanent fill within 0.02 acres of Palustrine Emergent (PEM) wetlands.

Permanent indirect impacts would include 1.7 acres to wetlands and 2.77 acres to watercourses. These permanent indirect impacts would be associated with the existing and proposed maintained ROW and include functional conversion of Palustrine Forested (PFO) and Palustrine Scrub-Shrub (PSS) wetlands; which will result in 0.1 acres of conversion. This conversion is due to these features being located within the proposed permanent maintained pipeline right-of-way (ROW). A 10-foot-wide herbaceous corridor will be maintained over the center of the pipeline within the wetlands and riparian buffer areas. Trees within 15 feet of the centerline or between existing pipelines will be removed to maintain the integrity of the pipelines.

There are no temporary direct impacts proposed for the Project.

Temporary indirect impacts would include 1.64 acres to wetlands and 1.42 acres to watercourses. These temporary indirect impacts would be associated with impacts outside the existing and proposed maintained ROW including impacts associated with access roads.

S3.B Standard Information Responses

The below responses address resources identified in Module 2, Table S2.A.5-1.

S3.B.1 National, State, or Local Park, Forest or Recreation Area

The Project facilities, including the pipelines and aboveground facilities, will neither cross nor be located within 0.25 mile of federal lands, including national parks or national forests, however, portions of the Project are located on state forest land. Table S3.B.1-1 presents a summary of public land, conservation land, recreational areas, and other designated or special

uses areas crossed by the Project facilities, including land ownership type. The locations of these areas are shown on Figures 8B-1 and 8B-2.

Table S3.B.1-1
Federal, State, and Municipal Lands, and Recreation Areas within 0.25 Mile of the Project Facilities

Facility/ County	Begin MP [a]	End MP[a]	Distance Crossed (miles)	Name	Distance (miles) and Direction	Land Affected During Construction[b] (acres)	Land Affected During Operation[c] (acres)	Description
Hensel Replacement[d]								
Clinton	188.51 193.96	193.51 194.00	5.5	Sproul State Forest	Crossed	101.3	15.4	State forest managed by the DCNR for preservation and recreational purposes
Clinton	190.01		<0.1	Two Mile Run Snowmobile Trail	Crossed	<0.1	<0.1	Snowmobile trail within Sproul State Forest
Clinton	192.72		<0.1	Donut Hole Trail	Crossed	<0.1	<0.1	Multi-use trail within Sproul State Forest
Hilltop Loop								
Clinton	183.51	183.52	<0.1	Sproul State Forest	Crossed	3.0	<0.1	State forest managed by the DCNR for preservation and recreational purposes
MLV Facility at MP 188.15 (Hensel Replacement)								
Clinton	188.15		0.0	Sproul State Forest	0.1 / west	0.0	0.0	State forest managed by the DCNR for preservation and recreational purposes

Sources: PADCNR 2017; PADCNR 2019b

[a] Mileposts for the Project are based on Transco Leidy Line A, and do not reflect actual pipeline footage. Lengths reported in the table reflect actual pipeline length.

[b] Construction impacts include area within permanent ROW and ATWS.

[c] Operation impacts associated with maintenance of permanent ROW.

[d] Hensel Replacement includes the new Leidy Line D installation and the Leidy Line A abandonment.

Key:

ATWS = additional temporary workspace
MP = Milepost
NW = Northwest
DCNR = Pennsylvania Department of Conservation and Natural Resources
ROW = right-of-way

Sproul State Forest

The Pennsylvania Department of Conservation Natural Resources (DCNR) manages state forests in Pennsylvania and is responsible for issuing the License for Right-Of-Way on State Forest Land across its land. State forests are managed by the Bureau of Forestry, a division of the DCNR. The DCNR has developed siting criteria and guidelines for ROW development in state forests which Transco has utilized as part of the Project design.

Transco met with the DCNR on December 5, 2018, to discuss the process for applying for the License for Right-Of-Way on State Forest Land to cross Sproul State Forest. As part of the DCNR License for Right-Of-Way on State Forest Land application process, and to receive field survey permission, Transco submitted its application for License for Right-Of-Way on State Forest Land on December 21, 2018. Transco met with the DCNR again on April 19, 2019 for the Pre-Survey meeting as part of the License for Right-of-Way application process. The DCNR subsequently granted survey permission to Transco on April 22, 2019. Transco plans to submit the State Forest Environmental Review application to the DCNR in August 2019. Transco will continue the License for Right-of-Way application process which, if issued, would allow Transco to construct and operate the portions of the Hensel Replacement and Hilltop Loop that cross Sproul State Forest.

The proposed Hensel Replacement crosses Sproul State Forest for 5.5 miles, while 5.3 miles of Leidy Line A will be abandoned within the state forest. The Hilltop Loop crosses Sproul State Forest for less than 0.1 miles. Various recreational activities are allowed within the forest, including hunting, horseback riding, mountain biking, off-road use of all-terrain vehicles, cross-country skiing, and snowmobiling (PADCNR n.d.). In addition, Sproul State Forest is managed for timber production.

The Tamarack Swamp Natural Area located adjacent to the Hensel Replacement LOD is a 267-acre area within the Sproul State Forest that supports eight wetland types, including the tamarack and black spruce swamp for which it is named. Transco is not proposing disturbance within the limits of the Tamarack Swamp Natural Area and routed the proposed Hensel Replacement to avoid the Tamarack Swamp Natural Area.

Table S3.B.1-2 summarizes the land affected during construction on Sproul State Forest. Transco minimized impacts on Sproul State Forest by co-locating the proposed Hensel

Replacement and proposed Hilltop Loop with existing ROWs and siting the proposed pipelines away from any active recreation areas to the extent possible.

Table S3.B.1-2
Land Use Impacts on Sproul State Forest

Facility	Open Land (acres)		Transportation Land (acres)		Upland Forest/ Woodland (acres)		Wetlands (acres)[a]		Open Water (acres)		Total (acres)	
	Cons	Op	Cons	Op	Cons	Op	Cons	Op	Cons	Op	Cons	Op
Hensel Replacement	60.2	1.2	25.7	9.5	13.9	4.6	1.3	0.2	0.2	0.0	101.3	15.4
Hilltop Loop	0.7	0.0	1.8	0.0	0.5	0.0	0.1	0.0	0.0	0.0	3.0	0.0
Total	**60.9**	**1.2**	**27.4**	**9.5**	**14.4**	**4.6**	**1.4**	**0.2**	**0.2**	**0.0**	**104.3**	**15.4**

Source: Existing land use within proposed pipeline construction and operations workspaces were identified using field surveys and aerial imagery.

[a] Hensel Replacement includes the new Leidy Line D installation and the Leidy Line A abandonment.

Key:
Cons = Construction
Op = Operation

In addition, Transco developed its proposed abandonment plan for Leidy Line A to minimize impacts on Sproul State Forest. Transco is proposing to remove the existing Leidy Line A with the exception of an approximate 0.8-mile portion of the Leidy Line A within the Tamarack Swamp Natural Area and associated wetlands, which will be abandoned in place and grouted. Work needed for the removal and abandonment of Leidy Line A will take place within the workspace associated with the installation of the proposed Hensel Replacement.

As part of the application process to cross Sproul State Forest, Transco is continuing to coordinate with the DCNR's Bureau of Forestry to identify additional measures to minimize disturbance to Sproul State Forest and its visitors. Transco identified two trails crossed by the Hensel Replacement (see Table S3.B.1-1, above), including one snowmobile trail (Two Mile Run) and one hiking trail (Donut Hole Trail) (PADCNR 2018).

Within Sproul State Forest, the Hensel Replacement Proposed Leidy Line D crosses the Foley Tract. Transco's possesses an existing right-of-way agreement dated June 27, 1996 and recorded September 3, 1996 with Clinton County granted Transco a 75-foot wide easement across the Foley Tract (15 feet on the northerly side, and 60 feet on the southernly side of

Transco's existing pipeline). The right-of-way agreement allows for a maximum of two pipelines, the existing Leidy Line C pipeline and one additional pipeline, with rights to clear and use, as temporary workspace during construction of the additional pipeline, and an additional 25 feet of temporary workspace for the construction of an additional pipeline. While, the Foley Tract was acquired by the DCNR in 2003, and portions of the tract are proposed for inclusion in the Tamarack Swamp Natural Area, Transco's proposed route would cross the Foley Tract at a location where these existing rights dated June 27, 1996 are valid. Transco is not seeking modifications or proposing a new license boundary to its existing easement on the Foley Tract.

S3.B.2 National Natural Landmark

The Project facilities, including the pipelines and aboveground facilities, will neither cross nor be located within 0.25 mile of national natural landmarks or registered national landmarks (USGS 2014, 2015).

S3.B.3 National Wildlife Refuge, or Federal, State, or Private Wildlife or Plant Sanctuaries

The Project facilities, including the pipelines and aboveground facilities, will neither cross a National Wildlife Refuge, or Federal, State, or Private Wildlife or Plant Sanctuaries.

S3.B.4 State Game Lands

The Project facilities, including the pipelines and aboveground facilities, will neither cross nor be located within 0.25 mile of state game land.

S3.B.5 Areas Identified as Prime Farmland

Construction of the Hensel Replacement and Hilltop Loop will affect approximately 42.33 acres of prime and important farmland soils. Appendix S3-2 identifies important farmlands crossed by the overall Leidy South Project.

Construction may result in temporarily removing those soils from agricultural production if construction occurs during the growing season. Pipeline construction and operation will not result in any long-term loss of prime and important farmland. Soils that are currently designated as prime farmland and farmland of statewide importance will retain their designation after construction. While some short-term decreases in agricultural productivity may result because of the disturbance of soil during construction, those effects can be mitigated over time by the restoration measures outlined in Appendix S3-3 Transco Project Specific Upland Erosion Control, Revegetation, and Maintenance Plan, and by resumption of proper soil management by

landowners. Pipeline operation will not adversely affect agricultural soils, including prime farmland and farmland of statewide importance.

S3.B.6 Source for a Public Water Supply

Public Water Supply Well Information

Transco reviewed public water supply well information for Pennsylvania, which is available on the Pennsylvania Department of Environmental Protection (PADEP) *eMapPA* online map-based query (PADEP 2019). Based on this review, groundwater wells were identified within one mile of three of the proposed crossing locations. Appendix 1 – Public Water Supply Report of the Joint Permit Application submittal provides additional information on groundwater wells.

Wellhead Protection Areas

Transco reviewed the PADEP *eMapPA* GIS-based web-based mapping tool to identify if any WHPAs are within 0.25-mile of the Project. Based on this review of *eMapPA,* no public water systems or WHPAs are within 0.25-mile of the Project (PADEP 2019) No WHPAs are crossed by the Project pipeline facilities or occur within the workspace of the aboveground facilities (PADEP 2019); therefore, there will be no effect on WHPAs.

Public Surface Water Intake Information

Transco reviewed the PADEP *eMap*PA GIS-based web-based mapping tool to identify the presence of surface water intakes within 5 miles of the Project area on August 8, 2019. The review indicated that only the Renovo Borough Water Authority (RBWA) associated with the Hensel Replacement exists within 5 miles of the Project. All other Project components did not indicate a surface water intake within 5 miles.

The closest waterbody crossing to the RBWA surface water intake is on an unnamed tributary to Paddy Run. This crossing is located 3.75 river-miles upstream from the surface water intake. The Hensel Replacement crosses the Paddy Run watershed from MP 188.52 to MP 192.36. Transco will update the RBWA of the proposed construction schedule, so they can temporarily turn off the surface water intake during the stream crossings, as recommended by the RBWA engineer. Transco will notify the RBWA at the start of the construction of the Hensel Replacement, and provide further details on the timing of stream crossings in the Paddy Run watershed when available.

Private Water Supply Wells

In addition to identifying public water supply wells, Transco has identified private water supply wells and springs within 150 feet of construction workspaces that serve individual uses or residences. Transco primarily identified these private wells through environmental surveys and by directly contacting landowners. Transco also identified additional private water supply locations within 150 feet of the workspaces through civil survey. Table S3.B.6-1 lists the private water supply wells and springs identified to date within 150 feet of construction workspaces.

Table S3.B.6-1
Private Water Supply Wells and Private Springs within 150 Feet of Construction Workspaces

Nearest Milepost	County	Supply Type	Distance from Workspace (feet)	Direction from Workspace
Hensel Replacement[a]				
193.80	Clinton	Private well	0	N/A
Hilltop Loop				
185.01	Clinton	Private well	98	North
185.84	Clinton	Private well	11	South
MLV Facility at MP 188.15 (Hensel Replacement)				
None				

[a] Hensel Replacement includes both the new Leidy Line D installation and the Leidy Line A abandonment.

Key:
N/A = Not Applicable

Transco will offer to have a qualified, independent testing service conduct groundwater tests for private wells located within 150 feet of the Project workspace or within 150 feet of blasting activities. Water quantity testing will include yield measurements using the existing pump and discharge line when possible and a portable submersible pump when necessary. Any well modification for the purposes of testing will be completed with the permission of the landowner. Water samples collected for water quality analysis will be tested for specific conductivity, temperature, pH, turbidity, nitrate, volatile organic compounds, and total petroleum hydrocarbon. Sampling methods will adhere to the prevailing EPA and state sampling and analytical procedures in place at the time of construction.

A Transco representative will contact landowners after the sample analysis has been conducted to provide the sample results. In the unlikely event that construction of the Project temporarily affects the water quality or yield of a private or public well/spring, Transco will provide alternative water sources or other compensation to the well owner(s). In the unlikely event that a

well/spring is permanently affected due to construction activities, Transco will repair, replace, or provide alternative sources of potable water.

S3.B.7 National Wild or Scenic River or the Commonwealth's Scenic River System

No state wild or scenic rivers are within 100 feet or will be crossed by the Project facilities (PADCNR 2014).

S3.B.8 Designated Federal Wilderness Area

The Project is not located in, or within, 100 feet of a federal wilderness area.

S3.C.1-10 Subfacility Details Tables

The proposed water obstructions and encroachments are included in the Subfacility Details Table provided in Appendix S3-1. This table includes the subfacility identifier, subfacility code, resource identifier, coordinates, municipality, county, and temporary and permanent, indirect, and direct impacts for each subfacility.

S3.D Resource Function Effects

S3.D.1 Subfacility Identifier

The Project impacts are grouped by the subfacilities as defined by the PADEP. The subfacilities applicable to the Project and their definition is provided Table S3.D-1 below.

Table S3.D-1
Subfacility Codes Table

Subfacility Code	Name	Definition
PIPE	Pipeline or Conduit	Used for installation of the proposed pipelines. Both the Hensel Replacement and Hilltop Loop are 36 inches in diameter. This code will also be used for the impacts resultant from the abandonment portion of the Hensel Replacement and cathodic protection to be installed on portions of the Hilltop Loop and Hensel Replacement which will be within same trench as the pipeline through resources and is included within the pipeline subfacility table
TMPWI	Temporary Wetland Impact	Used for direct and indirect temporary wetland impacts resultant from temporary workspace outside of the permanent ROW. This code does not apply to utility line crossings within the wetland.
WDTIM	Wetland Direct Impact	Used for direct wetland impacts resultant from the placement of permanent fill in a wetland. This code is used for permanent fill associated with access roads and compressor stations and does not apply to utility line crossings within a wetland.
BRDG	Bridge	Used for direct wetland impacts resultant from the placement of permanent fill in a wetland associated with access road.

The effects of the of the subfacilities identified in Table S3.D-1, either individually or in combination, are provided in the following sections.

S3.D.2 Impact Types

Impacts for the pipeline components utilized both the Pipe (PIPE) and Temporary Wetland Impact (TMPWI) subfacility codes. Impacts associated with the Big Ridge Trail utilized the Wetland Direct Impact (WDTIM), TMPWI and Bridge (BRDG) subfacility codes. When discussing each of the resource functions outlined below, the subfacilities are grouped based on these two main items (Pipeline and Big Ridge Trail).

S3.D.2(i) Hydrologic

The characteristics of water quantity, stream flow, and sources, groundwater basal flows, drainage patterns, flushing characteristics, flow currents, natural recharge or source areas, stormwater and floodwater storage and control are discussed below.

<u>Water Quantity, Stream Flow and Sources</u>

Pipeline

Transco will cross waterbodies with flowing water present at the time of construction using dry-ditch construction methods. The dry-ditch construction method shall be completed with a clean water bypass that may include dam and pump, flume pipe and/or cofferdam. Each option passes water around the crossing location, minimizing construction impacts downstream. The pipeline is installed in the dry, with the trench excavation, pipe installation, and backfill completed at this time. Once complete, the stream banks and streambed will be restored to pre-construction

contours. To stabilize the banks, stream banks and riparian areas will be revegetated using approved seed mixes and/or erosion control blankets or matting.

Transco will install temporary equipment bridges across waterbodies to reduce the potential for turbidity caused by movement of construction equipment and vehicular traffic and also allow for continuous flow of the waterbodies. Equipment bridges may include instream supports. Equipment bridges will be constructed of clean rock or gravel and culverts, timber mats, or portable prefabricated bridges, depending on stream conditions (e.g., if excessively soft soils are encountered in the streambed, or if high water flows occur, portable bridges will be used at minor stream crossings instead of rock and culverts). Equipment bridges will be maintained until the pipe is installed and final restoration is completed. Equipment bridges will accommodate normal to high stream flow and will be maintained to prevent flow restriction during the period of time the bridge is in use during construction.

To minimize sedimentation during pipeline construction across each waterbody, trench spoil will be placed at least 10 feet away from waterbody banks, unless impractical due to topography. Erosion controls will be placed around spoil piles to prevent sediment from flowing into waterbodies. Within the top of bank (TOB) of streams, a 50-foot-wide construction ROW will be used, and a 75-foot-wide construction ROW will be used in floodways, except where Transco has provided justification, as outlined in Requirement S - Alternative Analysis of the Joint Permit Application.

The pipeline components of the Project will also have temporary and permanent wetland impacts. E&S Control BMP's will be installed during construction which will avoid impacts to water quantity, stream flow and sources associated with the wetland crossings. Temporarily impacted wetlands will be restored upon completion of construction. Wetlands that will involve functional conversion will be mitigated for offsite, as outlined in Module 4.

Big Ridge Trail

Only wetland impacts are proposed on the Big Ridge Trail. The design of this wetland crossing will allow for the wetland to remain connected above and below the access road, as a French mattress installed on the existing access road will allow for water to pass through this feature. Both temporary and permanent wetland impacts are proposed on the Big Ridge Trail. Temporarily impacted resources will be restored. Those wetlands permanently impacted will be mitigated for offsite, as outlined in Module 4.

Groundwater Basal Flows and Natural Recharge or Source Areas

No impacts to groundwater basal flows and natural recharge or source areas are anticipated as part of the Project. Impacts to groundwater basal flows and natural recharge or source areas will be avoided and minimized through the utilization of Transco's Plan and Procedures, found in Appendices S3-3 and S4-1. Additionally, potential impacts will also be minimized through the use of the Spill Plan for Oil and Hazardous Materials (Spill Plan) provided in Appendix S3-4 Construction Spill Prevention and Response Procedures for Oil and Hazardous Materials if incidents occur.

Pipeline

With the exception of the valve settings at the pipeline tie-ins at each terminus of the Hensel Replacement, no impervious areas are to be added as a result of the pipeline component of the Project. The valve settings will have some impervious area, however, will be mitigated for through stormwater management design, which will promote infiltration at the site. The pipeline construction will restore the site to pre-existing contours, allowing for these functions to restore once construction is complete. In addition, existing valve settings at the eastern terminus of Hilltop Loop will be removed to promote infiltration within these areas.

Big Ridge Trail

These resource functions will not be impacted as a result of the crossing installation on the Big Ridge Trail. The design and installation of the French mattress will allow for water to pass through the access road, which will promote infiltration and recharge throughout the wetland resource impacted.

Drainage Patterns, Flushing Characteristics and Flow Currents

The proposed Project will have minimal impacts during construction to drainage patterns, flushing characteristics and flow currents to wetlands and waterbodies, with no long-term impacts anticipated.

Pipeline

Pipeline components of the Project will take place within or adjacent to a previously disturbed pipeline ROW. Stormwater controls which will be installed during construction have been designed to avoid impacts to natural drainage features. These controls will only have temporary impacts while installed and will be removed once the site is stabilized with vegetation.

Minimal impacts to wetland resources is anticipated, as these functions are generally limited when compared to watercourses.

Transco will restore pipeline facility workspaces to pre-construction contours along the Hilltop Loop. The Hensel Replacement workspaces will be restored to pre-construction contours, with the exception of MP 191.10 to MP 192.55, where Transco will regrade the ROW in this area to restore approximate original contours to remove a two-tone area as requested by DCNR.

Big Ridge Trail

The permanent wetland impact associated with the crossing design on the Big Ridge Trail will allow for the hydrologic connectivity through the installation of a French mattress. This will maintain a surface connection on both sides of the access road and allow for a stable road surface. Temporarily impacted portions of these PFO wetland resources will be restored and replanted as part of the Project.

Stormwater and Floodwater Storage and Control

The proposed Project will have minimal impacts during construction and post-construction to stormwater and floodwater storage and control, with no long-term impacts anticipated.

Pipeline

Restoration of pre-construction contours along the pipeline components will preserve the existing condition of the FEMA floodplains, FEMA Floodways, 50-foot floodways, and wetlands. This restoration shall limit the pipeline facilities from having adverse effects on flood-storage capacity or stormwater control. With the exception of the valve settings at each terminus of the Hensel Replacement, no impervious areas are to be added as a result of the pipeline component of the Project. The valve settings will have some impervious area, the impact of which will be mitigated through stormwater management design. In addition, existing valve settings at the eastern terminus of Hilltop Loop will be removed to promote infiltration within this area.

Big Ridge Trail

The crossing design on Big Ridge Trail will allow for water passage through the crossing. This crossing is located outside of a regulated floodway or floodplain, and has no associated stormwater control, therefore, no impact to these functions is anticipated at this location.

S3.D.2(ii) Biogeochemical

Hydrodynamics

Pipeline

All stream and wetland crossings will be restored to pre-existing conditions. Natural streambed materials will be replaced in the streambed and the pre-existing stream alignment should be restored to pre-construction alignments. Erosion control blankets shall be placed on restored stream banks to the ordinary high-water mark and outside of wetland areas. If streams have existing bank protection, such as rock bank protections along Young Womans Creek, these bank protection measures shall be restored.

Forested riparian areas, PFO, and PSS wetlands shall be restored outside of the proposed maintained ROW. Riparian areas and wetlands will be revegetated using approved seed mixes and/or erosion control blankets or matting. Transco will replant existing forested riparian buffers and wetlands impacted outside of the permanent maintained ROW. A 10-foot-wide herbaceous corridor will be maintained over the center of the pipeline within the riparian buffer areas. Trees within 15 feet of the centerline or between existing pipelines will be removed to maintain the integrity of the pipelines. An Onsite Wetland and Riparian Reforestation Plan is included in Module 4, Appendix S4-2.

Big Ridge Trail

The location of the Big Ridge Trail is on an existing access road where a wetland has formed due to improper drainage. The permanent installation of the French mattress will have a positive effect on the hydrodynamics of the site, as this resource function is limited in its current state due to it being an existing access road.

Food Chain Production

Pipeline

All of the wetland and waterbody crossings are adjacent to existing pipelines or utilities as the Hensel Replacement and Hilltop Loop are primarily co-located. Cover types for these resources are primarily herbaceous, with some instances of forested cover types. Onsite replanting of existing forested riparian buffers within 150’ of streams, and impacted PSS and PFO wetlands will be implemented for the project as outlined in Appendix S4-2. Cover type changes are likely to have minimal impact on aquatic habitat and the associated food chain production, as cover type changes expected to result from the Project are minimal.

All waterbodies crossed by the Project are minor and intermediate streams with the exception of Young Womans Creek and Drury Run. Crossing windows for instream construction

will be minimized to the extent practical as approved in Chapter 102 and 105 permits. Crossing construction shall be completed as dry-open cut, with a clean water bypass that may include dam and pump, flume pipe and/or cofferdam. Each option passes water around the crossing location, minimizing construction impacts downstream. Additionally, the Pennsylvania Fish and Boat Commission (PFBC) instream construction restriction periods will be followed, unless waivers are obtained, further minimizing stream impacts. Due to the short instream construction duration and coordinated crossing window timing with the PFBC, impacts have been minimized at each crossing.

Big Ridge Trail

For those wetlands being permanently filled associated with the Big Ridge Trail, food chain production will be permanently impacted as result of the wetland loss, however, the current food chain production capacity is minimal due to the wetland being on an existing access road. Temporarily impacted wetlands associated with the Big Ridge Trail will be restored with no long-term impacts to food chain production anticipated.

Water Quality

The PADEP Erosion and Sediment Pollution Control Program Manual, dated March 2012 (Manual), was used as a primary reference for design and selection of E&S control BMPs to be implemented during the Project. These will be consistent with the requirements of the PA Code Title 25 Chapter 105 requirements, as it relates to wetland and waterbody impacts.

Sediment controls will be designed to stay within the Limits of Disturbance, with controls and plans in place to minimize potential impacts. Post construction stormwater measures will be designed to manage stormwater runoff. With the implementation of the E&S Plan and the PCSM, impacts to water quality are not anticipated.

The following techniques will be employed during construction to minimize the potential for soil erosion and sediment migration:

All Subfacilty Types

- E&S BMP measures will be installed prior to commencement of earthwork and will not be removed until after the up-gradient areas are stabilized.

- Rock construction entrances will be installed along points of access to the pipeline alignment to mitigate the potential for construction vehicles to transport sediment onto public roadways.
- Compost filter sock will be installed along the down-gradient perimeter of the work areas.
- Removal of the erosion and sediment control BMP measures will occur only after the disturbed areas have been stabilized by uniform perennial vegetative coverage (density) of seventy percent (70%) or greater, or by other permanent non-vegetative cover with a density sufficient to resist accelerated surface erosion and subsurface characteristics sufficient to resist sliding and other movements.
- Diligent maintenance of the erosion and sediment control BMP measures will be conducted throughout the duration of the project.

<u>Pipeline</u>

- At areas of concentrated flow in natural drainage ways, diversions will be installed to intercept and convey upslope stormwater runoff around the work corridor without contacting disturbed surfaces.
- Waterbars and outlet structures will be installed to mitigate the potential for stormwater to erode soils on steep slopes by diverting water away from the pipeline alignment. Waterbars will discharge to a well vegetated area to limit the potential for sediment-laden water to flow downgradient from the terrace.
- Trench plugs will be installed intermittently within the pipeline trench and at wetland and stream crossings to control and allow for managing the flow of sediment-laden stormwater within the trench. Stormwater pooling within the excavation behind a trench plug will be removed and discharged through a pumped water filter bag over stable, undisturbed earth.
- Timber mats will be installed within wetland crossings to minimize the impacts and compaction of the wetland crossings.
- Timber bridges will be installed to cross streams to prevent onsite site sediments from entering the waterbodies.

Big Ridge Trail

- French mattress installation will allow for clean water to flow through the site during and post construction and allow for the hydrologic connection of adjacent wetlands.

Post-construction stormwater management measures will also be implemented for water quality in areas where it is required. The PCSM is designed to manage stormwater runoff associated with new impervious areas for the proposed aboveground facilities. The design will promote retention and infiltration into the ground, controlling sediments by keeping them onsite. With the implementation of the E&S Plan and the stormwater management measures, water quality impacts are not anticipated.

Transco reviewed the 303(d) lists for streams crossed by the Project that are included in EPA Categories 4 and 5. Category 4 lists waterbodies where TMDLs have been established or cannot be established due to the nature of the contamination. Category 5 lists waterbodies where TMDLs need to be developed by the state. (PADEP 2019). No surface waters crossed by the Project are classified as impaired waterbodies. However, one Project component, Contractor Yard CY-003, associated with the Hensel Replacement, is in proximity to a reach of West Branch Susquehanna River, which is classified as impaired due to the presence of metals associated with acid mine drainage (PADEP 2019). West Branch Susquehanna River has an approved TMDL for metals and pH associated with acid mine drainage (PADEP 2001). Transco has sited Contractor Yard CY-003 to avoid impact to this watercourse. In addition, Antidegradation Best Available Combination of Technologies (ABACT) controls will be installed at this location.

S3.D.2(iii) Habitat

General Habitat

General construction related impacts on wildlife species, as it relates to wetlands, waterbodies, and the surrounding areas, will result from habitat disturbance and human activities. Indirect impacts on wildlife will include those associated with increased human activity. Construction of the Project is likely to result in the temporary displacement of, or stress on, animals in areas adjacent to construction and cause movement of some wildlife away from the Project area. Stress on wildlife could affect general health, reproduction, and viability of young animals, depending on the sensitivity of a particular species, season of the year, and other factors. Impacts to forested areas may have an impact on nesting bird species, rearing of young, and availability of escape cover. While the Project does have impacts to typical wildlife habitat of the

region, it is unlikely the Project has an influence on biodiversity, as the areas to be impacted are typical settings for the region, and unique areas have been avoided.

Pipeline

Other temporary impacts on wildlife species as a result of the general habitat impact could include those from pipeline trenching activities and associated spoil piles, which could result in a short-term barrier to movement to some species.

Temporary habitat alteration at the waterbody crossing locations may degrade fish spawning and nursery areas due to the excavation in the channel, resulting in temporary impacts. Because crossings will be completed in a short timeframe, these effects are expected to be temporary in nature and aquatic communities will subsequently recolonize the affected area once construction activity is complete. Permanent impacts to spawning are not anticipated as a result of this Project. Impacts to spawning should be avoided by timing construction to occur outside of the PFBC restricted period.

All of the stream crossings associated with the Project cross either stocked or wild trout streams. At some of these crossings, wetlands are located adjacent to the wild trout streams. As a result, these wetlands are considered exceptional value (EV) under PA Code Chapter 105.17. Impacts to these wetlands have been minimized through workspace reductions. Work in these areas will follow the Transco Project Specific Wetland and Waterbody Construction and Mitigation Procedures found in Appendix S4-1

During clearing and grading activities, more mobile wildlife species (e.g., larger mammals, birds, and reptiles) will be able to avoid the construction area, and many are expected to leave the area during construction and migrate to surrounding areas. Construction activity will be temporary and will occur in a given area for only a few weeks, in general. Habitat recovery will occur, aided by the use of the impact minimization and restoration measures.

Transco does not anticipate the Project to reduce or degrade habitat for terrestrial, aquatic, or avian species significantly due to the pipeline co-location. Habitat fragmentation has been minimized through the use of pipeline co-location. While temporary impacts on food, cover, and water sources may occur, none of the species located within the Project area are specialized in such a way that construction of the Project will inhibit the overall fitness or reproductive output of the populations as a whole. Minimal changes to existing habitat types will occur due to this Project

siting. Wildlife populations that utilize the Project area are not expected to be permanently adversely affected by the proposed Project.

Along the Hensel Replacement, the Tamarack Swamp Natural Area is located adjacent to the Project. Impacts to this natural area have been avoided. Similarly, the Foley Tract, a "Special Use" area on Sproul State Forest will be crossed by the Project, however, no wetland or waterbody impacts are proposed.

Big Ridge Trail

The general habitat associated with the wetland crossing at the Big Ridge Trail consists of a wetland located on an access road in an isolated area within the Sproul State Forest. While temporary impacts, similar to those described above with the Pipeline subfacility, are likely to occur, no long-term impacts are anticipated as a result of this crossing installation due to it currently being an existing road.

Environmental Study Areas

The Project will not result in impacts to environmental study areas at any of the subfacility areas.

Threatened and Endangered Species

The discussion below outlines the potential impacts and proposed mitigation for all subfacilities associated with the Hensel Replacement and Hilltop Loop, as survey requests from the regulatory agencies with jurisdiction of each of the species listed below reviewed.

United States Fish and Wildlife Service

Indiana Bat

The United States Fish and Wildlife Service (USFWS) indicated that the Project is within the range of the Indiana bat, which is federally listed as endangered. The USFWS indicated that as long as tree clearing occurred between November 15 and March 31 for the Project, then surveys were not required for the Indiana bat.

Transco plans to complete all tree clearing outside of the active Indiana bat season to avoid impacts on any Indiana bats that may be present in the Limits of Disturbance (LOD). Specifically, tree clearing will be completed between November 15 and March 31. As such, Transco does not expect impacts to Indiana bats as a result of the Project.

Northern Long-eared Bat

The proposed Hensel Replacement and Hilltop Loop in Clinton County are in proximity to several northern long-eared bat captures. "On February 16, 2016, a special conservation rule (i.e., 4(d) rule) was adopted that tailors protections for the northern long-eared bat under the Endangered Species Act (81 FR 1900). Incidental take that occurs as a result of tree removal that is not within 0.25 mile of a known northern long-eared bat hibernaculum or within 150 feet from a known, occupied maternity roost tree is not prohibited in accordance with the 4(d) rule" (Jahrsdoerfer 2019b).

Transco previously completed surveys for northern long-eared bats in 2014 through 2016 for its Atlantic Sunrise Project, which is located adjacent to the proposed Project. Based on review of that survey data within 0.25 mile of the Project, two known maternity roost trees are located near the Hensel Replacement. No known maternity roost trees are located within 0.25 mile of the Hilltop Loop.

Transco plans to complete all tree clearing outside of the active northern long-eared bat season to avoid impacts on any northern long-eared bats that may be present in the LOD. Specifically, tree clearing will be completed between November 15 and March 31. As such, Transco does not expect impacts to northern long-eared bats as a result of the Project.

Northeastern Bulrush

All Project components are within the range of the northeastern bulrush (*Scirpus ancistrochaetus*), which is federally listed as endangered (Jahrsdoerfer 2019b). The preferred habitat of the northeastern bulrush is along the fringes of seasonal ponds, shallow wet depressions, and wetlands. It fruits in July and persists through January (Podniesinski 2018).

PRIVILEDGED

Pennsylvania Department of Conservation and Natural Resources

The DCNR identified several target plant species associated with the Hensel Replacement (Table S2.C.2(ii)-1). No target plant species associated with the Hilltop Loop were identified. Target species include those that are state-listed or proposed for state listing as rare, threatened, or endangered. Although the DCNR did not indicate that any rare, threatened, or endangered plant species were documented on-site, plant surveys were requested to be conducted for target species in Project areas that met the conditions of each species' habitat (Podniesinski 2018). Survey windows vary for each species based primarily on flowering times, or other times of year when the plant is most readily apparent. Table S2.C.2(ii)-1 describes suitable habitat and flowering windows for each of the seven state-listed plant species. The federally listed northeastern bulrush is described above under the USFWS section.

Table S2.C.2(ii) - 1
Habitat and Flowering Windows for State-Listed Plant Species Potentially Occurring Within the Hensel Replacement Project Area

Common Name	Scientific Name	Habitat	Flowing / Fruiting Window
Showy Mountain-ash	*Sorbus decora*	Documented in a tamarack swamp; suitable habitat includes rocky slopes	Flowers: May Fruits: September – October
Bebb's Sedge	*Carex bebbii*	Documented in sphagnum meadow; suitable habitat includes pond edges, boggy pastures, and moist sand flats	Fruits: June – July
Soft-leaved Sedge	*Carex disperma*	Documented in a tamarack swamp; suitable habitat includes swampy woods, bogs, and rhododendron swamps	Fruits: May-August
Purple Bedstraw	*Galium latifolium*	Documented along Hensel Fork creek; suitable habitat includes woods, rocky slopes and roadsides	Flowers: June-July

Sources: Podniesinski 2018; PNHP n.d.(b);

Transco completed surveys for state-listed plant species identified within and surrounding the Project area. No state-listed species were identified within the LOD. The closest occurrence of a state-listed species was Purple Bedstraw along the Hensel Replacement. The population of Purple Bedstraw was located upslope of the existing and proposed ROW ranging from approximately 10 to 75 feet outside the LOD. A survey report is included in Appendix S2-3.

Pennsylvania Fish and Boat Commission

Timber Rattlesnake

According to correspondence with the PFBC, Hensel Replacement and Hilltop Loop are within the range of the timber rattlesnake (*Crotalus horridus*) (Allison 2018).

The PFBC requested Transco complete a habitat assessment of the Hensel Replacement and Hilltop Loop in Clinton County. Transco completed Phase I habitat assessment surveys and Phases II presence/absence surveys between March 20 and May 10, 2019. Potential habitat was identified in ten areas along the Hensel Replacement, and eight areas along the Hilltop Loop. No timber rattlesnake habitat was found at the Compressor Station 620 site. The location of the identified habitat are provided in the Timber Rattlesnake Phase I Habitat Assessment and Phase II Presence/Absence Denning Survey Report provided in Appendix 2-3. During Phase II presence/absence surveys, timber rattlesnakes were observed in six of the ten potential habitat areas along the Hensel Replacement and three of the eight potential habitat areas along the Hilltop Loop.

Three of the active habitat areas along the Hensel Replacement and one of the active habitat areas along the Hilltop Loop are within the proposed Project workspaces. The active habitat areas within Hensel Replacement workspaces are gestation habitat areas only; no confirmed denning habitat is present within the Project area. The single active habitat area within Hilltop Loop consists of four discrete denning locations, with one location also containing gestation habitat.

Transco has consulted with PFBC to develop mitigation measures for impacts to timber rattlesnake habitat. Transco proposes to restrict blasting to mitigate denning impacts: no blasting will occur within 50 feet of confirmed denning habitat between the start of denning in the fall (approximately October 1st) and spring emergence (approximately May 15th). Transco proposes to mitigate impacts to gestation habitat by restoring habitat areas to pre-construction conditions. Habitat restoration will be performed in accordance with PFBC guidelines. PFBC acknowledged the avoidance and mitigation measures for the Project in an August 21, 2019 correspondence letter and reissued a letter on August 26, 2019 associated with minor changes to the Project; however, their comments regarding potential impacts to the timber rattlesnake remain unchanged.

S3.D.2(iv) Recreation

Hunting

Pipeline

The majority of the Hensel Replacement and a small portion of the Hilltop Loop is located on Sproul State Forest. Private lands along the Project may allow for similar recreational opportunities as Sproul State Forest; however, such opportunities are limited to only those with permission to access these properties. Hunting opportunities may be temporarily impacted as a result of the Project. Considering the timeline and extent of the Project, it is anticipated that construction may overlap with hunting seasons, and therefore may limit hunting opportunities in and within the vicinity of the ROW. Transco will coordinate with affected landowners to minimize potential conflicts with hunting to the extent practicable.

Big Ridge Trail

Due to the small size of this resource, hunting opportunities are not anticipated to be impacted as a result of the Project.

Fishing

Pipeline

The Hensel Replacement has resource crossing within the Paddy Run, Hensel Fork and Drury Run watersheds which are considered wild trout streams by the PFBC. The Hilltop Loop resource crossing within the Womans Creek and Skunk Hollow watersheds which are considered wild trout streams by the PFBC. PFBC instream construction restrictions for these streams would be from October 1 – December 31. Young Womans Creek is also listed as trout stocked streams where the Hilltop Loop is proposed. PFBC instream construction restrictions for Young Womans Creek would also include March 1 – June 15.

The restrictions outlined above have been adopted to not only minimize potential impacts to spawning trout at the instream crossings, but also to the stocked trout fisheries, as the spring stocking windows are generally at a peak use period for trout fishing. Due to the adoption of the trout restrictions, and use of approved Project BMPs, it is expected that minimal impacts will occur as a result of the Project.

The streams listed above are located on both public and private grounds. Access and use to these properties to recreationally fish may be limited during construction; however, fishing

opportunities exist to those that have permission to access the property upstream and downstream of the construction activities.

Big Ridge Trail

No watercourse impacts are proposed at the Big Ridge Trail; therefore, no recreational fishing opportunities will be impacted.

Hiking and Plant/Wildlife Observation

Pipeline

The Project will cross the Sproul State Forest, where hiking and plant/wildlife observation opportunities are available to the public. Transco will coordinate with DCNR concerning activities occurring in Sproul State Forest. Typical notification measures include posting signs during construction and posting a notification regarding the timing and location of planned construction activities at centrally located or designated facilities within each recreation area. Impacts on users of these areas may include temporary increases in noise and dust during construction, as well as temporary delays for traffic in the area when equipment is being moved. Permanent impacts on hiking or observation of plants/wildlife is not expected as a result of the proposed Project.

Big Ridge Trail

Temporary use of the trail during construction could be impacted by hikers, however Transco will coordination with DCNR on activities within Sproul State Forest. No plant/wildlife observation are anticipated to be impacted at this subfacility.

Swimming/Boating

Pipeline

One navigable water will be impacted by dry, open-cut crossings (Dam-and-Pump or Cofferdam) in Clinton County: Young Womans Creek (S1-T4-HL). Young Womans Creek is approximately 100 feet wide at the proposed crossing location. To enable navigation safely around the work area, signage will be placed as shown on the attached Aids to Navigation Plan (Appendix S3-5), and will include warning, portage, and exit signs (as needed). Signs will be placed at least two weeks prior to commencement of the crossing and will remain in place for the duration of the construction. Upon completion of all work, the signs will be removed. Aids to Navigation Plan includes an approval letter from the PFBC for the plans and appropriate procedures to be conducted prior to and during construction.

Big Ridge Trail

No watercourses will be impacted at this site.

S3.D.3 Effect on Overall Ecology

The majority of impacts associated with construction of the pipeline component of the Project are temporary in nature. Streams impacted by the project will be crossed in dry conditions with equipment bridges installed to not create sediment pollution in the watercourse. Although minor stream and wetland impacts (TMPWI and PIPE) will occur during construction of the pipelines, they will be crossed and restored in accordance with PADEP Chapter 102 and 105 guidelines. Ecological impacts associated with permanent direct and temporary wetland impacts (WDTIM, TMPWI and BRDG) along Big Ridge Trail are anticipated to be minor because they are located on and adjacent to an existing access road. As a result, there is very minimal effect to the overall regime and ecology of the watercourse or wetland associated with the Project. Water quality, streamflow, fish and wildlife, aquatic habitat, and instream and downstream uses are minimally impacted by the subfacilities mentioned above, which will have very minimal effect on these environmental factors.

S3.D.4 Upstream and Downstream Property or Riparian Rights

The Project is not expected to result in impacts to upstream and downstream properties. The implementation of the BMPs associated with applicable state and federal permits to be approved for the project prior to construction will minimize impacts to properties upstream and downstream of the Project. The general nature of construction of pipeline projects is that it is temporary in nature.

S3.E Antidegradation Analysis

Transco is meeting the state antidegradation requirements contained in Chapters 93, 95, 102 and 105 through various measures provided in the Project design, such as proposed construction measures and requests for permit approvals for activities associated with the Project. The Project is almost entirely located within EV and HQ watersheds, as defined by Chapter 93. Transco will install ABACT BMPs throughout the Project, protecting the existing uses of the designated high-quality streams, “Other” and “EV” wetlands impacted by the Project, and within a Section 303(d) listed impaired watershed. BMPs outlined in the E&S control and site restoration plans will be installed, monitored and maintained until the Project meets the vegetative cover requirements required by the approved permits for earth disturbance and water

obstruction and encroachment. During the Project's construction, any issues identified with the BMPs shall be repaired as described in the permits and plans.

No changes to the aquatic community or water chemistry within the streams or wetlands crossed or impacted by the Project are anticipated to occur. All streams crossed by the Project shall utilize clean water bypass BMPs during construction to allow continuous flow of all streams crossed, and these streams will be restored to pre-existing conditions once construction is complete. The wetlands impacts associated with temporary disturbance will be restored and stabilized upon final restoration with PSS and PFO impacted wetlands outside the proposed maintained corridor being replanted. The wetland, stream, and floodway impacts are considered isolated to their disturbance area and do not extend beyond the Projects LOD.

As part of the Project design, impacts to resources were avoided and minimized where possible and include the following measures: siting new compressor stations with minimal water resource impacts, pipeline co-location within/adjacent to an existing right-of-way, restoration of disturbed areas to pre-existing conditions with the exception of above ground facilities and from MP 191.10 to MP 192.55 where Transco will regrade the ROW to restore approximate original contours to remove an unnatural two-tone area, and limiting the extent and duration of earth disturbance. Transco has provided a nominal workspace of 75 feet in wetlands and floodways and 50 feet within the stream top-of-bank for the pipeline installation in most cases. Where these nominal workspaces were exceeded, site specific justification has been provided in Requirement S - Alternatives Analysis of the Joint Permit Application. During construction, excavated trenches will be kept to the minimum width and depth necessary to safely complete construction activities. Project access has been designed to utilize existing access roads as much as possible, thereby minimizing the need for new road construction.

Consultation is ongoing with the state and federal agencies regulating threatened and endangered (T&E) species. The agencies include the Pennsylvania Game Commission, PFBC, DCNR and the USFWS. Transco completed surveys, as required by the appropriate agency, for T&E species. Clearance letters from each agency will be required prior to issuance of Chapter 102 and 105 approvals.

During construction, the Transco's Construction Spill Prevention and Response Procedures for Oil and Hazardous Materials (Spill Plan) outlined in Appendix S3-4 will be implemented to minimize the potential for spills and the effects of any spills that may occur.

Details of how the site materials are managed, including the storage of equipment, hazardous materials, fuels, and lubricating oils and other construction items are identified in the Spill Plan. The plan defines the procedures for spill notification, emergency response, spill response, personal protective equipment, clean-up procedures and spill presentation practices. As part of the Project, hydrostatic discharge testing will be completed. Discharges associated with the testing will conform to permit conditions specific to the discharge, meeting the state antidegradation requirements.

The cumulative effect of the Project will not result in the impairment of the Commonwealth's EV and other wetland resources. A review of the Section 303(d) list of the Clean Water Act indicated that no surface waters crossed by the Project are classified as impaired waterbodies. The wetlands impacts will involve temporary disturbance while the pipeline is being installed, as the wetlands will be restored and stabilized upon final restoration. The wetland impacts are isolated to their disturbance area and do not extend beyond the Projects LOD. The Project has been primarily co-located with Transco's existing gas pipeline system, to avoid fragmentation and to minimize resource impacts. Construction BMPs, including erosion control devices and timber matting, to mitigate for soil compaction within the wetlands, will be utilized to minimize impacts throughout the Project. Transco will follow their Project specific Upland Erosion Control, Revegetation, and Maintenance Plan (Appendix S3-3) and their Project-Specific Wetland and Waterbody Construction and Mitigation procedures (Appendix S4-1), as well as other permit conditions outlined by the PADEP. The Leidy South Project is a single and complete Project, with no foreseeable additional impacts to wetland resources of the Commonwealth of Pennsylvania, other than those proposed. The Project will result in no loss of wetland resources and will not result a major impairment of the Commonwealths "EV" or "other" wetland resources.

S3.F. Alternatives Analysis

The Alternatives Analysis is provided in Requirement S of the Joint Permit Application.

S3.G. Potential Secondary Impact Evaluation

S3.G.1 Environmental Impacts on Adjacent Lands

The wetlands proposed for permanent fill along the existing access road (Big Ridge Trail) associated with the Hensel Replacement will consist of drainage improvements to properly convey sheet flow across the road. Filling these wetlands will not cause any direct or any indirect impacts on adjacent landowners given the isolated nature of the resource.

The remaining stream and wetland resources crossed by the Hensel Replacement and Hilltop Loop will be restored to original contours following construction. Impacts addressed as permanent indirect are not anticipated to cause any direct or indirect impact on adjacent land or resources because the construction activities are temporary in nature.

S3.G.2 Impacts on all other Dams, Water Obstructions, or Encroachments

There are no other dams, water obstructions, or encroachments necessary to fulfill this project purpose.

S3.H Cumulative Impacts to Wetland Resources

The cumulative impacts associated with the Project may result from the impacts of construction and operation of the Project components combined with the impacts of other proposed major developments occurring within the vicinity of the Project. To review potential cumulative impacts, Transco considered recently completed, current, and reasonably foreseeable future major projects and other human-related activities (collectively "activities") near the Project facilities. The basic assumption of the cumulative impacts analysis was that if activities were deemed to have minor or insignificant impacts, the cumulative impacts resulting from the activities and Project would also be considered minor or insignificant.

Focus was placed on permanent wetland and watercourse impacts, as temporary impacts are not considered an adverse cumulative impact based on PADEP's Comprehensive Environmental Assessment Technical Guidance Document (TGD) entitled *Comprehensive Environmental Assessment of Proposed Project Impacts for Chapter 105 Water Obstruction and Encroachment Permit Applications Technical Guidance Number 310-2137-006*.

Permanent direct impacts would include 0.02 acres. These impacts would be associated with improvements to an existing access road (Hensel Replacement) that will result in permanent fill within 0.02 acres of Palustrine Emergent (PEM) wetlands.

Permanent indirect impacts would include 1.7 acres to wetlands and 2.77 acres to watercourses. These permanent indirect impacts would be associated with the existing and proposed maintained ROW and include functional conversion of Palustrine Forested (PFO) and Palustrine Scrub-Shrub (PSS) wetlands; which will result in 0.1 acres of conversion. The PFO and PSS wetland cover type conversion will result in a change to the wetland Cowardin class but will result in no more than minimal individual and cumulative adverse environmental effects.

Functional conversion impacts will be offset through the enhancement at an offsite compensatory mitigation site, described in the Appendix S4-3.

Transco has identified past, present, and reasonably foreseeable projects and other human-related activities occurring in the vicinity of the Project (within 10 miles) that may result in cumulative effects when combined with the effects of the Project. Transco consulted with the affected municipal and county planning agencies to identify projects in the vicinity of the Project. Transco also identified other activities, such as transportation and energy development projects located within the counties affected by the Project. Table S3.H-1 provides a list of recent, ongoing, and reasonably foreseeable projects in the vicinity of the Project.

Table S3.H-1
Summary of Impacts for Projects Evaluated for Potential Cumulative Effects

Project (Company Name as appropriate)	Construction Impacts (acres)	Waterbody Impacts (number of crossings)	Wetland Impacts (acres)	Land Use Impacts
FERC-Jurisdictional Natural Gas Pipeline Projects				
Transco Atlantic Sunrise Project (CP15-138)	2,822.2	388	PEM – 30.8 acres PSS – 4.3 acres PFO – 11.3 acres	Agricultural land – 1,789.2 acres Open land – 430.6 acres Upland forest – 1,043.2 acres Industrial/commercial land – 255.0 acres Transportation land – 88.5 acres Residential land – 70.9 acres
Transco Regional Energy Expansion	Information not available	Information not available	Information not available	Information not available
National Fuel FM100 Project (CP-19-491)	529.3	120	PEM – 12.0 acres PSS – 1.9 acres POW – 92.0 acres PUB – 16.5 acres	Agricultural land – 57.0 acres Open land – 197.0 acres Upland forest – 145.4 acres Industrial/commercial land – 147.5 acres Residential land – 0.9 acres
Transco Leidy Southeast Expansion (CP13-551-000)	796.6	87	PEM – 15.1 acres PSS – 2.9 acres PFO – 8.5 acres	Agricultural land – 26.9 acres Open land – 226.5 acres Upland forest – 105.2 acres Industrial/commercial land – 7.9 acres Residential land - 18.8 acres
Other Natural Gas Facilities				
Wells/Shale Development				
Various	Information not available	Information not available	Information not available	Information not available

Table S3.H-1
Summary of Impacts for Projects Evaluated for Potential Cumulative Effects

Project (Company Name as appropriate)	Construction Impacts (acres)	Waterbody Impacts (number of crossings)	Wetland Impacts (acres)	Land Use Impacts
Other Actions				
Other Energy Facilities				
Renovo Energy Center	68	Information not available	Information not available	Information not available
Potential wind development	Information not available	Information not available	Information not available	Information not available
Transportation Projects				
Various bridge replacement and improvement projects	Information not available	Information not available	Information not available	Information not available
Other Development				
Nicholas Meat Anaerobic Digester Wastewater Treatment System	40.7	Information not available	Information not available	Agricultural land – 40.7 acres

Sources: FERC 2019a, 2019b; PADEP 2019; PennDOT 2019

Key:
PEM = Palustrine emergent
PFO = Palustrine forested
PSS = Palustrine scrub-shrub
POW = Palustrine open water

As described in Table S3.H-1, many of the projects considered in the cumulative impact assessment involve wetland and watercourse crossings. Transco expects that these projects will be or were constructed in accordance with the FERC Order (for FERC jurisdictional pipelines) and applicable environmental permit conditions and construction plans to avoid, minimize, and mitigate effects on wetlands and watercourses. Other projects not regulated by the FERC would also need to comply with federal and state regulations and permit conditions relative to wetlands and waterbody effects, including implementation of BMPs to avoid and minimize potential effects, as well as development of suitable mitigation plans for unavoidable effects or losses of water resources. Based on the above analysis, Transco believes there will be no significant measurable cumulative effects of the Project on wetlands or watercourses.

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FIGURES

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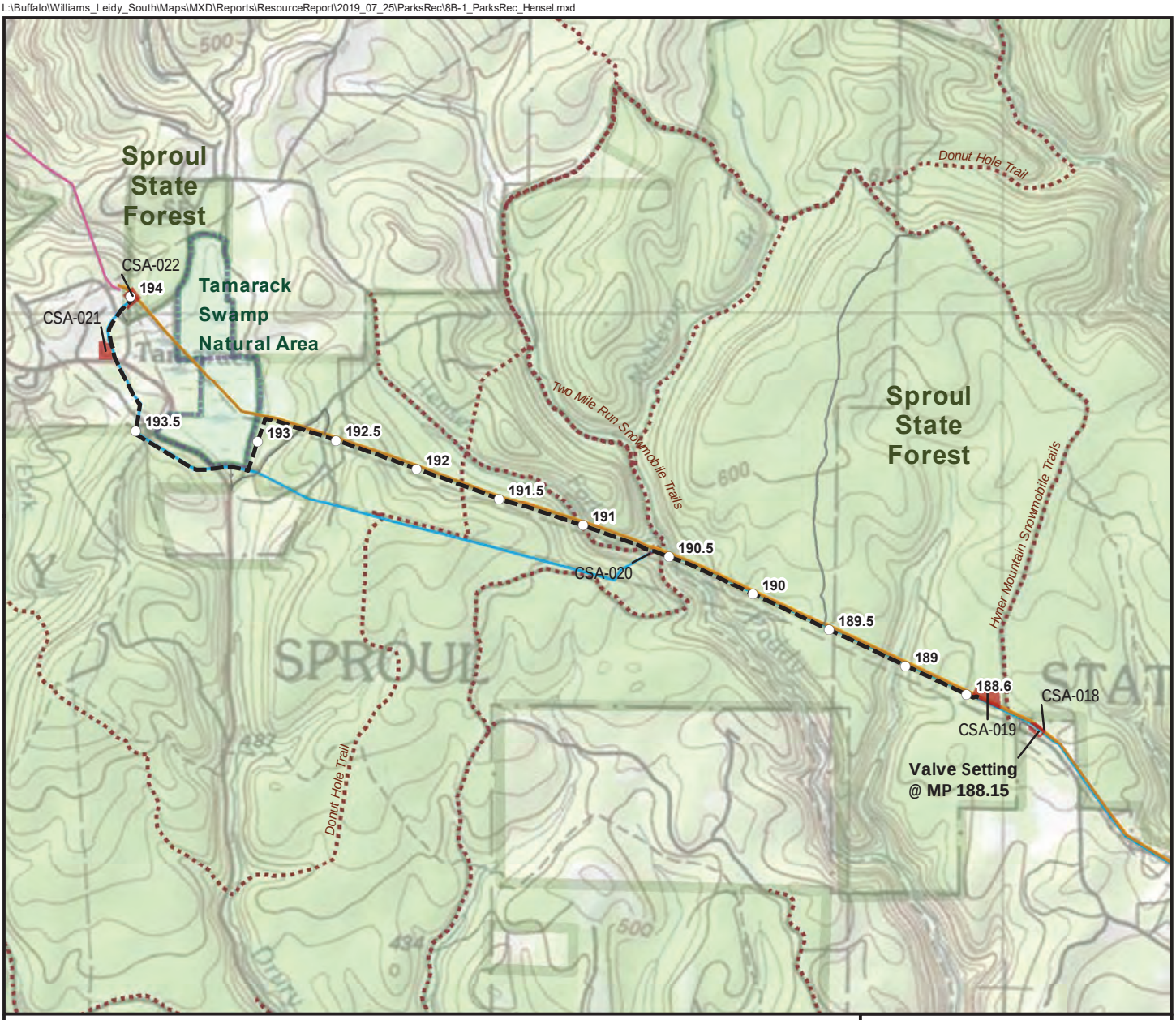

Legend:

- Milepost
- Proposed 36" Hensel Replacement
- Existing Leidy Line "A" Pipeline
- Existing Leidy Line "B" Pipeline
- Existing Leidy Line "C" Pipeline
- Leidy Wharton Storage 24"
- Access Road
- Contractor/ Pipe Yards and Staging Areas
- Trails
- Wildand Natural Areas
- Tamarack Swamp Natural Area
- State Forest Land

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SCALE IN MILES
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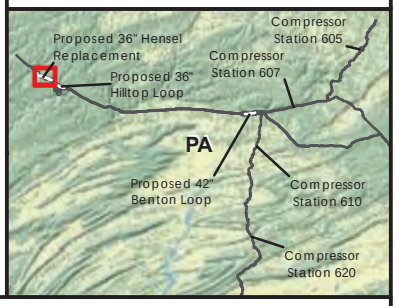
SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	8B-1

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
FEDERAL, STATE, AND MUNICIPAL LANDS, AND RECREATION AREAS
CROSSED BY 36" HENSEL REPLACEMENT
LEIDY SOUTH PROJECT
PENNSYLVANIA

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	7/25/2019	HT	ISSUE FOR FERC APPLICATION	1211223	ES	ES

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APPROVED BY: ES	DATE: 7/25/2019	DRAWING NUMBER:	FIGURE 8B-1
WO: 1211223		9:24 PM 7/25/2019	

Data Sources: ESRI 2012, 2016;
PASDA; PA DCNR 2005, 2008, 2011, 2015, 2017, 2018, 2019.

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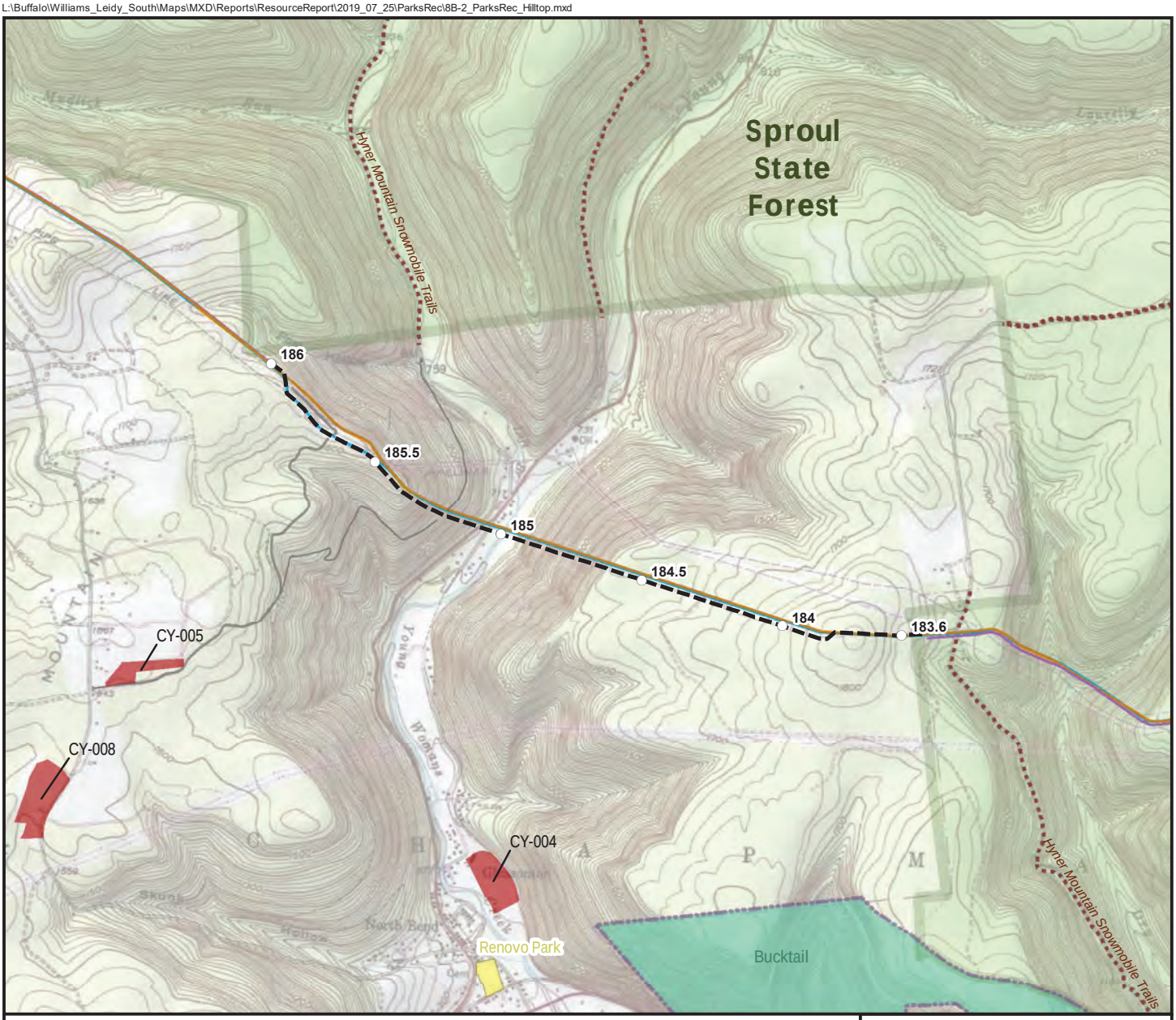

Legend:

- Milepost
- Proposed 36" Hilltop Loop
- Existing Leidy Line "A" Pipeline
- Existing Leidy Line "B" Pipeline
- Existing Leidy Line "C" Pipeline
- Existing Leidy Line "D" Pipeline
- Access Road
- Contractor/ Pipe Yards and Staging Areas
- Trails
- Wildand Natural Areas
- State Forest Land
- Local Park
- State Park

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SCALE IN MILES

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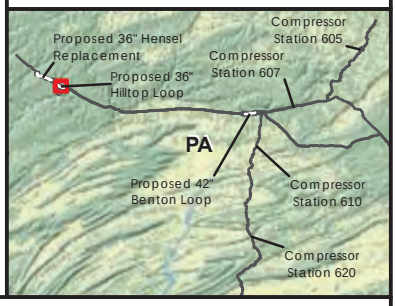
SITE LOCATION



DRAWING NO.	REFERENCE TITLE
	8B-2

TRANSCONTINENTAL GAS PIPE LINE COMPANY LLC
FEDERAL, STATE, AND MUNICIPAL LANDS, AND RECREATION AREAS
CROSSED BY 36" HILLTOP LOOP
LEIDY SOUTH PROJECT
PENNSYLVANIA

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
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Data Sources: ESRI 2012, 2016;
PASDA; PA DCNR 2005, 2008, 2011, 2015, 2017, 2018, 2019.

APPENDIX S3-1

SUBFACILITY DETAILS TABLE

TABLE S3-1-1 HENSEL REPLACEMENT - WETLANDS SUBFACILITY DETAILS TABLE

									SUBFACILITY CODE: PIPE									IMPACT GROUP SUBFACILITIES	
Milepost	Crossing Name [1]	Wetland ID [2]	Cowardin Code [3]	§ 105.17 Classification [4]	Latitude	Longitude	County	Municipality	Type [5]	Product Code [6]	Pipeline Diameter	Depth of Cover [7]	Line Encased [8]	Shut Off Controls [9]	Attached to Water Obstruction [10]	ROW Width [11]	Pipe Length [12]	Temporary Wetland Impact (TMPWI) [13]	Wetland Direct Impact (WTDIM) [14]
																(linear ft.)	(linear ft.)	(acres)	(acres)
190	HR-2 [15]	W17-T7-HR	PEM	Other	41.406722	-77.778681	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	75	122	0.22	0
190.5	HR-4 [15]	W8-T6-HR	PSS	EV	41.409451	-77.787396	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	81	3	0.01	0
190.7	HR-5	W1-T7-HR	PSS	EV	41.410580	77.791493	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	9	N/A	0.01	0
190.7	HR-5	W1-T7-HR	PEM	EV	41.410447	77.791247	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	34	27	0.04	0
190.7	HR-5	W1-T7-HR	PFO	EV	41.410490	77.791816	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	22	N/A	0.01	0
191	HR-7	W1-T7-HR	PEM	Other	41.412013	77.797535	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	24	N/A	0.01	0
191	HR-7	W1-T7-HR	PSS	Other	41.411968	77.797441	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	25	18	0.02	0
193	HR-8	W4-T5-HR	PSS	EV	41.419136	77.832958	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	68	64	0.11	0
193	HR-8	W4-T5-HR	PEM	EV	41.418643	-77.833261	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N	Yes	No	3	N/A	0.001	0
193.1	HR-9	W4-T5-HR	PEM	EV	41.415742	-77.835091	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	Y	Yes	No	71	303	0.42	0
193.1	HR-9	W4-T5-HR	PFO	EV	41.415565	-77.834754	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	Y	Yes	No	30	35	0.05	0
193.1	HR-9	W4-T5-HR	PSS	EV	41.415670	-77.835236	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	Y	Yes	No	90	155	0.27	0
193.6	HR-10	W3-T1-HR	PEM	Other	41.421967	-77.847515	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	Y	Yes	No	90	257	0.48	0
193.8	HR-11	W1-T1-HR	PEM	EV	41.426073	-77.849822	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	Y	Yes	No	90	188	0.38	0

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. Cowardin Codes: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested.
4. Exceptional Value Wetland Classifications as defined in §105.17 of the PA Code:
   i. Wetland serves as habitat for species listed as ''threatened'' or ''endangered.''
   ii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iv. Wetland is located along an existing private or public water supply.
5. Description of the method of pipe crossing employed. TRNC - Open Trenched.
6. Description of the product delivered in the pipeline. PETRO - Petroluem, Natural Gas, Oil, etc.
7. If shallow bedrock is present during the construction phase, the pipeline may be installed with a minimum of 1 foot of cover.
8. Notes if concrete encasement is used on the pipeline at the crossing.
9. Notes if shut off controls are employed or required.
10. Notes if the pipe is attached to another water obstruction.
11. Indicates the width of the right-of-way (ROW) at the resource crossing. For those features that are only partially within the ROW, a width across the ROW is noted.
12. Pipe length measured as the length of the wetland crossing. N/A indicates the resource is in the Project workspace, but not crossed by the pipe.
13. Area of wetland impact within the Project workspace, where only temporary fill or excavation is occuring.
14. Area of wetland impact within the Project workspace, where only permanent fill, draining or conversion of a resource to another type is occuring.
15. Cathodic Protection will be installed adjacent to the pipeline at this location.

TABLE S3-1-2 HENSEL REPLACEMENT - WATERWAYS SUBFACILITY DETAILS TABLE

											SUBFACILITY CODE: PIPE								
Milepost	Crossing Name [1]	Watercourse ID[2]	Stream Type[3]	Chapter 93 Classification[4]		PFBC Classification[7]	Latitude	Longitude	County	Municipality	Type[8]	Product Code[9]	Pipeline Diameter	Depth of Cover [10]	Line Encased[11]	Shut Off Controls[12]	Attached to Water Obstruction[13]	ROW Width[14]	Pipe Length[15]
				Designated Use[5]	Existing Use[6]													(linear ft.)	(linear ft.)
189.1	HR-1[16]	S12-T6-HR	Perennial	EV, MF	-	Wild Trout Waters	41.401528	-77.762655	Clinton	Chapman	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	79	21
190.4	HR-3[16]	S9-T6-HR	Perennial	EV, MF	-	Wild Trout Waters	41.408864	-77.785269	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	NO	80	6
190.5	HR-4[16]	S7-T7-HR	Perennial	EV, MF	-	Wild Trout Waters	41.409432	-77.787402	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	84	35
190.7	HR-5	S1-T7-HR	Perennial	EV, MF	-	Wild Trout Waters	41.410526	-77.791599	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	128	39
191.0	HR-7	S1-T7-HR	Perennial	EV, MF	-	Wild Trout Waters	41.411875	-77.797321	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	135	20
193.1	HR-9	S1-T5-HR	Intermittent	EV, MF	-	Wild Trout Waters	41.415907	-77.834091	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	51	N/A
193.2	HR-9	S2 T7a-HR	Perennial	EV, MF	-	Wild Trout Waters	41.415782	-77.835919	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	53	52
193.9	HR-11	S1-T1-HR	Ephemeral	EV, MF	-	Wild Trout Waters	41.426692	-77.849971	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	Yes	Yes	No	87	5

Notes:

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. The flow regime of the stream; I = Intermittent, E = Ephemeral, P = Perennial.
4. Chapter 93 classification as outlined in Title 25 of the PA Code: CWF = Coldwater Fishes, WWF = Warm Water Fishes, MF = Migratory Fishes, HQ = High Quality, EV = Exception Value, TSF = Trout Stocked Fishery.
5. Those uses specified in PACODE Chapter 93.4(a) and 93.9a-93.9z for each water body or segment whther or not they are being attained.
6. Thoses uses actually attained in the water body on or after 11/28/75, whether or not they are included in the water quality standards.
7. PA Fish and Boat Commission stream designation, as it relates to trout or other species where seasonal restrictions are implemented.
8. Description of the method of pipe crossing employed. TRNC - Open Trenched
9. Description of the product delivered in the pipeline. PETRO - Petroluem, Natural Gas, Oil, etc.
10. If shallow bedrock is present during the construction phase, the pipeline may be installed with a minimum of 1 foot of cover.
11. Notes if concrete encasement is used on the pipeline at the crossing.
12. Notes if shut off controls are employed or required.
13. Notes if the pipe is attached to another water obstruction.
14. Indicates the width of the right-of-way (ROW) at the resource crossing. For those features that are only partially within the ROW, a width across the ROW is noted.
15. Pipe length measured as the length of the stream crossing. N/A indicates the resource is in the Project workspace, but not crossed by the pipe.
16. Cathodic Protection will be installed adjacent to the pipeline at this location.

TABLE S3-1-3 HENSEL REPLACEMENT - ABANDONMENT - WETLANDS SUBFACILITY DETAILS TABLE

									SUBFACILITY CODE: PIPE									IMPACT GROUP SUBFACILITIES	
Milepost	Crossing Name [1]	Wetland ID[2]	Cowardin Code[3]	§ 105.17 classification[4]	Latitude	Longitude	County	Municipality	Type[5]	Product Code[6]	Pipeline Diameter	Depth of Cover [7]	Line Encased[8]	Shut Off Controls[9]	Attached to Water Obstruction[10]	ROW Width[11]	Pipe Length[12]	Temporary Wetland Impact (TMPWI)[13]	Wetland Direct Impact (WTDIM)[14]
																(linear ft.)	(linear ft.)	(acres)	(acres)
190	HR-2	W17-T7-HR	PEM	Other	41.406722	-77.778681	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	75	122	0.22	0
190.5	HR-4	W8-T6-HR	PSS	EV	41.409451	-77.787396	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	81	3	0.01	0
190.7	HR-5	W1-T7-HR	PSS	EV	41.410580	77.791493	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	9	N/A	0.01	0
190.7	HR-5	W1-T7-HR	PEM	EV	41.410447	77.791247	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	34	27	0.04	0
190.7	HR-5	W1-T7-HR	PFO	EV	41.410490	77.791816	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	22	N/A	0.01	0
191	HR-7	W1-T7-HR	PEM	Other	41.412013	77.797535	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	24	N/A	0.01	0
191	HR-7	W1-T7-HR	PSS	Other	41.411968	77.797441	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	25	18	0.02	0
194	HR-12	W4-T5-HR	PEM	EV	41.423177	-77.839199	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	NA	2226	0.16	0
194	HR-12	W4-T5-HR	PSS	EV	41.421904	-77.837794	Clinton	Leidy	TRNC	PETRO	36"	3' Min.	N/A	Yes	No	NA	1632	0.12	0

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. Cowardin Codes: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested.
4. Exceptional Value Wetland Classifications as defined in §105.17 of the PA Code:
   i. Wetland serves as habitat for species listed as ''threatened'' or ''endangered.''
   ii. Wetland is hydrologically connected to or located within ½ mile from habitat for species listed above that are wetland dependent.
   iii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iv. Wetland is located along an existing private or public water supply.
5. Description of the method of pipe crossing employed. TRNC - Open Trenched
6. Description of the product delivered in the pipeline. PETRO - Petroluem, Natural Gas, Oil, etc.
7. If shallow bedrock is present during the construction phase, the pipeline may be installed with a minimum of 1 foot of cover.
8. Notes if concrete encasement is used on the pipeline at the crossing.
9. Notes if shut off controls are employed or required.
10. Notes if the pipe is attached to another water obstruction.
11. Indicates the width of the right-of-way (ROW) at the resource crossing. For those features that are only partially within the ROW, a width across the ROW is noted.
12. Pipe length measured as the length of the wetland crossing. N/A indicates the resource is in the Project workspace, but not crossed by the pipe.
13. Area of wetland impact within the Project workspace, where only temporary fill or excavation is occuring.
14. Area of wetland impact within the Project workspace, where only permanent fill, draining or conversion of a resource to another type is occuring.
15. Cathodic Protection will be installed adjacent to the pipeline at this location.
16. Abandonment refers to A-Line where either the removal of the existing line or abandonment in-place with grout is proposed. Only Crossing HR-12 is to be abandoned in place. Removal will occur at the other crossings noted.

TABLE S3-1-4 HENSEL REPLACEMENT - ABANDONMENT - WATERWAYS SUBFACILITY DETAILS TABLE

											SUBFACILITY CODE: PIPE								
Milepost	Crossing Name [1]	Watercourse ID[2]	Stream Type[3]	Chapter 93 Classification[4]		PFBC Classification[7]	Latitude	Longitude	County	Municipality	Type[8]	Product Code[9]	Pipeline Diameter	Depth of Cover [10]	Line Encased[11]	Shut Off Controls[12]	Attached to Water Obstruction[13]	ROW Width[14]	Pipe Length[15]
				Designated Use[5]	Existing Use[6]													(linear ft.)	(linear ft.)
189.1	HR-1	S12-T6-HR	Perennial	EV, MF	-	Wild Trout Waters	41.401528	-77.762655	Clinton	Chapman	TRNC	PETRO	36"	4' Min.	N/A	Yes	No	79	21
190.4	HR-3	S9-T6-HR	Perennial	EV, MF	-	Wild Trout Waters	41.408864	-77.785269	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	N/A	Yes	No	80	6
190.5	HR-4	S7-T7-HR	Perennial	EV, MF	-	Wild Trout Waters	41.409432	-77.787402	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	N/A	Yes	No	84	35
190.7	HR-5	S1-T7-HR	Perennial	EV, MF	-	Wild Trout Waters	41.410526	-77.791599	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	N/A	Yes	No	128	39
191.0	HR-7	S1-T7-HR	Perennial	EV, MF	-	Wild Trout Waters	41.411875	-77.797321	Clinton	Leidy	TRNC	PETRO	36"	4' Min.	N/A	Yes	No	135	20

Notes:

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. The flow regime of the stream; I = Intermittent, E = Ephemeral, P = Perennial.
4. Chapter 93 classification as outlined in Title 25 of the PA Code: CWF = Coldwater Fishes, WWF = Warm Water Fishes, MF = Migratory Fishes, HQ = High Quality, EV = Exception Value, TSF = Trout Stocked Fishery.
5. Those uses specified in PACODE Chapter 93.4(a) and 93.9a-93.9z for each water body or segment whther or not they are being attained.
6. Thoses uses actually attained in the water body on or after 11/28/75, whether or not they are included in the water quality standards.
7. PA Fish and Boat Commission stream designation, as it relates to trout or other species where seasonal restrictions are implemented.
8. Description of the method of pipe crossing employed. TRNC - Open Trenched
9. Description of the product delivered in the pipeline. PETRO - Petroluem, Natural Gas, Oil, etc.
10. If shallow bedrock is present during the construction phase, the pipeline may be installed with a minimum of 1 foot of cover.
11. Notes if concrete encasement is used on the pipeline at the crossing.
12. Notes if shut off controls are employed or required.
13. Notes if the pipe is attached to another water obstruction.
14. Indicates the width of the right-of-way (ROW) at the resource crossing. For those features that are only partially within the ROW, a width across the ROW is noted.
15. Pipe length measured as the length of the stream crossing. N/A indicates the resource is in the Project workspace, but not crossed by the pipe.
16. Cathodic Protection will be installed adjacent to the pipeline at this location.
17. Abandonment refers to A-Line where either the removal of the existing line or abandonment in-place with grout is proposed. Only Crossing HR-12 is to be abandoned in place. Removal will occur at the other crossings noted.

TABLE S3-1-5 HENSEL REPLACEMENT - PERMANENT ACCESS ROAD -WETLAND DIRECT IMPACT SUMMARY TABLE

								SUBFACILITY CODE: WTDIM				
Milepost	Crossing Name [1]	Wetland ID[2]	§ 105.17 Classification[3]	Latitude	Longitude	County	Municipality	Deminimus Impact[4]	Impact Area (ac)[5]	Classification Type Code[6]	Regulatory Classification Code[7]	Total Impact[8]
AR-189.5	HR-AR-2	W5-T7a-HR	Other	41.432587	-77.768256	Clinton	Chapman	No	0.02	PEM	OW	0.020

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. Exceptional Value Wetland Classifications as defined in §105.17 of the PA Code:
   i. Wetland serves as habitat for species listed as ''threatened'' or ''endangered.''
   ii. Wetland is hydrologically connected to or located within ½ mile from habitat for species listed above that are wetland dependent.
   iii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iv. Wetland is located along an existing private or public water supply.
4. Indicates whether theimpact qualifies under the Deminimus policy, which applies to the impact sizes equal to or less than 0.05 acres.
5. Area of resource impacted with permanent fill.
6. Cowardin Codes: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested
7. Code used to identify the regulatory classification of the impacted area. OW- Other Waters.
8. Total acres for all impact area records.

TABLE S3-1-6 HENSEL REPLACEMENT - PERMANENT ACCESS ROAD -BRIDGE SUMMARY TABLE																										
								SUBFACILITY CODE: BRDG																		
Milepost	Crossing Name [1]	Wetland ID[2]	§ 105.17 Classification[3]	Latitude	Longitude	County	Municipality	Design Flood: Event Code	Design Flood: Flow	Design Flood: Event Elevation	Drainage Area (ac)	Replace Existing Structure	Footprint: Width	Footprint: Length	Hydrologic Meth Code	Hydraulic Meth Code	Total Length of Impact	Type of Structure Code	Appurtenant Structure Code	Mitigation Measure Code	# Opening	Width	Height	Diamter	Material Used
AR-189.5	HR-AR-2	W5-T7a-HR	Other	41.432587	-77.768256	Clinton	Chapman	N/A	N/A	N/A	15.45	No	9'	127'	N/A	N/A	127'	N/A	N/A	N/A	OW	N/A	N/A	N/A	Other

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. Exceptional Value Wetland Classifications as defined in §105.17 of the PA Code:
   i. Wetland serves as habitat for species listed as ''threatened'' or ''endangered.''
   ii. Wetland is hydrologically connected to or located within ½ mile from habitat for species listed above that are wetland dependent.
   iii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iv. Wetland is located along an existing private or public water supply.
4. The code that identifies the flood event for which the structure will pass or was evaluated for during the review.
5. The amount of low, measured in CFS, occuring in USGS Datum. Of the flood event if available.
6. The elevation, measured in USGS Datum, of the flood event if available.
7. The drainage area, measured in acreas, upstream of the reviewed structure.
8. A checkbox indicating whether an existing structure is being replaced with a new one of the same or similar size.
9. The width of the surface space occupied by the structure.
10. The length of the surface space occupied by the structure.
11. The code used to identify the hydrologic method used during the review.
12. The code used to identify the hydraulic method used during the review.
13. The total length of area that is impacted by the structure.
14. The code used to identify the general type of structure.
15. The code used to identify the appurtenant structure(s) with the reviewed structure.
16. The code used to identify the mitigation measure voluntary employed or required as part of the structure itself.
17. The number of waterway openings sharing the same dimensions.
18. The width of the waterway opening, measured in feet.
19. The height of the waterway opening, measured in feet.
20. The diameter of the pipe, measured in feet.
21. The code used to identify the structure's general material makeup.

TABLE S3-1-7 HENSEL REPLACEMENT - TEMPORARY ACCESS ROAD - TEMPORARY WETLAND IMPACT SUMMARY TABLE

								SUBFACILITY CODE: TMPWI				
Milepost	Crossing Name [1]	Wetland ID[2]	§ 105.17 Classification[3]	Latitude	Longitude	County	Municipality	Deminimus Impact[4]	Impact Area (ac)[5]	Classification Type Code[6]	Regulatory Classification Code[7]	Total Impact[8]
AR-189.5	HR-AR-1	W4-T7a-HR	Other	41.405131	-77.770637	Clinton	Chapman	-	0.003	PEM	OW	0.003
AR-189.5	HR-AR-1	W3-T7a-HR	Other	41.405074	-77.770752	Clinton	Chapman	-	0.002	PEM	OW	0.002
AR-189.5	HR-AR-2	W6-T7a-HR	Other	41.432774	-77.768006	Clinton	Chapman	-	0.02	PFO	OW	0.020
AR-189.5	HR-AR-2	W5-T7a-HR	Other	41.432764	-77.768133	Clinton	Chapman	-	0.05	PFO	OW	0.050
AR-189.5	HR-AR-2	W5-T7a-HR	Other	41.432542	-77.768256	Clinton	Chapman	-	0.01	PFO	OW	0.010
AR-193.2/AR-193.2 EXT	HR-AR-4	W4-T5-HR	EV	41.415458	-77.836138	Clinton	Leidy	-	0.02	PEM	OW	0.02

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. Exceptional Value Wetland Classifications as defined in §105.17 of the PA Code:
   i. Wetland serves as habitat for species listed as ''threatened'' or ''endangered.''
   ii. Wetland is hydrologically connected to or located within ½ mile from habitat for species listed above that are wetland dependent.
   iii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iv. Wetland is located along an existing private or public water supply.
4. Indicates whether theimpact qualifies under the Deminimus policy, which applies to the impact sizes equal to or less than 0.05 acres.
5. Area of resource impacted with permanent fill.
6. Cowardin Codes: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested.
7. Code used to identify the regulatory classification of the impacted area. OW- Other Waters.
8. Total acres for all impact area records.

TABLE S3-1-8 HILLTOP LOOP - WETLANDS SUBFACILITY DETAILS TABLE

									SUBFACILITY CODE: PIPE									IMPACT GROUP SUBFACILITIES	
Milepost	Crossing Name [1]	Wetland ID[2]	Cowardin Code[3]	§ 105.17 classification[4]	Latitude	Longitude	County	Municipality	Type[5]	Product Code[6]	Pipeline Diameter	Depth of Cover [7]	Line Encased[8]	Shut Off Controls[9]	Attached to Water Obstruction[10]	ROW Width[11]	Pipe Length[12]	Temporary Wetland Impact (TMPWI)[13]	Wetland Direct Impact (WTDIM)[14]
																(linear ft.)	(linear ft.)	(acres)	(acres)
183.6	HL-1	W3-T7a-HL	PEM	Other	41.365787	-77.675327	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	178	255	0.61	0
184.4	HL-2	W1-T5-HL	PEM	Other	41.367649	-77.690820	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	36	55	0.07	0
184.4	HL-2	W1-T5-HL	PFO	Other	41.367546	-77.690937	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	12	N/A	0.05	0
184.9	HL-3	W1-T4-HL	PFO	EV	41.369513	-77.699805	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	15	10	0.03	0
184.9	HL-3	W1-T4-HL	PEM	EV	41.369687	-77.699703	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	152	25	0.07	0
185.0	HL-3	W2-T4-HL	PEM	EV	41.369871	-77.701401	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	44	2	0.05	0
185.0	HL-3	W3-T2-HL[15]	PEM	EV	41.370009	-77.701600	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	147	8	0.03	0
185.1	HL-3	W5-T2-HL	PFO	EV	41.369915	-77.701971	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	29	N/A	0.02	0
185.9	HL-4	W11-T5-HL	PEM	Other	41.376393	-77.714242	Clinton	Chapman	TRNC	PETRO	36"	3' Min.	No	Yes	No	18	N/A	0.01	0

1. Unique Identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. Cowardin Codes: PEM = Palustrine Emergent; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested.
4. Exceptional Value Wetland Classifications as defined in §105.17 of the PA Code:
   i. Wetland serves as habitat for species listed as "threatened" or ''endangered.''
   ii. Wetland is hydrologically connected to or located within ½ mile from habitat for species listed above that are wetland dependent.
   iii. Wetland is located within the floodplain of a wild trout stream, or its tributaries, or an exceptional value stream.
   iv. Wetland is located along an existing private or public water supply.
5. Description of the method of pipe crossing employed. TRNC - Open Trenched
6. Description of the product delivered in the pipeline. PETRO - Petroluem, Natural Gas, Oil, etc.
7. If shallow bedrock is present during the construction phase, the pipeline may be installed with a minimum of 1 foot of cover.
8. Notes if concrete encasement is used on the pipeline at the crossing.
9. Notes if shut off controls are employed or required.
10. Notes if the pipe is attached to another water obstruction.
11. Indicates the width of the right-of-way (ROW) at the resource crossing. For those features that are only partially within the ROW, a width across the ROW is noted.
12. Pipe length measured as the length of the wetland crossing. N/A indicates the resource is in the Project workspace, but not crossed by the pipe.
13. Area of wetland impact within the Project workspace, where only temporary fill or excavation is occuring.
14. Area of wetland impact within the Project workspace, where only permanent fill, draining or conversion of a resource to another type is occuring.
15. Cathodic Protection will be installed adjacent to the pipeline at this location.

TABLE S3-1-9 - HILLTOP LOOP - WATERWAYS SUBFACILITY DETAILS TABLE

											SUBFACILITY CODE: PIPE								
Milepost	Crossing Name [1]	Watercourse ID[2]	Stream Type[3]	Chapter 93 Classification[4]		PFBC Classification[7]	Latitude	Longitude	County	Municipality	Type[8]	Product Code[9]	Pipeline Diameter	Depth of Cover [10]	Line Encased[11]	Shut Off Controls[12]	Attached to Water Obstruction[13]	ROW Width[14]	Pipe Length[15]
				Designated Use[5]	Existing Use[6]													(linear ft.)	(linear ft.)
185.0	HL-3	S1-T4-HL	Perennial	HQ-CWF, MF	-	Stocked Trout & Wild Trout Waters	41.369701	-77.70053	Clinton	Chapman	TRNC	PETRO	36"	4' Min.	Yes	Yes	Yes	95	100'

Notes:

1. Unique identifier for Single and Complete Crossings.
2. Unique name for impacted resource.
3. The flow regime of the stream; I = Intermittent, E = Ephemeral, P = Perennial.
4. Chapter 93 classification as outlined in Title 25 of the PA Code: CWF = Coldwater Fishes, WWF = Warm Water Fishes, MF = Migratory Fishes, HQ = High Quality, EV = Exception Value, TSF = Trout Stocked Fishery.
5. Those uses specified in PACODE Chapter 93.4(a) and 93.9a-93.9z for each water body or segment whther or not they are being attained.
6. Thoses uses actually attained in the water body on or after 11/28/75, whether or not they are included in the water quality standards.
7. PA Fish and Boat Commission stream designation, as it relates to trout or other species where seasonal restrictions are implemented.
8. Description of the method of pipe crossing employed. TRNC - Open Trenched
9. Description of the product delivered in the pipeline. PETRO - Petroluem, Natural Gas, Oil, etc.
10. If shallow bedrock is present during the construction phase, the pipeline may be installed with a minimum of 1 foot of cover.
11. Notes if concrete encasement is used on the pipeline at the crossing.
12. Notes if shut off controls are employed or required.
13. Notes if the pipe is attached to another water obstruction.
14. Indicates the width of the right-of-way (ROW) at the resource crossing. For those features that are only partially within the ROW, a width across the ROW is noted.
15. Pipe length measured as the length of the stream crossing. N/A indicates the resource is in the Project workspace, but not crossed by the pipe.
16. Cathodic Protection will be installed adjacent to the pipeline at this location.

APPENDIX S3-2

SOIL CHARACTERIZATION TABLE

Transcontinental Gas Pipe Line Company, LLC

Appendix S3-2

Soil Characteristics Tables

Leidy South Project

August 2019

Table 7A-1
Soil Characteristics of each Soil Map Unit Crossed by Leidy South Pipeline Facilities

Begin Milepost[a]	End Milepost[a]	Map Unit Symbol[b]	Percent Slope[c]	Depth To Bedrock (inches)[c,d]	Land Capability Class[c,e]	High Compaction Potential[f]	Erosion Potential[c,g]	Wind Erodibility Group[c]	Poor Revegetation Potential[h]	Stony/ Rocky Soils[i]	Hydric Soil[c]	Prime Farmland[c,j]
Hensel Replacement												
188.52	188.57	WeB	4	65	6	No	Moderate	5	No	No	No	N
188.57	188.67	CgB	4	50	7	Yes	Slight	6	No	No	No	N
188.67	188.73	CpB	4	46	7	Yes	Slight	6	No	No	No	N
188.73	188.78	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
188.78	188.89	CgB	4	50	7	Yes	Slight	6	No	No	No	N
188.89	189.16	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
189.16	189.23	CfB	4	50	7	No	Slight	5	No	No	No	N
189.23	189.37	CpB	4	46	7	Yes	Slight	6	No	No	No	N
189.37	189.49	HmD	17	50	7	No	Moderate	5	Yes	Yes	No	N
189.49	189.61	CgB	4	50	7	Yes	Slight	6	No	No	No	N
189.61	189.79	CpB	4	46	7	Yes	Slight	6	No	No	No	N
189.79	189.91	CfB	4	50	7	No	Slight	5	No	No	No	N
189.91	190.01	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
190.01	190.05	CpD	18	46	7	No	Severe	6	Yes	No	No	N
190.05	190.08	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
190.08	190.15	CfB	4	50	7	No	Slight	5	No	No	No	N
190.15	190.29	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
190.29	190.38	CpD	18	46	7	No	Severe	6	Yes	No	No	N
190.38	190.41	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
190.41	190.73	CpD	18	46	7	No	Severe	6	Yes	No	No	N
191.73	191.83	CpB	38	60	7	No	Severe	5	Yes	Yes	No	N
191.83	191.88	HoF	4	46	7	Yes	Slight	6	No	No	No	N
191.88	192.12	CpB	38	60	7	No	Severe	5	Yes	Yes	No	N

Table 7A-1
Soil Characteristics of each Soil Map Unit Crossed by Leidy South Pipeline Facilities

Begin Milepost[a]	End Milepost[a]	Map Unit Symbol[b]	Percent Slope[c]	Depth To Bedrock (inches)[c,d]	Land Capability Class[c,e]	High Compaction Potential[f]	Erosion Potential[c,g]	Wind Erodibility Group[c]	Poor Revegetation Potential[h]	Stony/ Rocky Soils[i]	Hydric Soil[c]	Prime Farmland[c,j]
192.12	192.41	HoF	4	46	7	Yes	Slight	6	No	No	No	N
192.41	192.49	CpD	38	60	7	No	Severe	5	Yes	Yes	No	N
192.49	192.57	HmD	18	46	7	No	Severe	6	Yes	No	No	N
192.57	192.57	CgB	17	50	7	No	Moderate	5	Yes	Yes	No	N
192.57	192.67	HmD	4	50	7	Yes	Slight	6	No	No	No	N
192.67	192.71	HoF	17	50	7	No	Moderate	5	Yes	Yes	No	N
192.71	193.12	CpD	38	60	7	No	Severe	5	Yes	Yes	No	N
193.12	193.14	HuB	18	46	7	No	Severe	6	Yes	No	No	N
193.14	193.16	At	6	58	2	No	Moderate	6	No	No	No	Y
193.16	193.24	MhD	1.5	80	4	Yes	Slight	5	No	No	Yes	SWI
193.24	193.39	HoF	19	91	6	No	Severe	6	Yes	No	No	N
193.39	193.44	MhD	38	60	7	No	Severe	5	Yes	Yes	No	N
193.44	193.56	HoF	19	91	6	No	Severe	6	Yes	No	No	N
193.56	193.76	UnB	38	60	7	No	Severe	5	Yes	Yes	No	N
193.76	193.80	HuB	6	48	2	No	Moderate	5	No	No	No	Y
193.80	193.88	At	6	58	2	No	Moderate	6	No	No	No	Y
193.88	193.88	HuB	1.5	80	4	Yes	Slight	5	No	No	Yes	SWI
193.88	193.97	UnB	6	58	2	No	Moderate	6	No	No	No	Y
193.91	193.98	HuB	6	48	2	No	Moderate	5	No	No	No	Y
193.98	194.00	UpF	6	58	2	No	Moderate	6	No	No	No	Y
Hilltop Loop												
183.55	183.60	WeB	4	65	6	No	Moderate	5	No	No	No	N
183.60	183.67	CpD	18	46	7	No	Severe	6	Yes	No	No	N
183.67	183.78	CfB	4	50	7	No	Slight	5	No	No	No	N

Table 7A-1
Soil Characteristics of each Soil Map Unit Crossed by Leidy South Pipeline Facilities

Begin Milepost[a]	End Milepost[a]	Map Unit Symbol[b]	Percent Slope[c]	Depth To Bedrock (inches)[c,d]	Land Capability Class[c,e]	High Compaction Potential[f]	Erosion Potential[c,g]	Wind Erodibility Group[c]	Poor Revegetation Potential[h]	Stony/ Rocky Soils[i]	Hydric Soil[c]	Prime Farmland[c,j]
183.78	183.90	CpD	18	46	7	No	Severe	6	Yes	No	No	N
183.90	184.06	WgB	4	46	6	No	Moderate	5	No	No	No	N
184.06	184.48	WeB	4	65	6	No	Moderate	5	No	No	No	N
184.48	184.60	HmD	17	50	7	No	Moderate	5	Yes	Yes	No	N
184.60	184.81	HkE	53	60	7	No	Severe	5	Yes	No	No	N
184.81	184.93	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
184.93	185.07	Bb	2	>65	1	No	Slight	3	No	No	No	SWI
185.07	185.15	HkE	53	60	7	No	Severe	5	Yes	No	No	N
185.15	185.35	HoF	38	60	7	No	Severe	5	Yes	Yes	No	N
185.35	185.76	CpD	18	46	7	No	Severe	6	Yes	No	No	N
185.76	185.90	WeB	4	65	6	No	Moderate	5	No	No	No	N
185.90	186.00	CpD	18	46	7	No	Severe	6	Yes	No	No	N
Benton Loop												
116.95	117.04	LkB	6	58	2	No	Moderate	6	No	No	No	Y
117.04	117.08	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
117.08	117.25	LkB	6	58	2	No	Moderate	6	No	No	No	Y
117.25	117.28	AbB	6	48	2	No	Moderate	5	No	No	No	Y
117.28	117.73	LkB	6	58	2	No	Moderate	6	No	No	No	Y
117.73	117.85	AbB	6	48	2	No	Moderate	5	No	No	No	Y
117.85	118.14	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
118.14	118.18	Ho	2	80	5	No	Slight	8	No	No	Yes	N
118.18	118.23	LkD	20	58	4	No	Severe	6	Yes	No	No	N
118.23	118.44	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
118.44	118.47	LkB	6	58	2	No	Moderate	6	No	No	No	Y

Table 7A-1
Soil Characteristics of each Soil Map Unit Crossed by Leidy South Pipeline Facilities

Begin Milepost[a]	End Milepost[a]	Map Unit Symbol[b]	Percent Slope[c]	Depth To Bedrock (inches)[c,d]	Land Capability Class[c,e]	High Compaction Potential[f]	Erosion Potential[c,g]	Wind Erodibility Group[c]	Poor Revegetation Potential[h]	Stony/ Rocky Soils[i]	Hydric Soil[c]	Prime Farmland[c,j]
118.47	118.55	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
118.55	118.62	KID	20	19	6	No	Severe	6	Yes	Yes	No	N
118.62	118.74	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
118.74	118.92	Ho	2	80	5	No	Slight	8	No	No	Yes	N
118.92	118.99	LaC	12	117	3	No	Moderate	6	No	Yes	No	SWI
118.99	119.06	LkB	6	58	2	No	Moderate	6	No	No	No	Y
119.06	119.13	AbC	12	0	3	No	Severe	5	No	Yes	No	SWI
119.13	119.18	WIC	12	80	3	No	Moderate	6	No	Yes	No	SWI
119.18	119.21	LkD	20	58	4	No	Severe	6	Yes	No	No	N
119.21	119.26	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
119.26	119.30	LkD	20	58	4	No	Severe	6	Yes	No	No	N
119.30	119.34	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
119.34	119.50	LkB	6	58	2	No	Moderate	6	No	No	No	Y
119.50	119.6	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
119.6	119.58	WIC	12	80	3	No	Moderate	6	No	Yes	No	SWI
119.58	119.63	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
119.63	119.64	LkD	20	58	4	No	Severe	6	Yes	No	No	N
119.64	119.77	LkB	6	58	2	No	Moderate	6	No	No	No	P
119.77	119.94	LkC	12	58	3	No	Moderate	6	No	No	No	SWI
119.94	120.08	KID	20	19	6	No	Severe	6	Yes	Yes	No	SWI
120.08	120.09	LkC	12	58	3	No	Moderate	6	No	No	No	N
120.09	120.12	KID	20	19	6	No	Severe	6	Yes	Yes	No	SWI
120.12	120.18	WIC	12	80	3	No	Moderate	6	No	Yes	No	N
120.18	120.20	WkE	53	15	7	No	Severe	7	Yes	Yes	No	SWI

Table 7A-1
Soil Characteristics of each Soil Map Unit Crossed by Leidy South Pipeline Facilities

Begin Milepost[a]	End Milepost[a]	Map Unit Symbol[b]	Percent Slope[c]	Depth To Bedrock (inches)[c,d]	Land Capability Class[c,e]	High Compaction Potential[f]	Erosion Potential[c,g]	Wind Erodibility Group[c]	Poor Revegetation Potential[h]	Stony/ Rocky Soils[i]	Hydric Soil[c]	Prime Farmland[c,j]
120.20	120.28	KIC	12	19	4	No	Moderate	6	Yes	Yes	No	N
120.28	120.34	KID	20	19	6	No	Severe	6	Yes	Yes	No	N
120.34	120.35	KIC	12	19	4	No	Moderate	6	Yes	Yes	No	N
120.35	120.44	LkB	6	58	2	No	Moderate	6	No	No	No	N

[a] Mileposts for the Project are based on Transco Leidy Line A, and do not reflect actual pipeline footage.
[b] Map unit names and descriptions are located in Appendix 7B.
[c] As identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey and USDA NRCS Web Soil Survey.
[d] Where no bedrock depth is identified, bedrock depth is assumed to be greater than the deepest depth noted in the USDA NRCS Web Soil Survey (>60, >65, >80).
[e] Land capability classes are defined as follows:
Class 1 – soils with moderate limitations that restrict their use
Class 2 – soils with moderate limitations that reduce the choice of plants or that require moderate conservation practices
Class 3 – soils with severe limitations that reduce the choice of plants or that require moderate conservation practices, or both
Class 4 – soils with very severe limitations that reduce the choice of plants or that require very careful management
Class 5 – soils that are not likely to erode but have other limitations that limit their use, impractical to remove
Class 6 – soils that have severe limitations that make them generally unsuitable for cultivation
[f] Compaction Potentials: Soils with Yes compaction potential are those with more than 18 percent clay in the surface horizon with somewhat poorly drained or wetter drainage class, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey. Dashes indicate that the compaction potential is not Yes.
[g] Erosion Potential: NRCS rating for the relative hazard of erosion of soil by water that may result from construction of forest roads and trails, as identified in USDA NRCS SSURGO database.
[h] Poor Revegetation Potential: Soils with poor revegetation potential are those with greater than 15 percent slopes or with a very low available water storage (less than 2.5 inches of water per 40 inches of soil), as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey. Dashes indicate that revegetation potential is not poor.
[i] Stony/Rocky Soils: Soils with a Yes risk for introducing large rocks into the topsoil are those with 15 percent or more percent by weight of the surface horizon occupied by rock fragments greater than 3 inches in size or soils with bedrock within 39 inches of the surface, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey. Dashes indicate that soils do not have a Yes risk for introducing large rocks into the topsoil.
[k] Prime Farmland Soils: Y = yes; N = no; SWI = statewide importance.

Key:
N/A = Information Not Available

Table 7A-2
Soil Characteristics and Affected Acreage Associated with Contractor Yards and Contractor Staging Areas

Map Unit Symbol[a]	Affected Acres[b]	Percent Slope[c]	Depth to Bedrock (inches)[c]	Land Capability Class[d]	High Compaction Potential[e]	Erosion Potential[f]	Wind Erodibility Group[c]	Poor Revegetation Potential[g]	Stony / Rocky Soils[h]	Hydric Soil[b]	Prime Farmland[i]
Hensel Replacement											
CY-003											
LdC	0.3	13	90	7	No	Moderate	6	No	No	No	N
Lr	8.6	2	90	1	No	Slight	5	No	No	No	P
CSA-018											
HmD	1.5	17	50	7	No	Moderate	5	No	No	No	N
CSA-019											
CgB	6.8	4	50	7	No	Slight	6	No	No	No	N
CpB	0.4	4	46	7	No	Slight	6	Yes	No	No	N
WeB	2.3	4	65	6	No	Moderate	5	No	No	No	N
CSA-020											
HoF	0.2	38	60	7	No	Severe	5	No	No	No	N
CSA-021											
At	<0.1	1.5	>80	4	No	Slight	5	No	No	Yes	SWI
HuB	4.2	6	>65	2	No	Moderate	6	No	No	No	P
CSA-022											
HuB	0.1	6	>65	2	No	Moderate	6	No	Yes	No	P
UnB	0.2	6	48	2	No	Moderate	5	Yes	Yes	No	P
UpF	2.4	35	48	7	No	Severe	7	No	No	No	N
Hilltop Loop											
CY-004											
Bb	0.2	2	>80	1	No	Slight	3	No	No	No	SWI
Lr	11.6	2	90	1	No	Slight	5	No	No	No	P

Table 7A-2
Soil Characteristics and Affected Acreage Associated with Contractor Yards and Contractor Staging Areas

Map Unit Symbol[a]	Affected Acres[b]	Percent Slope[c]	Depth to Bedrock (inches)[c]	Land Capability Class[d]	High Compaction Potential[e]	Erosion Potential[f]	Wind Erodibility Group[c]	Poor Revegetation Potential[g]	Stony / Rocky Soils[h]	Hydric Soil[b]	Prime Farmland[i]
CY-005											
WeB	6.0	4	65	6	No	Moderate	5	No	No	No	N
CY-008											
CfB	7.4	4	50	7	No	Slight	5	No	No	No	N
CpB	4.7	4	46	7	No	Slight	6	No	No	No	N
CpD	0.9	18	46	7	No	Severe	6	Yes	No	No	N
WeB	2.1	4	65	6	No	Moderate	5	No	No	No	N
CSA-014											
WeB	1.3	4	65	6	No	Moderate	5	No	No	No	N
CSA-015											
CpD	0.1	18	46	7	No	Severe	6	Yes	N/A	No	N
WeB	2.0	4	65	6	No	Moderate	5	No	No	No	N
CSA-016											
HmD	0.8	17	50	7	No	Moderate	5	Yes	Yes	No	N
WeB	0.4	4	65	6	No	Moderate	5	No	No	No	N
CSA-017											
CpD	1.2	18	46	7	No	Severe	6	Yes	No	No	N
Benton Loop											
CY-001											
LaB2	4.2	8	>80	2	No	Moderate	6	Yes	Yes	No	P
CY-002											
KlC	0.2	12	19	4	No	Moderate	6	Yes	Yes	No	N
LkB	12.9	6	58	2	No	Moderate	6	No	No	No	P
LkC	2.0	12	58	3	No	Moderate	6	No	No	No	SWI

Table 7A-2
Soil Characteristics and Affected Acreage Associated with Contractor Yards and Contractor Staging Areas

Map Unit Symbol[a]	Affected Acres[b]	Percent Slope[c]	Depth to Bedrock (inches)[c]	Land Capability Class[d]	High Compaction Potential[e]	Erosion Potential[f]	Wind Erodibility Group[c]	Poor Revegetation Potential[g]	Stony / Rocky Soils[h]	Hydric Soil[b]	Prime Farmland[i]
CSA-008											
LkB	0.3	6	58	2	No	Moderate	6	No	No	No	P
LkC	0.2	12	58	3	No	Moderate	6	Yes	No	No	SWI
CY-009											
LkB	9.5	6	58	2	No	Moderate	6	No	No	No	P
LkC	6.8	12	58	3	No	Moderate	6	No	No	No	SWI
LkD	2.0	20	58	4	No	Severe	6	No	No	No	N
CY-010											
LkB	1.8	6	58	2	No	Moderate	6	No	No	No	P
LkC	0.1	12	58	3	No	Moderate	6	No	No	No	SWI
CSA-011											
LkB	0.2	6	58	2	No	Moderate	6	No	N/A	No	P
CSA-012											
LkB	0.8	6	58	2	No	Moderate	6	No	No	No	P
LkC	0.3	12	58	3	No	Moderate	6	No	No	No	SWI
CSA-013											
KlB	3.2	6	19	3	No	Moderate	6	No	Yes	No	SWI
KlC	2.5	12	19	4	No	Moderate	6	No	Yes	No	N
KlD	1.7	20	19	6	No	Severe	6	Yes	Yes	No	N

Table 7A-2
Soil Characteristics and Affected Acreage Associated with Contractor Yards and Contractor Staging Areas

Map Unit Symbol[a]	Affected Acres[b]	Percent Slope[c]	Depth to Bedrock (inches)[c]	Land Capability Class[d]	High Compaction Potential[e]	Erosion Potential[f]	Wind Erodibility Group[c]	Poor Revegetation Potential[g]	Stony / Rocky Soils[h]	Hydric Soil[b]	Prime Farmland[i]

Notes:

[a] Map unit names and descriptions are located in Appendix 7B.

[b] Area in acres within construction workspace, in acres. All effects are temporary. If less than 0.1 acres then shown on table as <0.01.

[c] As identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey. Where no bedrock depth is identified, bedrock depth is assumed to be greater than the deepest depth noted in the USDA NRCS Web Soil Survey (>65, >70, >80).

[d] As identified in USDA NRCS SSURGO database. Land capability classes are defined as follows:

Class 1 – soils with moderate limitations that restrict their use

Class 2 – soils with moderate limitations that reduce the choice of plants or that require moderate conservation practices

Class 3 – soils with severe limitations that reduce the choice of plants or that require moderate conservation practices, or both

Class 4 – soils with very severe limitations that reduce the choice of plants or that require very careful management

Class 5 – soils that are not likely to erode but have other limitations that limit their use, impractical to remove

Class 6 – soils that have severe limitations that make them generally unsuitable for cultivation

Class 7 – soils that have very severe limitations that make them unsuitable for cultivation

[e] Compaction Potentials: Soils with high compaction potential are those more than 18 percent clay in the surface horizon with somewhat poorly or wetter drainage class, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey.

[f] Erosion Potential: NRCS rating for the relative hazard of erosion of soil by water that may result from construction of forest roads and trails, as identified in USDA NRCS SSURGO database.

[g] Poor Revegetation Potential: Soils with poor revegetation potential are those with greater than 15 percent slopes or have a low available water storage (less than 2.5 inches of water per 40 inches of soil, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey.

[h] Stony/Rocky Soils: Soils with a high risk for introducing large rocks into the topsoil are those with 15 percent or more percent by weight of the surface horizon occupied by rock fragments greater than 3 inches in size or soils with bedrock within 29 inches of the surface, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey.

[I] Prime Farmland Soils: Y = yes; N = no; SWI = statewide importance. As identified in USDA NRCS SSURGO database.

Key:

N/A = Information Not Available

Table 7A-3
Soil Characteristics And Affected Acreage Associated with New Aboveground Facilities and Existing Compressor Stations

Map Unit Symbol [a]	Temp. Effect Acres [b]	Perm. Effect Acres [c]	Percent Slope [d]	Depth To Bedrock (inches) [d]	Land Capability Class [e]	High Compaction Potential [f]	Erosion Potential [g]	Wind Erodibility Group [d]	Poor Revegetation Potential [h]	Stony / Rocky Soils [i]	Hydric Soil [d]	Prime Farmland [j]
Compressor Station 607												
LaB	12.0	9.5	6	>70	2	No	Moderate	6	No	Yes	No	P
LaC	1.8	1.6	12	>70	3	No	Moderate	6	No	Yes	No	SWI
LcB	0.4	0.2	6	>70	7	No	Moderate	6	No	Yes	No	N
LcD	<0.1	0.0	17	>70	7	Yes	Severe	6	Yes	Yes	No	N
MoB	0.3	0.0	4	>70	3	No	Moderate	6	No	Yes	No	SWI
WIB	3.5	1.0	6	>70	2	No	Moderate	6	No	Yes	No	P
Compressor Station 610												
AeB2	0.9	0.0	8	>80	2	No	Moderate	5	No	No	No	P
HhB2	30.6	0.0	8	30	2	No	Moderate	6	No	Yes	No	SWI
HhC3	0.3	0.0	16	30	4	No	Severe	6	Yes	Yes	No	N
WbB2	1.2	0.0	6	>80	2	No	Moderate	5	No	No	No	P
WcC2	0.7	0.0	16	15	4	N/A	Severe	7	Yes	N/A	No	N
Compressor Station 620												
Ba	0.3	0.0	2	>70	2	No	Slight	5	No	Yes	No	A
BxB	0.4	0.0	6	>70	7	No	Moderate	6	No	Yes	No	N
CaB	7.0	4.5	6	30	2	No	Moderate	5	No	Yes	No	SWI
CaC	4.9	2.7	12	30	3	No	Moderate	6	No	Yes	No	SWI
LeB	22.6	15.5	6	58	2	No	Moderate	6	No	No	No	A
LeC	5.8	1.5	12	58	3	No	Moderate	6	No	No	No	SWI
MeB	0.7	0.0	6	98	2	No	Moderate	5	No	No	No	A
WKF	3.6	0.0	50	15	7	No	Severe	7	Yes	Yes	No	N
Valve Setting and Pig Launcher/Receiver at MP 116.95 (Benton Loop)												
LkB	<0.1	<0.1	6	58	2	No	Moderate	6	No	No	No	A

Table 7A-3
Soil Characteristics And Affected Acreage Associated with New Aboveground Facilities and Existing Compressor Stations

Map Unit Symbol [a]	Temp. Effect Acres [b]	Perm. Effect Acres [c]	Percent Slope [d]	Depth To Bedrock (inches) [d]	Land Capability Class [e]	High Compaction Potential [f]	Erosion Potential [g]	Wind Erodibility Group [d]	Poor Revegetation Potential [h]	Stony / Rocky Soils [i]	Hydric Soil [d]	Prime Farmland [j]
LkC	0.3	0.3	12	58	3	No	Moderate	6	No	No	No	SWI
Valve Setting and Pig Launcher/Receiver at MP 188.15 (Hensel Replacement)												
HmD	0.7	0.7	17	50	7	No	Moderate	5	No	No	No	N

Notes:

[a] Map unit names and descriptions are located in Appendix 7B.

[b] Area in acres within construction workspace, in acres.

[c] Area within permanent facility boundary, in acres.

[d] As identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey. Where no bedrock depth is identified, bedrock depth is assumed to be greater than the deepest depth noted in the USDA NRCS Web Soil Survey (>65, >70, >80).

[e] As identified in USDA NRCS SSURGO database. Land capability classes are defined as follows:

Class 1 – soils with moderate limitations that restrict their use

Class 2 – soils with moderate limitations that reduce the choice of plants or that require moderate conservation practices

Class 3 – soils with severe limitations that reduce the choice of plants or that require moderate conservation practices, or both

Class 4 – soils with very severe limitations that reduce the choice of plants or that require very careful management

Class 5 – soils that are not likely to erode but have other limitations that limit their use, impractical to remove

Class 6 – soils that have severe limitations that make them generally unsuitable for cultivation

Class 7 – soils that have very severe limitations that make them unsuitable for cultivation

[f] Compaction Potentials: Soils with high compaction potential are those more than 18 percent clay in the surface horizon with somewhat poorly or wetter drainage class, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey.

[g] Erosion Potential: NRCS rating for the relative hazard of erosion of soil by water that may result from construction of forest roads and trails, as identified in USDA NRCS SSURGO database.

[h] Poor Revegetation Potential: Soils with poor revegetation potential are those with greater than 15 percent slopes or have a low available water storage (less than 2.5 inches of water per 40 inches of soil, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey.

[i] Stony/Rocky Soils: Soils with a high risk for introducing large rocks into the topsoil are those with 15 percent or more percent by weight of the surface horizon occupied by rock fragments greater than 3 inches in size or soils with bedrock within 29 inches of the surface, as identified in USDA NRCS SSURGO database and USDA NRCS Web Soil Survey.

[j] Prime Farmland Soils: Y = yes; N = no; SWI = statewide importance. As identified in USDA NRCS SSURGO database.

Key:

Perm. = Permanent

Temp. = Temporary

APPENDIX S3-3

TRANSCO PROJECT SPECIFIC UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

Transcontinental Gas Pipe Line Company, LLC

Transco Project-Specific Upland Erosion Control, Revegetation, and Maintenance Plan

Leidy South Project

July 2019

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I. APPLICABILITY

A. The intent of this Plan is to identify baseline mitigation measures for minimizing erosion and enhancing revegetation for the Transcontinental Gas Pipe Line Company, LLC (Transco) Leidy South Project (Project). Transco will specify in its application for a new FERC authorization and in prior notice and advance notice filings, any individual measures in this Plan it considers unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Transco will also explain how those alternative measures would achieve a comparable level of mitigation. Deviations from the FERC Plan proposed by Transco to reflect site-specific conditions are **bolded** in the text.

Once the Project is authorized, Transco will request further changes as variances to the measures in the Transco Plan. The Director of the Office of Energy Projects (Director) will consider approval of variances upon Transco's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of this Plan is infeasible or unworkable based on project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Project-related impacts on wetland and waterbody systems are addressed in the Transco Project-specific Wetland and Waterbody Construction and Mitigation Procedures (Transco Procedures).

II. SUPERVISION AND INSPECTION

A. ENVIRONMENTAL INSPECTION

1. At least one Environmental Inspector is required for each construction spread during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

2. Environmental Inspectors shall have peer status with all other activity inspectors.

3. Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action.

B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS

At a minimum, the Environmental Inspector(s) shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of the Transco Plan, Transco Procedures, the environmental conditions of the FERC's Orders, the mitigation measures (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.

2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;

3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;

4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;

5. Identifying erosion/sediment control and soil stabilization needs in all areas;

6. Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;

7. Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;

8. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;

9. Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;

10. Ensuring restoration of contours and topsoil;

11. Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;

12. Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental resource areas (e.g., wetlands, waterbodies,

cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;

13. Inspecting and ensuring the maintenance of temporary erosion control measures at least:

    a. on a daily basis in areas of active construction or equipment operation;

    b. a minimum of once a week in areas with no construction or equipment operation; and

    c. within 24 hours of each 0.5 inch of rainfall.

14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;

15. Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures in the Transco application submitted to the FERC, and other federal or state environmental permits during active construction and restoration;

16. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and

17. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E.

III. PRECONSTRUCTION PLANNING

Transco will do the following before construction:

A. CONSTRUCTION WORK AREAS

1. Identify all construction work areas (e.g., construction right-of-way, extra work space areas, additional temporary workspaces (ATWS) areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. Transco will ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.

2. Transco will expand any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.

3. Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas.

B. DRAIN TILE AND IRRIGATION SYSTEMS

1. Attempt to locate existing drain tiles and irrigation systems.

2. Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.

3. Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.

4. Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the Project area, if available.

C. GRAZING DEFERMENT

Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts.

D. ROAD CROSSINGS AND ACCESS POINTS

Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

E. DISPOSAL PLANNING

Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements.

F. AGENCY COORDINATION

Transco will coordinate with the appropriate local, state, and federal agencies as outlined in this Plan and/or required by the FERC's Orders.

1. Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.

2. Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests resulting from construction and restoration activities. Refer to the Transco Project-specific Noxious and Invasive Plant Management Plan.

3. Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction.

4. Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas. Refer to the Transco Project-specific Blasting Plan.

G. SPILL PREVENTION AND RESPONSE PROCEDURES

Transco will develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy will be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. Refer to the Transco Project-specific Spill Plan for Oil and Hazardous Materials.

H. RESIDENTIAL CONSTRUCTION

For all properties with residences located within 50 feet of construction work areas, Transco will avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following clean-up operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

I. WINTER CONSTRUCTION PLANS

Transco has filed a Project-specific Winter Construction Plan with the FERC application.

The plan addresses:

1. winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

2. stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

3. final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

IV. INSTALLATION

A. APPROVED AREAS OF DISTURBANCE

1. Project-related ground disturbance will be limited to the construction right-of-way, extra work space areas, ATWS areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any Project- related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements.

2. **The Transco construction rights-of-way widths in upland locations for this Project will include:**

   a. **90 feet for the Hensel Replacement and Hilltop Loop; and**

   b. **150 feet for the Benton Loop.**

   Transco will provide extra work spaces and ATWS areas outside of the construction rights-of-way for full construction right-of-way topsoil segregation and to ensure safe construction where required by topographic conditions (e.g., side-slopes) or soil limitations. Extra work space and ATWS areas may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.

   Project use of extra work space and ATWS areas outside of authorized work areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. **Transco will request variances (per section I.A) for these additional areas and will report the requested and approved variances in its weekly construction reports to FERC.** The following materials will be included in the reports:

   a. the location of each additional area by milepost and reference to previously filed alignment sheets showing the additional areas;

   b. identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and

   c. a statement that landowner approval has been obtained and is available in project files.

B. TOPSOIL SEGREGATION

1. Unless the landowner or land management agency specifically approves otherwise, Transco will prevent the mixing of topsoil with subsoil by stripping

topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

a. cultivated or rotated croplands, and managed pastures;

b. residential areas;

c. hayfields; and

d. other areas at the landowner's or land managing agency's request.

2. In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation.

3. Where topsoil segregation is required:

a. segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and

b. make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil.

4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

5. Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.

6. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

C. DRAIN TILES

1. Mark locations of drain tiles damaged during construction.

2. Probe all drainage tile systems within the area of disturbance to check for damage.

3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.

4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

D. IRRIGATION

Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. ROAD CROSSINGS AND ACCESS POINTS

1. Maintain safe and accessible conditions at all road crossings and access points during construction. Refer to the Transco Project-specific Traffic and Transportation Management Plan.

2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.

3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.

F. TEMPORARY EROSION CONTROL

Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers

   a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.

   b. Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing in Pennsylvania (closer spacing shall be used if necessary):

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

   c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.

d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

2. Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill.

a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.

b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.

3. Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.

a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.

b. At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Mulch

a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.

b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.

c. Mulch all disturbed upland areas (except cultivated cropland) before seeding if:

(1) final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or

(2) construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

d. If mulching before seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).

f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.

g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

V. RESTORATION

A. CLEANUP

1. Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

   Transco will file with the Secretary for the review and written approval of the Director, a Winter Construction Plan (as specified in section III.I). Refer to the Transco Project-specific Winter Construction Plan.

2. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored.

3. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

4. Remove excess rock **in excess of 4 inches** from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing.

5. Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting.

6. Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.

7. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

B. PERMANENT EROSION CONTROL DEVICES

1. Trench Breakers

a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.

b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.

c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.

d. At a minimum, install a trench breaker at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or

wetland. Install trench breakers at wetland boundaries, as specified in the Transco Procedures.

e. Trench breakers will be installed in wetlands to prevent water from traveling along the trench and altering micro-watersheds within the wetlands.

2. Permanent Slope Breakers

a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction right-of-way, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.

In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.

d. **Unless restricted by state permitting,** slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements.

C. SOIL COMPACTION MITIGATION

1. Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.

2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil. If subsequent construction and cleanup activities result in further compaction, conduct additional tilling. Refer to the Transco Project-specific Agricultural Construction and Monitoring Plan.

3. Perform appropriate soil compaction mitigation in severely compacted residential areas.

D. REVEGETATION

1. General

a. Transco will ensure successful revegetation of soils disturbed by Project-related activities, except as noted in section V.D.1.b.

b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

2. Soil Additives

Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

3. Seeding Requirements

a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.

b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.

c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Lawns may be seeded on a schedule established with the landowner.

d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.

e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.

f. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).

g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the Environmental Inspector.

VI. OFF-ROAD VEHICLE CONTROL

To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:

a. signs;

b. fences with locking gates;

c. slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and

d. conifers or other appropriate trees or shrubs across the right-of-way.

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING

A. MONITORING AND MAINTENANCE

1. Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons.

2. Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

   Continue revegetation efforts until revegetation is successful.

3. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful.

4. Restoration will be considered successful when the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agency per section V.A.6), revegetation is successful, and proper drainage has been restored.

5. Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands will not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case will routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.

6. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary.

B. REPORTING

1. Transco will maintain records that identify by milepost:

   a. method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;

   b. acreage treated;

   c. dates of backfilling and seeding;

   d. names of landowners requesting special seeding treatment and a description of the follow-up actions;

   e. the location of any subsurface drainage repairs or improvements made during restoration; and

   f. any problem areas and how they were addressed.

2. Transco will file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.

APPENDIX S3-4

CONSTRUCTION SPILL PREVENTION AND RESPONSE PROCEDURES FOR OIL AND HAZARDOUS MATERIALS

Transcontinental Gas Pipe Line Company, LLC

Construction Spill Prevention and Response Procedures for Oil and Hazardous Materials

Leidy South Project

July 2019

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SECTION 1 - GENERAL INFORMATION

1.1 SPILL PLAN REQUIREMENTS

Contractor shall determine the approximate quantities of oil or oil-like substances (including fuels) and any hazardous materials or substances that will be present or stored at the work site(s) to assist Company's Environmental Inspector in identifying the appropriate spill plan that shall be applicable for the Work. The quantities carried by fuel trucks that are on site temporarily to refuel equipment shall not be included in Contractor's calculation of the amount of oil or oil-like substances stored at any facility/site.

1.1.1 Company Construction Spill Plan For Oil and Hazardous Materials

If during the course of Work, 1,320 gallons or less of oil or oil-like substances or hazardous materials will be present or stored at any facility/site, Contractor shall comply with and complete the remaining sections and requirements of this document (i.e., Construction Spill Plan). Contractor's field personnel shall be familiar with this plan before initiating any onsite activities and shall follow all requirements and responsibilities of this plan as they are listed for Contractor. Contractor shall provide, prior to start of the Work but no later than the pre-job meeting, all of the initial information required by the applicable/designated plan. Contractor shall provide Company with additional information to keep the plan current.

1.1.2 U.S. Environmental Protection Agency Tier I Qualified Facility Spill Prevention, Control, and Countermeasure (SPCC) Plan

If during the course of Work, greater than 1,320 gallons of oil or oil-like substances but less than 10,000 gallons with no containers greater than 5,000 gallons in capacity will be present or stored at any facility/site, Contractor shall comply with and complete the remaining sections and requirements of this document PLUS comply with and complete the requirements of the "U.S. Environmental Protection Agency Tier I Qualified Facility SPCC Plan," attached to this section, or develop a full SPCC Plan. Contractor's field personnel shall be familiar with this plan before initiating any onsite activities and shall follow all requirements and responsibilities of this plan as they are listed for Contractor. Contractor shall provide, prior to start of the Work but no later than the pre-job meeting, all of the initial information required by the plan. Contractor shall provide Company with additional information to keep the plan current.

1.1.3 U.S. Environmental Protection Agency Full SPCC Plan

If during the course of Work, 5,000 gallons or more of oil or oil-like substances contained in a single container, or a total of 10,000 gallons or more, will be present or stored at any facility/site, Contractor shall comply with and complete the remaining section of this document PLUS comply with and complete the requirements of a full U.S. Environmental Protection Agency SPCC Plan, which must be reviewed and approved by a professional engineer. Contractor's field personnel shall be familiar with this plan before initiating any onsite activities and shall follow all requirements and responsibilities of this plan as they are listed for Contractor. Contractor shall provide, prior to start of the Work but no later than the pre-job meeting, all of the initial information required by the plan. Contractor shall provide Company with additional information to keep the plan current.

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1.2 PROJECT LOCATION AND DESCRIPTION

This Construction Spill Plan was developed for the following project:

Insert project name, work order # and description.

Definitions:

Oil is defined in the SPCC regulations as oil of any kind or in any form including, but not limited to, petroleum, fuel oil, sludge, oil refuse, and oil mixed with wastes other than dredged spoil and oily mixtures.

Hazardous Material as defined by the DOT includes hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table (see 49 CFR 172.101), and materials that meet the defining criteria for hazard classes and divisions in part 173 of subchapter C of this chapter. Hazardous Materials typically found on construction projects include, but are not limited to, petroleum oils, hydraulic fluids, engine coolants (ethylene glycol), x-ray film developer, chemical additives, pipe coatings, used abrasive blasting media, etc.

Contractor Responsibility:

The Contractor shall be familiar with this Construction Spill Plan and its contents prior to commencing any construction-related activities. All workers handling fuels, oils or other hazardous materials shall be properly trained. The Plan will be followed to prevent any spills that may occur during the project and to mitigate any spills that do occur.

Company representatives assigned to this project include:

Manager, Operations (MO):	*To be inserted*
Chief Inspector (CI):	*To be inserted*
Company Lead Environmental Specialist:	*To be inserted*
Land, GIS, & Permits Lead:	*To be inserted*

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SECTION 2 - DRAINAGE PATTERNS AND SPILL PREVENTION PRACTICES

2.1 DRAINAGE PATTERNS

Insert a brief description about the general drainage patterns at the work site(s).

Responsibility: Chief Inspector

Construction and Technicians will be familiar with drainage patterns for the project and be prepared to implement measures to control any release.

2.2 SPILL PREVENTION PRACTICES

The Contractor shall take the following precautions to ensure that an oil or hazardous materials spill does not occur:

A. Containers/Pumps/Concrete Coating

(1) All containers of oil, fuel, or hazardous materials shall be stored on level ground at least 100 feet from any waterway, wetland, or designated municipal watershed area or as prescribed by a project specific permit or agency. All containers should be located within temporary containment.

(2) Temporary containment will include, but not be limited to, temporary hay bale berms with plastic sheets underlining the entire contained area and it is recommended that these areas be inspected daily or after any significant precipitation event.

(3) Containment areas shall be capable of containing 100% of the volume of the single largest container of hazardous material being stored plus sufficient freeboard to hold the 25 year/24 hour storm.

(4) All container storage areas shall be routinely inspected for integrity purposes. If hazardous wastes are being stored a weekly inspection must be documented.

(5) Leaking and/or deteriorated containers shall be replaced as soon as the condition is first detected with clean-up measures immediately taking place.

(6) No incompatible materials shall be stored in the same containment area.

(7) No container storage areas shall be left unsecured during non-work hours.

(8) Accumulated rainwater in the containment areas must be inspected prior to release to the ground; it must be free of sheens or other hazardous materials.

(9) Pumps operating within 100 feet of a waterbody or wetland boundary shall utilize the appropriate agricultural or industrial grade containers/materials as a secondary containment system to prevent spills.

(10) Concrete coating operations shall not be performed within 100 feet of a wetland or waterbody unless the location is an existing industrial site designated for such use. If no reasonable alternatives exist, consult with the EI and Company Environmental Lead for other options.

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B. Tanks

(1) The Contractor shall operate only those tanks that meet the requirements and specifications of applicable regulations and that are surrounded with temporary containment as described above.

(2) Self-supporting tanks shall be constructed of materials compatible with its contents.

(3) All tanks shall be routinely inspected for integrity purposes.

(4) Vehicle mounted tanks shall be equipped with flame/spark arrestors on vents to ensure that self-ignition does not occur.

(5) Tanks will not be used to store incompatible materials in sequence unless first thoroughly decontaminated.

(6) Any tank utilized for storing different products between construction locations will be thoroughly decontaminated prior to refilling.

C. Unloading/Loading Areas

(1) If it is necessary during the project, re-fueling and transferring of liquids shall only occur in pre-designated locations that are on level ground and at least 100 feet from any waterway. This activity must be continuously manned (minimum of two attendants plus a Company inspector) to ensure that overfilling, leaks, or spills do not occur. In addition, all equipment must be surrounded by temporary containment as described above.

Where conditions require construction equipment (e.g., Bobcat/front-end loader/excavator) to be re-fueled within 100 feet of any waterway, or as prescribed by a project specific permit, the above requirements shall also apply and will be strictly enforced.

(2) All service vehicles used to transport fuel must travel only on approved access roads and workspace and be equipped with an appropriate number of fire extinguishers and an oil spill response kit as identified in Appendix C.

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SECTION 3 - EMERGENCY RESPONSE PROCEDURES

This section provides a generic description of emergency response procedures to be performed to address oil and hazardous materials spills at the job site. Each response will vary depending upon the nature and extent of the incident. However, the general procedures outlined below will be followed.

3.1 CONTRACTOR RESPONSIBILITIES

(1) The Contractor must designate both an Emergency Coordinator (EC) and an Alternate EC for the project.

(2) The Contractor is responsible for immediately and appropriately addressing all spills that occur directly as a result of construction-related activities.

(3) For all spills the internal notification requirements of this Plan need to be followed.

(4) The Contractor shall supply the necessary manpower, PPE, and spill response equipment to immediately and appropriately address all spills that directly occur as a result of construction-related activities.

(5) Ensure that all emergency spill response equipment and PPE is well-stocked and in good condition. Replace used materials immediately after a response. .

(6) If the situation warrants, the Contractor, in consultation with the CI, shall immediately notify any local emergency spill response contractors for assistance.

(7) The Contractor shall be responsible for hiring a Company approved emergency spill response contractor if the nature of the incident requires it.

(8) The Contractor is responsible for immediately notifying the CI, EI or Operations Manager of any spills.

3.2 COMPANY RESPONSIBILITIES

(1) The Company shall be responsible for ensuring that the Contractor adequately follows the procedures outlined in this Plan at all times.

(2) The Company shall be responsible for all verbal and written external notifications made to any regulatory agency or any local emergency responders.

3.3 EMERGENCY CONTACTS

Table I (Appendix A) provides a list of Company and Contractor emergency contacts.

3.4 DUTIES OF CHIEF INSPECTOR OR MANAGER, OPERATIONS.

The duties of the CI, EI or MO for reportable spills include the following:

(1) Determine the source, character, amount, and extent of the spill.

(2) Assess the potential hazards to the job site, environment, and surrounding community and contact the Construction Safety Representative if any hazards are detected.

(3) Evacuate the area if necessary.

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(4) Report the spill in accordance with the internal notification procedures outlined in Section 5.1 and the external notification procedures outlined in Section 5.2.

(5) Commit manpower and equipment for minor incidents that can be reasonably remediated by the Contractor.

(6) Oversee Contractor's spill response efforts to contain and control all spills to ensure they adequately follow the procedures outlined in this Plan.

(7) Document the Contractor's response effort, including taking photographs wherever possible.

(8) Generate an Emergency Incident Report (form WGP-0187).

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SECTION 4 - EMERGENCY SPILL RESPONSE AND PERSONAL PROTECTIVE EQUIPMENT

Each construction crew (including cleanup crews) shall have on-hand sufficient supplies, as Identified in Appendix C; of absorbents, barrier materials, and personal protective equipment (PPE) to allow for the rapid containment and recovery of any spilled material.

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SECTION 5 - SPILL NOTIFICATION PROCEDURES

5.1 INTERNAL NOTIFICATIONS

(1) All spills are to be immediately reported to the CI, EI or MO who will immediately contact The Security Operations Center (SOC). Table I (Appendix A) includes a list of emergency contacts.

(2) The person reporting the spill/release should use the checklist in Appendix B to ensure that the minimum information needed is collected in order to make a report.

(3) The SOC is responsible for generating a Concern Report in Gensuite and notifying the appropriate Environmental Specialist.

(4) The Environmental Specialist will review the Concern Report and “escalate” or “close” the concern as appropriate.

5.2 EXTERNAL NOTIFICATIONS

(1) The CI, EI and or MO will consult with the appropriate Company Lead Environmental Specialist and determine who will be responsible for any necessary first-response notifications to an emergency spill response team to help contain the spill. If the spill occurs offshore, refer to the Offshore Spill Response Plan (OSRP).

(2) After all required immediate internal notifications are made by the SOC, the Company Lead Environmental Specialist and the SOC shall confer and use the gathered information to make any necessary subsequent verbal and written notifications to regulatory agencies.

(3) If a spill poses an immediate threat to human health or the environment, the CI, EI or MO shall immediately contact the Local Emergency Planning Committee (LEPC). When determining if the LEPC should be contacted, any gas release to the atmosphere must be taken into consideration. Note: Linear Projects may extend through multiple LEPC jurisdictions. As a result, all jurisdictions must be listed below.

The appropriate LEPC is:

Name:	*To be inserted*
Organization:	*To be inserted*
Phone Number:	*To be inserted*

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5.3 EMERGENCY SPILL RESPONSE CONTRACTORS

The Company has arrangements with several emergency spill response contractors to address emergency responses beyond the capabilities of the Contractor.

If necessary, the following firms could be utilized for this project:

Company: *To be inserted*

Name:

Location:

Phone Number:

Company:

Name:

Location:

Phone Number:

5.4 LOCAL EMERGENCY RESPONDERS

The Contractor or the CI (or MO) may call the following local emergency responders should their assistance be required: Note: Linear Projects may extend through multiple Emergency Responder areas. Contractor must insure all jurisdictions are listed. Use attachments as needed.

Service	Telephone Number
Emergency Medical Services	*To be inserted*
Hospital	*To be inserted*
Fire	*To be inserted*
Police	*To be inserted*

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SECTION 6 – CLEAN-UP PROCEDURES

The following section outlines specific procedures to be followed when addressing spills:

6.1 SPILLS

(1) Small spills and leaks must be remediated immediately. Use adsorbent pads wherever possible.

(2) Restrict spills to the containment area if possible by stopping or diverting flow.

(3) If the spill exceeds the containment structure's capacity, immediately construct additional containment using sandbags or fill material. Every effort must be made to prevent the spills from entering a water body.

(4) If a spill reaches a water body, immediately place oil booms downstream in order to contain the material. As soon as possible, remove the floating layer with absorbent pads.

(5) After all recoverable spilled material has been collected, place all contaminated PPE, spill clean-up equipment, and any impacted soil into appropriate containers.

(6) For significant quantities of impacted soils, construct temporary waste piles using plastic sheets. This material should subsequently be transferred into lined roll-off boxes as soon as feasible.

(7) The Company Lead Environmental Representative will coordinate all waste characterization, profiling, and disposal activities.

6.2 EQUIPMENT CLEANING/STORAGE

(1) Upon completion of remedial activities, the Contractor shall be responsible for decontaminating reusable emergency response equipment and PPE.

(2) The Contractor shall be responsible for replacing any spent emergency response equipment and PPE prior to resuming construction-related activities.

(3) Decontamination rinse fluids shall be collected and containerized. The Company Lead Environmental Representative will coordinate waste characterization and disposal activities.

(4) Reusable PPE shall be tested and inventoried prior to being placed back into service.

6.3 WASTE DISPOSAL

The Contractor may be responsible for waste management and waste disposal or any waste generated as the result of a spill (review contract language and project specifics); however, The Lead Environmental Representative will coordinate all waste characterization, profiling, and disposal activities.

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APPENDIX A

TABLE I: LIST OF EMERGENCY CONTACTS

Names	Job Description	Phone Number
Security Operations Center		855-945-5762 (24-hrs)
To be inserted	Chief Inspector	*to be inserted by*
To be inserted	Manager, Operations	*to be inserted by*
To be inserted	Company Lead Environmental Specialist	*to be inserted by*
Contractor	**Job Description**	**Phone Number**
To be inserted	Emergency Coordinator	*to be inserted by*
To be inserted	Alternate Emergency Coordinator	*to be inserted by*
Regulatory Agencies	**Name**	**Phone Number**
	National Response Center	800/424-8802
	State Environmental Agency	*To be inserted*

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APPENDIX B

SPILL/RELEASE REPORTING CHECKLIST

APPENDIX B SPILL / RELEASE REPORTING CHECKLIST			
Please see below for a summary of information to be obtained for reporting spills / releases:			**Comments**
Name Title, Company and Phone number of Person Reporting Incident	☐		
Spill / Release Location, Project, Facility, ROW (State, county, city, township, range, address, coordinates, if on ROW-nearest crossroads)	☐		
Date of Spill/Release	☐		
Was material released as a liquid, solid, or gas	☐		
Description of material released (oil, hydraulic fluid, glycol, condensate, etc.)	☐		
Time of Spill/Release	☐		
Estimated amount (volume or weight) of material spilled / released (Specify unit - gal, ft^3, lbs, etc.)	☐		
Has spill / release been stopped?	☐		
Duration of Spill/Release (Date and Time release was stopped)	☐		
Affected Media (Land, Water, Air, secondary containment, building)	☐		
Has affected area of spill / release been cleaned up?	☐		
Duration of spill / release cleanup activities	☐		
Estimated volume and/or weight of cleaned up material. Specify type of material removed, such as soil, concrete, pads, and unit of measure (gal, ft^3, lbs, etc.)	☐		
Containment of cleaned up material (drum, tank, roll-off) and location (spill site, contractor yard, station)	☐		
Brief description of cause of spill / release	☐		
Complete Form WGP-0187	☐		
Contacted:	Supervisor	☐	
	Pipeline Control	☐	
	Environmental Services Manager	☐	
	Environmental Field Rep	☐	
Notes:			

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APPENDIX C

EMERGENCY SPILL RESPONSE AND PERSONAL PROTECTIVE EQUIPMENT

Equipment Inventory Option (to be determined by Company):

_____ **Option 1 – Adequate supplies as determined by the Contractor (min = supplies to respond to a 5 gal spill).**

_____ **Option 2 – As Directed by a Company representative with below minimum requirements.**

Equipment	Quantity	Location
(1) chemical spill kit	1	Office or storage accessible within 1 hour
(2) oil spill kit	1	adjacent to work space and fuel service vehicles

SPILL KIT CONTENTS:

(1) 1 bag loose chemical pulp	3 chemical pillows (18” x 18”)
3 chemical socks (48” x 3”)	10 chemical mats/pads (24” x 24”)
1 box contractor-sized, 6-mil, disposal polyethylene bags (w/ ties)	
blank drum labels	one 30-gallon PE open-head drum or equal
2 shovels	
(2) 1 oil boom (100’ x 3”)	10 oil pillows (18” x 18”)
10 oil socks (48” x 3”)	25 oil mats/pads (24” x 24”)
1 box contractor-sized, 6-mil, disposal polyethylene bags (w/ ties)	
blank drum labels	three, 55-gallon PE open-head drums
4 shovels	
Detergent (Dawn, Simple Green,etc…)	Spray Bottles

PERSONAL PROTECTIVE EQUIPMENT:

The inventory of PPE should include enough for at least 4 responders reacting to a significant leak/spill including the below items.

Splash goggles, half-face respirators (w/ cartridges for benzene),
Tyvek suits, nitrile gloves, waterproof/ chemical resistant hip-waders

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APPENDIX S3-5

AIDS TO NAVIGATION PLAN

Pennsylvania Fish & Boat Commission

established 1866

August 6, 2019

WHM Consulting, Inc
ATTN Paul Fisher, PWS
2525 Green Tech Drive, Suite B
State College, PA 16803

I have reviewed the recently submitted Aids to Navigation Plan for the Leidy South Project, Young Woman's Creek, Chapman Twp., Clinton County. The Plan is acceptable as submitted and has been approved. All signage/buoys must be installed prior to construction and inspected frequently to ensure it is always visible to boaters. Any changes to this plan must be submitted directly to this office for further review. If buoys are to be utilized PFBC-277 Application to Install Floating Structures/Private Aids to Navigation must be submitted and approved prior to installation.

I will share the approved ATON plan with the PA Fish & Boat Commission Division of Environmental Services and the Regional Law Enforcement Office to ensure they are aware of the project. Please advise the contractor that the project site may be inspected at any time by Bureau of Law Enforcement personnel for compliance with this plan. A copy of the approved plan along with this letter should be available for inspection if requested.

Please feel free to contact me if you have any questions concerning this project or the PA Fish & Boat Commission Aids to Navigation program in general.

Sincerely,

Clyde Warner, Captain
Bureau of Law Enforcement

Cc: (electronic) SE Region BLE-DES

Transcontinental Gas Pipe Line Company, LLC

AIDS TO NAVIGATION PLAN
Young Womans Creek (S1-T4-HL)

LEIDY SOUTH PROJECT

Chapman Township

Clinton County, Pennsylvania

Submitted to:
Pennsylvania Fish and Boat Commission
P.O. Box 67000
Harrisburg PA 17106

August 2019

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ATTACHMENT A

PROJECT NARRATIVE

Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams) is proposing the Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6

Per Chapter 113.1 of the Pennsylvania Administrative Code (Title 58 Recreation), the Pennsylvania Fish and Boat Commission regulates the placement of aids to navigation (ATON) within waters not marked by the United States Coast Guard. The Pennsylvania Fish and Boat Commission requires, "persons, including clubs, individuals, State agencies, municipalities and other groups, wishing to establish an aid shall apply for permission from the Commission." To that end, Transco is submitting this application for the placement of aids to navigation within Young Womans Creek (S1-T4-HL) associated with the construction of the Project.

A component of the Project is the Hilltop Loop. The Hilltop Loop will cross S1-T4-HL between mile post 184.9 and 185.0 in Chapman Township, Clinton County. Attachment B includes a United States Geologic Survey 7.5-Minute topographic map depicting the location of the Project's crossing. S1-T4-HL is approximately 100 feet wide at the proposed crossing location. Photographs of the proposed crossing are shown in Attachment C. Construction activities include the installation of a 36-inch natural gas pipeline with a minimum of four feet of cover over the pipeline, below the streambed, unless in shallow bedrock.

Construction Schedule

Construction of the Project is anticipated to commence in winter 2020/2021. A final construction schedule for the Project has not been determined at this time. The Pennsylvania Fish and Boat Commission will be notified 60 days prior to the start of construction activities at the crossing of S1-T4-HL. Aid to Navigation Plan (ATON), Sign Details, and Timing

Construction Methods

Transco proposes to utilize a dry-crossing construction method (Dam-and-Pump or Cofferdam) at the S1-T4-HL crossing. Dry-crossing construction methods are described as follows:

Dam-and-Pump

The dam-and-pump construction method is employed to temporarily divert stream flow around the construction area and discharge the water downstream. This method allows downstream flow to be maintained at all times, while also creating a dry work area. Multiple discharge pumps may be required to keep the area dry and maintain adequate flow, to avoid flooding upstream. Pumps and hoses will be sized to accommodate flow, in accordance with the applicable regulations. After the pump or pumps are installed, damming structures such as concrete jersey barriers, water bladders, port-a-dams, steel plates, and/or sand bags, are installed upstream and downstream of the proposed pipeline trench. At the time of construction, the stream will be evaluated and depending on the stream's depth, flow velocity, channel width, streambed material, and flow type, one of the above damming structures will be used.

Once the dam-and-pump and damming structures are in place, the trench will be excavated, and the pipe installed in the dry ditch. Following the installation of the pipeline, the trench will be backfilled with natural streambed material to pre-existing elevations and the dam-and-pump will be removed to allow natural flow to resume within the stream channel.

Cofferdam

The cofferdam construction method involves the installation of temporary dam that extends from one stream bank to approximately the center of the stream channel, which allows for the diversion of stream flow to the opposite half of the stream channel; thereby, maintaining downstream flow at all times. Prior to excavation, sandbags, sandbag/plastic sheeting diversion structures, metal road plates or the equivalent, will be used to develop an effective seal, and to divert stream flow through to the opposite side of the stream channel.

During excavation, equipment will only work within the dry area behind the cofferdam, while regular flow is maintained outside of this area within the remaining portion of the stream channel. The pipeline will be place approximately halfway across the stream, and the trench will be

backfilled to pre-existing elevations with natural streambed material. The coffer dam will remain in place and be maintained until restoration of the waterbody is complete for that portion of the installation. Following restoration, the cofferdam will be removed and installed from the opposite bank for the remaining half of the pipeline installation, which will follow the above-referenced procedures.

The Young Womans Creek, at the project location, is not large enough for motorized boats, therefore the plan is developed to provide safety for non-motorized boats (canoes and kayaks) which will travel in a southwestern direction with flow. To enable navigation safely around the work area, signage will be placed as shown on the attached plan and will include warning, portage, and exit signs (as needed). Details for each sign are attached. Signs will be placed at least two weeks prior to commencement of the crossing and will remain in place for the duration of the construction. Upon completion of all work, the signs will be removed.

Signage / Plan Routing Details

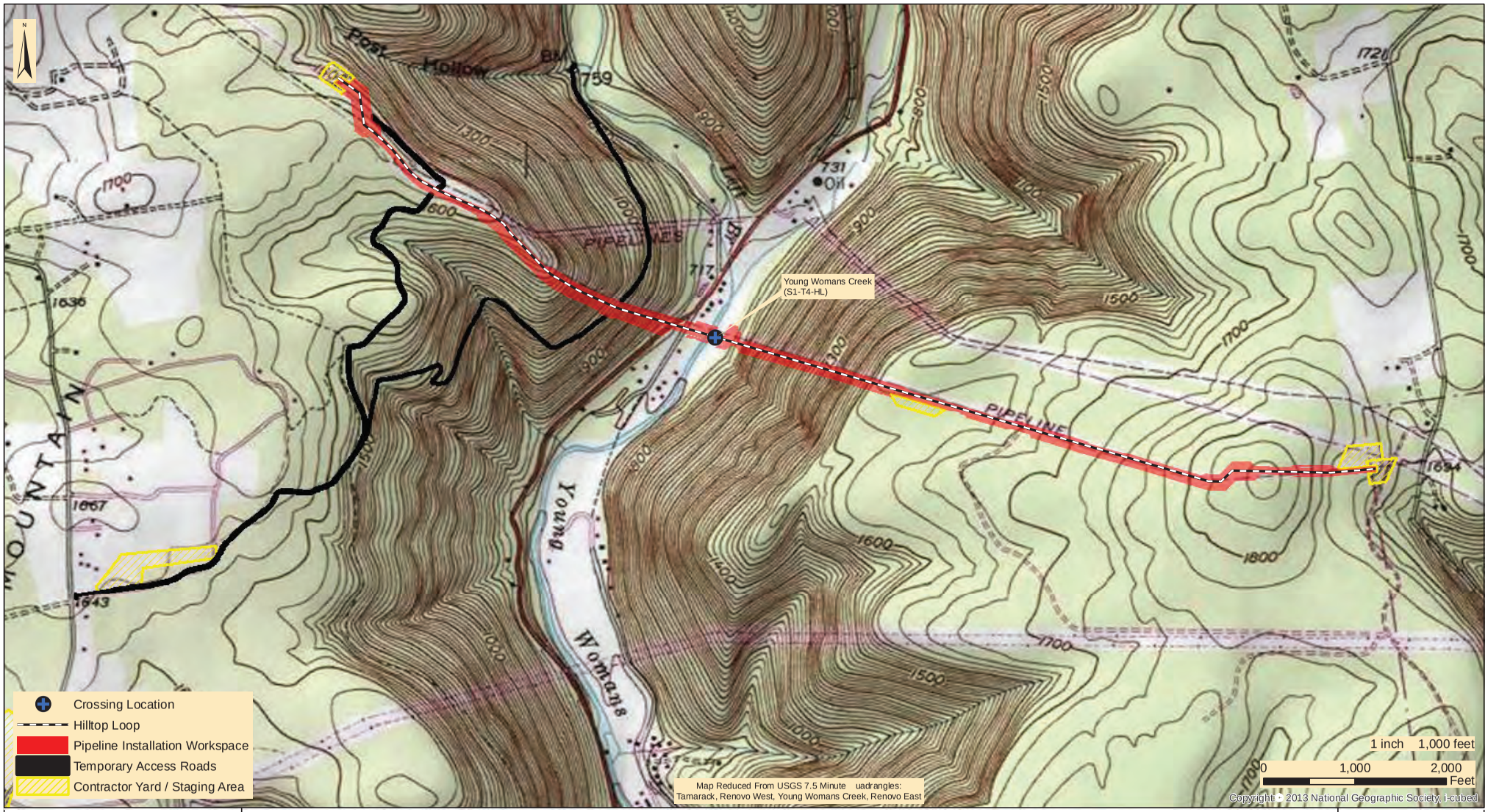
Proposed signage will be placed in accordance with U.S. Coast Guard and Pennsylvania Fish and Boat Commission specifications and will consist of rectangular information signs showing the location of the submerged pipeline and the portage area. Signage will be placed at least two weeks prior to the commencement of the crossing and will remain in place for the duration of construction. Canoers and kayakers will be instructed to exit on the right side facing downstream of the creek above and below the project area.

A plan view of the proposed signage locations are shown in Attachments D & E. Signs will be worded as follows:

1. WARNING – PIPELINE CONSTRUCTION USE EXTREME CAUTION WHEN BOATING IN THIS AREA.
2. PORTAGE 200 FEET AHEAD
3. PORTAGE – ALL BOATS EXIT HERE
4. BOATS KEEP OUT
5. PORTAGE – ALL BOATS RE-ENTER HERE

ATTACHMENT B

PROJECT CROSSING LOCATION MAP



WHM consulting, INC.
designs, permits, resolutions
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PRO ECT

LEIDY LINE D 36" HILLTOP LOOP
AIDS TO NAVIGATION PLAN
PROJECT CROSSING LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	07/30/19
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	KMC
Figure Number:	1

ATTACHMENT C
PHOTOGRAPHS

ID: Photo 1

Date: 4/04/2019

Taken by: DW

Comments: This photo depicts a northwestern view looking across Young Womans Creek.

ID: Photo 2

Date: 4/04/2019

Taken by: DW

Comments: This photo shows a southwestern view looking downstream of Young Womans Creek

ID: Photo 3

Date: 4/04/2019

Taken by: DW

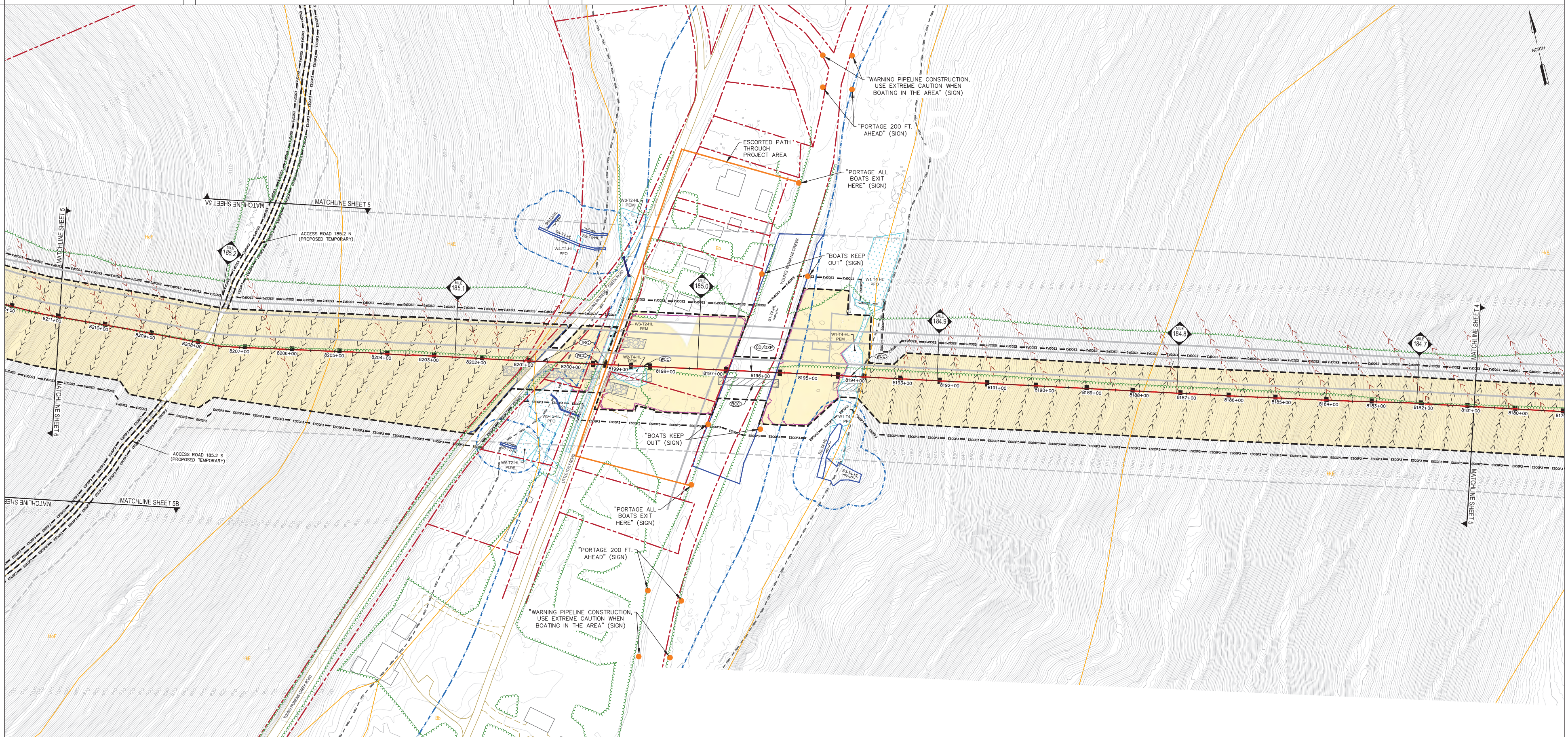
Comments: This photo depicts a northern view looking upstream of Young Womans Creek.

ATTACHMENT D

SITE SPECIFIC PLAN DRAWING

OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS 7-25915	MARK A. JONES 7-3928-33	MARK A. JONES 7-3928-33	THOMAS WILSON 7-3934	MUNICIPAL BOUNDARY	ESTATE OF ROBERT J. GLEICHERT 7-4063
PROFILE (MIN. PIPE DEPTH)	3'	5'	3' / 5'	3'	4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		WETLAND	WETLAND/RESIDENTIAL AREA/MAINTAINED ROW	OPEN WATER / WETLAND	MIXED FOREST LAND/MAINTAINED ROW
SOIL TYPE	HoF / HxE			Bb		HoF / HxE
AVERAGE % SLOPE	60% / 21% / 53%			<2%		55%

ALIGNMENT



LEGEND

- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- RIPARIAN PLANTING AREAS
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- APPROXIMATE EXISTING WATERBAR
- TIMBER MAT/BRIDGE
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- EXISTING GRADE CONTOURS (10' C.I.)
- EXISTING GRADE CONTOURS (2' C.I.)
- 12" COMPOST FILTER SOCK
- 18" COMPOST FILTER SOCK
- 24" COMPOST FILTER SOCK
- 32" COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP

SOIL LEGEND

Bb	BARBOUR-CRAIGSVILLE COMPLEX
HxE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80% SLOPES
HoF	HAZLETON-LAIDIG GRAVELLY LOAM, EXTREMELY STONY, 25 TO 50% SLOPES

SCALE IN FEET 0 100 200 300 1" = 100'

WHM consulting, INC.

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

Williams.

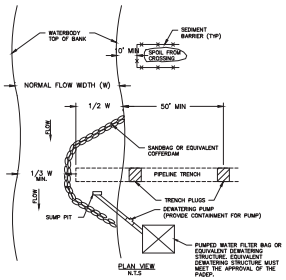
DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION	REVISION:
APPROVED BY:	DATE:		SHEET 1 OF 5
WO: 1211227	RID:	DRAWING NUMBER:	

PIPELINE WORK SEQUENCE AT YOUNG WOMAN CREEK CROSSING

1. MAKE NOTIFICATIONS TO THE PA FISH AND BOAT COMMISSION A MINIMUM OF 10 DAYS PRIOR TO CONSTRUCTION.
2. INSTALL APPROPRIATE PFBC AID TO NAVIGATION SIGNAGE.
3. PRIOR TO INITIATING CONSTRUCTION OF A STREAM CHANNEL LARGER THAN 10 FEET CONTRACTORS AND ENVIRONMENTAL INSPECTOR SHALL EVALUATE WEATHER FORECASTS FOR ANTICIPATED INCLEMENT WEATHER WHICH MAY RESULT IN FLOW CONDITIONS UNSUITABLE FOR CONSTRUCTION. BEFORE CONSTRUCTION OF A STREAM CROSSING GREATER THAN 10 FEET, ENVIRONMENTAL INSPECTOR, FOREMAN, AND ANY OTHER RESPONSIBLE INDIVIDUAL SHOULD SIGN-OFF THAT THE CROSSING CAN BE CONSTRUCTED DURING THE SPECIFIC TIME FRAME.
4. IF INCLEMENT WEATHER IS ANTICIPATED, A CONTINGENCY PLAN WILL BE DISCUSSED TO AVOID THE STREAM CROSSING DURING THE POTENTIALLY UNSUITABLE CONDITIONS.
5. AFTER INSTALLATION OF APPROPRIATE E&S BMPS, INSTALL TEMPORARY EQUIPMENT BRIDGE IN ACCORDANCE WITH DETAILS.
6. FOR DRY OPEN CUT CROSSINGS, INSTALL DAM AND PUMP OR COFFERDAM AS DESCRIBED IN STREAM CROSSING DETAILS.
7. DEWATER WORK AREA. WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT FILTER BAG. WHERE POSSIBLE, EXCAVATION SHALL BE FROM THE TOP OF THE STREAM BANK.
8. INSTALL PIPE.
9. A UTILITY LINE CROSSING OF A STREAM CHANNEL (DITCHING AND STABILIZATION FROM TOP OF BANK TO TOP OF BANK) SHALL BE COMPLETED WITHIN 24 HOURS FOR STREAM CHANNELS 10 FEET OR LESS AND 48 HOURS FOR STREAM CHANNELS BETWEEN 10 – 100 FEET UNLESS SPECIFICALLY OUTLINED IN THE APPROVED PERMIT OR AUTHORIZED BY PADEP.
10. STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

(ATON) AID TO NAVIGATION (ATON) SIGNAGE



PADEP STANDARD NOTES:

1. GRUBBING SHALL NOT TAKE PLACE WITHIN 50 FEET OF TOP-OF-BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE AN PIPE IS READY FOR INSTALLATION.
2. TRENCH PLUG SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE WATERBODY CHANNEL.
3. WATER ACCUMULATING WITHIN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.
4. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM THE TOP OF WATERBODY BANK.
5. ALL EXCESS EXCAVATED MATERIAL SHALL BE IMMEDIATELY REMOVED FROM THE WATERBODY CROSSING AREA.
6. ALL DISTURBED AREAS WITHIN 50 FEET OF TOP-OF-BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR WATERBODIES OR 48 HOURS OF INITIAL DISTURBANCE FOR INTERMEDIATE WATERBODIES UNLESS OTHERWISE AUTHORIZED (SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

1. THE WATERBODY CROSSING WILL GENERALLY BE COMPLETED IN 2 STAGES. THE DETAIL DEPICTS STAGE 1. STAGE 2 WILL GENERALLY BE COMPLETED USING THE SAME CONFIGURATION FROM THE OPPOSITE BANK;
2. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
3. THE 24–48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
4. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24–48 HOUR TIMEFRAMES WHERE SPECIFIED.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

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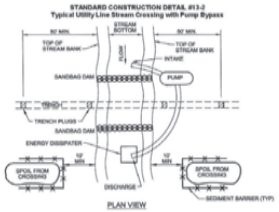
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

(CD) COFFERDAM STREAM CROSSING



PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Bypass pump intake shall be maintained a sufficient distance from the bottom to prevent pumping of channel bottom materials.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #12-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any receiving surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized.

Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

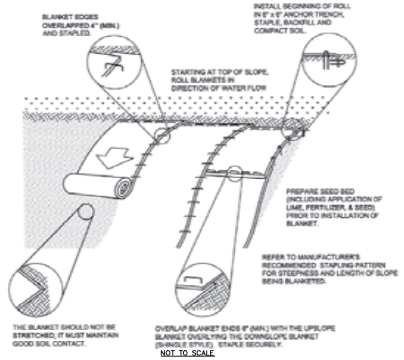
WILLIAMS STANDARD NOTES:

1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24–48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24–48 HOUR TIMEFRAMES WHERE SPECIFIED.
4. DAM-AND-PUMPS MAY ONLY BE IN THE STREAM FOR TWO WEEKS.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

(DPX) DAM AND PUMP STREAM CROSSING



NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
5. STAPLING OF THE BLANKET SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.
7. BIODEGRADABLE STAPLES SHALL BE USED.

WILLIAMS SUPPLEMENTAL NOTES:

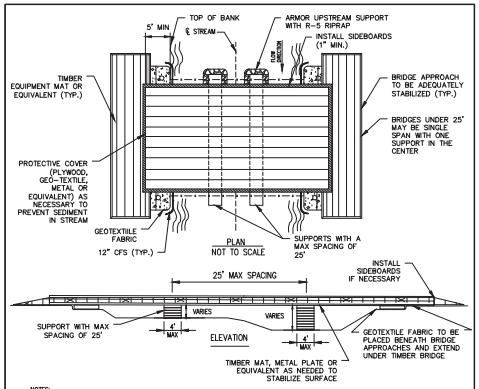
1. CONTRACTOR SHALL USE SINGLE MAT STRAW FOR SLOPES FLATTER THAN 3:1.
2. HYDRAULIC APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF ECB.
3. EROSION CONTROL MATS SHOULD CONSIST OF NATURAL MATERIALS. NO PLASTIC OR SYNTHETIC MATERIALS SHALL BE USED. MATTING SUCH AS NORTH AMERICAN GREEN S150BN OR EQUIVALENT SHALL BE USED.

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP STANDARD CONSTRUCTION DETAIL (E1-1).

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

(ECB) EROSION CONTROL BLANKET



NOTES:

1. THIS TYPE OF BRIDGE IS GENERALLY USED FOR INTERMEDIATE TO LARGE STREAM CROSSINGS GREATER THAN 20' IN WIDTH IN COMBINATION WITH A PROPER STREAM BANK CONFIGURATION.
2. BOTTOM CHORD OF BRIDGE STRUCTURE SHALL BE CONSTRUCTED ABOVE ORDINARY HIGH WATER MARK/TOP OF BANK.
3. BRIDGE TO REMAIN IN PLACE UNTIL THE COMPLETION OF FINAL RESTORATION.
4. A "SKIRT" FORMED OF GEOTEXTILE FABRIC OR EQUIVALENT SHALL BE PLACED ON THE SIDES AND BOTTOM OF THE BRIDGE TO TRAP SEDIMENT.
5. INDIVIDUAL MATS SHALL BE ANCHORED AND BUTTED TIGHTLY TO MINIMIZE THE INTRODUCTION OF SEDIMENT TO THE WATER BODY.
6. COMPOST FILTER SOCK WILL BE PLACED AT THE EDGE OF EQUIPMENT BRIDGE AT THE END OF THE WORK DAY TO PREVENT EROSION BUT WILL BE REMOVED DURING CONSTRUCTION ACTIVITY.
7. CONTRACTOR SHALL EXTEND TIMBER MAT BRIDGE A MINIMUM OF 10' BEYOND TOP OF STREAM BANK. ABUTMENTS MAY BE KEYED INTO BANK WHERE NEEDED TO INSURE SAFETY.
8. BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
9. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
10. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
11. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
12. RUNOFF FROM ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
13. INSTALLATION AND REMOVAL OF INSTREAM SUPPORT SHALL ADHERE TO TIME OF YEAR RESTRICTIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

(BCC) BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

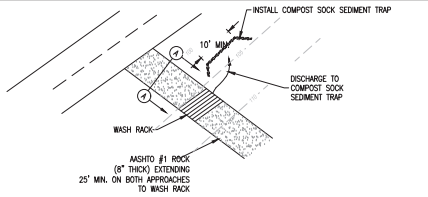
REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

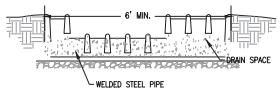
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

Williams

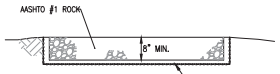
DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 2 OF 5
WO: 1211227	RID:		



PLAN VIEW



WASH RACK

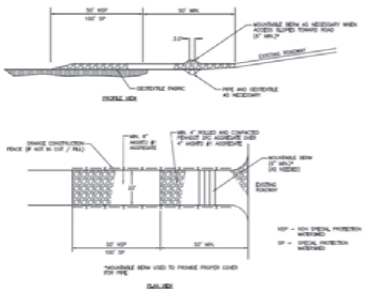


SECTION A-A

NOTE:
1) WASH RACK SHALL BE 30 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS, WHICHEVER IS GREATER.
2) WASH RACK SHALL BE CONSTRUCTED TO ACCOMMODATE ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.
3) A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL VEHICLES EXITING THE SITE.
4) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. DRAIN SPACE UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. WASHING THE ROADWAYS OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

CONSTRUCTION ENTRANCE (CE)
TEMPORARY EROSION CONTROL MEASURE

Example Alternative Rock Construction Entrance



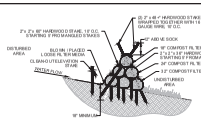
NOTES:
1) REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2) MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
3) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
4) STREET SWEEPING ON PAVED ROADS
   a. USE A VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT.
   b. AT A MINIMUM – ANY DAY IN WHICH CONSTRUCTION TRAFFIC IS EXITING THE ROCK CONSTRUCTION ENTRANCE, THE VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT SHALL CLEAN THE ROAD WAY AT THE END OF THE WORK DAY AND PRIOR TO ANY FORECASTED RAIN EVENT.
5) STREET SWEEPING ON DIRT OR GRAVEL SURFACE PUBLIC ROADS
   a. RIGOROUS MANUAL REMOVAL OF MUD/DIRT FROM VEHICLE/EQUIPMENT TIRES PRIOR TO EXITING CONSTRUCTION SITE, SUPPLEMENTED BY IMMEDIATE RECOVERY, BY MANUAL OR MECHANICAL MEANS, OF SOIL WHICH MAY BECOME DISCHARGED ONTO PUBLIC ROADWAYS. DUST CONTROL AND/OR COMPACTION VIA ROLLING OF THE DIRT PUBLIC ROAD SURFACE WILL BE IMPLEMENTED AS NEEDED.

CONSTRUCTION ENTRANCE (ALTERNATIVE) (CE)
TEMPORARY EROSION CONTROL MEASURE

PENNSYLVANIA

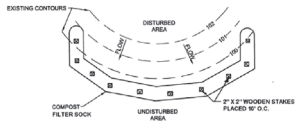
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(CE) CONSTRUCTION ENTRANCE
GAS PIPELINE



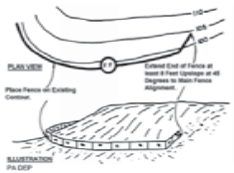
TRIPLE STACK SOCK TRAP SECTION
N.T.S.

SECTION VIEW
NTS



PLAN VIEW
NOT TO SCALE

FIGURE 4.1
Sediment Barrier Alignment



NOT TO SCALE

NOTES:
1. ALL MATERIAL TO MEET MANUFACTURER SPECIFICATIONS.
2. COMPOST FILTER SOCK FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY CONSTRUCTION CONTRACTOR.
4. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.
5. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
6. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
7. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION WITH ADDITIONAL SOCK OR ROCK FILTER.
8. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
9. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.5
MOISTURE CONTENT	30% – 40%
PARTICLE SIZE	30% – 50% PASS THROUGH 3/8" SIEVE
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

MATERIAL TYPE	3 mil HDPE	5 mil HDPE	5 mil HDPE	MULTI-FILAMENT POLYPROPYLENE (MFPP)	HEAVY-DUTY MULTI-FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE	BIO-DEGRADABLE	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		20 psi	20 psi	44 psi	202 psi
ULTRAVIOLET STABILITY (% ORIGINAL STRENGTH) (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS
TWO-PLY SYSTEMS					
INNER CONTAINMENT NETTING				HDPE BIAXIAL NET CONTINUOUSLY WOUND FUSION-WELDED JUNCTURES 3/4" x 3/4" MAX. APERTURE SIZE	
OUTER FILTRATION MESH				COMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON-WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH) 3/16" MAX. APERTURE SIZE	
SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.					

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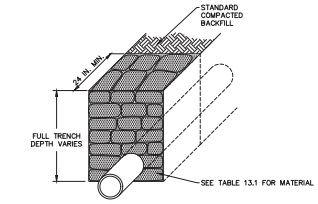
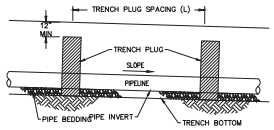
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(CFS) COMPOST FILTER SOCK
GAS PIPELINE



SECTION VIEW
NOT TO SCALE



PROFILE VIEW
NOT TO SCALE

TABLE 13.1
MAXIMUM SPACING AND MATERIALS FOR TRENCH PLUGS

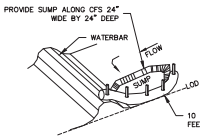
TRENCH SLOPE (%)	SPACING L (FT)	TRENCH PLUG MATERIAL FOR FILLED SACKS
<5	1,000	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
5 – 15	500	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
15 – 25	300	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
25 – 35	200	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
35 – 100	100	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
>100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

*TOPSOIL MAY NOT BE USED TO FILL SACKS.

IMPERVIOUS TRENCH PLUGS ARE REQUIRED FOR ALL STREAM, RIVER, WETLAND, OR OTHER WATER BODY CROSSINGS. FOAM TRENCH PLUGS ARE AN APPROVED ALTERNATE E&S BMP.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
(TP) TRENCH PLUG INSTALLATION



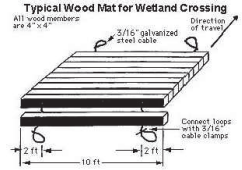
NOTES:
1. 10 LINEAR FEET OF 18 INCH COMPOST FILTER SOCK (CFS) SHALL BE INSTALLED WITH ONE END RESTING ON THE WATERBAR AS PER DETAIL CFS, ALLOWING FOR 8 FEET OF EFFECTIVE LENGTH AND A SPECIFIED FLOW THROUGH RATE OF 15 GALLONS PER MINUTE PER LINEAR FOOT. A PASS THROUGH FLOW OF 0.26 CUBIC FEET PER SECOND CAN BE ACCOMMODATED THROUGH THE FILTER SOCK. THIS FLOW RATE IS ADEQUATE FOR 20,000 SQUARE FEET OF DRAINAGE AREA FOR THE 2-YEAR, 24-HOUR STORM, 5 MINUTE TIME OF CONCENTRATION (RATIONAL METHOD).
2. CONSTRUCTION OF A 24" WIDE AND 24" DEEP SUMP AT THE DISCHARGE END OF THE WATERBAR WILL REDUCE VELOCITY AND PROVIDE A SHEET FLOW CONDITION TO THE CFS. THE SUMP SHALL BE MAINTAINED AND CLEANEDOUT WHEN IT BECOMES A MINIMUM OF 12" DEEP. THE SUMP SHALL BE FILLED AND STABILIZED WHEN THE CFS IS REMOVED AFTER SITE STABILIZATION.
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN ACCORDANCE WITH WILLIAMS STANDARDS. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
(OS) CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION

FIGURE 3.7
Typical Wood Mat for Wetland Crossing

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP FIGURE 3.07.



University of Minnesota FS 07009
A geotextile underlayment shall be used under the wood mat.

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(MAT.1) TIMBER MATTING CONSTRUCTION

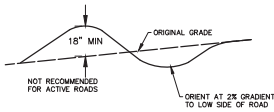
KEVIN CLARK, P.E.
PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

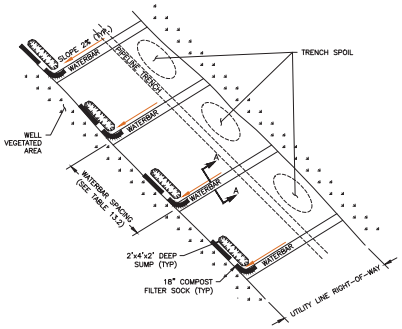
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

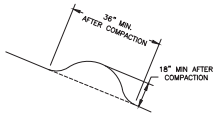
DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 3 OF 5
W.O. 1211227	R.I.D.		



PLAN VIEW
N.T.S.



LAYOUT VIEW
N.T.S.



SECTION A–A

NOTES:

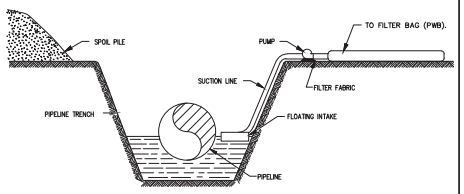
1. DURING CONSTRUCTION, WATERBARS SHALL BE PREPARED AT THE END OF EACH WORK DAY AND PRIOR TO STORM EVENTS.
2. AFTER EARTH DISTURBING WORK HAS BEGUN, WATERBARS SHALL BE INSTALLED AT THE SPACING SHOWN IN THE ABOVE TABLE OR AS SHOWN ON THE DRAWINGS. WATERBARS SHALL BE IMMEDIATELY STABILIZED WITH EROSION CONTROL BLANKET.
3. TEMPORARY AND PERMANENT WATERBARS ARE REQUIRED AT ALL WATERBODY CROSSINGS AND UPSLOPE FROM ALL WETLAND BOUNDARIES.
4. THE WATERBAR OUTLET SHALL BE LOCATED WHERE RUNOFF WILL BE RELEASED ONTO AN EXISTING WELL–VEGETATED AREA. AN OUTLET STRUCTURE (OS) MUST BE INSTALLED AT THE WATERBAR OUTLET.
5. WHEREVER EDIBLE SOILS ARE PRESENT, OR WHERE THERE IS NOT A SUFFICIENT VEGETATIVE FILTER STRIP BETWEEN THE WATERBAR AND A RECEIVING SURFACE WATER, THE WATERBAR SHOULD BE PROVIDED WITH A TEMPORARY PROTECTIVE LINER.

TABLE 3.1 – MAXIMUM WATERBAR SPACING

PERCENT SLOPE	SPACING (FT)
<5	250
5–15	150
>15–30	100
>30	50

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE, LLC
STANDARD ENVIRONMENTAL DETAIL
WB WATERBAR
GAS PIPELINE



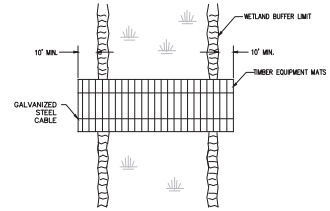
ELEVATION
N.T.S.

NOTES:

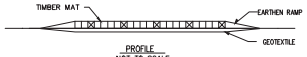
1. WATER PUMPED OUT OF TRENCH SHALL NOT BE DISCHARGED INTO WATERWAYS. WATER SHALL BE DISCHARGED INTO A FILTER BAG OR DEWATERING STRUCTURE.
2. PUMP SHALL BE CONTROLLED SO THAT DISCHARGE DOES NOT OVERFLOW DEWATERING STRUCTURE.
3. PUMP SUCTION HOSE MUST NOT BE ALLOWED TO COME IN CONTACT WITH TRENCH BOTTOM. PROVISIONS MUST BE MADE TO ELEVATE THE SUCTION HOSE TO AT LEAST ONE FOOT ABOVE THE BOTTOM OF THE PIPE TRENCH UNTIL BOTTOM DEWATERING IS NECESSARY.
4. DEWATERING SHALL NOT OCCUR DURING TIMES OF HEAVY RAINFALL EXCEPT AS REQUIRED TO PREVENT FLOODING OF CONSTRUCTION EQUIPMENT LOCATED IN BORE PITS AND TRENCHES.
5. PUMP WATER FILTER BAG (PWB) SHALL BE PLACED ON A WELL VEGETATED AREA AWAY FROM CONSTRUCTION SO THAT FILTERED WATER IS NOT RETURNED TO THE TRENCH.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TD TRENCH DEWATERING



PLAN
NOT TO SCALE



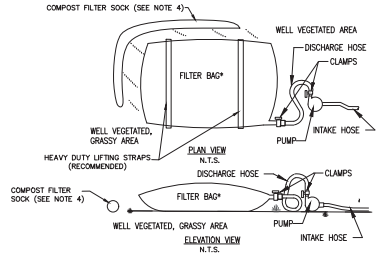
PROFILE
NOT TO SCALE

NOTES:

1. PERIODICALLY CHECK INSTALLATION AND REMOVE BUILD–UP OF SEDIMENT OR DEBRIS.
2. MATERIALS PLACED IN WETLANDS SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN–UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
3. IF A WATERBODY IS LOCATED WITHIN A WETLAND SYSTEM, EXTEND TIMBER EQUIPMENT MATS TO THE BRIDGE EQUIPMENT CROSSING (BEC) USED TO CROSS THE WATERBODY IN ORDER TO ALLOW FOR CONTINUOUS TIMBER EQUIPMENT MAT COVERAGE THROUGH THE WETLAND AND WATERBODY AREA.
4. USE ADDITIONAL TIMBER MAT LAYERS TO RAISE CROSSING ABOVE GRADE WHERE POOR SOIL CONDITIONS EXIST.
5. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WETLAND BOUNDARIES.
6. INSTALL EARTHEN RAMP APPROACHES TO TIMBER EQUIPMENT MATS. EARTHEN RAMPS TO BE CONSTRUCTED OF UPLAND MATERIAL, TOP SOIL SHALL NOT BE USED TO CONSTRUCT EARTHEN RAMPS.
7. A GEOTEXTILE UNDERLAYMENT SHALL BE USED UNDER THE WOOD MAT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WEC WETLAND EQUIPMENT CROSSING



LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON–WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED 4–TYPE. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS MAY BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D–4884	60 LB/IN
GRAB TENSILE	ASTM D–4632	205 LB
PUNCTURE	ASTM D–4833	110 LB
MULLEN BURST	ASTM D–3786	350 PSI
UV RESISTANCE	ASTM D–4355	70%
AOS % RETAINED	ASTM D–4751	80 SIEVE

NOTES:

1) A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME ½ FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS TO BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.

2) BAGS SHALL BE LOCATED IN WELL–VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON–ERODIBLE AND NON–POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.

3) NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST WORM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.

4) THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.

5) THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR ½ THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.

6) FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

7) CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF USED FILTER BAGS UPON COMPLETION OF DEWATERING OPERATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
PWB PUMP WATER FILTER BAG

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
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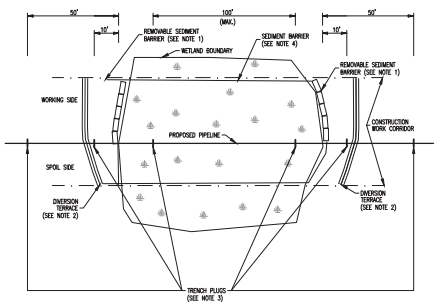
WO: 1211227	R/D:		



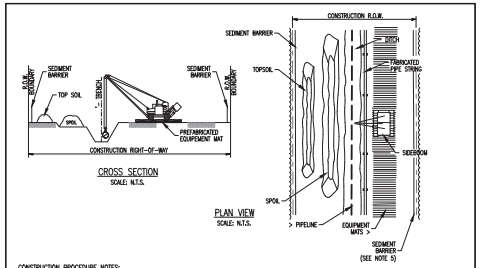
NOTES:

1. INSTALL REMOVABLE SEDIMENT BARRIERS (COMPOST FILTER SOCK) OR DRIVEABLE BERMS ACROSS THE TRAVEL LANE AT BOTH WETLAND BOUNDARIES. THE REMOVABLE SEDIMENT BARRIERS CAN BE REMOVED DURING THE CONSTRUCTION DAY, BUT MUST BE RE-INSTALLED AFTER CONSTRUCTION HAS STOPPED FOR THE DAY AND/OR WHEN HEAVY PRECIPITATION IS IMMINENT.
2. INSTALL DIVERSION TERRACES IMMEDIATELY UPSLOPE OF BOTH WETLAND BOUNDARIES TO PREVENT SEDIMENT FROM ENTERING THE WETLAND.
3. INSTALL TRENCH PLUGS TEN (10) FEET FROM THE EDGE OF A WETLAND; FIFTY (50) FEET FROM THE EDGE OF A WETLAND; PLACE A MINIMUM OF ONE (1) TRENCH PLUG AT A MAXIMUM SPACING OF 100 FEET BETWEEN TRENCH PLUGS WITHIN A WETLAND TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED UPLAND TRENCH WATER OUT OF WETLAND. WETLAND CROSSINGS LESS THAN FIFTY (50) FEET DO NOT REQUIRE AN INTERNAL TRENCH PLUG.
4. FOR TYPE II ("SATURATED") AND TYPE III ("FLOODED") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES AND ALONG BOTH WETLAND EDGES. FOR TYPE I ("DRY") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES, ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WCC WETLAND CROSSING CONFIGURATION
TYPE I, II AND III WETLANDS



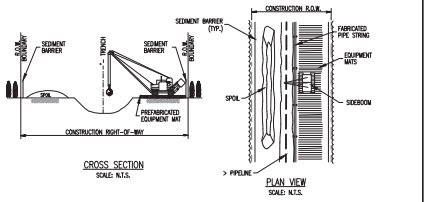
CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF THE WETLAND, INSTALL SEDIMENT BARRIERS ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR THROUGH THE WETLAND AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY-RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE SATURATED TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE COMPANY ENVIRONMENTAL INSPECTOR. TOPSOIL AND SATURATED TOPSOIL SHALL BE STOCKPILED SEPARATELY. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEDE WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING TRENCH, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE SATURATED TOPSOIL AND TOPSOIL (IF NOT SATURATED) AND INSTALL PERMANENT EROSION CONTROL.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLANDS AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WCC.1 TYPE I "DRY WETLAND"
INSTALLATION PROCEDURE



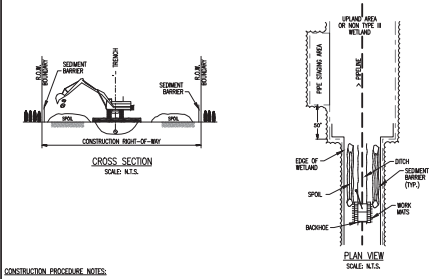
CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEDE WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION. SEED DISTURBED WETLAND AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WCC.2 TYPE II "SATURATED WETLAND"
INSTALLATION PROCEDURE



CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL WETLAND BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
5. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFTY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
6. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
7. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY PREFABRICATED EQUIPMENT MATS OR FLOATS TO EXCAVATE TRENCH. IF PREFABRICATED EQUIPMENT MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MATS FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
8. FABRICATE PIPE IN A STAGING AREA OUTSIDE THE TYPE III WETLAND AS INDICATED ON THE CONSTRUCTION DRAWINGS. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
9. LEAVE HARD PLUGS AT THE EDGE OF TYPE III WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER-IN, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, AND BACKFILL.
11. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.
12. REMOVE ANY MATS UTILIZED TO SUPPORT AMPHIBIOUS EQUIPMENT FROM WETLANDS UPON COMPLETION.
13. WETLANDS CROSSED USING PUSH/PULL METHOD TEND TO BE TOO WET FOR EFFECTIVE SEEDING. HOWEVER, IF THE SITE IS DRY ENOUGH AND IF DIRECTED BY THE ENVIRONMENTAL INSPECTOR, THE RIGHT-OF-WAY SHALL BE SEEDED IN ACCORDANCE WITH DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

WCC.3 TYPE III "FLOODED WETLAND"
INSTALLATION PROCEDURE

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR RID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 5 OF 5
WO: 1211227	RID:		

ATTACHMENT E

SIGNAGE EXAMPLES

WARNING

PIPELINE CONSTRUCTION

USE EXTREME CAUTION WHEN BOATING IN THIS AREA

PORTAGE

200 FEET

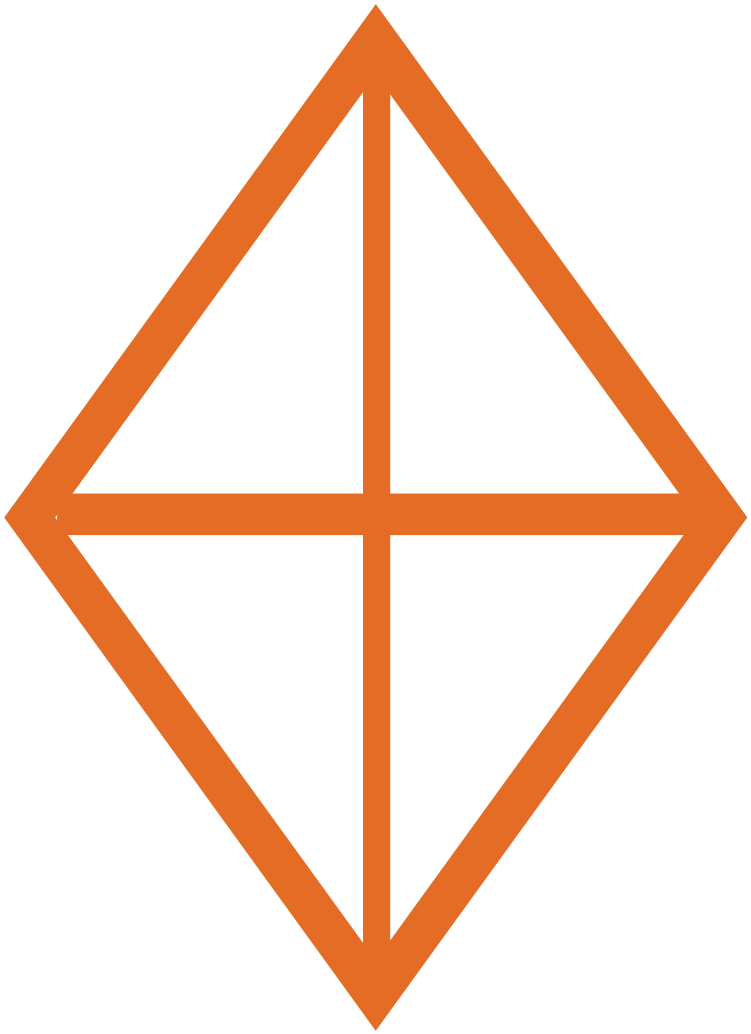
AHEAD

PORTAGE

ALL BOATS EXIT HERE

PORTAGE

ALL BOATS RE-ENTER HERE



BOATS KEEP OUT

REQUIREMENT L-5

MODULE S4- MITIGATION PLAN

Transcontinental Gas Pipe Line Company, LLC

Requirement L-5, Environmental Assessment
Module S4 – Mitigation Plan

Leidy South Project – Hensel Replacement and Hilltop Loop

September 2019

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S4.B.3 Restoration

S4.C & D Compensatory Mitigation and Monitoring Plan

S4.C & D Compensatory Mitigation Plan

References

Appendices

Appendix S4 – 1 Transco Project-Specific Wetland and Waterbody Construction and Mitigation Procedures

Appendix S4 – 2 Onsite Wetland and Riparian Reforestation Plan

Appendix S4 – 3 Compensatory Offsite Wetland Mitigation Plan

MODULE S4

MITIGATION PLAN

S4.A.1-2 Resource Impact Avoidance and Minimization Measures

Transco has sited the Project to avoid and minimize effects to wetland and watercourse to the greatest extent practicable while maintaining constructability and safety, as described in greater detail in the Section S3.F of Module 3. Given the linear nature of the pipeline component of the Project, total avoidance of wetlands, streams, and floodways is not feasible and therefore installation of the proposed pipelines will result in temporary and permanent impacts to wetlands and watercourses.

S4.B.1 Repair, Rehabilitation, and Restoration of Impacted Resources

Watercourses, Floodway and Riparian Areas

Construction of the Hensel Replacement and Hilltop (Project) will result in 9 pipeline crossings and 5 crossing associated with existing bridged or culverted watercourses or associated floodways within the Project's Limit of Disturbance. To minimize adverse effects at stream crossings, Transco proposes to implement the Transco Project-Specific Wetland and Waterbody Construction and Mitigation Procedures (Procedures) provided in Appendix S4-1 during the construction, post-construction restoration, and operation of the Project. Construction activities at stream crossings will be performed in accordance with applicable federal and applicable state permit requirements. Transco developed the Procedures to address temporary waterbody effects associated with construction of the Project. The Procedures are intended to satisfy the waterbody restoration requirements of applicable resource protection agencies with jurisdiction over areas affected by the Project.

In-stream construction will be conducted during normal or low flow conditions, to the extent practicable. Construction during this period will minimize sedimentation and turbidity, minimize streambed and bank disturbances, and limit the time it takes to complete in-stream construction. Selected trees may be preserved along the edge of the pipeline corridor to help minimize impacts, if possible. Stumps and root systems will be left intact when feasible by cutting them at or slightly above ground level. Preserving tree/shrub stumps and root systems will facilitate re-sprouting during the restoration period.

Upon completion of in-stream construction, Transco will stabilize the stream banks and streambed to pre-construction contours. Riparian areas will be revegetated with the Ernst

Riparian Buffer Mix (ERNMX-178), or an alternative riparian seed mix that contains similar species. This seed mix will be used to revegetate riparian areas where slopes are less than 10%. For slopes greater than 10%, a standard upland ROW seed mix will be used. Erosion control blankets will be placed on restored stream banks at the ordinary water line and should extend 100 feet beyond the top of bank unless wetlands are encountered. Streams that have existing bank protection measures installed (Young Womans Creek – rock bank protection) should be restored to match the pre-existing conditions of the stream banks in those locations. Native streambed material shall be placed within the streambed over top the pipeline, without additional stone added. No significant changes in the streambed grade and thalwag alignment should occur at any crossing location.

Transco will replant native tree and shrubs within the impacted forested riparian buffers, as outlined in Appendix S4-2 Onsite Wetland and Riparian Reforestation Plan. A 10-foot-wide herbaceous corridor will be maintained over the center of the pipeline within the riparian buffer area. Trees and other woody vegetation will also be allowed to reestablish naturally within the construction ROWs that were cleared for construction of the pipeline. However, trees within 15 feet of the centerline and between existing pipelines will be removed to maintain the integrity of the pipeline. The use of erosion control BMP's will avoid and/or minimize erosion and runoff that could potentially affect surface water quality.

Wetlands

Construction of the Project will result in temporary impacts to seventeen wetlands. Functional conversion impacts (PFO/PSS to PEM) of wetlands located within the proposed maintained pipeline ROW will occur to 5 wetlands, for a total of 0.1 acres. To minimize adverse impacts at wetland crossings, Transco will implement its Procedures during the construction, post-construction restoration, and operation of the Project. Transco developed the Procedures to address temporary wetland effects associated with construction of the Project. The Procedures are intended to satisfy the wetland restoration requirements of applicable resource protection agencies with jurisdiction over areas affected by the Project.

Transco will use pipeline construction crossing methods based on site-specific conditions and resource sensitivity. These methods are conventional open-cut or push-pull. Operation of construction equipment through wetlands will be limited to only that necessary for each stage of construction (e.g., clearing, trenching, staging). Transco will minimize compaction of topsoil within unsaturated wetlands by stripping, segregating, and stockpiling topsoil separately from subsoil

during construction. Topsoil segregation techniques will be used in unsaturated wetlands to preserve the seed bank and to facilitate successful restoration. Construction workspaces have been minimized to the extent practicable within these resources. Pipeline construction will use the conventional open-cut method at most locations. Construction equipment will use timber mats to prevent soil rutting for construction access through the wetlands. Trench plugs will be installed at the entrance and exit of the pipeline through the wetland to ensure that the wetland is not drained along the pipeline. In forested and scrub-shrub wetlands, Transco will minimize clearing to the extent practicable while maintaining safe construction conditions.

Pipe stringing and fabrication may occur within saturated and unsaturated wetlands adjacent to the trench or adjacent to the wetland. Soil structure and the presence of standing water commonly found in wetlands along with the large surface loads of construction equipment and materials to construct large diameter pipelines contribute to the need for additional workspace adjacent to wetland crossings. Hydric soils typically are lower in strength and become weaker when saturated. Handling weak material during the excavation/stockpile process further reduces the strength of the soil mass by disturbance/remolding/mixing, thus requiring a larger area to stockpile the soils. Additionally, buoyancy control (e.g., weights, concrete-coated pipe) may be necessary in wetland environments, which require the trench to be larger in both width and depth, resulting in additional stockpile material. Wetland crossing that require concrete coating are outlined in Appendix S3-1 Subfacility Details Table. Consequently, wetland soils crossed by pipelines have properties contributing to the need for increased workspace for both trenching and stockpiling.

Upon completion of construction within wetlands, Transco will promptly restore wetlands to their original configurations and contours and stabilize disturbed adjacent upland areas. Wetland areas will be revegetated with Ernst FACW Meadow Mix (ERNMX-122), or an alternative wetland seed mix that contains similar species, where standing water is not present, to stabilize disturbed soils. PEM wetlands, dominated primarily by low-growing sedges, rushes, and other herbaceous vegetation, will revert to emergent vegetation following construction, resulting in no permanent change to wetland type. PSS and PFO wetlands affected during construction will be seeded with the wetland seed mix and also replanted with native trees and shrubs outside of the proposed maintained ROW (See Appendix S4-2). Following construction, Transco will monitor disturbed wetlands and adjacent uplands until restoration and long-term stabilization is documented.

S4.B.2 Proposed Preservation and Maintenance Operations to Reduce or Eliminate Project Impacts

During operation and maintenance, the following actions will be taken to reduce or limit impacts of the ROW:

- Transco will limit routine vegetation mowing or clearing within wetlands and adjacent to waterbodies. A 10-foot-wide herbaceous corridor will be maintained over the center of the pipeline within the wetland and riparian buffer areas. Trees and other woody vegetation will also be allowed to reestablish naturally within the construction ROWs that were cleared for construction of the pipeline. However, trees within 15 feet of the centerline and between existing pipelines will be removed to maintain the integrity of the pipeline.
- Transco will not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.
- Transco will implement time of year restrictions for mowing as specified in in the Transco Plan found in Appendix S3-3. (April 15 - August 1 of any year is the typical restriction period which applies to routine mowing and clearing of riparian areas.

S4.C & D Compensatory Mitigation and Monitoring Plan

To mitigate for the wetland impacts associated with the Hensel Replacement and Hilltop Loop, an offsite mitigation area has been designated to offset functional losses by providing 0.02 acres of wetland creation associated with permanent fill associated with impacts on the Big Ridge Trail. Additionally, 0.20 acres of wetland enhancement is proposed, which is associated with functional conversion of PSS and PFO wetlands within the proposed maintained ROW. An Offsite Compensatory Wetland Mitigation Plan including performance standards and a monitoring plan has been prepared and is provided in Appendix S4-3.

References

Cowardin LM, Carter V, Golet FC, LaRoe ET. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Fish & Wildlife Service Pub. FWS/OBS-79/31, Washington, DC.

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APPENDIX S4-1

TRANSCO PROCEDURES

Transcontinental Gas Pipe Line Company, LLC

Appendix S4 – 1

Transco Project-Specific Wetland and Waterbody Construction and Mitigation Procedures

Leidy South Project

July 2019

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I. APPLICABILITY

A. The intent of these Procedures is to identify baseline mitigation measures for minimizing the extent and duration of the Transcontinental Gas Pipe Line Company, LLC (Transco) Leidy South Project (Project) related disturbance on wetlands and waterbodies. Transco will specify in its applications for a new FERC authorization, and in prior notice and advance notice filings, any individual measures in these Procedures it considers unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Transco will also explain how those alternative measures will achieve a comparable level of mitigation. Deviations from the FERC Procedures proposed by Transco to reflect site-specific conditions are **bolded** in the text.

Once the Project is authorized, Transco may request further changes as variances to the measures in the Transco Procedures. The Director of the Office of Energy Projects (Director) will consider approval of variances upon Transco's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of these Procedures is infeasible or unworkable based on Project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Project-related impacts on non-wetland areas are addressed in the Transco Project-specific Upland Erosion Control, Revegetation, and Maintenance Plan (Transco Plan).

B. Definitions

1. "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:

   a. "minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;

   b. "intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and

   c. "major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.

2. "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

A. The following information will be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:

1. site-specific justifications for additional temporary workspace (ATWS) areas that would be closer than 50 feet from a waterbody or wetland; and

2. site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.

B. The following information will be filed with the Secretary prior to the beginning of construction:

1. Spill Prevention and Response Procedures specified in Section IV.A;

2. a schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated coldwater fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. Transco will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;

3. plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in Section V.B.6.d;

4. site-specific plans for major waterbody crossings, described in Section V.B.9;

5. a wetland delineation report as described in Section VI.A.1, and

6. the hydrostatic testing information specified in Section VII.B.3.

III. ENVIRONMENTAL INSPECTORS

A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the Project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

B. The Environmental Inspector's responsibilities are outlined in the Transco Plan.

IV. PRECONSTRUCTION PLANNING

A. Transco will develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy will be filed with the Secretary prior to construction and made available in the field on each construction spread. Refer to the Transco Project-specific Spill Plan for Oil and Hazardous Materials.

1. Transco and its contractors will structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. Transco and its contractors must, at a minimum, ensure that:

    a. all employees handling fuels and other hazardous materials are properly trained;

    b. all equipment is in good operating order and inspected on a regular basis;

    c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;

    d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary;

    e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;

    f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

    g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and

    h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

2. Transco and its contractors will structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, Transco and its contractors will:

    a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;

b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;

c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U.S. Coast Guard and the National Response Center) that must be notified of a spill; and

d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

Transco will coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (USACE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.

2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic Section 401 water quality certification or waiver.

4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

B. INSTALLATION

1. Time Window for Construction

As permitted by state agencies, instream work, except that required to install or remove equipment bridges, will occur during the following time windows:

a. PA Trout Stocked Waters – June 16 through February 28;

b. PA Wild Trout Waters – January 1 through September 30; and

c. PA Class A Wild Trout Waters – April 2 through September 30.

Transco may request at specific identified locations to perform in-stream work outside of specific state agency windows at individual waterbodies, as approved by state agencies prior to construction.

2. Extra Work Areas

   a. Locate all extra work areas (such as staging areas) and ATWS areas (such as spoil storage areas and full right-of-way topsoil) at least 50 feet away from water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

      In select areas, Transco will need to locate ATWS within 50 feet of a stream in areas that are not active agricultural land due to adjacent land use or topographic limitations. Transco has filed with the Secretary for review and written approval by the Director, site-specific justification for each ATWS area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. Refer to Resource Report 2, Appendix 2C of the Transco application. The justifications specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.

   b. Limit the size of ATWS areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

   a. Comply with the USACE, or its delegated agency, permit terms and conditions.

   b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

   c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.

   d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

   e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

   f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Project-specific Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for "waterbodies" as defined in Section I.B.1.

4. Spoil Pile Placement and Control

a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in ATWS areas as described in Section V.B.2.

b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.

b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

(1) equipment pads and culvert(s);

(2) equipment pads or railroad car bridges without culverts;

(3) clean rock fill and culvert(s); and

(4) flexi-float or portable bridges.

Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

d. Design and maintain equipment bridges to prevent soil from entering the waterbody.

e. Remove temporary equipment bridges as soon as practicable after permanent seeding.

f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.

g. Obtain any necessary approval from the USACE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally- designated as critical habitat.

b. Dam and Pump

(1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:

(i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
(ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
(iii) screen pump intakes to minimize entrainment of fish;
(iv) prevent streambed scour at pump discharge; and
(v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

c. Flume Crossing

The flume crossing method requires implementation of the following steps:

(1) install flume pipe after blasting (if necessary), but before any trenching;

(2) use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow

through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);

(3) properly align flume pipe(s) to prevent bank erosion and streambed scour;

(4) do not remove flume pipe during trenching, pipe laying, or backfilling activities, or initial streambed restoration efforts.; and

(5) remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, Transco will file with the Secretary for the review and written approval by the Director, a plan that includes:

(1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

(2) justification that disturbed areas are limited to the minimum needed to construct the crossing;

(3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;

(4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and

(5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours.

b. streambanks and unconsolidated streambeds may require additional restoration after this period;

c. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

d. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in Section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, Transco will cross intermediate waterbodies using the open-cut crossing method, with the following restrictions:

a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. all other construction equipment must cross on an equipment bridge as specified in Section V.B.5.

9. Crossings of Major Waterbodies

Before construction, Transco will file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing. This plan will be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in Section IV.F.3.a of the Transco Plan) immediately after initial disturbance of the waterbody or adjacent upland.

Sediment barriers will be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Transco Plan; however, Transco will implement the following specific measures at stream crossings:

a. install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or drivable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-

installed after construction has stopped for the day and/or when heavy precipitation is imminent;

b. where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

c. use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank re-contouring. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Application of riprap for bank stabilization must comply with USACE, or its delegated agency, permit terms and conditions.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the

waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan

In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

3. Time of year restrictions specified in Section VII.A.5 of the Transco Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

VI. WETLAND CROSSINGS

A. GENERAL

1. Transco will conduct wetland delineations using the current federal methodology and will file wetland delineation reports with the Secretary before construction.

This report will identify:

a. by milepost all wetlands that would be affected;

b. the National Wetlands Inventory (NWI) classification for each wetland;

c. the crossing length of each wetland in feet; and

d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a

wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process Transco will identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.

4. Wetland boundaries and buffers will be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

5. Implement the measures of Sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of Sections V and VI cannot be met, Transco will file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan will address at a minimum:

   a. spoil control;

   b. equipment bridges;

   c. restoration of waterbody banks and wetland hydrology;

   d. timing of the waterbody crossing;

   e. method of crossing; and

   f. size and location of all extra work areas.

6. Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. INSTALLATION

1. Extra Work Areas and Access Roads

   a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

   b. Transco will file with the Secretary for review and written approval by the

Director, site-specific justification for each extra work area and ATWS with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification will specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.

In select areas, Transco will need to locate ATWS within 50 feet of a wetland in areas that are not active agricultural land due to adjacent land use or topographic limitations. Transco has filed with the Secretary for review and written approval by the Director, site-specific justification for additional workspace within 50 feet of wetlands. Refer to Resource Report 2, Appendix 2D of the Transco application. The justifications specify the conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.

c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right- of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

d. In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

e. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

a. Comply with USACE, or its delegated agency, permit terms and conditions.

b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. Use “push-pull” or “float” techniques to place the pipe in the trench where water and other site conditions allow.

d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

g. Transco may burn woody debris in wetlands, if approved by the USACE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

h. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

i. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

j. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

k. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

l. Remove all Project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in Section IV.F.3.a of the Transco Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in Section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the

edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

c. Install sediment barriers along the edge of the construction right-of- way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

4. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Restore pre-construction wetland contours to maintain the original wetland hydrology.

3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Project Specific Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

5. Transco will consult with the appropriate federal or state agencies to develop a Project- specific wetland restoration plan. The restoration plan will include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Refer to the Project-specific Noxious and Invasive Plant Management Plan.

6. Until a Project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).

7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in Section VII.A.4 of the Transco Plan.

D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.

3. Time of year restrictions specified in Section VII.A.5 of the Transco Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.

4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:

   a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

   b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

   c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

   d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

6. Within 3 years after construction, Transco will file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in Section VI.D.5, above.

   For any wetland where revegetation is not successful at the end of 3 years after construction, Transco will develop and implement (in consultation with a professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is

successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state or inter-state issued water withdrawal permits or file Notices of Intent to rely upon General Permits, as required.

2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, or file Notices of Intent to rely upon General Permits, as required,as required.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.

2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and the refueling of these pumps in the project-specific Spill Prevention and Response Procedures. Refer to the Transco Project-specific Spill Plan for Oil and Hazardous Materials.

3. Transco will file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.

3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

D. DISCHARGE LOCATION, METHOD, AND RATE

1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission

APPENDIX S4-2

WETLAND AND RIPARIAN REFORESTATION PLAN

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT

ONSITE WETLAND AND RIPARIAN REFORESTATION PLAN

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Attachments

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT

ONSITE WETLAND AND RIPARIAN REFORESTATION PLAN

1.0 PROJECT OVERVIEW

On behalf of Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams), WHM Consulting, Inc. has prepared an onsite restoration and planting plan for the pipeline facilities associated with the Leidy South Project (Project) located in Clinton and Lycoming Counties. This plan addresses the replanting of trees and shrubs associated with temporarily impacted forested riparian buffers and to Palustrine Forested (PFO) and Palustrine Scrub-Shrub (PSS) wetlands along the pipeline Right-of-Way (ROW). Tree and shrub plantings will take place outside of the permanent maintained ROW.

2.0 FORESTED AND SCRUB-SHRUB WETLANDS

Restoration of temporarily impacted wetlands associated with PFO and PSS wetlands will involve onsite replanting. After the completion of construction, wetland areas within the ROW will be restored to pre-construction contours and seeded with Ernst FACW Meadow Mix (ERNMX-122), as outlined in Attachment A, or an alternative wetland seed mix that contains similar species. After seeding, impacted PSS and PFO wetlands outside the permanent maintained ROW will be replanted with native live stakes, bare root or container tree and shrub species up to 5 feet from the pipeline centerline. In PFO impacted wetlands, only shrub species shall be planted from 5 to 15 feet of the pipeline centerline. Outside 15 feet, tree species may be planted. A summary table outlining proposed PFO and PSS impacted wetlands, their location, and proposed restoration is outlined in Attachment C – Onsite Wetland and Riparian Buffer Replanting Table. In addition, replanting areas for each pipeline facility are outlined on the provided figures.

The vegetative design of the PFO and PSS impacted wetlands outlines a combination of specific native tree and shrub species selected for different hydrologic regimes and different vegetative cover types throughout the Project. Trees and shrubs selected for the replanting were based on species identified during wetland delineations and area outlined in Table 2-1.

TABLE 2-1 - WETLAND REPLANTING SPECIES LIST

COMMON NAME	LATIN NAME	WETLAND INDICATOR	STRATUM
Black Willow	*Salix nigra*	OBL	Tree
Silver Maple	*Acer saccharinum*	FACW	Tree
River Birch	*Betula nigra*	FACW	Tree
Red Maple	*Acer rubrum*	FAC	Tree
Black Gum	*Nyssa sylvatica*	FAC	Tree
American sycamore	*Platanus occidentalis*	FACW	Tree
Quaking Aspen	*Populus tremuloides*	FAC (EMP)	Tree
Smooth Alder	*Alnus serrulata*	OBL	Shrub
Silky Dogwood	*Cornus amomum*	FACW	Shrub
Common Ninebark	*Physocarpus opulifolius*	FACW	Shrub

Highbush Blueberry	*Vaccinium corymbosum*	FACW	Shrub
Winterberry	*Ilex verticillata*	FACW	Shrub
Red Chokeberry	*Aronia arbutifolia*	FACW	Shrub
Northern Spicebush	*Lindera benzoin*	FAC (EMP)	Shrub
Pussy Willow	*Salix discolor*	FACW	Shrub

3.0 FORESTED RIPARIAN BUFFERS

Temporarily impacted riparian buffers (150' from each watercourse) will involve onsite replanting. After the completion of construction, riparian buffers within the ROW will be restored to pre-construction contours and revegetated with Ernst Riparian Buffer Mix (ERNMX-178), as outlined in Attachment B, or an alternative riparian seed mix that contains similar species. Impacted forested riparian buffers outside the permanent maintained ROW will be replanted with native live stakes, bare root or container tree and shrub species up to 5 feet from the pipeline centerline. Only shrub species shall be planted from 5 to 15 feet of the pipeline centerline. Outside 15 feet, both tree and shrub species may be planted. A summary table outlining proposed forested riparian buffer impact areas, their location, and proposed restoration is outlined in Attachment C – Onsite Wetland and Riparian Buffer Replanting Table. In addition, replanting areas for each pipeline facility are outlined on the provided figures.

The vegetative design of the forested riparian buffers outlines a combination of specific native tree and shrub species selected for different hydrologic regimes and different vegetative cover types throughout the Project. Trees and shrubs selected for the project were selected based on the Department of Environmental Protection's Riparian Forest Buffer Guidance, document number 394-5600-001 and observations of woody vegetation within riparian buffers during field surveys. The trees and shrubs selected for forested riparian buffer replanting are in Table 3-1 below:

TABLE 3-1 - RIPARIAN BUFFER REPLANTING SPECIES LIST			
COMMON NAME	**LATIN NAME**	**WETLAND INDICATOR**	**STRATUM**
Black Willow	*Salix nigra*	OBL	Tree
Silver Maple	*Acer saccharinum*	FACW	Tree
American Sycamore	*Platanus occidentalis*	FACW	Tree
River Birch	*Betula nigra*	FACW	Tree
Red Maple	*Acer rubrum*	FAC	Tree
Black Gum	*Nyssa sylvatica*	FAC	Tree
Tuliptree	*Liriodendron tulipifera*	FACU	Tree
Bigtooth Aspen	*Populus grandidentata*	FACU	Tree
White Pine	*Pinus strobus*	FACU	Tree
Eastern Hemlock	*Tsuga canadensis*	FACU	Tree
Smooth Alder	*Alnus serrulata*	OBL	Shrub/Small Tree
Speckled Alder	*Alnus incana*	FACU	Shrub/Small Tree
American Hornbeam	*Carpinus caroliniana*	FAC	Shrub/Small Tree
Silky Dogwood	*Cornus amomum*	FACW	Shrub
Common Ninebark	*Physocarpus opulifolius*	FACW	Shrub

Highbush Blueberry	*Vaccinium corymbosum*	FACW	Shrub
Rosebay Rhododendron	*Rhododendron maximum*	FAC	Shrub
American Hazelnut	*Corylus americana*	FACU	Shrub
Mountain Laurel	*Kalmia latifolia*	FACU	Shrub
Southern Arrowwood	*Viburnum recognitum*	FAC	Shrub

4.0 METHOD OF PLANTING

All plants shall be installed according to acceptable standards of the trade under the supervision of a landscape professional with suitable practical field experience in pipeline replanting projects. A qualified professional with documented experience shall oversee the replanting effort. Minor changes to the plan that will not adversely affect the overall success of the site or changes which enhance the success of the site may be implemented during the project without consultation. Any plan deviations will be documented in the as-built reporting.

All plant materials shall be nursery grown and shall be guaranteed to be true to name and healthy upon delivery. During planting operations, the contractor shall keep the trees and shrubs out of direct sunlight and maintain moisture on the roots to ensure that the roots don't dry out prior to planting. Trees and shrubs shall be planted by digging a hole twice the size of the width of the rootball down into the substrate at the point of installation. If the plant is in a plastic container, this shall be carefully removed to keep the rootball intact. After planting, the area will be backfilled and watered. Trees may be provided with support stakes or tree or shrub shelters. Shelters will only be placed on those plants suitable for shelters. Care shall be taken when installing support stakes or tree shelters to ensure that the root ball is not disturbed when driving the support stake into the soil. Fertilizer tablets may be placed in the backfilled soil to help the growth of the planted trees and shrubs.

5.0 PLANT DENSITY AND PLACEMENT

All plants will be planted in clumps of monocultures consisting of three to six plants of the species. All plants will be planted in a clumped distribution of monoculture blocks of individual species. Monocultures will be planted randomly with spacing of approximately 8.0 feet on center for shrubs and small trees species and 12.0 feet on center for tree species. Trees and shrubs will be planted at a density of 435 stems per acre. No tree plantings are to take place within 15' of the pipeline or between existing utilities. Typical planting details are included within Attachment D.

6.0 WILDLIFE DAMAGE CONTROL

After planting of the site has been completed, tree and shrub shelters shall be installed for those plants suitable for shelters. If deemed necessary, other methods of wildlife damage control may include the application of rodenticide to each tree/shrub or installing bait boxes for meadow vole control.

7.0 AS-BUILT DOCUMENTATION AND MONITORING PLAN

As-built documentation for the planting shall occur as the planting is completed. Thereafter, monitoring of the onsite wetland and riparian buffers replanting areas shall take

place annually for three years after planting to determine the success of the replanting areas. During the monitoring, the survival of trees and shrubs will be counted and documented. Any threats to the riparian buffers will be documented and remedial measures will be recommended. Photographs will be taken at representative crossings to document the success of the replanting areas. The as built documentation and monitoring reports will include, at a minimum, the following information:

a) Dates of inspection and names of inspectors;

b) Photographic Documentation;

c) Vegetation data shall summarize plant survival, the growth of planted trees and shrubs (monitoring plan only);

d) Identification of any problems that need required remedial measures.

8.0 PERFORMANCE STANDARDS

Performance standards have been established for the onsite replanting areas. These standards will be used to determine the success of the replanting effort. By monitoring the site as proposed in the monitoring plan and comparing results to the performance standards, a determination of success can be evaluated. The performance standards are as follows:

- Planted trees and shrubs shall meet 85% survival throughout the 3-year monitoring period.

If the performance standards have not been achieved, appropriate remedial actions, as outlined in the adaptive management plan must take place to ensure the success of the site. A vegetative analysis must continue on a yearly basis until the performance standards or goals have been met. In the situations where the buffer planting is not successful, the monitoring report must include a discussion of remedial measures to correct the deficiencies.

REFERENCES

Pennsylvania Department of Environmental Protection Bureau of Watershed Management. 2010. Riparian Forest Buffer Guidance. Document number 394-5600-001. Pennsylvania Department of Environmental Protection. Harrisburg, PA.

U.S. Army Corps of Engineers. 2016. National Wetland Plant List, version 3.3. http://wetland_plants.usace.army.mil/ US Army Corps of Engineers Engineer Research and Development Center Cold Regions Research and Engineering Laboratory, Hanover, NH.

WHM Consulting, Inc. 2019. *Leidy South Project - Wetland and Watercourse Delineation Report.* State College, PA. August, 2019.

FIGURES

BENTON LOOP

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LEIDY SOUTH PROJECT - BENTON LOOP
WETLAND AND RIPARIAN REFORESTATION PLAN

MAP KEY

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Date:	08/06/19
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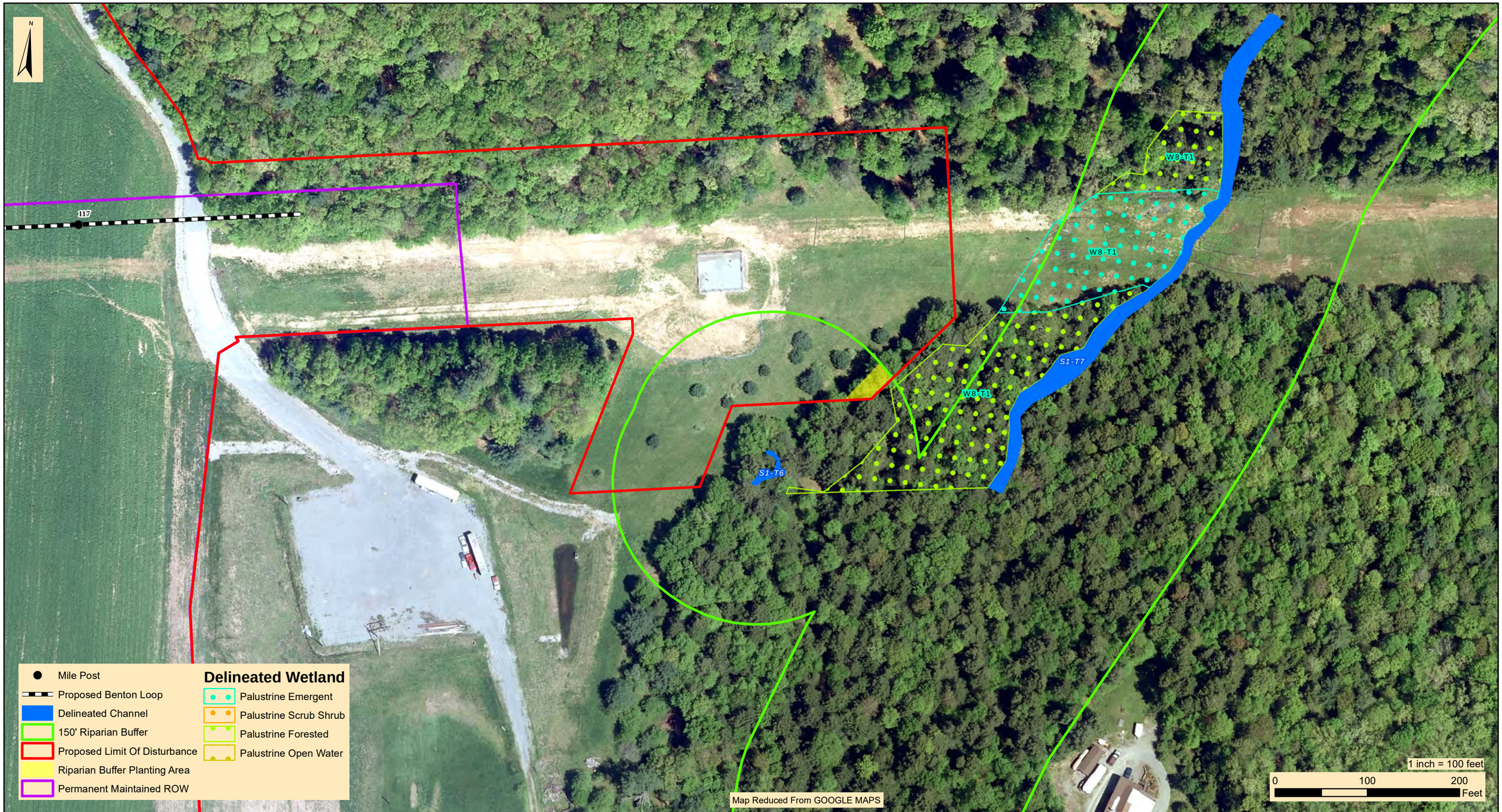
Drawn By:	PJF
Figure Number:	BL-1



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LEIDY SOUTH PROJECT - BENTON LOOP
WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 1 (RP-1)

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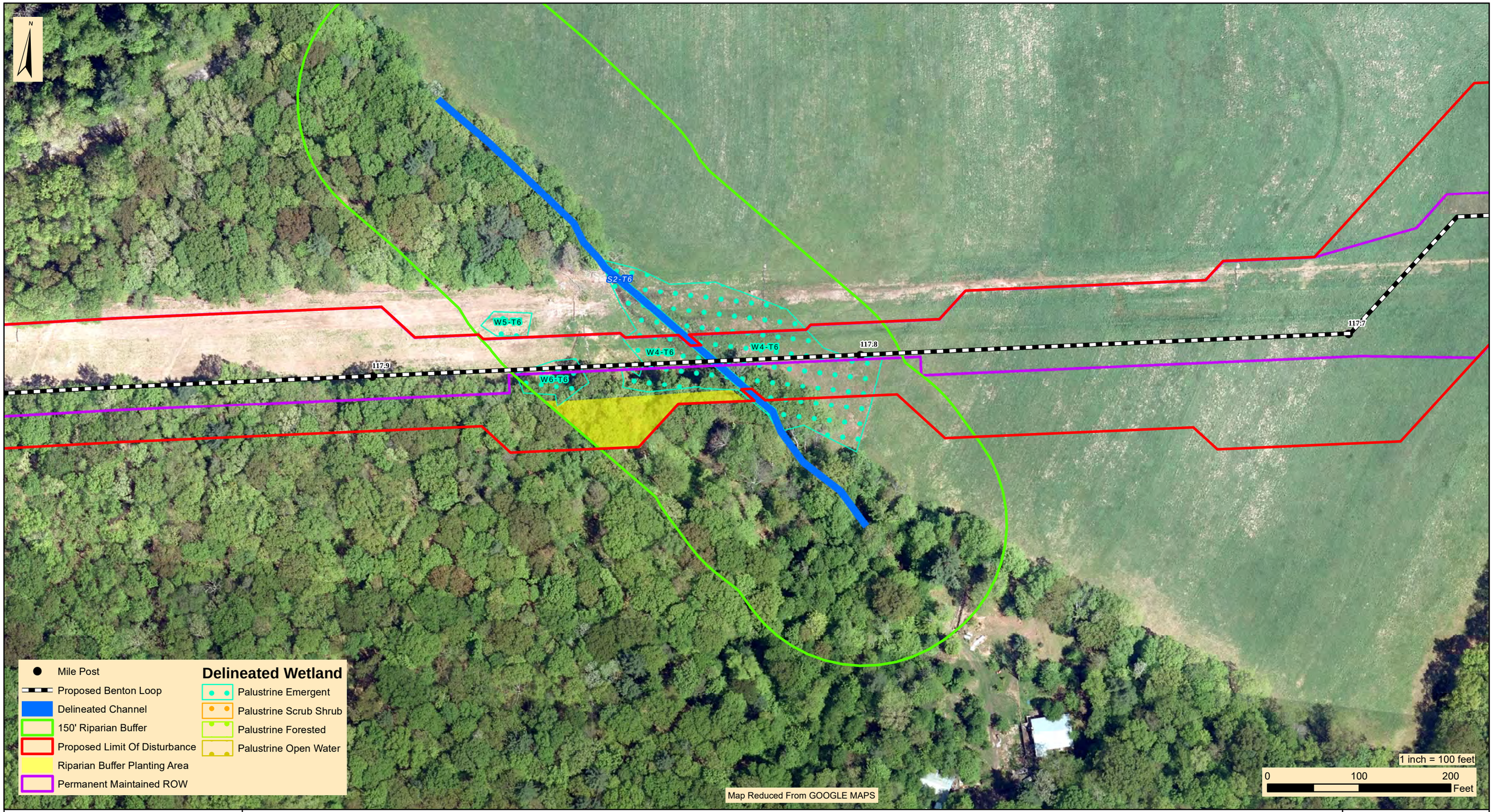
Date:	08/06/19
WHM DRAWING NUMBER:	WILLIAMS202B002-BL
Drawn By:	PJF
Figure Number:	BL-2



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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 2 (BL-3)

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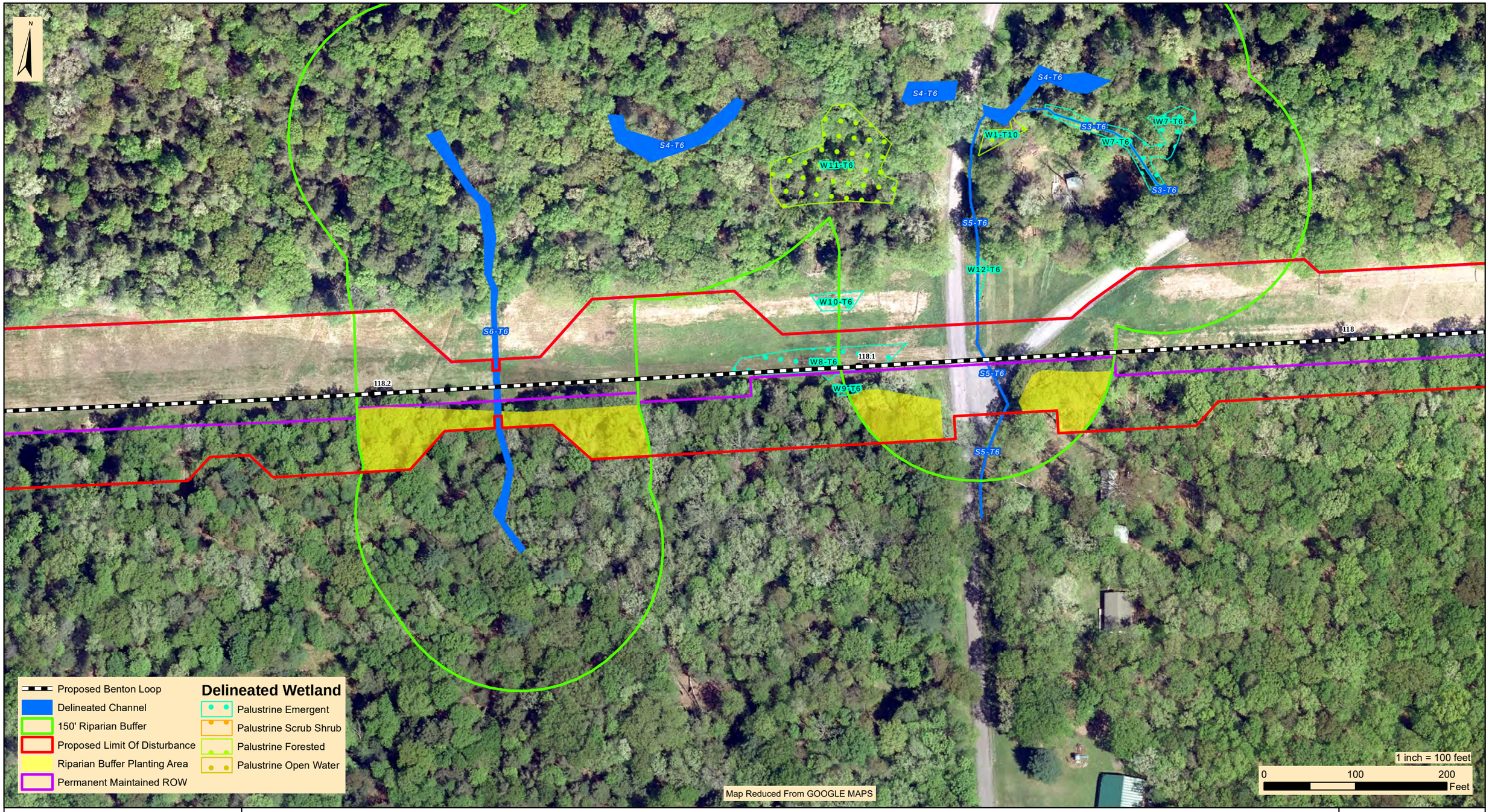
Date:	08/25/19
WHM DRAWING NUMBER:	WILLIAMS202B003-BL
Drawn By:	PJF
Figure Number:	BL-3



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RESOURCE CROSSING 3 (BL-4, BL-6)

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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 4 (BL-7)

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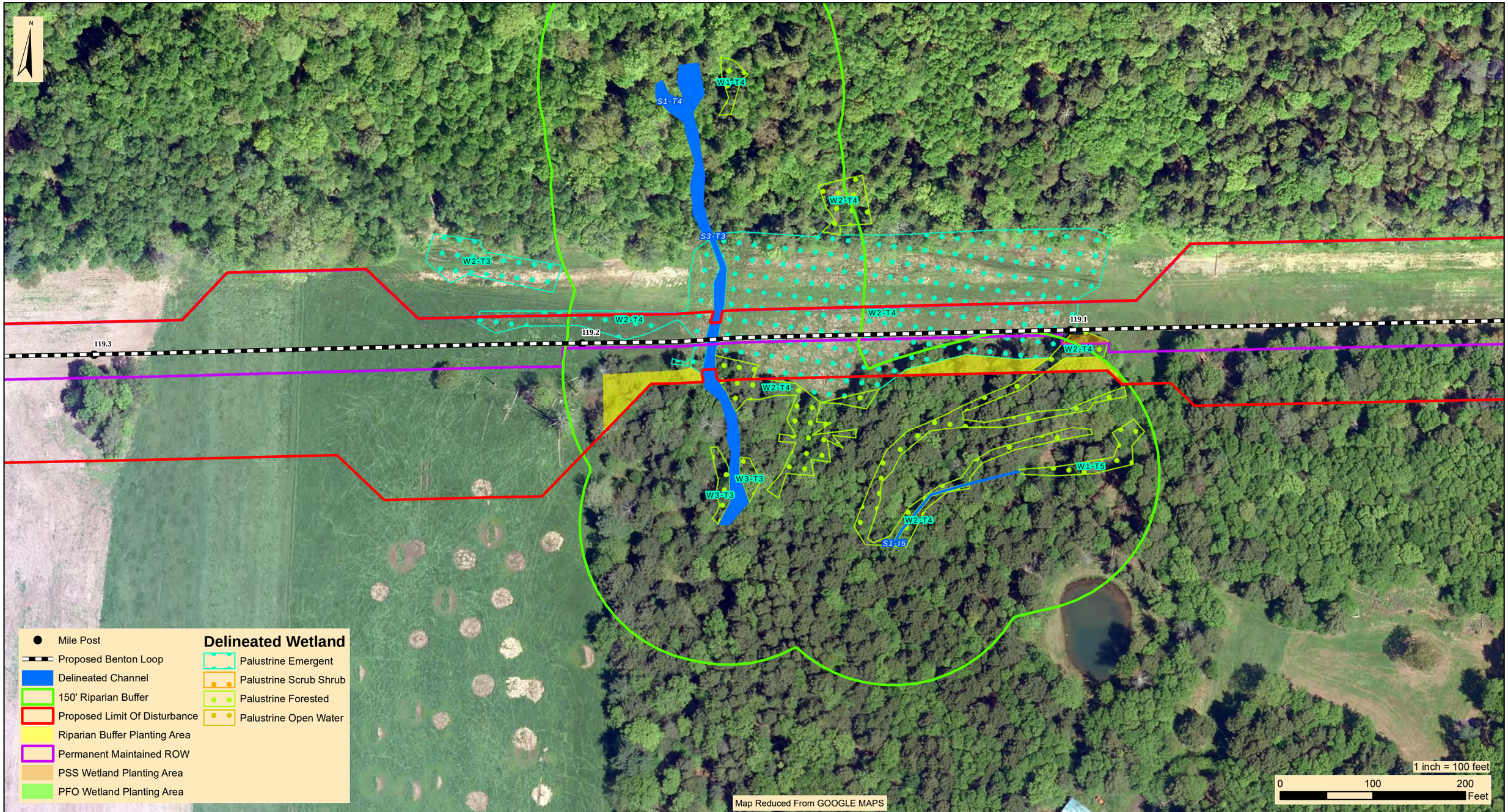

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RESOURCE CROSSING 5 (BL-8)

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Date:	08/15/19
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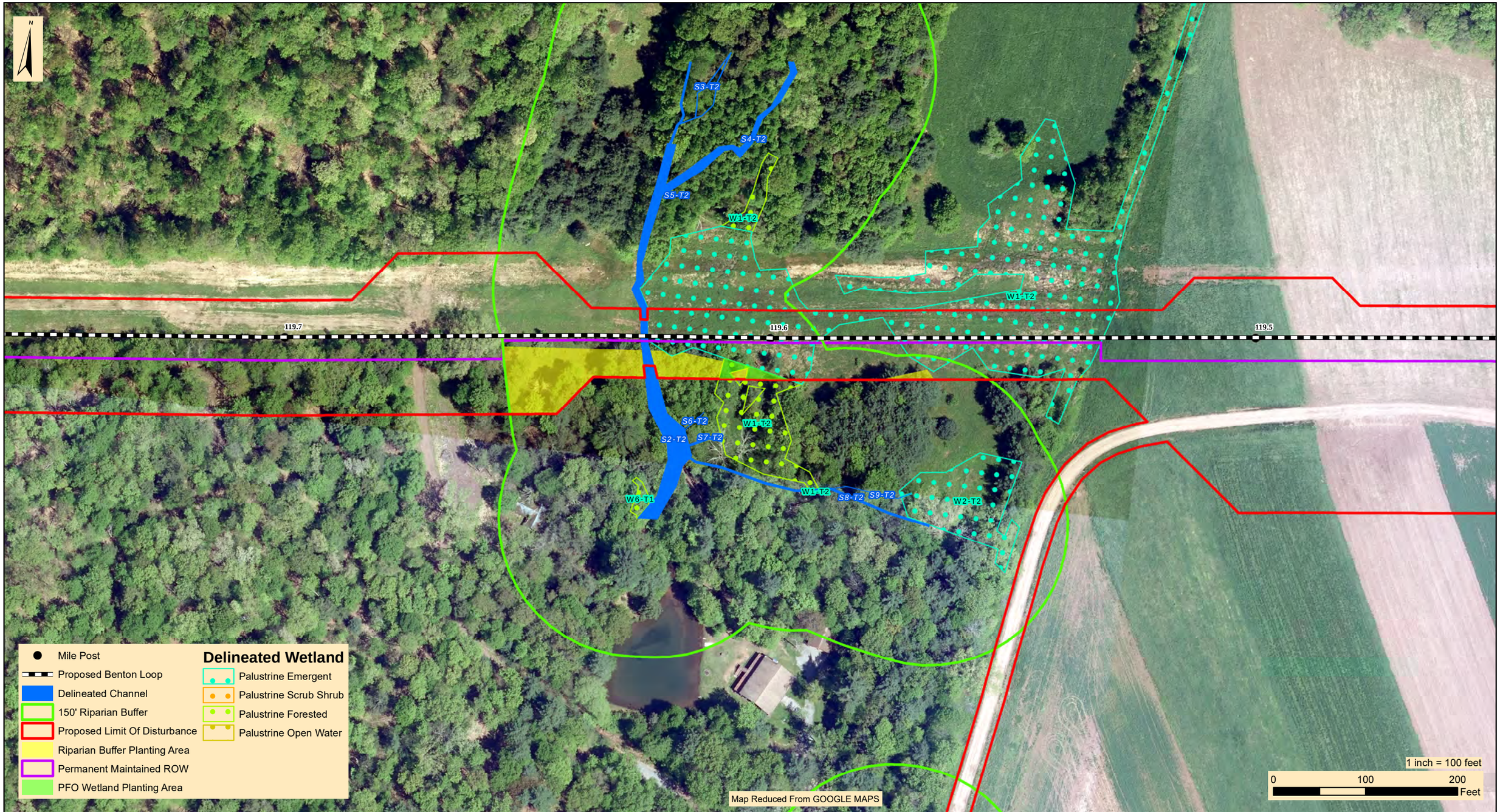

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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 6 (BL-9)

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Date:	08/25/19
WHM DRAWING NUMBER:	WILLIAMS202B007-BL
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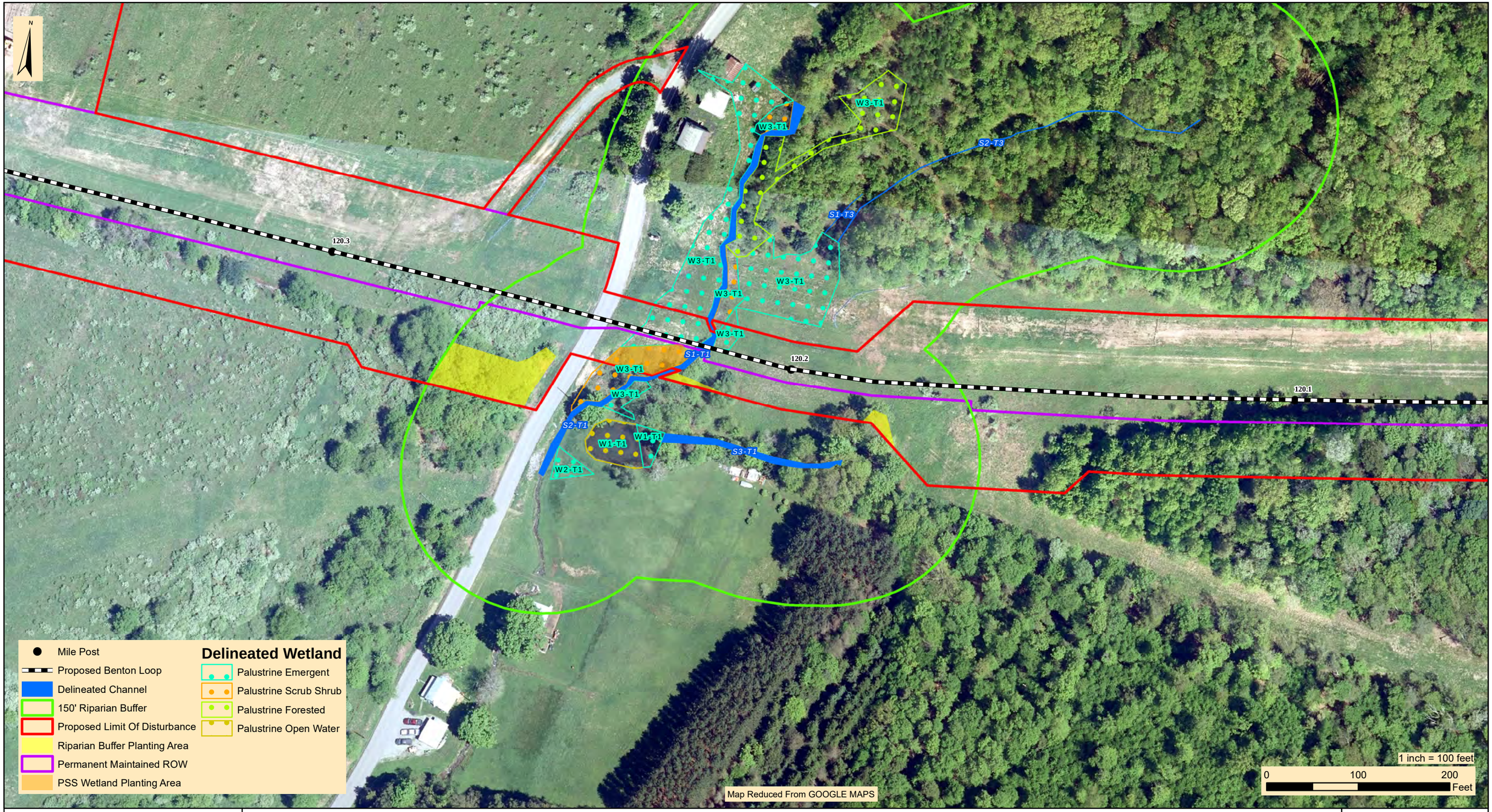
Figure Number:	BL-7



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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING 7 (BL-10)

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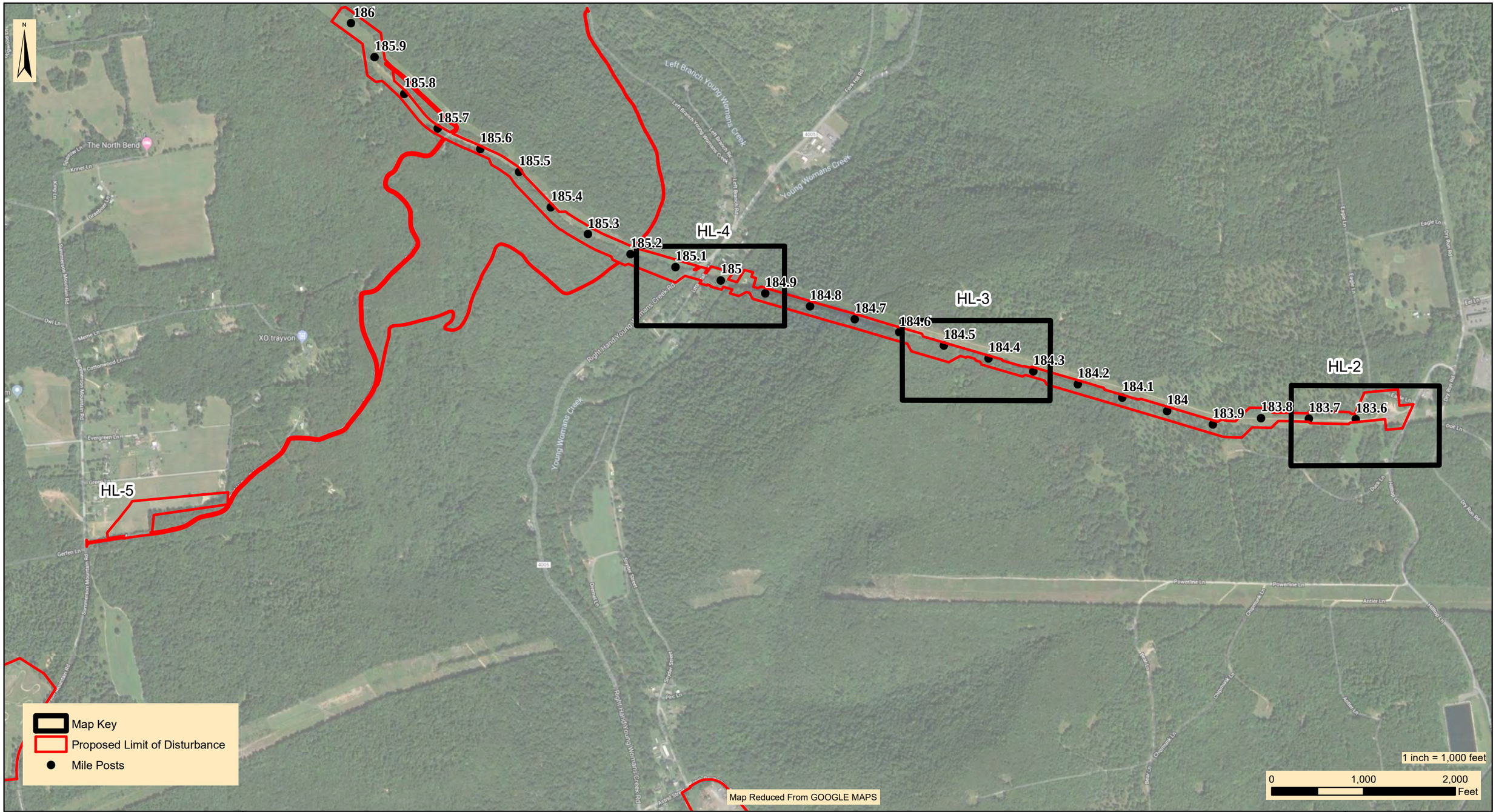
Drawn By:	PJF
Figure Number:	BL-8

HILLTOP LOOP



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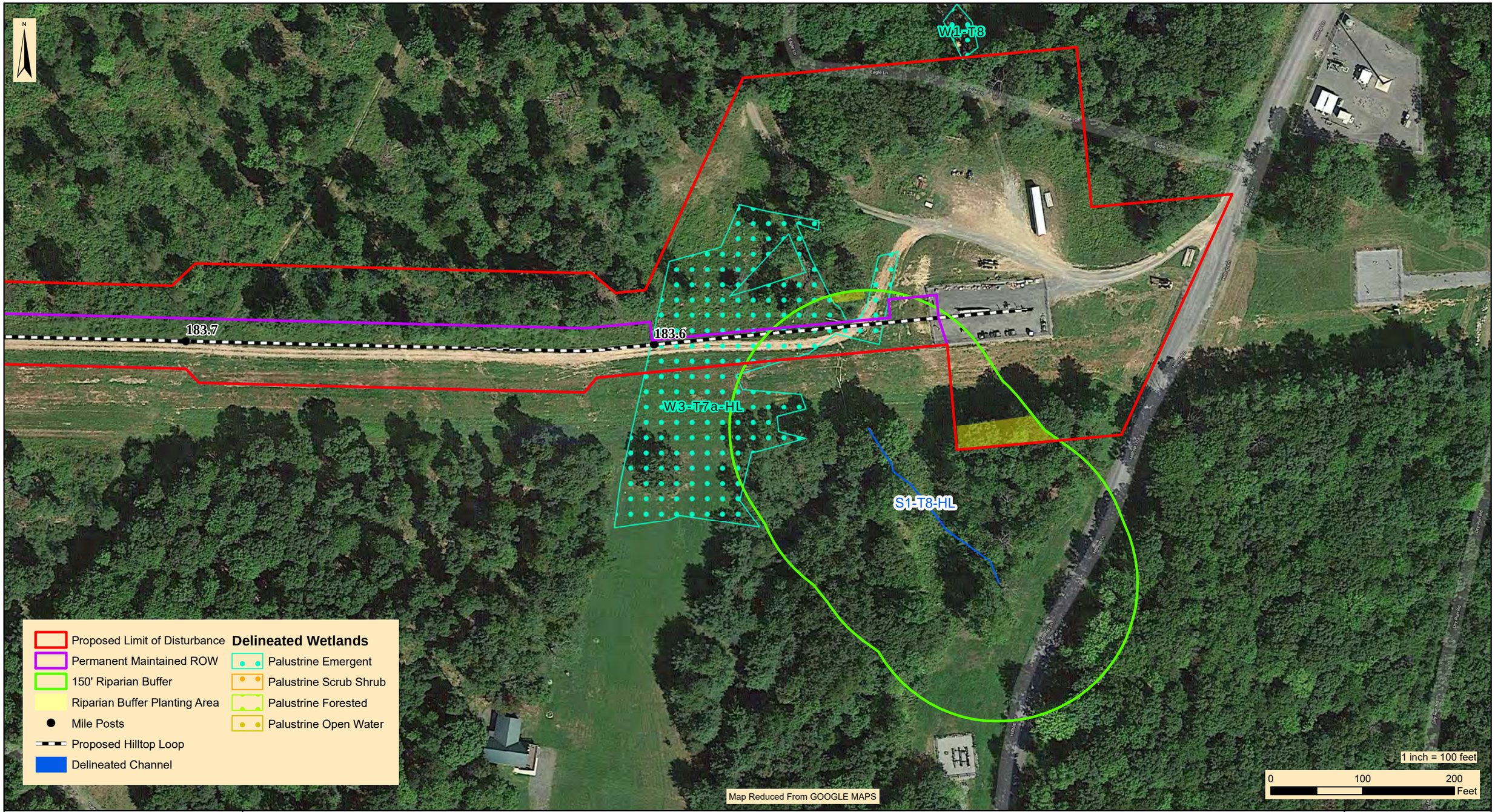
Date:	08/09/19
WHM DRAWING NUMBER:	WILLIAMS201B001-HL
Drawn By:	PJF
Figure Number:	HL-1



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RESOURCE CROSSING - 1 (RP-1)

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Date:	08/09/19
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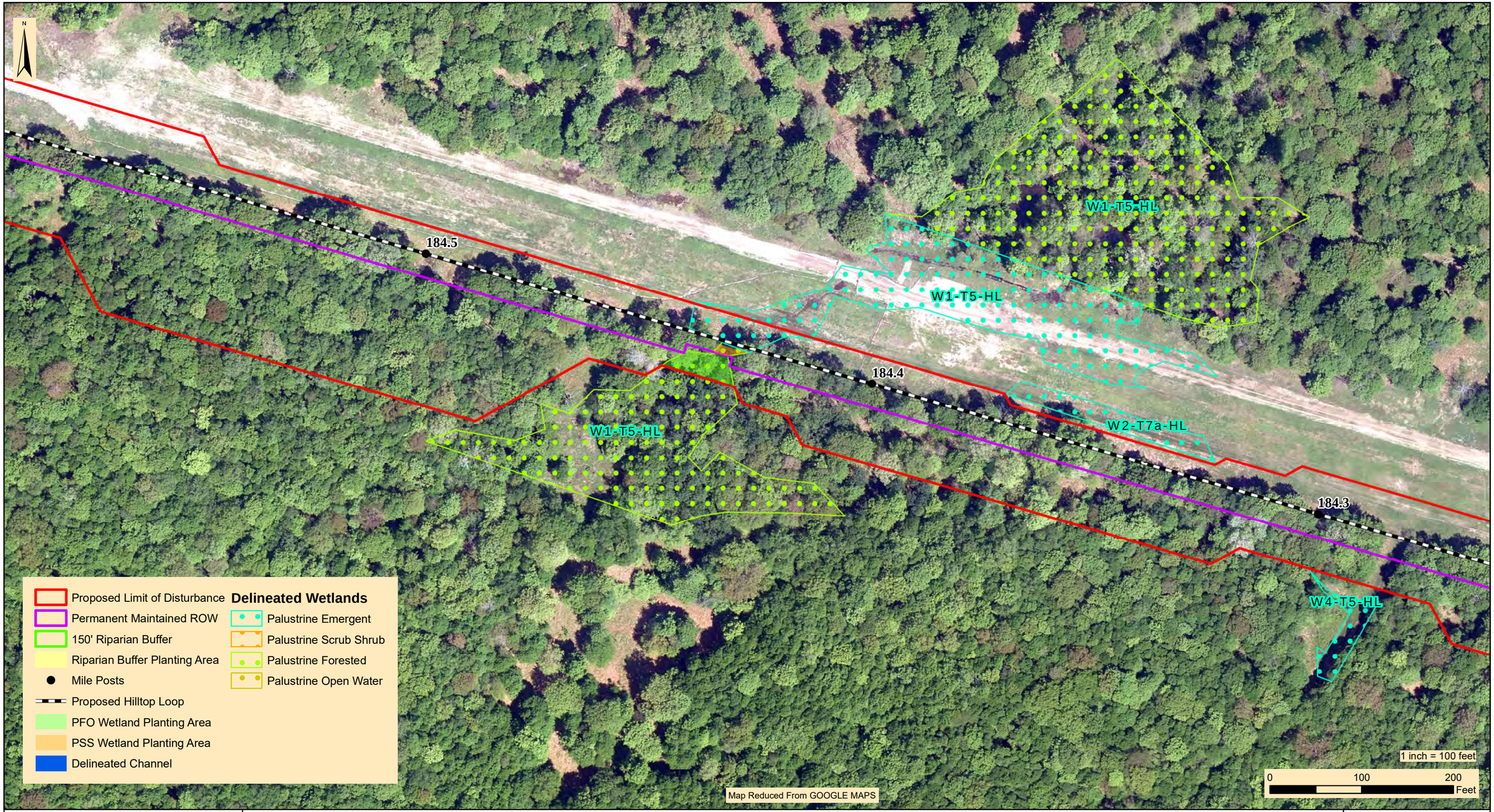

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RESOURCE CROSSING - 2 (HL-2)

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS201B003-HL
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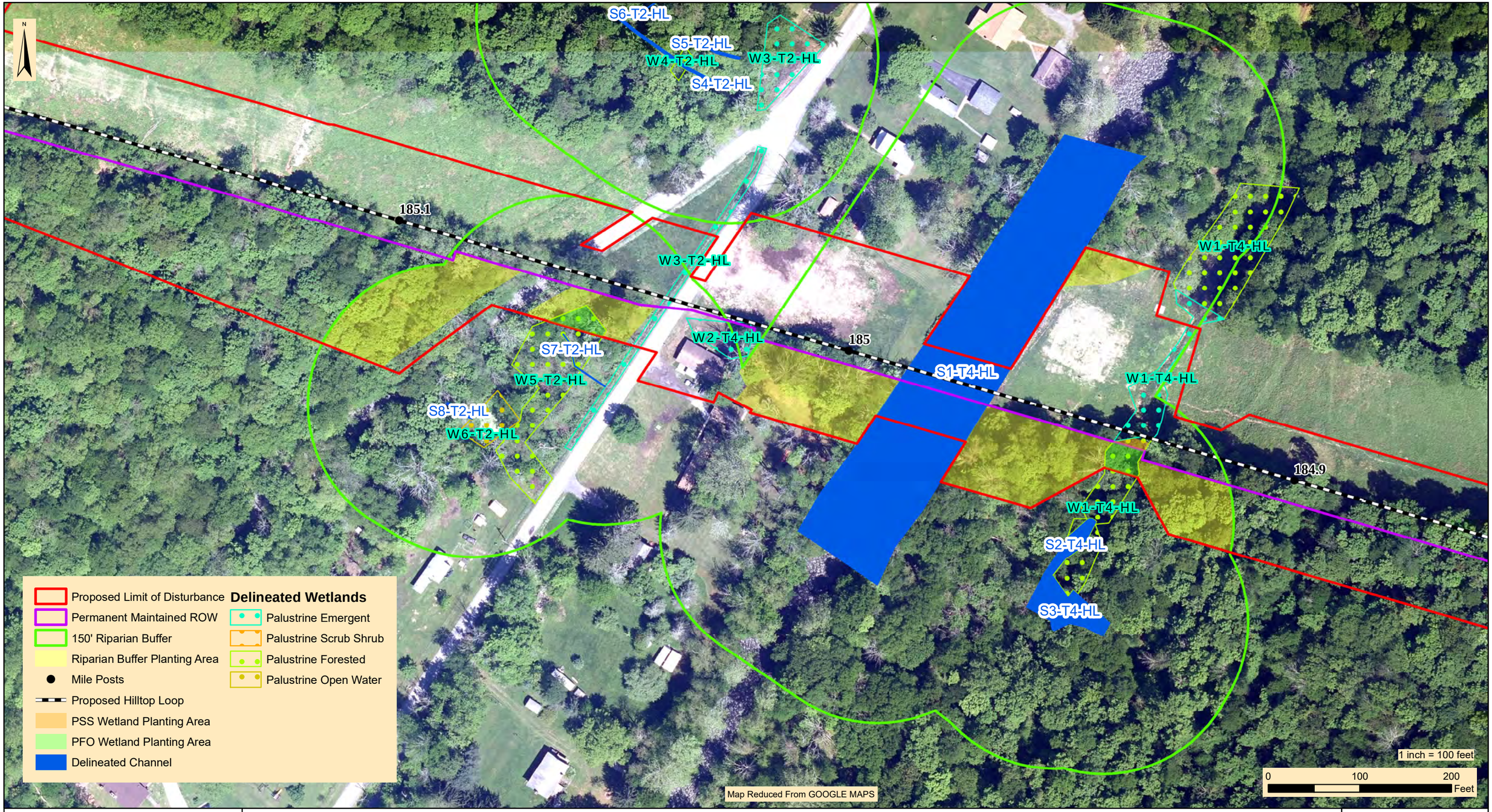

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RESOURCE CROSSING - 3 (HL-3)

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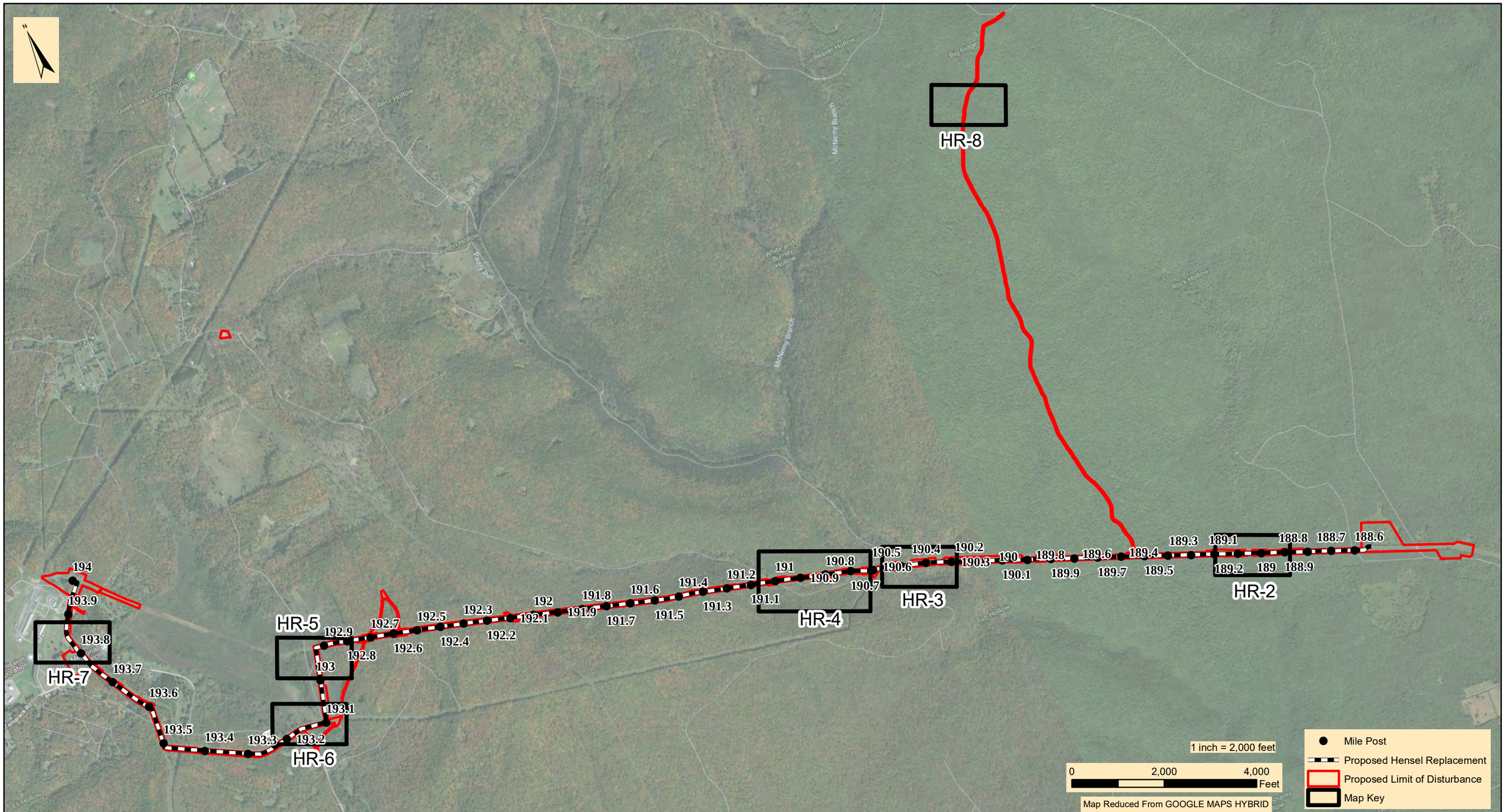
Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS201B004-HL
Drawn By:	PJF
Figure Number:	HL-4

HENSEL REPLACEMENT



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Date:	08/09/19
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RESOURCE CROSSING - 1 (HR-1)

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Date:	08/09/19
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Drawn By:	PJF
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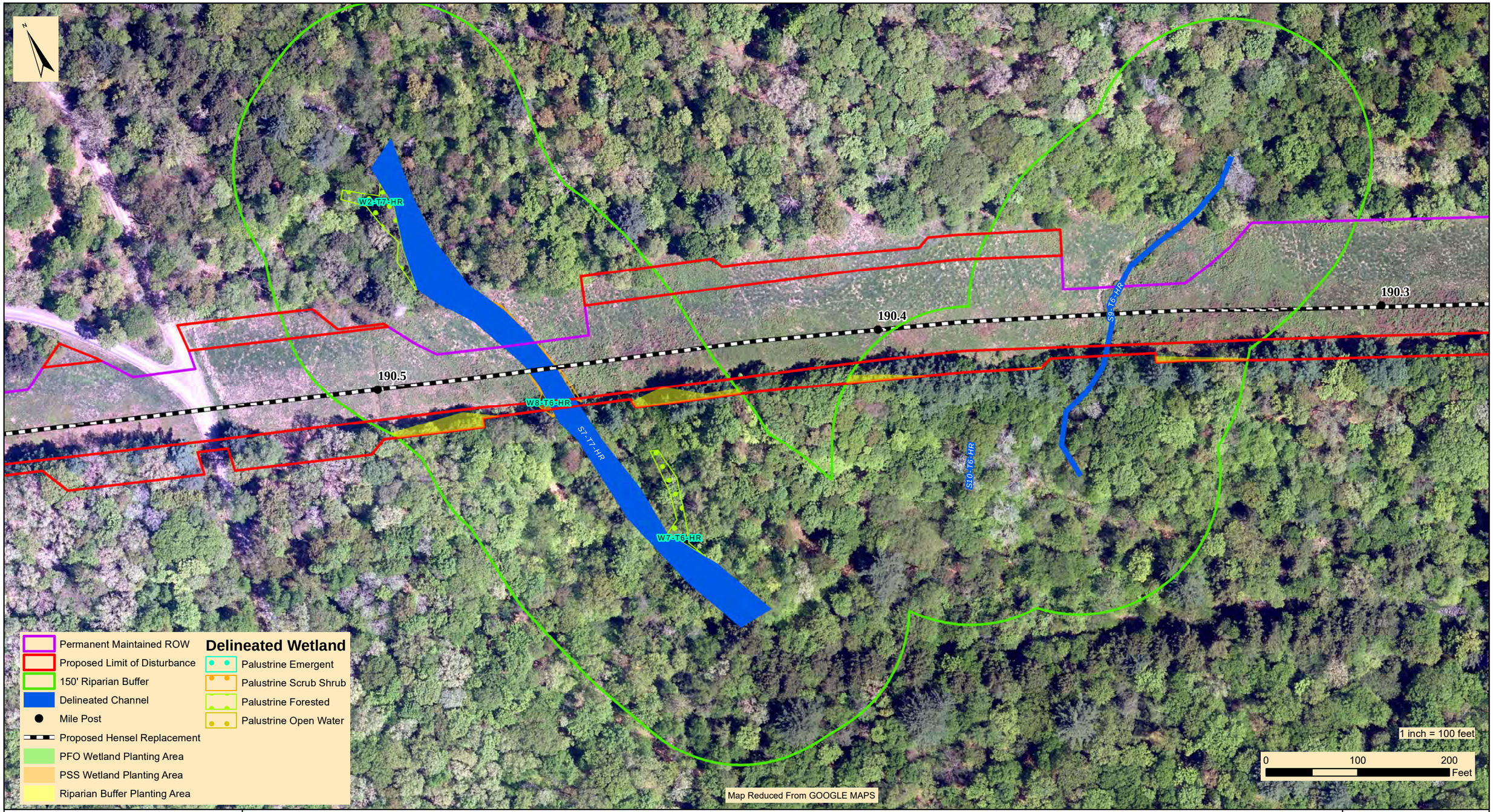

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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 2 (HR-3)

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Date:	08/15/19
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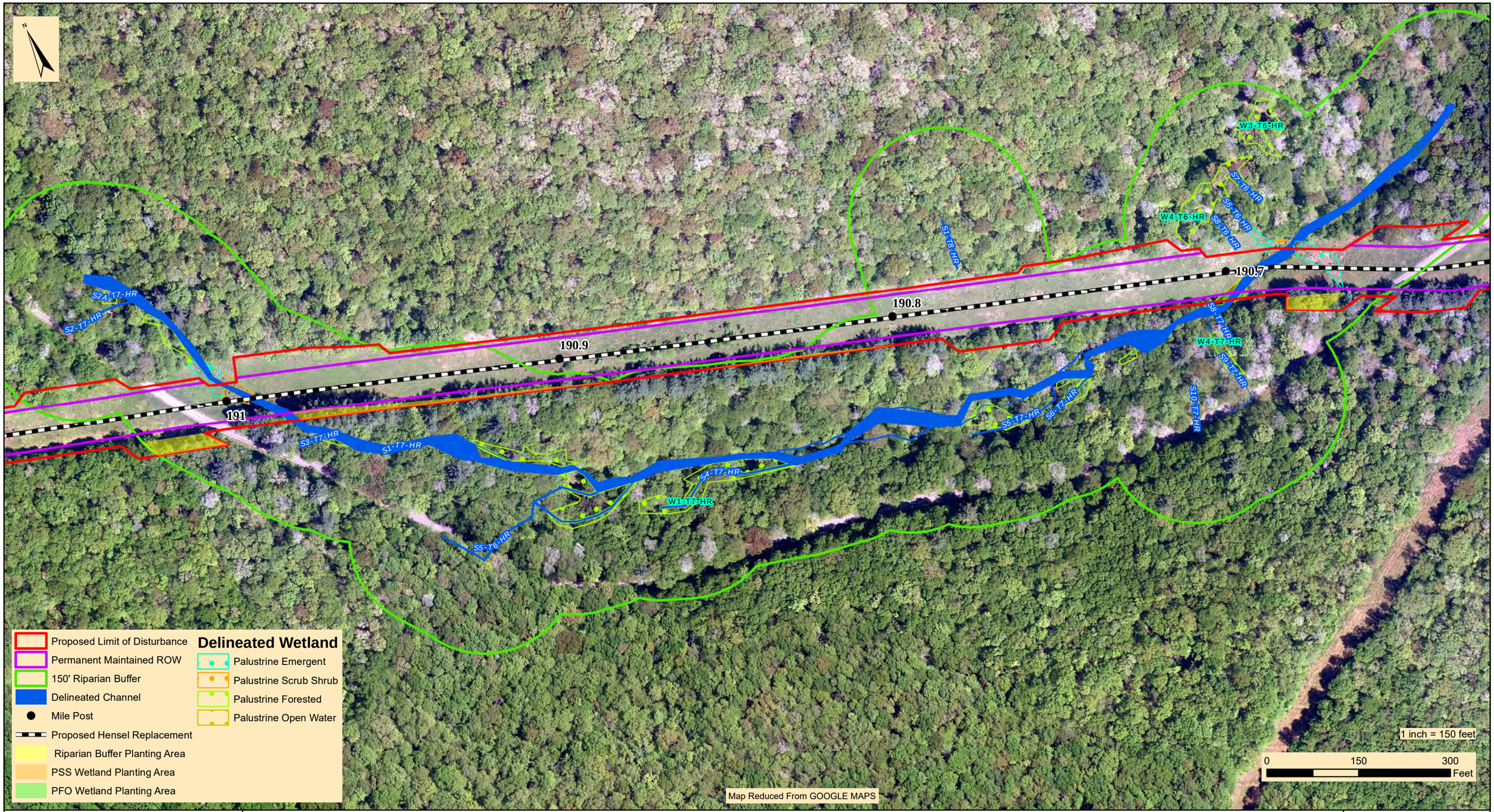

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LEIDY SOUTH PROJECT- HENSEL REPLACEMENT WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 3 (HR-5 and HR-7)

LEIDY TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

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Figure Number:	HR-4

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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 4 (HR-8)

LEIDY TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B005-HR
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Figure Number:	HR-5

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WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 4 (HR-9)

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Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B006-HR
Drawn By:	PJF
Figure Number:	HR-6

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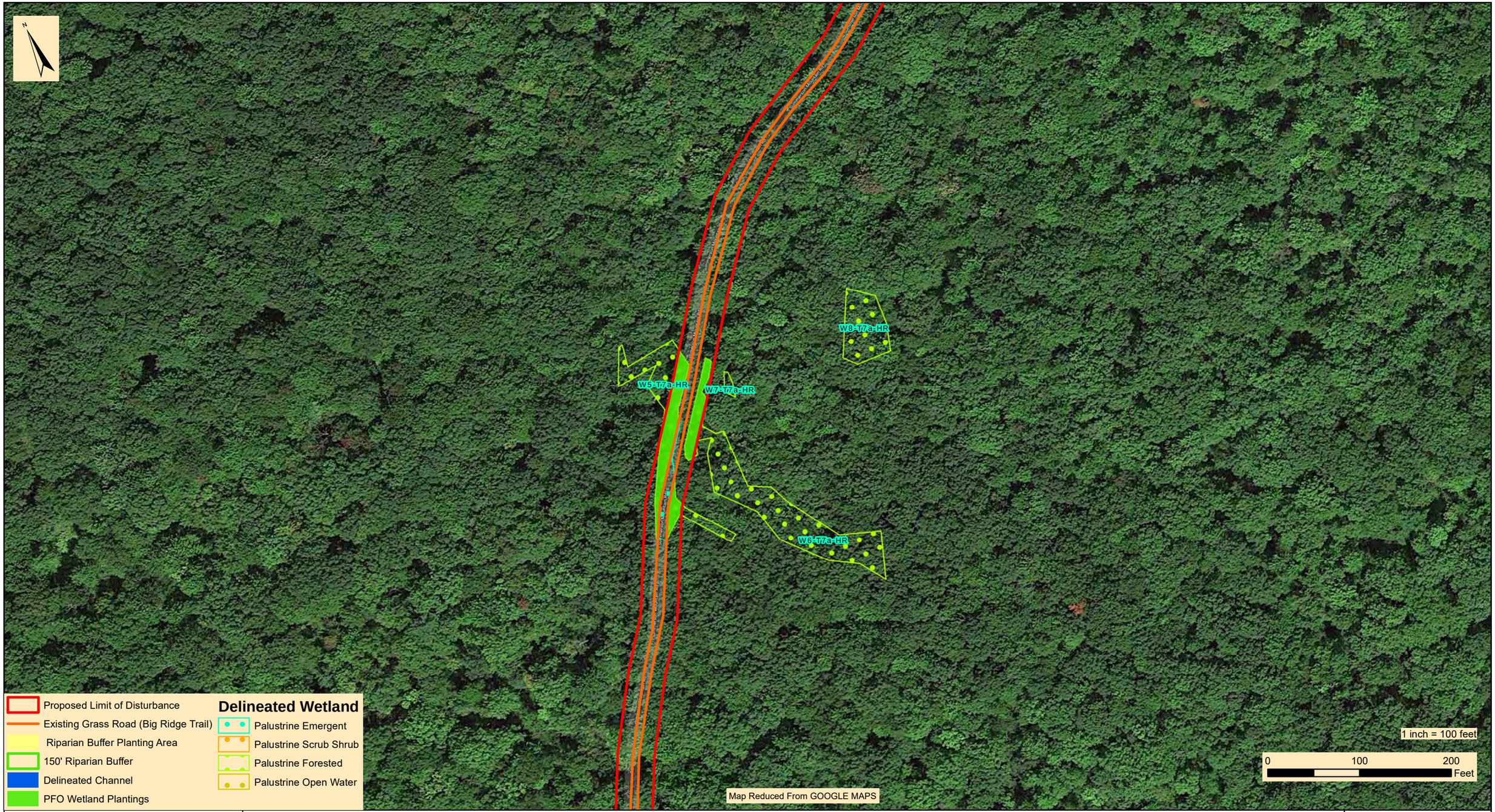
WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING -6 (RP-1)

LEIDY TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B007-HR
Drawn By:	PJF
Figure Number:	HR-7



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LEIDY SOUTH PROJECT- HENSEL REPLACEMENT
WETLAND AND RIPARIAN REFORESTATION PLAN

RESOURCE CROSSING - 7 (AR-2)

LEIDY TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/15/19
WHM DRAWING NUMBER:	WILLIAMS200B008-HR
Drawn By:	DMW
Figure Number:	HR-8

ATTACHMENT A

ERNST – FACW MEADOW MIX (ERNMX-122)

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: April 04, 2018

FACW Meadow Mix - ERNMX-122

	Botanical Name	Common Name	Price/lb
32.00 %	*Carex vulpinoidea, PA Ecotype*	Fox Sedge, PA Ecotype	24.00
20.00 %	*Elymus virginicus, PA Ecotype*	Virginia Wildrye, PA Ecotype	9.65
14.00 %	*Carex lurida, PA Ecotype*	Lurid (Shallow) Sedge, PA Ecotype	64.00
10.00 %	*Carex lupulina, PA Ecotype*	Hop Sedge, PA Ecotype	72.00
6.30 %	*Carex scoparia, PA Ecotype*	Blunt Broom Sedge, PA Ecotype	72.00
3.00 %	*Juncus effusus*	Soft Rush	40.00
2.00 %	*Aster puniceus, PA Ecotype*	Purplestem Aster, PA Ecotype	320.00
2.00 %	*Heliopsis helianthoides, PA Ecotype*	Oxeye Sunflower, PA Ecotype	42.00
2.00 %	*Verbena hastata, PA Ecotype*	Blue Vervain, PA Ecotype	32.00
1.50 %	*Asclepias incarnata, PA Ecotype*	Swamp Milkweed, PA Ecotype	240.00
1.00 %	*Aster umbellatus, PA Ecotype*	Flat Topped White Aster, PA Ecotype	320.00
1.00 %	*Eupatorium perfoliatum, PA Ecotype*	Boneset, PA Ecotype	300.00
1.00 %	*Onoclea sensibilis*	Sensitive Fern	108.00
0.50 %	*Alisma subcordatum, PA Ecotype*	Mud Plantain (Water Plantain), PA Ecotype	160.00
0.50 %	*Carex intumescens, PA Ecotype*	Bladder Sedge, PA Ecotype	128.00
0.50 %	*Cinna arundinacea, PA Ecotype*	Wood Reedgrass, PA Ecotype	120.00
0.50 %	*Juncus tenuis, PA Ecotype*	Path Rush, PA Ecotype	66.00
0.50 %	*Scirpus cyperinus, PA Ecotype*	Woolgrass, PA Ecotype	180.00
0.50 %	*Zizia aurea, PA Ecotype*	Golden Alexanders, PA Ecotype	240.00
0.30 %	*Eupatorium fistulosum, PA Ecotype*	Joe Pye Weed, PA Ecotype	228.00
0.30 %	*Penthorum sedoides, PA Ecotype*	Ditch Stonecrop, PA Ecotype	240.00
0.20 %	*Chelone glabra, PA Ecotype*	Turtlehead, PA Ecotype	600.00
0.20 %	*Ludwigia alternifolia, PA Ecotype*	Seedbox, PA Ecotype	180.00
0.20 %	*Mimulus ringens, PA Ecotype*	Square Stemmed Monkeyflower, PA Ecotype	260.00
100.00 %		**Mix Price/lb Bulk:**	**$58.22**

Seeding Rate: 20 lb per acre, or 1/2 lb per 1,000 sq ft

Wet Meadows & Wetlands

The diverse species provide pollinator habitat and erosion control in wet meadows. Excellent for facultative wetland mitigation sites. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

Price quotes guaranteed for 30 days.
All prices are FOB Meadville, PA.
Please check our web site at www.ernstseed.com
for current pricing when placing orders.

ATTACHMENT B

ERNST – RIPARAIN BUFFER MIX (ERNMX-178)

Ernst Conservation Seeds
8884 Mercer Pike
Meadville, PA 16335
(800) 873-3321 Fax (814) 336-5191
www.ernstseed.com

Date: February 06, 2018

Riparian Buffer Mix - ERNMX-178

	Botanical Name	Common Name	Price/lb
30.00 %	*Panicum clandestinum, 'Tioga'*	Deertongue, 'Tioga'	17.09
16.00 %	*Sorghastrum nutans, PA Ecotype*	Indiangrass, PA Ecotype	12.62
15.00 %	*Elymus riparius, PA Ecotype*	Riverbank Wildrye, PA Ecotype	7.44
10.00 %	*Andropogon gerardii, 'Niagara'*	Big Bluestem, 'Niagara'	12.25
7.00 %	*Panicum virgatum, 'Carthage', NC Ecotype*	Switchgrass, 'Carthage', NC Ecotype	5.17
3.00 %	*Chamaecrista fasciculata, PA Ecotype*	Partridge Pea, PA Ecotype	10.00
3.00 %	*Rudbeckia hirta, Coastal Plain NC Ecotype*	Blackeyed Susan, Coastal Plain NC Ecotype	20.00
3.00 %	*Verbena hastata, PA Ecotype*	Blue Vervain, PA Ecotype	32.00
2.00 %	*Asclepias incarnata, PA Ecotype*	Swamp Milkweed, PA Ecotype	240.00
2.00 %	*Heliopsis helianthoides, PA Ecotype*	Oxeye Sunflower, PA Ecotype	42.00
2.00 %	*Juncus effusus*	Soft Rush	40.00
2.00 %	*Juncus tenuis, PA Ecotype*	Path Rush, PA Ecotype	66.00
1.50 %	*Aster puniceus, PA Ecotype*	Purplestem Aster, PA Ecotype	320.00
1.00 %	*Eupatorium perfoliatum, PA Ecotype*	Boneset, PA Ecotype	300.00
0.80 %	*Vernonia noveboracensis, PA Ecotype*	New York Ironweed, PA Ecotype	220.00
0.50 %	*Aster novae-angliae, PA Ecotype*	New England Aster, PA Ecotype	360.00
0.50 %	*Eupatorium fistulosum, PA Ecotype*	Joe Pye Weed, PA Ecotype	228.00
0.50 %	*Monarda fistulosa, Fort Indiantown Gap-PA Ecotype*	Wild Bergamot, Fort Indiantown Gap-PA Ecotype	160.00
0.20 %	*Pycnanthemum tenuifolium*	Narrowleaf Mountainmint	140.00
100.00 %		**Mix Price/lb Bulk:**	**$33.05**

Seeding Rate: 20 lb per acre with a cover crop at 30 lb per acre (dry sites - grain oats, Jan 1-Aug 1; or, grain rye, Aug 1-Jan 1; moist sites - grain rye year-round)

Riparian Sites

A diverse mix of upland and wetland grasses, forbs and shrubs with extensive wildlife and pollinator value. Provides food and cover for many of our songbirds, pheasants, deer and turkey. Mix formulations are subject to change without notice depending on the availability of existing and new products. While the formula may change, the guiding philosophy and function of the mix will not.

Price quotes guaranteed for 30 days.
All prices are FOB Meadville, PA.
Please check our web site at www.ernstseed.com
for current pricing when placing orders.

ATTACHMENT C

ONSITE WETLAND AND RIPARIAN BUFFER REPLANTING TABLE

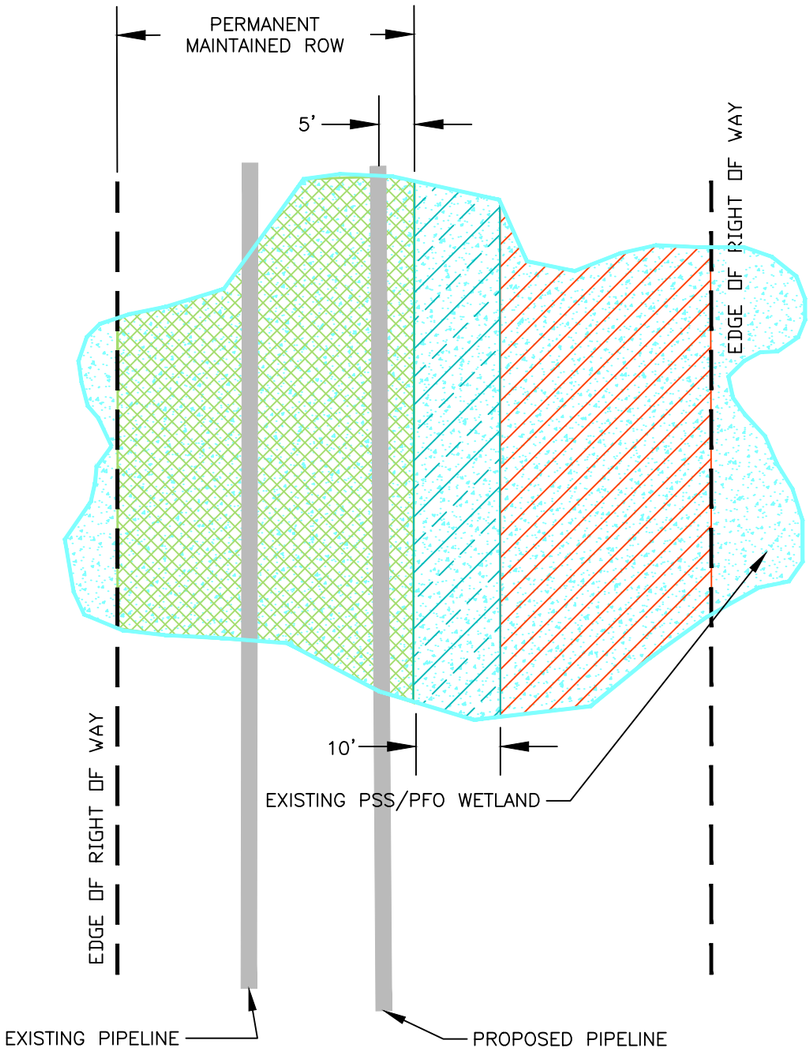
ATTACHMENT C

Onsite Wetland and Riparian Buffer Replanting Table

Pipeline Facility	Crossing Number	Mile Post	Feature ID	Type	Replanting Area (sq.ft.)	Replanting Area (acres)
Benton Loop	RP-1	117.0	S1-T6	RIPARIAN	939	0.02
	BL-3	117.8	S2-T6	RIPARIAN	6,251	0.14
	BL-4	118.1	S5-T6	RIPARIAN	9,387	0.22
	BL-6	118.2	S6-T6	RIPARIAN	12,585	0.29
	BL-7	118.7	W16-T6	PFO	2,991	0.07
	BL-7	118.7	S9-T6, S10-T6	RIPARIAN	5,724	0.13
	BL-7	118.8	W4-T5	PFO	326	0.01
	BL-7	118.8	S2-T5, S3-T5	RIPARIAN	13,246	0.30
	BL-8	119.1	W2-T4	PFO	2,026	0.05
	BL-8	119.1	W2-T4	PFO to PSS	388	0.01
	BL-8	119.1	S1-T5	RIPARIAN	3,247	0.07
	BL-8	119.1	S3-T3	RIPARIAN	2,761	0.06
	BL-9	119.6	W1-T2	PFO	728	0.02
	BL-9	119.6	S2-T2, S9-T2	RIPARIAN	9,988	0.23
	BL-10	120.2	W3-T1	PSS	2,101	0.05
	BL-10	120.2	S1-T1, S3-T1	RIPARIAN	6,558	0.15
				PSS Replanting Area	**2,101**	**0.05**
				PFO Replanting Area	**6,071**	**0.14**
				PFO to PSS Conversion Area	**388**	**0.01**
				Forested Riparian Replanting Area	**70,686**	**1.62**
Hilltop Loop	RP-1	183.6	S1-T8-HL	RIPARIAN	2,925	0.07
	HL-2	184.4	W1-T5-HL	PFO	1,683	0.04
	HL-2	184.4	W1-T5-HL	PFO to PSS	240	0.01
	HL-3	184.9	W1-T4-HL	PFO	1,124	0.03
	HL-3	184.9	W1-T4-HL	PFO to PSS	269	0.01
	HL-3	184.9	S2-T4-HL	RIPARIAN	6,661	0.15
	HL-3	185.0	W5-T2-HL	PFO	1,017	0.02
	HL-3	185.0	S1-T4-HL	RIPARIAN	26,583	0.61
	HL-3	185.1	S7-T2-HL, S8-T2-HL	RIPARIAN	15,910	0.37
				PFO Replanting Area	**3,825**	**0.09**
				PFO to PSS Conversion Area	**509**	**0.01**
				Forested Riparian Replanting Area	**52,079**	**1.20**
Hensel Replacement	HR-1	189	S12-T6-HR	RIPARIAN	4,067	0.09
	HR-3	190.3	S9-T6-HR	RIPARIAN	814	0.02
	HR-3	190.5	S7-T7-HR	RIPARIAN	2,509	0.06
	HR-3	190.5	W8-T6-HR	PSS	110	0.00
	HR-5	190.7	S1-T7-HR	RIPARIAN	2,367	0.05
	HR-5	190.7	W1-T7-HR	PFO to PSS	200	0.00
	HR-5	190.7	W1-T7-HR	PFO	271	0.01
	HR-7	191	S1-T7-HR	RIPARIAN	5,523	0.13
	HR-8	193.0	W4-T5-HR	PSS	4,182	0.10
	HR-8	193.0	S2-T5-HR	RIPARIAN	673	0.02
	HR-9	193.1	W4-T5-HR	PFO	1,694	0.04
	HR-9	193.1	W4-T5-HR	PSS	10,376	0.24
	HR-9	193.1	W4-T5-HR	PFO to PSS	432	0.01
	HR-9	193.1	S1-T5-HR, S2-T7a-HR	RIPARIAN	10,758	0.25
	RP-1	193.9	S1-T1-HR	RIPARIAN	3,023	0.07
	AR-2		W5-T7a-HR, W6-T7a-HR	PFO	3,653	0.08
				PSS Replanting Area	**14,668**	**0.34**
				PFO Replanting Area	**5,618**	**0.05**
				PFO to PSS Conversion Area	**632**	**0.01**
				Forested Riparian Replanting Area	**29,734**	**0.70**

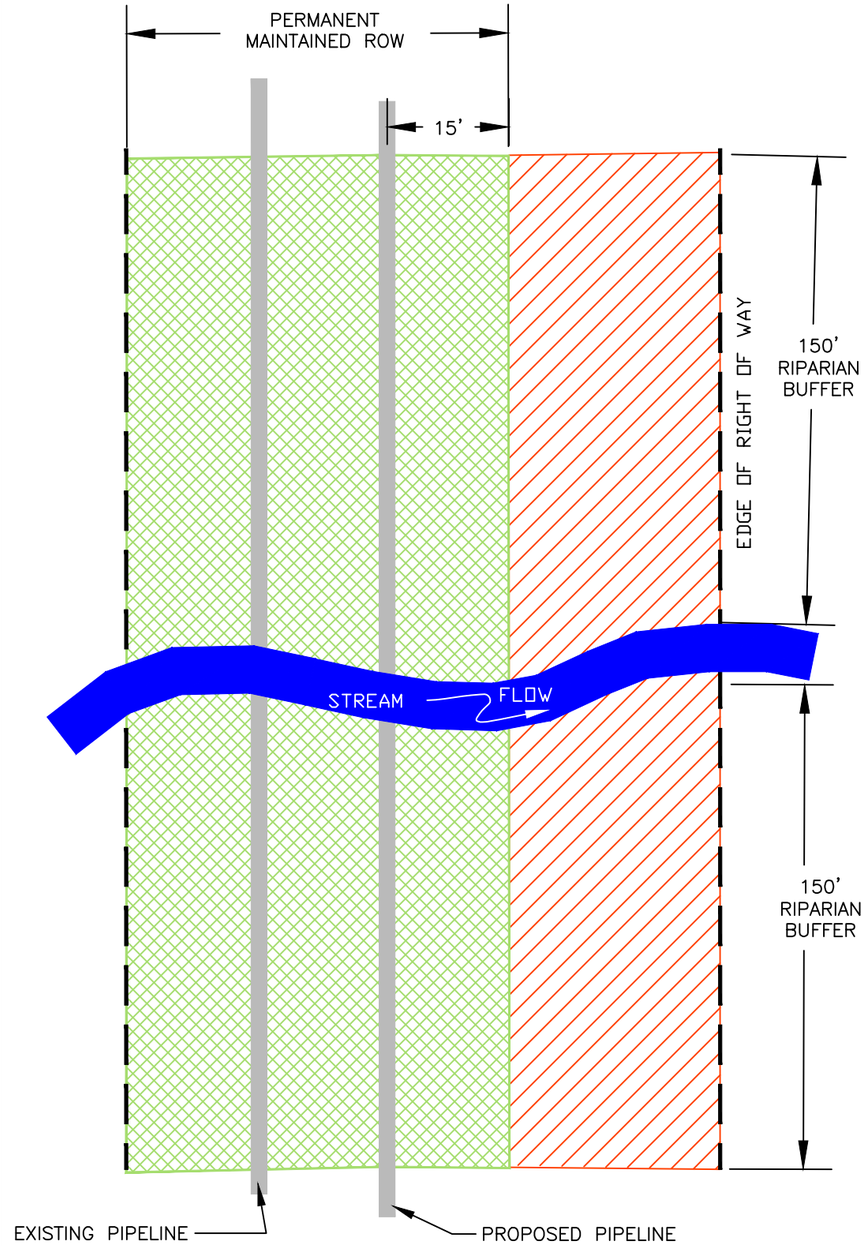
ATTACHMENT D

PLANTING DETAILS



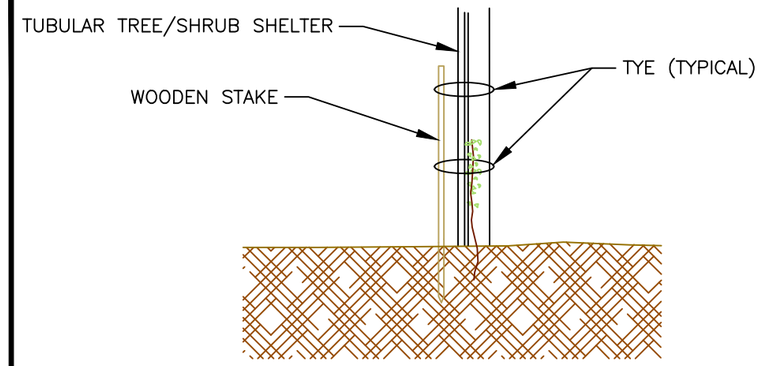
TYPICAL PSS / PFO REPLANTING DETAIL

NOT TO SCALE



TYPICAL RIPARIAN REPLANTING DETAIL

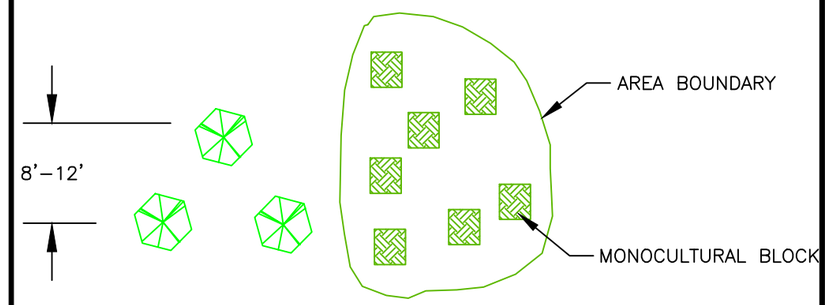
NOT TO SCALE



NOTE: TREE/SHRUB SHELTERS ARE TO BE MADE FROM BIODEGRADABLE PLASTIC TUBING. SIZE OF SHELTERS AND WOODEN STAKE TO BE DETERMINED BY PROJECT MANAGER.

TYPICAL TREE / SHRUB SHELTER DETAIL

NOT TO SCALE



PLAN VIEW – RANDOMLY SPACED MONOCULTURAL PLANTING BLOCKS
PLANT SPACING WITHIN MONOCULTURAL BLOCKS

1. TYPICAL SPACING IS APPROXIMATE. PLANTS SHOULD BE LOCATED RANDOMLY TO AVOID THE APPEARANCE OF ORGANIZED ROWS WITHIN THE MONOCULTURAL PLANTING BLOCKS.
2. TREES AND SHRUBS ARE TO BE PLANTED IN THE PLANTING ZONES IDENTIFIED IN THE PLANTING SCHEDULE. MONOCULTURAL BLOCKS SHOULD CONTAIN 3–6 PLANTS IN SHRUB AND TREE ZONES. MONOCULTURAL BLOCKS SHOULD BE APPROXIMATELY 20' BY 20' IN SIZE, OR AS DIRECTED OR MODIFIED BY THE CONSTRUCTION MANAGER.

TYPICAL PLANT SPACING DETAIL

NOT TO SCALE

* ALL PLANTINGS ARE TO BE PLANTED AND MAINTAINED IN ACCORDANCE WITH NURSERY RECOMMENDATIONS FOR THE FERTILIZER, LIME, SOIL AMENDMENTS, WATER, AND WILDLIFE PROTECTION. WEEKLY INSPECTION, WATERING AS NEEDED, AND OTHER NECESSARY CARE SHOULD BE PROVIDED DURING THE FIRST WEEKS OF THE GROWING SEASON UNTIL SUCCESSFUL TRANSPLANTATION IS EVIDENT.

LEGEND

- TREE / SHRUB REPLANTING AREA
- SHRUB REPLANTING AREA
- WETLAND / RIPARIAN SEED MIX ONLY

WHM consulting, INC.
designs, permits, resolutions
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
TELEPHONE: (814)–689–1650 FAX: (814)–689–1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT
WETLAND AND RIPARIAN REFORESTATION PLAN

REPLANTING DETAILS

LYCOMING AND CLINTON COUNTY PENNSYLVANIA

DATE:	08/08/19
DRAWN BY:	KMC
CHECKED:	PF
DRAWING NO.	WILLIAMS186B001
SHEET NO.	ATTACHMENT D

APPENDIX S4-3

COMPENSATORY OFFSITE MITIGATION PLAN

TRANSCONTINENTAL GAS PIPE LINE, LLC
LEIDY SOUTH PROJECT

COMPENSATORY OFFSITE WETLAND MITIGATION PLAN

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- 4.2 Existing Soil Conditions
  - 4.2.1 Holly silt loam, rarely flooded (Hz)
- 4.3 Waters of the United States

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6.0 Mitigation Work Plan

- 6.1 Wetland Enhancement
- 6.2 Wetland Creation
  - 6.2.1 Hydrologic Design
  - 6.2.2 Grading Design
  - 6.2.3 Vegetative Design
    - 6.2.3.1 Shallow Open Water Refugium
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2 – Project Location Map

3 – USDA/NRCS Soils and NWI Map

4 – Wetland Delineation Map

5 – Mitigation Design Plan

6 – Details

B) Declaration of Restrictive Covenants Agreement Template

C) Wetland Delineation Report

D) Photographic Documentation

E) Pennsylvania Natural Diversity Index Environmental Review Receipt and Correspondence

F) Cultural Resource Notice

G) Past Performance History, Resumes & Project Profiles

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC.

LEIDY SOUTH PROJECT

COMPENSATORY OFFSITE WETLAND MITIGATION PLAN

1.0 OBJECTIVES

The objective of the compensatory wetland mitigation project is to provide sufficient compensation to offset unavoidable wetland impacts resulting from the Leidy South Project (Project) proposed by Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams). Impacts resulting from the Project include: 1) permanent impacts to 0.22 acre of Palustrine Emergent (PEM) wetlands; 2) functional conversion impacts to 0.06 acre of Palustrine Shrub-Scrub (PSS) wetlands, and; 4) functional conversion impacts to 0.05 acre of PFO wetlands. The impacts associated with the Project are located in the Central West Branch Susquehanna Subbasin, Lower West Branch Susquehanna Subbasin and the Upper Central Susquehanna River Subbasin which corresponds to the Geographic Service Area of the Pennsylvania State Water Plan (Appendix A, Figure 1 – Geographic Service Area Map.

To mitigate for the wetland impacts, an offsite mitigation site has been designated to offset functional losses by providing 0.51 acre of wetland mitigation consisting of 0.27 acre of wetland creation and 0.24 acre of wetland enhancement within the Lower West Branch Susquehanna River Subbasin. The proposed offsite mitigation site is located within an existing property that is currently in use for other offsite permittee-responsible mitigation. The area proposed for mitigation activities associated with this Project is currently being used and has been historically altered for agriculture purposes.

This document has been prepared in accordance with 25 PA Code Chapter 105-20a - Wetland Replacement Criteria, and Federal Register, Department of the Army, Corps of Engineers 33 CFR Parts 325 and 332, Environmental Protection Agency 40 CFR Part 230 – Compensatory Mitigation for Losses of Aquatic Resources; Final Rule, April 10, 2008.

2.0 SITE SELECTION CRITERIA

A desktop analysis was completed within the geographic service areas of Project to determine potential locations to offset water resource impacts resultant of the project (Appendix A, Figure 1 – Geographic Service Area Map). Based on the review, several properties within the geographic service area were currently under an option agreement and have been assessed as areas where mitigation and/or water quality improvement projects would be beneficial within the watershed. Ultimately due to site suitability, the property serving other permittee-responsible mitigation, landowner cooperation, and the large contiguous nature of wetland features on the site, a farm within the Lower West Branch Susquehanna River Subbasin located in Liberty Township, Montour County was selected as an appropriate site to provide compensatory mitigation (Appendix A, Figure 2 – Project Location Map).

3.0 SITE PROTECTION INSTRUMENTS

This site is currently under contract and will be placed in a Declaration of Restrictive Covenants upon acceptance from regulatory agencies (Appendix B – Declaration of Restrictive Covenants Agreement Template). This agreement states that any construction restrictions as well as any other restrictions will be imposed upon the mitigation area. This Restrictive

Covenant shall run with the property in perpetuity and shall be binding on the owner; future owners; and their successors and assigns, lessees, easement holders, and any authorized agents, employees, or persons acting under their direction and control.

4.0 BASELINE INFORMATION

The site is located approximately 3.15 miles east – northeast of the town of Milton along Kelly's Dam Road. Coordinates of the site are Latitude: 41.012344°N / Longitude: 76.752311°W. Current land use for the proposed mitigation site consists of wetlands and drained agriculture fields primarily used to harvest corn. Through a review of historic aerial imagery the property has been utilized for agriculture purposes for at least 70 years. The portion of property proposed for mitigation contains marginal crop farmland due to the high-water table and frequent flooding and ponding at the site.

4.1 EXISTING HYDROLOGY

The proposed mitigation site is located within the floodplain of the Chillisquaque Creek watershed which according to the Pa. Code 25, Chapter 93 water quality standards is classified as: Warm Water Fisheries (WWF). Through a review of historical aerial photography and during recent onsite investigations, drainage ditches were observed throughout the agricultural field (Appendix A, Figure 4 – Wetland Delineation Map). The noted drainage measures have effectively removed or reduced hydrology in only portions of the field. The remnant hydrology that drives the existing wetlands is provided primarily by upslope runoff and direct precipitation that support a shallow seasonal groundwater table.

4.2 EXISTING SOIL CONDITIONS

Holly silt loam, noted as soil mapping units Hz was mapped within the proposed mitigation site. Holly soils area considered hydric and are alluvial in nature. The following text briefly describes soils found within the project area as described by the USDA/NRCS Soil Survey for Montour County (1985).

4.2.1 HOLLY SILT LOAM, RARELY FLOODED (Hz)

This soil is nearly level, deep, and poorly drained and very poorly drained located on floodplains and is considered hydric. The permeability is moderately slow or moderate, and the available water capacity is high. Runoff is slow. The seasonal high-water table is between the surface and a depth of 6 inches in the winter and spring. The seasonal high-water table is the main limitation for crops, pasture and non-farm uses.

4.3 WATERS OF THE UNITED STATES

A field investigation was conducted to delineate wetland and water resource boundaries on the property and to determine if suitable conditions exist for mitigation activities to take place onsite. The proposed site was originally delineated on October 24, 2013 and boundaries were reconfirmed on August 5, 2019 (Appendix C – Wetland Delineation Report).

The wetland proposed to be enhanced and expanded (created) is an existing PEM wetland located in a slightly depressed area adjacent to and within agricultural fields east of Kelly's Dam road. Portions of the wetland extended into agricultural fields

which was evident though stunted growth of crops. The remainder of the agricultural field displayed upland vegetation with less hydrologic wetland indicators. Evidence of standing water was located in the most depressed areas of the wetland area. Several drainage ditches were located within the wetland area to assist with draining fields for agricultural uses. Primary soil and hydrologic indicators consisted of oxidized rhizospheres, saturated soils, and a depleted matrix. Dominant vegetation included: *Setaria sp*. (Bristle grass, Facultative Wetland (FACW)), *Scirpus cyperinus* (Woolgrass, FACW), *Juncus effusus* (Soft rush, Obligate (OBL)), *Phalaris arundinacea* (Reed canary grass, FACW), and *Carex alopecoidea* (Foxtail Sedge, FACW).

5.0 CREDIT DETERMINATION METHODOLOGY

The Leidy South Project results in 0.22 acre of permanent PEM wetland impacts, 0.06 acre of functional conversion impacts to PSS wetlands, and functional conversion impacts to 0.05 acre of PFO wetlands. The following mitigation ratios were assessed for the Project:

- 2.5:1 for Exceptional Value (EV) PFO wetlands
- 2:1 for non-EV PFO wetlands
- 1.75:1 for EV PSS wetlands
- 1.5:1 for non-EV PSS wetlands
- 1.25:1 for EV PEM wetlands; and
- 1:1 for non-EV PEM wetlands

Table 5-1 outlines a breakdown of the impacts and proposed mitigation for the Project.

Table 5-1
Offsite Compensatory Wetland Mitigation Summary

Facility	Crossing	Milepost	Feature ID	Wetland Type	Chapter 105.17	Impact Type	Impacted Area (sq.ft.)	Impacted Area (acres)	Mitigation Ratio	Wetland Mitigation (sq.ft.)
Benton Loop										
	BL-8	119.1	W2-T4	PFO	EV	Conversion	464	0.011	2.5 to 1	1,161
	BL-10	120.2	W3-T1	PSS	EV	Conversion	99	0.002	1.75 to 1	173
									PFO Functional Conversion Mitigation	**1,161**
									PSS Functional Conversion Mitigation	**173**
Hilltop Loop										
	HL-2	184.4	W1-T5-HL	PFO	EV	Conversion	284	0.007	2.5 to 1	709
	HL-3	184.9	W1-T4-HL	PFO	EV	Conversion	340	0.008	2.5 to 1	851
									PFO Functional Conversion Mitigation	**1,560**
Hensel Replacement										
	HR-4	190.5	W8-T6-HR	PSS	EV	Conversion	381	0.009	1.75 to 1	667
	HR-5	190.7	W1-T7-HR	PSS	EV	Conversion	220	0.005	1.75 to 1	384
	HR-5	190.7	W1-T7-HR	PFO	EV	Conversion	471	0.011	2.5 to 1	1,178
	HR-8	193.0	W4-T5-HR	PSS	EV	Conversion	687	0.016	1.75 to 1	1,203
	HR-9	193.1	W4-T5-HR	PFO	EV	Conversion	620	0.014	2.5 to 1	1,549
	HR-9	193.1	W4-T5-HR	PSS	EV	Conversion	1,266	0.029	1.75 to 1	2,216
	HR-AR-2	-	W5-T7a-HR	PEM	Other	Fill	816	0.019	1 to 1	816
									PEM Wetland Creation Mitigation	**816**
									PFO Functional Conversion Mitigation	**2,727**
									PSS Functional Conversion Mitigation	**4,469**
Compressor Station 607										
	CS607A-1	-	W2-T2-CS607A	PEM	EV	Fill	8,429	0.194	1.25 to 1	10,536
	CS607A-4	-	W2-T3-CS607A	PEM	Other	Fill	13	0.0003	1 to 1	13
	CS607A-5	-	W3-T3-CS607A	PEM	Other	Fill	437	0.01	1 to 1	437
									PEM Wetland Creation Mitigation Area	**10,986**
						Overall Permanent PEM Impacts	**9,695**	**0.22**	**Wetland Creation Mitigation**	**11,802 (0.27 acres)**
						Overall Functional Conversion PSS Impacts	**2,652**	**0.06**	**PSS Functional Conversion Mitigation**	**4,642 sq.ft (0.11 acres)**
						Overall Functional Conversion PFO Impacts	**2,179**	**0.05**	**PFO Functional Conversion Mitigation**	**5,449 sq.ft (0.13 acres)**

The functions and values provided at the proposed mitigation site will provide sufficient compensation to offset water resource impacts. The functional conversion impacts will be offset by providing a functional gain in low quality PEM wetlands historically used for agricultural purposes by reverting to a higher quality wetland/riparian buffer ecosystem; while the permanent impacts will be offset at a ratio that will exceed no net loss and expand upon wetland habitat at the site. The mitigation areas will enhance and expand the existing wetland complex located at the site. The work plan will result in the expansion and functional enhancement of the existing condition of the PEM wetlands onsite, which are considered low quality due to land use. The permanent protection/conservation of the area, including implementation of a diverse tree and shrub planting plan, will result in an enhanced wetland ecosystem consisting of a mixed wetland /riparian buffer complex. The mitigation activities at the site will allow for the areas to once again provide essential functions and values within the sensitive resource areas. The primary functional improvements of the mitigation area include: 1) water quality benefits through the increased sediment and nutrient sequestration; 2) floral and vegetative diversity; and 3) enhanced wildlife habitat / utilization.

6.0 MITIGATION WORK PLAN

The design of the proposed enhancement and creation area consists of increasing and expanding functions of the existing wetland onsite. The wetland creation area will involve the creation of shallow vegetated open-water components to create and enhance habitat for amphibians, waterfowl, wading birds, and migratory songbird species. The wetlands proposed to be enhanced are in a degraded state due to current farming. Less diverse portions of the enhancement area will be cultivated or plowed to create appropriate conditions for wetland seeding. The design of the overall mitigation site will incorporate meandering flightways paralleled by an emergent and scrub/shrub fringe. Clumped distribution of tree and shrub plantings will be positioned on graded low hummocks or mounds where the collars will be above typical standing water elevations early in the growing season. Tree and shrub plantings are proposed along the perimeter of the site to act as screening/buffer for the enhanced and created wetlands.

6.1 WETLAND ENHANCEMENT

Wetlands within the enhancement areas are PEM wetlands. The existing vegetation with the proposed enhancement areas will be supplemented with native tree and shrub plantings to allow the wetlands to revert to a forested and/or scrub-shrub state; thereby increasing functions and values in these sensitive resource areas. The vegetative design proposed will incorporate diverse planting plans for each site that consist of a clumped distribution of monocultural blocks of trees and shrubs within the wetland enhancement areas to create a mixed wetland ecosystem. All plants will be planted in clumps of monocultures consisting of five (5) to ten (10) plants. Shrub and willow monocultures will be planted 4 feet on center (O.C.); while tree monocultures are to be planted 10 feet O.C. Table 6.1-1 outlines the wetland enhancement planting plan for 0.24 acre.

TABLE 6.1-1
WETLAND ENHANCEMENT PLANTING PLAN (0.24 ACRES)

Scientific Name	***Common Name***	***Status***	***Container***	***Spacing***
Cornus amomum	silky dogwood	FACW Shrub	bare root / 1 gallon	4' O.C.

Cornus racemosa	gray dogwood	FAC Shrub	bare root / 1 gallon	4' O.C.
Ilex verticillata	winterberry	FACW Shrub	bare root / 1 gallon	4' O.C.
Alnus serrulata	hazel alder	OBL Shrub	bare root / 1 gallon	4' O.C.
Salix discolor	pussy willow	FACW Shrub	cutting / 1 gallon	4' O.C.
Salix nigra	black willow	OBL Shrub/Tree	cutting / 1 gallon	4' O.C.
Quercus palustris	pin oak	FACW Tree	1 or 2 gallon	10' O.C.
Acer saccharinum	silver maple	FACW Tree	1 or 2 gallon	10' O.C.
Nyssa sylvatica	black gum	FAC Tree	1 of 2 gallon	10' O.C.
Platanus occidentalis	american sycamore	FACW Tree	1 or 2 gallon	10' O.C.

Notes:
- Select a minimum of 3 tree species and 3 shrubs species to be planted in enhancement area.
- Plant at a density of 400 stems per acre (or 96 total stems) with trees (48) and shrubs (48)

6.2 WETLAND CREATION

6.2.1 Hydrologic Design

The hydrology that drives the existing wetland is the result of a seasonal high water table which is between the surface and a depth of 6 inches in the winter and spring in the Holly (Hz) soil mapping unit, as described in the USDA-SCS Soil Survey for Montour County. Overbank flows from the adjacent tributary also provide additional hydrology during flooding events. Ancillary hydrologic inputs include upslope runoff and direct precipitation. The wetland complex experiences natural drawdown during the drier months of the growing season. The hydrologic design for the wetland creation areas will mimic that of the existing adjacent wetlands hydrology resulting in a shared hydrology model. Grading will be conducted to lower elevations in the proposed creation areas to provide closer interface with the seasonal groundwater. As a result, the design of the wetland creation site is dependent on groundwater, limited runoff and flooding, and direct precipitation as the hydrologic inputs for the mitigation wetlands. Primary water losses are expected to result from monthly evapotranspiration. The resulting inputs/losses hydrograph is expected to closely mirror the existing seasonal rise and fall of the adjacent farmed wetlands.

6.2.2 Grading Design

With respect to the design, the soils within the mitigation area are moderately slow to moderately permeable, have a slow runoff potential, have a seasonally high water table at or within 6 inches of the soil surface in the spring and winter, and have slopes that are nearly flat. Therefore, a wetland creation design based on capturing runoff and holding precipitation through the use of embankments is not appropriate in this setting/hydrogeomorphic landscape position. Instead, a wetland design approach that seeks to excavate to intercept seasonally high-water tables and eliminates potential failure from loss of earthen structures during major flood events is best suited for this site.

Shallow excavations in the wetland creation area and portions of the wetland enhancement area will be necessary to interface with seasonal groundwater and thereby support wetland development in creation areas and

open water pockets in the enhancement areas. The grading design includes a meandering flightway that mimics an old oxbow scour within the wetland creation areas. The flightway will be graded to a depth of approximately 3 feet below the existing and proposed surface elevation with a bottom width of approximately 10 feet. Side slopes will be graded at a 3:1 ratio located 2 feet from the bottom elevation and the final 1 foot will be graded at an 8:1 slope where fringe plantings are proposed along the side cast. Additional microtopography, including hummocks and shallow depressional areas will be included throughout both the wetland creation and enhancement areas to create diversity.

Contour elevations selected for the site are such that a significant soil surplus is not expected. Excess material generated by grading operations will be incorporated into the adjacent agricultural fields. No excess spoil will be placed within the floodplain. Elevations for newly graded contours have been based in part on depths of predicted seasonal groundwater as interpreted by depths of low chroma colors and redoximorphic features. The overall grading design within wetland creation areas and flightway zone will include the stripping of topsoil layer with a typical thickness of 10 – 12 inches, prior to initial grading. The areas will then be brought to within 10 inches (minimum) of final grade and the topsoil replaced to a minimum thickness of 10 inches. The existing topsoil will be acceptable as a substrate for wetland plantings due to the presence of ample sequestered organic matter.

6.2.3 Vegetative Design

The final grading of the site will result in microtopographic changes in elevations which will result in several hydrologic regimes and planting zones. The vegetative design of the site outlines a combination of a specific wetland seed mix, shrub, and tree species that were selected for each hydrologic regime. The site will be seeded and planted immediately following final grading/cultivation operations. If weather or timing following grading operations are not ideal for installation of trees and shrubs, woody plantings will be delayed until more favorable fall or spring seasons to ensure successful growth.

The wetland creation area will be seeded with a mixture of 40 pounds per acre of Annual Rye Grass and 15 pounds per acre of Ernst Seed Mix's – Waterfowl Buffet Mix for Wetland Enhancement (or equivalent). Hay or straw mulch will be applied at a rate of 3 tons per acre to the newly seeded sloping areas for protection against erosion during seed germination.

Plantings selected for the various regimes have been based on saturation/inundation tolerance for each species. All propagules and containerized plant materials will be planted in a clumped distribution of monoculture blocks of individual species. Monocultures will be planted from 2 to 4 feet O.C. for willow cuttings, and 4 to 8 feet O.C. for shrub species, and 8 to 12 feet O.C. for tree species. Spacing has been designed to provide uniform

ground cover and even diversity between strata in the wetland and surrounding upland.

6.2.3.1 SHALLOW VEGETATED OPEN WATER (FLIGHTWAY)

Shallow open water flightways will be located throughout the wetland creation and enhancement areas and will contain up to 3 feet of water. These areas have been designed to remain at least partially inundated throughout most or all of a typical growing season. Therefore, this area will be planted with Obligate (OBL) aquatic species such as, sago pondweed, water smartweed, pond lily, spatterdock, and pickerel weed (or equivalent).

6.2.3.2 SCRUB/SHRUB FRINGE

Fringe planting will take place within side casting from the excavated flightway and in clumped distributions within enhanced wetland approximately 0.3 to 0.5 feet above the high groundwater table and/or planned surface water inundation elevation. The area will range from being inundated or saturated throughout the spring of the year and be planted with mainly FACW shrub species consisting of silky dogwood, redosier dogwood, button bush, northern arrowwood, spicebush, and pussy willow (or equivalent).

6.2.3.3 TREE HUMMOCKS AND SCREENING

Tree planting will also take place within side casting from the excavated flightway, in intentionally fashioned hummocks, and in clumped distributions within other portions of the wetland approximately 0.3-foot above the control elevation of the wetland (seasonal highwater), and along the perimeter or buffer of the wetland mitigation site to act as a screening to block noise, light, human and other disturbances from the wetland. The species selected for the hummocks and screening includes deciduous species that are FACW and facilitative (FAC). Tree plantings will be placed in areas that will be saturated but slightly above the seasonal highwater elevation anticipated at the onset of the growing season. Plantings will consist of swamp white oak, pin oak, silver maple, red maple, black willow, American sycamore, and tulip-poplar (or equivalent).

6.3 METHOD OF PLANTING

All plants shall be installed according to acceptable standards of the trade under supervision of a landscape professional with suitable practical field experience in wetlands installation projects. All plant materials shall be nursery grown and shall be guaranteed to be true to name and healthy upon delivery.

Herbaceous species will be planted by digging down into the substrate at the point of installation. If the plant is in a plastic container, this shall be removed, taking care to keep the root mass intact. If the plant condition is bare root, plug, peat pot, or fiber pot, it can be installed directly into the planting hole. In all cases, the original grade in enhancement area and final grade in creation areas will be balanced with soil, compacted and watered in order to keep the original ground elevation when planting.

Shrubs and trees shall be planted by digging a hole twice the size of the width of the rootball down into the substrate at the point of installation. If the plant is in a plastic container, this shall be carefully removed to keep the rootball intact. After planting, the area should be backfilled and watered. Trees may be provided with support stakes if this is deemed necessary by the installer. Care should be taken when installing support stakes to ensure that the root ball is not disturbed by driving of the support stake into the soil.

6.4 WILDLIFE DAMAGE CONTROL

After planting of the site has been completed, a method for herbivory control will be established by installation of tree and shrub tubes. Alternatively, temporary electric fencing may be installed along the perimeter of the site, if necessary. Other methods of wildlife damage control include the application of rodenticide to each tree/shrub and meadow vole bait stations established at a minimum of 1 per acre.

6.5 BOUNDARY DEMARCATION

The boundary of the recorded conservation area will be demarcated in the field with either fiberglass sign/posts marked “Conservation Area”, with metal t-posts, or with large boulders. Once trees and shrubs are established within the mitigation area, the woody vegetation shall also serve as the demarcation of the conservation area.

7.0 MAINTENANCE PLAN

The goal of the project is for the site to be self-sustaining post-construction with little to no maintenance needs beyond the five-year monitoring period. The proposed site design includes only minor grading and no mechanical structures. Maintenance for the first five years will take place in conjunction with the monitoring requirements for the site. The site shall be inspected at least twice a year for the first two years and no less than once per year during the following three years, or as directed by regulatory agencies. Maintenance activities may include removal of noxious/invasive species by cutting or spot herbicide treatment, inspection of the site after significant flooding events, tree tube alignment and removal, and other appropriate measures to ensure the performance standards are being met.

8.0 PERFORMANCE STANDARDS

Performance standards have been established that correspond with the goals and objective to offset water resource impacts. These standards will be used to determine the success of the Project. By monitoring the site for a period of no less than five years, and comparing results to the performance standards, a determination of the success of the site can be determined. The performance standards are as follows:

- Provide 0.24 acre of wetland enhancement consisting of mixed PSS & PFO habitat;

- Provide 0.27 acre of wetland creation consisting of mixed PEM, PSS & PFO habitat. The wetland creation site shall have saturation to the soil surface for a minimum of approximately 18 consecutive days during a typical growing season (during normal years);

- Planted trees and shrubs shall meet 85% survival throughout the 5-year monitoring period. Native woody plants naturally colonizing the enhancement area shall be included in plant density estimates;

- Vegetation within the enhanced wetland areas shall not be dominated by state or federally listed introduced, invasive, and/or noxious species identified on the current *Pennsylvania noxious weed control list* and the *Federal noxious weed list;* and

- Any deviation from these standards must be agreed upon by appropriate regulatory agencies.

If a successful mixed wetland community has not been achieved, additional plantings may be necessary to supplement the natural succession of the site. A vegetative analysis must continue on an annual basis until the performance standards or goals have been met. If mitigation is not successful, the monitoring report must include a discussion of remedial measures to correct the deficiencies.

9.0 MONITORING REQUIREMENTS

The monitoring will involve periodic inspections by qualified personnel for a period of five consecutive growing seasons. The inspections will take place at an interval of no less than twice per year for the first two years and no less than once per year during the following three years, or as outlined in permit conditions. Each monitoring report will include, at a minimum, the following information:

a) Dates of inspection
b) Photographic Documentation
c) Vegetation data should summarize vegetative density, invasive species, dominant species, and species diversity
d) Identification of any problems that need required remedial measures with description of remedial measures to be taken
e) A species list of any wildlife observed at the mitigation site

10.0 LONG-TERM MANAGEMENT PLAN

The goal of the proposed wetland mitigation site is to be self-sustaining natural areas with no long-term management needs. No mechanical structures or berms were incorporated into the design of the site. The mitigation will result in wetland communities that will fit naturally into the landscape. The deed restriction placed on the property will ensure long-term protection of the area and will be referenced by future landowners. After meeting performance standards, long-term financing mechanisms for each site are not proposed due to the nature of the work, and the likeliness of invasive species colonizing and becoming dominant at the site after tree/shrub canopy has become fully established is unlikely.

11.0 ADAPTIVE MANAGEMENT PLAN

A qualified professional with documented experience in wetland mitigation will oversee the project. If plant species or spacing requirements need to be modified during the project, the consultant shall notify the district engineer of the modifications and reasons that were necessary to achieve the overall goal of the project. Minor changes to the plan that will not adversely affect the overall success of the site or enhance to success of the site may be implemented during the project.

To ensure the compensatory mitigation proposed meets the objectives and goals outlined in the offsite wetland mitigation plan, measures will be implemented to identify if success is being achieved, and to modify activities during and post-construction to ensure success of the site. Adaptive management is closely related to the mitigation work plan, monitoring/maintenance plan, and linked directly to the performance standards. Monitoring of the sites will identify the progression of the mitigation areas toward the performance standards set and will identify any areas not trending in the desired direction. For any areas not progressing towards the performance standards, appropriate remedial actions or measures, as outlined below will be implemented.

Although most of the mitigation activities proposed are low risk in nature, several potential challenges to achieving success have been identified regarding plant survival and noxious/invasive species control, as outlined below.

11.1 PLANT SURVIVAL

The planting plan was developed with the knowledge that trees and shrubs do not survive or do well in all locations within wetlands. Several potential challenges to the success of plantings have been identified. These challenges relate to competition from other vegetation, predation by deer and meadow voles, and mortality from excessively wet soils.

To prevent competition with other vegetation, herbicide application is proposed as a remedial measure and will be applied at the base of trees and shrub shelters. Herbicide application will be performed at an interval necessary to suppress growth in these areas as the trees and shrubs become established. The installation of tree and shrub shelters will also aid in vegetation success.

Predation due to deer browse and meadow vole girdling is a noted concern for newly planted woody vegetation. Tree and shrub shelters will protect woody vegetation from browsing until a time when they've become established or branches of trees are above browse height. Also, each planted tree/shrub will include the application and reapplications of Repellex tablets (animal repellent). In certain situations, where the meadow vole population is extensive, meadow vole bait stations including rodenticide may be utilized to control the local population.

If the survival rate is not meeting performance standards, replanting will take place. Replanting will be based upon best professional judgment when determining the conditions that may have resulted in the low survival rate. Replanting could take into account a species-specific replanting or only planting woody vegetation within certain locations within the mitigation area that are more adaptable.

11.2 INVASIVE SPECIES CONTROL

Invasive species will be documented during all monitoring events. As needed, herbicides and/or hand pulling will be utilized to control the occurrence of any invasive species. Invasive species will be controlled in order to prevent the site from becoming dominated by invasive and/or noxious species identified on the current *Pennsylvania noxious weed control list* and the *Federal noxious weed list*.

12.0 FINANCIAL ASSURANCES

The permittee (Transco) has contracted WHM Consulting, Inc. (WHM) to provide mitigation services as it relates to the proposed Leidy South Project. WHM will be responsible for the execution of the deed restriction on the property, the permitted design, construction, and monitoring/maintenance of the project. Kevin Clark, PWS, is the lead designer and will carry out his role as a technical advisor for this project.

WHM has successfully employed over 30 wetland mitigation projects in the Baltimore, Pittsburgh, and Philadelphia USACE Districts over the past 15 years. Within the last 5 years, most of the mitigation provided has consisted of wetland enhancement primarily due to permanent functional conversion impacts (similar to this proposed mitigation project). Financial Assurances have not been required due to the relative nature of these projects (tree and shrub plantings within existing wetlands), selecting of appropriate sites for mitigation activities to occur, and the past performance of WHM in fulfilling mitigation requirements. The deed restriction on the property provides long-term assurance that after performance standards are met the mitigation area will be maintained in a natural state. Appendix G – Past Performance History, Resumes & Project Profiles has been included to outline our experience.

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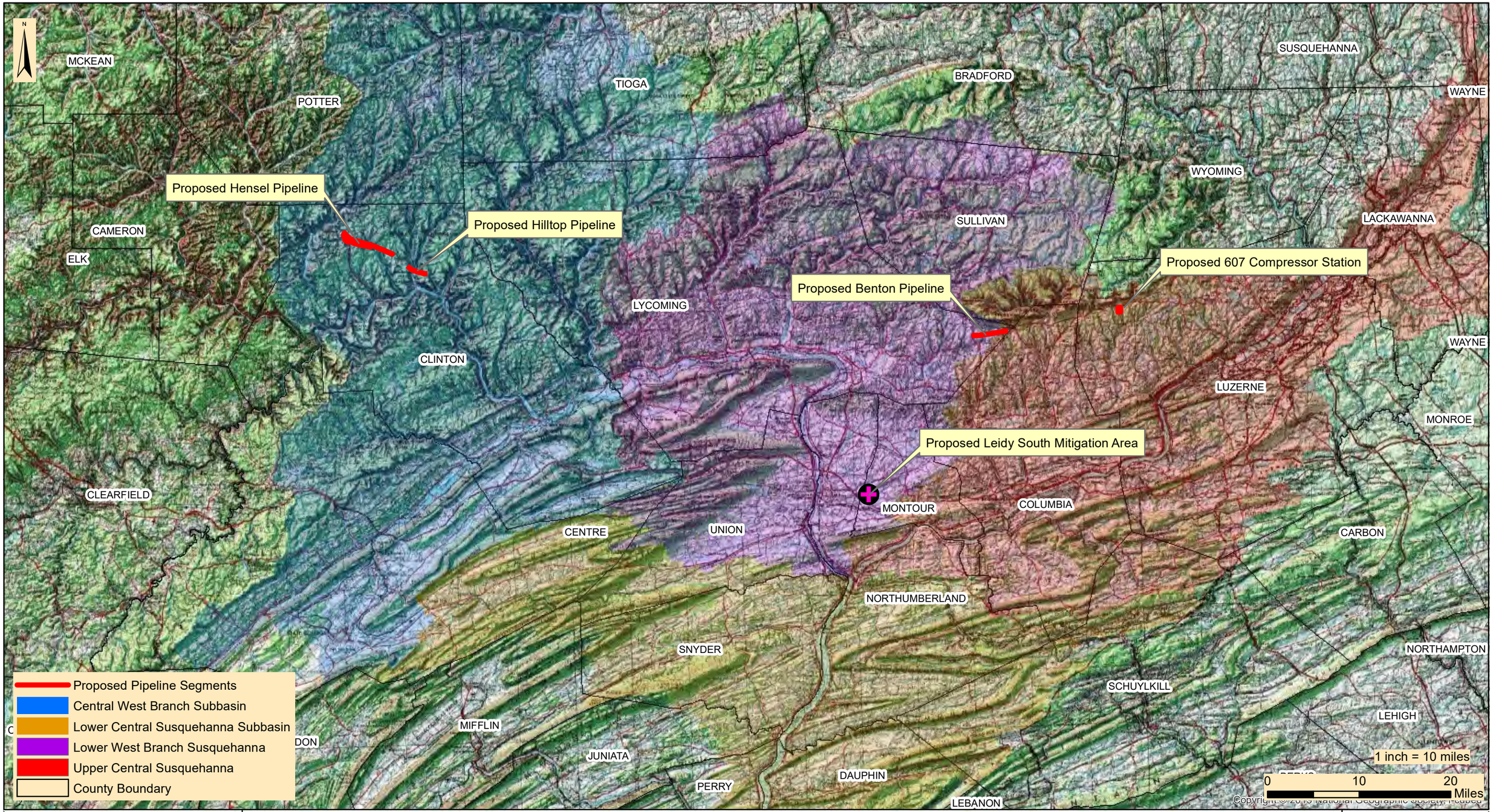
APPENDIX A

FIGURES / DRAWINGS



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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT
COMPENSATORY OFFSITE MITIGATION PLAN

MITIGATION GEOGRAPHIC SERVICE AREA MAP

PENNSYLVANIA

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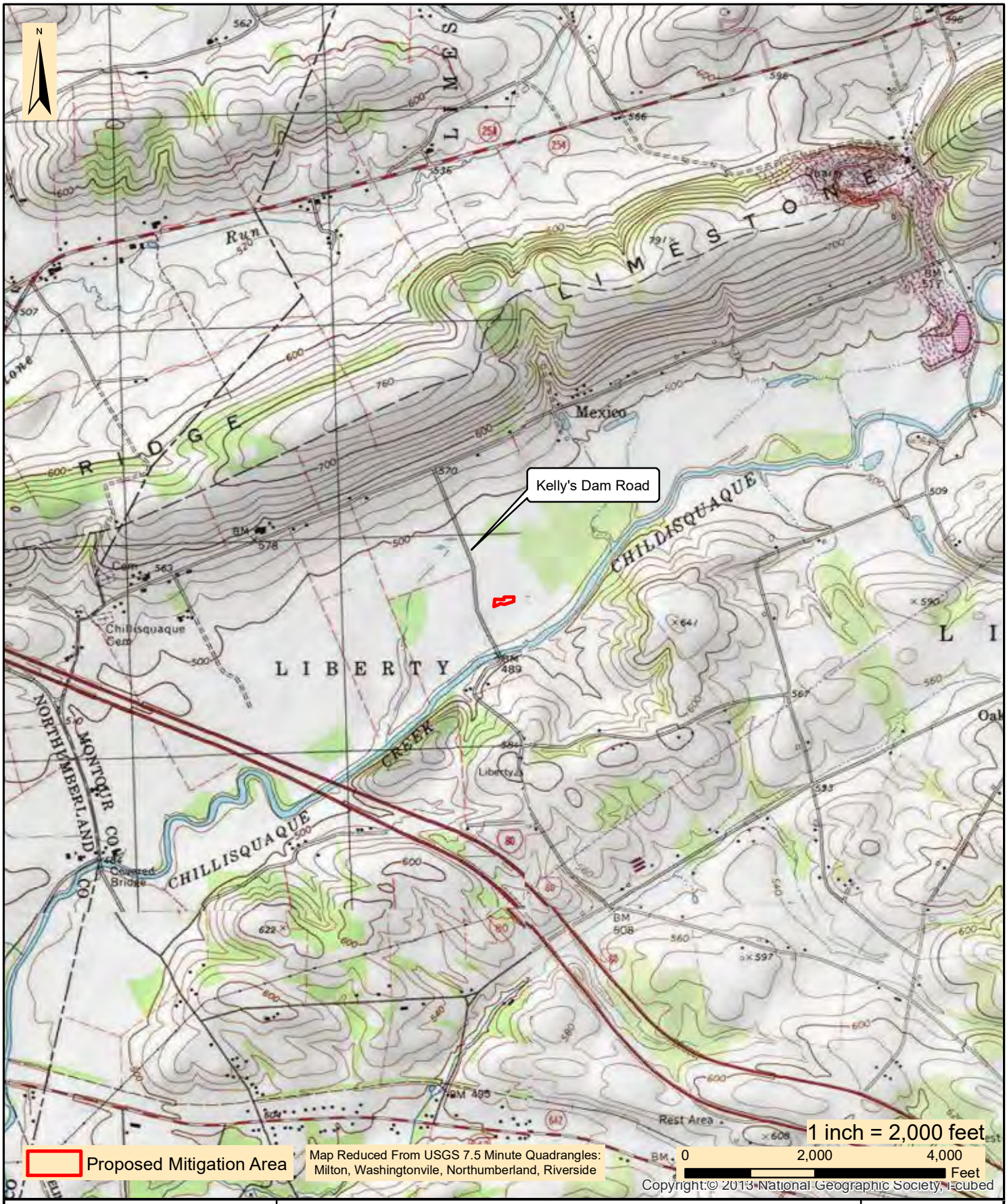
Drawn By:	PJF
Figure Number:	1



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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT
COMPENSATORY OFFSITE MITIGATION PLAN

PROJECT LOCATION MAP

LIBERTY TOWNSHIP MONTOUR COUNTY PENNSYLVANIA

Date:	08/21/19
WHM Drawing Number:	WILLIAMS186A002
Drawn By:	PJB
Figure Number:	2

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LEIDY SOUTH PROJECT
COMPENSATORY OFFSITE MITIGATION PLAN

USDA-NRCS SOILS & NWI MAP

LIBERTY TOWNSHIP | MONTOUR COUNTY | PENNSYLVANIA

Date:	08/21/19
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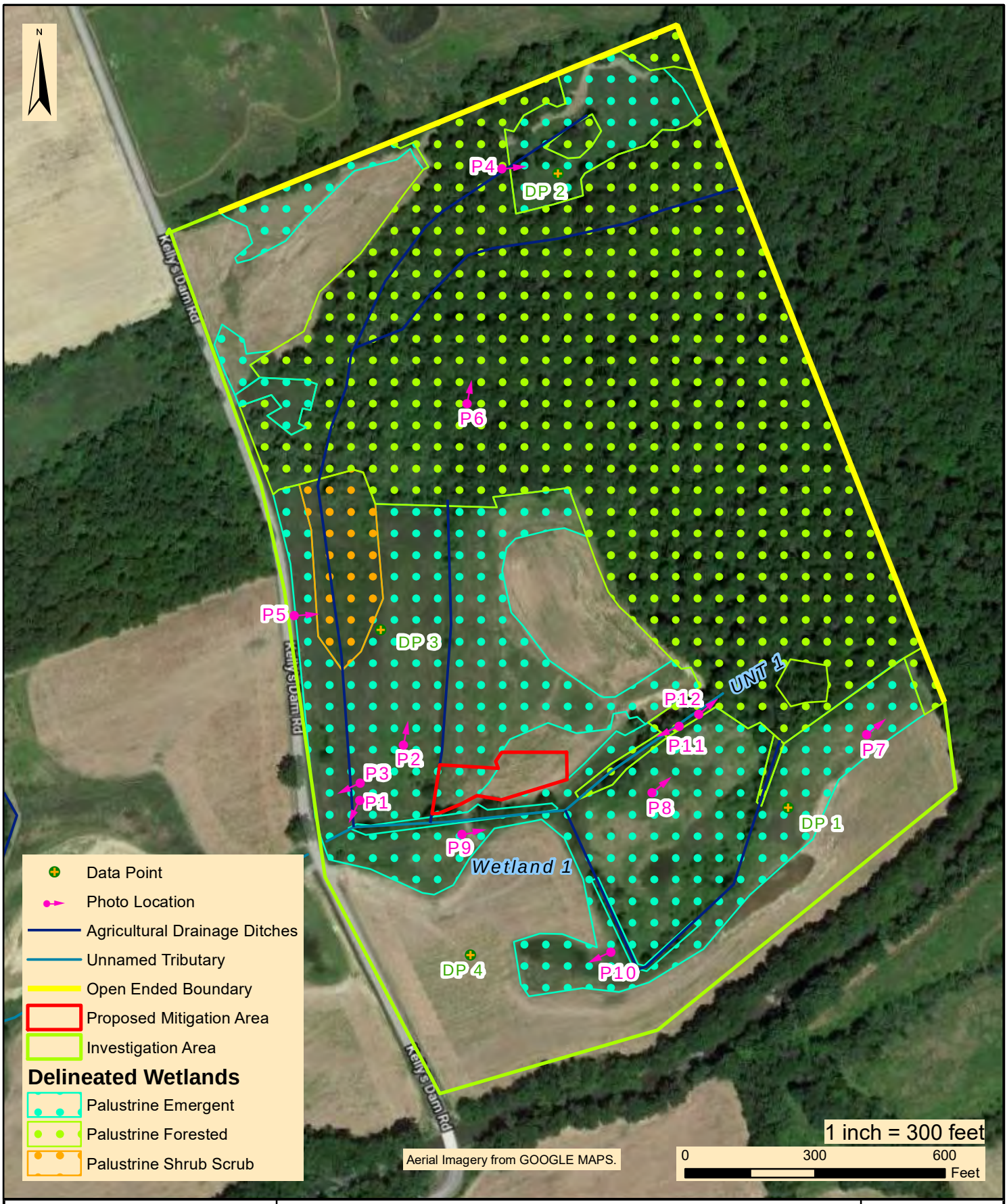

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT
COMPENSATORY OFFSITE MITIGATION PLAN

WETLAND DELINEATION MAP

LIBERTY TOWNSHIP MONTOUR COUNTY PENNSYLVANIA

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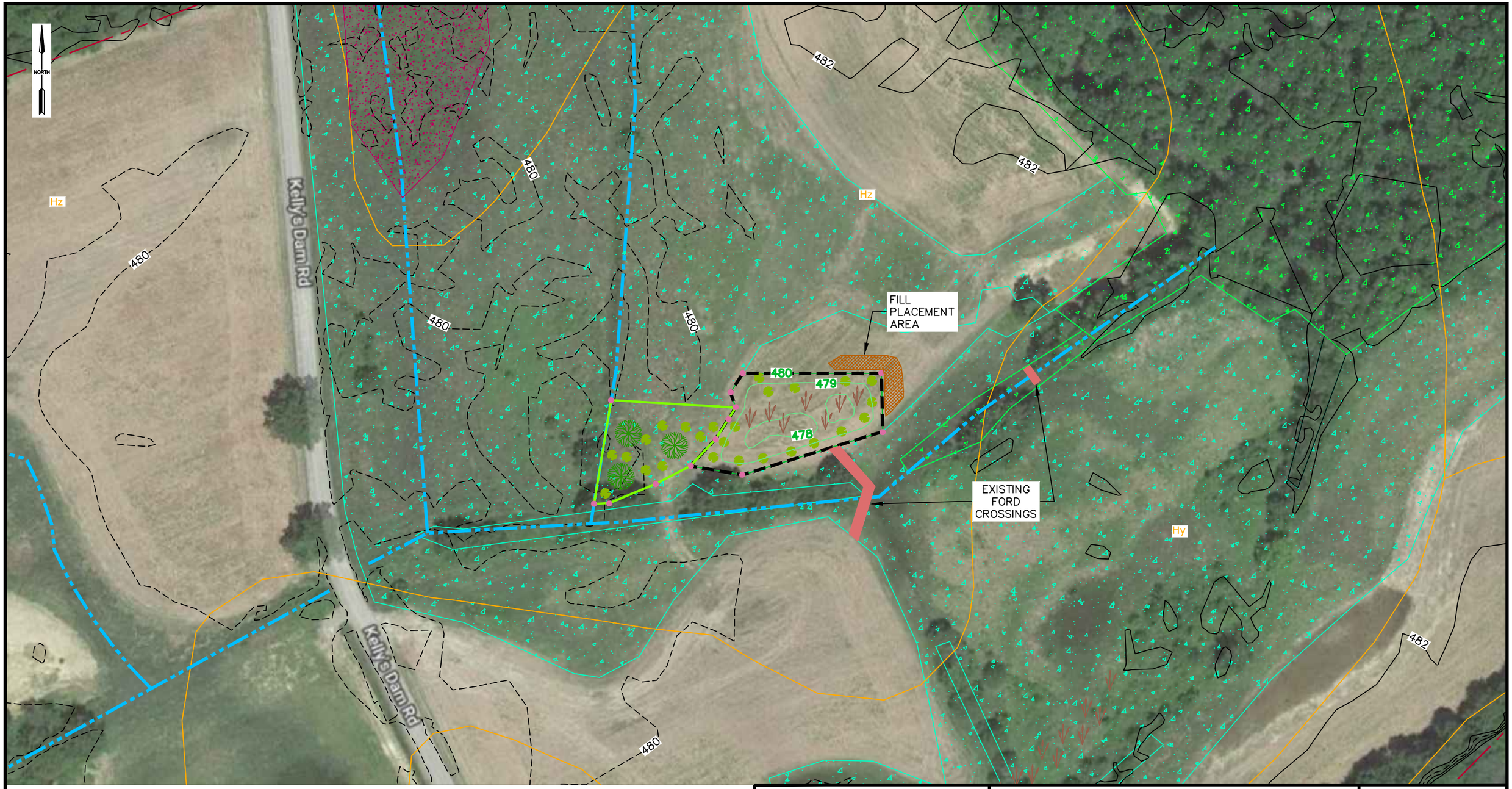

LEGEND

- WETLAND CREATION AREA (0.27 ACRE)
- WETLAND ENHANCEMENT AREA (0.24 ACRE)
- DELINEATED PEM WETLAND
- DELINEATED PSS WETLAND
- DELINEATED PFO WETLAND
- EXISTING DRAINAGE CHANNEL
- SOIL BOUNDARIES
- CONSERVATION AREA POSTS
- FILL PLACEMENT AREA
- PROPERTY LINE
- EXISTING CONTOURS (C.I.=10')
- EXISTING CONTOURS (C.I.=2')
- FINAL GRADE CONTOURS (C.I.=5')
- FINAL GRADE CONTOURS (C.I.=1')

Williams.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT
COMPENSATORY OFFSITE WETLAND MITIGATION PLAN

MITIGATION DESIGN PLAN

LIBERTY TOWNSHIP MONTOUR COUNTY PENNSYLVANIA

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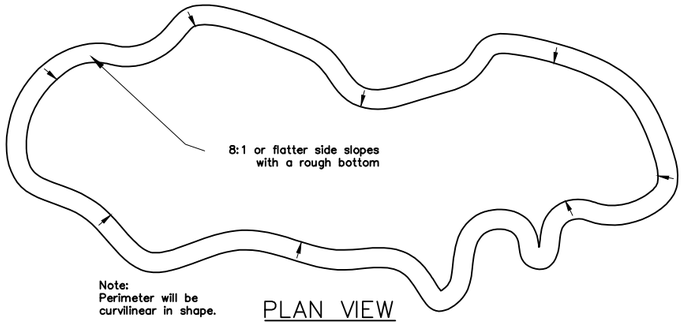
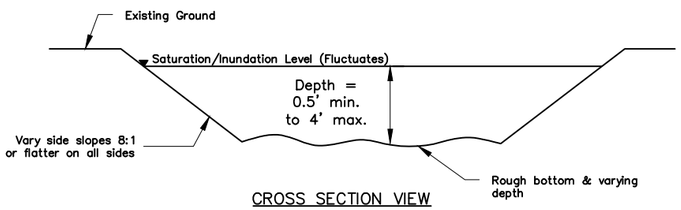
CHECKED:	KMC
DRAWING NO.	WILLIAMS186B001
SHEET NO.	5



PLAN VIEW



CROSS SECTION VIEW

See Sheet 3 for the
location of the scrapes

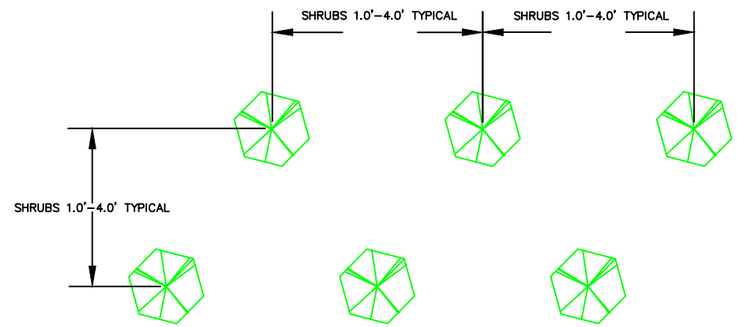
TYPICAL WETLAND CREATION/EXPANSION DETAIL

NOT TO SCALE

Notes:
1. Wetland Creation/Expansion areas will be constructed at locations and defined on plan drawings.
2. Wetland bottom shall be irregular in shape when completed.
3. Strip minimum 10" of topsoil and stockpile it for spreading, if needed, after the excavation is completed.
4. Before topsoil is spread, the depth and slopes must be checked by the Onsite Project Manager. Seeding shall be done as as outlined on Sheet 4.
5. Spoil shall be disposed of at locations approved by the Onsite Project Manager.

TABLE 6.2-1
WETLAND CREATION PLANTING PLAN (0.27 ACRE)

Scientific Name	*Common Name*	*Status*	*Container*	*Spacing*
Cornus amomum	silky dogwood	FACW Shrub	bare root / 1 gallon	4' O.C.
Cornus racemosa	gray dogwood	FAC Shrub	bare root / 1 gallon	4' O.C.
Ilex verticillata	winterberry	FACW Shrub	bare root / 1 gallon	4' O.C.
Alnus serrulata	hazel alder	OBL Shrub	bare root / 1 gallon	4' O.C.
Salix discolor	pussy willow	FACW Shrub	cutting / 1 gallon	4' O.C.
Salix nigra	black willow	OBL Shrub/Tree	cutting / 1 gallon	4' O.C.
Rhododenron maximum	great laurel	FAC Shrub	cutting / 1 gallon	4' O.C.
Hamamelis virginiana	witch hazel	FACU Shrub/Tree	cutting / 1 gallon	4' O.C.
Acer rubrum	red maple	FAC Tree	1 or 2 gallon	10' O.C.
Quercus palustris	pin oak	FACW Tree	1 or 2 gallon	10' O.C.
Acer saccharinum	silver maple	FACW Tree	1 or 2 gallon	10' O.C
Nyssa sylvatica	black gum	FAC Tree	1 of 2 gallon	10' O.C.
Platanus occidentalis	american sycamore	FACW Tree	1 or 2 gallon	10' O.C.
Populus grandidentata	big-tooth aspen	FACU Tree	1 or 2 gallon	10' O.C.
Robinia pseudoacacia	black locust	FACU Tree	1 or 2 gallon	10' O.C.
*Select a minimum of 3 tree species and 3 shrubs species to be planted in enhancement area and one tree and one shrub species to be planted in the screening area.				
**Plant at a density of 200 stems per acre (or 54 total stems) with trees (27) and shrubs (27)				



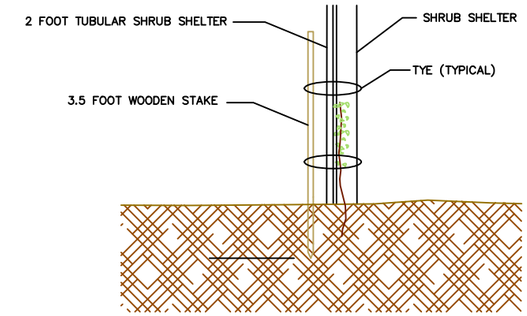
1. TYPICAL SPACING IS APPROXIMATE. PLANTS SHOULD BE LOCATED RANDOMLY TO AVOID THE APPEARANCE OF ORGANIZED ROWS. SPECIES SHALL BE LOCATED IN CLUSTERS AS DIRECTED BY THE CONSTRUCTION MANAGER
2. TREES AND SHUBS ARE TO BE PLANTED ALONG FLIGHTWAY FRINGE, IN CLUSTERS AS DESIGNATED BY CONSTRUCTION MANAGER, AND ALONG THE PERIMETER OF THE SITE.

TYPICAL PLANT SPACING DETAIL

NOT TO SCALE

TABLE 6.1-1
WETLAND ENHANCEMENT PLANTING PLAN (0.24 ACRES)

Scientific Name	*Common Name*	*Status*	*Container*	*Spacing*
Cornus amomum	silky dogwood	FACW Shrub	bare root / 1 gallon	4' O.C.
Cornus racemosa	gray dogwood	FAC Shrub	bare root / 1 gallon	4' O.C.
Ilex verticillata	winterberry	FACW Shrub	bare root / 1 gallon	4' O.C.
Alnus serrulata	hazel alder	OBL Shrub	bare root / 1 gallon	4' O.C.
Salix discolor	pussy willow	FACW Shrub	cutting / 1 gallon	4' O.C.
Salix nigra	black willow	OBL Shrub/Tree	cutting / 1 gallon	4' O.C.
Quercus palustris	pin oak	FACW Tree	1 or 2 gallon	10' O.C.
Acer saccharinum	silver maple	FACW Tree	1 or 2 gallon	10' O.C.
Nyssa sylvatica	black gum	FAC Tree	1 of 2 gallon	10' O.C.
Platanus occidentalis	american sycamore	FACW Tree	1 or 2 gallon	10' O.C.
*Select a minimum of 3 tree species and 3 shrubs species to be planted in enhancement area.				
**Plant at a density of 400 stems per acre (or 96 total stems) with trees (48) and shrubs (48)				



NOTE: SHELTERS ARE TO BE MADE FROM BIODEGRADABLE PLASTIC TUBING.

SHRUB SHELTER PLANTING DETAIL

NOT TO SCALE

ERNST WATERFOWL BUFFET MIX for WETLAND ENHANCEMENT
ERNMX-175
(Application Rate- 15 pounds per acre)

Percent	*Scientific Name*	*Common Name*
30.00%	Carex vulpinoidea	Fox Sedge
25.00%	Carex lurida	Shallow Sedge
14.00%	Sparganium eurycarpum	Giant Bur Reed
10.00%	Sparganium americanum	Eastern Bur Reed
10.00%	Carex crinita	Fringed Sedge
3.00%	Carex comosa	Bearded Sedge
3.00%	Carex lupulina	Hop Sedge
3.00%	Juncus effusus	Soft Rush
1.00%	Schoenoplectus tabernaemontani	Softstem bulrush
1.00%	Schoenoplectus acutus	Hardstem bulrush

ERNST QUICK EROSION CONTROL COVER MIX
(Application Rate- 50 pounds per acre)

Percent	*Scientific Name*	*Common Name*
50.00%	Lolium multiflorum	Annual ryegrass
50.00%	Lolium perenne	Perennial ryegrass

WHM designs, permits, resolutions consulting, INC.
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
TELEPHONE: (814)-689-1650 FAX: (814)-689-1557

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT
COMPENSATORY OFFSITE WETLAND MITIGATION PLAN

DETAILS

LIBERTY TOWNSHIP MONTOUR COUNTY PENNSYLVANIA

DATE: 08/21/19
DRAWN BY: BWH
CHECKED: KMC
DRAWING NO. WILLIAMS186B002
SHEET NO. 6

APPENDIX B

DECLARATION OF RESTRICTIVE COVENANTS AGREEMENT TEMPLATE

Parcel: 4-13-25

DECLARATION OF RESTRICTIVE COVENANTS FOR CONSERVATION

THIS DECLARATION OF RESTRICTIVE COVENANTS FOR CONSERVATION (hereinafter "Declaration") is made this ____ day of _____, 2015 by Melanie J. Cunningham, (HEREINAFTER "Grantor");

WITNESSETH:

WHEREAS, Grantor is the fee simple owner of a certain tract of land located in Liberty Township, Montour County, Commonwealth of Pennsylvania, known as Tax Parcel No. 4-13-25, and being the property conveyed to the Grantor by deed recorded as in the land records of Montour County, Pennsylvania, more particularly described in Exhibit A attached hereto and incorporated by reference, hereinafter referred to as the "Property"; and

WHEREAS, the United States Department of the Army Corps of Engineers, through either its Baltimore, Philadelphia, or Pittsburgh District, Regulatory Branch, (hereinafter "Corps") and the Grantor have agreed that the Grantor would make the portion of the Property hereinafter referred to as the "Conservation Area", as more particularly described in Exhibit B attached hereto, subject to the conservation-based covenants described in this Declaration as a condition of the Department of Army Permit(s) or verification letter(s) to be issued for the Chillisquaque Creek Mitigation Site; and

WHEREAS, the Grantor agrees to the creation of these conservation-based covenants and intends the Conservation Area shall be preserved and maintained in a natural condition in perpetuity;

NOW, THEREFORE, in consideration of the mutually-held interests in preservation of the environment, as well as the terms, conditions, and restrictions contained herein, and pursuant to the laws of the Commonwealth of Pennsylvania, the Grantor declares and agrees as follows:

1. PURPOSE

The purpose of this Declaration of Restrictive Covenants for Conservation is:

To preserve and protect the native flora, fauna, soils, water table and drainage patterns,

and other conservation values of the Conservation Area;

To view the Conservation Area in its scenic and open condition; and in general,

To assure that the Conservation Area, including its air space and subsurface, will be retained in perpetuity in its natural condition as provided herein and to prevent any use of the Conservation Area that will impair or interfere with its natural resource functions and values. Grantor intends that this Declaration will confine the use of the Conservation Area to such activities as are consistent with the purpose of this Declaration.

To accomplish the purpose of this Declaration, the following rights are created in accordance with Pennsylvania common law:

A. To allow the Grantor, the Corps or the Pennsylvania Department of Environmental Protection (hereinafter "PADEP") the right to enter upon the Property to inspect the Conservation Area at reasonable times to monitor compliance with and otherwise enforce the terms of this Declaration; provided that, except in cases where any of such entities determines that immediate entry is necessary to prevent, terminate, or mitigate a violation of this Declaration; such entry shall, when practicable, be upon reasonable prior notice to any successor or assign, and Grantor shall not unreasonably interfere with the successor's or assign's use or quiet enjoyment of the Property in accordance with the terms of this Declaration;

B. To allow the Grantor, the Corps or the PADEP to enforce the terms of this Declaration by appropriate legal proceedings in accordance with Pennsylvania common law so as to prevent any activity on or use of the Conservation Area that is inconsistent with the purpose of this Declaration and to require the restoration of such areas or features of the Conservation Area that may be damaged by any inconsistent activity or use; and

C. To allow the Grantor, or their authorized representatives, to enter upon the Property and its Conservation Area at reasonable times, upon prior notice to the then current Property owner; and upon prior notice and written approval by the Corps to take any appropriate environmental or conservation management measures consistent with the terms and purposes of this Declaration, including:

1) Planting of native vegetation (i.e. trees, shrubs, grasses and forbs); or
2) Restoring, altering or maintaining: the topography; hydrology; drainage; structural integrity; streambed; water quantity; water quality; any relevant feature of any stream, wetland, water body, or vegetative buffer within the Conservation Area.

2. DURATION

This Declaration shall remain in effect in perpetuity, shall run with the land regardless of ownership or use, and is binding upon all subsequent Property owners,

their heirs, executors, administrators, successors, representatives, devisees, and assigns, as the case may be, as long as said party shall have any interest in any part of the Conservation Area.

3. PERMITTED USES

This Declaration will not prevent the Grantor, subsequent Property owner(s), and/or the personal representatives, heirs, successors, and assigns of either the Grantor or any subsequent Property owner from making any use of the Conservation Area that is not expressly prohibited herein and is not inconsistent with the purpose of this Declaration.

4. RESTRICTIONS

Any activity in or use of the Conservation Area inconsistent with the purpose of the Declaration by the Grantor, subsequent Property owner(s), and/or the personal representatives, heirs, successors, and assigns of either the Grantor or any subsequent Property owner, is prohibited. Without limiting the generality of the foregoing, and except when an approved purpose under 1 .C above, or as necessary to accomplish mitigation approved under the aforementioned permit or any subsequent such approval or permit, the following activities and uses are expressly prohibited in, on, over, or under the Conservation Area, subject to all of the express terms and conditions below:

A. **Structures.** The construction of man-made structures including but not limited to the construction, removal, placement, preservation, maintenance, alteration, or decoration of any buildings, roads, utility lines, billboards, or other advertising. This restriction does not include deer stands, bat boxes, bird nesting boxes, bird feeders, duck blinds, and the placement of signs for safety purposes or boundary demarcation.

B. **Demolition.** The demolition of any fencing structures constructed for the purpose of demarcation of the Conservation Area or for public safety.

C. **Soils.** The removal, excavation, disturbance, or dredging of soil, sand, peat, gravel, or aggregate material of any kind; or any change in the topography of the land, including any discharges of dredged or fill material, ditching, extraction, drilling, driving of piles, mining, or excavation of any kind.

D. **Drainage.** The drainage or disturbance of the water level or the water table, except for pre-existing or approved project-related stormwater discharges and any maintenance associated with those stormwater discharges.

E. **Waste or Debris.** The storage, dumping, depositing, abandoning, discharging, or releasing of any gaseous, liquid, solid, or hazardous waste substance, materials or debris of whatever nature on, in, over, or underground or into surface or ground

water, except for pre-existing or approved project-related stormwater discharges and any maintenance associated with those stormwater discharges.

F. **Non-Native Species.** The planting or introduction of non-native species.

G. **Herbicides, Insecticides and Pesticides.** The use of herbicides, insecticides, or pesticides, or other chemicals, except as may be necessary to control invasive species that threaten the natural character of the Conservation Area. State-approved municipal application programs necessary to protect the public health and welfare are not included in this prohibition.

H. **Removal of Vegetation.** The mowing, cutting, pruning, or removal of any kind; disturbance, destruction, or the collection of any trees, shrubs, or other vegetation, except for pruning, cutting or removal for:

1) safety purposes; or
2) control in accordance with accepted scientific forestry management practices for diseased or dead vegetation; or
3) control of non-native species and noxious weeds; or
4) scientific or nature study.

I. **Agricultural Activities.** Unless currently used for agricultural or similarly related purposes, conversion of, or expansion into, any portion of the Conservation Area for use of agricultural, horticultural, aquacultural, silvicultural, livestock production or grazing activities. This prohibition also includes conversion from one type of these activities to another (e.g., from agricultural to silvicultural).

J. **Other:** Other acts, uses, excavation, or discharges which adversely affect fish or wildlife habitat or the preservation of lands, waterways, or other aquatic resources within the Conservation Area.

K. **Destruction or alteration of the Conservation Area EXCEPT:**

(i) Alteration necessary to construct any mitigation sites within the Conservation Area and associated improvements proposed to be built by a permittee, its contractors, successors, and/or assigns, and any alterations necessary to ensure the success of any such mitigation sites including monitoring, reconstruction, maintenance, or repair, all as permitted and/or approved by the Corps and PADEP, any such permit(s) and related mitigation plan(s) being incorporated herein by reference; and

(ii) Removal of vegetation when approved by the Corps and PADEP and conducted for removal of noxious or invasive plants, or other purposes under H. above.

5. INSPECTION, ENFORCEMENT AND ACCESS RIGHTS

The Corps, and/or the PADEP, and its/their authorized representatives, agents, contractors, and/or designated surety/sureties shall have the right to enter and go upon the Property, to inspect the Conservation Area, to take actions necessary to verify compliance with this Declaration and as determined to be necessary by the Corps and/or PADEP, to complete, monitor, maintain, repair, rehabilitate or restore any or all compensatory mitigation to be created on all or any portion of the Conservation Area. When practicable, and except in cases of emergency, such entry shall be upon prior reasonable notice preferably at least twenty-four (24) hours in advance, to the Property owner. The Grantor grants to the Corps, the U.S. Department of Justice, and/or the PADEP, a discretionary right to enforce this Declaration in a judicial action against any person(s) or other entity(ies) violating or attempting to violate these restrictive covenants: provided, however, that no violation of these restrictive covenants shall result in a forfeiture or reversion of title. In any enforcement action, an enforcing agency shall be entitled to a complete restoration for any violation, as well as any other judicial remedy such as civil penalties. Nothing herein shall limit the right of the Corps to modify, suspend, or revoke any related permit.

6. RECORDING AND EXECUTION

The Grantor agrees to record this Declaration in the Land Records of the county or counties where the Property is located and provide the Corps with proof of recordation prior to the start of the work authorized by any related permit. Further, if anticipated activities in the Conservation Area are agreed upon for future phases of the site, as spelled out in the “Reserved Rights”, the Grantor must submit plans to the Corps and PADEP for review and approval prior to any work in the Conservation Area.

7. NOTICE OF TRANSFER OF PROPERTY INTERESTS

No voluntary transfer of the rights of this Declaration, or of any other property interests pertaining to the Conservation Area or the underlying property it occupies shall occur without thirty (30) calendar days prior written notice to the PADEP and the Corps.

8. MODIFICATIONS

The restrictions contained in this Declaration fulfill requirements of one or more Department of the Army Permits or verification letters. There shall be no changes or alterations to the provisions in this Declaration without prior written approval from the appropriate District Commander of the Corps.

9. RESERVED RIGHTS

A. The Grantor and any holders of easements or other property rights for the operation and maintenance of pre-existing or project-related structures or infrastructure such as roads, utilities, drainage ditches, or stormwater facilities that are present on,

over or under the Conservation Area reserve the right, within the terms and conditions of their permits, their agreements, and the law, to continue with such operation and maintenance. All pre-existing or approved project-related structures or infrastructure are shown on the accompanying plat map attached to this instrument.

B. If the authorized project requires any related or unanticipated infrastructure modifications, utility relocation, drainage ditches, or stormwater controls within the identified Conservation Area, or if situations require measures to remove threats to life or property within the identified Conservation Area, said activities must be approved in writing by the Corps subject to terms and conditions set forth in the written approval. Approval is subject to the Corps' sole discretion. If approved, said activities must be identified on amended Exhibits A and B and must be recorded and specifically noted as an "amendment" and copies of the recorded amended Exhibits must be provided to the Corps and PADEP within 60 days of Corps approval. Approval of said activity by the Corps is in addition to any Clean Water Act, Section 404 permit, or other authorization, which may be required in order to legally implement said activity. The Grantor agrees to place any other responsible party on reasonable prior notice of their need to request such Corps approval, should Grantor have actual prior knowledge of such activity.

C. The Grantor intends and the Corps has acknowledged that various additional environmental mitigation projects will be performed from time to time within the Conservation Area by WHM Solutions, Inc., a Pennsylvania corporation with its current principal place of business at 2525 Green Tech Dr., State College, PA, provided that any such projects shall only be performed pursuant to prior written approval or permitting as required by the Corps; Grantor hereby authorizes WHM Solutions, Inc. to execute any and all permit applications and related documents necessary or helpful to the approval and permitting of any such projects within the Conservation Area, and this Declaration shall constitute a limited power of attorney for such purpose.

10. SEVERABILITY

If any portion of this Declaration, or the application thereof to any person or circumstance, is found to be invalid, the remainder of the provisions of this instrument, or application of such provision to persons or circumstances other that those as to which it is found to be invalid, as the case may be, shall not be affected thereby.

11. CONSENT OF LENDER

Grantor is the maker of that certain note dated 8/28/2012 secured by a certain mortgage of even date therewith from the Grantor to FNB Bank, N.A. as Mortgagee/Lender, recorded in the Office of the Recorder of Deeds in and for Montour County in Record Book 360, page 878. Mortgagee/Lender joins herein for the sole purpose of subordinating the lien, dignity and priority of the Mortgage to this Declaration.

Mortgagee/Lender:

By:_____

Name:_____

Title:_____

Date:_____

Commonwealth of Pennsylvania :

: ss

County of :

On _____, 2014, before me, the undersigned officer, personally appeared _____, who acknowledged him/herself to be the _____ of FNB Bank, N.A., for itself and/or as agent for FNB Bank, N.A., and as such officer, being authorized to do so, acknowledged that he/she executed the within document for the purposes herein contained.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

_____.

Notary Public

IN WITNESS WHEREOF said GRANTOR has executed this Declaration the day and year first above written.

By:_____
Melanie J. Cunningham

Commonwealth of Pennsylvania :
: ss
County of :

On _____, 2014, before me, the undersigned officer, personally appeared Melanie J. Cunningham, known to me (or satisfactorily proven) to be the persons whose names are subscribed to the within Declaration as Grantor, and acknowledge that they executed the same for the purposes herein contained.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

_____
Notary Public

_____

APPROVED AS TO LEGALITY AND FORM

Date:_____ _____

W. Scott Staruch, Esq.
Laws, Staruch & Pisarcik
20 Erford Rd., Ste 105
Lemoyne, PA 17043
(717) 975-0600

EXHIBIT A

ALL THOSE THREE CERTAIN MESSUAGES AND TRACTS OF LAND situate in the Township of Liberty, County of Montour, and Commonwealth of Pennsylvania, bounded and described as follows, to wit:

Tract No. 1:

BEGINNING at a post corner of said land and land now or formerly of James G. Acor;

THENCE by lands now or formerly of Oliver Ferry, hereinafter described, land now or formerly of Benjamin McWilliams and land now or formerly of Michael Fix, deceased, and lands now or formerly of Daniel Moll;

THENCE North 73 degrees East 187 perches to a post;

THENCE North 17 degrees West 61 perches to Chillisquaque Creek;

THENCE down said Creek South 37 degrees West 37 perches;

THENCE along land of the heirs of George Auten North 16¼ degrees West 116.5 perches to a post;

THENCE by land now or formerly of Alexander Billmeyer South 73½ degrees West 78 perches to a post;

THENCE along lands now or formerly of William Murray, deceased; South 16¼ degrees East 49.3 perches, South 73 degrees West 83 perches to a post;

THENCE along lands of same South 14 degrees East 108 perches to the corner, the place of BEGINNING.

CONTAINING 138 acres and 114 perches of land. **(Scrivener's Note:** Prior deeds erroneously state 38 acres 114 perches. However, the correct amount is 138 acres 114 perches and is as set forth in the deed of William Oliver Ferry, et ux. to John Pacovsky, et ux. dated and recorded August 17, 1923 at Montour County Deed Book 37, page 193.)

Tract No. 2:

BEGINNING at a post a corner of said lot of land and land now or formerly of James G. Acor;

THENCE along said Acor land South 3 degrees East 15.4 perches to a post;

THENCE along lands now or formerly of Michael Ficks, deceased, North 72 degrees East 10.4 perches to a post;

THENCE along land hereinafter described North 3 degrees West 15.4 perches to a post;

THENCE by land hereinabove described South 72 degrees West 10.4 perches to the post, the place of BEGINNING.

CONTAINING 1 acre of land.

Tract No. 3:

BEGINNING at a stone in line of land now or formerly of George Kelley;

THENCE by the same South 73¼ degrees West 4.9 perches to a maple tree;

THENCE by the same South 6¼ degrees East 16.9 perches to a tree;

THENCE by lands now or formerly of Michael Ficks, deceased; North 72 degrees East 14.9 perches to the center of the public road leading from Mooresburg to Mexico, to a stone corner in said road;

THENCE by the same in said road North 46 degrees West 11.5 perches to the stone, the place of BEGINNING.

CONTAINING 158 perches of land, neast measure.

EXCEPTING AND RESERVING FROM THE HEREINABOVE DESCRIBED TRACTS OF LAND, All that certain tract of land situate in said Township of Liberty, bounded and described as follows:

BEGINNING at a stake along the said of the public road East 1,146 feet to a stone on line of land now or formerly of Steve Skerda;

THENCE along said land North 1,000 feet to middle of Chillisquaque Creek;

THENCE following line of said creek West 1,450 feet;

THENCE South along land now or formerly of John Pacovsky 375 feet to the place of BEGINNING.

The hereinabove conveyed land consists of 138 acres, more or less, of vacant land on which no dwellings are located.

EXHIBIT B

MAP REDUCED FROM ESRI WORLD IMAGERY - Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

EXHIBIT B

CONSERVATION AREA

LIBERTY TOWNSHIP MONTOUR COUNTY PENNSYLVANIA

APPENDIX C

WETLAND DELINEATION REPORT

CHILLISQUAQUE CREEK MITIGATION SITE

LIBERTY TOWNSHIP, MONTOUR COUNTY, PENNSYLVANIA

WETLAND DELINEATION REPORT

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6.0 References

Attachments

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B Photographic Documentation

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CHILLISQUAQUE CREEK MITIGATION SITE
LIBERTY TOWNSHIP, MONTOUR COUNTY, PENNSYLVANIA

WETLAND DELINEATION REPORT

1.0 INTRODUCTION

WHM Consulting, Inc. (WHM) conducted a delineation of wetland and water resources associated with the Chillisquaque Creek Mitigation Site located in Liberty Township, Montour County, Pennsylvania (Figure 1 – Project Location Map). The purpose of this investigation was to determine whether regulated wetlands and waters exist within the subject project area in accordance with U.S. Army Corps of Engineers (USACE) guidelines which are regulated under Section 404 of the Clean Water Act (CWA) and Pa Code 25 Chapter 105. This report provides information on the methodology, data collected, delineation field findings, and conclusions pertaining to wetland and water resources identified in the study area. The initial delineation was performed by WHM on October 24th, 2013 and boundaries were confirmed on August 5th, 2019 by WHM.

2.0 METHODOLOGY

WHM conducted an investigation on the previously referenced project area in accordance with procedures and technical guidelines outlined in the 1987 *USACE Wetland Delineation Manual,* including specifically the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region*. The USACE protocol establishes a three parameter approach for identification and delineation of wetlands, which includes confirmation of the following:

I. Hydrophytic Vegetation: This condition exists when greater than 50% of the plant species contain obligate (OBL), facultative-wet (FACW), or facultative (FAC) indicator status.

II. Hydric Soils: Hydric soils are defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil (Federal Register, July 13, 1994).

III. Wetland Hydrology: Wetland hydrology is recognized through evidence of inundation and/or saturation to the soil surface for at least 5% of the growing season during most years.

In undisturbed conditions, all three parameters must be confirmed to be present to characterize an area as a wetland. In highly disturbed or problematic wetland situations, Corps guidance details procedures to be used for evaluating these areas and determining which areas will most likely be considered wetlands upon review by a Corps representative. Upon completing our investigations, areas exhibiting all three of the USACE criteria presented above and which also have surface water connection to other waters of the United States are identified as resources that are likely to be regulated by the USACE as Jurisdictional Wetlands. Areas

exhibiting all three parameters but without surface water connection to other waters are also likely to be designated as wetlands or water resources that may or may not be regulated by the USACE.

In many cases, wetland areas not regulated by the USACE are still likely to be regulated by other state or local governing bodies.

In addition to wetlands, WHM also identifies adjacent waterways that are also likely to be regulated as waters of the United States, including ephemeral, intermittent and perennial waterways. The term "jurisdictional waters of the United States" as used by Section 404 of the CWA and defined under 33 Code of Federal Register (CFR) Section 328.1, includes adjacent wetlands and tributaries to traditionally navigable waters (TNW) and other waters with a hydrological connection to a TNW.

WHM provides a complete delineation flagging of wetland/waters resources and supporting data. As noted above, our determinations are based on our collective "best professional judgment" exercised with the guidance of the Corps' Manual and Supplements. However, the final determination of the Jurisdictional status of the resources that we identify lies entirely within the purview of the reviewing regulatory agencies. In other words, we identify a technically defensible boundary that must either be accepted or adjusted by the reviewing regulatory agencies in situations where encroachments may occur. As consultant environmental scientists, we do not have authority to assign regulatory jurisdiction.

For delineations performed in the Commonwealth of Pennsylvania, all wetlands and waters identified during the wetland delineation are deemed probable "Jurisdictional waters of the United States" until otherwise reviewed and accepted by the USACE and/or Pennsylvania Department of Environmental Protection (DEP). If upon review the wetland or water is determined to be isolated by the regulators (i.e. has no significant nexus to "jurisdictional waters of the United States"), the regulatory body for such waters then becomes the DEP.

3.0 DESKTOP FINDINGS

Prior to conducting field investigations, WHM completed a review of natural resource data associated with the project site. Specifically, WHM reviewed USGS 7.5 minute topographical mapping for Milton and Washingtonville, Pennsylvania, U.S. Fish and Wildlife National Wetland Inventory mapping, and the U.S Department of Agriculture – NRCS Soil Survey for Montour County, Pennsylvania. The results of this desktop analysis were used to help establish probable areas where wetlands and watercourses could be located before conducting the field investigation portion of the project.

3.1 USGS & TOPOGRAPHIC DATA

According to the 7.5 minute USGS quadrangles for Milton and Washingtonville, Pennsylvania, the center of the study area is located at approximately 41.013614°N, -76.751881°W.

3.2 WATER QUALITY

The project is located in the Chillisquaque Creek watershed, which has a Designated Use as a Warm Water Fishery with Migratory Fishes (WWF, MF), under PA Code 25, Chapter 93 Water Quality Standards.

3.3 NATIONAL WETLAND INVENTORY

The U.S. Fish and Wildlife Service National Wetlands Inventory (NWI) mapping within the project area is presented in Figure 2–USDA-NRCS Soils and NWI Map. According to the NWI mapping there are three (3) NWI wetlands located within the investigation area. The following is a list of the NWI classifications:

PFO1C – Palustrine, Forested, Broad-Leaved Deciduous, Seasonally Flooded

PEM5C – Palustrine, Emergent, *Phragmites australis*, Seasonally Flooded

3.4 USDA/NRCS SOIL DESCRIPTIONS

The soil associations on the site are identified through the Natural Resources Conservation Service (NRCS) web soil survey for Montour County, Pennsylvania. Four (4) soil mapping units were located within the investigation area: Basher soils (Bc), Evendale cherty silt loam (EvB), Holly silt loam, ponded (Hy) and Holly silt loam, rarely flooded (Hz). The mapping limits of these soils can be viewed in Figure 2–USDA-NRCS Soils and NWI Map. The following briefly describes the soil series mapped within the investigation area as described in the Soil Survey for Montour County, Pennsylvania:

Basher soils (Bc): This mapping unit consists of nearly level, deep, moderately well drained and somewhat poorly drained soils on flood plains. The soils are flooded on an average of less than once every 2 years. The average slope ranges from 0-3 percent. The permeability of these soils is moderate or moderately slow, and the available water capacity is moderate or high. Runoff is slow. Rooting is restricted by a seasonal high water table at a depth of about 12 to 36 inches. These soils have high productivity potential for trees. Removal of undesirable species will increase the water available to more desirable trees. Use of equipment is restricted in some years by flooding, but machine planting is generally practical on large areas. The capability subclass is llw; the woodland ordination group is 2o. The taxonomic class is Coarse-loamy, mixed, active, mesic Fluvaquentic Dystudepts. The following is a typical soil profile for the Basher soils:

Ap--0 to 9 inches; dark reddish brown (5YR 3/4) silt loam, light reddish brown (5YR 6/4) dry; weak fine granular structure; friable; many fine roots; very strongly acid; clear smooth boundary. (6 to 10 inches thick)

Bw1--9 to 14 inches; dark reddish brown (5YR 3/4) silt loam; weak medium subangular blocky structure parting to weak medium granular; friable; many fine roots; common fine pores; very strongly acid; clear wavy boundary.

Bw2--14 to 20 inches; dark reddish brown (5YR 3/4) silt loam; very weak medium subangular blocky structure; friable; common fine roots; common fine

pores; few fine distinct brown (7.5YR 5/2) iron depletions and many medium distinct brown (7.5YR 5/4) iron concentrations; very strongly acid; clear wavy boundary. (Combined thickness of the Bw is 10 to 24 inches.)

BC--20 to 27 inches; yellowish brown (10YR 5/4) silt loam; very weak medium subangular blocky structure; friable; few fine roots; common fine pores; many medium distinct grayish brown (10YR 5/2) iron depletions and common medium distinct strong brown (7.5YR 5/6) iron concentrations; very strongly acid; clear wavy boundary. (0 to 12 inches thick)

C1--27 to 32 inches; grayish brown (10YR 5/2) loam; massive; friable; few fine roots; few fine pores; many medium distinct yellowish brown (10YR 5/4) iron concentrations; moderately acid; clear irregular boundary.

C2--32 to 42 inches; gray (10YR 5/1) loam; massive; friable; few fine roots; few fine pores; common medium distinct yellowish brown (10YR 5/4) iron concentrations; slightly acid; clear wavy boundary.

C3--42 to 72 inches; very dark gray (10YR 3/1) fine sandy loam; massive; very friable; contains partially decomposed woody and herbaceous organic material; moderately acid.

Evendale cherty silt loam (EvB): This mapping unit consists of gently sloping, deep, and somewhat poorly drained soils found on toe slopes on cherty limestone ridges. The permeability of this Evendale soil is slow and the available water capacity is moderate or high. The erosion hazard is moderate. Runoff is slow. Bedrock is at a depth of more than 4 feet. Rooting is restricted by a seasonally high water table at a depth of about 6 to 18 inches. from slow to rapid and the runoff rating is slow to rapid. A seasonal high water table is usually located from 6 to 36 inches below the soil surface. This soil has high productivity potential for trees. The seasonal high water table restricts equipment use, but machine planting is generally practicable on large areas. The capability subclass is IIIw; the woodland ordination group is 2w. The taxonomic class is Fine, mixed, semiactive, mesic Aquultic Hapludalfs. The following is a typical Evendale soil profile:

Ap--0 to 8 inches; very dark grayish brown (10YR 3/2) gravelly silt loam, light gray (10YR 7/2) dry; weak fine and medium granular structure; friable, nonsticky, slightly plastic; many roots; 15 percent chert fragments; moderately acid; abrupt smooth boundary. (6 to 12 inches thick)

Bt1--8 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; many medium distinct light gray (10YR 7/2) and strong brown (7.5YR 5/8) mottles; moderate medium subangular blocky structure; friable, slightly sticky, plastic; many roots; few faint clay films on faces of peds; 10 percent chert fragments; moderately acid; clear wavy boundary. (4 to 15 inches thick)

Bt2--15 to 23 inches; yellowish brown (10YR 5/6) gravelly silty clay loam; light gray (10YR 7/1) coatings on peds; common fine distinct light gray (10YR 7/1) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm, slightly sticky, plastic; common roots; common faint clay films on faces of peds and in pores; 15 percent chert fragments; strongly acid; gradual wavy boundary. (6 to 20 inches thick)

Bt3--23 to 35 inches; yellowish brown (10YR 5/6) gravelly silty clay; light gray (10YR 7/1) coatings on peds; common fine distinct light gray (10YR 7/2) and strong brown (7.5YR 5/6) mottles; weak coarse subangular blocky structure; firm, slightly sticky,
plastic; few roots; common faint clay films on faces of peds and in pores; 15 percent chert fragments; few black coatings on peds; very strongly acid; clear wavy boundary. (0 to 15 inches thick)

Bt4--35 to 41 inches; brown (7.5YR 4/4) gravelly silty clay loam; light gray (N 7/0) coating on faces of prisms; weak very coarse prismatic structure parting to weak coarse subangular blocky; firm, slightly sticky, plastic; few roots; common faint clay films on faces of peds and in pores; 25 percent chert fragments; very strongly acid; clear wavy boundary. (0 to 15 inches thick)

Bt5--41 to 51 inches; strong brown (7.5YR 5/6) very gravelly clay; gray (5Y 5/1) coatings on faces of prisms; fine prominent light gray (N 7/0) mottles; weak very coarse prismatic structure parting to weak coarse subangular blocky; firm, sticky, plastic; few faint clay films on faces of peds and in pores; 45 percent chert and shale fragments; very strongly acid; abrupt wavy boundary. (0 to 15 inches thick)

2BC--51 to 64 inches; dark reddish brown (5YR 3/3) very shaly clay loam; gray (5YR 5/1) coatings on faces of prisms; weak very coarse prismatic structure; firm, slightly sticky, plastic; few clay films in pores; 40 percent shale fragments; very strongly acid.(0 to 20 inches thick)

2R--64 inches; thin bedded black (5Y 2/1) and gray (5Y 5/1) shale bedrock.

Holly silt loam, ponded (Hy): This soil consists of poorly drained and very poorly drained soils located on floodplains. Water is ponded on the surface throughout the year. Slopes range from 0 to 3 percent. Rooting is restricted by a high water table located within 6 inches of the soil surface in the spring and winter. A seasonal high water table and frequent flooding makes this soil poorly suited for crops. The soil has a high productivity potential for trees. The following represents a typical Holly soil profile:

A-- 0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; slightly acid; clear wavy boundary. (2 to 8 inches thick.)

Bg1-- 3 to 9 inches; dark gray (5Y 4/1) silt loam; weak medium subangular blocky structure; friable; common fine prominent brown (7.5YR 4/4) masses of iron accumulation in the matrix; slightly acid; clear smooth boundary.

Bg2-- 9 to 14 inches; dark gray (5Y 4/1) silt loam; weak coarse subangular blocky structure; friable; common medium prominent yellowish red (5YR 4/6) masses of iron accumulation in the matrix; slightly acid; clear smooth boundary.

Bg3-- 14 to 27 inches; gray (5Y 5/1) sandy loam; weak coarse subangular blocky structure; friable; common medium and fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; slightly acid; clear wavy boundary. (Combined thickness of the Bg horizons are 10 through 32 inches.)

C1-- 27 to 35 inches; gray (N 5/0) loam; massive; friable; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation in the matrix; slightly acid; clear wavy boundary.

C2-- 35 to 43 inches; dark gray (N 4/0) sandy loam; massive; friable; slightly alkaline; clear wavy boundary.

2C3-- 43 to 60 inches; dark greenish gray (5BG 4/1) gravelly sand; single grain; loose; slightly alkaline.

Holly silt loam, rarely flooded (Hz): This soil consists of poorly drained and very poorly drained soils located on floodplains. Water is ponded on the surface throughout the year. Slopes range from 0 to 3 percent. Rooting is restricted by a high water table and flooding is frequent. The high water table interferes with the seeding and harvesting of some cops. The soil has a high productivity potential for trees. The main concern with tree growth is seedling mortality because of wetness. The following represents a typical Holly soil profile:

A-- 0 to 3 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; slightly acid; clear wavy boundary. (2 to 8 inches thick.)

Bg1-- 3 to 9 inches; dark gray (5Y 4/1) silt loam; weak medium subangular blocky structure; friable; common fine prominent brown (7.5YR 4/4) masses of iron accumulation in the matrix; slightly acid; clear smooth boundary.

Bg2-- 9 to 14 inches; dark gray (5Y 4/1) silt loam; weak coarse subangular blocky structure; friable; common medium prominent yellowish red (5YR 4/6) masses of iron accumulation in the matrix; slightly acid; clear smooth boundary.

Bg3-- 14 to 27 inches; gray (5Y 5/1) sandy loam; weak coarse subangular blocky structure; friable; common medium and fine prominent brown (7.5YR 4/4) and strong brown (7.5YR 5/6) masses of iron accumulation in the matrix; slightly

acid; clear wavy boundary. (Combined thickness of the Bg horizons are 10 through 32 inches.)

C1-- 27 to 35 inches; gray (N 5/0) loam; massive; friable; common medium prominent yellowish brown (10YR 5/6) masses of iron accumulation in the matrix; slightly acid; clear wavy boundary.

C2-- 35 to 43 inches; dark gray (N 4/0) sandy loam; massive; friable; slightly alkaline; clear wavy boundary.

2C3-- 43 to 60 inches; dark greenish gray (5BG 4/1) gravelly sand; single grain; loose; slightly alkaline.

4.0 WATER RESOURCE DESCRIPTIONS

After the completion of a desktop analysis, a formal wetland delineation was completed. Areas exhibiting the potential for regulated wetlands and watercourses were evaluated to determine whether they satisfied the USACE requirements. A total of one (1) wetland and one (1) UNT were identified during the delineation. Attachment A - Representative Data Forms includes data collected for the wetlands at the site. Attachment B - Photographic Documentation includes photographs of the investigation area as well as a brief description. The following provides a descriptive summary of the findings within the investigation area.

4.1 Wetland 1

Wetland 1 is primarily a palustrine emergent (PEM) wetland with intermingled areas of palustrine scrub-shrub (PSS) and palustrine forested (PFO) wetlands. The wetland is located in a large depressional area adjacent to and within agricultural fields east of Kelly's Dam road. Areas of the wetland extended into the agricultural fields where stunted vegetation (stunted corn) was present. The remainder of the agricultural field displayed upland vegetation. Evidence of standing water was located in the most depressed areas of the wetland area, just east of Kelly's dam road where Broad-leaf cattails are present. An area of PSS wetland was identified near the northern section of the wetland. Buttonbush (*Cephalanthus occidentalis*, OBL) was the primary shrub in this area. Several areas were dominated by stiltgrass (*Microstegium vimineum*) within Wetland 1. Several drainage tiles were located within the wetland area likely controlling hydrology. The drainage tiles are approximately 1 foot wide and are approximately 4698 linear feet.

Dominant vegetation included: *Setaria sp.* (Bristlegrass, FACW), *Typha latifolia* (Broadleaf cattail, OBL), *Phalaris arundinacea* (Reed canary grass, FACW), *Carex vulpinoidea* (Fox Sedge, FACW), *Scirpus cyperinus* (Woolgrass, FACW), *Microstegium vimineum* (Stiltgrass, FAC), *Euthamia graminifolia* (Flat top golden top, FAC), and *Juncus effusus* (Soft rush, OBL). Observed soils in the wetland had a dominant matrix of 10YR 4/2 from 0-3 inches with 10% 10YR 5/8 redox concentrations and from 3-14"+ had a matrix of 10YR 4/1 with 20% 10YR 5/8 concentrations. Wetland 1 is 49.01 acres or 2,137,259 sq. ft. in size within the investigation area. The PEM portion of the wetland is 19.67 acres or 856,619 sq. ft. in size. The PSS portion of the wetland is 1.4 acres or

60,769 sq. ft. in size. The PFO portion of the wetland is 28 acres or 1,219,870 sq. ft. in size.

4.2 UNT 1 to Chillisquaque Creek

UNT 1 is an intermittent stream that flows through the investigation area. The UNT has a narrow forested buffer on both sides consisting mainly of pin oak (*Quercus palustris*) and red maple (*Acer rubrum*) within the wetland areas and shagbark hickory (*Carya ovata,* FACU) within the upland areas. The substrate includes silt and clay with leave litter and woody debris scattered throughout. The UNT is approximately 3 feet wide and 1,015 linear feet long, comprising approximately 3,045 sq. ft. of the investigation area.

5.0 CONCLUSIONS

Based on the results of the field investigation 49.01 acres or 2,137,259 square feet of wetlands and 1,015 linear feet or 3,045 square feet of channel were identified within the investigation area. Any impacts to the identified resources would require authorization under PADEP and USACE guidelines.

6.0 REFERENCES

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6. United States Fish and Wildlife Service. National Wetland Inventory Map, 7.5 Minute Series Quadrangle Milton and Washingtonville, Pennsylvania.

7. United States Geological Survey (USGS). Topographic Quadrangle 7.5 minute Series Quadrangle, Milton and Washingtonville, PA.

8. United State Department of Agriculture Soil Conservation Service. 1985 Soil Survey of Montour County Pennsylvania.

ATTACHMENT A

DATA FORMS

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Cunningham Property City/County: Montour County Sampling Date: 10/24/13

Applicant/Owner: Cunningham State: PA Sampling Point DP-1-Wet-1

Investigator(s): PF, DW,CB Section, Township, Range: Liberty Township

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 0-3

Subregion (LRR or MLRA): LRR Lat.: 41.01276 Long.: -76.752743 Datum: NAD 83

Soil Map Unit Name Holly silt loam NWI Classification: none

Are climatic/hydrologic conditions of the site typical for this time of the year? Yes x No ___ (If no, explain in remarks)

Are vegetation No , soil No , or hydrology No significantly disturbed? Are "normal circumstances" present? Yes x No ___

Are vegetation No , soil No , or hydrology No naturally problematic? (If needed, explain any answers in remarks)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Y	**Is the sampled area within a wetland?** Yes x No ___
Hydric soil present? Y	
Wetland hydrology present? Y	If yes, optional wetland site ID: Wetland-1

Remarks: Partly Cloudy, 55 degrees. Wetland-1 is a PEM/PSS/PFO wetland located within a floodplain.

HYDROLOGY

Primary Indicators (minimum of one is required; check all that apply)		Secondary Indicators (minimum of two required)
___ Surface Water (A1)	x Water-Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	x Drainage Patterns (B10)
x Saturation (A3)	___ Marl Deposits (B15)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits (B2)	x Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	x Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	x Geomorphic Position (D2)
x Inundation Visible on Aerial Imagery (B7)	___ Other (Explain in Remarks)	___ Shallow Aquitard (D3)
___ Sparsely Vegetated Concave Surface (B8)		x FAC-Neutral Test (D5)
		___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes ___	No x	Depth (inches): ___		
Water table present?	Yes ___	No x	Depth (inches): ___	**Wetland hydrology present?**	Yes x No ___
Saturation present? (includes capillary fringe)	Yes x	No ___	Depth (inches): -8		

Descrive recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Hydrology received from seasonal high water table.

VEGETATION - Use scientific names of plants

Sampling Point: DP-1-Wet-1

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
6			
7			
	=	Total Cover	

Sapling/Shrub Stratum (Plot Size: 15')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
6			
7			
	=	Total Cover	

Herb Stratum (Plot Size: 5')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Juncus effusus*	10		FACW
2 *Typha latifolia*	5		OBL
3 *Scirpus cyperinus*	50	Yes	FACW
4 *Scirpus atrovirens*	10		FACW
5 *Setara sp.*	40	Yes	FACW
6 *Carex alopecoidea*	10		FACW
7			
	125 =	Total Cover	

Woody vine Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
	=	Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species ____ x 1 = ____

FACW species ____ x 2 = ____

FAC species ____ x 3 = ____

FACU species ____ x 4 = ____

UPL species ____ x 5 = ____

Column totals ____ (A) ____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

x 1 - Rapid test for hydrophytic vegetation

x 2 - Dominance test is >50%

___ 3 - Prevalence index is ≤3.0*

___ 4 - Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ 5 - Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes x No ____

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP-1 Wet-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks
0-3	10YR 4/2	90	10YR 5/8	10	C	M	SL	oxidized roots
3-14"+	10YR 4/1	80	10YR 5/8	20	C	M	SL	oxidized roots

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains **Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Suface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Yes x No ___

Remarks: Depleted Matrix and oxidized roots were observed.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Cunningham Property City/County: Montour County Sampling Date: 10/24/13

Applicant/Owner: Cunningham State: PA Sampling Point DP-2-Wet-1

Investigator(s): PF, DW,CB Section, Township, Range: Liberty Township

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 0-3

Subregion (LRR or MLRA): LRR Lat.: 41.016832 Long.: -76.752743 Datum: NAD 83

Soil Map Unit Name Evendale cherty silt loam NWI Classification: none

Are climatic/hydrologic conditions of the site typical for this time of the year? Yes x No ___ (If no, explain in remarks)

Are vegetation No , soil No , or hydrology No significantly disturbed? Are "normal circumstances" present? Yes x No ___

Are vegetation No , soil No , or hydrology No naturally problematic? (If needed, explain any answers in remarks)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Y	**Is the sampled area within a wetland?** Yes x No ___
Hydric soil present? Y	
Wetland hydrology present? Y	If yes, optional wetland site ID: Wetland-2

Remarks: Partly Cloudy, 55 degrees. Wetland-2 is an emergent and forested wetland located in a old pasture area.

HYDROLOGY

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- x Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- x Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- x Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes ___	No	x	Depth (inches): ___	
Water table present?	Yes ___	No	x	Depth (inches): ___	**Wetland hydrology present?** Yes x No ___
Saturation present? (includes capillary fringe)	Yes x	No	___	Depth (inches): -8	

Descrive recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Hydrology received from seasonal high water table.

VEGETATION - Use scientific names of plants

Sampling Point: DP-2-Wet-1

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Quercus palustris*	30	Yes	FACW
2			
3			
4			
5			
6			
7			
	30 =	Total Cover	

Sapling/Shrub Stratum (Plot Size: 15')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Quercus palustris*	10	Yes	FACW
2			
3			
4			
5			
6			
7			
	10 =	Total Cover	

Herb Stratum (Plot Size: 5')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Juncus effusus*	10		FACW
2 *Onoclea sensibilis*	20		OBL
3 *Scirpus cyperinus*	30	Yes	FACW
4 *Symplocarpus foetidus*	20		FACW
5 *Setara sp.*	40	Yes	FACW
6			
7			
	120 =	Total Cover	

Woody vine Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
	0 =	Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species ____ x 1 = ____

FACW species ____ x 2 = ____

FAC species ____ x 3 = ____

FACU species ____ x 4 = ____

UPL species ____ x 5 = ____

Column totals ____ (A) ____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

x 1 - Rapid test for hydrophytic vegetation

x 2 - Dominance test is >50%

___ 3 - Prevalence index is ≤3.0*

___ 4 - Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ 5 - Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes x No ___

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP-2 Wet-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks
0-4	10YR 4/2	90	10YR 5/8	10	C	M	SL	oxidized roots
4-16"+	10YR 4/1	80	10YR 5/8	20	C	M	SL	oxidized roots

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains **Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Suface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Yes x No ___

Remarks: Depleted Matrix and oxidized roots were observed.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Cunningham Property City/County: Montour County Sampling Date: 10/24/13

Applicant/Owner: Cunningham State: PA Sampling Point DP-3-Wet-1

Investigator(s): PF, DW,CB Section, Township, Range: Liberty Township

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 0-3

Subregion (LRR or MLRA): LRR Lat.: 41.013923 Long.: -76.751952 Datum: NAD 83

Soil Map Unit Name Holly silt loam NWI Classification: none

Are climatic/hydrologic conditions of the site typical for this time of the year? Yes x No ___ (If no, explain in remarks)

Are vegetation No , soil No , or hydrology No significantly disturbed? Are "normal circumstances" present? Yes x No ___

Are vegetation No , soil No , or hydrology No naturally problematic? (If needed, explain any answers in remarks)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? Y	**Is the sampled area within a wetland?** Yes x No ___
Hydric soil present? Y	
Wetland hydrology present? Y	If yes, optional wetland site ID: Wetland-1

Remarks: Partly Cloudy, 55 degrees. DP-3-Wet-1 within Wetland-1 near an inundated area.

HYDROLOGY

Primary Indicators (minimum of one is required; check all that apply)

- x Surface Water (A1)
- x High Water Table (A2)
- x Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- x Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- x Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- x Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- x Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- x Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- x FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present?	Yes x	No ___	Depth (inches): 2"	
Water table present?	Yes x	No ___	Depth (inches): surface	**Wetland hydrology present?** Yes x No ___
Saturation present? (includes capillary fringe)	Yes x	No ___	Depth (inches): 0"+	

Descrive recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: Hydrology received from seasonal high water table.

VEGETATION - Use scientific names of plants

Sampling Point: DP-3-Wet-1

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
6			
7			
	=	Total Cover	

Sapling/Shrub Stratum (Plot Size: 15')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
6			
7			
	10 =	Total Cover	

Herb Stratum (Plot Size: 5')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Typha latifolia*	50	Yes	OBL
2 *Onoclea sensibilis*	20		OBL
3 *Scirpus cyperinus*	35	Yes	FACW
4 *Symplocarpus foetidus*	5		FACW
5 *Setara sp.*	10		FACW
6			
7			
	120 =	Total Cover	

Woody vine Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
	0 =	Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across all Strata: 2 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 100.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species ____ x 1 = ____

FACW species ____ x 2 = ____

FAC species ____ x 3 = ____

FACU species ____ x 4 = ____

UPL species ____ x 5 = ____

Column totals ____ (A) ____ (B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

x 1 - Rapid test for hydrophytic vegetation

x 2 - Dominance test is >50%

___ 3 - Prevalence index is ≤3.0*

___ 4 - Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ 5 - Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes x No ____

Remarks: (Include photo numbers here or on a separate sheet)

SOIL

Sampling Point: DP-3 Wet-1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks
0-2	10YR 4/1	90	10YR 5/8	10	C	M	SL	oxidized roots
2-16"+	10YR 4/1	80	10YR 5/8	20	C	M	SL	oxidized roots

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains **Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Suface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Yes x No ___

Remarks: Depleted Matrix and oxidized roots were observed.

WETLAND DETERMINATION DATA FORM - Northcentral and Northeast Region

Project/Site: Cunningham Property City/County: Montour County Sampling Date: 10/24/13

Applicant/Owner: Cunningham State: PA Sampling Point DP-4-UP

Investigator(s): PF, DW,CB Section, Township, Range: Liberty Township

Landform (hillslope, terrace, etc.): flat Local relief (concave, convex, none): none Slope (%): 0-3

Subregion (LRR or MLRA): LRR Lat.: 41.011824 Long.: -76.751278 Datum: NAD 83

Soil Map Unit Name Holly silt loam NWI Classification: none

Are climatic/hydrologic conditions of the site typical for this time of the year? Yes x No ____ (If no, explain in remarks)

Are vegetation No , soil No , or hydrology No significantly disturbed? Are "normal circumstances" present? Yes x No ____

Are vegetation No , soil No , or hydrology No naturally problematic? (If needed, explain any answers in remarks)

SUMMARY OF FINDINGS - Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic vegetation present? N	**Is the sampled area within a wetland?** Yes ____ No X
Hydric soil present? Y	
Wetland hydrology present? N	If yes, optional wetland site ID: ____

Remarks: Partly Cloudy, 55 degrees. DP-4-UP is located in a corn field. The area displayed hydric soils likley due to the soil series but no other wetland indicators were present.

HYDROLOGY

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Microtopographic Relief (D4)

Field Observations:

Surface water present? Yes ____ No ____ Depth (inches): ____

Water table present? Yes ____ No ____ Depth (inches): ____

Saturation present? Yes ____ No ____ Depth (inches): ____

(includes capillary fringe)

Wetland hydrology present? Yes ____ No x

Descrive recorded data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION - Use scientific names of plants

Sampling Point: DP-4 UP

Tree Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
6			
7			
	=	Total Cover	

Sapling/Shrub Stratum (Plot Size: 15')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
5			
6			
7			
	10 =	Total Cover	

Herb Stratum (Plot Size: 5')	Absolute % Cover	Dominant Species	Indicator Staus
1 *Zea Mays*	100	Yes	FACU
2			
3			
4			
5			
6			
7			
	100 =	Total Cover	

Woody vine Stratum (Plot Size: 30')	Absolute % Cover	Dominant Species	Indicator Staus
1			
2			
3			
4			
	0 =	Total Cover	

Dominance Test Worksheet

Number of Dominant Species that are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across all Strata: 1 (B)

Percent of Dominant Species that are OBL, FACW, or FAC: 0.00% (A/B)

Prevalence Index Worksheet

Total % Cover of:

OBL species		x 1 =	
FACW species		x 2 =	
FAC species		x 3 =	
FACU species	100	x 4 =	400
UPL species		x 5 =	
Column totals	100 (A)		400 (B)

Prevalence Index = B/A = 4.00

Hydrophytic Vegetation Indicators:

___ 1 - Rapid test for hydrophytic vegetation

___ 2 - Dominance test is >50%

___ 3 - Prevalence index is ≤3.0*

___ 4 - Morphogical adaptations* (provide supporting data in Remarks or on a separate sheet)

___ 5 - Problematic hydrophytic vegetation* (explain)

*Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic

Definitions of Vegetation Strata:

Tree - Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub - Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb - All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines - All woody vines greater than 3.28 ft in height.

Hydrophytic vegetation present? Yes ___ No x

Remarks: Corn plants were 8ft tall and looked very healthy with no impacts from water/wetland conditions. Wetlands were delineated into the corn only in the areas where the corn was stunted and the foxtail bristlegrass encroached into the corn.

SOIL

Sampling Point: DP-4-UP

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type*	Loc**	Texture	Remarks
0-14"+	10YR 4/2	95	7.5YR 5/8	5	C	M	SL	

*Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains **Location: PL=Pore Lining, M=Matrix

Hydric Soil Indicators:

- ___ Histisol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Suface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- x Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

*Indicators of hydrophytic vegetation and weltand hydrology must be present, unless disturbed or problematic

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric soil present? Yes x No ___

Remarks: Soil was dry. Soil series is Holly which is listed as a hydric soil for Montour county.

ATTACMENT B

PHOTOGRAPHIC DOCUMENTATION

ID: Photo 1

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a western view of Wetland 1 looking towards Kelly's Dam road.

ID: Photo 2

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a northeastern view of Wetland 1.

ID: Photo 3

Date: 3/31/13

Taken by: DW

Comments: This photo depicts a western view of Wetland 1 looking towards Kelly's Dam road.

ID: Photo 4

Date: 10/24/13

Taken by: DW

Comments: This photo depicts an eastern view of Wetland 1.

ID: Photo 5

Date: 10/24/13

Taken by: DW

Comments: This photo depicts an eastern view of Wetland 1 from Kelly's Dam road.

ID: Photo 6

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a northern view of the forested portion of Wetland 1.

ID: Photo 7

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a northern view of Wetland 1 near the most eastern edge of the investigation area.

ID: Photo 8

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a northeastern view of Wetland 1.

ID: Photo 9

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a northeastern view of Wetland 1 along a corn field.

ID: Photo 10

Date: 10/24/13

Taken by: DW

Comments: This photo depicts a northeastern view of Wetland 1 along a corn field.

ID: Photo 11

Date: 3/31/13

Taken by: DW

Comments: This photo depicts a southwestern view of UNT 1.

ID: Photo 12

Date: 3/31/13

Taken by: DW

Comments: This photo depicts a northeastern view of UNT 1.

ATTACHMENT C

WATER RESOURCE SUMMARY TABLE

CHILLISQUAQUE CREEK MITIGATION SITE
WATER RESOURCE SUMMARY TABLE

Waters Name	Cowardin Code	HGM Code	Estimated Amount of Aquatic Resource in Review Area (sq. ft.)	Estimated Amount of Aquatic Resource in Review Area Linear (ft.)	Estimated Channel Width (ft)	Waters Types	Latitude (dd nad83)	Longitude (dd nad83)	Local Waterway	Stream Type (P-Perennial, I-Intermittent, or E-Epherneral)
Wetland 1	PEM	DEPRESS	856,619	N/A	N/A	RPWWD	41.012963	-76.751322	Chillisquaque	N/A
Wetland 1	PSS	DEPRESS	60,769	N/A	N/A	RPWWD	41.014372	-76.752212	Chillisquaque	N/A
Wetland 1	PFO	DEPRESS	1,219,870	N/A	N/A	RPWWD	41.012959	-76.750071	Chillisquaque	N/A
UNT 1	R4	RIVERINE	3,045	1,015	3	RPW	41.012810	-76.750378	Chillisquaque	I
Drain*	N/A	RIVERINE	4,096	4,096	1	N/A	41.012952	-76.751522	Chillisquaque	N/A
		Total Wetland	2,137,258	N/A						
		Total Stream	3,045	1,015						
		Total Drain	4,096	4,096						
		TOTAL RESOURCES	**2,144,399**	**5,111.0**						

*Drains are considered drainage patterns within the wetlands.

ATTACHMENT D

RESUMES

Paul Fisher, WPIT

COMPANY TITLE:
Environmental Technician II
Health and Safety Officer (HSO)

EDUCATION

- *Environmental Soil Science, Bachelors of Science, The Pennsylvania State University, University Park, Pennsylvania, 2009.*

PROFESSIONAL CERTIFICATIONS

- *Wetland Professional In Training (WPIT) Certification March 2012*
- *Occupational Safety and Health Professional Certification May 2012*

PROFESSIONAL TRAINING

- *PA DEP ESCGP-2 Training July 10, 2013 State College, PA*
- *OSHA 40 Hour HAZWOPER Training; AllProbe Environmental; June 2013*
- *E&S Manual Training – Scranton, PA - PA Association of Conservation Districts - May 15-16, 2013, at the Hilton Scranton & Conference Center*
- *Hydric Soil Indicators Field Seminar April 25, 2013 Pennsylvania Association of Professional Soil Scientists - Stoll Natural Resources Center, Wysox, PA*
- *Williams Contractor Safety; May 2012*
- *First Aid/ CPR; Emergency Care & Safety Institute; May 2012*
- *Primary Headwater Habitat Assessment Training – West Woods Metro Park, Geauga County, Ohio May 23, 2012*
- *132 Hour Occupational Safety and Health Professional Training – OSHA Academy, May 2012*
- *"Planning Hydrology for Constructed Wetlands", Wetland Training Institute, State College, PA November 2011*
- *"Grasses, Sedges, and Rushes" Pennsylvania Institute for Conservation Education, Shavers Creek Environmental Center, Huntingdon, PA August 2011*
- *Hydrology of Wetlands Rutgers University – New Jersey Agricultural Experiment Station Tuckerton, New Jersey May, 2011*
- *"Functional Assessment as the Basis for Mitigation of Wetland Impacts - Overview and Discussion", State College, PA – M.N. Gilbert Environmental April , 2011*
- *ACOE Wetland Delineation/Regional Supplement Training Richard Chinn Environmental Training State College,*

Mr. Fisher is a graduate from The Pennsylvania State University in 2009, where he was awarded Bachelors degree in Environmental Soil Science with a minor in Watershed and Water Resources. Since graduation he has gained experience in many environmental areas including wetland delineations, stream projects, threatened and endangered species surveys and GIS mapping. Mr. Fisher was awarded certification as a Wetland Professional In Training (WPIT) in March of 2012 and is activly working towards the full-time professional experience requirement to gain his Professional Wetland Scientist (PWS) Certifcation.

PROFESSIONAL EXPERIENCE

GENERAL ENVIRONMENTAL PROJECTS

- Used GIS software for mapping and analysis
- Used a Trimble GPS for mapping boundaries for mapping purposes
- Composed various Environmental Reports for landfills, gas companies, wind farms, construction companies, private landowners, and regulatory agencies
- Performed land analysis's using GIS Software for determining suitable areas for development.
- Completed various Environmental Permits for clients.

WETLAND AND STREAM RESTORATION PROJECTS

- Performed wetland monitoring and maintenance on various wetlands
- Performed Stream Surveys
- Practiced wetland delineations using US Army Corps of Engineers Wetlands Delineation Manual 1987 and applicable regional supplements
- Used the Pa Code Chapter 93 Water Quality Standards and Chapter 105 Dam safety and Waterway Management
- Used surveying equipment to characterize stream profiles for mapping and design purposes
- Delineated wetlands and water resources at several projects throughout Pennsylvania, Ohio and West Virginia.
- Checked seismic testing locations for wetlands.

BIOLOGICAL EXPERIENCE

- Assisted on several Timber Rattlesnake Phase I and II surveys
- Assisted on several Bog Turtle Phase II surveys
- Assisted on Allegheny Wood Rat surveys
- Helped with tracking Timber Rattlesnakes in Eastern Pennsylvania
- Identification and documentation of different herptile species at numerous wetland sites
- Composed various Threatened and Endangered species reports
- Preformed Macro-invertebrate sampling on several streams.

David Wood

COMPANY TITLE:

Environmental Technician

EDUCATION

- *BA, Environmental Studies, The Pennsylvania State University, 2010: Minor in Biology*

PROFESSIONAL TRAINING

- *PA DEP ESCGP-2 Training July 10, 2013 State College, PA*
- *OSHA 8 Hour HAZWOPER Refresher Training; AllProbe Environmental; June 2013*
- *OSHA 40 Hour HAZWOPER Training; AllProbe Environmental; June 2012*
- *PA SFI® Training; Prof. Timber Harvesting Ess., Wildlife - Young Forest Initiative, Game of Logging - Level 1; May 2012*
- *First Aid/ CPR; Emergency Care & Safety Institute; May 2012*
- *Marcellus Workshop February 2012 "An Update On PHMSA Pipeline Regulations & Act 127" "Taking Cartopac Into The Field {Who, How, And Why)" "Streamlining Field Data Collection For Pipeline And Environmental Workflows"*
- *General Permit – 4 (PASPGP-4) Workshop; Army Corps of Engineers, Baltimore District, Regulatory Branch; October 2011*

RELAVENT COURSES

- *Field Biology- utilized field research methods and analyzed data.*
- *Biological Statistics- statistics in context to biology and ecology.*
- *Ecology of Mid Atlantic- assessed the ecology of the Mid Atlantic.*
- *Conservation Biology- dealt with conservation methods and theories.*
- *GIS- Practiced using Geographical Information Systems with layered mapping.*

SKILLS

- *Computer skills: Microsoft Word, Excel, PowerPoint.*
- *Mapping skills: Arch GIS.*
- *Communication skills: Public*

Mr. Wood graduated from The Pennsylvania State University with a degree in Environmental Studies and a minor in Biology. Since graduation, he has been associated with numerous projects at many different levels and has gained a vast knowledge of all aspects of environmental permitting. He gained skills through his previous experiences and WHM Consulting, Inc. in various environmental projects dealing with water quality and land use.

PROFESSIONAL EXPERIENCE

- Performed Erosion and Sediment control inspections on gas well sites.
- Assisted with a variety of environmental permitting projects.
- Field assistant on multiple Timber Rattlesnake Phase I and II surveys and Allegheny Wood Rat surveys.
- Forest inventory and assessment
- Performed a summer internship for the Green Environmental Management Systems at the Veterans Affairs Hospital in Altoona PA, which included researching conservation methods for a storm waste water wetlands/pond complex.
- Executed and reported on a six week stream study of Spring Run on Altoona campus.
- Performed macroinvertebrate sampling.
- Collected water samples and onsite water quality data.
- Produced mitigation plans for wetland and stream impacts.
- Penn DOT, bridge crew performing minor repairs on bridges. Also, highway maintenance with duties of flagging and laboring.
- Obtained certificate for training on the "Overview of Wetland Delineation Protocols and the Interim NC/NE Regional Supplement to the USACE Delineation Manual".
- Performed water resource delineations and reporting, and performed wetland and stream mitigation monitoring and reporting.
- Perform task utilizing Trimble surveying equipment.
- Collected elevation data for stream profiles and cross sections.
- Utilize GIS software for mapping and data analysis.
- Assisted with rare, threatened and endangered plant surveys and reporting.

APPENDIX D

PHOTOGRAPHIC DOCUMENTATION

ID: Photo 1

Date: 8/05/19

Taken by: CG

Comments: This photo shows a view of the proposed wetland creation area.

ID: Photo 2

Date: 8/05/19

Taken by: CG

Comments: This photo shows a view of the proposed wetland enhancement area.

APPENDIX E

PENNSYLVANIA NATURAL DIVERSITY INDEX ENVIRONNEMENTAL REVIEW RECEIPT AND CORRESPONDENCE

1. PROJECT INFORMATION

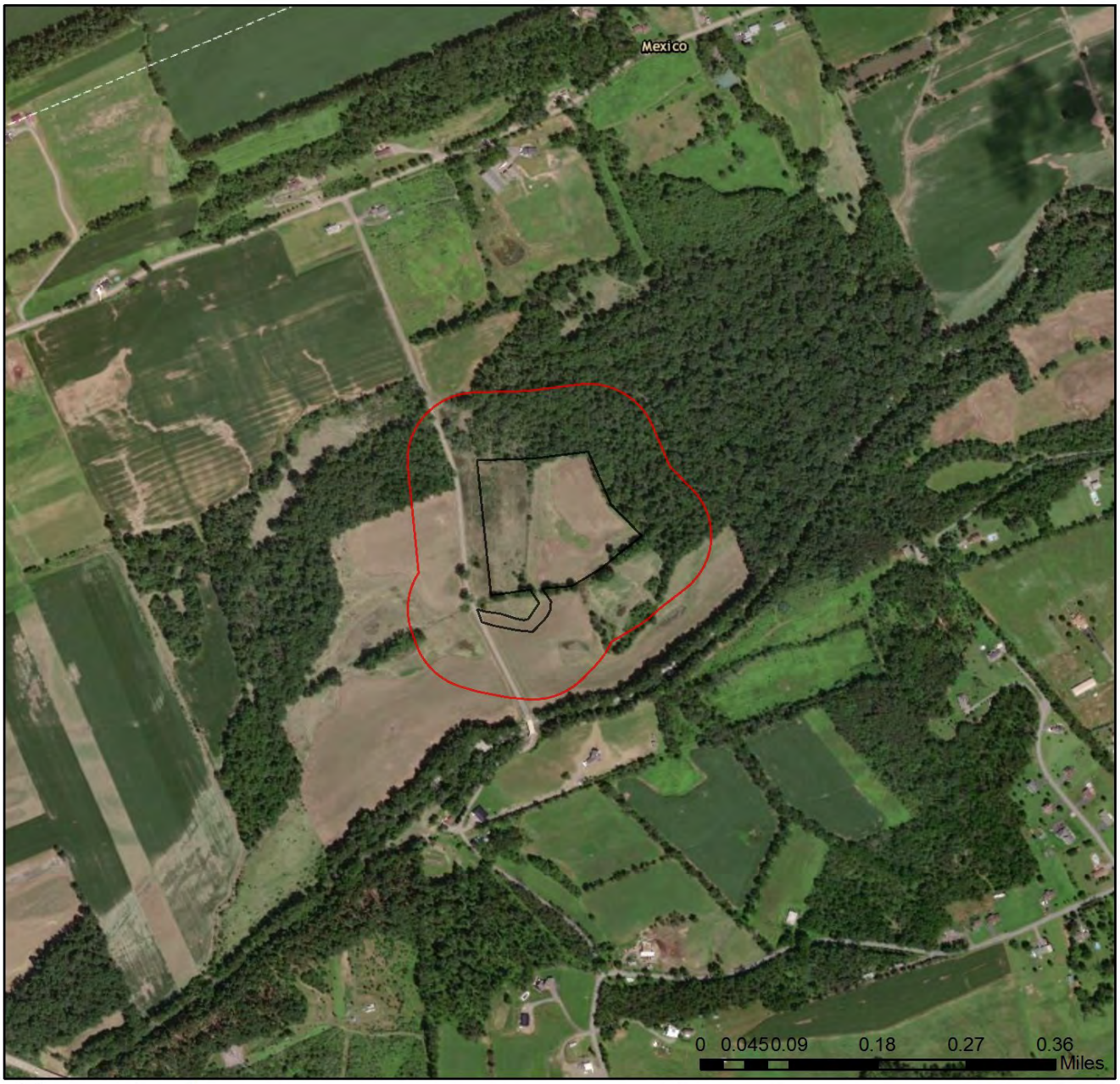
Project Name: **Cunningham Farm Mitigation Site**
Date of Review: **7/30/2019 09:54:33 AM**
Project Category: **Habitat Conservation and Restoration, Wetland Restoration, Wetland Creation, or Wetland Enhancement**
Project Area: **12.09 acres**
County(s): **Montour**
Township/Municipality(s): **LIBERTY**
ZIP Code: **17821**
Quadrangle Name(s): **MILTON; WASHINGTONVILLE**
Watersheds HUC 8: **Lower West Branch Susquehanna**
Watersheds HUC 12: **Chillisquaque Creek-West Branch Susquehanna River**
Decimal Degrees: **41.013670, -76.751094**
Degrees Minutes Seconds: **41° 0' 49.2137" N, 76° 45' 3.9370" W**

2. SEARCH RESULTS

Agency	Results	Response
PA Game Commission	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Department of Conservation and Natural Resources	**Potential Impact**	**FURTHER REVIEW IS REQUIRED, See Agency Response**
PA Fish and Boat Commission	No Known Impact	No Further Review Required
U.S. Fish and Wildlife Service	No Known Impact	No Further Review Required

As summarized above, Pennsylvania Natural Diversity Inventory (PNDI) records indicate there may be potential impacts to threatened and endangered and/or special concern species and resources within the project area. If the response above indicates "No Further Review Required" no additional communication with the respective agency is required. If the response is "Further Review Required" or "See Agency Response," refer to the appropriate agency comments below. Please see the DEP Information Section of this receipt if a PA Department of Environmental Protection Permit is required.

Cunningham Farm Mitigation Site

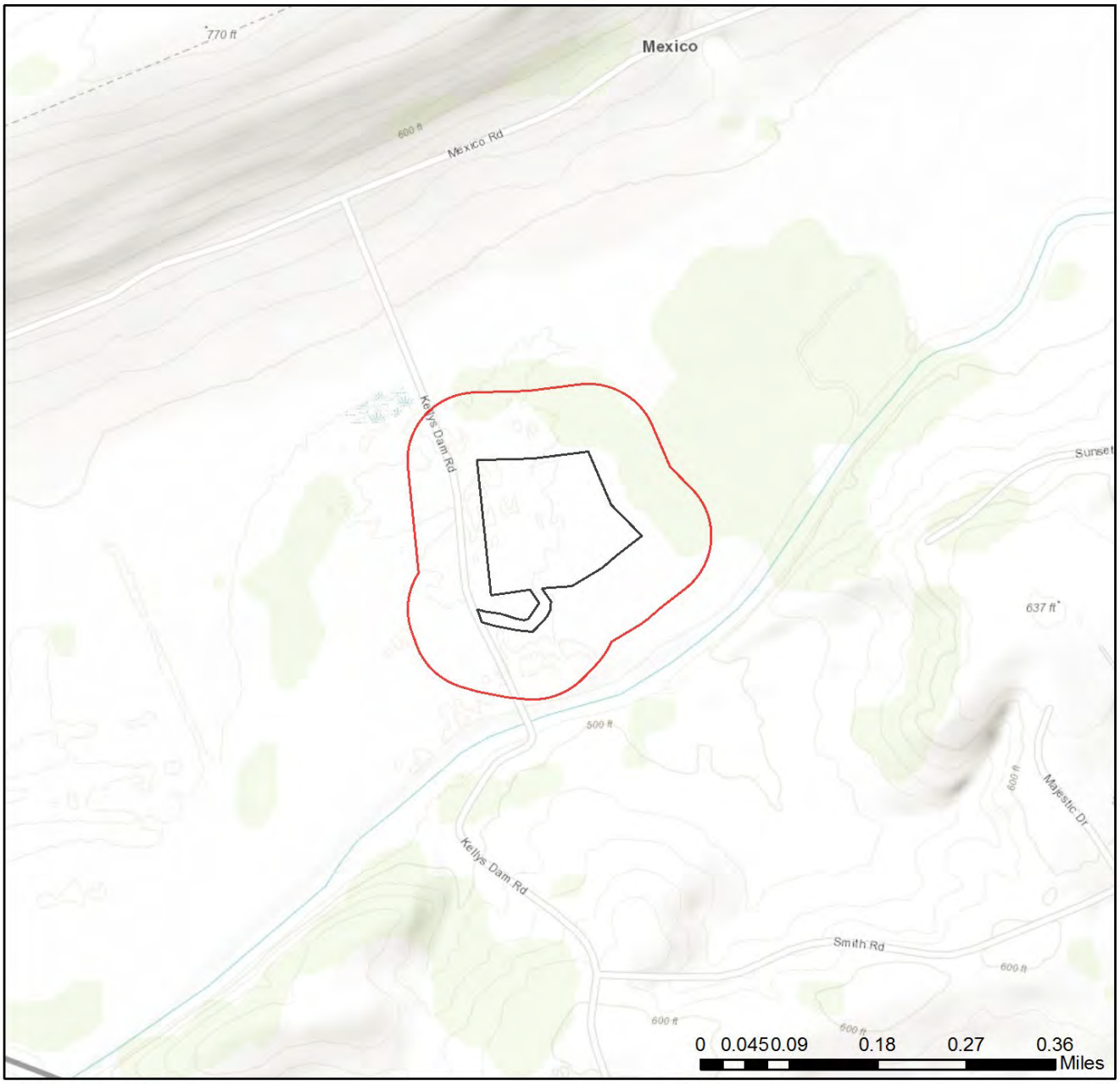


Project Boundary

Buffered Project Boundary

Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Cunningham Farm Mitigation Site



Project Boundary

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Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS,

3. AGENCY COMMENTS

Regardless of whether a DEP permit is necessary for this proposed project, any potential impacts to threatened and endangered species and/or special concern species and resources must be resolved with the appropriate jurisdictional agency. In some cases, a permit or authorization from the jurisdictional agency may be needed if adverse impacts to these species and habitats cannot be avoided.

These agency determinations and responses are **valid for two years** (from the date of the review), and are based on the project information that was provided, including the exact project location; the project type, description, and features; and any responses to questions that were generated during this search. If any of the following change: 1) project location, 2) project size or configuration, 3) project type, or 4) responses to the questions that were asked during the online review, the results of this review are not valid, and the review must be searched again via the PNDI Environmental Review Tool and resubmitted to the jurisdictional agencies. The PNDI tool is a primary screening tool, and a desktop review may reveal more or fewer impacts than what is listed on this PNDI receipt. The jursidictional agencies **strongly advise against** conducting surveys for the species listed on the receipt prior to consultation with the agencies.

PA Game Commission

RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

PGC Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below.)

Scientific Name	Common Name	Current Status
Cistothorus palustris	Marsh Wren	Special Concern Species*

PA Department of Conservation and Natural Resources

RESPONSE:

Further review of this project is necessary to resolve the potential impact(s). Please send project information to this agency for review (see WHAT TO SEND).

DCNR Species: (Note: The Pennsylvania Conservation Explorer tool is a primary screening tool, and a desktop review may reveal more or fewer species than what is listed below. After desktop review, if a botanical survey is required by DCNR, we recommend the DCNR Botanical Survey Protocols, available here: https://conservationexplorer.dcnr.pa.gov/content/survey-protocols)

Scientific Name	Common Name	Current Status	Proposed Status	Survey Window
Carex typhina	Cattail Sedge	Endangered	Threatened	Fruits mid June - September

PA Fish and Boat Commission

RESPONSE:

No Impact is anticipated to threatened and endangered species and/or special concern species and resources.

U.S. Fish and Wildlife Service

RESPONSE:

No impacts to **federally** listed or proposed species are anticipated. Therefore, no further consultation/coordination under the Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq. is required. Because no take of federally listed species is anticipated, none is authorized. This response does not reflect potential Fish and Wildlife Service concerns under the Fish and Wildlife Coordination Act or other authorities.

* Special Concern Species or Resource - Plant or animal species classified as rare, tentatively undetermined or candidate as well as other taxa of conservation concern, significant natural communities, special concern populations (plants or animals) and unique geologic features.
** Sensitive Species - Species identified by the jurisdictional agency as collectible, having economic value, or being susceptible to decline as a result of visitation.

WHAT TO SEND TO JURISDICTIONAL AGENCIES

If project information was requested by one or more of the agencies above, upload* or email* the following information to the agency(s). Instructions for uploading project materials can be found here. This option provides the applicant with the convenience of sending project materials to a single location accessible to all three state agencies. Alternatively, applicants may email or mail their project materials (see AGENCY CONTACT INFORMATION).
***Note:** U.S.Fish and Wildlife Service requires applicants to mail project materials to the USFWS PA field office (see AGENCY CONTACT INFORMATION). USFWS will not accept project materials submitted electronically (by upload or email).

Check-list of Minimum Materials to be submitted:
____Project narrative with a description of the overall project, the work to be performed, current physical characteristics of the site and acreage to be impacted.
____A map with the project boundary and/or a basic site plan(particularly showing the relationship of the project to the physical features such as wetlands, streams, ponds, rock outcrops, etc.)
In addition to the materials listed above, USFWS REQUIRES the following
____**SIGNED** copy of a Final Project Environmental Review Receipt

The inclusion of the following information may expedite the review process.
____Color photos keyed to the basic site plan (i.e. showing on the site plan where and in what direction each photo was taken and the date of the photos)
____Information about the presence and location of wetlands in the project area, and how this was determined (e.g., by a qualified wetlands biologist), if wetlands are present in the project area, provide project plans showing the location of all project features, as well as wetlands and streams.

4. DEP INFORMATION

The Pa Department of Environmental Protection (DEP) requires that a signed copy of this receipt, along with any required documentation from jurisdictional agencies concerning resolution of potential impacts, be submitted with applications for permits requiring PNDI review. Two review options are available to permit applicants for handling PNDI coordination in conjunction with DEP's permit review process involving either T&E Species or species of special concern. Under sequential review, the permit applicant performs a PNDI screening and completes all coordination with the appropriate jurisdictional agencies prior to submitting the permit application. The applicant will include with its application, both a PNDI receipt and/or a clearance letter from the jurisdictional agency if the PNDI Receipt shows a Potential Impact to a species or the applicant chooses to obtain letters directly from the jurisdictional agencies. Under concurrent review, DEP, where feasible, will allow technical review of the permit to occur concurrently with the T&E species consultation with the jurisdictional agency. The applicant must still supply a copy of the PNDI Receipt with its permit application. The PNDI Receipt should also be submitted to the appropriate agency according to directions on the PNDI Receipt. The applicant and the jurisdictional agency will work together to resolve the potential impact(s). See the DEP PNDI policy at https://conservationexplorer.dcnr.pa.gov/content/resources.

5. ADDITIONAL INFORMATION

The PNDI environmental review website is a preliminary screening tool. There are often delays in updating species status classifications. Because the proposed status represents the best available information regarding the conservation status of the species, state jurisdictional agency staff give the proposed statuses at least the same consideration as the current legal status. If surveys or further information reveal that a threatened and endangered and/or special concern species and resources exist in your project area, contact the appropriate jurisdictional agency/agencies immediately to identify and resolve any impacts.

For a list of species known to occur in the county where your project is located, please see the species lists by county found on the PA Natural Heritage Program (PNHP) home page (www.naturalheritage.state.pa.us). Also note that the PNDI Environmental Review Tool only contains information about species occurrences that have actually been reported to the PNHP.

6. AGENCY CONTACT INFORMATION

PA Department of Conservation and Natural Resources
Bureau of Forestry, Ecological Services Section
400 Market Street, PO Box 8552
Harrisburg, PA 17105-8552
Email: RA-HeritageReview@pa.gov

U.S. Fish and Wildlife Service
Pennsylvania Field Office
Endangered Species Section
110 Radnor Rd; Suite 101
State College, PA 16801
NO Faxes Please

PA Fish and Boat Commission
Division of Environmental Services
595 E. Rolling Ridge Dr., Bellefonte, PA 16823
Email: RA-FBPACENOTIFY@pa.gov

PA Game Commission
Bureau of Wildlife Habitat Management
Division of Environmental Planning and Habitat Protection
2001 Elmerton Avenue, Harrisburg, PA 17110-9797
Email: RA-PGC_PNDI@pa.gov
NO Faxes Please

7. PROJECT CONTACT INFORMATION

Name: Paul Fisher
Company/Business Name: WHM Consulting, Inc.
Address: 2525 Green Tech Drive Suite B
City, State, Zip: State College, PA 16803
Phone: (814) 689-1650 Fax: (814) 689-1650
Email: paulf@whmgroup.com

8. CERTIFICATION

I certify that ALL of the project information contained in this receipt (including project location, project size/configuration, project type, answers to questions) is true, accurate and complete. In addition, if the project type, location, size or configuration changes, or if the answers to any questions that were asked during this online review change, I agree to re-do the online environmental review.

applicant/project proponent signature 08/06/19
date

pennsylvania
DEPARTMENT OF CONSERVATION
AND NATURAL RESOURCES

BUREAU OF FORESTRY

Date: August 6, 2019

PNDI Number: 689723
Version: Final_1; 7/30/2019

Paul Fisher
WHM Consulting Inc.
2525 Green Tech drive Suite B
State College, PA 16803

Email: paulf@whmgroup.com (hard copy will not follow)

Re: Cunningham Farm Mitigation Site
Township: Liberty **County: Montour**

Dear Mr. Fisher,

Thank you for the submission of the Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt Number **689723 (Final_1)** for review. PA Department of Conservation and Natural Resources screened this project for potential impacts to species and resources under DCNR's responsibility, which includes plants, terrestrial invertebrates, natural communities, and geologic features only.

No Impact Anticipated (Conservation Measure)

PNDI records indicate species or resources under DCNR's jurisdiction are located in the vicinity of the project. However, based on the information you submitted concerning the nature of the project, the immediate location, and our detailed resource information, DCNR has determined that no impact is likely. No further coordination with our agency is needed for this project.

***Carex typhina* (Cattail Sedge) is known to occur in close proximity to the project site within wooded bottomland along Chillisquaque Creek. This species is currently ranked PA Endangered and proposed PA Threatened. Please avoid all impacts to wooded wetlands on the project site.**

Recommended Actions to avoid the spread of invasive species:

- Clean boot treads, construction equipment, and vehicles thoroughly (especially the undercarriage and wheels) before they are brought on site. This will remove invasive plant seeds and invasive earthworms/cocoons that may have been picked up at other sites.
- Do not transport unsterilized leaves, mulch, compost, or soil to the site from another location.
- Do not use seed mixes that include invasive species. Please also use weed-free straw or hay mixes. More information about invasive species in Pennsylvania can be found at the following link: http://www.dcnr.pa.gov/Conservation/WildPlants/InvasivePlants/Pages/default.aspx
- Use habitat appropriate seed mixes. For example, when reseeding along a waterway, utilize a riparian seed mix. The Bureau of Forestry Planting & Seeding Guidelines can be found here for recommendations: http://www.docs.dcnr.pa.gov/cs/groups/public/documents/document/dcnr_20031083.pdf
- Report occurrences of invasive species to iMapInvasives at https://www.imapinvasives.org/. Focus on large infestations and species that are not yet well established in the region or in Pennsylvania (https://www.paimapinvasives.org/be-on-the-lookout).

This response represents the most up-to-date review of the PNDI data files and is valid for two (2) years only. If project plans change or more information on listed or proposed species becomes available, our determination may be reconsidered. Should the proposed work continue beyond the period covered by this letter and a permit has not been acquired, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative, description ofPau project changes and accurate map). As a reminder, this finding applies to potential impacts under DCNR's jurisdiction only. Visit the PNHP website for directions on contacting the Commonwealth's other resource agencies for environmental review.

Should you have any questions or concerns, please contact Rich Shockey, Ecological Information Specialist, by phone (717-772-0263) or via email (c-rshockey@pa.gov).

Sincerely

Greg Podniesinski, Section Chief
Natural Heritage Section

COMMONWEALTH OF PENNSYLVANIA
PENNSYLVANIA GAME COMMISSION
2001 Elmerton Avenue
Harrisburg, PA 17110-9797
Wildlife Habitat Management
(717) 787-6818

September 10, 2019

Mr. Paul Fisher
WHM Consulting, Inc.
2525 Green Tech Drive, Suite B
State College, Pennsylvania 16803
paulf@whmgroup.com

PNDI Receipt File: *project_receipt_cunningham_farm_mitigatio_689723_FINAL_1.pdf*
Re: Cunningham Farm Mitigation Site
Liberty Township, Montour County, Pennsylvania

Dear Mr. Fisher,

Thank you for submitting Pennsylvania Natural Diversity Inventory (PNDI) Environmental Review Receipt *project_receipt_cunningham_farm_mitigatio_689723_FINAL_1.pdf* for review. The Pennsylvania Game Commission (PGC) screened this project for potential impacts to species and resources of concern under PGC responsibility, which includes birds and mammals only.

Potential Impact Anticipated

PNDI records indicate species or resources of concern are located within the vicinity of the project. The PGC has received and thoroughly reviewed the information that you provided to this office, as well as PNDI data, and has determined that there are no known occurrences of state listed threatened or endangered bird or mammal species associated with your project. However, potential impacts to species of special concern may be associated with your project, and as a result, additional measures are recommended to avoid potential impacts to the species listed below.

Conservation Measure(s)

The following is species of special concern and, therefore, not a target species for additional surveys:

Scientific Name	Common Name
Cistothorus palustris	Marsh Wren

However, because of their ecological significance, the following seasonal restriction is suggested to avoid potential impacts to nesting marsh wren located within the vicinity of the project area:

- *All project-related activities should be conducted outside nesting season, between August 16 and April 14. No work should occur during the breeding and nesting season which extends from April 15 through August 15.*

This response represents the most up-to-date summary of the PNDI data files and is valid for two (2) years from the date of this letter. An absence of recorded information does not necessarily imply actual conditions on site. Should project plans change or additional information on listed or proposed species become available, this determination may be reconsidered.

Should the proposed work continue beyond the period covered by this letter, please resubmit the project to this agency as an "Update" (including an updated PNDI receipt, project narrative and accurate map). If the proposed work has not changed and no additional information concerning listed species is found, the project will be cleared for PNDI requirements under this agency for two additional years.

This finding applies to impacts to birds and mammals only. To complete your review of state and federally-listed threatened and endangered species and species of special concern, please be sure that the U.S. Fish and Wildlife Service, the PA Department of Conservation and Natural Resources, and/or the PA Fish and Boat Commission have been contacted regarding this project as directed by the online PNDI ER Tool found at www.naturalheritage.state.pa.us.

Sincerely,

Olivia A. Braun
Environmental Planner
Division of Environmental Planning & Habitat Protection
Bureau of Wildlife Habitat Management
Phone: 717-787-4250, Extension 73128
Fax: 717-787-6957
E-mail: Olbraun@pa.gov

A PNHP Partner

Pennsylvania Natural Heritage Program

OAB/oab

cc: Schnupp
Brauning
Murphy
Barber
Figured
Wenner
Librandi Mumma
File

APPENDIX F

CULTURAL RESOURCE NOTICE

Pennsylvania State Historic Preservation Office
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION

6 January 2017

David J. Rue
Rue Environmental
1257 East College Avenue
State College, PA 16801

Re: ER 2014-0191-093-D
Phase I Archaeological Survey, Cunningham Wetland Mitigation Site, Liberty Township, Montour County, Pennsylvania

Dear Mr. Rue:

Thank you for submitting information concerning the above referenced project. The Pennsylvania State Historic Preservation Office (PA SHPO) reviews projects in accordance with state and federal laws. Section 106 of the National Historic Preservation Act of 1966, and the implementing regulations (36 CFR Part 800) of the Advisory Council on Historic Preservation, is the primary federal legislation. The Environmental Rights amendment, Article 1, Section 27 of the Pennsylvania Constitution and the Pennsylvania History Code, 37 Pa. Cons. Stat. Section 500 et seq. (1988) is the primary state legislation. These laws include consideration of the project's potential effects on both historic and archaeological resources.

This report meets our standards and specifications as outlined in *Guidelines for Archaeological Investigations in Pennsylvania* (PA SHPO 2016) and the Secretary of the Interior's Guidelines for Archaeological Documentation. We agree with the recommendations of this report and in our opinion no further archaeological work is necessary for this project.

Please send one bound copy and three digital copies (PDF preferred) on separate CDs of the final report for our files. For all copies, photographs must adhere to the National Register Photo Policy.

If you need further information in this matter concerning archaeological resources please consult Steven McDougal at (717) 772-0923.

Sincerely,

Douglas C. McLearen, Chief
Division of Archaeology & Protection

DCM/srm

Pennsylvania State Historic Preservation Office
PENNSYLVANIA HISTORICAL AND MUSEUM COMMISSION

Negative Survey Form

(This form may be used if the Phase I guidelines have been followed and no cultural resources have been identified.)

1. Project Identification:

ER Number: **2014-0191-093**

Project Name &/or Agency Tracking #: Cunningham Wetland Mitigation Site.

Agency: ACOE **Applicant:** WHM Consulting

Preparers Name and affiliation: David Rue, Rue Environmental LLC

Date Prepared: 11/29/2016

Project Area County/Municipality (list all)

County	Municipality
Montour	Liberty

2. Project Setting: (check all that apply)

☐ urban/suburban; ☒ rural
☐ upland; ☒ floodplain/terrace (☐active; ☒stable terrace)

7.5" USGS Quadrangle(s) Name (list all):

Name	Date
Milton	

Physiographic Zone(s)(list All. Use DCNR Map 13 compiled by W.D. Sevon, Fourth Edition, 2000.):

Physiographic Zone
Susquehanna Lowland (30)

Project Area Drainage(s), (list all) (Sub-basin and Watershed can be obtained from CRGIS):

Sub-basin	Watershed	Major Stream	Minor Stream
L. W. Br Susquehanna (10)	D	West Branch Susq	Other

3. Basic Field Conditions:

(Text fields will expand as needed. Please be complete)

Area of APE / Project Area in hectares: 2.26 Hectares tested: 2.26

General Description of APE / Project Area: Herbaceous covered terrain on alluvium with relatively shallow soils

Type of Proposed Project / Impact: Creation of wetlands through relatively shallow excavations averaging 75 cm

Date of field investigation(s): Nov 15-17, 2016

Description of Field Conditions including percentage of surface visibility:
Grass and weed cover in cultivated fields, very low surface visibility

4. Previously Recorded Archaeological Sites within APE / Project Area and not relocated by this project:

PASS Site Number	Reason not re-located
n/a	

5. Survey Methodology: (check all that apply to the entire project; attach any supporting documents)

☒ PASS file Research ☐ Contacted Local Historical Association/Commission/Park/Etc.
☐ Informant Data ☒ Historic Records/Maps/Photos ☒ SCS Soil Maps
☐ Surface Survey ☐ Geomorphological Borings ☒ STPs
☐ Test Units ☐ Geomorphological Trenches ☐ Remote Sensing
Other: _____

Professional Geomorphologist was ☐Present or ☒ Not Present During Field Investigations

Name: _ Affiliation:

Formal Geomorphological Report Prepared: ☐ Yes ☒ No

6. Results: (Describe both the design and the results of every methodology checked in **5.** Include the size and condition of the area tested by each.)

The APE included five sub-areas with a total area of 2.26 ha. The CRGIS indicated that no previously recorded sites were located in the APE. The 1875 atlas was reviewed (not reproduced here), it showed no expected historic resources in the APE. The predictive model shows the area to be categorized as primarily low probability for prehistoric sites. Soils are of the Holly series, formed in stream alluvium. Existing wetlands are located all around the area. The soils are relatively poorly drained, proving a low probability of significant prehistoric site use other than ephemeral resource procurement. A moderate probability shovel testing interval of 25 m was utilized across the area and no historic or prehistoric artifacts were recovered. Testing consisted of excavation of 36 shovel test pits.

In the northern most of the larger areas tested by STPS 101-109, the profile included an Ap horizon of brown (10YR4/2) silty clay loam ranging in thickness from 25-30 cm. The B horizon was a yellowish brown (10YR5/6) – mottled with 10YR5/2) clay loam, 25-35 cm thick. The underlying BC horizon was a 10YR7/2 sandy gravel tested to depths to 65 cm.

In the two larger sub-areas to the south of the above area, STPS 201-215 and 301-307 were completed. The profile here included an Ap horizon whose depth and characteristics were similar to that described above. The B horizon was a 10YR 5/4 (mottled with 5/2) clay loam 45-55 cm thick. This was underlain by a BC horizon of 10YR5/2 clay often with gravel tested to depths of 80 cm.

The two small areas to the south were tested with STPS 401 and 501-504. Here, project impacts will be limited to depths of 45 cm. Evidence of poorer drainage was encountered in the shovel testing of these areas. Beneath an Ap horizon congruent with the rest of the area, a B1 horizon from circa 30-45 cm of 10YR5/2 silty clay was encountered. A B2 horizon of similar soil color mottled with 10YR5/4 was encountered to excavated depths up to 60 cm.

7. Statewide Pre-Contact Probability Model Analysis: (Use the model from CRGIS to determine portions of the project area that were located within each sensitivity tier and list all testing methods used within each tier. If more than one method was used, estimate the percentage of the tier tested by each method. In the Sites Located section, include Isolated Finds for which a number is assigned.)

Sensitivity Tier	Area within this Tier	Percent of Total Project Area	Method(s) Used to test this tier (Use list from 5 above. Include % if multiple.)	Number of Sites Located
High	0 sq. m.	0 %		0
Moderate	0 sq. m.	0 %		0
Low	22,500 sq. m.	100 %	STPS 25 m	0

8. Required Attachments:

- ☒ 7.5' USGS Quadrangle Map delineating APE / Project Area
- ☒ Project map showing testing strategy(ies)
- ☒ Testing strategy justification / predictive model
- ☒ Supporting photographs with descriptions of view and view direction
- ☐ Engineering / Project Plans if prepared
- ☐ Geomorphological Report if prepared
- ☒ Representative excavation profiles and descriptions

List all other attachments to this Negative Survey Form:

Attachment Type

Survey Strategy Justification

The probability model indicated the project area had a low potential for prehistoric resources and there was no evidence wo suggest that historic resources were present. The entire APE was tested with a moderate shovel test interval of 25 m.

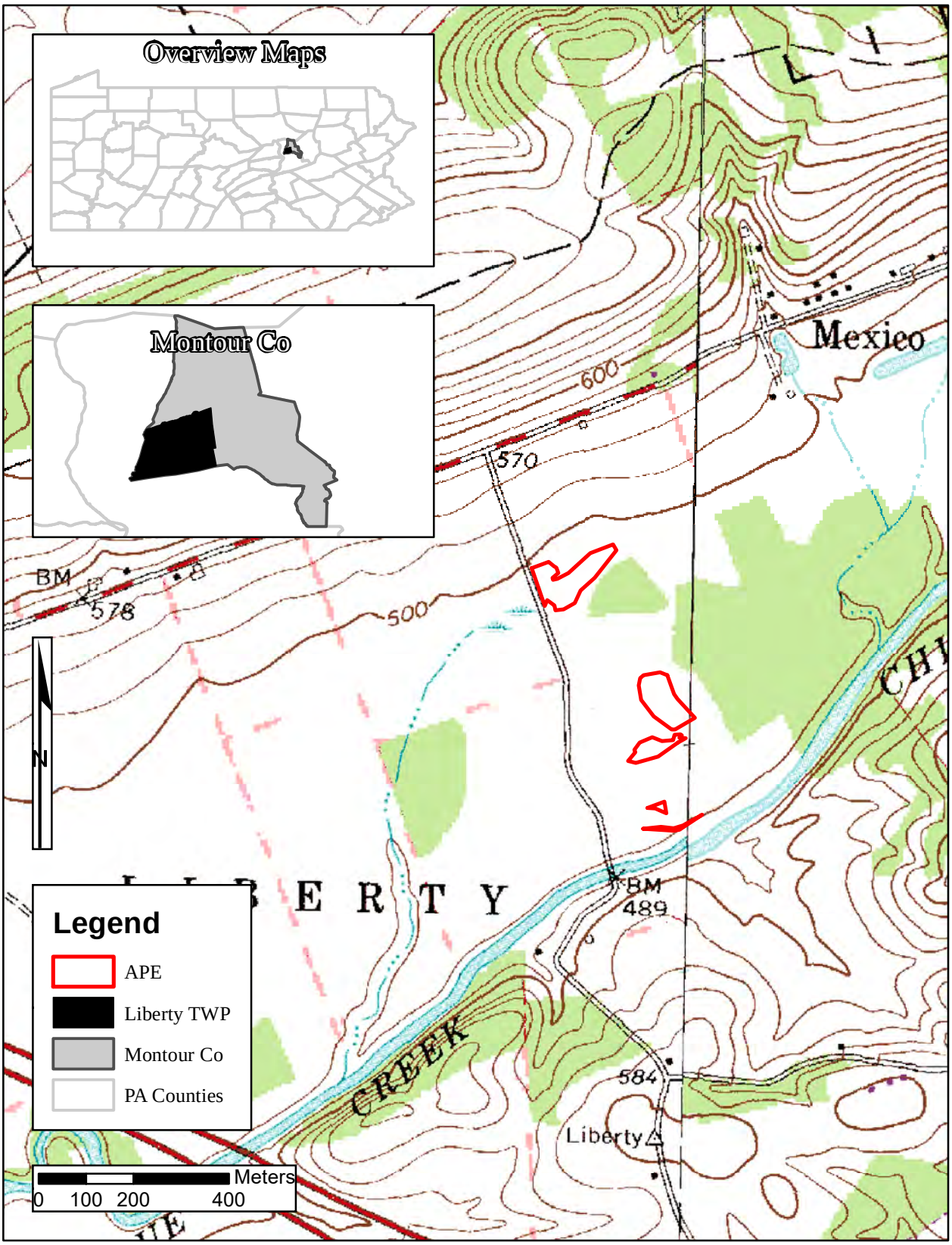

Figure 1. Liberty APE on topo map.

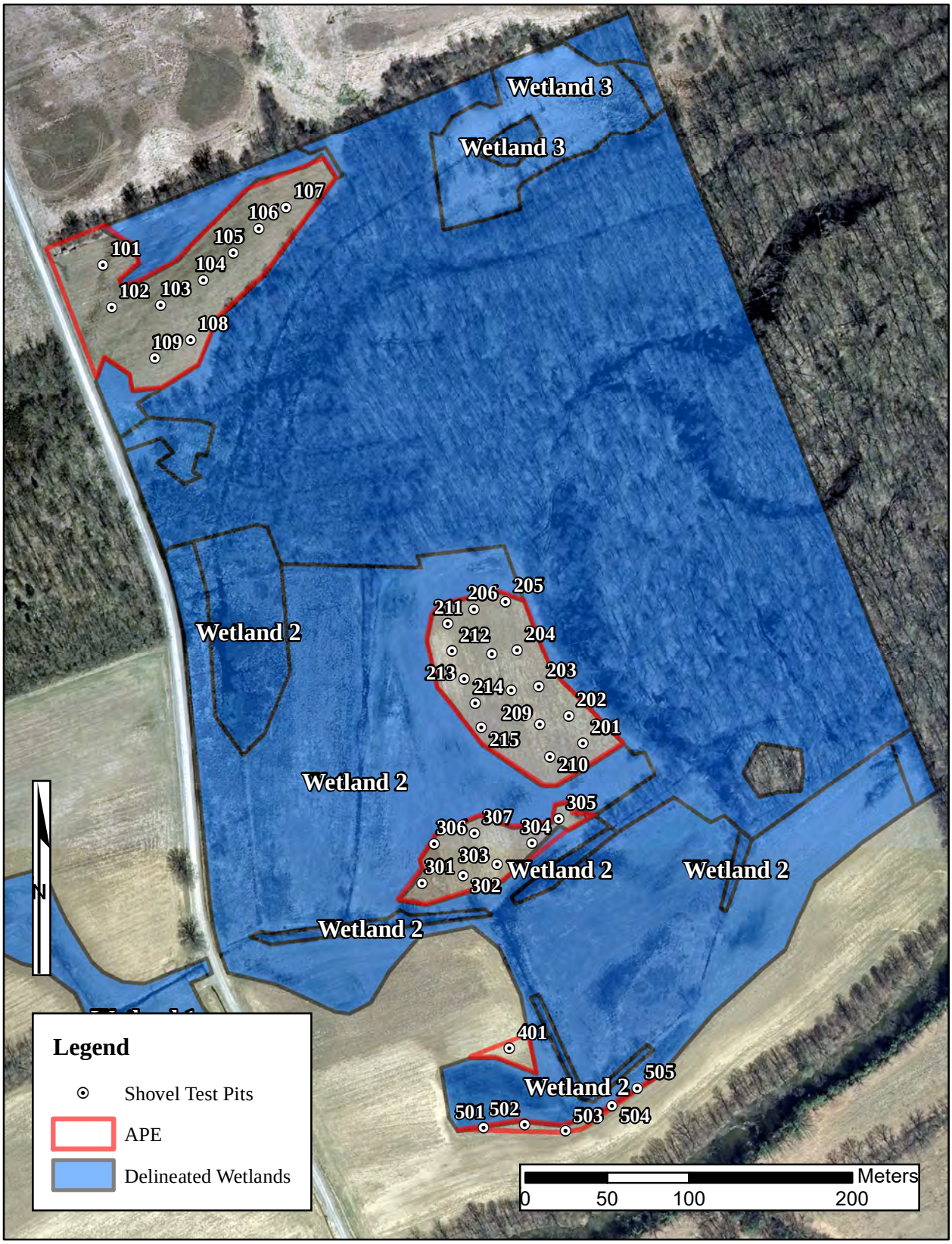

Figure 2. Shovel test locations.

Note: Wetland ID's of this Figure do not match ID's outlined in Wetland Delineation Report and mapping.

Photo 1. Area 1 East Side Looking Northeast.

Photo 2. Area 2 Southeast Corner Looking Southwest Towards Area 4.

Photo 3. Area 5 West End Looking East.

STP 103

Ap	Brown 10YR4/2 silty clay loam 0-25 cm
B	Yellowish brown 10YR5/6 mottled with 10YR5/2 clay loam 25-40 cm
BC	10YR7/2 sandy gravel 40-50 cm

STP 211

Ap	Brown 10YR4/2 silty clay loam 0-28 cm
B	10YR5/4 mottled with 5/2 clay loam 28-70cm
BC	10YR5/2 clay with gravel 70-80 cm

STP 505

Ap	Brown 10YR4/2 silty clay loam 0-25cm
B1	10YR5/2 mottled with 10YR5/4 silty clay 25-46 cm

Representative Shovel Test Profiles.

APPENDIX G

PAST PERFORMANCE HISTORY, RESUMES & PROJECT PROFILES

WHM PERFORMANCE HISTORY

PROJECT NAME	USACE PERMIT #	DEP PERMIT #	USACE DISTRICT	DEED RESTRICTION DATE	MITIGATION ACREAGE	MITIGATION TYPE	PERFORMANCE STANDARD MET / IN COMPLIANCE	FINANCIAL ASSURANCES REQUIRED
BALD EAGLE WETLAND	CENAB-OP-RPA-02-02087-12 CENAB-OP-RPA-04-01670-12	E14-427 E14-465	BALTIMORE USACE - PA	16-Nov-10	52.78	WETLAND CREATION WETLAND ENHANCEMENT WETLAND PRESERVATION	MET	YES
TUNKHANNOCK VIADUCT - WYOMING PIPELINE	CENAB-OP-2010-02810-P13	E6629-003	BALTIMORE USACE - PA	15-Dec-11	1.02	`	MET	NO
					4.55	WETLAND ENHANCEMENT		
USG ANCILLARY IMPROVEMENTS PROJECT	CENAB-OP-RPA-2007-1215-P05	E47-087	BALTIMORE USACE - PA	9-Mar-12	2.67	WETLAND CREATION	MET	NO
					1.69	WETLAND RESTORATION		
BONNELL TO ROGERS PIPELINE	CENAB-OP-RPA-2011-00411-05	E4129-056	BALTIMORE USACE - PA	22-Dec-11	0.22	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					0.48	RIPARIAN BUFFER		
FRYMIRE GATHERING PIPELINE	CENAB-OP-RPA-2011-00410-P05	E4129-078	BALTIMORE USACE - PA	22-Dec-11	5.07	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
SALT RUN PIPELINE	CENAB-OP-RPA-2011-00410-05	E4129-075	BALTIMORE USACE - PA	22-Dec-11	0.76	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					0.46	RIPARIAN BUFFER		
SALT RUN TO WALLIS RUN_SCHRINERTO WEST LATERAL_NEVIN SMITH TO ANNA SMITH GATHERING	CENAB-OP-RPA-2011-00410 CENAB-OP-RPA-2011-00411	E4129-039 E4129-057	BALTIMORE USACE - PA	22-Dec-11	1.17	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					2.20	RIPARIAN BUFFER		
WARRENSVILLE WEST LATERAL	CENAB-OP-RPA-20 11-00410-05	E4129-020	BALTIMORE USACE - PA	22-Dec-11	1.11	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					2.64	RIPARIAN BUFFER		
BRADFORD WEST COMPRESSOR STATION #2	CENAB-OP-RPA-2011-1923	GP05-08-29-13-026 GP07-08-29-13-006 GP08-08-29-13-024	BALTIMORE USACE - PA	31-Jul-13	0.01	WETLAND CREATION	IN COMPLIANCE	NO
					0.10	WETLAND ENHANCEMENT		
GARRISION PIPELINE & POLOVITCH EW	CENAB-OP2010-0281 0-P 13	GP05-66-29-11-11 GP07-66-29-11-03 GP08-66-29-11-10	BALTIMORE USACE - PA	4-Dec-12	0.09	WETLAND CREATION	IN COMPLIANCE	NO
					0.82	WETLAND ENHANCEMENT		
					0.15	RIPARIAN BUFFER		
POLOVITCH EAST TO JERAULD & TAYLOR PIPELINE	CENAB-OP-RPA-2010-02810-P13	E5829-034	BALTIMORE USACE - PA	15-Dec-11	0.48	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
BARTO TAP SYSTEM PIPELINE	NAB-2011-00177-P05	GP08-41-09-503 E4129-013	BALTIMORE USACE - PA	4-Dec-12	2,154 LINEAR FT	STREAM RESTORATION	IN COMPLIANCE	NO
					6.03	RIPARIAN BUFFER		
CANTON PIPELINE	CENAB-OP-RPA-2012-01107	E4129-037 E5929-030 E0829-039	BALTIMORE USACE - PA	10-Sep-12	0.05	WETLAND CREATION	MET	NO
					1.20	RIPARIAN BUFFER		
TGP SOUTH SALES PIPELINE	CENAB-OP-RPA-2012-00368-P09	E0829-055	BALTIMORE USACE - PA	16-Sep-13	3.10	RIPARIAN BUFFER	IN COMPLIANCE	NO
					2.50	WETLAND ENHANCEMENT		
U GATHERING	CENAB-OP-RPA-2012-00368-P09	E0829-061	BALTIMORE USACE - PA	16-Sep-13	1.35	RIPARIAN BUFFER	IN COMPLIANCE	NO
					0.10	WETLAND ENHANCEMENT		
UNIT 4 GATHERING LINE	CENAB-OP-RPA-2012-00368-P09	E0829-058	BALTIMORE USACE - PA	16-Sep-13	0.50	RIPARIAN BUFFER	IN COMPLIANCE	NO
					1.65	WETLAND ENHANCEMENT		
UNIT 9 GATHERING LINE	CENAB-OP-RPA-2012-00368	E0829-066	BALTIMORE USACE - PA	16-Sep-13	0.75	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
WHITE COMPRESSOR STATION	CANAB-OP-RPA-2012-00368-P09	GP-07-0824 GP-12-028	BALTIMORE USACE - PA	16-Sep-13	0.25	RIPARIAN BUFFER	IN COMPLIANCE	NO
					0.15	WETLAND CREATION		

WHM PERFORMANCE HISTORY

PROJECT NAME	USACE PERMIT #	DEP PERMIT #	USACE DISTRICT	DEED RESTRICTION DATE	MITIGATION ACREAGE	MITIGATION TYPE	PERFORMANCE STANDARD MET / IN COMPLIANCE	FINANCIAL ASSURANCES REQUIRED
WASTEWATER TREATMENT PLANT	CENAB-OP-RPA-2012-01099-05	E41-629	BALTIMORE USACE - PA	9-Mar-12	0.15	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
NW1 GATHERING LINE	CENAB-OP-RPA-2011-01795	E5829-049	BALTIMORE USACE - PA	24-Oct-13	0.60	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
VARGO COMPRESSOR STATION	CENAB-OP-RPA-2011-00410	E4129-080	BALTIMORE USACE - PA	22-Dec-11	0.90	WETLAND CREATION	IN COMPLIANCE	NO
WARRENSVILLE NORTH EXTENSION	CENAB-OP-RPA-20 11-00410-05	E4129-019	BALTIMORE USACE - PA	22-Dec-11	0.72	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					0.80	RIPARIAN BUFFER		
CHESAPEAKE ABLE LATERAL PIPELINE	CENAB-OP-RPA-2012-00561-05	E4129-052 E5729-038	BALTIMORE USACE - PA	31-Dec-12	0.98	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					3.03	RIPARIAN BUFFER		
S7 CROSSING	CENAB-OP-RPA-2012-01107	E4129-037 E5929-030 E0829-039	BALTIMORE USACE - PA	10-Sep-12	0.20	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
					0.05	WETLAND CREATION		
					1.30	RIPARIAN BUFFER		
AUBURN LINE EXTENSION PROJECT	CENAB-OP-RPA-2011-03756	E4029-003 E6629-015	BALTIMORE USACE - PA	31-Jul-13	3.39	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
TEAM 2014	CENAB-OP-RPA-2013-1374-P12	-	BALTIMORE USACE - PA	14-May-14	4.68	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
CANTON PIPELINE MAJOR MODIFICATION	CENAB-OP-RPA-2012-01107-P05	E4129-037 E5929-030 E0829-039	BALTIMORE USACE - PA	17-Jul-14	9.00	WETLAND CREATION	IN COMPLIANCE	NO
HEMLOCK LATERAL	CENAB-OP-RPA-2013-00806-05	-	BALTIMORE USACE - PA	17-Jul-14	0.18	WETLAND CREATION	IN COMPLIANCE	NO
					0.66	WETLAND ENHANCEMENT		
					0.35	RIPARIAN BUFFER		
UNION DALE LATERAL PROJECT	CENAB-OP-RPA-2013-01861-P25	-	BALTIMORE USACE - PA	24-Oct-13	0.21	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
EMERALD LONGWALL MINE PANEL D2 PROJECT	2014-0283	GP113014205 GP083014208	PITTSBURGH USACE - PA	29-Aug-14	0.31	WETLAND CREATION	IN COMPLIANCE	NO
AUBURN LOOP LINE	CENAB-OP-RPA-2010-03756-P25	-	BALTIMORE USACE - PA	24-Oct-13	0.33	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
BIRCHARD PIPELINE	CENAB-OP-RPA-2009-01676-P25	E5829-091	BALTIMORE USACE - PA	24-Oct-13	0.36	WETLAND ENHANCEMENT	IN COMPLIANCE	NO
LEIDY SOUTHEAST EXPANSION	CENAB-OP-RPA-2013-01107-05	E4129-037 E5929-030	PHILADELPHIA USACE - PA	20-May-15	15.20	WETLAND ENHANCEMENT	IN COMPLIANCE	NO

BALD EAGLE WETLAND MITIGATION SITE
CENTRE COUNTY, PENNSYLVANIA

Few issues have polarized the business community and environmentalists more than the balance between development and protecting wetlands. WHM has developed a highly innovative approach that creates new wetlands while allowing projects to move ahead. An example is the Bald Eagle Wetland Mitigation Site, the first of its kind in Pennsylvania.

Although avoidance of wetland damage is a goal in highway construction, some impact is unavoidable. The Pennsylvania Department of Transportation hired WHM to provide mitigation for such situations. We utilize a non-traditional methodology, assembling a team to handle everything at no risk to the client. We find a site, purchase the property, acquire the permits, deal with regulatory agencies and construct replacement wetlands – all at a per-acre fixed cost.

Through careful field and desktop evaluations, followed by numerous discussions with property owners, WHM located several potential properties in the Bald Eagle Valley in Centre County, Pa. These properties were selected based on their ability to create wetlands as determined by an examination of hydrology and soils, as well as other environmental and non-environmental factors. Larger contiguous properties create a more diverse habitat than smaller unwanted parcels. Properties that retained a high possibility of success were ranked for acquisition.

After clearances were issued and sites were selected, WHM began to create a design for the Bald Eagle project based on the overall shape of the landscape and the development of a hydrologic water budget. The concept was presented to the U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Pennsylvania Department of Environmental Protection, Pennsylvania Fish and Boat Commission, and other state and local agencies. The final design was based on input from each of these agencies, and then used to obtain regulatory approvals necessary for the construction of wetlands.

As the project progressed, a series of construction drawings was developed, resulting in a final, detailed design illustrating phased construction activities, erosion control practices and a complete planting and re-vegetation schedule. As part of the regulatory permits and approvals, WHM developed a monitoring plan to ensure long-term site maintenance and success. Funding for the project includes provisions for ongoing and long-term management of the wetlands by a non-profit organization.

In 2010, a search ensued for a suitable not-for-profit organization for the perpetual care and use of the property. WHM began discussions with the Wildlife for Everyone Endowment Foundation (WFEEF) and determined their goals to support to enhance wildlife habitat, scientific research and education; land preservation; and the development of youth programs would be a great fit as a steward of the property and the habitat into the future. In 2011, WHM donated more than 135 acres of land along Bald Eagle Creek, and a $50,000 maintenance fund for the property to WFEEF. Upon acquisition of the recreational property, WFEEF dedicated the land to an honorary board member and former Pennsylvania Governor Tom Ridge.

The Governor Tom Ridge Wetland Preserve has provided PennDOT with 50 acres of wetland mitigation credits. In addition, wetland preservation, restoration and upland habitat are part of this project. Based on past wetland construction costs for highway projects, the client stands to save considerable money. Rather than utilizing traditional methods of contracting with multiple entities and managing multiple contracts without guarantee of success, WHM provides a single “family” to ensure success.

WETLAND REMEDIATION PROJECT
MONTOUR COUNTY, PENNSYLVANIA

WHM Solutions, Inc. (WHM) was retained by an undisclosed client to provide sufficient compensation to offset impacts incurred by a site improvement project. Due to insufficient compensation of replacement acreage at an existing mitigation site, the client contracted WHM to develop additional compensation within an appropraite geographic service area or watershed. WHM was responsible for the execution of the deed restriction on the property, the permitted design, construction, and monitoring of the project.

BEFORE

DURING

AFTER

WHM completed a desktop analysis within an appropriate geographic service area to determine potential locations to offset water resource impacts resultant of the project. The site selection process focused on the location of the existing water resource impacts which span throughout the watershed, and a conducive location to offset the impacts. Potential sites or leads were initially reviewed through a GIS desktop analysis outlining: aerial photography, LiDAR topographic contour data, floodplain boundaries, and hydric soils. Based on the desktop review, landowners with suitable properties were contacted to determine interest of conducting a mitigation project on their property. Several landowners with favorable properties were contacted throughout the site selection process. Ultimately due to site suitability, landowner cooperation, and an onsite field meeting with the USACE, a farm located in Montour County was selected as an appropriate site to conduct wetland remediation measures.

The design of the wetland restoration and wetland creation consisted of increasing and expanding functions of the existing bottomland wetland located to the south of the mitigation area. The purpose of the remediation project was to provide additional compensation and the creation of a functional wetland system. The design incorporated expansion of the bottomland forest wetland with shallow vegetated open-water components to create and enhance habitat for amphibians, waterfowl, wading birds, and migratory songbird species. The design provided random clumped distribution of tree plantings positioned on graded low hummocks or mounds where the tree collars will be above typical standing water elevations early in the growing season. Trees were also planted along the perimeter of the site to act as screening/buffer for the wetlands. The open-water flightway was paralleled by emergent and scrub/shrub fringe to enhance diversity and mimic natural oxbow features in the watershed.

The result of the project has provided a native wetland community and riparian buffer that fit naturally into the landscape. The site is self-sustaining with no financial assurances or long-term management needs due to the relative nature of the project, selection of an appropriate site for mitigation activities, and the past performance of WHM in fulfilling mitigation requirements. The deed restriction on the property provides long-term assurance that after performance standards are met, the mitigation area will be maintained in a natural state.

MOORE FARM WETLAND MITIGATION SITE
LYCOMING COUNTY, PENNSYLVANIA

WHM Solutions, Inc. (WHM) offers comprehensive solutions to difficult environmental problems, steamlining the business endeavors of our clients while preserving our country's environmental assests. From permitting to design to erosion and settlement controls, we handle every aspect of the mitigation process and present it in one fixed-rate, turnkey package.

BEFORE

An undisclosed midstream company contracted WHM to develop compensation for several proposed natural gas pipeline projects in north central Pennsylvania that would result in wetland damage. WHM was responsible for the execution of the deed restriction on the property, for acquiring all necessary permits and dealing with regulatory agencies, and for the design, construction, and monitoring of the project.

DURING

WHM completed a desktop analysis within the appropriate geographic service area to determine potential locations. These sites were initially reviewed through a GIS desktop analysis outlining: aerial photography, LiDAR topographic contour data, floodplain boundaries, hydric soils, and tax parcel data. Landowners with suitable property to conduct mitigation activities were contacted and several landowners with favorable properties were approached throughout the site selection process. Ultimately, due to site suitability, landowner cooperation, and the non-attaining status of the waters, a farm located in Piatt Township, Lycoming County was chosen to accomplish compensatory mitigation for the proposed project impacts.

AFTER

The design of the mitigation site consists of wetland enhancement and the installation of a forested riparian buffer. The mitigation area is a contiguous land feature that will be expanded by future projects leading to an overall benefit to functions and values. The work plan will enhance functions of the existing wetland which is in a degraded state due to the current land use as a cattle pasture, resulting in considerable nutrient inputs. The purpose of the project is to offset function and value losses resulting from impacts associated with the proposed pipeline project. The design will incorporate wetland and stream fencing to remove cattle from the areas proposed for mitigation. It will include a meandering flightway to create and enhance habitat for waterfowl, wading birds, and migratory songbird species. The flightway will be paralleled by an emergent and scrub/shrub fringe. The vegetative design of the site will incorporate a diverse planting plan consisting of herbaceous seeding followed by a clumped distribution of tree and shrub plantings. Once the mitigation areas are established, increased nutrient and sediment sequestering will be provided within the areas resulting in an improvement of water quality and habitat enhancement.

The result of the project has provided 11.82 acres of native wetland community and 6.58 acres of forested riparian buffer that fit naturally into the landscape. The site is self-sustaining with no financial assurances or long-term management needs due to the relative nature of the project, selection of an appropriate site for mitigation activities, and the past performance of WHM in fulfilling mitigation requirements. The deed restriction on the property provides long-term assurance that after performance standards are met, the mitigation area will be maintained in a natural state.

WHM's design-built and innovative approach to wetland mitigation proves that development in the natural gas industry doesn't have to come at the risk of our aquatic resources or at the hassle of our clients working towards the future of the energy industry.

SPADINE FARM MITIGATION SITE
WYOMING COUNTY, PENNSYLVANIA

WHM Solutions, Inc. (WHM) has a design-built and highly innovative approach to wetland mitigation that allows our clients to move projects forward without compromising the condition of our natural resources.WHM is unique in that everything from permitting, to design, to monitoring, and more is handled through one company. An undisclosed midstream company retained WHM to provide compensatory mitigation projects for several pipeline projects that caused functional conversion and permanent wetland impacts in the Upper Susquehanna – Tunkhannock Subbasin.

BEFORE

WHM completed a desktop analysis to determine geographically appropriate location sites. These sites were initially reviewed through a GIS desktop analysis outlining: aerial photography, LiDAR topographic contour data, floodplain boundaries, hydric soils, and tax parcel data. Landowners with suitable property to conduct mitigation activities were contacted and several landowners with favorable properties were approached throughout the site selection process. Ultimately, due to site suitability, landowner cooperation, and previous mitigation activities already occurring on portions of this property, a farm located in Nicholson Township, Wyoming County was selected as an appropriate site to conduct mitigation measures.

DURING

The design for the 6.78 acre wetland enhancement and 1.14 acre wetland creation consists of increasing and expanding functions of the adjacent existing wetland which is in a degraded state due to current and past agricultural use. The design will incorporate minor grading in the wetland creation area and a diverse planting plan to expand function and value of the adjacent existing mitigation areas.

The vegetative design of the site is intended to jump start or supplement naturally occurring succession (volunteer species) ensuing from the change in land use type as a result of installation of cattle exclusion fencing. The planting plan will consist of a clumped distribution of monocultural blocks of trees and shrubs within portions of the wetland system. A 0.15 acre forested riparian buffer will be installed along the spring fed channel which flows into an Unnamed Tributary to Tunkhannock Creek. The area will be planted with a forested riparian buffer to create a stable ecosystem adjacent to the water's edge, provide soil/water contact area to facilitate nutrient buffering processes, provide shade to moderate and stabilize water temperature encouraging the production of beneficial algal forms and to contribute necessary detritus and large woody debris to the stream ecosystem.

AFTER

The result of the project provides 7.72 acres of native wetland community and .15 acres of forested riparian buffer that fit naturally into the landscape. The site is self-sustaining with no financial assurances or long-term management needs due to the relative nature of the project, selection of an appropriate site for mitigation activities, and the past performance of WHM in fulfilling mitigation requirements. The deed restriction on the property provides long-term assurance that after performance standards are met, the mitigation area will be maintained in a natural state.

TAYLOR PROPERTY WETLAND MITIGATION SITE
TIOGA COUNTY, PENNSYLVANIA

Natural gas development is one of the fastest growing industries in our country and the new infrastructure necessary to keep production moving forward sometimes begets an unavoidable impact on our aquatic resources. WHM Solutions, Inc. (WHM) offers an all-encompassing remediation solution, handling every aspect of the mitigation process from design to landowner relations to permitting.

BEFORE

An undisclosed midstream company contracted WHM to develop compensation for a new natural gas pipeline project that resulted in significant temporary and converstion impacts to wetlands and channels crossed by the pipeline. WHM was responsible for the execution of the deed restriction on the property, for acquiring all necessary permits and dealing with regulatory agencies, and for the design, construction, and monitoring of the project.

DURING

WHM completed a desktop analysis within watersheds proposed to be impacted by the project. These sites were initially reviewed through a GIS desktop analysis outlining: aerial photography, LiDAR topographic contour data, floodplain boundaries, hydric soils, and tax parcel data. Landowners with suitable property to conduct mitigation activities were contacted and several landowners with favorable properties were approached throughout the site selection process. Ultimately, due to site suitability, landowner cooperation, and the degraded state of the waters onsite, a farm located in Liberty Township, Tioga County within the Little Elk Run watershed was chosen to accomplish compensatory mitigation for the proposed impacts.

AFTER

The design of the mitigation site consists of a wetland creation area and the installation of a forested riparian buffer. The mitigation area is a contiguous land feature that will lead to an overall benefit to functions and values in Little Elk Run and the Antes-Lycoming Creeks watershed. The work plan will establish a forested riparian buffer and additional wetland acreage adjacent to Little Elk Run to increase functions and values of the existing condition of the water resources which is in a degraded state due to the current land use as a cattle pasture, resulting in considerable nutrient inputs. The design will incorporate the removal of cattle from the areas proposed for mitigation. The vegetative design of the site will incorporate a diverse planting plan consisting of herbaceous seeding in the wetland creation area and a clumped distribution of tree and shrub plantings. Once the mitigation areas are established, increased nutrient and sediment sequestering will be provided within the areas resulting in an improvement of water quality and habitat enhancement.

The result of the project created 2,364 square feet, or 0.05 acres, of wetland by taking the area out of an active cattle pasture and reverting to functional forested wetland habitat. It has also provided 1.2 acres of forested riparian buffer along Little Elk Run. The site is self-sustaining with no financial assurances or long-term management needs due to the relative nature of the project, selection of an appropriate site for mitigation activities, and the past performance of WHM in fulfilling mitigation requirements. The deed restriction on the property provides long-term assurance that after performance standards are met, the mitigation area will be maintained in a natural state.

COMPANY TITLE:
Chief Operating Officer

Education

- *BS, Environmental Resource Management, The Pennsylvania State University, 1998*

Professional Training

- *First Aid/ CPR; Emergency Care & Safety Institute; May 2012*
- *"Applied Fluvial Geomorphology", Canaan Valley Institute, WV, 2000.*
- *"River Morphology and Applications" Wildland Hydrology, Pagosa Springs, CO, 2000.*
- *"Macroinvertebrate Monitoring for North Carolina Stream Restoration" Raleigh NC, 2001.*
- *"River Assessment and Monitoring", Wildland Hydrology, Pagosa Springs, CO, 2001*
- *"River Restoration and Natural Channel Design", Wildland Hydrology, Pagosa Springs CO, 2002*
- *"AutoCAD use for Stream Restoration and Monitoring", The North Carolina State University, University Park, PA, 2005*
- *"Overview of Wetland Delineation Protocols and the Interim Regional Supplement to the USACE Delineation Manual", State College, April 2011*
- *"Planning Hydrology for Constructed Wetlands", Wetland Training Institute, State College, PA November 2011*

Conferences and Seminars

- *The SGA Technical Conference on Environmental Permitting & Construction Hyatt Regency – Austin TX February 17-19, 2014*
- *Mid-Atlantic Stream Restoration Conference, Baltimore, MD 21530 , 2013*
- *Federal Energy Commission "Environmental Review and Compliance for Natural Gas Facilities Seminar" San Antonio, TX, 2013*
- *SGA FERC Environmental Permitting & Construction Compliance Workshop, Houston, TX, 2013*
- *SGA FERC Environmental Permitting & Construction Compliance Workshop, New Orleans, LA, 2012*
- *SGA FERC Environmental Permitting & Construction Compliance Workshop, San Antonio, TX, 2011*
- *Mid-Atlantic Stream Restoration Conference, Flinstone, MD 21530 , 2011*

D. Josh Lincoln

Mr. Lincoln has over 12 years of experience providing professional environmental and natural resource consulting services to private, industrial and institutional landowners; nonprofit organizations, and all levels of government. He has implemented eclectic blends of regulatory strategies and restoration practices to support land development, energy, transportation, mining, solid waste, and community infrastructure. Technical proficiencies include resource assessment, impact analysis, permitting and compliance, ground and surface water quality, ecosystem restoration design, environmental monitoring, watershed assessments, stream monitoring, stream design, wetland delineation, and construction management. Mr. Lincoln's diverse background in this field allows him to provide turnkey services for environmental resource projects.

As Chief Operating Officer at WHM Consulting, Inc., Mr. Lincoln coordinates and manages scientists, engineers, and environmental experts to oversee environmental projects from planning through construction.

PROFESSIONAL EXPERIENCE

WETLANDS PROJECTS

- Managed wetland investigation teams for large site development projects throughout the Mid-Atlantic.
- Permitting of development projects involving regulated water resources, e.g., landfill expansions, interstate road alignments, wind farms, and residential developments.
- Selection and design of wetland replacement sites.
- Manager of wetland replacement construction projects
- Operator of heavy equipment for the construction of wetland replacement projects.
- Manager of landfill wetland mitigation projects

STREAM RESTORATION

- Monitored stream bank erosion rates and calculated sediment loading curves for several watersheds in Pennsylvania, West Virginia, Maryland, New York and North Carolina.
- Developed regression relations for bankfull stream characteristics based on drainage area used for natural channel design.
- Selected and surveyed reference reach streams to develop natural channel design criteria based on bankfull stage channel dimensions.
- Designer of several miles of stream restoration projects using natural channel design methods in Pennsylvania, North Carolina, New York, Maryland, and West Virginia.
- Manager of several miles of stream restoration projects.
- Operator of heavy equipment to construct cross rock vanes and j-hooks vanes structures for stream restoration project.

WATERSHED MANAGEMENT

- Manager of several watershed assessments conducted throughout Pennsylvania. The projects included developing GIS data bases that inventoried assessment results.
- Developed watershed management plans for nonprofit watershed groups.
- Manager of wind farm permitting projects.
- Prepared grants for nonprofit watershed groups.

Kevin Clark, PWS

COMPANY TITLE:
Project Manager

EDUCATION

- *BA, Environmental Studies, The Pennsylvania State University, 2006*

CERTIFICATIONS

- *Professional Wetland Scientist PWS Seal #: 2285*

PROFESSIONAL TRAINING

- *Federal Energy Commission "Environmental Review and Compliance for Natural Gas Facilities Seminar" Orlando, Florida Feb. 26-28, 2013*
- *Planning Hydrology, Vegetation, and Soils for Constructed Wetlands – The Wetland Training Institute; State College, PA – Sept. 10-12, 2012*
- *Erosion & Sediment (E&S) Manual Training (Northampton Co.) by the PACD in conjunction PADEP August 20, 2012*
- *Williams Contractor Safety; May 2012*
- *First Aid/ CPR; Emergency Care & Safety Institute; May 2012*
- *Primary Headwater Habitat Assessment Training – West Woods Metro Park, Geauga County, Ohio May 23, 2012*
- *"Functional Assessment as the Basis for Mitigation of Wetland Impacts - Overview and Discussion", State College, PA – M.N. Gilbert Environmental April , 2011*
- *PaDEP—Technical Review of the revised Chapter 102 Regulations, Penn Tech Campus, Williamsport, PA – December, 2010*
- *"Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual": PAPSS, DCNR Bureau of Forestry, Laporte, PA - April, 2010*
- *Department of Environmental Protection "Regulatory Requirements Seminar for Marcellus Shale"; Harrisburg, PA - March , 2010*
- *Wetland Delineator Training, Institute for Wetland and Environmental Education and Research, Inc., Tiner and Veneman, Albany, New York – July, 2008.*
- *Plant ID: Wetlands and Their Borders, Institute for Wetland and Environmental Education and Research, Inc., Weldy, Albany, New York - July 2008.*
- *DEP Stormwater Best Management Practices Manual Training Session, State College, Pennsylvania - May 2007.*

Kevin Clark has over 7 years experience with wetland delineation and evaluation, permitting, mitigation design, and the preparation of environmental compliance documents in accordance with national (NEPA), state, and local criteria and guidelines. Mr. Clark is a Professional Wetland Scientist (PWS) certified by the Society of Wetland Scientists (SWS) that manages the design and construction of habitat and wetland restoration, enhancement and replacement projects for WHM. Additionally, Mr. Clark, specializes in the assessment and remediation of polluted mine drainage, primarily by passive treatment techniques. Mr. Clark regulary works with various watershed organizations, townships and municipalities, non-profit organizations, engineering firms, energy companies, and state and federal agencies. Mr. Clark also has been successful in acquiring state and federal grants for non-profit organizations to secure funding for water quality improvement projects.

PROFESSIONAL EXPERIENCE

ENVIRONMENTAL PERMITTING

- Completed local, state, and federal environmental permitting for various types of development and water quality improvement projects, which included detail studies/reports and thorough coordination with regulatory agencies;
- Completed and assisted with NPDES permit applications, Erosion and Sedimentation Control Plans, and Post-Construction Stormwater Management Plans;
- Produced detailed ArcGIS and AutoCAD maps of various projects.

WATER RESOURCE PROJECTS

- Completed and assisted with wetland and stream mitigation plans, including designs, in accordance with USACE's *Compensatory Losses of Aquatic Resources* guidance document;
- Construction oversight and monitoring of wetland construction project;
- Completed small to large scale delineations throughout the northeast in accordance with 1987 USACE Wetland Delineation Manual and applicable regional supplements.
- Completed numerous watershed assessments to determine point and non-point source pollution with a main focus on Abandoned Mine Lands (AML) and Abandoned Mine Drainage (AMD) impacted streams;
- Assisted with treatment system design and restoration plans for watersheds impacted by AMD;
- Conducted water quality analysis's including: macroinvertebrate sampling and identification and habitat assessment.
- Obtained numerous Growing Greener and Chesapeake Bay Small Watershed Grant awards for several non-profit organizations for AMD related issues.
- Utilized GPS units for high accurate field data collection and produce detailed mapping.
- Assisted with threatened and endangered species surveys through the Pennsylvania Natural Diversity Index (PNDI) program for various plant and animal species.

REQUIREMENT M

EROSION AND SEDIMENT CONTROL PLAN NARRATIVE AND DRAWINGS

Transcontinental Gas Pipe Line Company, LLC

Section 2-2 E&SC/SR Plan Narrative and Drawings

Leidy South Project – Hilltop Loop

September 2019

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4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

- 4.1 Resolutions to Soil Limitations
- 4.2 Geologic Formations

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

8.0 Thermal Impacts (NOI Checklist Item 3.m, 7.m)

9.0 Antidegradation Requirements (NOI Checklist Item 3.p, 7.o)

10.0 Riparian Buffers (NOI Checklist Item 3.o, 7.n)

11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

12.0 The Erosion and Sediment Control Plan Shall be Prepared by a Person Trained and Experienced in Erosion Control Methods and Techniques

Attachments

1 Project Location Maps

2 Soils Map and Report

3 E&SC and SR Plan BMP Design Worksheets and Calculations

Drawings (NOI Checklist Item 3.i, 7.i)

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1.0 Project Description (NOI Checklist Item 3.n)

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Hilltop Loop. The Hilltop Loop will take place in Chapman Township, Clinton County. The Hilltop Loop will consist of approximately 2.4 miles of 36-inch pipeline co-located with the existing Transco Leidy Lines in Clinton County, Pennsylvania. The Hilltop Loop will be offset from the existing Leidy Line A and Leidy Line C by 25 feet. Once placed into operation, Transco will refer to the Hilltop Loop as the Leidy Line D. Transco will be removing an existing Main Line Valve (MLV) at the eastern terminus of the Hilltop Loop that is no longer needed. Cathodic protection cable will be installed from approximate MP 188.05 to MP 185.37. The Hilltop Loop will include the construction of three offline temporary contractor yards and four temporary contractor staging areas along the right-of-way (ROW).

The Hilltop Loop is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

The E&SC and SR Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). Transco will use and implement the practices, measures and details outlined herein to control soil erosion and off-site sedimentation. All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Hilltop Loop will be approximately 86.6 acres. Subject to receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 3.a, 7.a)

A Project Location Map for the Hilltop Loop is included in Attachment 1. This map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Young Womans Creek and Renovo East, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 3.e, 7.e)

The following table (Table 1) list each watershed located Hilltop Loop Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters

Watershed Name	Designated Use	Existing Use	PFBC Classification
Young Womans Creek	HQ-CWF, MF	-	Naturally Reproducing Trout & Stocked Trout
Paddy Run	EV, MF	-	Naturally Reproducing Trout
Left Branch of Young Womans Creek	EV, MF	-	Naturally Reproducing Trout & Stocked Trout
Skunk Hollow	HQ-CWF, MF	-	Naturally Reproducing Trout
Post Hollow	EV, MF	-	Naturally Reproducing Trout
Dry Run	HQ-CWF, MF	-	Naturally Reproducing Trout

EV: Exceptional Value, MF: Migratory Fishes, WWF: Warm Water Fishes
HQ-CWF: High Quality- Cold Water fishes

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 11 soil mapping units located within the LOD, see Table 2 below:

Table 2 – Soils Mapping Units with Limits of Disturbance

Soil Mapping Unit	Soil Series
Bb	Barbour-Craigsville complex
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony
HkE	Hazleton channery sandy loam, 25 to 80 percent slopes, rubbly
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony
Lr	Linden silt loam, rarely flooded
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony
WgB	Wharton-Cookport complex, 0 to 8 percent slopes, very stony

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the Hilltop Loop and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Barbour	Bb	X	C	X		X	X	X				X	X				X
Clymer	CfB	X	C	X	X			X	X	X	X	X	X				X
Cookport	CpB, CpD	X	C/ S	X	X		X	X	X	X	X	X	X				X
Hazleton	HkE, HmD	X	C	X	X			X	X	X	X	X	X				
Laidig	LdC	X	C/ S	X	X		X	X	X	X	X	X	X				
Linden	Lr	X	C			X	X	X	X	X	X		X				
Wharton	WeB, WgB	X	C/ S		X		X	X	X	X	X	X	X	X			X

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.
3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.

4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc. to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Hilltop Loop does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Hilltop Loop lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the vicinity of the Hilltop Loop Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

The Hilltop Loop will be co-located with the existing Transco Leidy Lines in Clinton County, Pennsylvania. All work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. Along the edges of the ROW land use is primarily forested with some residences along Young Womans Creek. The proposed contractor yards and staging areas will be used temporarily and subsequently removed after the completion of the Project. Staging areas will be used for parking, equipment turn-arounds, and temporary storage of equipment. Transco will use contractor/pipe yards for parking, contractor offices, and the storage of construction equipment and pipes. These areas consist of agricultural fields, shrubland, forest land and area. All disturbed areas will be restored to the original contours. Transco will use and implement the practices, measures, and details to control soil erosion and off-site sedimentation during construction. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that the Hilltop Loop has been an existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years likely would have been either forested land or meadow.

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

Various erosion and sediment control measures will be used during the construction of the Hilltop Loop. BMPs proposed to be used at the Site to control soil erosion and sediment pollution are listed below. Details of BMPs proposed to be used at the Project location is included in the Erosion and Sedimentation Control Plan sheets. BMP's listed will be used at the Project location at the discretion of the environmental inspector, when found necessary to comply with 25 PA Code Chapter 102 and to adequately address potential erosion and sediment control issues.

Rock Construction Entrances

Rock construction entrances shall be installed whenever sediment tracking onto road surfaces is a potential or if required by the county conservation district or other agency. Soil erosion control measures shall be installed, if required and as needed. In special protection watersheds, either a 100' long rock construction entrance or a standard 50' rock construction

entrance with a wash rack will be used at the construction entrance to wash construction vehicle wheels before they enter the public roadway. The wash rack will discharge to a 24" compost filter sock (min.). Rock construction entrance thickness shall be constantly maintained to the specified dimensions by adding rock. All sediment deposited on roadways shall be removed and returned to the construction site immediately.

Compost Filter Sock

Compost filter sock shall be placed downslope of disturbed areas to serve as a sediment barrier and filter. Filter sock shall be placed at existing level grade, parallel to contours, with both ends of the sock extended up slope at a 45 degree angle. Socks can be used on both steep and rocky slopes. Socks can range in size from 12 inch to 32 inch diameter depending on the site conditions. The Maximum Permissible Slope Lengths Above Compost Filter Socks will be used to determine the sizes of compost filter.

Compost Filter Sock Sediment Trap

Runoff may be directed into the Compost Filter Sock Sediment Traps of sheet flow into the trap. Compost sock sediment traps shall not exceed three socks in height and shall be stacked in pyramidal form. Minimum trap height is one 24" diameter sock. Additional storage may be provided by means of an excavated sump 12" deep extending 1 to 3 feet upslope of the socks along the lower side of the trap. The maximum tributary drainage area is 5.0 acres. Since compost socks are "flow-through," no spillway is required. Installation of an excavated sump immediately above the socks may increase trap efficiency where soil conditions permit their construction.

Broad Based Dips

Broad-based dips may be used to direct runoff from access roads to well-vegetated areas. In HQ/EV watersheds, sump with compost filter sock should be utilized at the discharge end of the broad-based dip.

Waterbars

Waterbars will be aligned along the pipeline ROW to direct runoff towards the downslope side of the disturbed area and to avoid backflow into the ROW. Compost filter sock shall be installed along the edge of the limit of disturbance to slow run off. Compost filter sock hooks shall be installed at an upslope angle and shall discharge to a well-vegetated area. Upslope of the CFS, a sump shall be constructed to reduce velocity and provide a sheet flow condition to the

CFS. Permanent waterbars within the ROW shall be left in place after permanent stabilization has been achieved.

Compost Filter Sock Waterbar Discharge / Waterbar Sump

An 18" Compost Filter Sock shall be installed at the edge of the LOD where waterbar cross the LOD. Upslope of the CFS a 24" x 24" sump shall be constructed to reduce velocity and provide a sheet flow condition to the CFS. The sump shall be filled and stabilized when the CFS is removed after site stabilization.

Diversion Channels / Mountable Berms

Diversion channels or mountable berms shall be used to divert runoff from disturbed areas and convey it to appropriate BMPs such as a sedimentation basin sediment trap or clean water crossing.

Trench Plug

These will be placed at the banks of waterbodies in order to maintain stable working conditions and keep sediment from entering the waterways. Earth filled sacks will be used to secure the plug. The spacing of these structures varies based on the site and the slope of the dig location, as indicated in the plan drawings.

Erosion Control Blankets

A suitable erosion control blanket or soil stabilizer shall be used wherever earth disturbance occurs in close proximity (within 50 feet) of surface waters especially if site conditions make use of conventional E&S BMPs difficult. Erosion control blankets should be used on finished slopes greater than 3:1.

Timber Mats

Timber mats can be used for temporary wetland crossings. The timber mats are placed over the wetland to allow equipment to cross and then are removed.

Rock Bank Protection

This bank protection BMP is to be reinstalled along Young Womans Creek where the pipeline installation workspace will impact the existing rock bank protection feature.

Temporary Equipment Bridges

A temporary bridge equipment crossing will be built in order to cross any streams along the pipeline installation. The bridge equipment crossing will utilize geotextile material, timber

mats, and a timber or metal bridge with side rails any may include instream supports (where necessary). Culvert Equipment crossings may be used in areas where equipment must cross stream channels. Culverts shall be placed in the stream channel sized appropriately to convey the flow within the channel and shall be placed at least one-half their diameter apart. Coarse aggregate may be used for fill surrounding the culverts. Upon completion, all material placed in the stream channel shall be completely removed.

Flumed Crossing/ Dam and Pump Crossing / Cofferdam Crossing

These may be used when work is to be completed in a waterway. A flumed crossing involves the placement of a flume pipe within the waterway and using diversion structures up and down gradient to divert flow through the flume pipe and out of the work area. A dam and pump crossing involves placing sandbag barriers on the upstream and downstream sides of the work space to prevent water from entering the maintenance area. A cofferdam crossing involves sealing around the perimeter with sandbags or equivalent materials to prevent water entering the workspace. The cofferdam in completed in two phases from the right and left bank of the stream. A pump shall be placed to move any water from the upstream side, around the workspace and back to the downstream side of the work area. Trench plugs may be used on the banks of the stream to keep water from leaving the bed and banks limit of the waterway.

Pumped Water Filter Bag

Filter bags shall be placed in well-vegetated grassy areas and discharge onto stable, erosion resistant areas, and staked if the slope is greater than 5 percent. In the event that this is not possible, a geotextile path will be provided. A compost filter sock shall be placed below the filter bag when placed within 50 of streams or wetlands located within a HQ/EV watershed.

Trench Dewatering

Trench dewatering may be required, depending on the site conditions during the excavation. Water shall be pumped out and discharged into a filter bag or a dewatering structure when deemed necessary.

Safety Fence

Safety fence shall be installed to protect sensitive environmental features as depicted on the plan drawings. The fencing shall remain in place during all phases of construction.

Siltron Pollution Prevention Fence

Siltron Pollution Prevention Fence may be used throughout the project where environmental features make it necessary in lieu of Compost Filter Sock (CFS). The site specific sediment barriers will be selected by the environmental inspector on a site by site basis. These barriers will be placed at existing level grade, with both ends of the barrier extending at least 8' upslope at a 45 degree angle. Sediment must be removed when accumulations reach ½ the above ground height of the fence. The size and type of fence will be selected based on slope lengths as determined in the maximum slope length for Multi-Layer Geotextile Filter Fence figures. The 16-inch filter fence is equivalent to an 18-inch compost filter sock, the 21-inch filter fence is equivalent to a 24-inch compost filter sock, and a 28-inch filter fence is equivalent to a 32-inch compost filter sock. Approved for use as an Alternative E&S and PCSM BMP by PA DEP on 8/22/18.

Rock Filter Outlet

Rock filter outlets may be used to address areas where concentrated flows intersect sediment barriers. They may also be used in instances where sediment barriers such as silt fence or compost filter socks have failed due to concentrated flow.

Wetland Installation Procedures

During the course of pipeline maintenance and replacement within wetland areas, BMP's including slope breakers, equipment mats, sediment barriers, and trench plugs may be used to prevent altering the hydrology of the wetland and to prevent sediment from entering the wetland. Work within the wetland boundaries shall be limited to the extent possible. Upon completion of work the wetland area shall be restored to pre-construction grades and seeded with an appropriate wetland seed mixture.

Hydrostatic Dewatering Structure

A hydrostatic dewatering structure will be placed on a level, well vegetated site such that water will flow away from the structure and work areas. Flow rates through discharge and diverter pipes will be such that structures will not overflow. Contractor will properly remove and dispose of the dewatering structure immediately upon completion of dewatering operations.

Bored Road Crossing/Trenched Road Crossing

These may be used where pipeline installation or maintenance under a bored road is necessary. Sediment barriers shall be used around the work area. Culverts will be placed where required to maintain water flow for stormwater ditches.

Clean Water Crossings

Temporary diversion channels or mountable berms shall be used to divert runoff from undisturbed upslope areas and convey the runoff around areas of earth disturbance within the pipeline ROW corridor. From the diversion, the flow will outlet to a temporary pipe(s) crossing, which is installed across the right-of-way, and discharge to an outlet basin. Clean water leaving the outlet basin will return to sheet flow downslope of the disturbed ROW.

Revegetation Plan and Procedures

The construction site should be stabilized as soon as possible after completion. Establishment of final cover must be initiated no later than 7 days after reaching final grade. Temporary erosion and sedimentation control BMPs can be removed when the site meets final stabilization. Final stabilization means that all soil-disturbing activities are completed, and that either a permanent vegetative cover with a density of 70% or greater has been established or that the surface has been stabilized by hard cover such as pavement or buildings. It should be noted that the 70% requirement refers to the total area vegetated and not just a percent of the site.

Surface Roughening

Surface roughening is the practice of providing a rough 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.

Typical Topsoil Stockpile

The maximum stockpile height shall not exceed 35 feet. Stockpile slopes shall be no steeper than 2H:1V. Stockpiles shall be stabilized in accordance with temporary seeding specifications and mulch is to be maintained until the stockpile is stabilized. Stockpile location shown on the plans are illustrative and may vary in location as construction proceeds.

Typical Channel and Vegetation Restoration

The impacted riparian zone will be restored for a minimum of 15 feet landward of the top of bank. If the pre-impact riparian buffer of native herbaceous and shrub vegetation exceeds 15 feet beyond the top of bank, the area to be seeded should be as follows: 150 feet in High-Quality waters, 100 feet in other waters, or existing width of the riparian zone if it is less than the minimum requirements. Ernst Seed Mix 178 (Riparian Buffer Mix) or similar shall be applied on restored banks and riparian zones. In addition, where existing forested buffers are impacted these shall be replanted outside of the existing maintained ROW, as indicated in forest replanting plans for the Project outlined in the Chapter 105 permit.

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

8.0 Thermal Impacts (NOI Checklist Item 3.m, 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The pipeline installation activities will primarily take place within an existing cleared and maintained pipeline right-of-way. There will be no increase in stormwater discharge. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and Sequence of Construction outline disturbed areas being immediately revegetated. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

9.0 Antidegradation Requirements (NOI Checklist Item 3.p, 7.o)

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the eastern and western terminus of the Hilltop Loop. In order for the Project to meet the required purpose and need, siting the Hilltop Loop outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the Hilltop Loop because there are no viable non-discharge alternatives. The

Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

Pipeline installation activities along the pipeline ROW and at the contractor yards/staging areas will not result in increase in discharge of stormwater to surface waters. The existing / designated use of the streams within the Project area are to be protected through E&S and PCSM measures taken by Transco.

10.0 Riparian Buffers (NOI Checklist Item 3.o, 7.n)

Pipeline installation will take place primarily within an existing cleared and maintained pipeline ROW and forested areas. Due to the linear nature of the project, temporary impacts within riparian buffers are unavoidable. At locations where it was impossible to avoid riparian impacts, Transco will implement BMPs to minimize the impacts. After completing the construction activities, all areas will be restored back to pre-existing contours and reseeded with a riparian seed mix in areas where slopes are less than 10%. Tree and shrub plantings will also occur in forested riparian buffers outside of the maintained ROW as outlined in riparian reforestation plans outlined in the Chapter 105 permit.

Linear projects including pipelines are eligible for the Riparian Buffer Waiver under 25 PA Code §102.14(d)(2)(ii) if riparian buffers are undisturbed to the extent practicable. As such, a Riparian Buffer Waiver has been requested along with this ESCGP-3 application (Section 1-7).

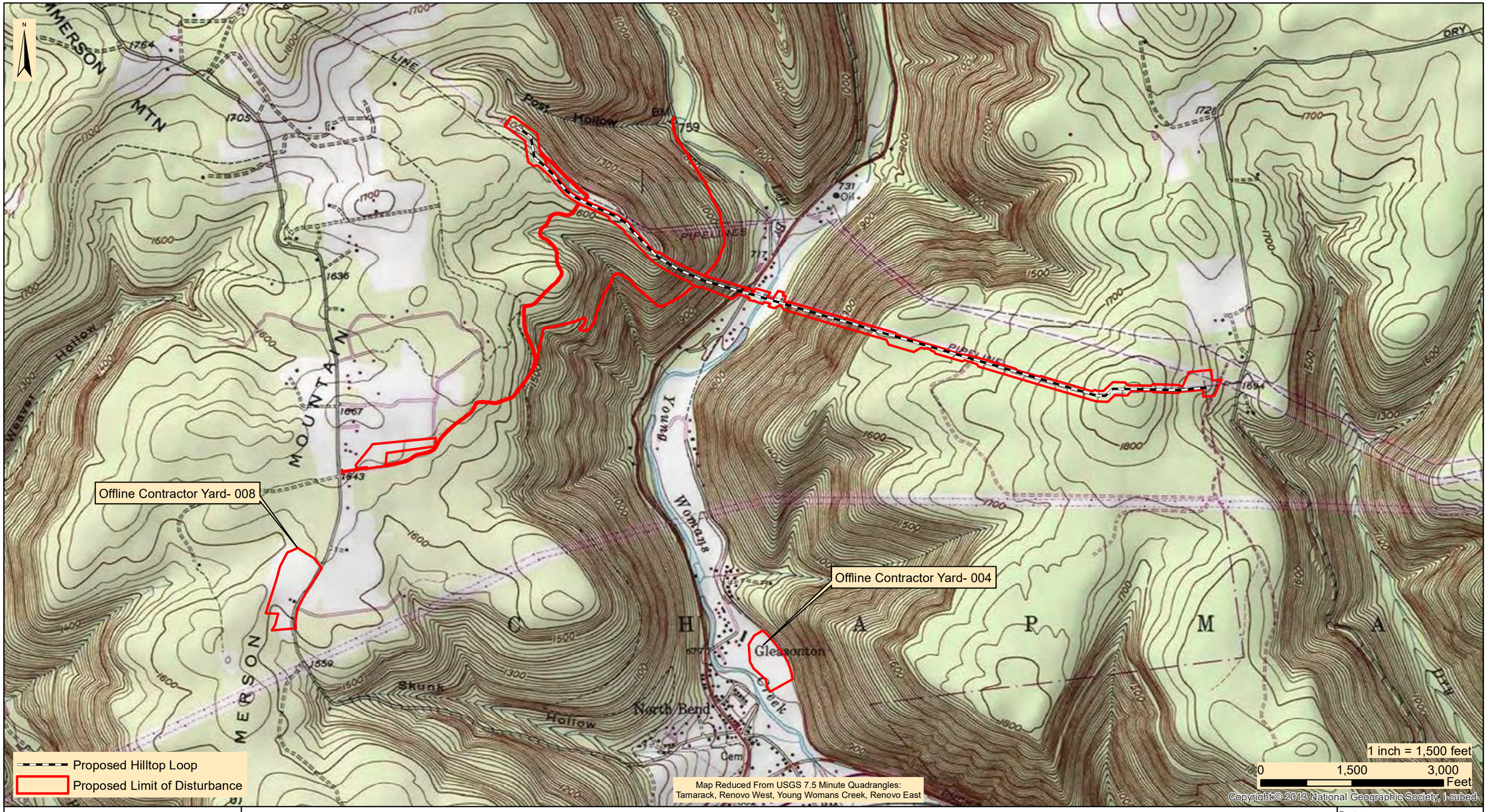
11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

Changes in Project site runoff are not anticipated as a result of the Project. The Project site is primarily an existing and maintained pipeline right-of-way in meadow condition with a forested fringe. The project site will be restored to meadow condition upon the completion of construction. Proposed BMPs were sized based on the maximum tributary drainage area anticipated during construction.

12.0 The Erosion and Sediment Control Plan Shall be Prepared By a Person Trained and Experienced in Erosion Control Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual, March 2012. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



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TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HILLTOP LOOP
PROJECT LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	8/21/2019
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	FTN
Figure Number:	2-1

ATTACHMENT 2
SOILS MAP AND REPORT

United States Department of Agriculture

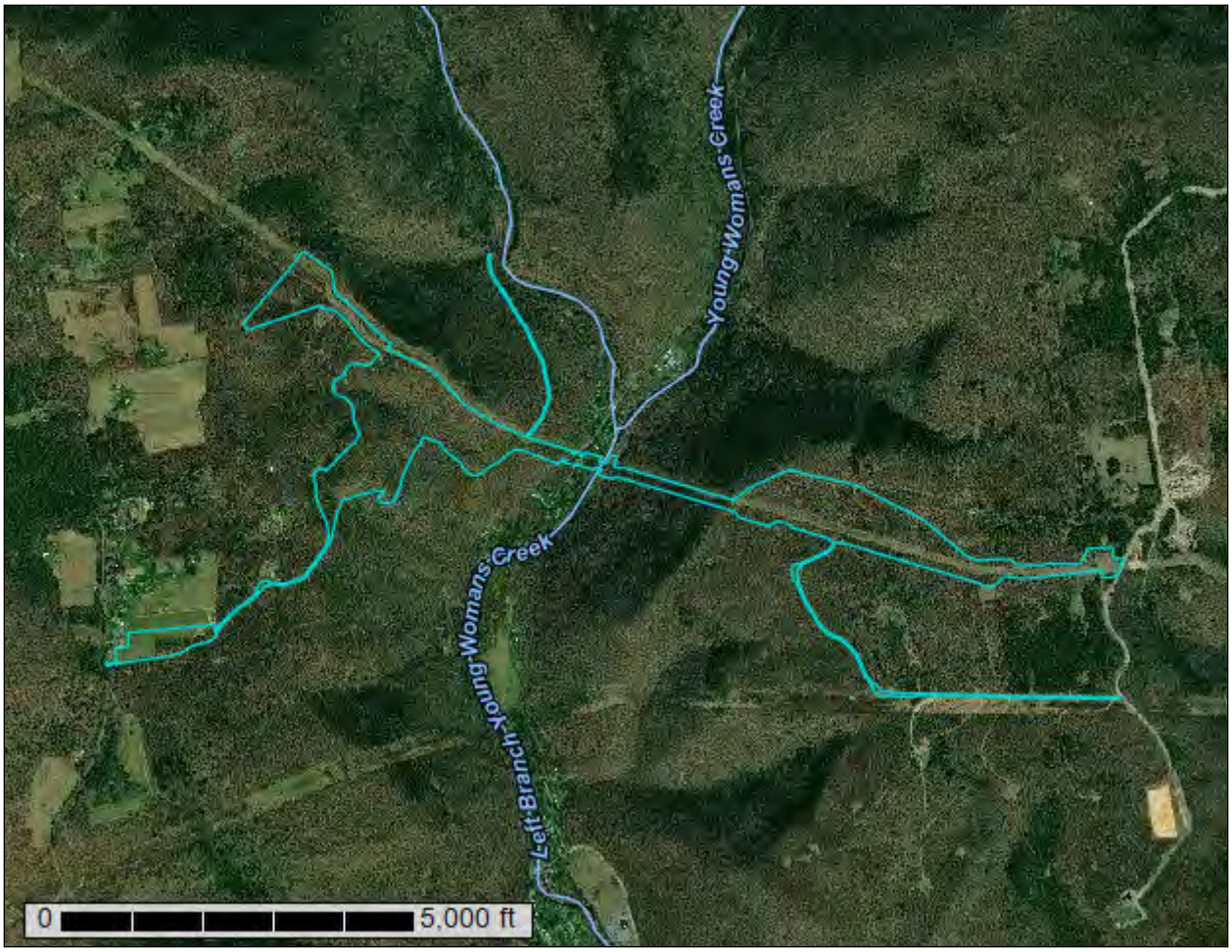
Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Clinton County, Pennsylvania

Hilltop Loop



June 21, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

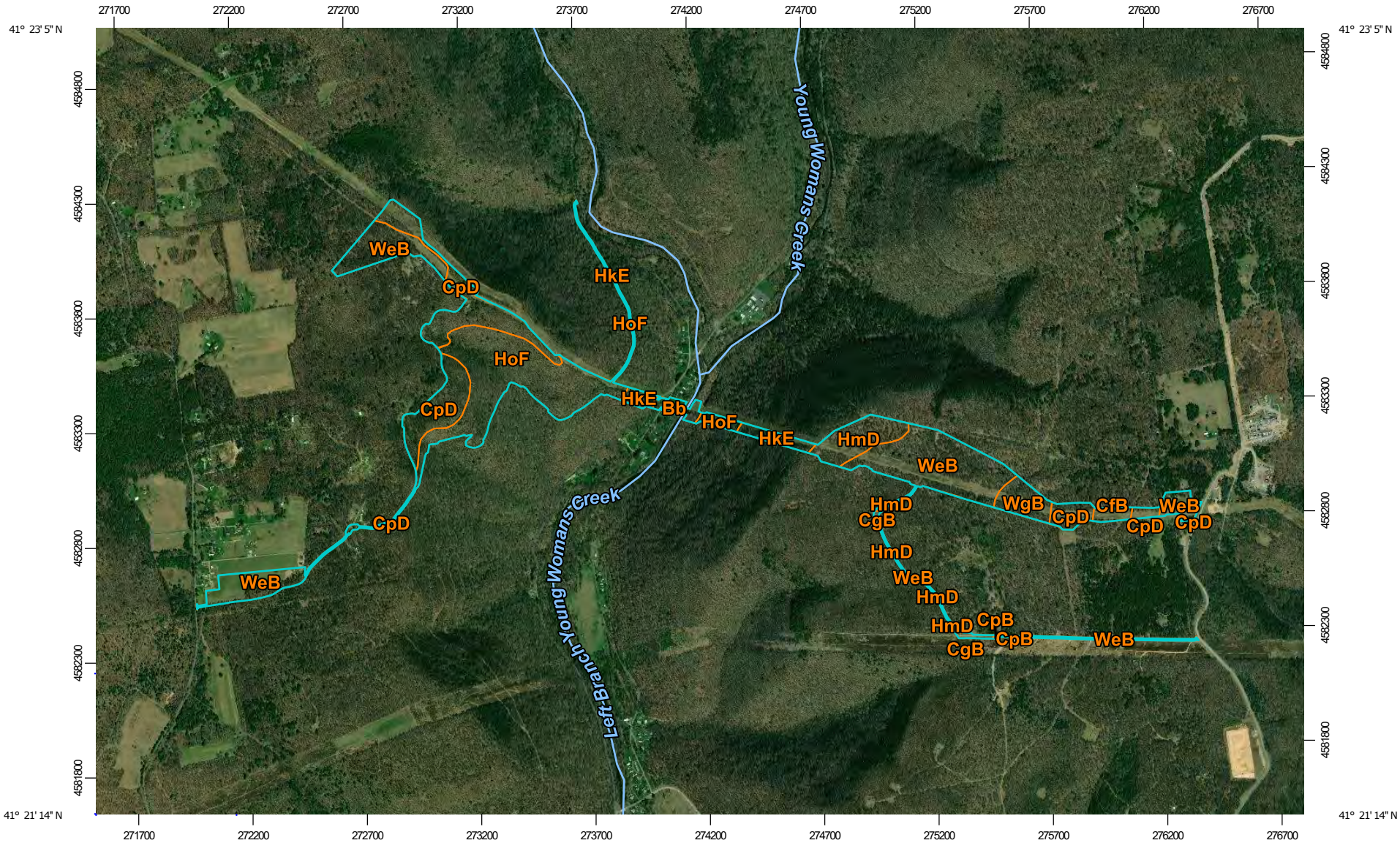
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:24,100 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 350 700 1400 2100

Feet: 0 1000 2000 4000 6000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clinton County, Pennsylvania
Survey Area Data: Version 14, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 4, 2012—Sep 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
Bb	Barbour-Craigsville complex	3.1	1.6%
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony	2.3	1.2%
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony	1.5	0.8%
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony	0.2	0.1%
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony	41.9	21.9%
HkE	Hazleton channery sandy loam, 25 to 80 percent slopes, rubbly	7.3	3.8%
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony	13.3	7.0%
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony	50.6	26.5%
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony	63.4	33.2%
WgB	Wharton-Cookport complex, 0 to 8 percent slopes, very stony	7.5	3.9%
Totals for Area of Interest		**191.2**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made

up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Pennsylvania

Bb—Barbour-Craigsville complex

Map Unit Setting

National map unit symbol: l7yn
Elevation: 400 to 3,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Barbour and similar soils: 35 percent
Craigsville and similar soils: 35 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Barbour

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Reddish coarse-loamy alluvium derived from sedimentary rock

Typical profile

Ap - 0 to 6 inches: fine sandy loam
Bw - 6 to 20 inches: fine sandy loam
C - 20 to 65 inches: very gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 36 to 72 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Craigsville

Setting

Landform: Flood plains
Down-slope shape: Linear

Across-slope shape: Linear
Parent material: Sandy and gravelly alluvium derived from sedimentary rock

Typical profile

A - 0 to 5 inches: gravelly loam
Bw - 5 to 32 inches: very gravelly loam
C - 32 to 65 inches: extremely gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (2.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Philo

Percent of map unit: 5 percent
Hydric soil rating: No

Atkins

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

Basher

Percent of map unit: 5 percent
Hydric soil rating: No

CfB—Clymer channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80f
Elevation: 1,000 to 4,000 feet
Mean annual precipitation: 32 to 60 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Hartleton

Percent of map unit: 5 percent
Landform: — error in exists on —
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

CgB—Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80g
Elevation: 1,000 to 2,500 feet
Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 101 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 40 percent
Cookport and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: channery loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A - 0 to 8 inches: channery loam

Bt - 8 to 22 inches: loam
Btx - 22 to 46 inches: loam
C - 46 to 54 inches: channery loam
R - 54 to 64 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Dekalb

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Buchanan

Percent of map unit: 5 percent

Hydric soil rating: No

CpB—Cookport channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshh
Elevation: 910 to 2,620 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

CpD—Cookport channery loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshq
Elevation: 610 to 2,450 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: Yes

Hazleton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

HkE—Hazleton channery sandy loam, 25 to 80 percent slopes, rubbly

Map Unit Setting

National map unit symbol: 2wkcj
Elevation: 520 to 2,310 feet
Mean annual precipitation: 37 to 50 inches
Mean annual air temperature: 50 to 56 degrees F
Frost-free period: 155 to 177 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Upper third of mountainflank, mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material

Oe - 2 to 3 inches: moderately decomposed plant material
A - 3 to 6 inches: channery sandy loam
E - 6 to 9 inches: channery sandy loam
Bs - 9 to 11 inches: channery sandy loam
Bw1 - 11 to 19 inches: channery sandy loam
Bw2 - 19 to 30 inches: very channery sandy loam
C - 30 to 60 inches: very channery sandy loam
R - 60 to 70 inches: bedrock

Properties and qualities

Slope: 25 to 80 percent
Percent of area covered with surface fragments: 32.0 percent
Depth to restrictive feature: 40 to 69 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.06 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Laidig

Percent of map unit: 10 percent
Landform: Mountain slopes
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Hydric soil rating: No

Clymer

Percent of map unit: 10 percent
Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

HmD—Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82t
Elevation: 800 to 4,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 50 percent
Clymer and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A

Hydric soil rating: No

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Laidig

Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Wharton

Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent

Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

HoF—Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82w
Elevation: 800 to 2,900 feet
Mean annual precipitation: 34 to 60 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 35 percent
Laidig and similar soils: 35 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained

Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Laidig

Setting
Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sandstone and shale

Typical profile
A - 0 to 3 inches: extremely stony loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities
Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clymer
Percent of map unit: 10 percent
Hydric soil rating: No

Hapludults, nonstony
Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 10 percent
Hydric soil rating: No

WeB—Wharton silt loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86l
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave, convex
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

WgB—Wharton-Cookport complex, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86m
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 50 percent
Cookport and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Concave, linear
Across-slope shape: Convex, linear, concave
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A1 - 0 to 8 inches: channery loam
Bt2 - 8 to 23 inches: channery loam
Btx3 - 23 to 40 inches: channery sandy clay loam
C4 - 40 to 46 inches: channery sandy loam
R - 46 to 50 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 10 percent
Hydric soil rating: No

Nolo

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

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ATTACHMENT 3

E&SC AND SR PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

TABLE OF CONTENTS

Attachment

3.1 Compost Filter Sock Worksheets (Standard E&S Worksheet #1)

3.2 Channel Design Worksheets (Standard E&S Worksheet #11)

3.3 Sediment Trap Worksheets (Standard E&S Worksheet #14 and #19)

ATTACHMENT 3.1
COMPOST FILTER SOCK WORKSHEETS

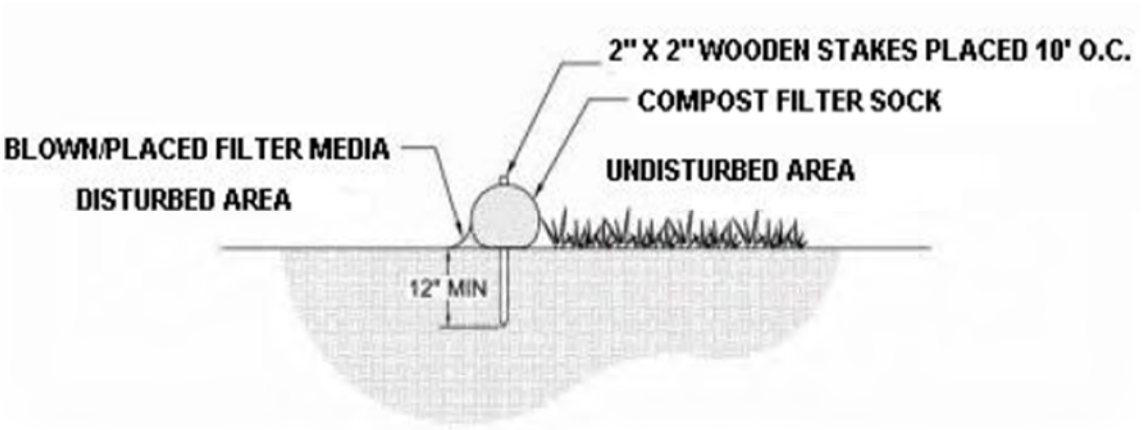
STANDARD E&S WORKSHEET #1
Compost Filter Socks

PROJECT NAME: Leidy South – Hilltop Loop

LOCATION: Hilltop Loop

PREPARED BY: FJ DATE: 7/11/2019

CHECKED BY: KCC DATE: 8/8/2019



SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 1	18	See map	4	341
CFS-HL 2	18	See map	4	341
CFS-HL 3	18	See map	4	341
CFS-HL 4	18	See map	13	130
CFS-HL 5	18	See map	13	130
CFS-HL 6	18	See map	13	130
CFS-HL 7	18	See map	13	130
CFS-HL 8	18	See map	13	130
CFS-HL 9	18	See map	6	252
CFS-HL 10	18	See map	6	252
CFS-HL 11	18	See map	6	252
CFS-HL 12	12	See map	7	111
CFS-HL 13	12	See map	7	111
CFS-HL 14	12	See map	7	111
CFS-HL 15	18	See map	12	136
CFS-HL 16	18	See map	9	215
CFS-HL 17	18	See map	9	215
CFS-HL 18	12	See map	6	161
CFS-HL 19	12	See map	6	161
CFS-HL 20	12	See map	6	142

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 21	12	See map	6	142
CFS-HL 22	12	See map	6	169
CFS-HL 23	12	See map	6	169
CFS-HL 24	12	See map	6	169
CFS-HL 25	12	See map	8	54
CFS-HL 26	12	See map	10	86
CFS-HL 27	12	See map	10	86
CFS-HL 28	12	See map	2	284
CFS-HL 28A	12	See map	2	284
CFS-HL 28B	12	See map	2	284
CFS-HL 29	12	See map	2	284
CFS-HL 30	12	See map	2	284
CFS-HL 31	12	See map	2	284
CFS-HL 32	12	See map	2	284
CFS-HL 33	12	See map	7	171
CFS-HL 34	12	See map	7	171
CFS-HL 35	12	See map	7	171
CFS-HL 36	12	See map	7	171
CFS-HL 37	12	See map	7	171
CFS-HL 38	12	See map	7	171
CFS-HL 39	12	See map	7	171
CFS-HL 40	12	See map	7	171
CFS-HL 41	12	See map	7	171
CFS-HL 42	12	See map	7	171
CFS-HL 43	12	See map	7	171
CFS-HL 44	12	See map	7	171
CFS-HL 45	12	See map	7	171
CFS-HL 46	12	See map	9	140
CFS-HL 47	12	See map	9	140
CFS-HL 48	12	See map	9	140
CFS-HL 49	12	See map	4	141
CFS-HL 50	12	See map	4	141
CFS-HL 51	12	See map	4	141
CFS-HL 52	12	See map	4	141
CFS-HL 53	12	See map	4	141
CFS-HL 54	12	See map	4	141
CFS-HL 55	12	See map	4	141
CFS-HL 56	12	See map	2	233

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 57	12	See map	2	233
CFS-HL 58	12	See map	2	233
CFS-HL 59	12	See map	2	233
CFS-HL 60	12	See map	2	233
CFS-HL 61	12	See map	2	233
CFS-HL 62	12	See map	2	233
CFS-HL 63	12	See map	2	233
CFS-HL 64	12	See map	2	233
CFS-HL 65	12	See map	16	100
CFS-HL 66	12	See map	16	100
CFS-HL 67	12	See map	16	100
CFS-HL 68	12	See map	16	100
CFS-HL 69	12	See map	16	100
CFS-HL 70	12	See map	16	100
CFS-HL 71	12	See map	16	100
CFS-HL 72	24	See map	60	60
CFS-HL 72A	24	See map	60	60
CFS-HL 73	24	See map	60	60
CFS-HL 74	24	See map	60	60
CFS-HL 75	24	See map	60	60
CFS-HL 76	24	See map	60	60
CFS-HL 77	24	See map	60	60
CFS-HL 78	24	See map	60	60
CFS-HL 79	24	See map	60	60
CFS-HL 80	24	See map	60	60
CFS-HL 81	24	See map	60	60
CFS-HL 82	24	See map	60	60
CFS-HL 83	24	See map	60	60
CFS-HL 84	24	See map	60	60
CFS-HL 85	24	See map	47	60
CFS-HL 86	24	See map	47	60
CFS-HL 87	24	See map	47	60
CFS-HL 88	24	See map	47	60
CFS-HL 89	24	See map	47	60
CFS-HL 90	18	See map	23	93
CFS-HL 91	18	See map	23	93
CFS-HL 92	18	See map	23	93
CFS-HL 93	18	See map	23	93

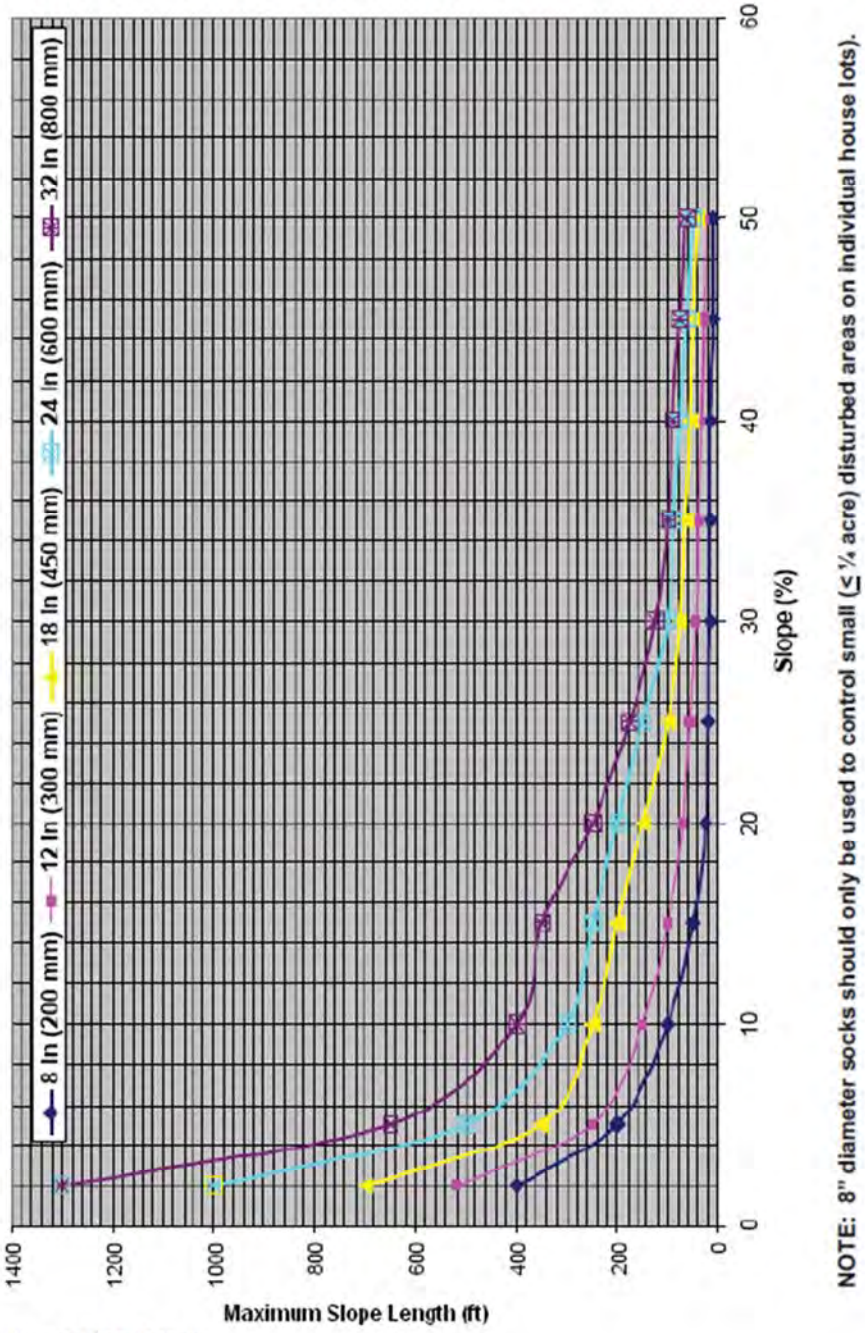
STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 94	18	See map	23	93
CFS-HL 95	18	See map	23	93
CFS-HL 96	18	See map	23	93
CFS-HL 97	18	See map	13	114
CFS-HL 98	18	See map	13	114
CFS-HL 99	18	See map	13	114
CFS-HL 100	18	See map	13	114
CFS-HL 101	18	See map	18	90
CFS-HL 102	18	See map	18	90
CFS-HL 103	18	See map	18	90
CFS-HL 104	18	See map	18	90
CFS-HL 105	18	See map	18	90
CFS-HL 106	18	See map	13	182
CFS-HL 107	12	See map	10	70
CFS-HL 108	12	See map	10	70
CFS-HL 109	12	See map	10	70
CFS-HL 110	12	See map	10	70
CFS-HL 111	12	See map	7	62
CFS-HL 112	12	See map	7	62
CFS-HL 113	12	See map	7	62
CFS-HL 114	12	See map	7	62
CFS-HL 115	12	See map	3	84
CFS-HL 116	12	See map	3	84
CFS-HL 117	12	See map	3	84
CFS-HL 118	18	See map	24	76
CFS-HL 119	18	See map	24	76
CFS-HL 120	18	See map	24	76
CFS-HL 121	18	See map	24	76
CFS-HL 122	18	See map	24	76
CFS-HL 123	18	See map	24	76
CFS-HL 124	18	See map	24	76
CFS-HL 125	18	See map	24	76
CFS-HL 126	18	See map	18	108
CFS-HL 127	18	See map	18	108
CFS-HL 128	18	See map	18	108
CFS-HL 129	18	See map	9	235
CFS-HL 130	18	See map	9	235
CFS-HL 131	18	See map	9	235

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HL 132	18	See map	9	235
CFS-HL 133	18	See map	9	235
CFS-HL 134	18	See map, CY#4	2	531
CFS-HL 135	18	See map, CY#4	2	531
CFS-HL 135A	18	See map, CY#4	2	531
CFS-HL 135B	18	See map, CY#4	2	531
CFS-HL 135C	18	See map, CY#4	2	531
CFS-HL 135D	18	See map, CY#4	2	531
CFS-HL 136	18	See map, CY#4	2	531
CFS-HL 137	18	See map, CY#4	2	531
CFS-HL 138	18	See map, CY#4	2	531
CFS-HL 139	24	See map, CY#5	3	641
CFS-HL 140	24	See map, CY#5	3	641
CFS-HL 141	24	See map, CY#5	3	641
CFS-HL 142	24	See map, CY#5	3	641
CFS-HL 143	32	See map, CY#8	5	650
CFS-HL 144	32	See map, CY#8	5	650
CFS-HL 145	32	See map, CY#8	5	650
CFS-HL 146	32	See map, CY#8	5	650
CFS-HL 147	32	See map, CY#8	5	650
CFS-HL 148	32	See map, CY#8	5	650
CFS-HL 149	32	See map, CY#8	5	650
CFS-HL 150	32	See map, CY#8	5	650
CFS-HL 151	32	See map, CY#8	5	650
CFS-HL 152	32	See map, CY#8	5	650
CFS-HL 153	32	See map, CY#8	5	650
CFS-HL 154	32	See map, CY#8	5	650

FIGURE 4.2
MAXIMUM PERMISSIBLE SLOPE LENGTH ABOVE COMPOST FILTER SOCKS



NOTE: 8" diameter socks should only be used to control small (≤ ¼ acre) disturbed areas on individual house lots).

Adapted from Filtrexx

ATTACHMENT 3.2
CHANNEL DESIGN WORKSHEETS

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Hilltop Loop Clean Water Crossing — Prepared by: FJ, 9/2019
LOCATION: Chapman Township, Clinton County, Pennsylvania — Checked by: KCC, 9/2019

CHANNEL OR CHANNEL SECTION		HL1	HL2	HL3-1	HL3-2	HL4
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	3.823	0.892	1.35	0.689	4.37
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	2.12	0.39	1.39	0.64	5.0
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.2	0.8	1.9	0.9	5.8
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.1	1.7	2.4	1.9	3.8
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.3	0.2	0.4	0.3	1.1
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.0	0.75	1.0	0.75	1.0
CHANNEL TOP WIDTH @ D	(FT)	6.0	5.0	6.0	5.0	6.0
d (CALCULATED FLOW DEPTH)	(FT)	0.50	0.20	0.30	0.20	0.50
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.0	2.8	3.2	2.8	4.0
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	4.0	10.0	6.67	10.0	4.0
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.5	0.48	0.78	0.48	1.5
R (HYDRAULIC RADIUS)		0.354	0.166	0.233	0.166	0.354
S (BED SLOPE)[3]	(FT/FT)	0.011	0.019	0.024	0.024	0.035
S_c (CRITICAL SLOPE)	(FT/FT)	0.028	0.035	0.032	0.035	0.028
$.7S_c$	(FT/FT)	0.0196	0.0245	0.0224	0.0245	0.0196
$1.3S_c$	(FT/FT)	0.0364	0.0455	0.0416	0.0455	0.0364
STABLE FLOW?	(Y/N)	Y	Y	N	Y	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	0.1	--	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.03	--	0.03	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South- Hilltop Loop CY005 Prepared by: FJ, 7/2019
LOCATION: Clinton County, PA Checked by: KCC: 8/2019

CHANNEL OR CHANNEL SECTION		HL-5-ECM	HL-5-ECM with grass
TEMPORARY OR PERMANENT?	(T OR P)	P	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	1.3	1.3
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	3.13	3.13
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.9	5.0
PROTECTIVE LINING[2]		SC250	SC250 with grass
n (MANNING'S COEFFICIENT)[2]		0.04	0.06
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.6	2.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	3.0	10.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6	0.9
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1.25
CHANNEL TOP WIDTH @ D	(FT)	6	7
d (CALCULATED FLOW DEPTH)	(FT)	0.5	0.7
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4	4.8
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	4	2.9
d_{50} STONE SIZE	(IN)	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.5	5.13
R (HYDRAULIC RADIUS)		0.354	0.464
S (BED SLOPE)[3]	(FT/FT)	0.02	0.02
S_c (CRITICAL SLOPE)	(FT/FT)	0.035	0.072
$.7S_c$	(FT/FT)	0.0245	0.0504
$1.3S_c$	(FT/FT)	0.0455	0.0936
STABLE FLOW?	(Y/N)	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.125	0.175
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South- Hilltop Loop CY008 Prepared by: FJ, 7/2019
LOCATION: Clinton County, PA Checked by: KCC: 8/2019

CHANNEL OR CHANNEL SECTION		HL-6-ECM	HL-6-ECM with grass
TEMPORARY OR PERMANENT?	(T OR P)	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	1.147	1.147
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	1.86	1.86
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.5	3.9
PROTECTIVE LINING[2]		SC250	SC250 with grass
n (MANNING'S COEFFICIENT)[2]		0.04	0.054
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.1	2.6
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	3.0	10.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.9	1.1
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1
CHANNEL TOP WIDTH @ D	(FT)	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.4	0.5
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.6	4.0
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5	4
d_{50} STONE SIZE	(IN)	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.12	1.5
R (HYDRAULIC RADIUS)		0.296	0.354
S (BED SLOPE)[3]	(FT/FT)	0.036	0.036
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.064
$.7S_c$	(FT/FT)	0.0258	0.0445
$1.3S_c$	(FT/FT)	0.0478	0.0826
STABLE FLOW?	(Y/N)	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.1	--
FREEBOARD BASED ON STABLE FLOW	(FT)	--	0.125
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HL-7-ECM	HL-7-ECM with grass
TEMPORARY OR PERMANENT?	(T OR P)	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr
ACRES	(AC)	3.713	3.713
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	4.48	4.48
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	5.2	5.7
PROTECTIVE LINING[2]		SC250	SC250 with grass
n (MANNING'S COEFFICIENT)[2]		0.04	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	9.5	15
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.6	5.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	3.0	10.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.9	1.9
CHANNEL BOTTOM WIDTH	(FT)	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2
D (TOTAL DEPTH)	(FT)	1	1
CHANNEL TOP WIDTH @ D	(FT)	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.4	0.4
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.6	3.6
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	5	5
d_{50} STONE SIZE	(IN)	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.12	1.12
R (HYDRAULIC RADIUS)		0.296	0.296
S (BED SLOPE)[3]	(FT/FT)	0.078	0.078
S_c (CRITICAL SLOPE)	(FT/FT)	0.037	0.037
$.7S_c$	(FT/FT)	0.0258	0.0258
$1.3S_c$	(FT/FT)	0.0478	0.0478
STABLE FLOW?	(Y/N)	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.1	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	--	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V

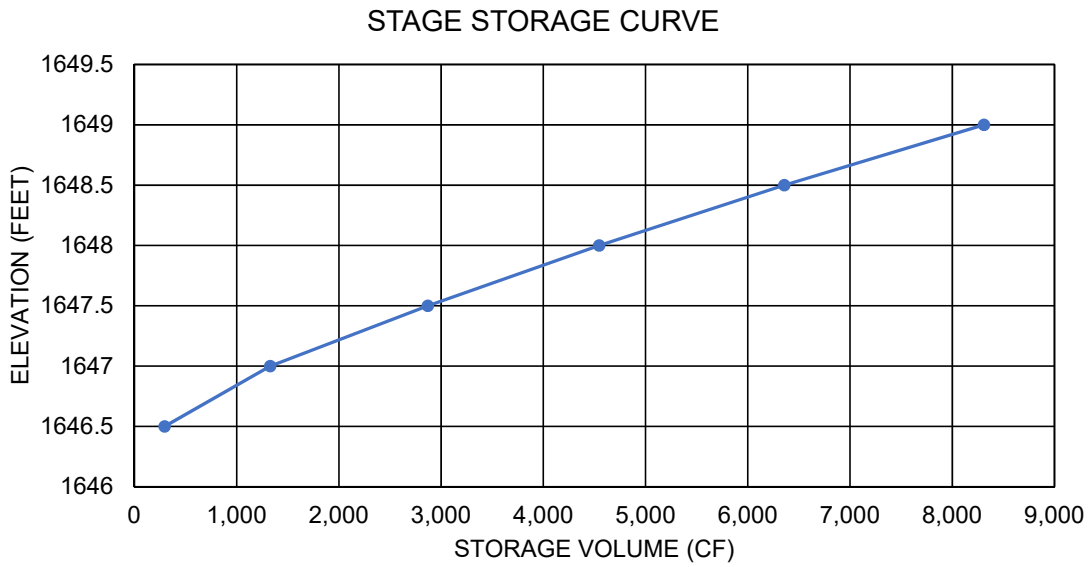
1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

ATTACHMENT 3.3
SEDIMENT TRAP WORKSHEETS

STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT NAME: Leidy South: Hilltop Loop
LOCATION: CY005-Sediment Trap #1
PREPARED BY: FJ DATE: 8/2019
CHECKED BY: KCC DATE: 8/2019

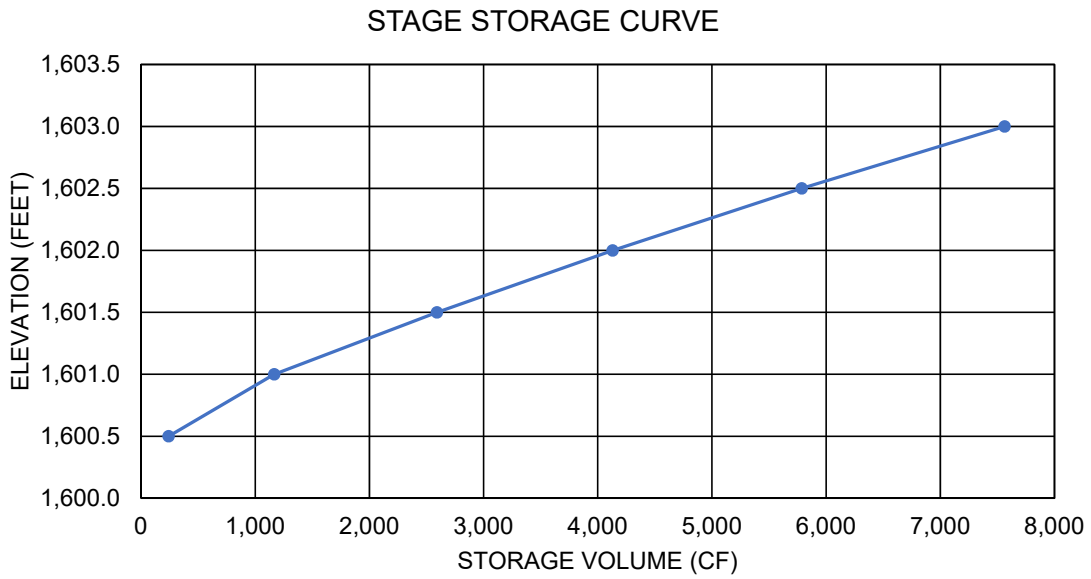
WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT)	AVERAGE (SQ.FT)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
1,644.0	0				0
		591	0.5	295.5	
1,644.5	1,182				296
		2,068	0.5	1,033.8	
1,645.0	2,953				1,329
		3,084	0.5	1,541.8	
1,645.5	3,214				2,871
		3,349	0.5	1,674.5	
1,646.0	3,484				4,546
		3,624	0.5	1,811.8	
1,646.5	3,763				6,357
		3,908	0.5	1,953.8	
1,647.0	4,052				8,311



STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT NAME: Leidy South: Hilltop Loop
LOCATION: CY008-Sediment Trap #2
PREPARED BY: FJ DATE: 8/2019
CHECKED BY: KCC DATE: 8/2019

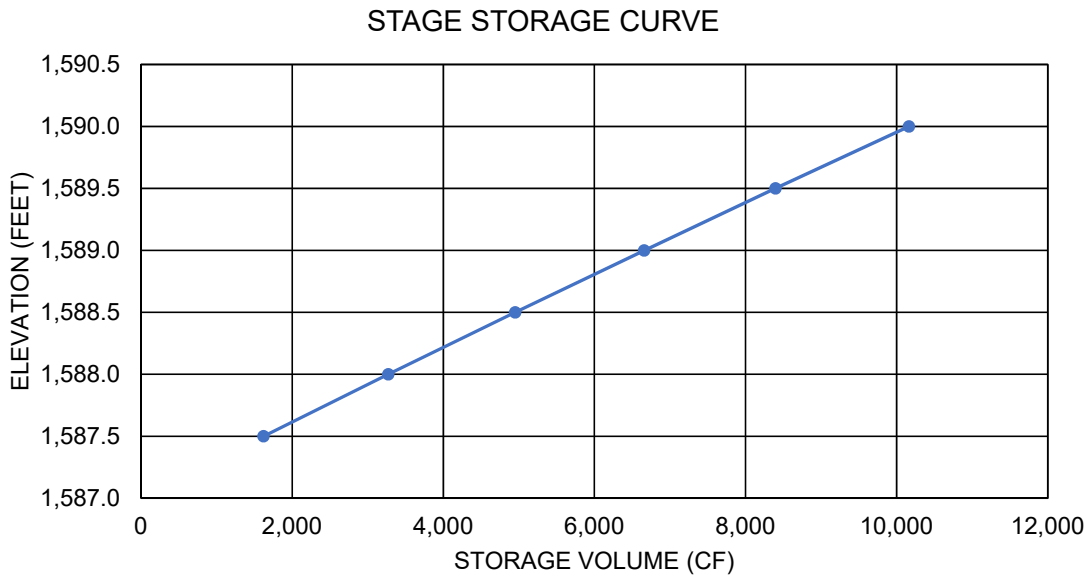
WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT)	AVERAGE (SQ.FT)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
1,599.0	0				0
		483	0.5	241.3	
1,599.5	965				241
		1,851	0.5	925.5	
1,600.0	2,737				1,167
		2,849	0.5	1,424.5	
1,600.5	2,961				2,591
		3,077	0.5	1,538.5	
1,601.0	3,193				4,130
		3,313	0.5	1,656.3	
1,601.5	3,432				5,786
		3,556	0.5	1,777.8	
1,602.0	3,679				7,564



STANDARD E&S WORKSHEET # 14
Sediment Basin/Sediment Trap Storage Data

PROJECT NAME: Leidy South: Hilltop Loop
LOCATION: CY008-Sediment Trap #3
PREPARED BY: FJ DATE: 8/2019
CHECKED BY: KCC DATE: 8/2019

WATER SURFACE ELEVATION (FEET)	AREA (SQ.FT)	AVERAGE (SQ.FT)	DIFFERENCE IN ELEVATION (FEET)	STORAGE VOLUME (CUBIC FEET)	
				INCREMENTAL	TOTAL
1,587.0	0				0
		596	0.5	298.0	
1,587.5	1,192				298
		2,515	0.5	1,257.3	
1,588.0	3,837				1,555
		3,975	0.5	1,987.3	
1,588.5	4,112				3,543
		4,253	0.5	2,126.5	
1,589.0	4,394				5,669
		4,539	0.5	2,269.3	
1,589.5	4,683				7,938
		4,831	0.5	2,415.5	
1,590.0	4,979				10,354



STANDARD E&S WORKSHEET # 19
Sediment Trap Design Data

PROJECT NAME: Leidy South-Hilltop Loop
LOCATION: Contractor Yard 005
PREPARED BY: FJ DATE: Aug 2019
CHECKED BY: KCC DATE: Aug 2019

TRAP NUMBER	#1
DRAINAGE AREA (5 ACRES MAX) (AC)	3.8
REQUIRED CAPACITY (2,000 CF/AC) (CF)	7,600
CAPACITY PROVIDED AT ELEVATION h (CF)	8,311
SOIL TYPES IN DRAINAGE AREA	WeB (silt loam)
REQUIRED SURFACE AREA (5,300 x AC)[1] (SQ. FT)	N/A
* AVERAGE BOTTOM LENGTH (FT)	
* AVERAGE BOTTOM WIDTH (FT)	
* AVERAGE TRAP LENGTH AT ELEVATION h (FT)	
* AVERAGE TRAP WIDTH AT ELEVATION h (FT)	
SURFACE AREA AT ELEVATION h (SQ FT)	4,052
BOTTOM ELEVATION (FT)	1644
CLEAN-OUT ELEVATION (@ 700 CF/AC)[2] (FT)	N/A
TOP OF EMBANKMENT ELEVATION[3] (FT)	N/A
EMBANKMENT HEIGHT (FT)	N/A
CREST OF SPILLWAY ELEVATION[4] (FT)	N/A
FLOW LENGTH AT ELEVATION h (FT)	N/A
FLOW LENGTH/WIDTH RATIO AT ELEV. h[5] (2:1 MIN)	N/A

1 If sandy clays, silty clays, silty clay loams, clay loams, or clays predominate soil types.
2 Minimum 12” above bottom of trap
3 Minimum 12” above elevation at which 1.5 cfs/acre discharge capacity is provided.
4 Minimum 24” above bottom of trap
5 4:1 Flow Length:Width ratio required for HQ and EV watersheds.

EMBANKMENT SPILLWAYS

OUTLET WIDTH (2 x # ACRES MIN.)[1] (FT)	
SPILLWAY HEIGHT h (FT)	
OUTLET SIDE SLOPES (2H:1V MAX.)	
SPILLWAY OUTSIDE SLOPE Z1 (2 MIN.)	
SPILLWAY INSIDE SLOPE Z2 (2 MIN.)	

1 6 x # Acres Min. if not discharging directly to a waterway

RISER PIPE SPILLWAYS

Dr (RISER DIAMETER, 8” MIN.) (IN)	
Db (BARREL DIAMETER, 6” MIN.) (IN)	
SPILLWAY CAPACITY WITH 12” FREEBOARD(CFS)	
BARREL OUTLET ELEVATION (FT)	
MAX WATER SURFACE ELEVATION (@ 1.5 CFS/AC. DISCHARGE) (FT)	

OUTLET BASIN

LENGTH (6 Db) (FT)	
WIDTH (3 Db) (FT)	
DEPTH (Db) (FT)	
RIPRAP PROTECTION (R-Size, R-3 min.)	

STANDARD E&S WORKSHEET # 19
Sediment Trap Design Data

PROJECT NAME: Leidy South-Hilltop Loop
LOCATION: Contractor Yard 008
PREPARED BY: FJ DATE: Aug 2019
CHECKED BY: KCC DATE: Aug 2019

TRAP NUMBER	#2	#3
DRAINAGE AREA (5 ACRES MAX) (AC)	3.25	4.75
REQUIRED CAPACITY (2,000 CF/AC) (CF)	6,500	9,500
CAPACITY PROVIDED AT ELEVATION h (CF)	7,564	10,354
SOIL TYPES IN DRAINAGE AREA	WeB, CpD (silt loam, loam)	CpB,,CpD (loam)
REQUIRED SURFACE AREA (5,300 x AC)[1] (SQ. FT)	N/A	N/A
* AVERAGE BOTTOM LENGTH (FT)		
* AVERAGE BOTTOM WIDTH (FT)		
* AVERAGE TRAP LENGTH AT ELEVATION h (FT)		
* AVERAGE TRAP WIDTH AT ELEVATION h (FT)		
SURFACE AREA AT ELEVATION h (SQ FT)	3,679	4,979
BOTTOM ELEVATION (FT)	1,599	1,587
CLEAN-OUT ELEVATION (@ 700 CF/AC)[2] (FT)	N/A	N/A
TOP OF EMBANKMENT ELEVATION[3] (FT)	N/A	N/A
EMBANKMENT HEIGHT (FT)	N/A	N/A
CREST OF SPILLWAY ELEVATION[4] (FT)	N/A	N/A
FLOW LENGTH AT ELEVATION h (FT)	N/A	N/A
FLOW LENGTH/WIDTH RATIO AT ELEV. h[5] (2:1 MIN)	N/A	N/A

1 If sandy clays, silty clays, silty clay loams, clay loams, or clays predominate soil types.
2 Minimum 12” above bottom of trap
3 Minimum 12” above elevation at which 1.5 cfs/acre discharge capacity is provided.
4 Minimum 24” above bottom of trap
5 4:1 Flow Length:Width ratio required for HQ and EV watersheds.

EMBANKMENT SPILLWAYS

OUTLET WIDTH (2 x # ACRES MIN.)[1] (FT)		
SPILLWAY HEIGHT h (FT)		
OUTLET SIDE SLOPES (2H:1V MAX.)		
SPILLWAY OUTSIDE SLOPE Z1 (2 MIN.)		
SPILLWAY INSIDE SLOPE Z2 (2 MIN.)		

1 6 x # Acres Min. if not discharging directly to a waterway

RISER PIPE SPILLWAYS

Dr (RISER DIAMETER, 8” MIN.) (IN)		
Db (BARREL DIAMETER, 6” MIN.) (IN)		
SPILLWAY CAPACITY WITH 12” FREEBOARD(CFS)		
BARREL OUTLET ELEVATION (FT)		
MAX WATER SURFACE ELEVATION (@ 1.5 CFS/AC. DISCHARGE) (FT)		

OUTLET BASIN

LENGTH (6 Db) (FT)		
WIDTH (3 Db) (FT)		
DEPTH (Db) (FT)		
RIPRAP PROTECTION (R-Size, R-3 min.)		

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

LEIDY SOUTH PROJECT
36" HILLTOP LOOP

CHAPMAN TOWNSHIP,
CLINTON COUNTY, PENNSYLVANIA

SEPTEMBER 2019

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
2800 POST OAK BLVD. LEVEL 11
HOUSTON, TX. 77056
PH: (713) 215-3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

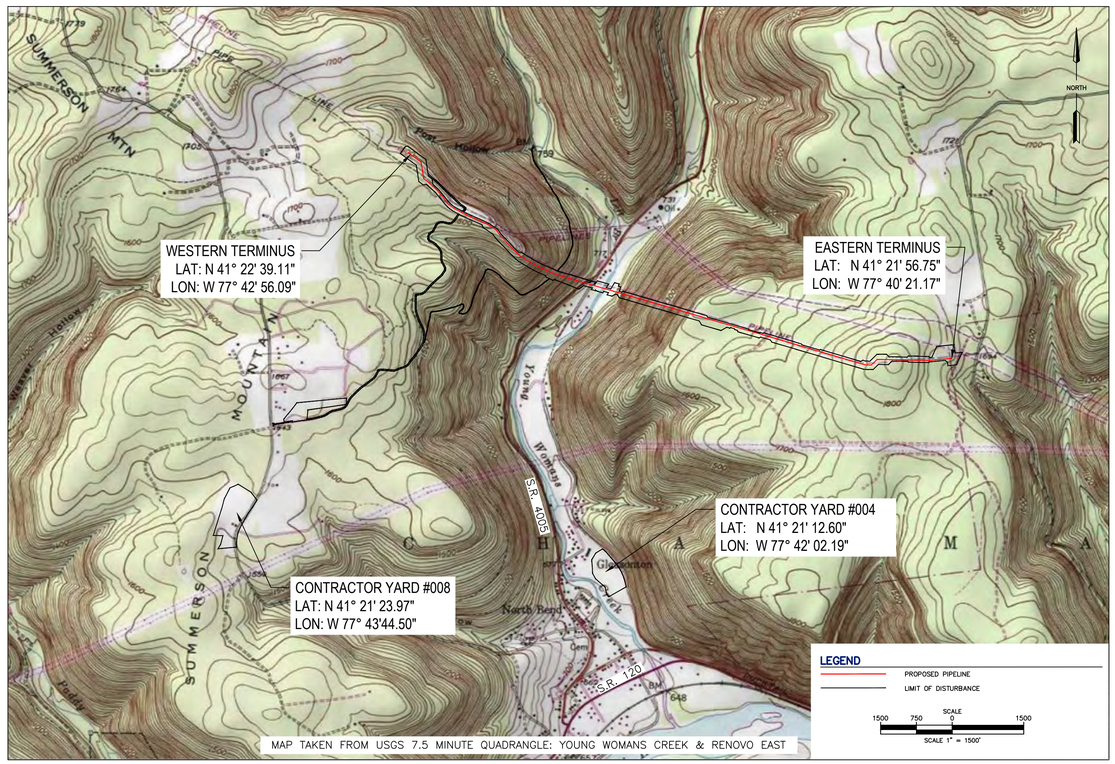
WHM CONSULTING, INC.
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
PH: (814) 689-1650
CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, INC
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
PH: (814) 238-2060
CONTACT: KEVIN C. CLARK, P.E.

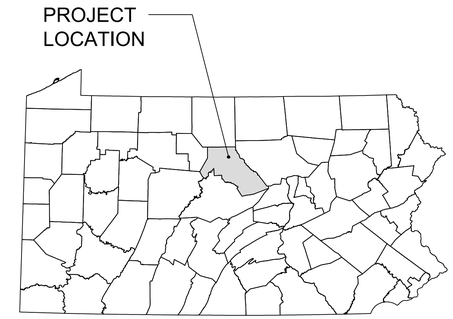
PROJECT INFORMATION

ESCGP-3 PERMIT BOUNDARY: 113.1 ACRES

LIMIT OF DISTURBANCE: 86.6 ACRES



LOCATION MAP



VICINITY MAP
N.T.S.

SHEET INDEX	
SHEET NUMBER	**DRAWING TITLE**
1 OF 22	EROSION & SEDIMENT CONTROL COVER SHEET
2 OF 22	EROSION & SEDIMENT CONTROL INDEX SHEET
3 - 9 OF 22	EROSION & SEDIMENT CONTROL SITE PLANS
10 - 12 OF 22	EROSION & SEDIMENT CONTROL NOTES
13 - 20 OF 22	EROSION & SEDIMENT CONTROL DETAILS
21 - 22 OF 22	GEOHAZARD MITIGATION DETAILS

RECEIVING WATERS			
NAME	**DESIGNATED USE**	**EXISTING USE**	**PFBC CLASSIFICATION**
YOUNG WOMANS CREEK	HQ-CWF, MF	-	NATURALLY REPRODUCING TROUT & STOCKED TROUT
PADDY RUN	EV, MF	-	NATURALLY REPRODUCING TROUT
LEFT BRANCH OF YOUNG WOMANS CREEK	EV, MF	-	NATURALLY REPRODUCING TROUT & STOCKED TROUT
SKUNK HOLLOW	HQ-CWF, MF	-	NATURALLY REPRODUCING TROUT
POST HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
DRY RUN	HQ-CWF	-	CLASS A WILD TROUT WILD TROUT

EV: EXCEPTIONAL VALUE, MF: MIGRATORY FISHES
HQ-CWF: HIGH QUALITY - COLD WATER FISHES

Call before you dig.
1-800-242-1776 or 811

PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

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KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

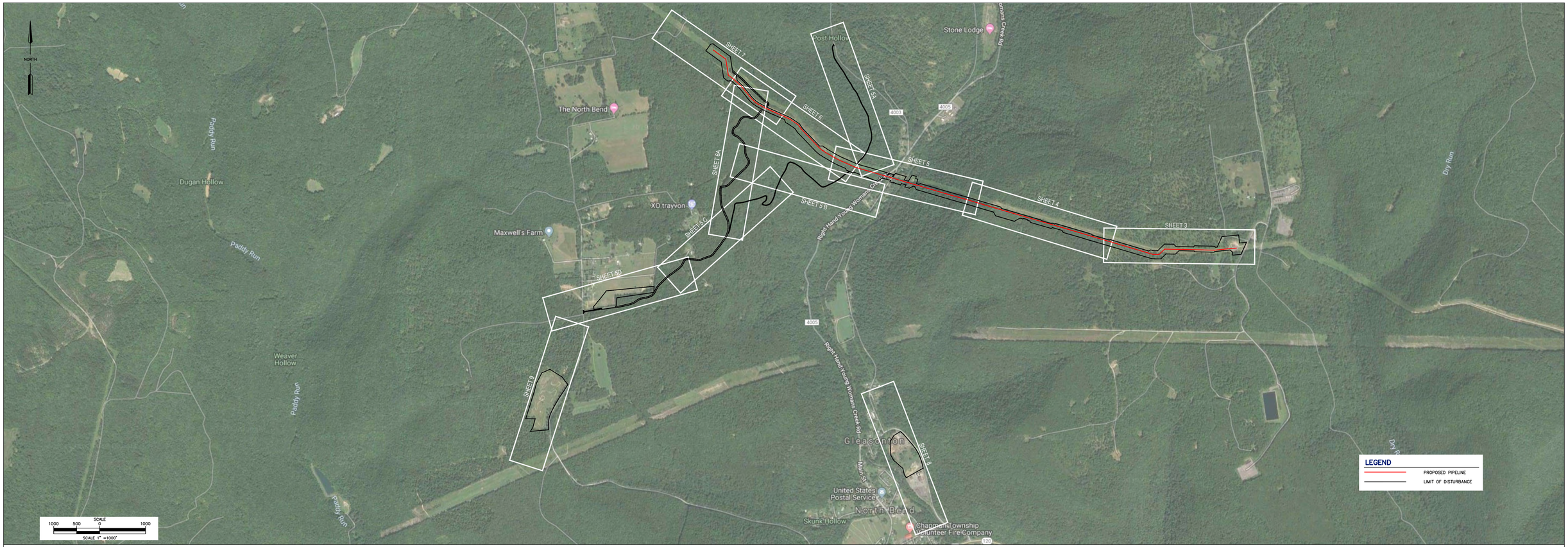
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

COVER SHEET

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 3/26/19	ISSUED FOR BID:	SCALE: 1" = 1500'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 1 OF 22



E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
CONSTRUCTION ENTRANCE	CE	13
TIMBER MATTING CONSTRUCTION	MAT.1	13
TIMBER MATTING WITH FILL OVER EXISTING PIPELINES	MAT.2	13
TIMBER MATTING AIR BRIDGE	MAT.3	13
BROAD-BASED DIP	BBD	13
BRIDGE EQUIPMENT CROSSING	BEC	14
CULVERT EQUIPMENT CROSSING	CEC	14
WETLAND EQUIPMENT CROSSING	WEC	14
PUMP WATER FILTER BAG	PWB	14
TRENCH DEWATERING	TD	14
TRENCH PLUG INSTALLATION	TP	14
SAFETY FENCE	SF	14
PERMANENT / TEMPORARY STONE ACCESS ROAD		14
WETLAND CROSSING CONFIGURATION	WCC	15
TYPE I "DRY WETLAND" INSTALLATION PROCEDURE	WCC.1	15
TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE	WCC.2	15
TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE	WCC.3	15
WATERBAR	WB	16
CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION	OS	16
BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS	BCC	16
TYPICAL SOIL STOCKPILE		16
SIDE SLOPE (TWO-TONE) CONSTRUCTION PROCEDURE	TTS	16
RIDGE TOP CONSTRUCTION PROCEDURE	RTC	16
COFFERDAM STREAM CROSSING	CD	17
FLUME STREAM CROSSING	FX	17
DAM AND PUMP STREAM CROSSING	DPX	17
HYDROSTATIC DEWATERING STRUCTURE	DS.2	17
EROSION CONTROL BLANKET	ECB	17
HYDRAULICALLY APPLIED BLANKETS		17
TOPSOIL SEGREGATION (1)	TS.1	18
TOPSOIL SEGREGATION (2)	TS.2	18
TOPSOIL SEGREGATION (3)	TS.3	18
SURFACE ROUGHENING	SR	18
TRENCHED ROAD CROSSING	TRC	18
ROCK BENCH PROTECTION		18
TYPICAL CHANNEL & VEGETATION RESTORATION - 1		18
TYPICAL CHANNEL & VEGETATION RESTORATION - 2		18
ROCK FILTER OUTLET	RFO	19
COMPOST FILTER SOCK	CFS	19
SILTRON POLLUTION PREVENTION FENCE	SPF	19

E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
CLEAN WATER CROSSING (TEMP. LEVEL SPREADER)	CWC-LS	20
CLEAN WATER CROSSING (RIP RAP OUTLET BASIN)	CWC-OB	20
DIVERSION CHANNEL	DC	20
COMPOST SOCK SEDIMENT TRAP	CST	20
GEOHAZARD MITIGATION DETAILS & SCHEDULE		21
GEOHAZARD MITIGATION DETAILS & SCHEDULE		22

(XXX) INDICATES SOIL EROSION CONTROL MEASURE DETAIL

GENERAL SITE NOTES

1. THE STAGING OF EARTHMOVING ACTIVITIES FOR THIS PROJECT IS A GENERAL DESCRIPTION OF THE WORK REQUIRED. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH PROJECT OWNER STANDARDS, THE PADEP REGULATIONS, AND ALL OTHER APPLICABLE FEDERAL, STATE, OR LOCAL REQUIREMENTS.
2. PIPELINE CONSTRUCTION IS ACCOMPLISHED THROUGH A SET OF SEQUENTIAL OPERATIONS: SURVEYING; INSTALLATION OF BMPS; CLEARING AND GRUBBING; GRADING; TRENCHING; PIPE STRINGING, ASSEMBLY AND WELDING; LOWERING-IN; TRENCH BACKFILL; HYDROSTATIC TESTING AND FINAL TIE-IN; FINAL GRADING; AND PERMANENT STABILIZATION. THE CONSTRUCTION SPREAD SHALL PROCEED ALONG THE PIPELINE ROW TO COMPLETE THESE ACTIVITIES AS ONE CONTINUOUS OPERATION IN ORDER TO MINIMIZE THE DURATION OF EARTH DISTURBANCE.
3. SCHEDULE WORK TO BE PERFORMED IN A MANNER THAT MINIMIZES THE LENGTH OF TIME THAT BARE SOIL WILL BE EXPOSED TO THE ELEMENTS.
4. THE AMOUNT AND DURATION OF OPEN TRENCH SHALL BE MINIMIZED DURING THE PROJECT.
5. CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SOIL EROSION AND SEDIMENT CONTROL NARRATIVE AND ENVIRONMENTAL CONSTRUCTION PLAN AND MINIMIZE THE TOTAL AREA OF DISTURBANCE, WHEN PRACTICAL.
6. DISCHARGING SEDIMENT LADEN WATER WHICH WILL CAUSE OR CONTRIBUTE TO THE DEGRADATION OF A BENEFICIAL USE OF A WATER OF THE STATE FROM THE CONSTRUCTION SITE, A DEWATERING SITE, OR SEDIMENT BASIN/TRAP INTO ANY WATER BODY OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.
7. DISCHARGES ORIGINATING FROM OFF-SITE SOURCES, WHICH FLOW THROUGH OR ACROSS THE AREAS DISTURBED BY CONSTRUCTION, SHALL BE DIVERTED AROUND THE ACTIVE CONSTRUCTION AREA WHENEVER POSSIBLE.
8. ALL EXCAVATED MATERIALS THAT WILL NOT BE USED ON THE SITE CANNOT BE STORED IN THE FLOODPLAIN AND MUST BE HAULED TO A DISPOSAL SITE LOCATED OUTSIDE OF THE FLOODPLAIN.
9. NO EROSION CONTROL BLANKET SHALL BE INSTALLED IN AGRICULTURAL AREAS EXCEPT AS REQUIRED TO CONSTRUCT THE TEMPORARY FLUME CROSSINGS.
10. HYDRAULICALLY APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF EROSION CONTROL BLANKETS WITH PRIOR APPROVAL FROM THE LOCAL COUNTY CONSERVATION DISTRICT.
11. LOCATION AND SPACING OF THE WATERBARS ARE SHOWN ON THE PLAN. WATERBARS MAY BE ADJUSTED IN THE FIELD DUE TO ACTUAL SITE CONDITIONS. HOWEVER, INSTALLATION AND SPACING MUST CONFORM TO THE DETAILS PROVIDED AND APPROVAL MUST BE OBTAINED FROM THE LOCAL COUNTY CONSERVATION DISTRICT OR PA DEP.
12. THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN, INCLUDING THE SOIL EROSION CONTROL DRAWINGS AND NARRATIVE, SHALL BE AVAILABLE ON SITE AT ALL TIMES DURING EARTH DISTURBANCE.

EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

PROJECT DESCRIPTION

THE HILLTOP LOOP WILL CONSIST OF APPROXIMATELY 2.4 MILES OF 36-INCH PIPELINE CO-LOCATED WITH THE EXISTING TRANSCO LEIDY LINES BETWEEN APPROXIMATE MILE POSTS (MPS) 183.55 AND 186.01 IN CLINTON COUNTY, PENNSYLVANIA. THE HILLTOP LOOP WILL BE OFFSET FROM THE EXISTING LEIDY LINE A AND LEIDY LINE C BY 25 FEET. ONCE PLACED INTO OPERATION, TRANSCO WILL REFER TO THE HILLTOP LOOP AS THE LEIDY LINE D. TRANSCO WILL BE REMOVING A MAIN LINE VALVE AT THE EASTERN TERMINUS OF THE HILLTOP LOOP THAT IS NO LONGER NEEDED. CATHODIC PROTECTION CABLE WILL BE INSTALLED FROM APPROXIMATE MP 188.05 TO MP 185.37. THE CATHODIC PROTECTION CABLE WILL BE INSTALLED IN THE SAME TRENCH AS THE PIPELINE WITHIN WETLAND, STREAM AND FLOODWAY CROSSINGS. THREE OFFLINE CONTRACTOR YARDS ARE ALSO PROPOSED AS PART OF THIS PROJECT.

THE EROSION AND SEDIMENTATION CONTROL PLAN (ENVIRONMENTAL PLAN OR PLANS) HAS BEEN DEVELOPED FOR THE PROJECT, AS DEPICTED ON THE DRAWINGS. THE E&S PLAN SHALL BE PLANNED, DESIGNED, AND IMPLEMENTED TO BE CONSISTENT WITH THE POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN UNDER 25 PA. CODE § 102.8 (RELATING TO PCSM REQUIREMENTS). TRANSCO WILL USE AND IMPLEMENT THE PRACTICES, MEASURES AND DETAILS OUTLINED HEREIN TO CONTROL SOIL EROSION AND OFF-SITE SEDIMENTATION. ALL WORK AND DISTURBED AREAS ARE LOCATED WITHIN TRANSCO PROPERTY, EXISTING EASEMENTS OR LEGALLY OBTAINED WORKSPACE. THE LIMIT OF DISTURBANCE WILL BE 86.6 ACRES. CONSTRUCTION IS SCHEDULED TO BEGIN IN 2021. THE PROJECT WILL TAKE PLACE WITHIN AN EXISTING AND MAINTAINED PIPELINE ROW.

CONTRACTOR NOTES

1. ALL EXISTING UTILITY DATA IS PROVIDED FOR INFORMATIONAL USE ONLY. ALTHOUGH THE DATA IS SHOWN AS ACCURATELY AS POSSIBLE, THE CONTRACTOR IS CAUTIONED THAT THE OWNER AND THE ENGINEER NEITHER ASSUME NOR IMPLY ANY RESPONSIBILITY FOR THE ACCURACY OF THIS DATA.
2. THE CONTRACTOR IS TO VERIFY LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. ALL CONTRACTORS/SUBCONTRACTORS PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE THEMSELVES WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM THEIR OPERATIONS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTORS AT THEIR EXPENSE AND SHALL BE APPROVED BY THE OWNER/REP. SAID EXISTING IMPROVEMENTS INCLUDE BUT ARE NOT LIMITED TO BERMS, DITCHES, FENCES, AND PLANTS.
4. CONTRACTORS MUST CONFINE THEIR ACTIVITIES TO THE WORK AREA. NO ENCROACHMENTS ONTO DEVELOPED AREAS WILL BE ALLOWED. ANY DAMAGE RESULTING THEREFROM SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR.
5. IT WILL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND PRIVATE UTILITIES THROUGHOUT THE CONSTRUCTION OF THIS PROJECT. CONTRACTORS SHALL CONTACT THE APPROPRIATE UTILITY COMPANIES FOR LINE LOCATES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL ASSUME FULL UABILITY FOR ANY DAMAGES CAUSED TO THOSE COMPANIES' FACILITIES.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRENCH SAFETY REQUIREMENTS IN ACCORDANCE WITH STANDARD WILLIAMS' TRENCH SAFETY GUIDELINES.
7. CONTRACTOR MAY ELECT TO USE DIVERSION CHANNEL OR IF CONDITIONS ALLOW WILL PLACE AN EARTHEN BERM OF APPROXIMATE SIZE THAT WILL CONVEY FLOW TO THE RESPECTIVE DESIGNATED CLEAN WATER CROSSING.

SCALE
1000 500 0 1000
SCALE 1" =1000'

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KEVIN C. CLARK, P.E.

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REGISTERED PROFESSIONAL ENGINEER
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047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

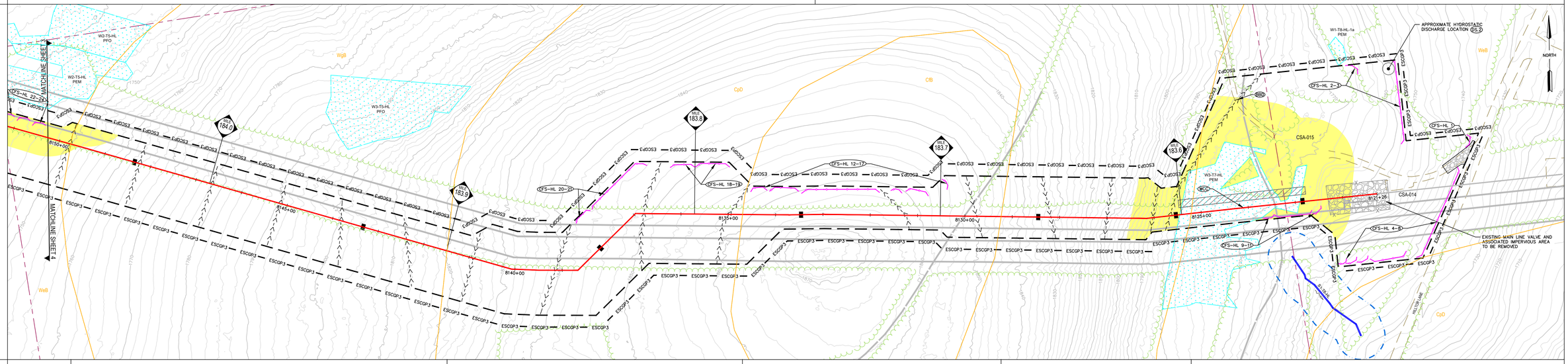
INDEX SHEET

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 3/25/19	ISSUED FOR BID:	SCALE: 1" = 1000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 2 OF 22
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	PA ROD AND GUN CLUB HL-PA-CL-0003		DEPARTMENT OF ENVIRONMENTAL RESOURCES HL-PA-CL-0001
PROFILE (MIN. PIPE DEPTH)	3'		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	WETLAND	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)	DRY RUN (HQ-CWF, MF)	

ALIGNMENT



SOIL TYPE	WeB	WgB	CpD	CfB	CpD	WeB
AVERAGE % SLOPE	6%	8%	5%	2%	6%	12%	20%	6%	16%	8%	16%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES
WgB	WHARTON-COOKPORT COMPLEX, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

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042214-E

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
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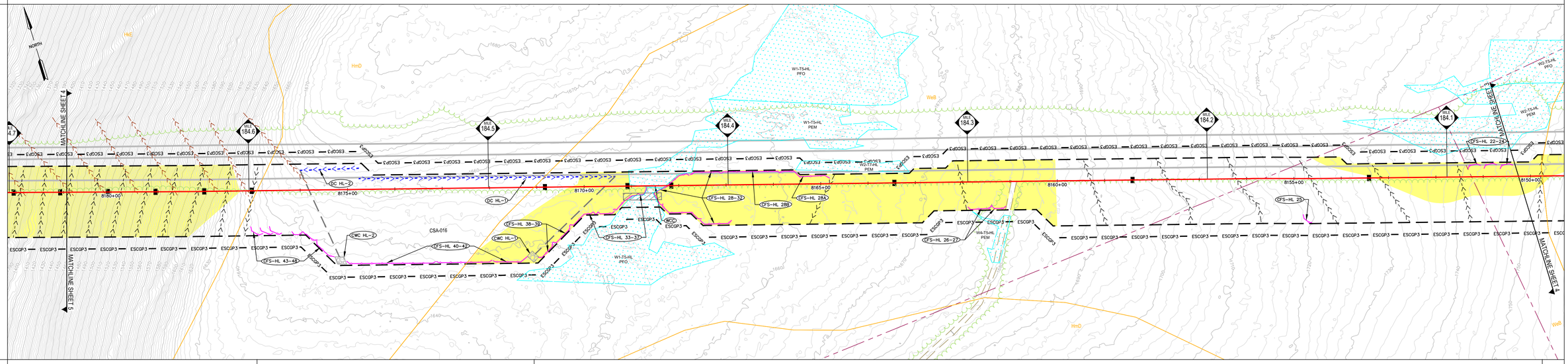
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 6/19/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 3
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

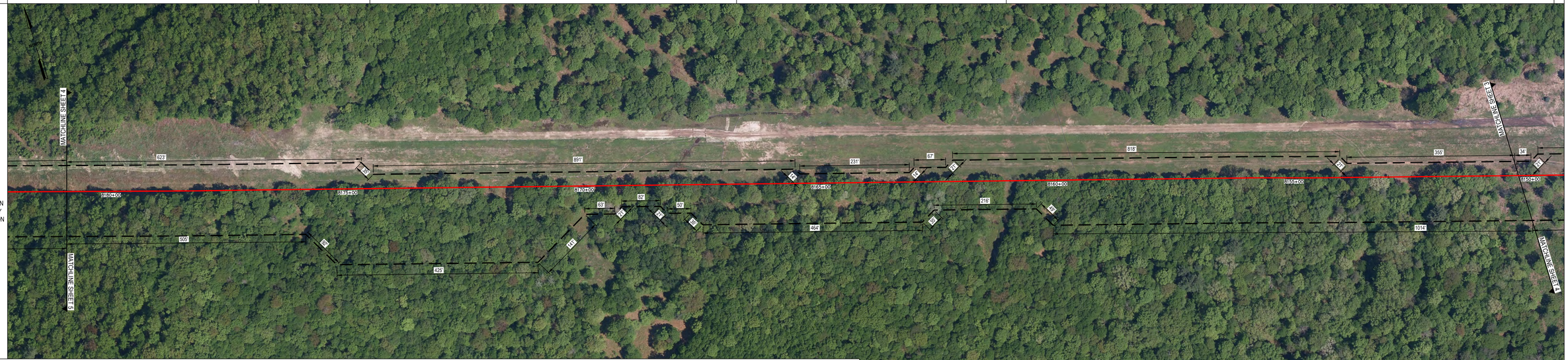
OWNERSHIP & TRACT NUMBER	ESTATE OF ROBERT J. GLEICHERT HL-PA-CL-0004	MICHAEL R. LONG HL-PA-CL-0002	PA ROD AND GUN CLUB HL-PA-CL-0003
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	WETLAND	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)		

ALIGNMENT



SOIL TYPE	HkE	HmD	WeB	WgB
AVERAGE % SLOPE	55%	5%	<2%	4%	7%	8%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
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- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES
WgB	WHARTON-COOKPORT COMPLEX, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

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LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

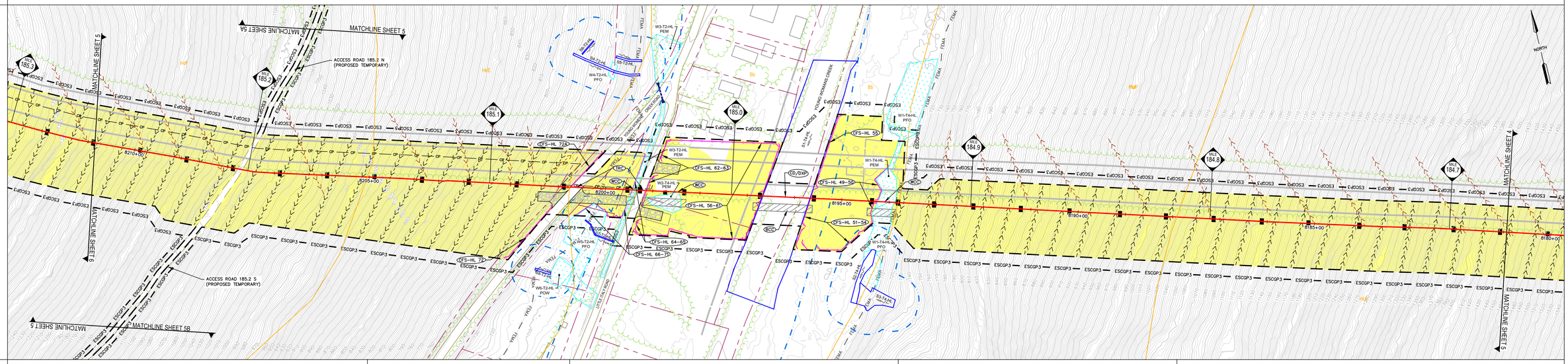
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/2019	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 4 OF 22

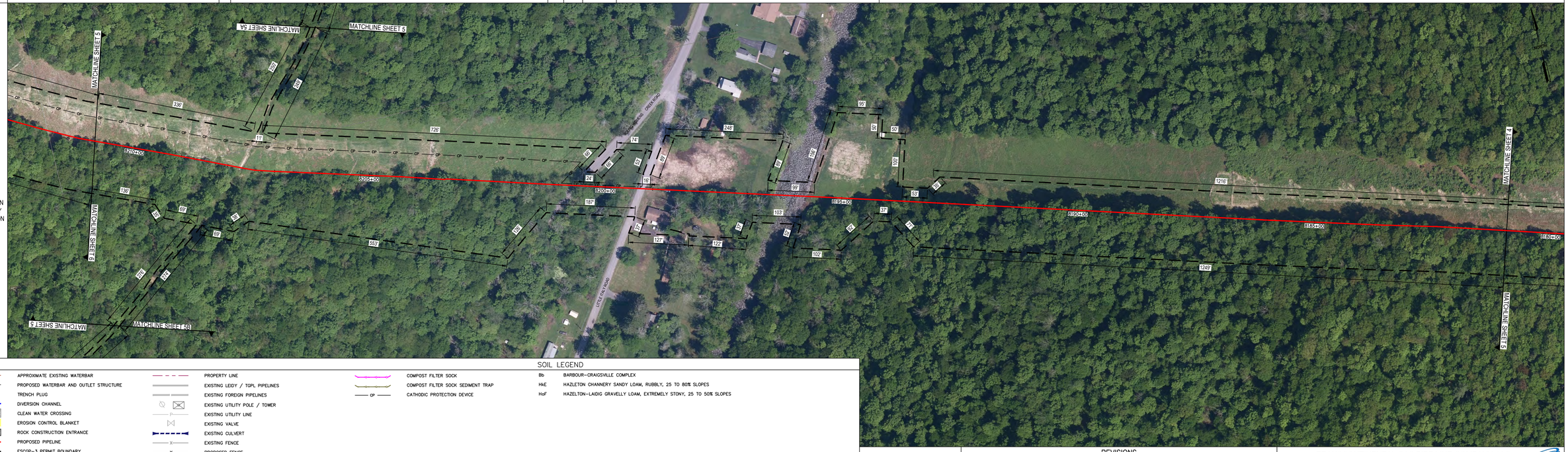
OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS HL-PA-CL-0009	YOUNG WOMANS CREEK RD	MARK A. JONES HL-PA-CL-0007	LITTLE ITALY RD	THOMAS WILSON HL-PA-CL-0008	YOUNG WOMANS CREEK	ESTATE OF ROBERT J. GLEICHERT HL-PA-CL-0004		
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	5'	3'	4'	3'		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW			WETLAND	WETLAND/RESIDENTIAL AREA/MAINTAINED ROW	STREAM	MIXED FOREST LAND/ MAINTAINED ROW	WETLAND	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)								

ALIGNMENT



SOIL TYPE	HoF	HkE	Bb	HoF	HkE
AVERAGE % SLOPE	60%	21% 53%	<2%	55%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 — EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE

SOIL LEGEND

- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

Bb	BARBOUR-CRAIGSVILLE COMPLEX
HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80% SLOPES
HoF	HAZELTON-LAIDIG GRAVELLY LOAM, EXTREMELY STONY, 25 TO 50% SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER DATE: 11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

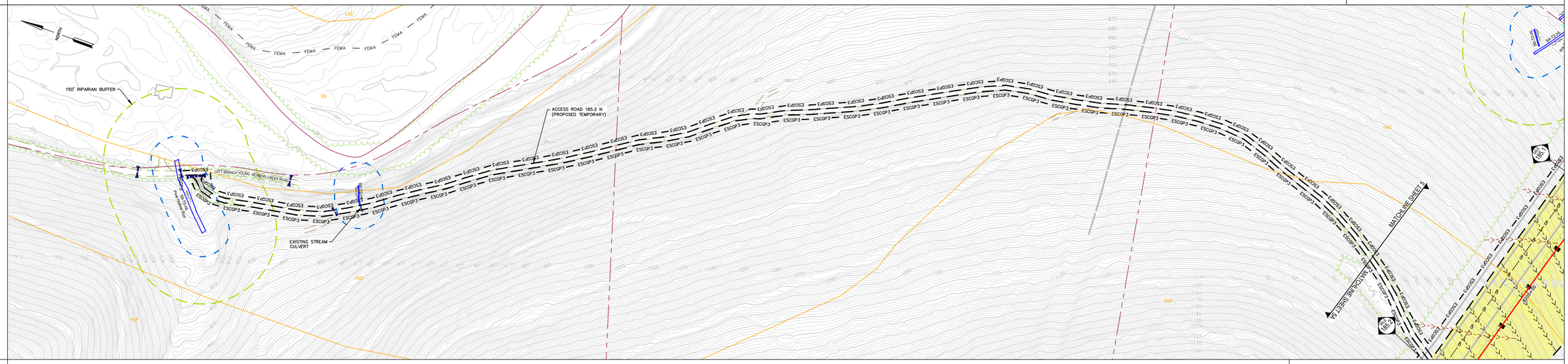
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	POST HOLLOW LLC HL-PA-CL-0017	MARK D. MCALANIS HL-PA-CL-0015	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	MIXED FOREST LAND		
RECEIVING WATERS	LEFT BRANCH YOUNG WOMANS CREEK (EV, MF)		YOUNG WOMANS CREEK (HQ-CWF, MF)

ALIGNMENT



SOIL TYPE	HkE	HoF
AVERAGE % SLOPE		

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
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- PROPOSED PIPELINE
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- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE: 11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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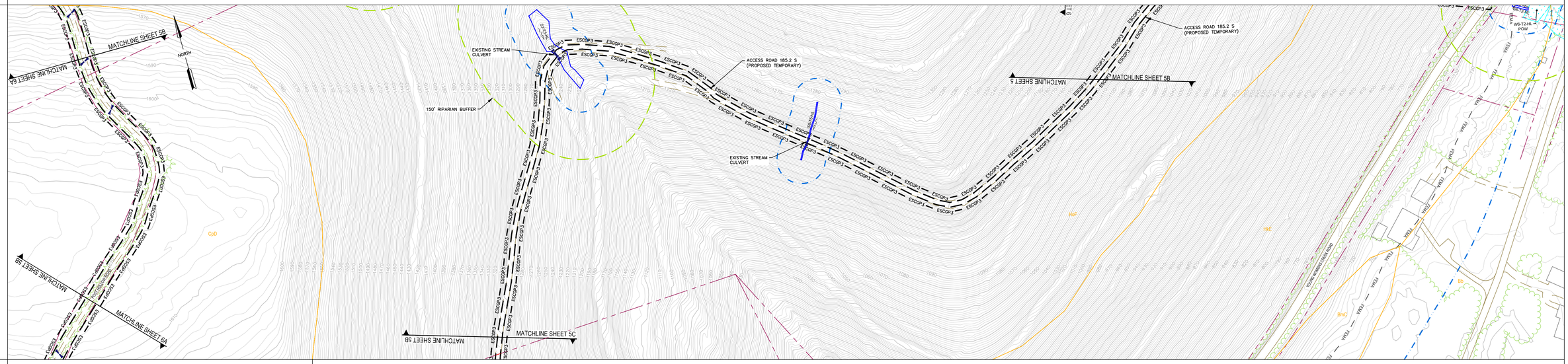
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5A OF 22
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS HL-PA-CL-0015	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	N/A	
COVER TYPE	MIXED FOREST LAND	STREAM / MIXED FOREST LAND / STREAM / MIXED FOREST LAND
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)	

ALIGNMENT



SOIL TYPE	CpD	HoF
AVERAGE % SLOPE		

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
CpD	COOKPORT CHANNERRY LOAM, EXTREMELY STONEY, 8 TO 25 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM designs, permits, resolutions consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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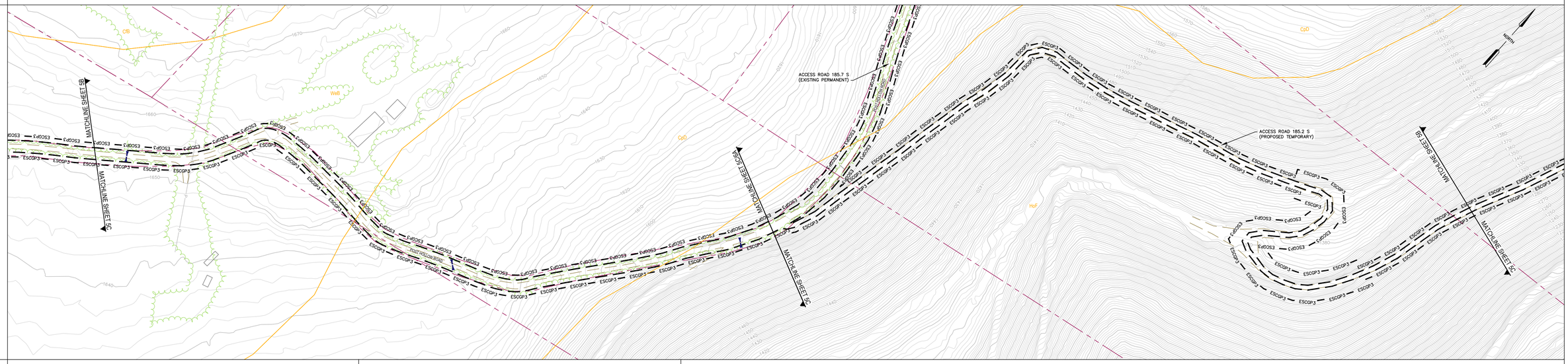
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5B
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

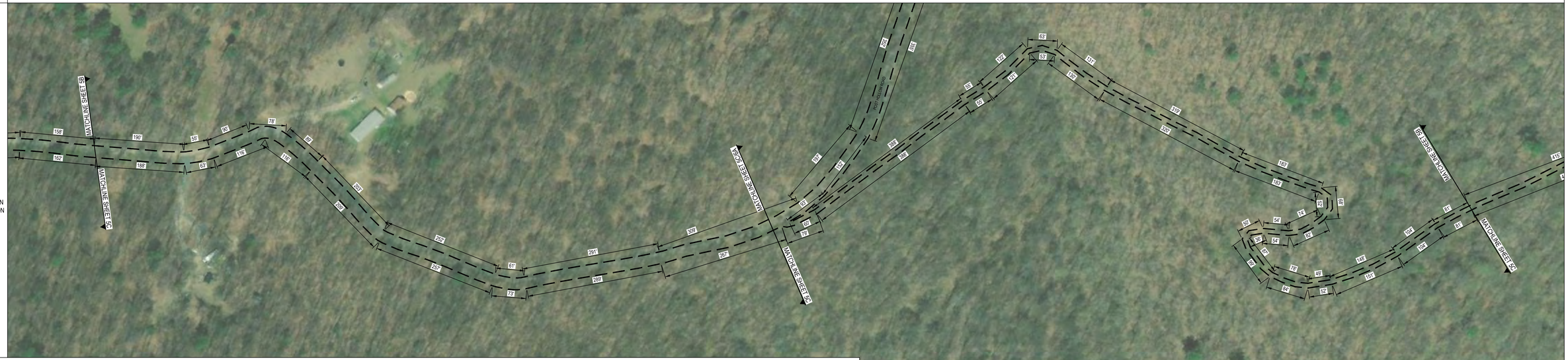
OWNERSHIP & TRACT NUMBER	DAVID L. GUIZAR HL-PA-CL-0009.003	ROBERT A. BINGAMAN HL-PA-CL-0009.002	GEORGE M. MCALANIS HL-PA-CL-0009.001	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	N/A			
COVER TYPE	MIXED FOREST LAND			
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)			

ALIGNMENT



SOIL TYPE	WeB	CpD	HoF
AVERAGE % SLOPE			

CONSTRUCTION CONFIGURATION



LEGEND

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- 50'/FEMA FLOODWAY
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- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE: 11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

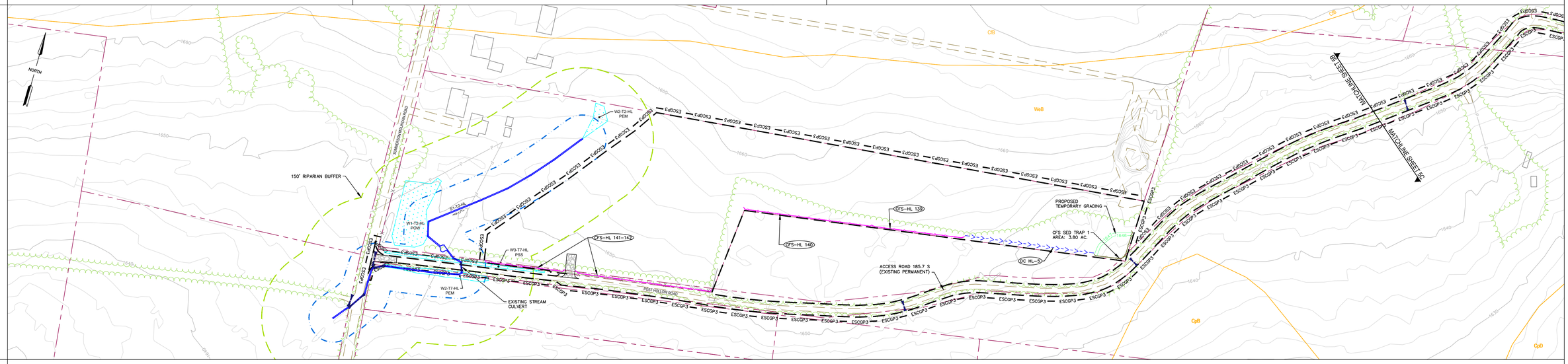
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5C
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	THOMAS F. CHARLES HL-PA-CL-0009.012	JOHN A. GREEN HL-PA-CL-0009.006	DAVID L. GUIZAR HL-PA-CL-0009.003	ROBERT A. BINGAMAN HL-PA-CL-0009.002
PROFILE (MIN. PIPE DEPTH)	N/A			
COVER TYPE	MIXED FOREST LAND	PASTURELAND / STREAM / PASTURELAND	MIXED FOREST LAND/PASTURELAND	MIXED FOREST LAND
RECEIVING WATERS	PADDY RUN (EV, MF)	SKUNK HOLLOW (HQ-CWF, MF)	YOUNG WOMANS CREEK (HQ-CWF, MF)	

ALIGNMENT



SOIL TYPE	WeB		
AVERAGE % SLOPE		5.1%	7.5%

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

SOIL LEGEND

WeB WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER — PENNSYLVANIA

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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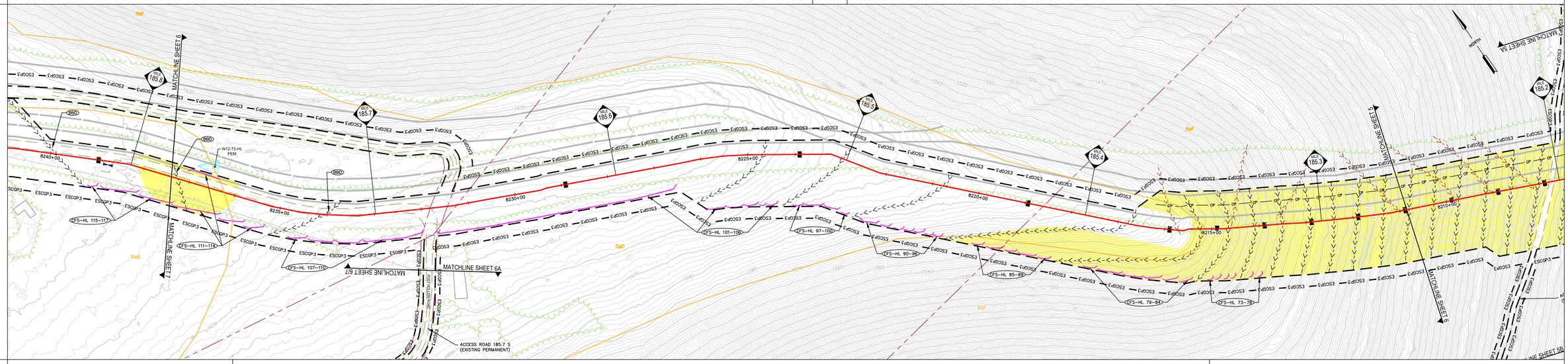
APPROVED BY: KCC	DATE: 9/20/19		SHEET 5D
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	POST HOLLOW, LLC HL-PA-CL-0017	MARK D. MCALANIS HL-PA-CL-0015	MARK D. MCALANIS HL-PA-CL-0009
PROFILE (MIN. PIPE DEPTH)	5'	3'	
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)	LEFT BRANCH YOUNG WOMANS CREEK (EV, MP) YOUNG WOMANS CREEK (HQ-CWF, MF)	
ALIGNMENT			
SOIL TYPE	WeB	CpD	HoF
AVERAGE % SLOPE			
CONSTRUCTION RIGHT-OF-WAY CONFIGURATION			

LEGEND

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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

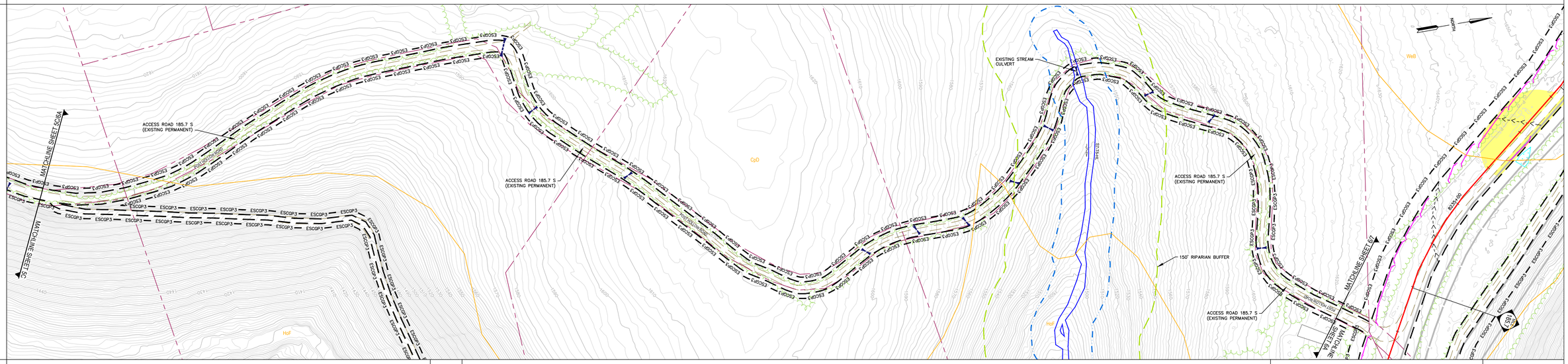
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 6
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	ROBERT A. BINGAMAN HL-PA-CL-0009.002	GEORGE M.. MCALANIS HL-PA-CL-0009.001	MARK D. M CALANIS HL-PA-CL-0009	MARK D. M CALANIS HL-PA-CL-0015	POST HOLLOW LLC HL-PA-CL-0017
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	MIXED FOREST LAND			STREAM	
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)				

ALIGNMENT



SOIL TYPE	CpD	HoF	CpD	HoF	CpD
AVERAGE % SLOPE					

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
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- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC — Williams.

LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

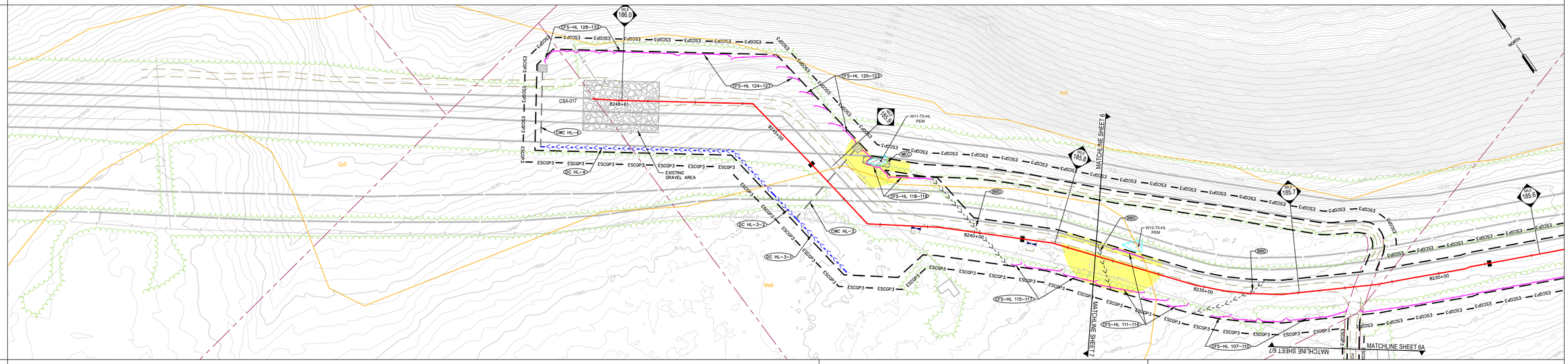
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 6A OF 22

OWNERSHIP & TRACT NUMBER	JEFFREY MORGAN HL-PA-CL-0016	POST HOLLOW LLC HL-PA-CL-0017	MARK D. MCALANIS HL-PA-CL-0015
PROFILE (MIN. PIPE DEPTH)	N/A	5'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	POST HOLLOW (EV, MF)		

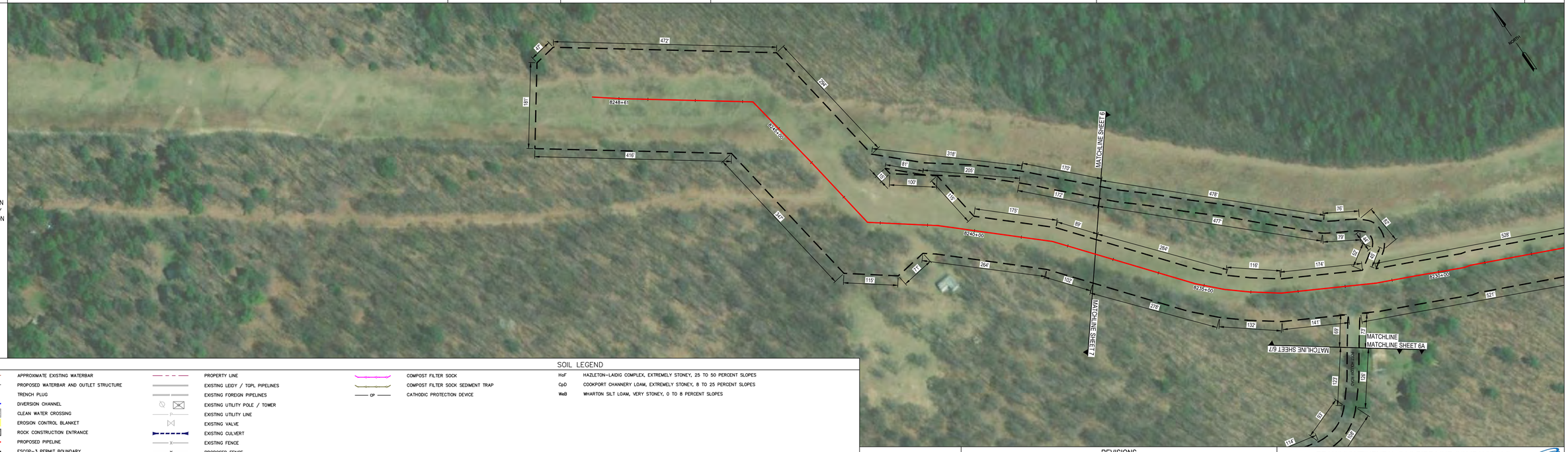
ALIGNMENT



SOIL TYPE	CpD	WeB	CpD

AVERAGE % SLOPE	9%	10%	3%	2%	8%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE

SOIL LEGEND

HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONEY, 25 TO 50 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONEY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONEY, 0 TO 8 PERCENT SLOPES

- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SCALE 1" =100'

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

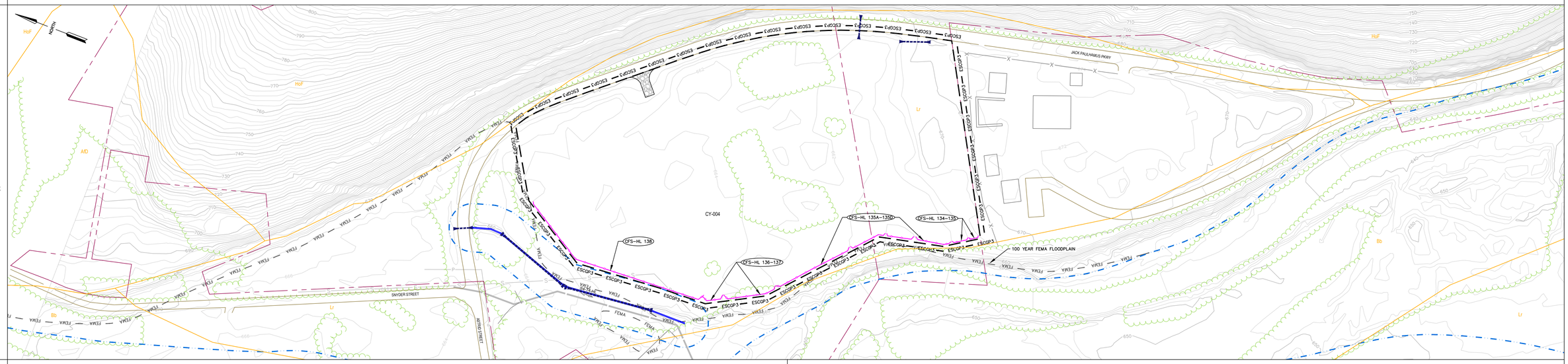
LEIDY SOUTH PROJECT - HILLTOP LOOP

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 7
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

OWNERSHIP & TRACT NUMBER	FARWELL REAL ESTATE LLC HL-PA-CL-0022	FARWELL REAL ESTATE LLC HL-PA-CL-0023	DEPT. OF TRANSPORTATION
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	TRANSITIONAL AREAS		
RECEIVING WATERS	YOUNG WOMANS CREEK (HQ-CWF, MF)		
CONTRACTOR YARD			
SOIL TYPE	Lr	Bb/Lr	
AVERAGE % SLOPE			
CONSTRUCTION CONFIGURATION			

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 — ESCGP-3 PERMIT BOUNDARY
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- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FORDIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1200 — EXISTING GRADE CONTOURS (2'/10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE

SOIL LEGEND

Bb	BARBOUR-CRAIGSVILLE COMPLEX
Lr	LINDEN SILT LOAM, RARELY FLOODED
HoF	HAZLETON-LAIDIG COMPLEX, EXTREMELY STONEY, 25 TO 50 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
044311-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

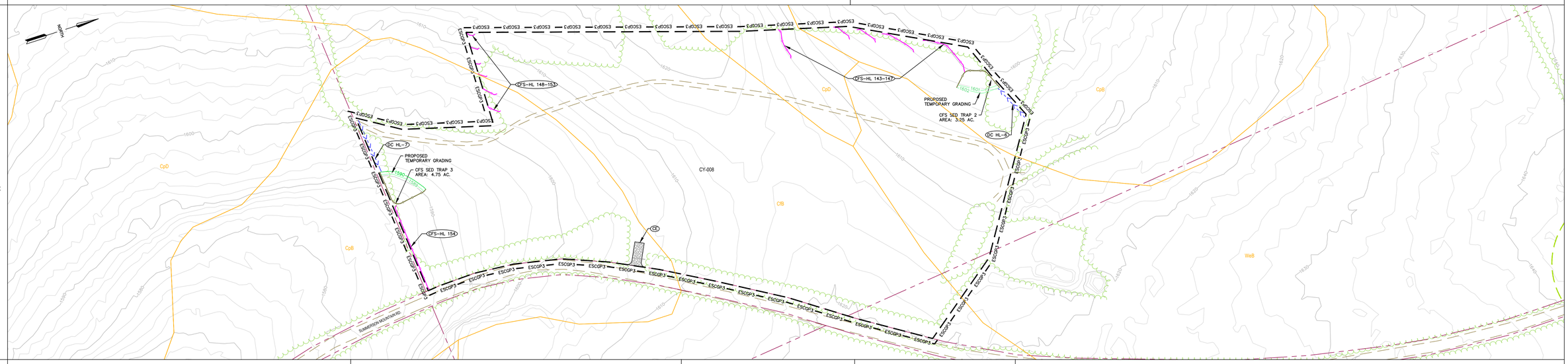
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 8 OF 22
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	THOMAS F. CHARLES HL-PA-CL-0009.011	THOMAS F. CHARLES HL-PA-CL-0025	THOMAS F. CHARLES HL-PA-CL-009.012
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	TRANSITIONAL AREAS		
RECEIVING WATERS	SKUNK HOLLOW (HQ-CWF, MF)	PADDY RUN (EV, MF)	

CONTRACTOR YARD



SOIL TYPE	CpB/CfB	CfB/CpD	CfB/CpB/WeB
AVERAGE % SLOPE			

CONSTRUCTION CONFIGURATION

LEGEND

- APPROXIMATE EXISTING WATERBAR
- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
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- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
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- 1200 EXISTING GRADE CONTOURS (2'/10' C.I.)
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- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE

SOIL LEGEND

CfB	CYLMER CHANNERY LOAM, EXTREMELY STONEY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONEY 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONEY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONEY, 0 TO 8 PERCENT SLOPES

SCALE 100 50 0 100
SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 2/1/2019	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 9
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 22

Transcontinental Gas Pipe Line Company, LLC

Section 2-1 E&SC/SR Plan Narrative and Drawings

Leidy South Project – Hensel Replacement

September 2019

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Sections

1.0 Project Description (NOI Checklist Item 3.n)

2.0 Topographic Features of the Area (NOI Checklist Item 3.a, 7.a)

3.0 Receiving Surface Waters (NOI Checklist Item 3.e, 7.e)

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

- 4.1 Resolutions to Soil Limitations
- 4.2 Geologic Formations

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

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11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

- 11.1 Eastern Terminus Main Line Valve and Access Road
- 11.2 Western Terminus Main Line Valve

12.0 The Erosion and Sediment Control Plan Shall be Prepared by a Person Trained and Experienced in Erosion Control Methods and Techniques

Attachments

1 Project Location Map

2 Soils Map and Report

3 E&SC and SR Plan BMP Design Worksheets and Calculations

Drawings (NOI Checklist Item 3.i, 7.i)

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38 - 39 of 39 Geohazard Mitigation Details

1.0 Project Description (NOI Checklist Item 3.n)

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. is proposing the Leidy South Project – Hensel Replacement. The Hensel Replacement consists of installing approximately 6.3 miles of 36-inch pipeline loop along Transco's Leidy Line in Leidy and Chapman Townships, Clinton County. This pipeline will replace the capacity of a segment of Transco's existing 23.375-inch Leidy Line A pipeline, and this segment of the Leidy Line A pipeline totaling 5.8 miles will be abandoned and removed with the exception of 0.8 mile under the Tamarack Swamp Natural Area, which is proposed to be grouted in-place. Once placed into operation, Transco will refer to the Hensel Replacement as the Leidy Line D. Transco will be relocating and installing a Mainline Valve (MLV) near the eastern terminus of the Hensel Replacement as a means to isolate gas flows along sections of a pipeline. At the western terminus of the Hensel Replacement at an existing MLV, pig traps and block valves will be added. Cathodic protection cable will be installed from proposed MLV near the eastern terminus to MP 190.5, and from the western terminus of Hensel Replacement to the Tamarack Swamp Natural Area and associated wetlands on the Leidy Line "A" and "B" existing right-of-way. The cathodic protection cable will be installed in the same trench as the pipeline within wetland, stream and floodway crossings. The Hensel Replacement will include the construction of one temporary offline contractor yard and five temporary contractor staging areas.

The Hensel Replacement is proposed as part of the overall Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

The E&SC and SR Plan shall be designed and implemented to be consistent with the Post Construction Stormwater Management (PCSM) Plan under 25 Pa. Code § 102.8 (relating to PCSM requirements). Transco will use and implement the practices, measures and details outlined herein to control soil erosion and off-site sedimentation. All work and disturbed areas are located within Transco property, existing easements or legally obtained workspace. The limit of disturbance (LOD) for the Hensel Replacement will be approximately 135.2 acres. Subject to

receipt of permits and authorizations, Transco anticipates construction of the Project would commence in January 2021 to meet a target in-service date of December 1, 2021.

2.0 Topographic Features of the Area (NOI Checklist Item 3.a, 7.a)

A Project Location Map for the Hensel Replacement is included in Attachment 1. This map shows the topographical features of the general site vicinity and is based on the USGS 7.5 Minute topographical mapping of the Tamarack, Young Womans Creek and Renovo East, Pennsylvania quadrangles.

3.0 Receiving Surface Waters (NOI Checklist Item 3.e, 7.e)

The following table (Table 1) list each watershed located Hensel Replacement Project Area, its Chapter 93 Water Quality Standards, and Pennsylvania Fish and Boat Commission classifications. A Wetland and Watercourse Delineation Report is included in Attachment A of the ESCGP-3 permit application.

Table 1 Receiving Waters

Watershed Name	Designated Use	Existing Use	PFBC Classification
Turtle Point Hollow	EV, MF	-	Naturally Reproducing Trout
Drury Run	EV, MF	-	Naturally Reproducing Trout
Austin Hollow	EV, MF	-	Naturally Reproducing Trout
Hensel Fork	EV, MF	-	Naturally Reproducing Trout
Paddy Run	EV, MF	-	Naturally Reproducing Trout
Dark Hollow	EV, MF	-	Naturally Reproducing Trout
Shingle Branch	EV, MF	-	Class A Wild Trout
Mudlick Run	EV, MF	-	Class A Wild Trout
Sandy Run	HQ-CWF, MF	-	Naturally Reproducing Trout
West Branch Susquehanna River	WWF, MF	-	-

EV: Exceptional Value, MF: Migratory Fishes, WWF: Warm Water Fishes
HQ-CWF: High Quality- Cold Water fishes

4.0 Types, Depth, Slope, Locations & Limitation of the Soils and Geologic Formations (NOI Checklist Item 3.b, 3.l, 7.b, 7.l)

The soil associations on site were identified by soil map units as mapped in the Web Soil Survey website (https://websoilsurvey.sc.egov.usda.gov/) by the United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS). There are 18 soil mapping units located within the LOD, see Table 2 below:

Table 2 – Soils mapping units within the LOD	
Soil Mapping Unit	**Soil Series**
At	Atkins silt loam, 0 to 3 percent slopes, frequently flooded
Bb	Barbour-Craigsville complex
CaB	Calvin channery silt loam, 3 to 8 percent slopes
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony
Fr	Freetown mucky peat
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony
HuB	Hustontown silt loam, 3 to 8 percent slopes
HuD	Hustontown silt loam, 15 to 25 percent slopes
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony
Lr	Linden silt loam, rarely flooded
MhD	Meckesville channery loam, 8 to 25 percent slopes, very stony
UnB	Ungers loam, 3 to 8 percent slopes
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony
WgB	Wharton-Cookport complex, 0 to 8 percent slopes, very stony

Detailed descriptions and mapping of soil mapping units are provided in the Attachment 2. Soil use limitations (outlined in Table 3) were reviewed in relation to the Hensel Replacement and resolutions were identified in Section 4.1.

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Atkins	At	X	C/S			X	X	X	X	X	X	X	X				X
Barbour	Bb	X	C	X		X	X	X				X	X				X

Table 3. Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Calvin	CaB	X	C	X	X			X			X		X				
Cookport	CpB, CpB	X	C/S	X	X		X	X	X	X	X	X	X				X
Freetown	Fr	X	C/S				X	X	X				X			X	
Hazleton	HmD , HoF	X	C	X	X			X	X	X	X	X	X				
Hustontown	HuB, HuD	X	C/S	X			X	X		X	X		X				
Laidig	LdC	X	C/S	X	X		X	X	X	X	X	X	X				
Linden	Lr	X	C			X	X	X	X	X	X		X				
Meckesville	MhD	X	C/S				X		X	X	X	X	X				X
Ungers	UnB, UpF	X	C		X				X	X			X				
Wharton	WeB , WgB	X	C/S		X		X	X	X	X	X	X	X	X			X

4.1 Resolution of Soil Limitations

Transco proposes the following resolutions to compensate for soil limitations summarized in Table 3 above:

1. To offset the caving of cutbanks, trenching operations will be conducted in accordance with the OSHA Technical Manual for Trenching.
2. Preventative coatings shall be used to prevent corrosion of concrete and/ or steel.

3. When bedrock is encountered it will be removed by mechanical methods or blasting. Blasting operations will conform with all local, state, and federal regulations.
4. Precautions will be taken to prevent slope failure when working within low strength soils by flattening cut / fill slopes, not overloading, maintaining lateral support, and preventing saturation of soils. Low strength soils will not be used for roadway construction.
5. Excavation in soils prone to flooding, slow percolation, ponding, wetness, located in a seasonal high water table, or which are hydric, will likely encounter water. Compensation will involve dewatering with appropriate means such as pump water filter bags, sediment traps, etc.
6. Soils that have the potential to swell, shrink, or heave due to frost action may cause damage to roadways or pads. Where foundations are critical, compensation may require removal and replacement of soils with suitable material.
7. In circumstances where soils appear to be a poor source of topsoil, droughty or prone to wetness, soil testing will be performed to determine the appropriate applications of soil amendments to promote growth. Soils onsite that are fair sources of topsoil, will be identified, stripped and stockpiled for use during restoration.
8. In order to minimize erosion of soils that are easily erodible, compensation may involve providing a protective lining, to apply seed, mulch, erosion control blankets (either in rolls or hydraulically applied), tracking slopes, upstream diversions, waterbars, etc to minimize soil erosion.

4.2 Geologic Formations

Transco utilized United States Geological Survey (USGS), Geologic Map of Pennsylvania - Map 1, dated 1980 (online), to evaluate geologic hazards on the Project. The desktop analysis completed for the Project revealed that the Hensel Replacement does not cross any known, mapped, or inferred faults. No mines or Karst formations were identified in the site vicinity. However, the analysis outlined that Hensel Replacement lies within a zone of moderate to high landslide incidence and susceptibility.

Due to the moderate to high landslide incidence and susceptibility, a Geological Hazard Assessment and Mitigation Plan was completed and is submitted with this application (Attachment B). This report provides information about any potential geological hazards occurring in the

vicinity of the Hensel Replacement Project area. The Geological Hazard Assessment and Mitigation Plan also identifies appropriate best management practices to avoid and mitigate for conditions encountered during construction.

5.0 Characterizations of Earth Disturbance Activities, Including Past, Present and Proposed Land Uses (NOI Checklist Item 3.c, 7.c)

The Hensel Replacement will be primarily co-located with the existing Transco Leidy Lines in Clinton County, Pennsylvania. The existing Leidy Line A pipeline totaling 5.8 miles will be abandoned and removed with the exception of 0.8 mile under the Tamarack Swamp Natural Area; which is proposed to be grouted in place. Transco will be relocating and installing a Mainline Valve (MLV) near the eastern terminus as a means to isolate gas flows. Pig launchers/receivers will be located at this MLV facility. At the western terminus, at an existing MLV, pig traps and block valves will be added. All work and disturbed areas are located within Transco property, existing easements, or legally obtained workspace where the past, present, and proposed land use is primarily an existing pipeline ROW. Along the edges of the ROW land use is primarily forested. The proposed contractor yard and staging areas will be used temporarily and subsequently removed after the completion of the Project. Staging areas will be used for parking, equipment turn-arounds, and temporary storage of equipment. Transco will use a contractor yard for parking, contractor offices, and the storage of construction equipment and pipes. This contactor yard consists of an agricultural field. All disturbed areas within these temporary workspaces will be restored to the original contours. Transco will use and implement the practices, measures, and details to control soil erosion and off-site sedimentation during construction. Using data taken from Google Earth and Multi-Resolution Land Characteristics (MRLC) Consortium website (https://www.mrlc.gov/viewer/), it appears that the Hensel Replacement site has been an existing and maintained gas pipeline right-of-way for the past 20 years and will continue to be an existing and maintained gas pipeline right-of-way once the Project is complete. Based on the surrounding land characteristics, land use prior to ROW construction within the past 50 years likely would have been either forested land or meadow.

6.0 Erosion and Sediment Control Best Management Practices (NOI Checklist Item 3.f, 7.f)

Various erosion and sediment control measures will be used during the construction of the Hensel Replacement. BMPs proposed to be used at the Site to control soil erosion and sediment pollution are listed below. Details of BMPs proposed to be used at the Project location is included

in the Erosion and Sedimentation Control Plan sheets. BMP's listed will be used at the Project location at the discretion of the environmental inspector, when found necessary to comply with 25 PA Code Chapter 102 and to adequately address potential erosion and sediment control issues.

Rock Construction Entrances

Rock construction entrances shall be installed whenever sediment tracking onto road surfaces is a potential or if required by the county conservation district or other agency. Soil erosion control measures shall be installed, if required and as needed. In special protection watersheds, either a 100' long rock construction entrance or a standard 50' rock construction entrance with a wash rack will be used at the construction entrance to wash construction vehicle wheels before they enter the public roadway. The wash rack will discharge to a 24" compost filter sock (min.). Rock construction entrance thickness shall be constantly maintained to the specified dimensions by adding rock. All sediment deposited on roadways shall be removed and returned to the construction site immediately.

Compost Filter Sock

Compost filter sock shall be placed downslope of disturbed areas to serve as a sediment barrier and filter. Filter sock shall be placed at existing level grade, parallel to contours, with both ends of the sock extended up slope at a 45 degree angle. Socks can be used on both steep and rocky slopes. Socks can range in size from 12 inch to 32 inch diameter depending on the site conditions. The Maximum Permissible Slope Lengths Above Compost Filter Socks will be used to determine the sizes of compost filter.

Compost Filter Sock Sediment Trap

Runoff may be directed into the Compost Filter Sock Sediment Traps of sheet flow into the trap. Compost sock sediment traps shall not exceed three socks in height and shall be stacked in pyramidal form. Minimum trap height is one 24" diameter sock. Additional storage may be provided by means of an excavated sump 12" deep extending 1 to 3 feet upslope of the socks along the lower side of the trap. The maximum tributary drainage area is 5.0 acres. Since compost socks are "flow-through," no spillway is required. Installation of an excavated sump immediately above the socks may increase trap efficiency where soil conditions permit their construction.

Broad Based Dips

Broad-based dips may be used to direct runoff from access roads to well-vegetated areas. In HQ/EV watersheds, sump with compost filter sock should be utilized at the discharge end of the broad-based dip.

Waterbars

Waterbars will be aligned along the pipeline ROW to direct runoff towards the downslope side of the disturbed area and to avoid backflow into the ROW. Compost filter sock shall be installed along the edge of the limit of disturbance to slow run off. Compost filter sock hooks shall be installed at an upslope angle and shall discharge to a well-vegetated area. Upslope of the CFS, a sump shall be constructed to reduce velocity and provide a sheet flow condition to the CFS. Permanent waterbars within the ROW shall be left in place after permanent stabilization has been achieved.

Compost Filter Sock Waterbar Discharge / Waterbar Sump

An 18" Compost Filter Sock shall be installed at the edge of the LOD where waterbar cross the LOD. Upslope of the CFS a 24" x 24" sump shall be constructed to reduce velocity and provide a sheet flow condition to the CFS. The sump shall be filled and stabilized when the CFS is removed after site stabilization.

Diversion Channels / Mountable Berms

Diversion channels or mountable berms shall be used to divert runoff from disturbed areas and convey it to appropriate BMPs such as a sedimentation basin sediment trap or clean water crossing.

Trench Plug

These will be placed at the banks of waterbodies in order to maintain stable working conditions and keep sediment from entering the waterways. Earth filled sacks will be used to secure the plug. The spacing of these structures varies based on the site and the slope of the dig location, as indicated in the plan drawings.

Erosion Control Blankets

A suitable erosion control blanket or soil stabilizer shall be used wherever earth disturbance occurs in close proximity (within 50 feet) of surface waters especially if site conditions make use of conventional E&S BMPs difficult. Erosion control blankets should be used on finished slopes greater than 3:1.

Timber Mats

Timber mats can be used for temporary wetland crossings. The timber mats are placed over the wetland to allow equipment to cross and then are removed.

Temporary Equipment Bridges

A temporary bridge equipment crossing will be built in order to cross any streams along the pipeline installation. The bridge equipment crossing will utilize geotextile material, timber mats, and a timber or metal bridge with side rails any may include instream supports (where necessary). Culvert Equipment crossings may be used in areas where equipment must cross stream channels. Culverts shall be placed in the stream channel sized appropriately to convey the flow within the channel and shall be placed at least one-half their diameter apart. Coarse aggregate may be used for fill surrounding the culverts. Upon completion, all material placed in the stream channel shall be completely removed.

Flumed Crossing/ Dam and Pump Crossing

These may be used when work is to be completed in a waterway. A flumed crossing involves the placement of a flume pipe within the waterway and using diversion structures up and down gradient to divert flow through the flume pipe and out of the work area. A dam and pump crossing involves placing sandbag barriers on the upstream and downstream sides of the work space to prevent water from entering the maintenance area. A pump shall be placed to move any water from the upstream side, around the workspace and back to the downstream side of the work area. Trench plugs may be used on the banks of the stream to keep water from leaving the bed and banks limit of the waterway.

Pumped Water Filter Bag

Filter bags shall be placed in well-vegetated grassy areas and discharge onto stable, erosion resistant areas, and staked if the slope is greater than 5 percent. In the event that this is not possible, a geotextile path will be provided. A compost filter sock shall be placed below the filter bag when placed within 50 of streams or wetlands located within a HQ/EV watershed.

Trench Dewatering

Trench dewatering may be required, depending on the site conditions during the excavation. Water shall be pumped out and discharged into a filter bag or a dewatering structure when deemed necessary.

Safety Fence

Safety fence shall be installed to protect sensitive environmental features as depicted on the plan drawings. The fencing shall remain in place during all phases of construction.

Siltron Pollution Prevention Fence

Siltron Pollution Prevention Fence may be used throughout the project where environmental features make it necessary in lieu of Compost Filter Sock (CFS). The site specific sediment barriers will be selected by the environmental inspector on a site by site basis. These barriers will be placed at existing level grade, with both ends of the barrier extending at least 8' upslope at a 45 degree angle. Sediment must be removed when accumulations reach ½ the above ground height of the fence. The size and type of fence will be selected based on slope lengths as determined in the maximum slope length for Multi-Layer Geotextile Filter Fence figures. The 16-inch filter fence is equivalent to an 18-inch compost filter sock, the 21-inch filter fence is equivalent to a 24-inch compost filter sock, and a 28-inch filter fence is equivalent to a 32-inch compost filter sock. Approved for use as an Alternative E&S and PCSM BMP by PA DEP on 8/22/18.

Rock Filter Outlet

Rock filter outlets may be used to address areas where concentrated flows intersect sediment barriers. They may also be used in instances where sediment barriers such as silt fence or compost filter socks have failed due to concentrated flow.

Wetland Installation Procedures

During the course of pipeline maintenance and replacement within wetland areas, BMP's including slope breakers, equipment mats, sediment barriers, and trench plugs may be used to prevent altering the hydrology of the wetland and to prevent sediment from entering the wetland. Work within the wetland boundaries shall be limited to the extent possible. Upon completion of work the wetland area shall be restored to pre-construction grades and seeded with an appropriate wetland seed mixture.

Hydrostatic Dewatering Structure

A hydrostatic dewatering structure will be placed on a level, well vegetated site such that water will flow away from the structure and work areas. Flow rates through discharge and diverter pipes will be such that structures will not overflow. Contractor will properly remove and dispose of the dewatering structure immediately upon completion of dewatering operations.

Bored Road Crossing/Trenched Road Crossing

These may be used where pipeline installation or maintenance under a bored road is necessary. Sediment barriers shall be used around the work area. Culverts will be placed where required to maintain water flow for stormwater ditches.

Clean Water Crossings

Temporary diversion channels or mountable berms shall be used to divert runoff from undisturbed upslope areas and convey the runoff around areas of earth disturbance within the pipeline ROW corridor. From the diversion, the flow will outlet to a temporary pipe(s) crossing, which is installed across the right-of-way, and discharge to an outlet basin. Clean water leaving the outlet basin will return to sheet flow downslope of the disturbed ROW.

Revegetation Plan and Procedures

The construction site should be stabilized as soon as possible after completion. Establishment of final cover must be initiated no later than 7 days after reaching final grade. Temporary erosion and sedimentation control BMPs can be removed when the site meets final stabilization. Final stabilization means that all soil-disturbing activities are completed, and that either a permanent vegetative cover with a density of 70% or greater has been established or that the surface has been stabilized by hard cover such as pavement or buildings. It should be noted that the 70% requirement refers to the total area vegetated and not just a percent of the site.

Surface Roughening

Surface roughening is the practice of providing a rough 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.

Typical Topsoil Stockpile

The maximum stockpile height shall not exceed 35 feet. Stockpile slopes shall be no steeper than 2H:1V. Stockpiles shall be stabilized in accordance with temporary seeding specifications and mulch is to be maintained until the stockpile is stabilized. Stockpile location shown on the plans are illustrative and may vary in location as construction proceeds.

Typical Channel and Vegetation Restoration

The impacted riparian zone will be restored for a minimum of 15 feet landward of the top of bank. If the pre-impact riparian buffer of native herbaceous and shrub vegetation exceeds 15 feet beyond the top of bank, the area to be seeded should be as follows: 150 feet in High-Quality waters, 100 feet in other waters, or existing width of the riparian zone if it is less than the minimum requirements. Ernst Seed Mix 178 (Riparian Buffer Mix) or similar shall be applied on restored banks and riparian zones. In addition, where existing forested buffers are impacted these shall be replanted outside of the existing maintained ROW, as indicated in forest replanting plans for the Project outlined in the Chapter 105 permit.

7.0 Recycling and Disposal of Materials (NOI Checklist Item 3.k, 7.k)

The restoration of the pipeline right-of-way will require the removal of the temporary materials. The temporary materials include, but may not be limited to, stone surfaces and associated geotextiles. The contractors are required to dispose of the materials at suitable disposal or recycling sites and in compliance with local, state and federal regulations.

Contractors are required to inventory and manage their construction site materials. The goal is to be aware of the materials on-site, ensure they are properly maintained, used, and disposed of, and to make sure the materials are not exposed to stormwater. The following materials or substances are expected to be present on-site during construction (Note: this list is not an all-inclusive list and the materials management plan can be modified to address additional materials used on-site):

- Acids
- Detergents
- Fertilizers (nitrogen/phosphorus)
- Hydroseeding mixtures
- Petroleum based products
- Sanitary wastes
- Soil stabilization additives
- Solder
- Solvents
- Other (list here):

These materials must be stored as appropriate and shall not contact storm or non-stormwater discharges. Contractor shall provide a weatherproof container to store chemicals or erodible substances that must be kept on the site. Contractor is responsible for reading, maintaining, and making employees and subcontractors aware of Material Safety Data Sheets (MSDSs).

8.0 Thermal Impacts (NOI Checklist Item 3.m, 7.m)

Due to the overall nature of the Project, thermal impacts to surface waters are not anticipated. The pipeline installation activities will primarily take place within an existing cleared and maintained pipeline right-of-way. There will be no increase in stormwater discharge. The primary means to address thermal impacts on this Project is to limit the size and duration of exposed earth. Revegetation procedures and the Sequence of Construction outline disturbed areas being immediately revegetated.

Stormwater runoff associated with the installation of the MLV's will be routed through the stormwater BMP's designed to retain and infiltrate the first surge of water from the site. The first surge of water will be the warmest water for the duration of the storm event and will quickly cool as the storm event progresses. The BMPs are designed to capture and infiltrate this warmest surge of stormwater. Based on routing calculations, stormwater is not discharged from the BMPs for the first 12 hours during a 100-year/24-hour storm event. The retention period is longer for less intense storms. Therefore, as a result of these measures, no significant thermal impact to the receiving waters is anticipated.

9.0 Antidegradation Requirements (NOI Checklist Item 3.p, 7.o)

Transco evaluated the feasibility of non-discharge alternatives that would be located outside of exceptional value (EV) or high-quality (HQ) watersheds. Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. The hydraulic model determined the eastern and western terminus of the Hensel Replacement. In order for the Project to meet the required purpose and need, siting the Hensel Replacement outside of EV and HQ watersheds, is not feasible.

Therefore, Transco determined that there are no cost-effective and environmental sound viable non-discharge alternatives for the project. Transco has minimized project impacts to EV and HQ watersheds through the use of co-location with existing pipelines and protecting riparian

buffers within the project workspace. Earth disturbance will be minimized to the extent practical and will be phased or sequenced to only disturbed portions that are necessary for the specific scope of work. Wherever possible, the LOD was decreased to avoid disturbing additional ground and will be kept to the minimum width and depth necessary to safely complete construction activities

Anti-Degradation Best Available Combination of Technologies (ABACT) standards have been proposed for the Hensel Replacement because there are no viable non-discharge alternatives. The Erosion and Sediment Control Plan prepared for the Project outlines a more stringent design and E&S BMPs that meet ABACT standards.

Pipeline installation activities along the pipeline ROW and at the contractor yards/staging areas will not result in increase in discharge of stormwater to surface waters. The existing / designated use of the streams within the Project area are to be protected through E&S and PCSM measures taken by Transco.

The eastern and western terminus MLV sites will result in increased discharge of stormwater to surface waters which will be mitigated by the implementation of post-construction stormwater management (PCSM) BMP's. Proposed PCSM BMPs are designed with stormwater volume reduction and water quality treatment maximized to the extent practicable within the site constraints to maintain and protect existing water quality and existing and designated uses.

10.0 Riparian Buffers (NOI Checklist Item 3.o, 7.n)

Pipeline installation will take place within an existing cleared and maintained pipeline ROW and forested areas. Due to the linear nature of the project, temporary impacts within riparian buffers are unavoidable. At locations where it was impossible to avoid riparian impacts due to safety issues, Transco will implement BMPs to minimize the impacts. After completing the construction activities, all areas used for pipeline installation and as contractor yards/staging areas will be restored back to pre-existing contours and reseeded with a riparian seed mix in areas where slopes are less than 10%. At the eastern and western terminus sites where permanent increase in impervious area is proposed, no riparian buffers were identified. Tree and shrub plantings will occur in forested riparian buffers outside of the maintained ROW as outlined in riparian reforestation plans outlined in the Chapter 105 permit.

Linear projects including pipelines are eligible for the Riparian Buffer Waiver under 25 PA Code §102.14(d)(2)(ii) if riparian buffers are undisturbed to the extent practicable. As such, a Riparian Buffer Waiver has been requested along with this ESCGP-3 application (Section 1-7).

11.0 Project Site Runoff (NOI Checklist Item 3.d, 7.d)

Changes in Project site runoff are not anticipated for the Project except at the eastern and western terminus MLV sites where increase in impervious areas are proposed. The Project site is primarily existing and maintained pipeline right-of-way in meadow condition with a forested fringe. The ROW will be restored to meadow condition upon the completion of construction. Proposed BMPs were sized based on the maximum tributary drainage area anticipated during construction. An analysis of pre- and post-development stormwater runoff was performed for the MLV sites. The installation of the valves and associated access road will increase the volume of stormwater runoff due to the increase in the type and size of the impervious area. The contractor will construct stormwater BMPs to mitigate the increase in volume and peak rates associated with construction. Refer to the Post-Construction Stormwater Management (PCSM) Plan for additional information (Section 3 of this ESCGP-3 Application). Changes in stormwater runoff between pre- and post-development conditions for 2-year rainfall event and changes in peak discharge rates for 1,2,10,25,50 and 100-yr storms are given in the tables below.

11.1 Eastern Terminus Main Line Valve and Access Road

Pre- and Post-Development Stormwater Volume for 2-yr Rainfall (cf)		
Pre-development	**Post-development before BMPs**	**Net**
1,761	4,118	2,357

Pre-Construction Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.03	0.16	1.20	2.30	3.41	4.75

Post-Construction without BMPs Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.36	0.98	3.33	5.23	7.05	9.12

11.2 Western Terminus Main Line Valve

Pre- and Post-Development Stormwater Volume for 2-yr Rainfall (cf)		
Pre-development	**Post-development before BMPs**	**Net**
5,532	6,229	697

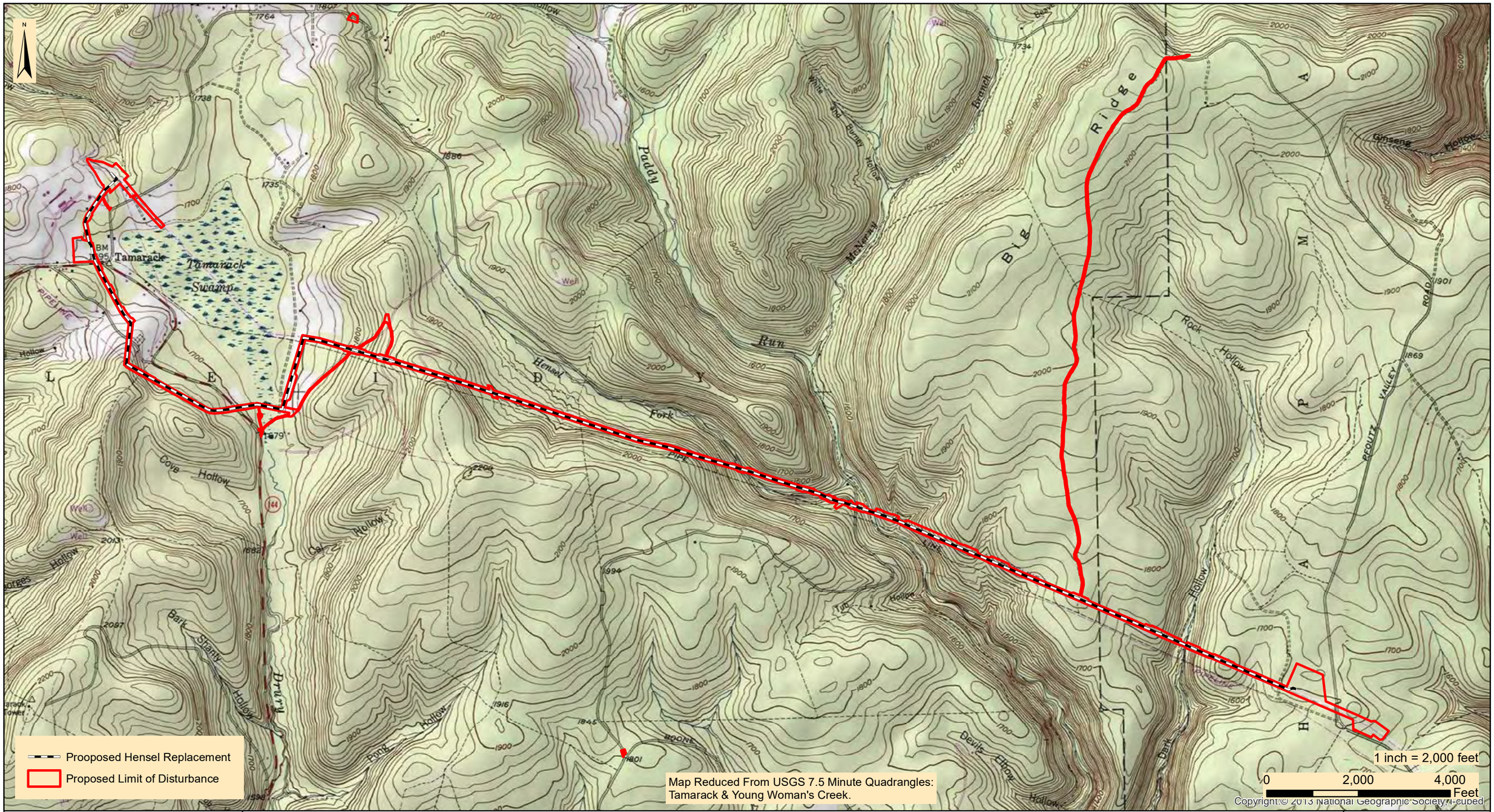
Pre-Construction Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.17	1.09	5.67	9.63	13.34	17.88

Post-Construction Peak Discharge Rates (cfs)					
1-year	**2-year**	**10-year**	**25-year**	**50-year**	**100-year**
0.42	1.77	7.36	11.97	16.35	21.44

12.0 The Erosion and Sediment Control Plan Shall be Prepared By a Person Trained and Experienced in Erosion Control Methods and Techniques

These plans and narrative were prepared by Kevin Clark, PE (BAI Group, LLC) of State College, PA in accordance with the Pennsylvania Department of Environmental Protection Erosion and Sediment Pollution Control Program Manual, March 2012. Plan preparer's resume is provided in Attachment C of the ESCGP-3 permit package).

ATTACHMENT 1
PROJECT LOCATION MAP



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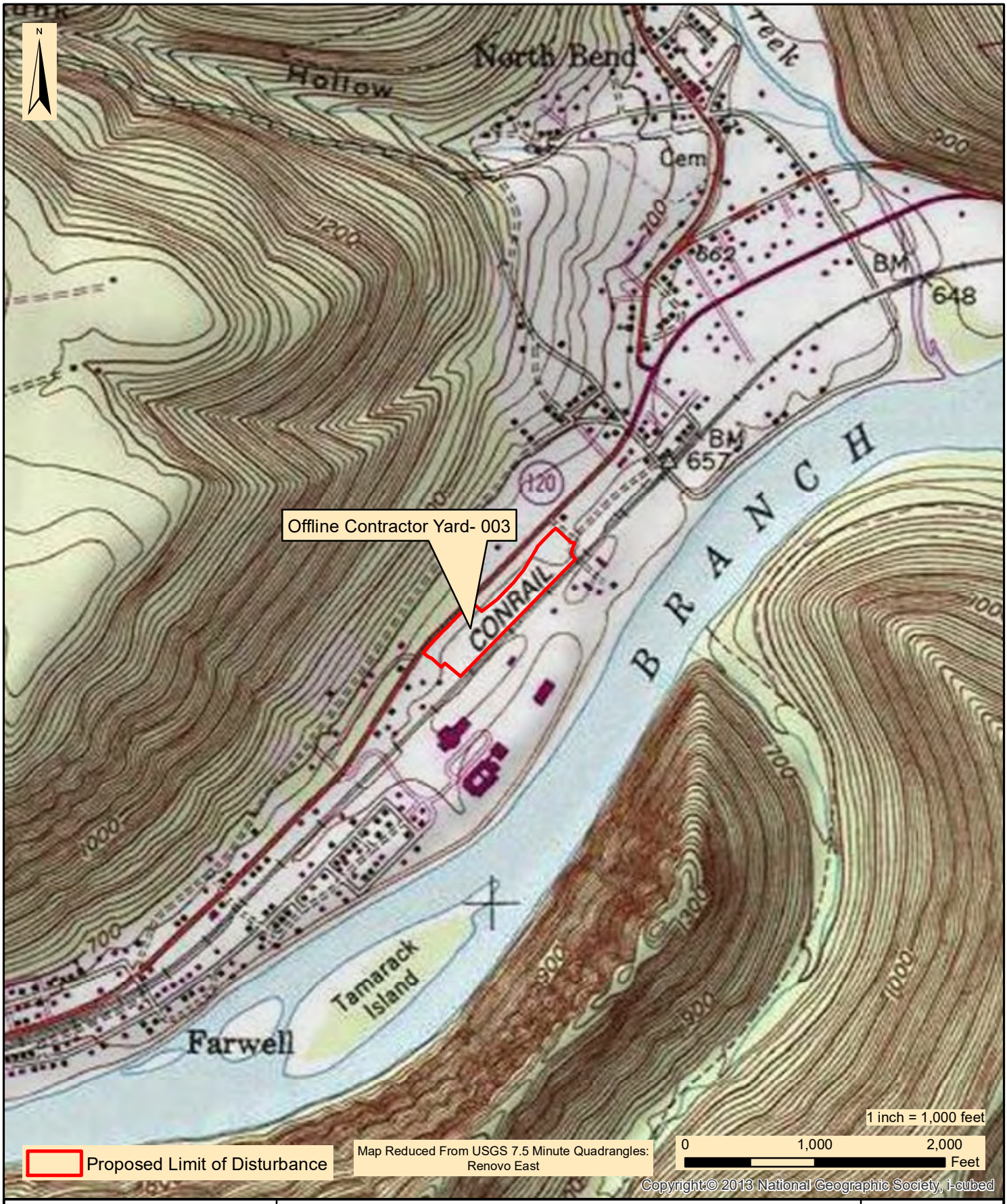
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HENSEL REPLACEMENT
PROJECT LOCATION MAP

LEIDY & CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	8/21/2019
WHM DRAWING NUMBER:	WILLIAMS202B001
Drawn By:	FTN
Figure Number:	1-1



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LEIDY SOUTH PROJECT

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PROJECT LOCATION MAP

CHAPMAN TOWNSHIP CLINTON COUNTY PENNSYLVANIA

Date:	8/21/2019
WHM Drawing Number:	WILLIAMS200A001-1
Drawn By:	FTN
Figure Number:	1-2

ATTACHMENT 2
SOILS MAP AND REPORT

United States Department of Agriculture

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for

Clinton County, Pennsylvania

Hensel Replacement

July 2, 2019

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

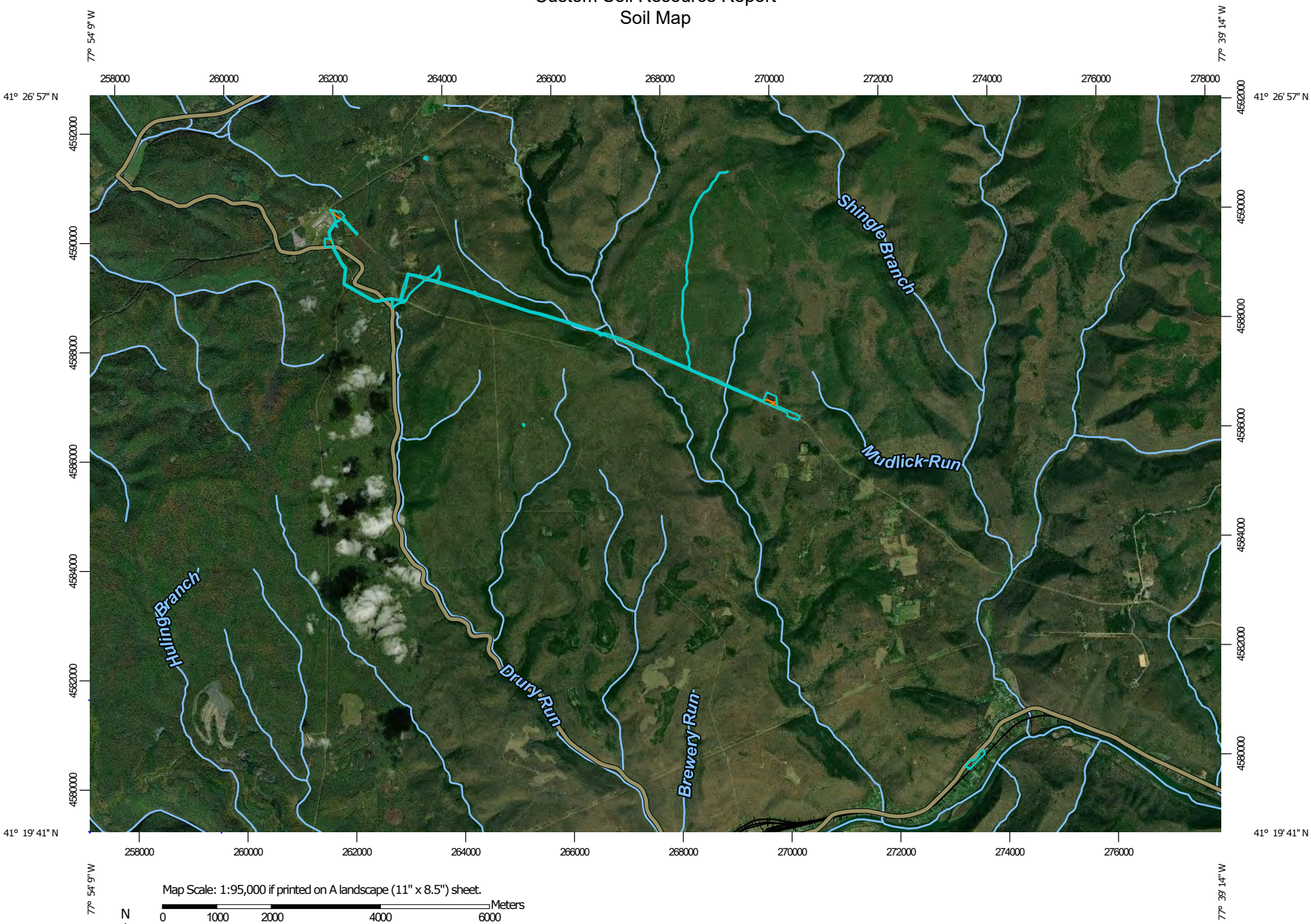
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



Map Scale: 1:95,000 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 1000 2000 4000 6000

Feet: 0 4500 9000 18000 27000

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Clinton County, Pennsylvania
Survey Area Data: Version 14, Sep 18, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Apr 4, 2012—Sep 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
At	Atkins silt loam, 0 to 3 percent slopes, frequently flooded	2.4	1.7%
CaB	Calvin channery silt loam, 3 to 8 percent slopes	1.0	0.7%
CfB	Clymer channery loam, 0 to 8 percent slopes, extremely stony	11.6	8.5%
CgB	Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony	12.5	9.2%
CpB	Cookport channery loam, 0 to 8 percent slopes, extremely stony	11.1	8.2%
CpD	Cookport channery loam, 8 to 25 percent slopes, extremely stony	13.4	9.9%
HmD	Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony	10.7	7.9%
HoF	Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony	36.6	27.0%
HuB	Hustontown silt loam, 3 to 8 percent slopes	6.4	4.7%
LdC	Laidig gravelly loam, 8 to 25 percent slopes, extremely stony	0.3	0.2%
Lr	Linden silt loam, rarely flooded	8.6	6.3%
MhD	Meckesville channery loam, 8 to 25 percent slopes, very stony	2.5	1.8%
UnB	Ungers loam, 3 to 8 percent slopes	9.4	6.9%
UpF	Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony	5.0	3.7%
WeB	Wharton silt loam, 0 to 8 percent slopes, very stony	4.1	3.0%
Totals for Area of Interest		**135.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps.

The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Clinton County, Pennsylvania

At—Atkins silt loam, 0 to 3 percent slopes, frequently flooded

Map Unit Setting

National map unit symbol: 2sfsp
Elevation: 550 to 2,790 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Atkins and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Atkins

Setting

Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Acid fine-loamy alluvium derived from sandstone and shale

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 8 inches: silt loam
Bg - 8 to 26 inches: loam
BCg - 26 to 38 inches: silt loam
Cg - 38 to 80 inches: gravelly sandy loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Frequent
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Philo

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Basher

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Linden

Percent of map unit: 5 percent
Landform: Flood plains
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Concave
Hydric soil rating: No

CaB—Calvin channery silt loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l801
Elevation: 300 to 2,800 feet
Mean annual precipitation: 34 to 50 inches
Mean annual air temperature: 45 to 57 degrees F
Frost-free period: 110 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Calvin and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Calvin

Setting

Landform: Ridges on valleys
Landform position (two-dimensional): Shoulder, summit
Landform position (three-dimensional): Crest

Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Acid reddish brown residuum weathered from shale and siltstone

Typical profile

A - 0 to 1 inches: channery silt loam
BE - 1 to 3 inches: very channery silt loam
Bw - 3 to 30 inches: very channery silt loam
R - 30 to 40 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Klinesville

Percent of map unit: 10 percent
Landform: Ridges, valleys
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Meckesville

Percent of map unit: 5 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hustontown

Percent of map unit: 5 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

CfB—Clymer channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80f
Elevation: 1,000 to 4,000 feet
Mean annual precipitation: 32 to 60 inches
Mean annual air temperature: 45 to 59 degrees F
Frost-free period: 110 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Hartleton

Percent of map unit: 5 percent
Landform: — error in exists on —
Landform position (two-dimensional): Shoulder, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Leetonia

Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

CgB—Clymer-Cookport channery loams, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l80g
Elevation: 1,000 to 2,500 feet
Mean annual precipitation: 35 to 60 inches

Mean annual air temperature: 41 to 62 degrees F
Frost-free period: 101 to 190 days
Farmland classification: Not prime farmland

Map Unit Composition

Clymer and similar soils: 40 percent
Cookport and similar soils: 35 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: channery loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Description of Cookport

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Residuum weathered from acid sandstone

Typical profile

A - 0 to 8 inches: channery loam

Bt - 8 to 22 inches: loam
Btx - 22 to 46 inches: loam
C - 46 to 54 inches: channery loam
R - 54 to 64 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 10.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 10 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Wharton

Percent of map unit: 10 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit
Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Dekalb

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Buchanan

Percent of map unit: 5 percent

Hydric soil rating: No

CpB—Cookport channery loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshh
Elevation: 910 to 2,620 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None

Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Head slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: Yes

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

CpD—Cookport channery loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2wshq
Elevation: 610 to 2,450 feet
Mean annual precipitation: 38 to 50 inches
Mean annual air temperature: 45 to 49 degrees F
Frost-free period: 126 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition

Cookport and similar soils: 80 percent
Minor components: 20 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Cookport

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Parent material: Acid fine-loamy residuum weathered from sandstone

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: channery loam
E - 4 to 8 inches: channery loam
Bt - 8 to 23 inches: channery loam
Btx - 23 to 40 inches: channery sandy clay loam
C - 40 to 46 inches: channery sandy loam
R - 46 to 56 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 16 to 30 inches to fragipan; 40 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.01 to 0.20 in/hr)
Depth to water table: About 15 to 21 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Clymer

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Andover

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope

Landform position (three-dimensional): Side slope, head slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: Yes

Hazleton

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Side slope, nose slope
Down-slope shape: Concave, linear
Across-slope shape: Linear
Hydric soil rating: No

Fenwick

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Mountaintop
Down-slope shape: Convex
Across-slope shape: Linear
Other vegetative classification: Acid Loams (AL3)
Hydric soil rating: No

HmD—Hazleton-Clymer channery loams, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l82t
Elevation: 800 to 4,000 feet
Mean annual precipitation: 32 to 55 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition

Hazleton and similar soils: 50 percent
Clymer and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Clymer

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and shale

Typical profile

A - 0 to 2 inches: loam
Bt - 2 to 28 inches: channery loam
C - 28 to 50 inches: channery sandy loam
R - 50 to 60 inches: bedrock

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Laidig
Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave

Wharton
Percent of map unit: 5 percent
Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve, side slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Unnamed
Percent of map unit: 5 percent
Hydric soil rating: No

Leetonia
Percent of map unit: 5 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, shoulder
Landform position (three-dimensional): Crest
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

HoF—Hazleton-Laidig complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting
National map unit symbol: l82w
Elevation: 800 to 2,900 feet
Mean annual precipitation: 34 to 60 inches
Mean annual air temperature: 46 to 59 degrees F
Frost-free period: 101 to 180 days
Farmland classification: Not prime farmland

Map Unit Composition
Hazleton and similar soils: 35 percent
Laidig and similar soils: 35 percent

Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hazleton

Setting

Landform: Mountains
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Mountaintop, upper third of mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone

Typical profile

A - 0 to 3 inches: channery sandy loam
Bw - 3 to 42 inches: channery sandy loam
C - 42 to 60 inches: very channery sandy loam
R - 60 to 68 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 68 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Laidig

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sandstone and shale

Typical profile

A - 0 to 3 inches: extremely stony loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock

Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Clymer
Percent of map unit: 10 percent
Hydric soil rating: No

Hapludults, nonstony
Percent of map unit: 10 percent
Hydric soil rating: No

Unnamed
Percent of map unit: 10 percent
Hydric soil rating: No

HuB—Hustontown silt loam, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: l835
Elevation: 600 to 2,800 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Hustontown and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hustontown

Setting
Landform: Valley sides
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Mountainbase

Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Red residuum weathered from sandstone and shale

Typical profile

Ap - 0 to 7 inches: silt loam
Bt - 7 to 24 inches: silt loam
Bt - 24 to 30 inches: channery silt loam
Btx - 30 to 65 inches: channery silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 18 to 32 inches to fragipan
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 12 to 26 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Ungers

Percent of map unit: 5 percent

Unnamed

Percent of map unit: 5 percent

Leck kill

Percent of map unit: 5 percent

LdC—Laidig gravelly loam, 8 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l83s

Elevation: 900 to 1,400 feet
Mean annual precipitation: 34 to 55 inches
Mean annual air temperature: 46 to 57 degrees F
Frost-free period: 110 to 170 days
Farmland classification: Not prime farmland

Map Unit Composition

Laidig and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Laidig

Setting

Landform: Mountain slopes, valley sides
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Convex
Parent material: Stony colluvium derived from sedimentary rock

Typical profile

A - 0 to 3 inches: gravelly loam
Bt - 3 to 34 inches: gravelly silt loam
Btx - 34 to 65 inches: very channery silty clay loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 50 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 27 to 47 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Buchanan

Percent of map unit: 10 percent
Hydric soil rating: No

Hazleton

Percent of map unit: 5 percent
Landform: Mountain slopes on mountains
Landform position (two-dimensional): Backslope, summit

Landform position (three-dimensional): Mountainflank, mountaintop, upper third of mountainflank
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Clymer
Percent of map unit: 5 percent
Hydric soil rating: No

Murrill
Percent of map unit: 5 percent
Hydric soil rating: No

Lr—Linden silt loam, rarely flooded

Map Unit Setting
National map unit symbol: l84b
Elevation: 520 to 1,000 feet
Mean annual precipitation: 32 to 45 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 140 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition
Linden and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Linden

Setting
Landform: Flood plains on river valleys
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium derived from sedimentary rock

Typical profile
Ap - 0 to 12 inches: silt loam
B - 12 to 48 inches: gravelly silt loam
C - 48 to 70 inches: sandy loam

Properties and qualities
Slope: 0 to 3 percent
Depth to restrictive feature: 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 36 to 72 inches

Frequency of flooding: Rare
Frequency of ponding: None
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Philo
Percent of map unit: 10 percent
Hydric soil rating: No

Barbour
Percent of map unit: 5 percent
Hydric soil rating: No

Basher
Percent of map unit: 5 percent
Hydric soil rating: No

MhD—Meckesville channery loam, 8 to 25 percent slopes, very stony

Map Unit Setting
National map unit symbol: l84q
Elevation: 700 to 1,100 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition
Meckesville and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Meckesville

Setting
Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile
A - 0 to 4 inches: channery loam

Bt - 4 to 35 inches: channery silt loam
Btx - 35 to 66 inches: channery silt loam

Properties and qualities

Slope: 8 to 25 percent
Percent of area covered with surface fragments: 3.0 percent
Depth to restrictive feature: 30 to 48 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 27 to 45 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Ungers

Percent of map unit: 10 percent
Hydric soil rating: No

Laidig

Percent of map unit: 5 percent
Landform: Mountains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

UnB—Ungers loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: l863
Elevation: 900 to 2,200 feet
Mean annual precipitation: 38 to 48 inches
Mean annual air temperature: 48 to 55 degrees F
Frost-free period: 110 to 170 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Ungers and similar soils: 75 percent
Minor components: 25 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope, shoulder
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from sandstone and siltstone

Typical profile

Ap - 0 to 9 inches: loam
Bt - 9 to 33 inches: channery clay loam
BC - 33 to 48 inches: very channery clay loam
R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Hydric soil rating: No

Minor Components

Meckesville

Percent of map unit: 10 percent
Hydric soil rating: No

Leck kill

Percent of map unit: 5 percent
Hydric soil rating: No

Hustontown

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

UpF—Ungers-Meckesville complex, 25 to 50 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: l869
Elevation: 900 to 2,200 feet
Mean annual precipitation: 34 to 48 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 101 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Ungers and similar soils: 50 percent
Meckesville and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Ungers

Setting

Landform: Mountain slopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Mountainflank
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Stony residuum weathered from sandstone and siltstone

Typical profile

A - 0 to 6 inches: very stony loam
Bt - 6 to 33 inches: very channery clay loam
BC - 33 to 48 inches: very channery clay loam
R - 48 to 58 inches: bedrock

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 40 to 60 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.20 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: B

Hydric soil rating: No

Description of Meckesville

Setting

Landform: Mountain valleys
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Lower third of mountainflank
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Sandstone, siltstone and shale colluvium derived from sedimentary rock

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 35 inches: channery silt loam
Btx - 35 to 66 inches: channery silt loam

Properties and qualities

Slope: 25 to 50 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 30 to 48 inches to fragipan; 61 to 120 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.60 in/hr)
Depth to water table: About 30 to 48 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

Minor Components

Leck kill

Percent of map unit: 10 percent
Hydric soil rating: No

Albrights

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

WeB—Wharton silt loam, 0 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: l86l
Elevation: 1,600 to 2,350 feet
Mean annual precipitation: 35 to 50 inches
Mean annual air temperature: 46 to 55 degrees F
Frost-free period: 110 to 160 days
Farmland classification: Not prime farmland

Map Unit Composition

Wharton and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Wharton

Setting

Landform: Ridges on plateaus
Landform position (two-dimensional): Summit, backslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave, convex
Parent material: Stony interbedded residuum weathered from shale and siltstone

Typical profile

A - 0 to 4 inches: silt loam
Bt - 4 to 20 inches: silt loam
Bt - 20 to 45 inches: channery silt loam
BC - 45 to 65 inches: very channery loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 61 to 72 inches to lithic bedrock
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 15 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Cookport

Percent of map unit: 10 percent
Landform: Ridges on plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Upper third of mountainflank
Down-slope shape: Concave, linear
Across-slope shape: Concave
Hydric soil rating: No

Tilsit

Percent of map unit: 5 percent
Hydric soil rating: No

Unnamed

Percent of map unit: 5 percent
Hydric soil rating: No

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ATTACHMENT 3

E&SC AND SR PLAN BMP DESIGN WORKSHEETS AND CALCULATIONS

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Attachment

3.1 Compost Filter Sock Worksheets (Standard E&S Worksheet #1)

3.2 Channel Design Worksheets (Standard E&S Worksheet #11)

3.3 Level Spreader Design Worksheet

3.4 Riprap Apron Worksheet (Standard E&S Worksheet #20)

ATTACHMENT 3.1
COMPOST FILTER SOCK WORKSHEETS

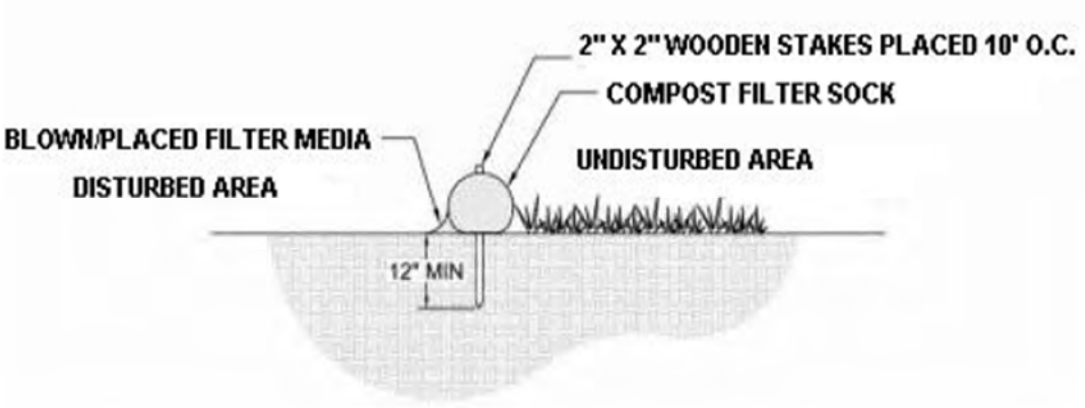
STANDARD E&S WORKSHEET #1
Compost Filter Socks

PROJECT NAME: Leidy South – Hensel Replacement

LOCATION: Hensel Replacement-ROW

PREPARED BY: FJ DATE: 7/26/2019

CHECKED BY: KCC DATE: 8/8/2019



SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 1	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 2	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 3	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 4	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 5	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 6	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 7	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 8	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 9	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 10	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 11	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 12	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 13	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 14	18	see map	4	384
CFS-HR 15	18	see map	4	384
CFS-HR 16	18	see map	4	384
CFS-HR 17	18	see map	4	384
CFS-HR 18	18	see map	4	384
CFS-HR 19	18	see map	4	384

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 20	18	see map	4	384
CFS-HR 21	18	see map	4	384
CFS-HR 22	18	see map	4	384
CFS-HR 23	18	see map	4	384
CFS-HR 24	18	see map	4	384
CFS-HR 25	18	see map	4	384
CFS-HR 26	18	see map	3	459
CFS-HR 27	18	see map	3	459
CFS-HR 28	18	see map	3	459
CFS-HR 29	18	see map	3	459
CFS-HR 30	18	see map	3	459
CFS-HR 31	18	see map	3	459
CFS-HR 32	18	see map	3	459
CFS-HR 33	18	see map	3	459
CFS-HR 34	12	see map	12	100
CFS-HR 35	12	see map	12	100
CFS-HR 36	12	see map	12	100
CFS-HR 37	12	see map	12	100
CFS-HR 38	12	see map	12	100
CFS-HR 39	12	see map	12	100
CFS-HR 40	12	see map	12	100
CFS-HR 41	12	see map	12	100
CFS-HR 42	32	see map, CSA018	6	566
CFS-HR 43	32	see map, CSA019	6	567
CFS-HR 44	32	see map, CSA019	6	567
CFS-HR 45	32	see map, CSA019	6	567
CFS-HR 46	32	see map, CSA019	6	567
CFS-HR 47	32	see map, CSA019	6	567
CFS-HR 48	32	see map, CSA019	6	567
CFS-HR 49	12	see map	12	100
CFS-HR 50	12	see map	12	100
CFS-HR 51	24	see map	6	376
CFS-HR 52	24	see map	6	376
CFS-HR 53	24	see map	6	376
CFS-HR 54	24	see map	6	376
CFS-HR 55	24	see map	6	376
CFS-HR 56	12	see map	9	127
CFS-HR 57	12	see map	9	127
CFS-HR 58	12	see map	9	127

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 59	12	see map	9	127
CFS-HR 60	12	see map	9	127
CFS-HR 61	12	see map	9	127
CFS-HR 62	12	see map	9	127
CFS-HR 63	12	see map	9	127
CFS-HR 64	18	see map	16	104
CFS-HR 65	18	see map	16	104
CFS-HR 66	18	see map	16	104
CFS-HR 67	18	see map	16	104
CFS-HR 68	18	see map	16	104
CFS-HR 69	18	see map	16	104
CFS-HR 70	18	see map	16	104
CFS-HR 71	12	see map	7	88
CFS-HR 72	18	see map	16	104
CFS-HR 73	18	see map	22	72
CFS-HR 74	18	see map	22	72
CFS-HR 75	18	see map	22	72
CFS-HR 76	18	see map	22	72
CFS-HR 77	18	see map	22	72
CFS-HR 78	12	see map	27	37
CFS-HR 79	12	see map	27	37
CFS-HR 79A	12	see map	17	30
CFS-HR 79B	18	see map	16	93
CFS-HR 79C	18	see map	16	93
CFS-HR 79D	18	see map	16	39
CFS-HR 80	18	see map	30	43
CFS-HR 81	18	see map	30	43
CFS-HR 82	12	see map	7	140
CFS-HR 83	12	see map	7	140
CFS-HR 84	12	see map	7	140
CFS-HR 85	12	see map	7	140
CFS-HR 86	12	see map	7	140
CFS-HR 87	12	see map	7	140
CFS-HR 88	12	see map	7	140
CFS-HR 89	12	see map	7	140
CFS-HR 90	12	see map	7	140
CFS-HR 91	12	see map	7	140
CFS-HR 92	12	see map	7	140
CFS-HR 93	12	see map	7	140

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 94	12	see map	6	131
CFS-HR 95	12	see map	6	131
CFS-HR 96	12	see map	6	131
CFS-HR 97	12	see map	6	131
CFS-HR 98	12	see map	6	131
CFS-HR 99	12	see map	3	126
CFS-HR 100	12	see map	3	126
CFS-HR 101	12	see map	3	126
CFS-HR 102	12	see map	9	89
CFS-HR 103	12	see map	9	89
CFS-HR 104	12	see map	9	89
CFS-HR 105	12	see map	9	89
CFS-HR 106	12	see map	9	89
CFS-HR 107	12	see map	9	89
CFS-HR 108	12	see map	9	89
CFS-HR 109	12	see map	9	89
CFS-HR 110	12	see map	9	89
CFS-HR 111	12	see map	9	89
CFS-HR 112	12	see map	9	89
CFS-HR 113	12	see map	9	89
CFS-HR 114	12	see map	9	89
CFS-HR 115	12	see map	10	135
CFS-HR 116	12	see map	10	135
CFS-HR 117	12	see map	10	135
CFS-HR 118	12	see map	3	126
CFS-HR 119	12	see map	3	126
CFS-HR 120	12	see map	3	126
CFS-HR 121	12	see map	9	89
CFS-HR 122	12	see map	9	89
CFS-HR 123	12	see map	9	89
CFS-HR 124	12	see map	9	89
CFS-HR 125	12	see map	9	89
CFS-HR 126	12	see map	9	89
CFS-HR 127	12	see map	9	89
CFS-HR 128	12	see map	9	89
CFS-HR 129	12	see map	9	89
CFS-HR 130	12	see map	9	89
CFS-HR 131	12	see map	9	89
CFS-HR 132	12	see map	12	121

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 133	12	see map	12	121
CFS-HR 134	12	see map	12	121
CFS-HR 135	12	see map	12	121
CFS-HR 136	12	see map	12	121
CFS-HR 137	12	see map	12	121
CFS-HR 138	12	see map	12	121
CFS-HR 139	12	see map	12	121
CFS-HR 140	12	see map	12	121
CFS-HR 141	12	see map	12	121
CFS-HR 142	12	see map	11	85
CFS-HR 143	12	see map	11	85
CFS-HR 144	12	see map	11	85
CFS-HR 145	12	see map	11	85
CFS-HR 145A	24	see map	24	143
CFS-HR 145B	24	see map	24	143
CFS-HR 145C	24	see map	24	143
CFS-HR 145D	12	see map	20	41
CFS-HR 145E	12	see map	20	41
CFS-HR 146	12	see map	11	85
CFS-HR 147	12	see map	11	85
CFS-HR 148	12	see map	11	85
CFS-HR 149	24	see map	24	143
CFS-HR 150	24	see map	24	143
CFS-HR 151	24	see map	24	143
CFS-HR 152	24	see map	24	143
CFS-HR 153	24	see map	24	143
CFS-HR 154	24	see map	24	143
CFS-HR 155	24	see map	24	143
CFS-HR 156	24	see map	24	143
CFS-HR 157	24	see map	24	143
CFS-HR 158	24	see map	24	143
CFS-HR 159	18	see map	20	137
CFS-HR 160	18	see map	20	137
CFS-HR 161	18	see map	20	137
CFS-HR 162	18	see map	20	137
CFS-HR 163	24	see map	37	65
CFS-HR 164	24	see map	37	65
CFS-HR 165	24	see map	37	65
CFS-HR 166	24	see map	37	65

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 167	24	see map	37	65
CFS-HR 168	24	see map	37	65
CFS-HR 169	24	see map	37	65
CFS-HR 170	24	see map	37	65
CFS-HR 171	24	see map	37	65
CFS-HR 172	24	see map	37	65
CFS-HR 173	24	see map	37	65
CFS-HR 174	24	see map	37	65
CFS-HR 175	24	see map	37	65
CFS-HR 176	24	see map	37	65
CFS-HR 177	24	see map	37	65
CFS-HR 178	24	see map	37	65
CFS-HR 179	24	see map	37	65
CFS-HR 180	24	see map	37	65
CFS-HR 181	24	see map	37	65
CFS-HR 182	24	see map	37	65
CFS-HR 183	24	see map	37	65
CFS-HR 184	24	see map	37	65
CFS-HR 185	24	see map	37	65
CFS-HR 186	24	see map	37	65
CFS-HR 187	24	see map	37	65
CFS-HR 188	24	see map	37	65
CFS-HR 189	24	see map	37	65
CFS-HR 190	24	see map	37	65
CFS-HR 191	24	see map	37	65
CFS-HR 192	24	see map	37	65
CFS-HR 193	24	see map	37	65
CFS-HR 194	24	see map	37	65
CFS-HR 195	24	see map	37	65
CFS-HR 196	24	see map	37	65
CFS-HR 197	24	see map	37	65
CFS-HR 198	24	see map	37	65
CFS-HR 199	24	see map	37	65
CFS-HR 200	24	see map	37	65
CFS-HR 201	24	see map	37	65
CFS-HR 202	24	see map	37	65
CFS-HR 203	24	see map	37	65
CFS-HR 204	24	see map	37	65
CFS-HR 205	24	see map	37	65

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 206	24	see map	37	65
CFS-HR 206A	24	see map	37	73
CFS-HR 206B	24	see map	37	73
CFS-HR 206C	24	see map	37	73
CFS-HR 206D	24	see map	37	73
CFS-HR 207	12	see map	34	35
CFS-HR 208	12	see map	34	35
CFS-HR 209	12	see map	34	35
CFS-HR 210	12	see map	34	35
CFS-HR 211	12	see map	34	35
CFS-HR 212	12	see map	34	35
CFS-HR 213	12	see map	34	35
CFS-HR 214	24	see map	36	84
CFS-HR 215	24	see map	36	84
CFS-HR 216	24	see map	36	84
CFS-HR 217	24	see map	36	84
CFS-HR 218	24	see map	44	66
CFS-HR 219	24	see map	44	66
CFS-HR 220	24	see map	44	66
CFS-HR 221	24	see map	44	66
CFS-HR 222	24	see map	44	66
CFS-HR 223	24	see map	33	90
CFS-HR 224	24	see map	33	90
CFS-HR 224A	24	see map	22	88
CFS-HR 224B	24	see map	22	88
CFS-HR 225	24	see map	33	90
CFS-HR 226	24	see map	33	90
CFS-HR 227	24	see map	33	90
CFS-HR 228	24	see map	33	90
CFS-HR 229	24	see map	33	90
CFS-HR 230	24	see map	33	90
CFS-HR 231	24	see map	33	90
CFS-HR 232	24	see map	33	90
CFS-HR 233	18	see map	20	118
CFS-HR 234	18	see map	20	118
CFS-HR 235	18	see map	20	118
CFS-HR 236	18	see map	20	118
CFS-HR 237	18	see map	20	118
CFS-HR 238	18	see map	18	111

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 239	18	see map	18	111
CFS-HR 240	18	see map	18	111
CFS-HR 241	18	see map	18	111
CFS-HR 242	18	see map	18	111
CFS-HR 243	18	see map	18	111
CFS-HR 244	18	see map	18	111
CFS-HR 245	18	see map	18	111
CFS-HR 246	18	see map	18	111
CFS-HR 247	18	see map	18	111
CFS-HR 248	18	see map	18	111
CFS-HR 249	18	see map	18	111
CFS-HR 250	18	see map	18	111
CFS-HR 251	32	see map, CSA020	18	120
CFS-HR 252	32	see map, CSA020	18	120
CFS-HR 253	18	see map	18	111
CFS-HR 254	18	see map	18	111
CFS-HR 255	18	see map	18	111
CFS-HR 256	18	see map	18	111
CFS-HR 257	18	see map	18	111
CFS-HR 257A	12	see map	30	30
CFS-HR 257B	12	see map	30	30
CFS-HR 257C	24	see map	wetland protection	
CFS-HR 257D	24	see map	wetland protection	
CFS-HR 257E	24	see map	wetland protection	
CFS-HR 258	24	see map	41	64
CFS-HR 259	24	see map	41	64
CFS-HR 260	24	see map	41	64
CFS-HR 261	24	see map	41	64
CFS-HR 262	24	see map	41	64
CFS-HR 263	24	see map	41	64
CFS-HR 264	24	see map	41	64
CFS-HR 265	24	see map	41	64
CFS-HR 266	24	see map	41	64
CFS-HR 267	24	see map	41	64
CFS-HR 268	18	see map	36	50
CFS-HR 269	18	see map	36	50
CFS-HR 270	18	see map	36	50
CFS-HR 271	18	see map	36	50
CFS-HR 272	18	see map	36	50

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 273	18	see map	36	50
CFS-HR 274	18	see map	36	50
CFS-HR 275	18	see map	36	50
CFS-HR 276	18	see map	36	50
CFS-HR 277	18	see map	36	50
CFS-HR 278	18	see map	33	72
CFS-HR 279	18	see map	33	72
CFS-HR 280	18	see map	33	72
CFS-HR 281	18	see map	33	72
CFS-HR 282	18	see map	33	72
CFS-HR 283	18	see map	33	72
CFS-HR 284	18	see map	33	72
CFS-HR 285	18	see map	33	72
CFS-HR 286	18	see map	33	72
CFS-HR 287	18	see map	33	72
CFS-HR 288	18	see map	33	72
CFS-HR 289	18	see map	33	72
CFS-HR 290	18	see map	33	72
CFS-HR 291	18	see map	33	72
CFS-HR 292	18	see map	33	72
CFS-HR 293	18	see map	33	72
CFS-HR 294	18	see map	33	72
CFS-HR 295	18	see map	33	72
CFS-HR 296	18	see map	33	72
CFS-HR 297	18	see map	33	72
CFS-HR 298	18	see map	33	72
CFS-HR 299	18	see map	33	72
CFS-HR 300	24	see map	33	86
CFS-HR 301	18	see map	41	58
CFS-HR 302	18	see map	41	58
CFS-HR 303	18	see map	41	58
CFS-HR 304	18	see map	41	58
CFS-HR 305	18	see map	41	58
CFS-HR 306	12	see map	11	79
CFS-HR 307	12	see map	11	79
CFS-HR 308	12	see map	11	79
CFS-HR 309	12	see map	11	79
CFS-HR 310	12	see map	11	79
CFS-HR 311	12	see map	11	79

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 312	12	see map	11	79
CFS-HR 313	12	see map	11	79
CFS-HR 314	12	see map	11	79
CFS-HR 315	12	see map	11	79
CFS-HR 316	12	see map	11	79
CFS-HR 317	18	see map	35	60
CFS-HR 318	18	see map	35	60
CFS-HR 319	18	see map	35	60
CFS-HR 320	18	see map	35	60
CFS-HR 321	18	see map	35	60
CFS-HR 322	18	see map	35	60
CFS-HR 323	18	see map	35	60
CFS-HR 324	18	see map	35	60
CFS-HR 325	18	see map	35	60
CFS-HR 326	24	see map	29	90
CFS-HR 327	24	see map	29	90
CFS-HR 328	24	see map	29	90
CFS-HR 329	24	see map	29	90
CFS-HR 330	24	see map	29	90
CFS-HR 331	24	see map	29	90
CFS-HR 332	24	see map	29	90
CFS-HR 333	24	see map	29	90
CFS-HR 334	24	see map	29	90
CFS-HR 335	24	see map	29	90
CFS-HR 336	24	see map	29	90
CFS-HR 337	24	see map	29	90
CFS-HR 338	24	see map	29	90
CFS-HR 339	24	see map	29	90
CFS-HR 340	24	see map	29	90
CFS-HR 341	24	see map	29	90
CFS-HR 342	24	see map	29	90
CFS-HR 343	24	see map	29	90
CFS-HR 344	24	see map	29	90
CFS-HR 345	24	see map	29	90
CFS-HR 346	24	see map	29	90
CFS-HR 347	24	see map	29	90
CFS-HR 348	24	see map	29	90
CFS-HR 349	24	see map	29	90
CFS-HR 350	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 351	24	see map	29	90
CFS-HR 352	24	see map	29	90
CFS-HR 353	24	see map	29	90
CFS-HR 354	24	see map	29	90
CFS-HR 355	24	see map	29	90
CFS-HR 356	24	see map	29	90
CFS-HR 357	24	see map	29	90
CFS-HR 358	24	see map	29	90
CFS-HR 359	24	see map	29	90
CFS-HR 360	24	see map	29	90
CFS-HR 361	24	see map	29	90
CFS-HR 362	24	see map	29	90
CFS-HR 363	24	see map	29	90
CFS-HR 364	24	see map	29	90
CFS-HR 365	24	see map	29	90
CFS-HR 366	24	see map	29	90
CFS-HR 367	24	see map	29	90
CFS-HR 368	24	see map	29	90
CFS-HR 369	24	see map	29	90
CFS-HR 370	24	see map	29	90
CFS-HR 371	24	see map	29	90
CFS-HR 372	24	see map	29	90
CFS-HR 373	24	see map	29	90
CFS-HR 374	24	see map	29	90
CFS-HR 375	24	see map	29	90
CFS-HR 376	24	see map	29	90
CFS-HR 377	24	see map	29	90
CFS-HR 378	24	see map	29	90
CFS-HR 379	24	see map	29	90
CFS-HR 380	24	see map	29	90
CFS-HR 381	24	see map	29	90
CFS-HR 382	24	see map	29	90
CFS-HR 383	24	see map	29	90
CFS-HR 384	24	see map	29	90
CFS-HR 385	24	see map	29	90
CFS-HR 386	24	see map	29	90
CFS-HR 387	24	see map	29	90
CFS-HR 388	24	see map	29	90
CFS-HR 389	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 390	24	see map	29	90
CFS-HR 391	32	see map	34	99
CFS-HR 392	32	see map	34	99
CFS-HR 393	32	see map	34	99
CFS-HR 394	32	see map	34	99
CFS-HR 395	32	see map	34	99
CFS-HR 396	32	see map	34	99
CFS-HR 397	32	see map	34	99
CFS-HR 398	32	see map	34	99
CFS-HR 399	32	see map	34	99
CFS-HR 400	32	see map	34	99
CFS-HR 401	32	see map	34	99
CFS-HR 402	32	see map	34	99
CFS-HR 403	32	see map	34	99
CFS-HR 404	32	see map	34	99
CFS-HR 405	32	see map	34	99
CFS-HR 406	32	see map	34	99
CFS-HR 407	32	see map	34	99
CFS-HR 408	32	see map	34	99
CFS-HR 409	32	see map	34	99
CFS-HR 410	32	see map	34	99
CFS-HR 411	32	see map	34	99
CFS-HR 412	32	see map	34	99
CFS-HR 413	32	see map	34	99
CFS-HR 414	32	see map	34	99
CFS-HR 415	32	see map	34	99
CFS-HR 416	32	see map	34	99
CFS-HR 417	32	see map	34	99
CFS-HR 418	32	see map	34	99
CFS-HR 419	32	see map	34	99
CFS-HR 420	32	see map	34	99
CFS-HR 421	32	see map	34	99
CFS-HR 422	32	see map	34	99
CFS-HR 423	32	see map	34	99
CFS-HR 424	32	see map	34	99
CFS-HR 425	32	see map	34	99
CFS-HR 426	32	see map	34	99
CFS-HR 427	32	see map	34	99
CFS-HR 428	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 429	18	see map	15	98
CFS-HR 430	18	see map	15	98
CFS-HR 431	18	see map	15	98
CFS-HR 432	18	see map	15	98
CFS-HR 433	18	see map	15	98
CFS-HR 434	18	see map	25	97
CFS-HR 435	18	see map	25	97
CFS-HR 436	18	see map	25	97
CFS-HR 437	18	see map	25	97
CFS-HR 438	18	see map	25	97
CFS-HR 439	18	see map	25	97
CFS-HR 440	18	see map	25	97
CFS-HR 441	18	see map	25	97
CFS-HR 442	18	see map	25	97
CFS-HR 443	18	see map	25	97
CFS-HR 444	18	see map	25	97
CFS-HR 445	18	see map	25	97
CFS-HR 446	18	see map	25	97
CFS-HR 447	18	see map	25	97
CFS-HR 448	18	see map	25	97
CFS-HR 449	18	see map	25	97
CFS-HR 450	18	see map	25	97
CFS-HR 451	18	see map	25	97
CFS-HR 452	18	see map	25	97
CFS-HR 453	18	see map	25	97
CFS-HR 454	18	see map	25	97
CFS-HR 455	18	see map	25	97
CFS-HR 456	18	see map	25	97
CFS-HR 457	18	see map	25	97
CFS-HR 458	18	see map	25	97
CFS-HR 459	18	see map	25	97
CFS-HR 460	18	see map	25	97
CFS-HR 461	18	see map	25	97
CFS-HR 462	18	see map	25	97
CFS-HR 463	18	see map	25	97
CFS-HR 464	18	see map	25	97
CFS-HR 465	24	see map	42	66
CFS-HR 466	24	see map	42	66
CFS-HR 467	24	see map	42	66

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 468	24	see map	42	66
CFS-HR 469	24	see map	42	66
CFS-HR 470	24	see map	42	66
CFS-HR 471	24	see map	42	66
CFS-HR 472	24	see map	42	66
CFS-HR 473	24	see map	42	66
CFS-HR 474	24	see map	42	66
CFS-HR 475	24	see map	42	66
CFS-HR 476	24	see map	42	66
CFS-HR 477	24	see map	42	66
CFS-HR 478	24	see map	42	66
CFS-HR 479	24	see map	42	66
CFS-HR 480	24	see map	42	66
CFS-HR 481	24	see map	42	66
CFS-HR 482	24	see map	42	66
CFS-HR 483	24	see map	42	66
CFS-HR 484	24	see map	42	66
CFS-HR 485	24	see map	42	66
CFS-HR 486	24	see map	42	66
CFS-HR 487	24	see map	42	66
CFS-HR 488	24	see map	42	66
CFS-HR 489	24	see map	42	66
CFS-HR 490	24	see map	42	66
CFS-HR 491	24	see map	42	66
CFS-HR 492	24	see map	42	66
CFS-HR 493	24	see map	42	66
CFS-HR 494	24	see map	42	66
CFS-HR 495	24	see map	42	66
CFS-HR 496	24	see map	42	66
CFS-HR 497	24	see map	42	66
CFS-HR 498	24	see map	42	66
CFS-HR 499	24	see map	42	66
CFS-HR 500	24	see map	42	66
CFS-HR 501	24	see map	42	66
CFS-HR 502	24	see map	42	66
CFS-HR 503	24	see map	42	66
CFS-HR 504	24	see map	42	66
CFS-HR 505	24	see map	42	66
CFS-HR 506	24	see map	42	66

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 507	24	see map	42	66
CFS-HR 508	24	see map	42	66
CFS-HR 509	24	see map	42	66
CFS-HR 510	24	see map	26	109
CFS-HR 511	24	see map	26	109
CFS-HR 512	24	see map	26	109
CFS-HR 513	24	see map	26	109
CFS-HR 514	24	see map	26	109
CFS-HR 515	24	see map	26	109
CFS-HR 516	24	see map	26	109
CFS-HR 517	24	see map	26	109
CFS-HR 518	24	see map	26	109
CFS-HR 519	24	see map	26	109
CFS-HR 520	24	see map	26	109
CFS-HR 521	24	see map	26	109
CFS-HR 522	24	see map	26	109
CFS-HR 523	24	see map	26	109
CFS-HR 524	24	see map	26	109
CFS-HR 525	24	see map	26	109
CFS-HR 526	24	see map	26	109
CFS-HR 527	24	see map	26	109
CFS-HR 528	24	see map	26	109
CFS-HR 529	24	see map	26	109
CFS-HR 530	24	see map	26	109
CFS-HR 531	24	see map	26	109
CFS-HR 532	24	see map	26	109
CFS-HR 533	18	see map	5	256
CFS-HR 534	18	see map	5	256
CFS-HR 535	18	see map	5	256
CFS-HR 536	18	see map	5	256
CFS-HR 537	18	see map	5	256
CFS-HR 538	18	see map	5	256
CFS-HR 539	18	see map	5	256
CFS-HR 540	18	see map	17	132
CFS-HR 541	18	see map	17	132
CFS-HR 542	18	see map	17	132
CFS-HR 543	18	see map	17	132
CFS-HR 544	18	see map	17	132
CFS-HR 545	18	see map	17	132

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 546	18	see map	17	132
CFS-HR 547	18	see map	17	132
CFS-HR 548	18	see map	17	132
CFS-HR 549	18	see map	17	132
CFS-HR 550	18	see map	17	132
CFS-HR 551	18	see map	17	132
CFS-HR 552	18	see map	17	132
CFS-HR 553	18	see map	17	132
CFS-HR 554	18	see map	17	132
CFS-HR 555	18	see map	17	132
CFS-HR 556	18	see map	17	132
CFS-HR 557	18	see map	17	132
CFS-HR 558	18	see map	17	132
CFS-HR 559	18	see map	17	132
CFS-HR 560	18	see map	17	132
CFS-HR 560A	18	see map	25	32
CFS-HR 560B	18	see map	25	32
CFS-HR 560C	18	see map	25	32
CFS-HR 561	18	see map	26	69
CFS-HR 562	18	see map	26	69
CFS-HR 563	18	see map	26	69
CFS-HR 564	18	see map	26	69
CFS-HR 564A	18	see map	25	56
CFS-HR 564B	18	see map	25	56
CFS-HR 564C	18	see map	25	56
CFS-HR 564D	18	see map	25	56
CFS-HR 565	18	see map	26	69
CFS-HR 566	18	see map	26	69
CFS-HR 567	18	see map	26	69
CFS-HR 568	18	see map	26	69
CFS-HR 569	18	see map	26	69
CFS-HR 570	18	see map	26	69
CFS-HR 571	18	see map	26	69
CFS-HR 572	18	see map	26	69
CFS-HR 573	18	see map	26	69
CFS-HR 574	12	see map	5	111
CFS-HR 575	12	see map	5	111
CFS-HR 576	12	see map	5	111
CFS-HR 577	12	see map	5	111

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 578	12	see map	5	111
CFS-HR 579	12	see map	5	111
CFS-HR 580	12	see map	5	111
CFS-HR 581	12	see map	7	98
CFS-HR 582	12	see map	7	98
CFS-HR 583	12	see map	7	98
CFS-HR 584	12	see map	7	98
CFS-HR 585	12	see map	7	98
CFS-HR 586	12	see map	7	98
CFS-HR 587	12	see map	7	98
CFS-HR 587A	12	see map	wetland protection	
CFS-HR 587B	12	see map	wetland protection	
CFS-HR 587C	24	see map	wetland protection	
CFS-HR 587D	24	see map	wetland protection	
CFS-HR 587E	24	see map	wetland protection	
CFS-HR 587F	12	see map	wetland protection	
CFS-HR 588	12	see map	7	98
CFS-HR 589	12	see map	7	99
CFS-HR 590	12	see map	7	90
CFS-HR 591	12	see map	12	117
CFS-HR 592	12	see map	12	117
CFS-HR 593	12	see map	12	117
CFS-HR 594	12	see map	12	117
CFS-HR 595	12	see map	12	117
CFS-HR 596	12	see map	12	117
CFS-HR 597	12	see map	12	117
CFS-HR 598	12	see map	12	117
CFS-HR 599	12	see map	12	117
CFS-HR 600	12	see map	12	117
CFS-HR 601	12	see map	12	117
CFS-HR 602	12	see map	12	117
CFS-HR 603	12	see map	12	117
CFS-HR 604	12	see map	12	117
CFS-HR 605	12	see map	12	117
CFS-HR 606	12	see map	12	117
CFS-HR 607	12	see map	12	117
CFS-HR 608	12	see map	12	117
CFS-HR 609	12	see map	12	117
CFS-HR 610	12	see map	12	117

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 611	12	see map	12	117
CFS-HR 612	12	see map	12	117
CFS-HR 613	12	see map	12	117
CFS-HR 614	12	see map	12	117
CFS-HR 615	18	see map	34	47
CFS-HR 616	18	see map	34	47
CFS-HR 617	18	see map	34	47
CFS-HR 618	18	see map	34	47
CFS-HR 619	18	see map	34	47
CFS-HR 620	18	see map	42	52
CFS-HR 621	18	see map	42	52
CFS-HR 622	18	see map	42	52
CFS-HR 623	18	see map	42	52
CFS-HR 624	18	see map	42	52
CFS-HR 625	18	see map	42	52
CFS-HR 626	18	see map	42	52
CFS-HR 627	18	see map	42	52
CFS-HR 628	18	see map	42	52
CFS-HR 629	18	see map	42	52
CFS-HR 630	18	see map	42	52
CFS-HR 631	18	see map	42	52
CFS-HR 632	18	see map	42	52
CFS-HR 633	18	see map	42	52
CFS-HR 634	18	see map	28	71
CFS-HR 635	18	see map	28	71
CFS-HR 636	18	see map	28	71
CFS-HR 637	18	see map	28	71
CFS-HR 638	18	see map	28	71
CFS-HR 639	18	see map	28	71
CFS-HR 640	18	see map	28	71
CFS-HR 641	18	see map	28	71
CFS-HR 642	18	see map	28	71
CFS-HR 643	18	see map	28	71
CFS-HR 644	18	see map	28	71
CFS-HR 645	18	see map	28	71
CFS-HR 646	18	see map	28	71
CFS-HR 647	18	see map	28	71
CFS-HR 648	24	see map	29	90
CFS-HR 649	24	see map	29	90

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 650	24	see map	29	90
CFS-HR 651	24	see map	29	90
CFS-HR 652	24	see map	29	90
CFS-HR 653	24	see map	29	90
CFS-HR 654	24	see map	29	90
CFS-HR 655	24	see map	29	90
CFS-HR 656	24	see map	29	90
CFS-HR 657	24	see map	29	90
CFS-HR 658	24	see map	29	90
CFS-HR 659	24	see map	29	90
CFS-HR 660	24	see map	29	90
CFS-HR 661	24	see map	29	90
CFS-HR 662	24	see map	29	90
CFS-HR 663	24	see map	29	90
CFS-HR 664	24	see map	29	90
CFS-HR 665	24	see map	29	90
CFS-HR 666	24	see map	29	90
CFS-HR 667	18	see map	41	54
CFS-HR 668	18	see map	41	54
CFS-HR 669	18	see map	41	54
CFS-HR 670	18	see map	41	54
CFS-HR 671	18	see map	41	54
CFS-HR 672	18	see map	41	54
CFS-HR 673	18	see map	41	54
CFS-HR 674	18	see map	41	54
CFS-HR 675	18	see map	41	54
CFS-HR 676	18	see map	41	54
CFS-HR 677	18	see map	41	54
CFS-HR 678	18	see map	41	54
CFS-HR 679	18	see map	41	54
CFS-HR 680	18	see map	41	54
CFS-HR 681	18	see map	41	54
CFS-HR 682	18	see map	41	54
CFS-HR 683	18	see map	41	54
CFS-HR 684	18	see map	41	54
CFS-HR 685	18	see map	41	54
CFS-HR 686	18	see map	41	54
CFS-HR 687	18	see map	41	54
CFS-HR 688	18	see map	41	54

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 689	18	see map	41	54
CFS-HR 690	18	see map	41	54
CFS-HR 691	18	see map	41	54
CFS-HR 692	18	see map	41	54
CFS-HR 693	18	see map	41	54
CFS-HR 694	18	see map	41	54
CFS-HR 695	18	see map	41	54
CFS-HR 696	18	see map	41	54
CFS-HR 697	18	see map	41	54
CFS-HR 698	18	see map	41	54
CFS-HR 699	18	see map	41	54
CFS-HR 700	18	see map	41	54
CFS-HR 701	18	see map	41	54
CFS-HR 702	18	see map	41	54
CFS-HR 703	18	see map	41	54
CFS-HR 704	18	see map	41	54
CFS-HR 705	18	see map	41	54
CFS-HR 706	18	see map	41	54
CFS-HR 707	18	see map	41	54
CFS-HR 708	18	see map	41	54
CFS-HR 709	18	see map	41	54
CFS-HR 710	18	see map	41	54
CFS-HR 711	18	see map	41	54
CFS-HR 712	18	see map	41	54
CFS-HR 713	18	see map	41	54
CFS-HR 714	18	see map	41	54
CFS-HR 715	18	see map	41	54
CFS-HR 716	18	see map	41	54
CFS-HR 717	18	see map	41	54
CFS-HR 718	18	see map	41	54
CFS-HR 719	18	see map	41	54
CFS-HR 720	18	see map	41	54
CFS-HR 721	18	see map	16	137
CFS-HR 722	18	see map	16	137
CFS-HR 723	18	see map	16	137
CFS-HR 724	18	see map	16	137
CFS-HR 725	18	see map	16	137
CFS-HR 726	18	see map	16	137
CFS-HR 727	18	see map	16	137

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 728	18	see map	16	137
CFS-HR 729	18	see map	16	137
CFS-HR 730	18	see map	16	137
CFS-HR 731	18	see map	16	137
CFS-HR 732	18	see map	16	137
CFS-HR 733	18	see map	16	137
CFS-HR 734	18	see map	16	137
CFS-HR 735	18	see map	16	137
CFS-HR 736	18	see map	16	137
CFS-HR 737	18	see map	16	137
CFS-HR 738	18	see map	16	137
CFS-HR 739	18	see map	16	137
CFS-HR 740	18	see map	16	137
CFS-HR 741	18	see map	16	137
CFS-HR 742	18	see map	16	137
CFS-HR 743	18	see map	16	137
CFS-HR 744	18	see map	16	137
CFS-HR 745	18	see map	16	137
CFS-HR 746	18	see map	16	137
CFS-HR 747	18	see map	16	137
CFS-HR 748	18	see map	16	137
CFS-HR 749	18	see map	16	137
CFS-HR 750	18	see map	16	137
CFS-HR 751	18	see map	16	137
CFS-HR 752	18	see map	16	137
CFS-HR 753	18	see map	16	137
CFS-HR 754	18	see map	16	137
CFS-HR 755	18	see map	16	137
CFS-HR 756	18	see map	16	137
CFS-HR 757	18	see map	16	137
CFS-HR 758	18	see map	16	137
CFS-HR 759	18	see map	16	137
CFS-HR 760	32	see map	16	281
CFS-HR 761	32	see map	16	281
CFS-HR 762	32	see map	16	281
CFS-HR 763	32	see map	16	281
CFS-HR 764	32	see map	16	281
CFS-HR 765	32	see map	16	281
CFS-HR 766	32	see map	16	281

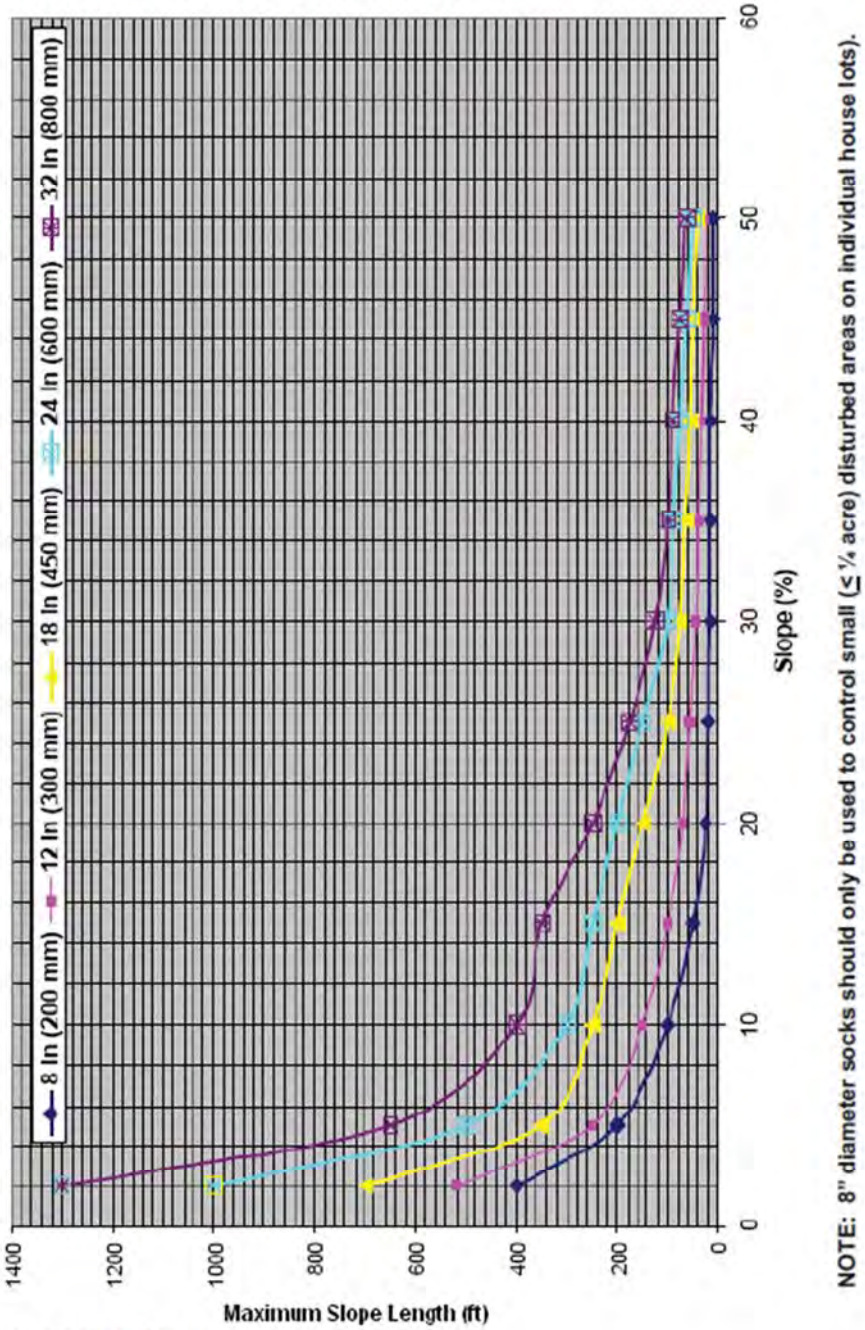
STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 767	32	see map	16	281
CFS-HR 768	32	see map	16	281
CFS-HR 769	32	see map	16	281
CFS-HR 770	32	see map	16	281
CFS-HR 771	32	see map	16	281
CFS-HR 772	32	see map	16	281
CFS-HR 773	32	see map	16	281
CFS-HR 774	32	see map	16	281
CFS-HR 775	32	see map	16	281
CFS-HR 776	32	see map	16	281
CFS-HR 777	32	see map	16	281
CFS-HR 778	32	see map	16	281
CFS-HR 779	32	see map, CSA021	5	546
CFS-HR 780	32	see map, CSA021	5	546
CFS-HR 781	32	see map, CSA021	5	546
CFS-HR 782	32	see map, CSA021	5	546
CFS-HR 783	32	see map, CSA021	5	546
CFS-HR 784	32	see map, CSA021	5	546
CFS-HR 785	18	see map	wetland protection	
CFS-HR 786	18	see map	wetland protection	
CFS-HR 787	32	see map	5	546
CFS-HR 788	32	see map	5	546
CFS-HR 789	32	see map	5	546
CFS-HR 790	32	see map	5	546
CFS-HR 791	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 792	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 793	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 794	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 795	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 796	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 797	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 798	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 799	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 800	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 801	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 802	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 803	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 804	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 805	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 806	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 807	18	see map, Western Terminus Valve Yard	15	119

STANDARD E&S WORKSHEET #1
Compost Filter Socks

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 808	12	see map	2	45
CFS-HR 809	12	see map	6	152
CFS-HR 810	24	see map	8	340
CFS-HR 811	24	see map	8	340
CFS-HR 812	24	see map	8	340
CFS-HR 813	24	Along the west of Paddy Run Road	6	226
CFS-HR 814	24	Along the east of Paddy Run Road	4	486
CFS-HR 815	24	See map, CY003	1	983
CFS-HR 816	24	See map, CY003	1	983

FIGURE 4.2
MAXIMUM PERMISSIBLE SLOPE LENGTH ABOVE COMPOST FILTER SOCKS



NOTE: 8" diameter socks should only be used to control small (≤ ¼ acre) disturbed areas on individual house lots).

Adapted from Filtrexx

ATTACHMENT 3.2
CHANNEL DESIGN WORKSHEETS

STANDARD E&S WORKSHEET # 11
Channel Design Data

PROJECT NAME: Leidy South-Hensel Replacement Pipeline Clean Water Crossing Prepared by: FJ, 7/2019
LOCATION: Clinton County, Pennsylvania Checked by: KCC, 7/2019

CHANNEL OR CHANNEL SECTION		HR1-1	HR1-2	HR2	HR3-1	HR3-2
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	61.287	61.133	0.239	7.484	7.24
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	59.43	59.28	0.16	2.68	5
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	61.5	60.7	1.5	3.89	6.30
PROTECTIVE LINING[2]		R-6 Riprap	R-6 Riprap	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.0594	0.0601	0.036	0.036	0.025
V_a (ALLOWABLE VELOCITY)	(FPS)	13.0	13.0	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.6	4.8	3.1	3.0	3.3
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	4.0	4.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	3.4	3.7	0.8	0.7	0.4
CHANNEL BOTTOM WIDTH	(FT)	4	4	2	2	2
CHANNEL SIDE SLOPES	(H:V)	3	3	2	2	2
D (TOTAL DEPTH)	(FT)	2.25	2.25	0.75	1	1.25
CHANNEL TOP WIDTH @ D	(FT)	17.5	17.5	5	6	7
d (CALCULATED FLOW DEPTH)	(FT)	1.55	1.5	0.2	0.45	0.6
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	13.3	13.0	2.8	3.8	4.4
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	2.58	2.67	10	4.4	3.3
d_{50} STONE SIZE	(IN)	12	12	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	13.41	12.75	0.48	1.305	1.92
R (HYDRAULIC RADIUS)		0.971	0.945	0.17	0.325	0.41
S (BED SLOPE)[3]	(FT/FT)	0.035	0.040	0.062	0.023	0.01
S_c (CRITICAL SLOPE)	(FT/FT)	0.054	0.056	0.035	0.029	0.013
$.7S_c$	(FT/FT)	0.038	0.039	0.025	0.0203	0.0091
$1.3S_c$	(FT/FT)	0.070	0.072	0.046	0.0377	0.0169
STABLE FLOW?	(Y/N)	Y	N	Y	N	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	0.5	--	0.1	0.15
FREEBOARD BASED ON STABLE FLOW	(FT)	0.4	--	0.1	--	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING [5]		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR4	HR5-1	HR5-2	HR6	HR7
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	7.42	13.032	15.936	7.551	2.794
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	4.08	5.27	4.52	2.39	1.29
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	6.73	8.05	6.64	4.16	3.04
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.025	0.025	0.025	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.9	4.7	3.9	3.7	2.7
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.5	0.8	0.5	1.0	0.5
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.25	1.25	1.25	1	1
CHANNEL TOP WIDTH @ D	(FT)	7	7	7	6	6
d (CALCULATED FLOW DEPTH)	(FT)	0.55	0.55	0.55	0.4	0.4
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.2	4.2	4.2	3.6	3.6
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	3.6	3.6	3.6	5.0	5.0
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.705	1.705	1.705	1.12	1.12
R (HYDRAULIC RADIUS)		0.382	0.382	0.382	0.296	0.296
S (BED SLOPE)[3]	(FT/FT)	0.016	0.023	0.015	0.041	0.022
S_c (CRITICAL SLOPE)	(FT/FT)	0.013	0.013	0.013	0.03	0.03
$.7S_c$	(FT/FT)	0.0091	0.0091	0.0091	0.021	0.021
$1.3S_c$	(FT/FT)	0.0169	0.0169	0.0169	0.039	0.039
STABLE FLOW?	(Y/N)	N	Y	N	Y	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.2	--	0.2	--	0.1
FREEBOARD BASED ON STABLE FLOW	(FT)	--	0.1	--	0.1	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR8	HR9	HR10	HR11	HR12
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	0.454	0.56	8.121	1.629	0.92
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.22	0.29	12.99	3.14	0.54
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.07	2.07	13.1	3.30	1.8
PROTECTIVE LINING[2]		ECM	ECM	R-6 Riprap	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.097	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	13.0	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.3	4.3	2.9	5.1	3.7
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	4.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.5	1.5	3.4	1.98	1.1
CHANNEL BOTTOM WIDTH	(FT)	2	2	6	2.5	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	0.75	0.75	1.25	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	5	5	11	5.5	5
d (CALCULATED FLOW DEPTH)	(FT)	0.2	0.2	0.62	0.22	0.2
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.8	2.8	8.5	3.4	2.8
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	10	10	9.7	11.4	10
d_{50} STONE SIZE	(IN)	--	--	12.0	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.48	0.48	4.49	0.65	0.48
R (HYDRAULIC RADIUS)		0.166	0.166	0.512	0.186	0.166
S (BED SLOPE)[3]	(FT/FT)	0.12	0.12	0.089	0.144	0.088
S_c (CRITICAL SLOPE)	(FT/FT)	0.035	0.035	0.177	0.034	0.035
$.7S_c$	(FT/FT)	0.0245	0.0245	0.124	0.0238	0.025
$1.3S_c$	(FT/FT)	0.0455	0.0455	0.230	0.0442	0.046
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.2	0.1	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S	S	S	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR13	HR14	HR15	HR16-1	HR16-2
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	9.901	14.022	14.309	14.756	11.13
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	4.49	6.59	5.43	8.52	4.13
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	7.5	7.3	6.8	10.7	4.6
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.025	0.025	0.036	0.025	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.8	4.8	4.6	4.5	5.1
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.8	0.8	1.5	0.7	1.95
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.25	1.25	1	1.25	1
CHANNEL TOP WIDTH @ D	(FT)	7	7	6	7	6
d (CALCULATED FLOW DEPTH)	(FT)	0.51	0.51	0.5	0.7	0.34
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.0	4.0	4	4.8	3.4
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	3.9	3.9	4	2.9	5.9
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.54	1.54	1.5	2.38	0.91
R (HYDRAULIC RADIUS)		0.36	0.36	0.354	0.464	0.259
S (BED SLOPE)[3]	(FT/FT)	0.026	0.025	0.049	0.016	0.092
S_c (CRITICAL SLOPE)	(FT/FT)	0.014	0.014	0.028	0.013	0.031
$.7S_c$	(FT/FT)	0.010	0.010	0.020	0.0091	0.022
$1.3S_c$	(FT/FT)	0.018	0.018	0.036	0.0169	0.0403
STABLE FLOW?	(Y/N)	Y	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	0.2	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.1	--	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR17	HR18-1	HR18-2	HR19	H20
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	19.175	14.089	14.089	2.994	0.97
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	11.1	10.4	10.4	1.07	0.53
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	12.1	12.4	12.4	1.72	1.59
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	5.9	4.6	4.6	3.6	3.3
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.9	1.5	1.6	1.0	1.0
CHANNEL BOTTOM WIDTH	(FT)	5	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.00	1.0	1.0	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	9	6	6	5	5
d (CALCULATED FLOW DEPTH)	(FT)	0.42	0.5	0.5	0.2	0.2
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	6.7	4.0	4.0	2.8	2.8
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	11.9	4.0	4.0	10	10
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.45	1.5	1.5	0.48	0.48
R (HYDRAULIC RADIUS)		0.357	0.354	0.354	0.166	0.166
S (BED SLOPE)[3]	(FT/FT)	0.073	0.049	0.049	0.083	0.071
S_c (CRITICAL SLOPE)	(FT/FT)	0.027	0.028	0.028	0.035	0.035
$.7S_c$	(FT/FT)	0.019	0.020	0.020	0.0245	0.0245
$1.3S_c$	(FT/FT)	0.035	0.037	0.037	0.0455	0.0455
STABLE FLOW?	(Y/N)	Y	Y	Y	Y	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	--	--	--	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	0.1	0.1	0.1	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR21-1	HR21-2	HR22	HR23	HR24
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr	10 yr	10 yr
ACRES	(AC)	14.5	0.40	3.55	4.22	1.20
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	14.5	0.82	4.60	1.74	0.52
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	17.3	1.6	5.3	3.0	1.3
PROTECTIVE LINING[2]		ECM	ECM	ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.025	0.036	0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.3	3.4	3.1	3.0	1.6
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6	0.9	0.3	0.7	0.2
CHANNEL BOTTOM WIDTH	(FT)	2	2	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2	2	2
D (TOTAL DEPTH)	(FT)	1.5	0.75	1.25	1.0	1.0
CHANNEL TOP WIDTH @ D	(FT)	8	5	7	6	6
d (CALCULATED FLOW DEPTH)	(FT)	1.0	0.2	0.55	0.35	0.30
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	6	2.8	4.2	3.4	3.2
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	2.0	10	3.64	5.7	6.7
d_{50} STONE SIZE	(IN)	--	--	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	4.0	0.48	1.71	0.945	0.78
R (HYDRAULIC RADIUS)		0.618	0.166	0.382	0.265	0.233
S (BED SLOPE)[3]	(FT/FT)	0.010	0.071	0.01	0.034	0.011
S_c (CRITICAL SLOPE)	(FT/FT)	0.012	0.035	0.013	0.031	0.032
$.7S_c$	(FT/FT)	0.008	0.0245	0.009	0.022	0.022
$1.3S_c$	(FT/FT)	0.016	0.0455	0.055	0.040	0.042
STABLE FLOW?	(Y/N)	N	Y	Y	N	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	0.3	--	--	0.1	--
FREEBOARD BASED ON STABLE FLOW	(FT)	--	0.1	0.1	--	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

CHANNEL OR CHANNEL SECTION		HR25	HR26	HR27
TEMPORARY OR PERMANENT?	(T OR P)	T	T	T
DESIGN STORM	(2, 5, OR 10 YR)	10 yr	10 yr	10 yr
ACRES	(AC)	3.97	2.38	1.14
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A	N/A	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	2.62	0.93	0.46
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.8	1.6	1.4
PROTECTIVE LINING[2]		ECM	ECM	ECM
n (MANNING'S COEFFICIENT)[2]		0.036	0.036	0.036
V_a (ALLOWABLE VELOCITY)	(FPS)	6.8	6.8	6.8
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.9	1.6	2.2
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	2.0	2.0	2.0
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	1.8	0.5	0.4
CHANNEL BOTTOM WIDTH	(FT)	2	2	2
CHANNEL SIDE SLOPES	(H:V)	2	2	2
D (TOTAL DEPTH)	(FT)	1.0	0.75	0.75
CHANNEL TOP WIDTH @ D	(FT)	6	5	5
d (CALCULATED FLOW DEPTH)	(FT)	0.30	0.25	0.25
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.2	3.0	3.0
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	6.7	8.0	8.0
d_{50} STONE SIZE	(IN)	--	--	--
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.78	0.625	0.625
R (HYDRAULIC RADIUS)		0.233	0.200	0.200
S (BED SLOPE)[3]	(FT/FT)	0.097	0.034	0.025
S_c (CRITICAL SLOPE)	(FT/FT)	0.032	0.033	0.033
$.7S_c$	(FT/FT)	0.022	0.023	0.0231
$1.3S_c$	(FT/FT)	0.042	0.043	0.043
STABLE FLOW?	(Y/N)	Y	N	N
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--	0.1	0.04
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1	--	--
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5	0.5	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

STANDARD E&S WORKSHEET # 11
Channel Design Data for Mountable Berms**

PROJECT NAME: Leidy South-Hensel Replacement Western Terminus Main Line Valve
Prepared by: FPV, 8/2019
LOCATION: Clinton County, Pennsylvania Checked by: KCC, 8/2019

CHANNEL OR CHANNEL SECTION		MB-2
TEMPORARY OR PERMANENT?	(T OR P)	P
DESIGN STORM	(2, 5, OR 10 YR)	10 yr
ACRES	(AC)	1.37
MULTIPLIER	(1.6, 2.25, or 2.75)[1]	N/A
Q_r (REQUIRED CAPACITY)	(CFS)	0.88
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.2
PROTECTIVE LINING[2]		Grass
n (MANNING'S COEFFICIENT)[2]		0.15
V_a (ALLOWABLE VELOCITY)	(FPS)	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	0.6
τ_a (MAX ALLOWABLE SHEAR STRESS)	(LB/FT^2)	--
τ_d (CALC'D SHEAR STRESS AT FLOW DEPTH d)	(LB/FT^2)	0.6
CHANNEL BOTTOM WIDTH	(FT)	--
CHANNEL SIDE SLOPES	(H:V)	2 and 10
D (TOTAL DEPTH)	(FT)	0.6
CHANNEL TOP WIDTH @ D	(FT)	4.4
d (CALCULATED FLOW DEPTH)	(FT)	1.10
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.40
BOTTOM WIDTH: FLOW DEPTH RATIO	(12:1 MAX)	--
d_{50} STONE SIZE	(IN)	N/A
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.160
R (HYDRAULIC RADIUS)		0.293
S (BED SLOPE)[3]	(FT/FT)	0.016
S_c (CRITICAL SLOPE)	(FT/FT)	0.505
$.7S_c$	(FT/FT)	0.353
$1.3S_c$	(FT/FT)	0.656
STABLE FLOW?	(Y/N)	Y
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	--
FREEBOARD BASED ON STABLE FLOW	(FT)	0.1
MINIMUM REQUIRED FREEBOARD[4]	(FT)	0.5
DESIGN METHOD FOR PROTECTIVE LINING[5] PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V

1. Use 1.6 for Temporary Channels; 2.25 for Temporary Channels in Special Protection (HQ or EV) Watersheds; 2.75 for Permanent Channels. For Rational Method, enter "N/A" and attach E&S Worksheets 9 and 10. For TR-55 enter "N/A" and attach appropriate Worksheets.
2. Adjust "n" value for changes in channel liner and flow depth. For vegetated channels, provide data for manufactured linings without vegetation and with vegetation in separate columns.
3. Slopes may not be averaged.
4. Minimum Freeboard is 0.5 ft. or ¼ Total Channel Depth, whichever is greater
5. Permissible velocity lining design method is not acceptable for channels with a bed slope of 10% or greater. Shear stress lining design method is required for channels with a bed slope of 10% or greater. Shear stress lining design method may be used for any channel bed slope.

** Mountable Berms are designed as V-channels with zero bottom width

ATTACHMENT 3.3
LEVEL SPREADER DESIGN WORKSHEET

LEIDY SOUTH PROJECT

HENSEL REPLACEMENT WESTERN TERMINUS MAIN LINE VALVE

LEVEL SPREADER DESIGN

NUMBER OF SLOPE PIPES	SLOPE PIPE DIAMETER (IN)	FLOW, Q (CFS)	STATIC HEAD (FT)	MAJOR LOSSES (DUE TO FRICTION) AND MINOR LOSSES	EFFECTIVE HEAD (FT)	LEVEL SPREADER PIPE DIAMETER (IN)	PERFORATION DIAMETER (IN)	NUMBER OF PERFORATIONS PER LINERAR FOOT OF PIPE	ORIFICE AREA (FT^2)	ORIFICE COEFFICIENT (C_d)	Q_O (PERFORATION FLOW RATE, CFS)	Q_L, DISCHARGE PER LINEAR FOOT (CFS/FT)	REQUIRED LENGTH (FT)	ACTUAL LENGTH (FT)	OVERALL LEVEL SPREADER CAPACITY (CFS)
1	12	1.27	10	4.538	5.462	12	0.375	36	7.7E-04	0.60	0.0086	0.311	4.08951	10	3.1

The Hazen-Williams formula was used to determine friction loss in the piping system under various flow conditions.

Hazen-Williams Formula:

$f = 0.2083\ ((100^* G)/C)^{1.852}(1/d)^{4.8655}$

f = Friction head in feet of water per 100 feet.

d = Inside diameter of pipe in inches.

G = Flow in gallons per minute

C = Constant for inside roughness of pipe (Use C = 60)

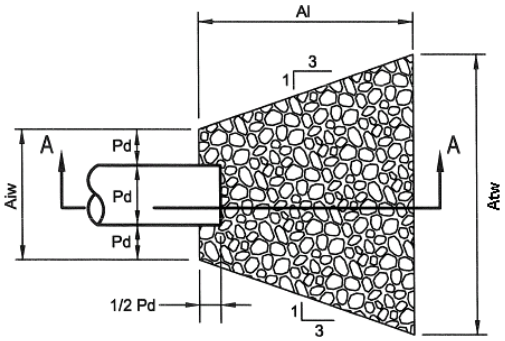
L_1 = 196 ft

Flow GPM	**C Roughness Coefficient**	**d Inside Pipe Diameter**	**Constant**	**$(100G)/C)^{1.852}$**	**$(1/d)^{4.8655}$**	**f Friction Loss per 100 ft**	**Length 100 ft**	**Minor Losses Equivalent Length 100 ft**	**Total Length 100 ft**	**Friction Loss ft**	**Velocity check**
3000	140	12	0.2083	1475704.636	5.6136E-06	1.7256	1.96	0.6700	2.6300	4.538	8.510959524

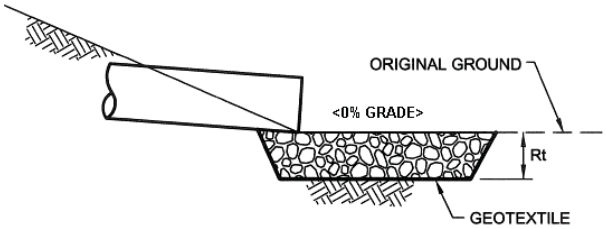
ATTACHMENT 3.4
RIPRAP APRON WORKSHEET

STANDARD E&S WORKSHEET # 20
Riprap Apron Outlet Protection

PROJECT NAME: Leidy South – Hensel Replacement
LOCATION: Hensel Replacement – Western Terminus Main Line Valve
PREPARED BY: LSD DATE: 6/17/2019
CHECKED BY: KCC DATE: 6/17/2019



PLAN VIEW

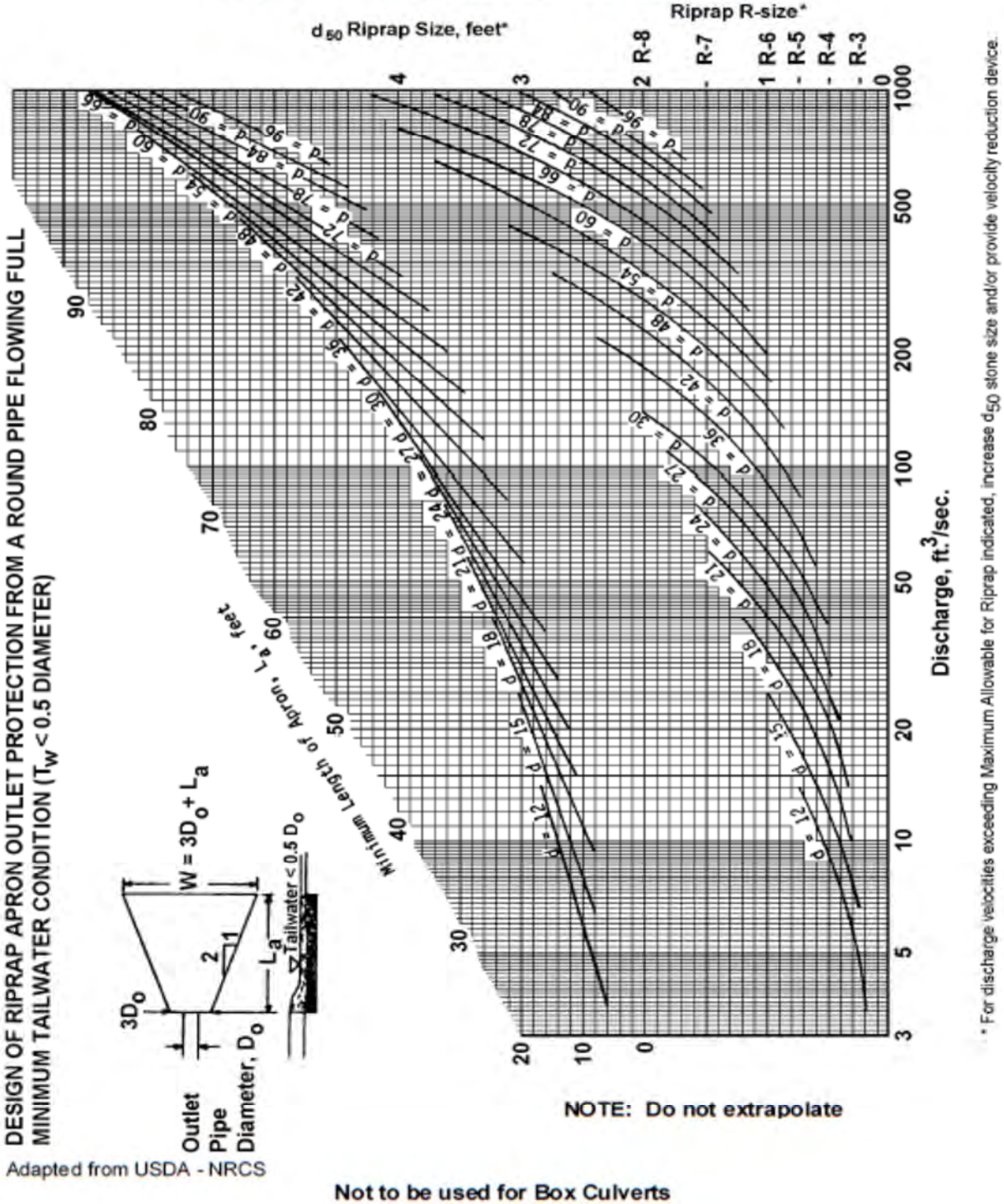


SECTION A - A

NO.	PIPE DIA. Do (in.)	TAIL WATER COND. (Max or Min)	MAN. "n" FOR PIPE	PIPE SLOPE (FT/FT)	Q (CFS)	V* (FPS)	RIPRAP SIZE	Rt (in)	Al (ft)	Aiw (ft)	Atw (ft)
HR31-pipe	12	Min	0.015	0.077	2.2	8.0	R-4	18	8	6	14

***:The anticipated velocity (V) should not exceed the maximum permissible shown in Table 6.6 for the proposed riprap protection. Adjust for less than full pipe flow. Use Manning's equation to calculate velocity for pipe slopes ≥ 0.05 ft/ft.**

FIGURE 9.3
Riprap Apron Design, Minimum Tailwater Condition



* For discharge velocities exceeding Maximum Allowable for Riprap indicated, increase d_{50} stone size and/or provide velocity reduction device.

Adapted from USDA - NRCS

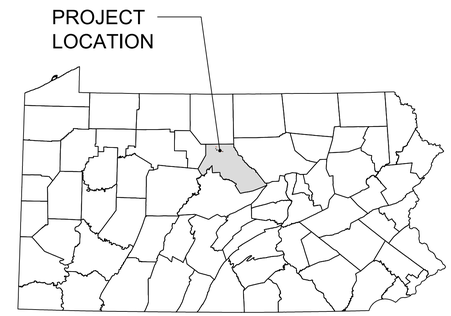
Not to be used for Box Culverts

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

LEIDY SOUTH PROJECT
36" HENSEL REPLACEMENT

LEIDY AND CHAPMAN TOWNSHIPS,
CLINTON COUNTY, PENNSYLVANIA

SEPTEMBER 2019



VICINITY MAP
N.T.S.

PROJECT OWNER/APPLICANT

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
2800 POST OAK BLVD. LEVEL 11
HOUSTON, TX. 77056
PH: (713) 215-3427
CONTACT: JOSEPH DEAN, ENVIRONMENTAL MANAGER

PLAN PREPARER / ENGINEER

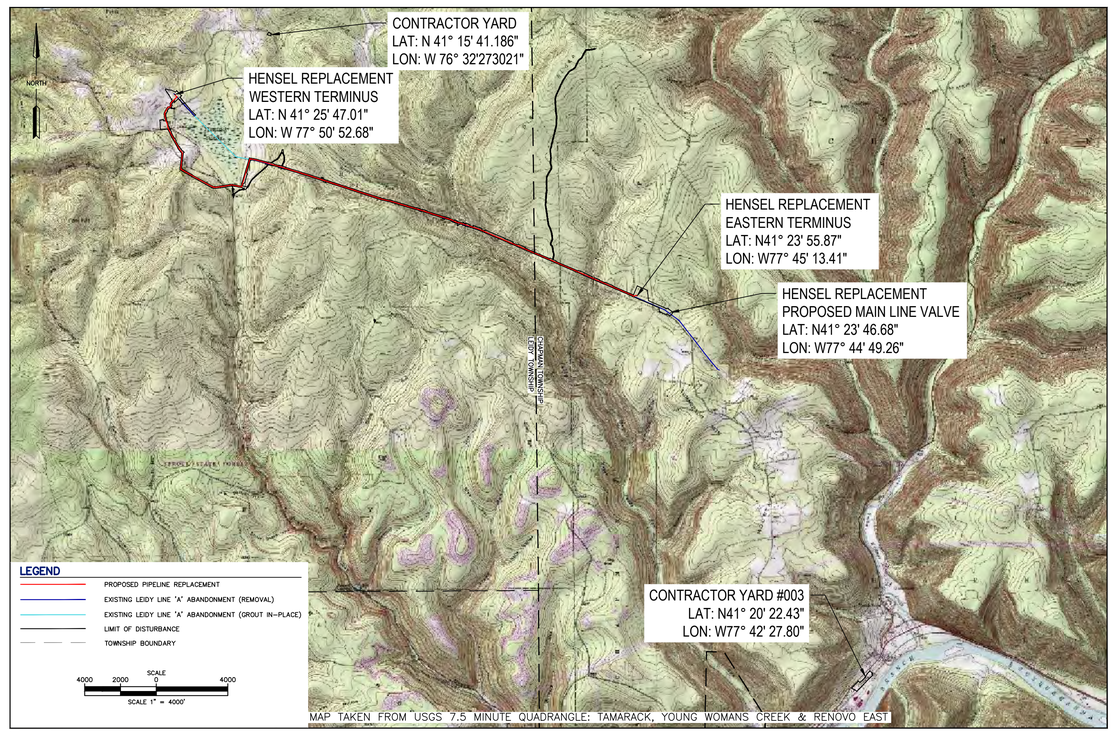
WHM CONSULTING, INC
2525 GREEN TECH DRIVE, SUITE B
STATE COLLEGE, PA 16803
PH: (814) 689-1650
CONTACT: KEVIN M. CLARK, PROJECT MANAGER

BAI GROUP, LLC.
2525 GREEN TECH DRIVE, SUITE D
STATE COLLEGE, PA 16803
PH: (814) 238-2060
CONTACT: KEVIN C. CLARK, P.E.

PROJECT INFORMATION

ESCGP-3 PERMIT BOUNDARY: 186.5 ACRES

LIMIT OF DISTURBANCE: 135.2 ACRES



LOCATION MAP

SHEET INDEX	
SHEET NUMBER	DRAWING TITLE
1 OF 39	EROSION & SEDIMENT CONTROL COVER SHEET
2 OF 39	EROSION & SEDIMENT CONTROL INDEX SHEET
3 - 23 OF 39	EROSION & SEDIMENT CONTROL SITE PLAN
24 - 25 OF 39	EROSION & SEDIMENT CONTROL NOTES
26 - 35 OF 39	EROSION & SEDIMENT CONTROL DETAILS
36 - 39 OF 39	GEOHAZARD MITIGATION MEASURES

RECEIVING WATERS			
NAME	DESIGNATED USE	EXISTING USE	PFBC CLASSIFICATION
TURTLE POINT HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
DRURY RUN	EV, MF	-	NATURALLY REPRODUCING TROUT
AUSTIN HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
HENSEL FORK	EV, MF	-	NATURALLY REPRODUCING TROUT
PADDY RUN	EV, MF	-	NATURALLY REPRODUCING TROUT
DARK HOLLOW	EV, MF	-	NATURALLY REPRODUCING TROUT
SHINGLE BRANCH	EV, MF	-	CLASS A WILD TROUT
MUDLICK RUN	EV, MF	-	CLASS A WILD TROUT
SANDY RUN	HQ-CWF, MF	-	NATURALLY REPRODUCING TROUT
WEST BRANCH SUSQUEHANNA RIVER	WWF, MF	-	-

EV: EXCEPTIONAL VALUE, MF: MIGRATORY FISHES, WWF: WARM WATER FISHES
HQ-CWF: HIGH QUALITY - COLD WATER FISHES

Call before you dig.
1-800-242-1776 or 811

PENNSYLVANIA ACT 287 (1974) AS AMENDED BY PENNSYLVANIA LESS THAN THREE (3) WORKING DAYS AND NO MORE THAN (10) WORKING DAYS NOTICE TO UTILITIES BEFORE YOU EXCAVATE, DRILL, BLAST OR DEMOLISH.

WHM consulting, INC. designs, permits, resolutions
BAI GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
DATE
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS						
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

COVER SHEET

LEIDY & CHAPMAN TOWNSHIPS, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 3/22/19	ISSUED FOR BID:	SCALE: 1" = 4000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 1 OF 39

E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
CONSTRUCTION ENTRANCE	CE	28
TIMBER MATTING CONSTRUCTION	MAT.1	28
TIMBER MATTING WITH FILL OVER EXISTING PIPELINES	MAT.2	28
TIMBER MATTING AIR BRIDGE	MAT.3	28
BROAD-BASED DIP	BBD	28
BRIDGE EQUIPMENT CROSSING	BEC	29
CULVERT EQUIPMENT CROSSING	CEC	29
WETLAND EQUIPMENT CROSSING	WEC	29
PUMP WATER FILTER BAG	PWB	29
TRENCH DEWATERING	TD	29
TRENCH PLUG INSTALLATION	TP	29
SAFETY FENCE	SF	29
PERMANENT / TEMPORARY STONE ACCESS ROAD		29
WETLAND CROSSING CONFIGURATION	WCC	30
TYPE I "DRY WETLAND" INSTALLATION PROCEDURE	WCC.1	30
TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE	WCC.2	30
TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE	WCC.3	30
FLUME STREAM CROSSING	FX	30
DAM AND PUMP STREAM CROSSING	DPX	30
WATERBAR	WB	31
CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION	OS	31
BORED WATERBODY/WETLAND CROSSING	WBX	31
BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS	BCC	31
TYPICAL CHANNEL & VEGETATION RESTORATION – 1		31
TYPICAL CHANNEL & VEGETATION RESTORATION – 2		31
TYPICAL SOIL STOCKPILE		31
HYDROSTATIC DEWATERING STRUCTURE	DS.2	32
ROCK FILTER OUTLET	RFO	32
SIDE SLOPE (TWO-TONE) CONSTRUCTION PROCEDURE		32
EROSION CONTROL BLANKET	ECB	32
HYDRAULICALLY APPLIED BLANKETS		32
TOPSOIL SEGREGATION (1)	TS.1	33
TOPSOIL SEGREGATION (2)	TS.2	33
TOPSOIL SEGREGATION (3)	TS.3	33
SURFACE ROUGHENING	SR	33
TRENCHED ROAD CROSSING	TRC	33
BORED ROAD CROSSING	BRC	33
COMPOST FILTER SOCK	CFS	34
SILTRON POLLUTION PREVENTION FENCE	SPF	34
FRENCH MATTRESS		34

E&S BMP LEGEND

DESCRIPTION	SYMBOL	SHEET NUMBER
TYPICAL DIVERSION CHANNEL	DC	35
COMPOST SOCK SEDIMENT TRAP	CST	35
CLEAN WATER CROSSING (TEMP. LEVEL SPREADER)	CWC-LS	35
CLEAN WATER CROSSING (RIP RAP OUTLET BASIN)	CWC-OB	35
GEOHAZARD MITIGATION MEASURES SHEET 1		36
GEOHAZARD MITIGATION MEASURES SHEET 2		39

(XXX) INDICATES SOIL EROSION CONTROL MEASURE DETAIL

GENERAL SITE NOTES

1. THE STAGING OF EARTHMOVING ACTIVITIES FOR THIS PROJECT IS A GENERAL DESCRIPTION OF THE WORK REQUIRED. ALL WORK SHALL BE COMPLETED IN ACCORDANCE WITH PROJECT OWNER STANDARDS, THE PADEP REGULATIONS, AND ALL OTHER APPLICABLE FEDERAL, STATE, OR LOCAL REQUIREMENTS.
2. PIPELINE CONSTRUCTION IS ACCOMPLISHED THROUGH A SET OF SEQUENTIAL OPERATIONS: SURVEYING; INSTALLATION OF BMPS; CLEARING AND GRUBBING; GRADING; TRENCHING; PIPE STRINGING, ASSEMBLY AND WELDING; LOWERING-IN; TRENCH BACKFILL; HYDROSTATIC TESTING AND FINAL TIE-IN; FINAL GRADING; AND PERMANENT STABILIZATION. THE CONSTRUCTION SPREAD SHALL PROCEED ALONG THE PIPELINE ROW TO COMPLETE THESE ACTIVITIES AS ONE CONTINUOUS OPERATION IN ORDER TO MINIMIZE THE DURATION OF EARTH DISTURBANCE.
3. SCHEDULE WORK TO BE PERFORMED IN A MANNER THAT MINIMIZES THE LENGTH OF TIME THAT BARE SOIL WILL BE EXPOSED TO THE ELEMENTS.
4. THE AMOUNT AND DURATION OF OPEN TRENCH SHALL BE MINIMIZED DURING THE PROJECT.
5. CONTRACTOR SHALL FAMILIARIZE THEMSELVES WITH THE SOIL EROSION AND SEDIMENT CONTROL NARRATIVE AND ENVIRONMENTAL CONSTRUCTION PLAN AND MINIMIZE THE TOTAL AREA OF DISTURBANCE, WHEN PRACTICAL.
6. DISCHARGING SEDIMENT LADEN WATER WHICH WILL CAUSE OR CONTRIBUTE TO THE DEGRADATION OF A BENEFICIAL USE OF A WATER OF THE STATE FROM THE CONSTRUCTION SITE, A DEWATERING SITE, OR SEDIMENT BASIN/TRAP INTO ANY WATER BODY OR STORM DRAIN WITHOUT FILTRATION OR EQUIVALENT TREATMENT IS PROHIBITED.
7. DISCHARGES ORIGINATING FROM OFF-SITE SOURCES, WHICH FLOW THROUGH OR ACROSS THE AREAS DISTURBED BY CONSTRUCTION, SHALL BE DIVERTED AROUND THE ACTIVE CONSTRUCTION AREA WHENEVER POSSIBLE.
8. ALL EXCAVATED MATERIALS THAT WILL NOT BE USED ON THE SITE CANNOT BE STORED IN THE FLOODPLAIN AND MUST BE HAULED TO A DISPOSAL SITE LOCATED OUTSIDE OF THE FLOODPLAIN.
9. NO EROSION CONTROL BLANKET SHALL BE INSTALLED IN AGRICULTURAL AREAS EXCEPT AS REQUIRED TO CONSTRUCT THE TEMPORARY FLUME CROSSINGS.
10. HYDRAULICALLY APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF EROSION CONTROL BLANKETS WITH PRIOR APPROVAL FROM THE LOCAL COUNTY CONSERVATION DISTRICT.
11. LOCATION AND SPACING OF THE WATERBARS ARE SHOWN ON THE PLAN. WATERBARS MAY BE ADJUSTED IN THE FIELD DUE TO ACTUAL SITE CONDITIONS. HOWEVER, INSTALLATION AND SPACING MUST CONFORM TO THE DETAILS PROVIDED AND APPROVAL MUST BE OBTAINED FROM THE LOCAL COUNTY CONSERVATION DISTRICT OR PA DEP.
12. THE APPROVED EROSION AND SEDIMENTATION CONTROL PLAN, INCLUDING THE SOIL EROSION CONTROL DRAWINGS AND NARRATIVE, SHALL BE AVAILABLE ON SITE AT ALL TIMES DURING EARTH DISTURBANCE.
13. PLACEMENT OF BRIDGE EQUIPMENT CROSSING SHOWN ON DRAWING IS NOT FINAL AND ADJUSTMENT OF LOCATION MAY BE NECESSARY FOR THE REMOVAL OF THE LEIDY A LINE AND INSTALLATION OF LEIDY LINE D.

EXISTING CONDITION NOTES/SOURCES

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES, LLC.

PROJECT DESCRIPTION

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC (TRANSCO), A SUBSIDIARY OF THE WILLIAMS COMPANIES, INC. IS PROPOSING THE LEIDY SOUTH PROJECT – HENSEL REPLACEMENT. THE HENSEL REPLACEMENT CONSISTS OF INSTALLING APPROXIMATELY 6.3 MILES OF 36-INCH PIPELINE LOOP ALONG TRANSCO'S LEIDY LINE IN LEIDY AND CHAPMAN TOWNSHIPS, CLINTON COUNTY. THIS PIPELINE WILL REPLACE THE CAPACITY OF A SEGMENT OF TRANSCO'S EXISTING 23.375-INCH LEIDY LINE A PIPELINE, AND THIS SEGMENT OF THE LEIDY LINE A PIPELINE TOTALING 5.8 MILES WILL BE ABANDONED AND REMOVED WITH THE EXCEPTION OF 0.8 MILE UNDER THE TAMARACK SWAMP NATURAL AREA, WHICH IS PROPOSED TO BE GROUTED IN-PLACE. ONCE PLACED INTO OPERATION, TRANSCO WILL REFER TO THE HENSEL REPLACEMENT AS THE LEIDY LINE D. TRANSCO WILL BE RELOCATING AND INSTALLING A MAINLINE VALVE (MLV) NEAR THE EASTERN TERMINUS OF THE HENSEL REPLACEMENT AS A MEANS TO ISOLATE GAS FLOWS ALONG SECTIONS OF A PIPELINE. AT THE WESTERN TERMINUS OF THE HENSEL REPLACEMENT AT AN EXISTING MLV, PIG TRAPS AND BLOCK VALVES WILL BE ADDED. CATHODIC PROTECTION CABLE WILL BE INSTALLED FROM PROPOSED MLV NEAR THE EASTERN TERMINUS TO MP 190.5, AND FROM THE WESTERN TERMINUS OF HENSEL REPLACEMENT TO THE TAMARACK SWAMP NATURAL AREA AND ASSOCIATED WETLANDS ON THE LEIDY LINE "A" AND "B" EXISTING RIGHT-OF-WAY. THE CATHODIC PROTECTION CABLE WILL BE INSTALLED IN THE SAME TRENCH AS THE PIPELINE WITHIN WETLAND, STREAM AND FLOODWAY CROSSINGS. THE HENSEL REPLACEMENT WILL INCLUDE THE CONSTRUCTION OF ONE TEMPORARY OFFLINE CONTRACTOR YARD.

THE EROSION AND SEDIMENTATION CONTROL PLAN (ENVIRONMENTAL PLAN OR PLANS) HAS BEEN DEVELOPED FOR THE PROJECT, AS DEPICTED ON THE DRAWINGS. THE E&S PLAN SHALL BE PLANNED, DESIGNED, AND IMPLEMENTED TO BE CONSISTENT WITH THE POST CONSTRUCTION STORMWATER MANAGEMENT (PCSM) PLAN UNDER 25 PA. CODE § 102.8 (RELATING TO PCSM REQUIREMENTS). TRANSCO WILL USE AND IMPLEMENT THE PRACTICES, MEASURES AND DETAILS OUTLINED HEREIN TO CONTROL SOIL EROSION AND OFF-SITE SEDIMENTATION. ALL WORK AND DISTURBED AREAS ARE LOCATED WITHIN TRANSCO PROPERTY, EXISTING EASEMENTS OR LEGALLY OBTAINED WORKSPACE. THE LIMIT OF DISTURBANCE WILL BE 135.2 ACRES. CONSTRUCTION IS SCHEDULED TO BEGIN IN 2021. THE PROJECT WILL TAKE PLACE PRIMARILY WITHIN AN EXISTING AND MAINTAINED PIPELINE ROW.

CONTRACTOR NOTES

1. ALL EXISTING UTILITY DATA IS PROVIDED FOR INFORMATIONAL USE ONLY. ALTHOUGH THE DATA IS SHOWN AS ACCURATELY AS POSSIBLE, THE CONTRACTOR IS CAUTIONED THAT THE OWNER AND THE ENGINEER NEITHER ASSUME NOR IMPLY ANY RESPONSIBILITY FOR THE ACCURACY OF THIS DATA.
2. THE CONTRACTOR IS TO VERIFY LOCATION AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO CONSTRUCTION.
3. ALL CONTRACTORS/SUBCONTRACTORS PERFORMING WORK ON THIS PROJECT SHALL FAMILIARIZE THEMSELVES WITH THE SITE AND SHALL BE SOLELY RESPONSIBLE FOR ANY DAMAGE TO EXISTING FACILITIES RESULTING DIRECTLY OR INDIRECTLY FROM THEIR OPERATIONS. ANY REMOVAL OR DAMAGE TO EXISTING IMPROVEMENTS SHALL BE REPLACED OR REPAIRED BY THE CONTRACTORS AT THEIR EXPENSE AND SHALL BE APPROVED BY THE OWNER/REP. SAID EXISTING IMPROVEMENTS INCLUDE BUT ARE NOT LIMITED TO BERMS, DITCHES, FENCES, AND PLANTS.
4. CONTRACTORS MUST CONFINE THEIR ACTIVITIES TO THE WORK AREA. NO ENCROACHMENTS ONTO DEVELOPED AREAS WILL BE ALLOWED. ANY DAMAGE RESULTING THEREFROM SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO REPAIR.
5. IT WILL BE THE RESPONSIBILITY OF EACH CONTRACTOR TO PROTECT ALL EXISTING PUBLIC AND PRIVATE UTILITIES THROUGHOUT THE CONSTRUCTION OF THIS PROJECT. CONTRACTORS SHALL CONTACT THE APPROPRIATE UTILITY COMPANIES FOR LINE LOCATES PRIOR TO COMMENCEMENT OF CONSTRUCTION AND SHALL ASSUME FULL LIABILITY FOR ANY DAMAGES CAUSED TO THOSE COMPANIES' FACILITIES.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING TRENCH SAFETY REQUIREMENTS IN ACCORDANCE WITH STANDARD WILLIAMS' TRENCH SAFETY GUIDELINES.

WHM consulting, INC. designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047271-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

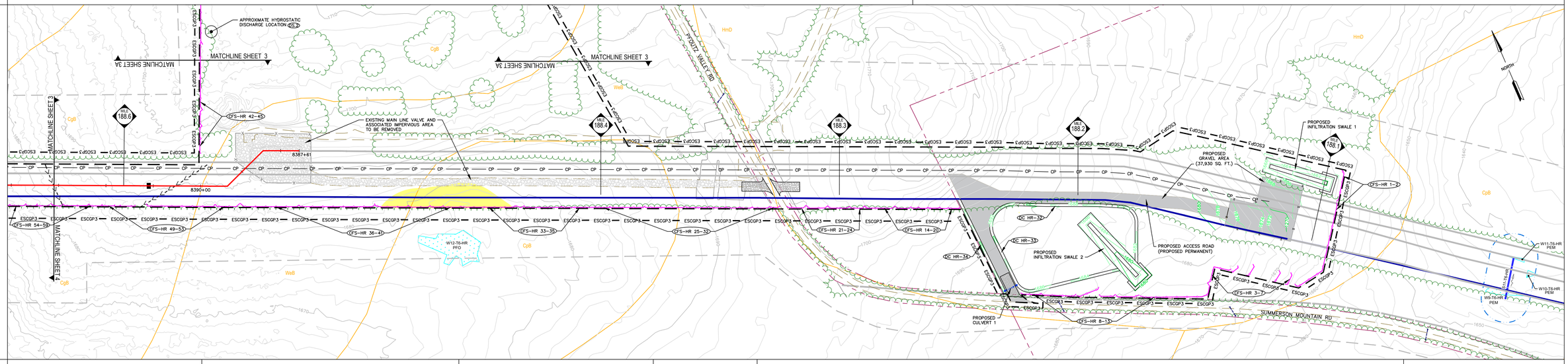
INDEX SHEET

LEIDY & CHAPMAN TOWNSHIPS, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 2000'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 2 OF 39
WO: 1211227	RID:		

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001			SUMMERSON MOUNTAIN RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001	LUCKY LEAP GUN CLUB HE-PA-CL-0001.001	
PROFILE (MIN. PIPE DEPTH)	3'	N/A					
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND	SHRUB AND BRUSH RANGELANDMIXED FOREST LAND/MAINTAINED ROW	MAINTAINED ROW/MIXED FOREST LAND	TRANSPORTATION/COMMUNICATION/MIXED FOREST LAND/MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	DARK HOLLOW (EV, MF)				MUDLICK RUN (EV, MF)		

ALIGNMENT



SOIL TYPE	CgB	WeB	CpB	WeB	HmD			CpB
AVERAGE % SLOPE	3%	1%	3%		9%	5%	5%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 042214-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

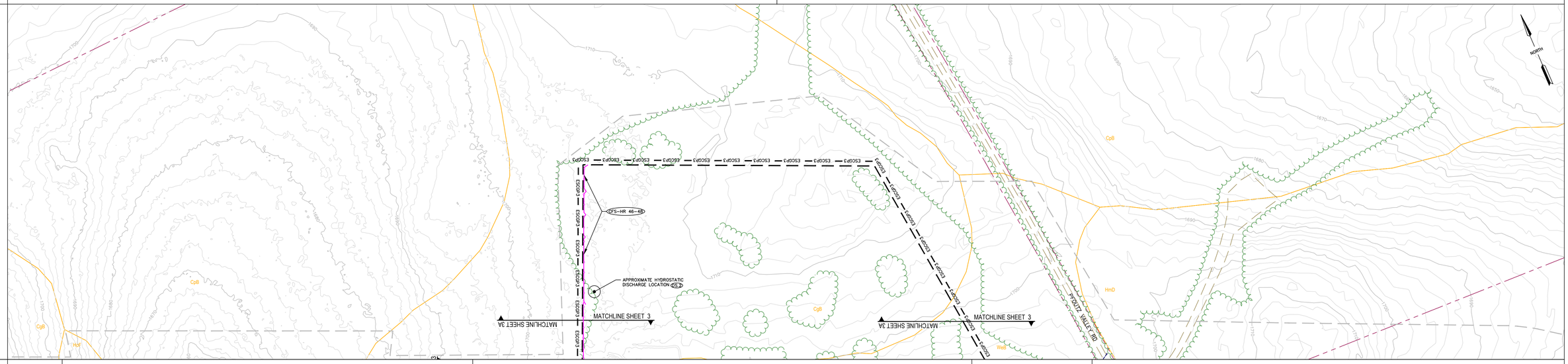
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001				
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND	SHRUB AND BRUSH RANGELANDMIXED FOREST LAND/MAINTAINED ROW	MAINTAINED ROW/MIXED FOREST LAND	TRANSPORTATION/COMMUNICATION/MIXED FOREST LAND/MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV, MF)				MUDLICK RUN (EV, MF)

ALIGNMENT



SOIL TYPE	CgB	CpB	CgB	WeB	HmD
AVERAGE % SLOPE	13%	23%	8%	3%	3%	1%	3%	9%	5%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
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- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
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- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
WeB	WHARTON SILT LOAM, VERY STONY, 0 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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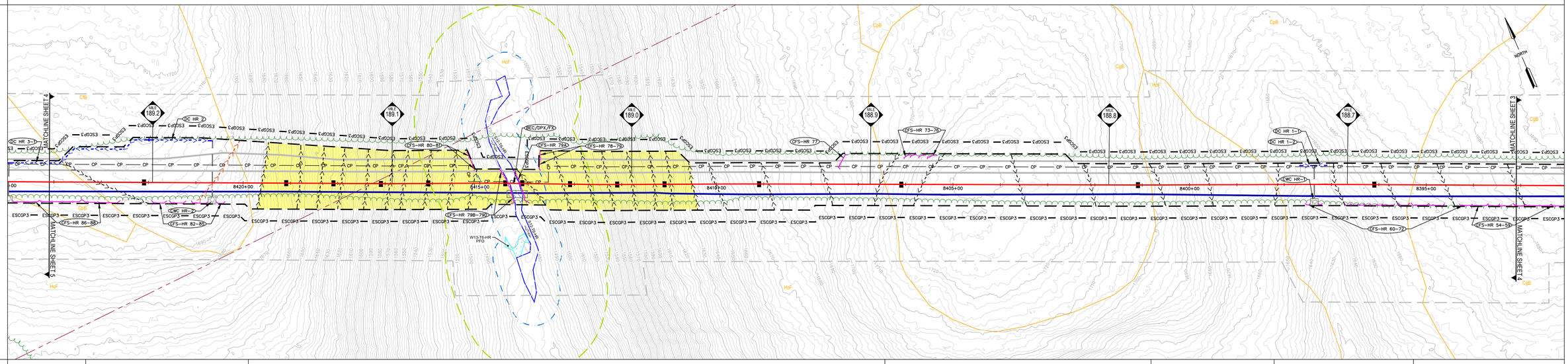
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 3A OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002		DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0001
PROFILE (MIN. PIPE DEPTH)	3'	4'	3'
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND		
RECEIVING WATERS	DARK HOLLOW (EV, MF)		

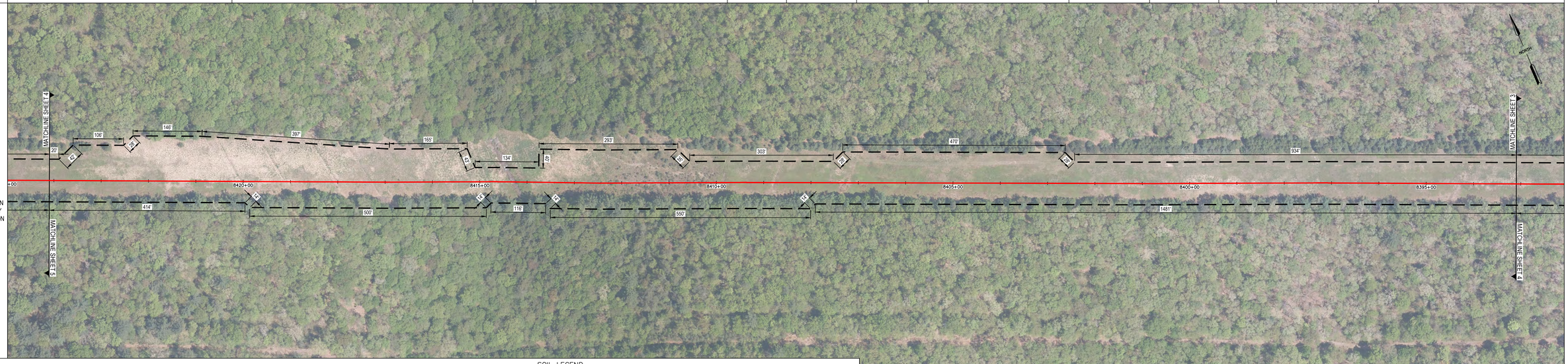
ALIGNMENT



SOIL TYPE	CpB	CfB	HoF	CgB	HoF	CpB	CgB
AVERAGE % SLOPE	1%	38%	5%	41%	19%	13%	13%

SOIL TYPE	13%	13%	23%	8%	3%	3%
AVERAGE % SLOPE	13%	13%				

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
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- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
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- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

designs, permits, resolutions WHM consulting, INC. BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

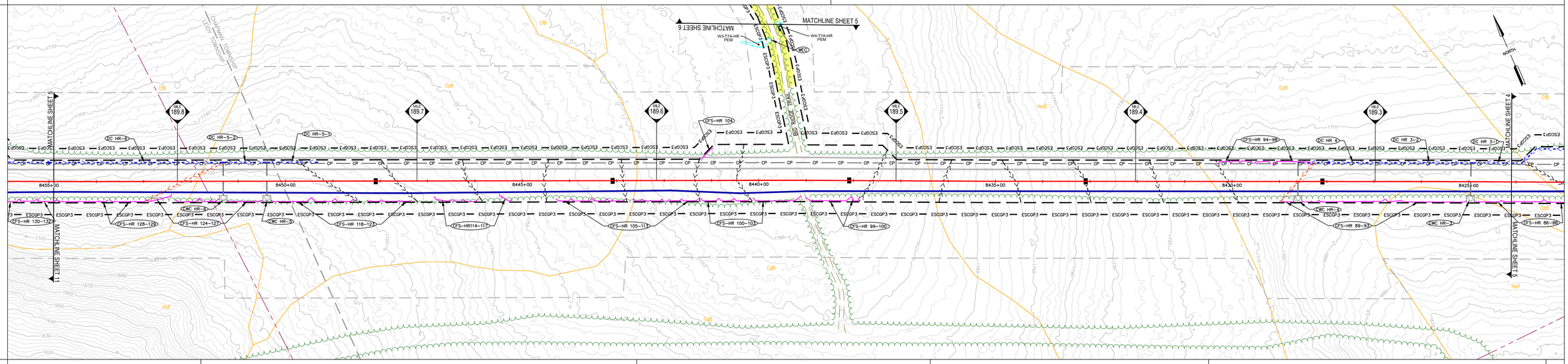
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 4 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002	
PROFILE (MIN. PIPE DEPTH)	3'		
COVER TYPE	MAINTAINED ROW/MIXED FOREST LAND	TRANSPORTATION/COMMUNICATION	MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	PADDY RUN (EV, MF)		DARK HOLLOW (EV, MF)

ALIGNMENT



SOIL TYPE	CfB	CpB	CgB	HmD	CpB	CfB
AVERAGE % SLOPE	5%	3% 7%	2%	10%	4%	1%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
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- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC Williams.
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
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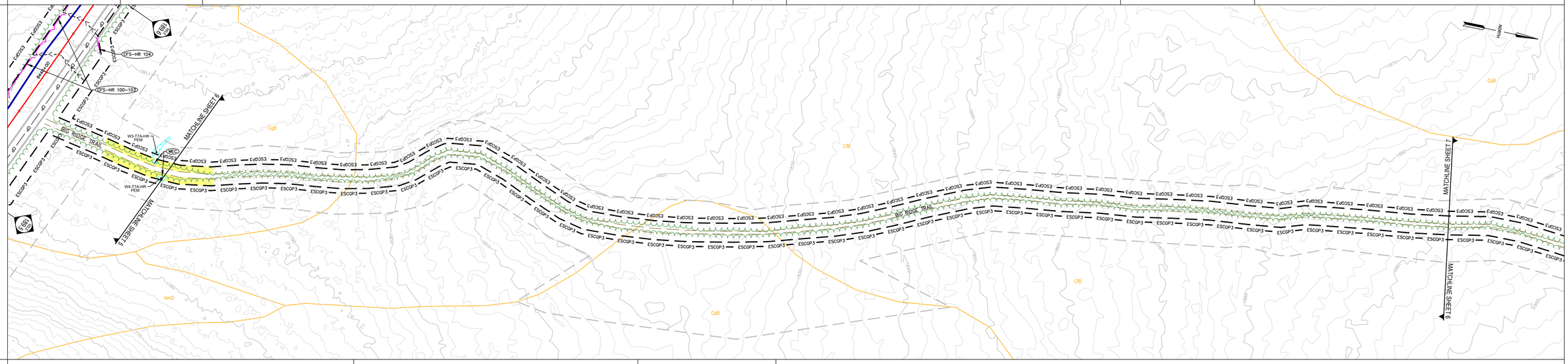
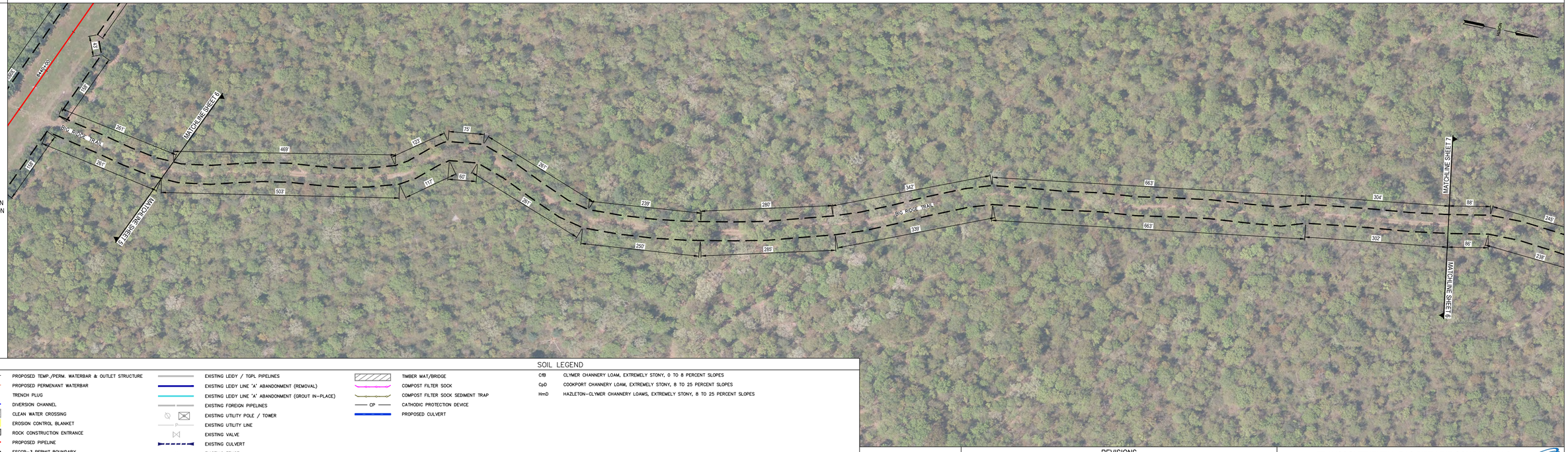
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 5 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002
PROFILE (MIN. PIPE DEPTH)	N/A
COVER TYPE	MIXED FOREST LAND
RECEIVING WATERS	PADDY RUN (EV, MF) | DARK HOLLOW (EV, MF) | PADDY RUN (EV, MF) | DARK HOLLOW (EV, MF) | PADDY RUN (EV, MF) | DARK HOLLOW (EV, MF) | PADDY RUN (EV, MF)
ALIGNMENT	



SOIL TYPE	CgB	CfB	CpB	CfB
AVERAGE % SLOPE				

CONSTRUCTION CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
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- COMPOST FILTER SOCK SEDIMENT TRAP
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- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

designs, permits, resolutions | consulting, inc. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

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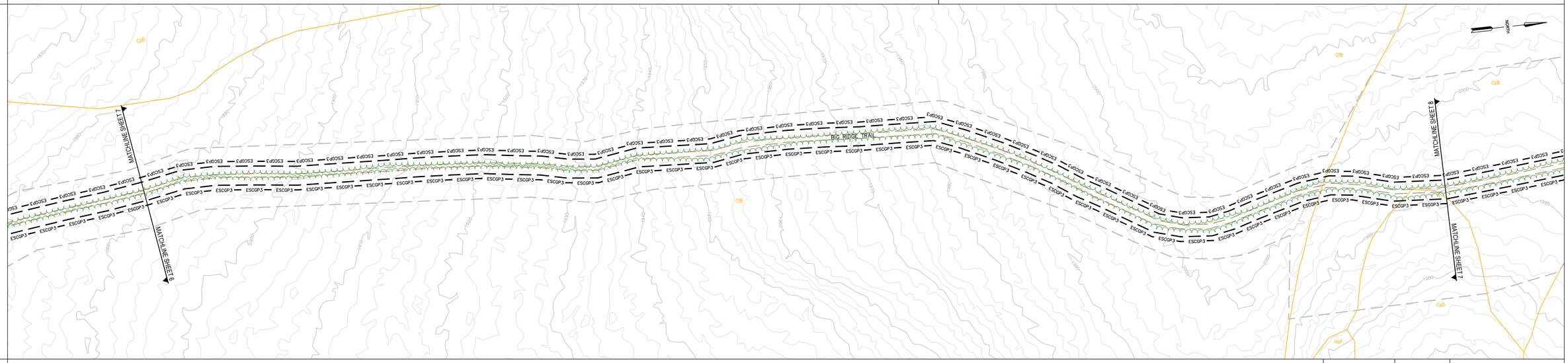
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 6 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002				
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	MIXED FOREST LAND				
RECEIVING WATERS	PADDY RUN (EV, MF)	DARK HOLLOW (EV, MF)			
SOIL TYPE	CfB		CpB	CpD	CpB
AVERAGE % SLOPE	3%	6%	3%	3%	1%

ALIGNMENT



CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
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HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM consulting, INC. designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 047231-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

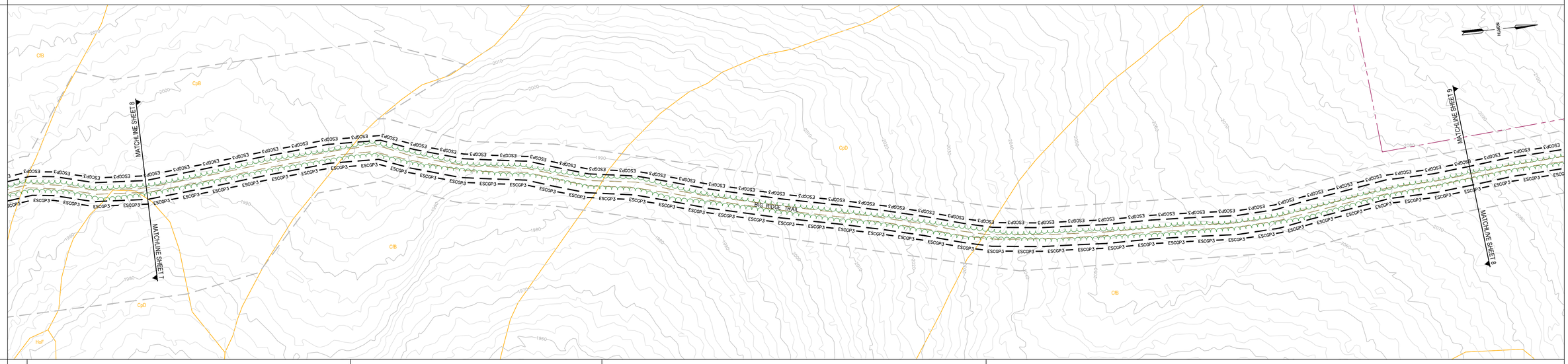
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 7 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002
PROFILE (MIN. PIPE DEPTH)	N/A
COVER TYPE	TRANSPORTATION/COMMUNICATION/MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV ,MF)

ALIGNMENT



SOIL TYPE	CfB	CpB/CpD	CfB	CpD	CfB
AVERAGE % SLOPE	3%	3%	3%	7%	3%	5%

CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES

SCALE 0
100 50 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

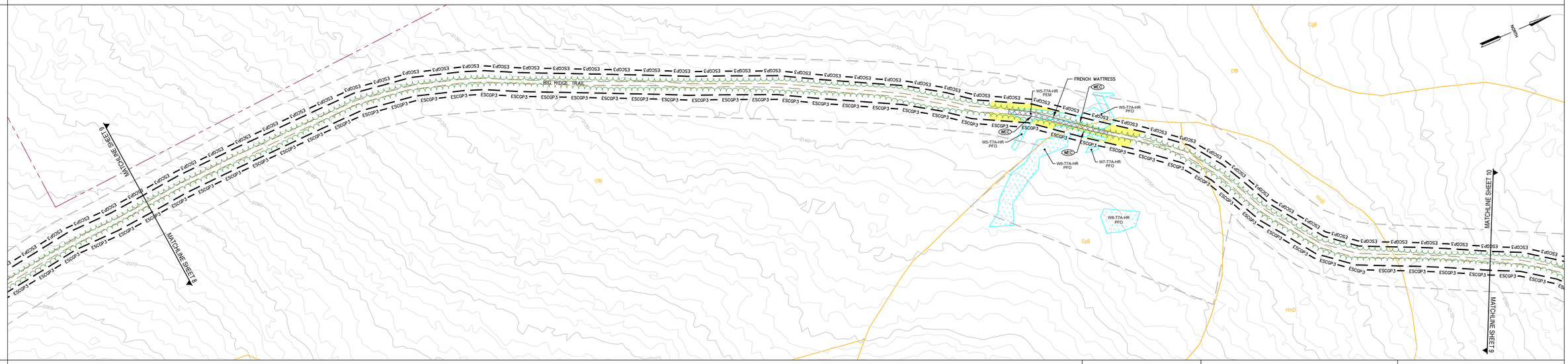
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		SHEET 8
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002		
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV, MF)		

ALIGNMENT



SOIL TYPE	CfB	CpB	HmD	CfB
AVERAGE % SLOPE	6%	4%	1%	2%	6%

CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
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- PROPOSED GRAVEL
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- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpB	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, inc.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

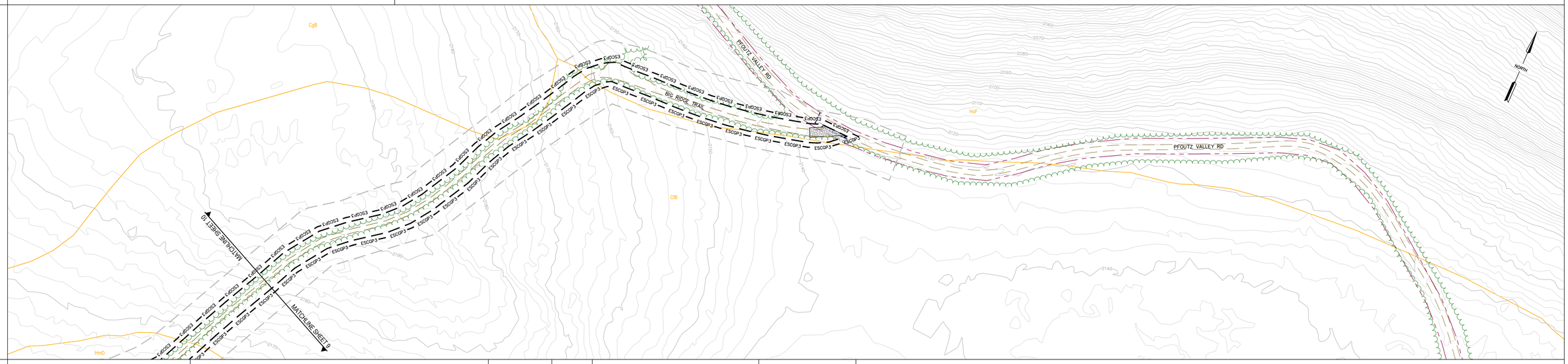
SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 9 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0002		
PROFILE (MIN. PIPE DEPTH)	N/A		
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW	MIXED FOREST LAND/MAINTAINED ROW/TRANSPORTATION/COMMUNICATION	MIXED FOREST LAND/MAINTAINED ROW
RECEIVING WATERS	DARK HOLLOW (EV, MF)	SHINGLE BRANCH (EV, MF)	

ALIGNMENT



SOIL TYPE	HmD	CfB	CgB/CfB	CfB	HoF	HoF/CfB	HoF
AVERAGE % SLOPE	7%	6%					

CONSTRUCTION CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
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- PROPOSED GRAVEL
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- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CfB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CgB	CLYMER CHANNERY LOAM, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 0 100 50 100
SCALE 1" =100'

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KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATCH-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

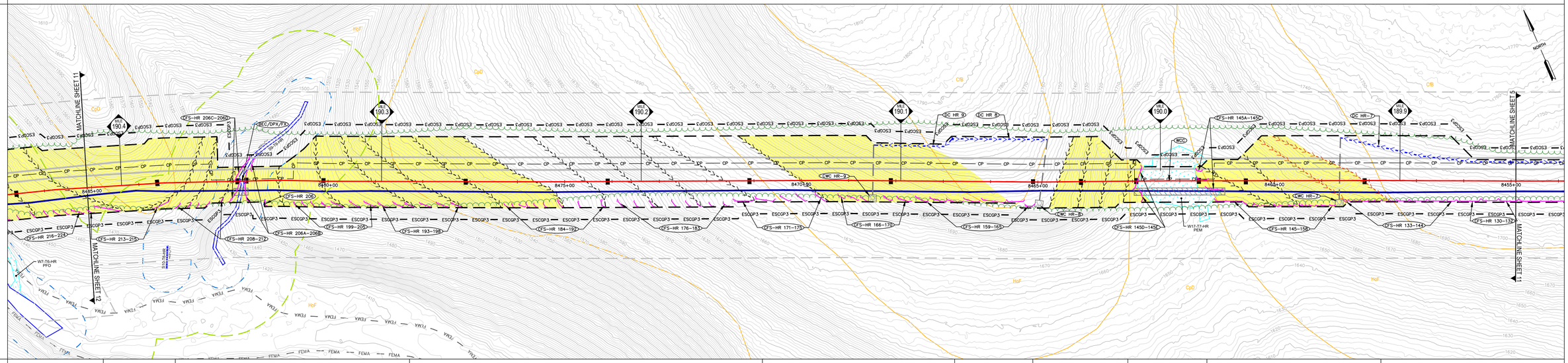
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 10 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004										
PROFILE (MIN. PIPE DEPTH)	3'	4'	3'								
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW		MIXED FOREST LAND/MAINTAINED ROW/TRANSPORTATION/COMMUNICATION						MIXED FOREST LAND/MAINTAINED ROW		
RECEIVING WATERS	PADDY RUN (EV, MF)										
ALIGNMENT											
SOIL TYPE	HoF	CpD	HoF	CpD			HoF	CfB	HoF	CpD	HoF	CfB
AVERAGE % SLOPE	8%	24%	21%			8%	1%			4%	5%
CONSTRUCTION RIGHT-OF-WAY CONFIGURATION											

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
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- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
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- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATZIT-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

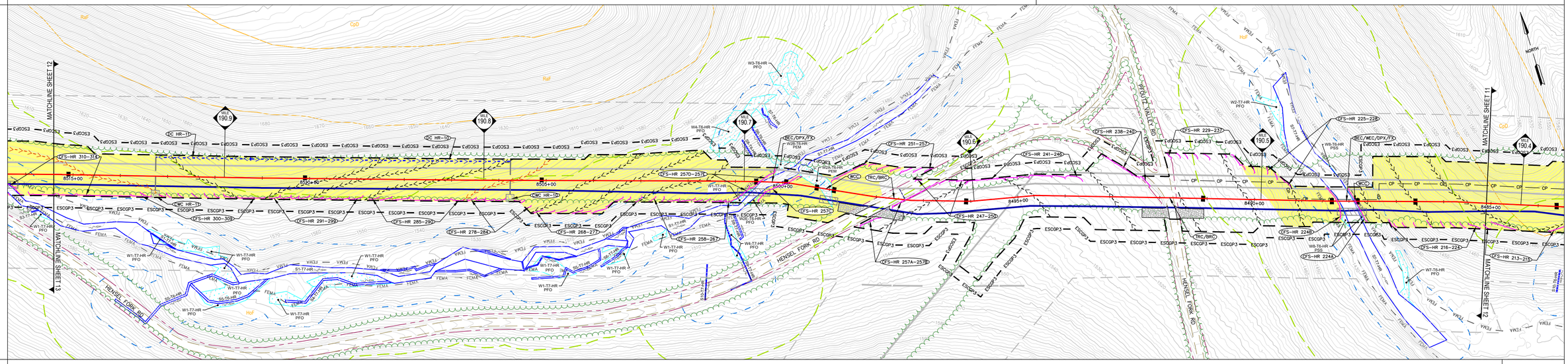
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 11 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0007				HENSEL FORK RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004		PADDY RUN RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004			
PROFILE (MIN. PIPE DEPTH)	3'		4'	3'	5'	3'		5'	3'		4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW			MIXED FOREST LAND/MAINTAINED ROW/TRANSPORTATION/COMMUNICATION					MIXED FOREST LAND/MAINTAINED ROW			
RECEIVING WATERS	HENSEL FORK (EV, MF)								PADDY RUN (EV, MF)			

ALIGNMENT



SOIL TYPE: HoF | CpD

AVERAGE % SLOPE: 2% | 5% | 13% | 8% | 15% | 31% | 10% | 8%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

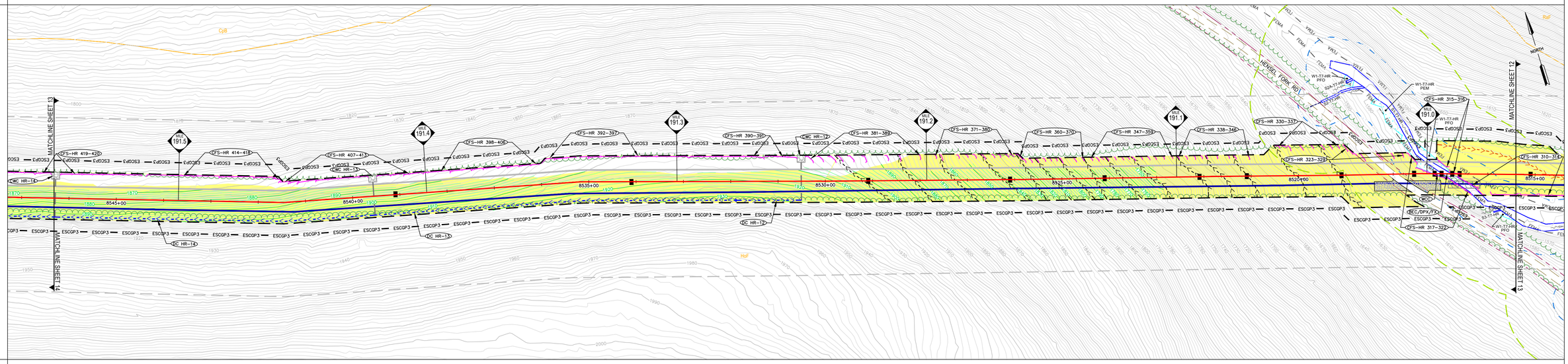
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 12 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004	HENSEL FORK RD ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0007		
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW/DECIDUOUS FOREST LAND				
RECEIVING WATERS	HENSEL FORK (EV, MF)				

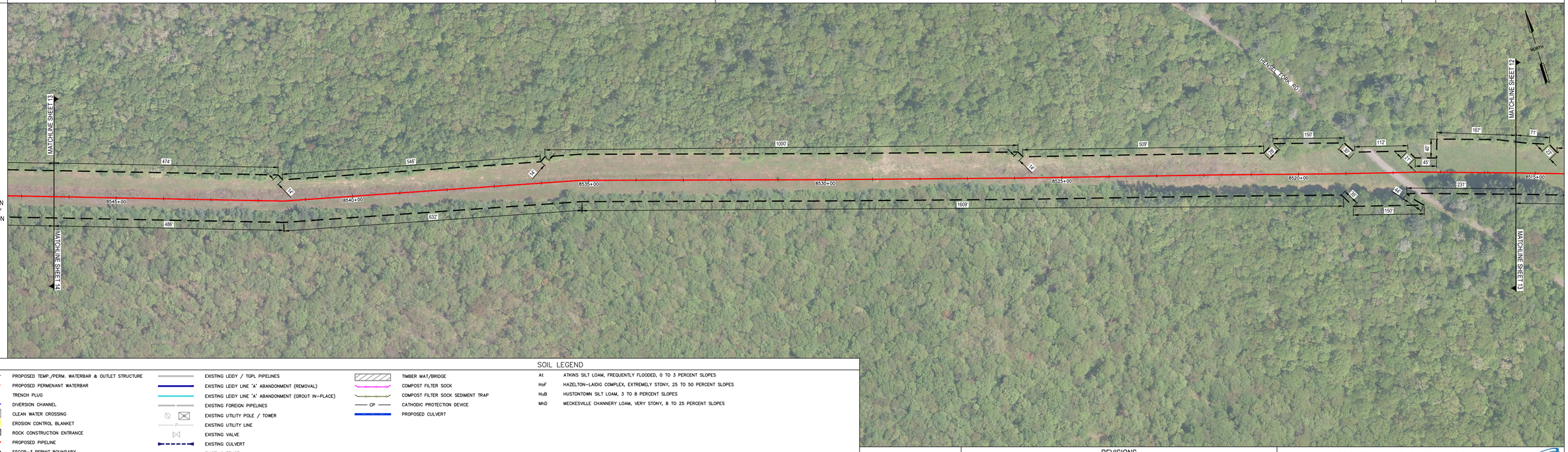
ALIGNMENT



SOIL TYPE: HoF

AVERAGE % SLOPE	3%	23%	25%	2%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
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- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
MhD	MECKESVILLE CHANNERY LOAM, VERY STONY, 8 TO 25 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM designs, permits, resolutions consulting, INC. | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

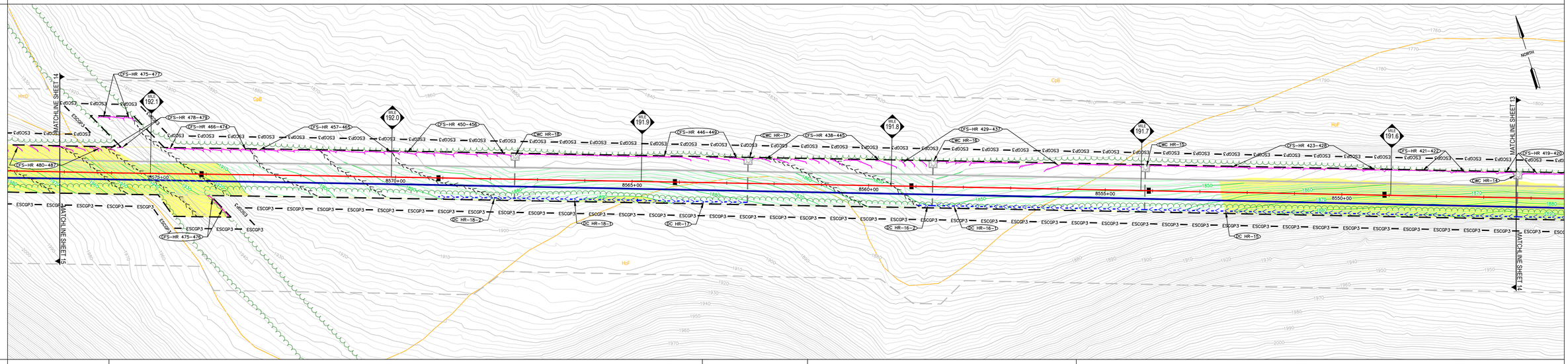
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 13 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004				
PROFILE (MIN. PIPE DEPTH)	3'				
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	HENSEL FORK (EV, MF)				

ALIGNMENT



SOIL TYPE	HoF	CpB	HoF	CpB	HoF
AVERAGE % SLOPE	18%	3%			3%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 0
100 50 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

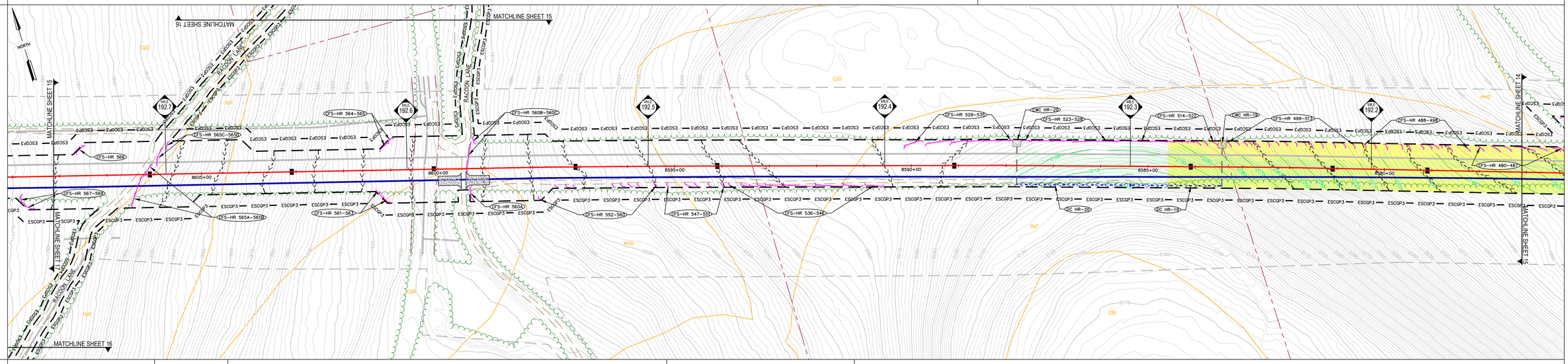
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 14 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0011					DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0010		DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'		5'	3'		
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/ COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS			MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)					HENSEL FORK (EV, MF)		

ALIGNMENT



SOIL TYPE	CpD	HoF	HmD	CpD	HoF
AVERAGE % SLOPE	14%	20%		5%	7%	18%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
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- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
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- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 0 50 100 / 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE:11-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

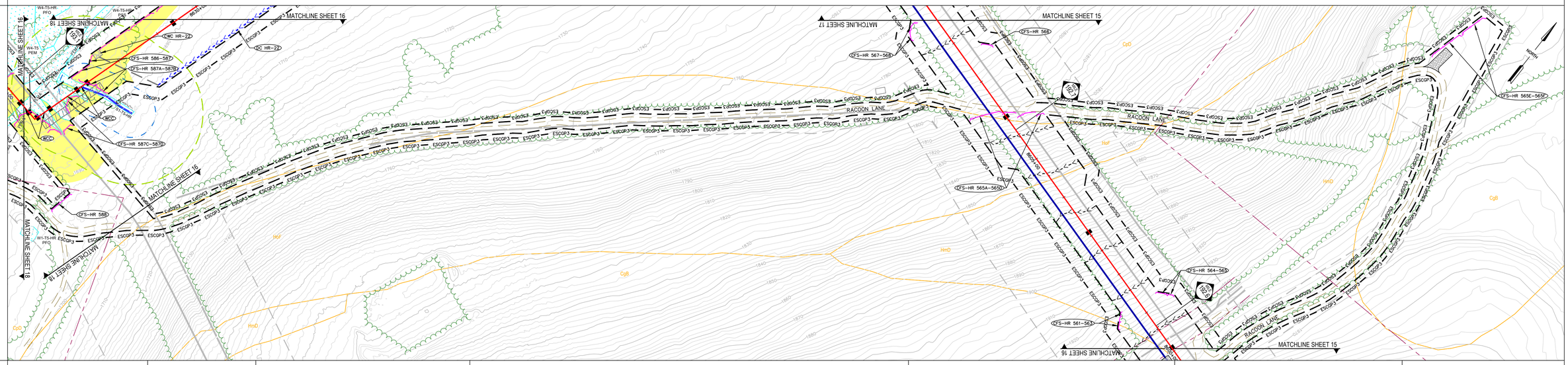
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 15 OF 39

OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0011						
PROFILE (MIN. PIPE DEPTH)	N/A			3'	5'	3'	N/A
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)						

ALIGNMENT



SOIL TYPE	CpD	HoF	CpD	HoF	CpD	HmD	CgB
AVERAGE % SLOPE	7%	7%	4%		12%		6%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
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- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
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- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CgB	CLYMER-COOKPORT CHANNERY LOAMS, EXTREMELY STONY, 0 TO 8 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HmD	HAZLETON-CLYMER CHANNERY LOAMS, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

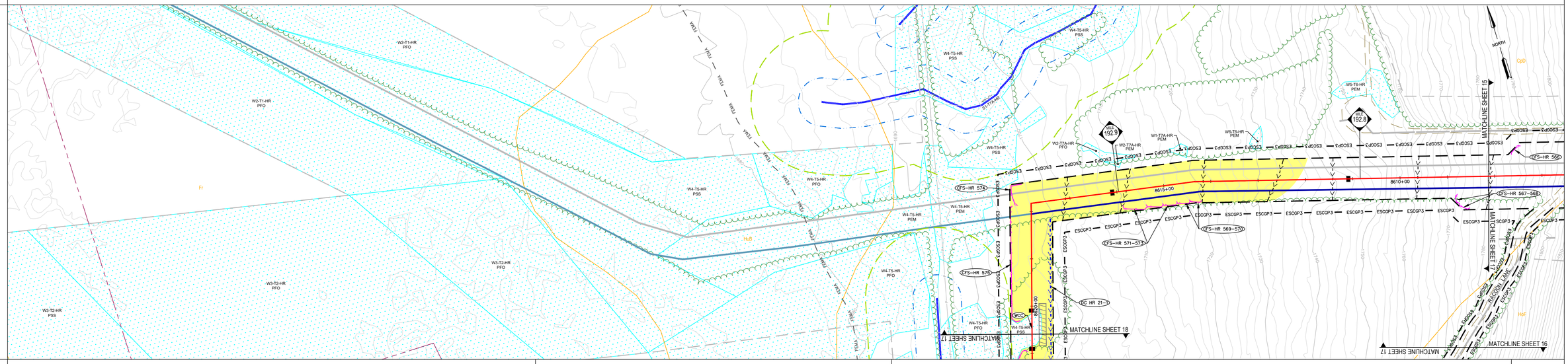
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 16 OF 39

OWNERSHIP & TRACT NUMBER	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0011				
PROFILE (MIN. PIPE DEPTH)	N/A			3'	
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW / TRANSITIONAL AREAS / TRANSPORTATION / COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)				

ALIGNMENT



SOIL TYPE	Fr	HuB	CpD	HoF
AVERAGE % SLOPE			7%	14%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
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- EXISTING TREELINE / TREE/SHRUB
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE 0
100 50 100
SCALE 1" =100'

WHM designs, permits, resolutions consulting, INC.
BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL ENGINEER
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
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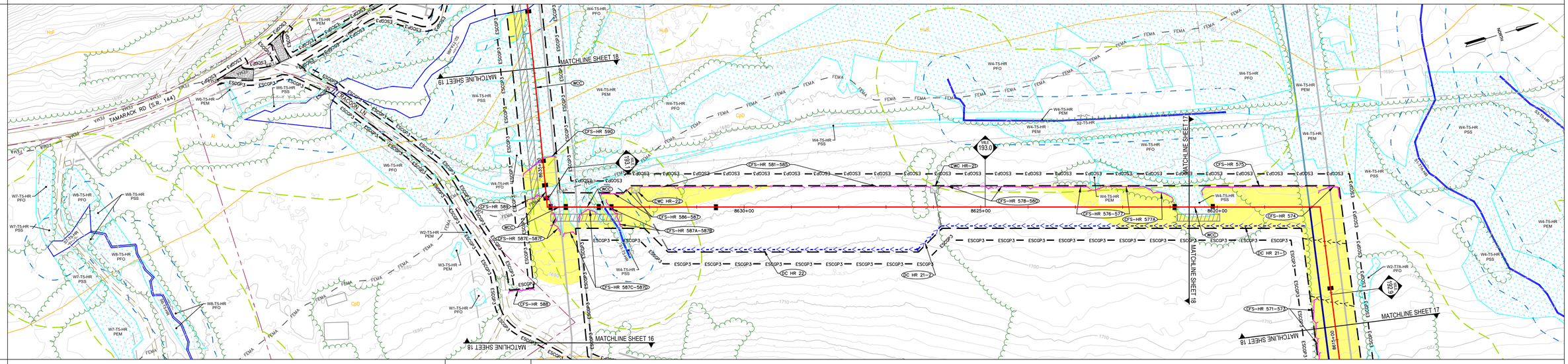
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 17 OF 39

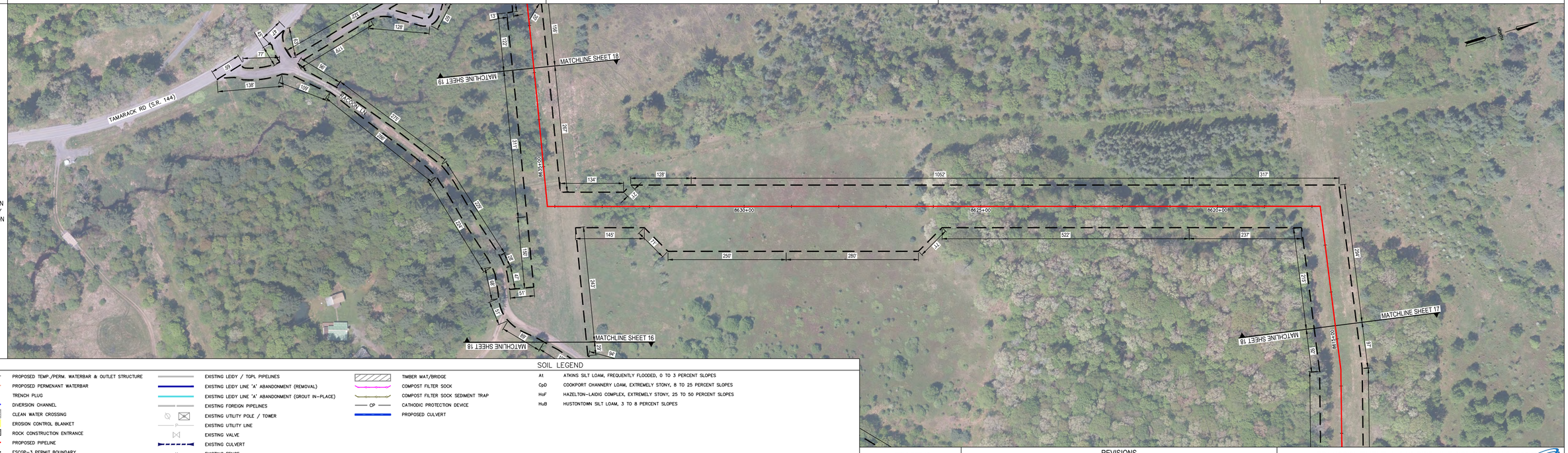
OWNERSHIP & TRACT NUMBER	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0011				
PROFILE (MIN. PIPE DEPTH)	N/A		3'		N/A
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/ COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	DRURY RUN (EV, MF)				

ALIGNMENT



SOIL TYPE	At	HuB	CpD		
AVERAGE % SLOPE	1%	2%	1%		7%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
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- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
CpD	COOKPORT CHANNERY LOAM, EXTREMELY STONY, 8 TO 25 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES

SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATZIT-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
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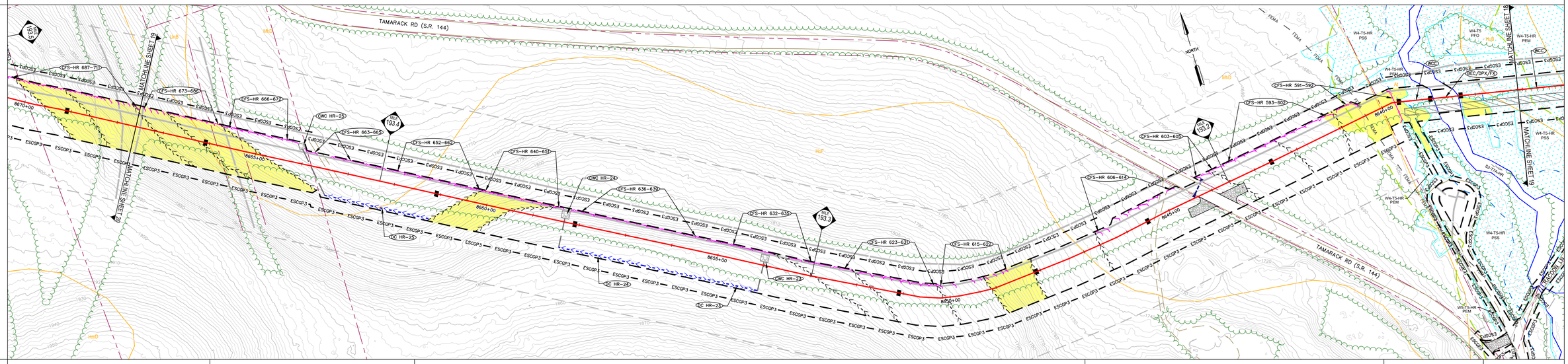
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 18 OF 39

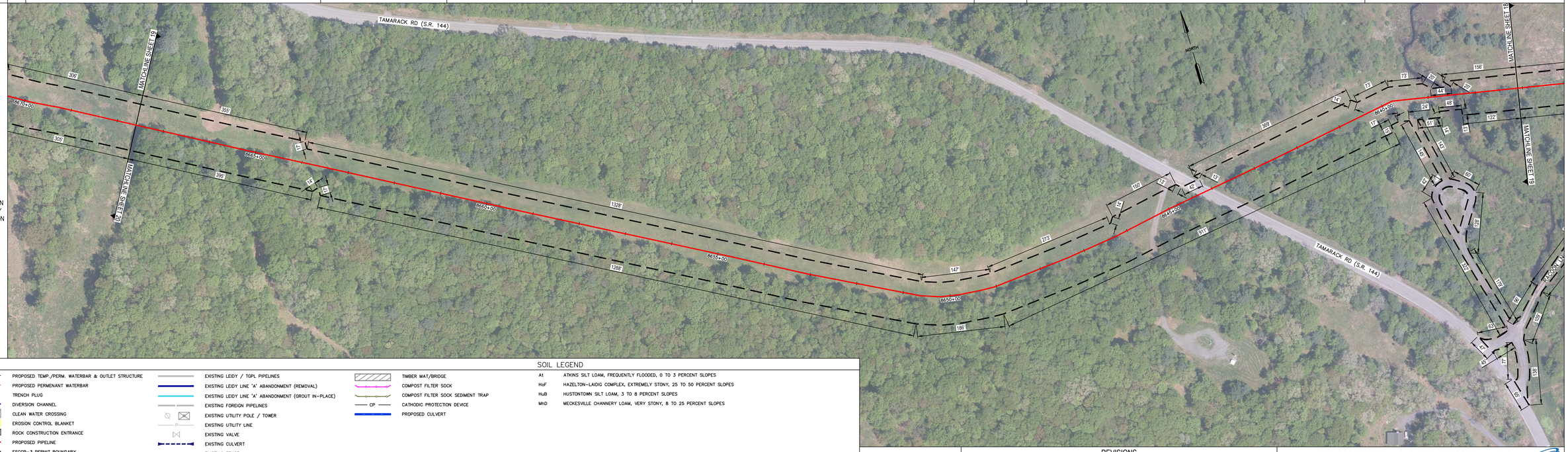
OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0005.010	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0005.007	TAMARACK RD (S.R. 144) ROW	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0005.0007	COMMONWEALTH OF PA - DEPARTMENT OF CONSERVATION & NATURAL RESOURCES HE-PA-CL-0011	
PROFILE (MIN. PIPE DEPTH)	3'			5'	3'	4'	3'
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND	
RECEIVING WATERS	DRURY RUN (EV, MF)						

ALIGNMENT



SOIL TYPE	HoF	MhD	HoF	MhD	At	HuB		
AVERAGE % SLOPE	1%	2%	4%	9%	7%	29%	10%	1%

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
MhD	MECKESVILLE CHANNERY LOAM, VERY STONY, 8 TO 25 PERCENT SLOPES

SCALE 1" =100'

100 50 0 100

WHM designs, permits, resolutions consulting, INC.

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATE21-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

Williams.

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 19 OF 39

OWNERSHIP & TRACT NUMBER	DOMINION TRANSMISSION INC. HE-PA-CL-0005.030	TAMARACK RD (S.R. 144) ROW	RAYMOND D. WOLFE HE-PA-CL-0005.016	RED HILL RD (S.R. 144) ROW	KERRY B. WILSON HE-PA-CL-0005.013	DANIEL M. LUCAS HE-PA-CL-0005.012	JOHN C. SMITH HE-PA-CL-0005.011	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0005.010	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0004
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	5'	3'				
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND				
RECEIVING WATERS	DRURY RUN (EV, MF)								

ALIGNMENT

SOIL TYPE	At	HuB	UnB	HoF	MhD				
AVERAGE % SLOPE	1%	1%	1%	6%	3%	6%	1%	2%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP3 — ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA — FEMA 100-YEAR FLOODPLAIN
- MrB2 — SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- P — EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- X — EXISTING FENCE
- X — PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 — EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 — EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 — PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 — PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP — CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
MhD	MECKESVILLE CHANNERY LOAM, VERY STONY, 8 TO 25 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 041211-E
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

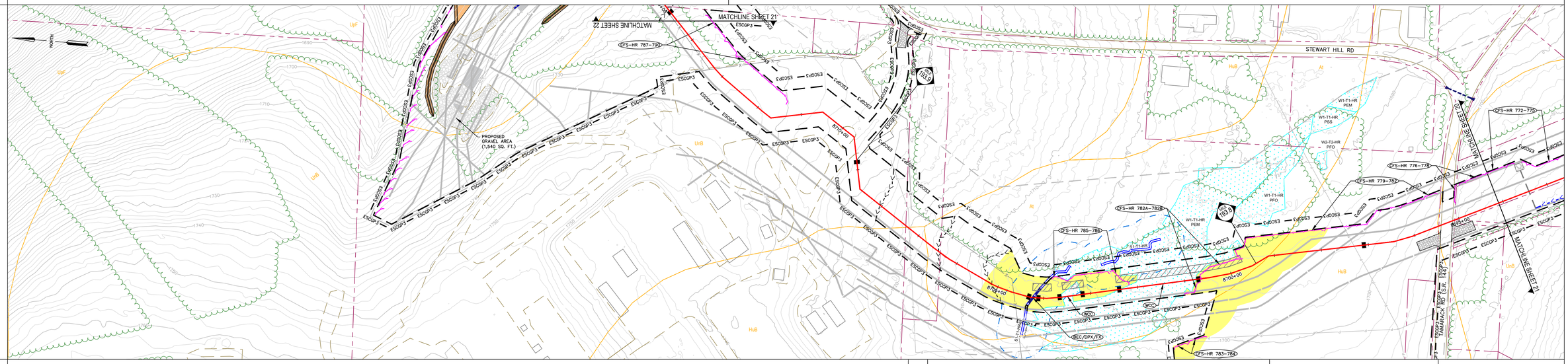
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 20 OF 39
WO: 1211227	RID:		

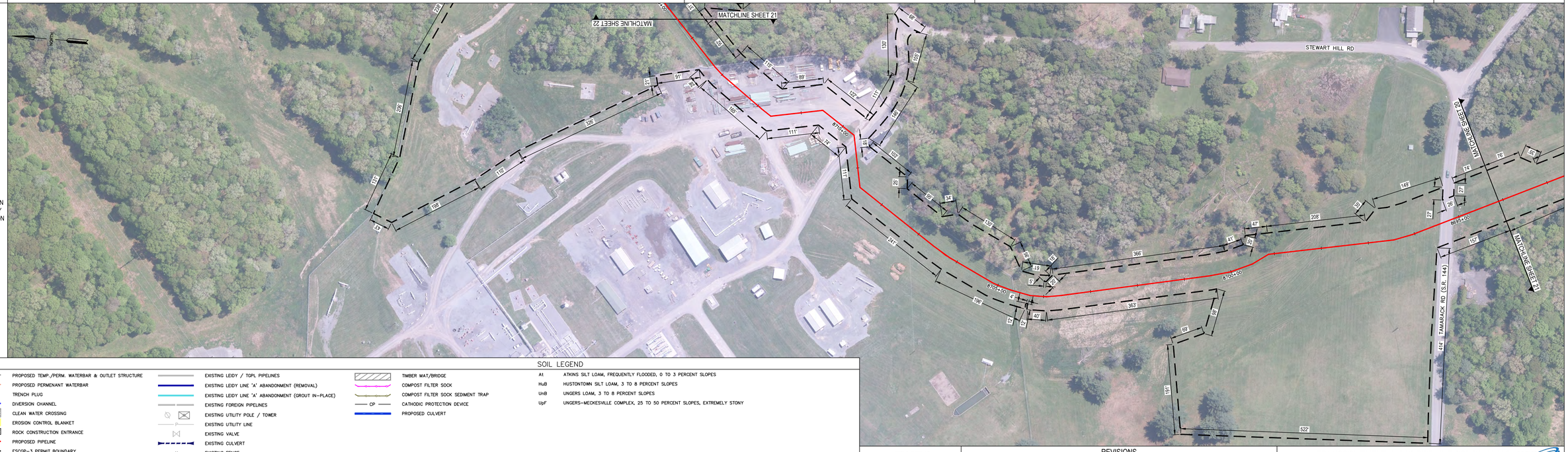
OWNERSHIP & TRACT NUMBER	DEPARTMENT OF ENVIRONMENTAL RESOURCES HE-PA-CL-0024		DOMINION TRANSMISSION INC. HE-PA-CL-0025	DOMINION TRANSMISSION INC. HE-PA-CL-0005.032	DOMINION TRANSMISSION INC. HE-PA-CL-0005.027		TAMARACK RD (S.R. 144) ROW	RAYMOND D. WOLFE HE-PA-CL-0005.016
PROFILE (MIN. PIPE DEPTH)	N/A		3'		4'	3'	5'	3'
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND	
RECEIVING WATERS	TURTLE POINT HOLLOW (EV, MF)				DRURY RUN (EV, MF)			

ALIGNMENT



SOIL TYPE	UnB/UpF	HuB	At	HuB	UnB	
AVERAGE % SLOPE	13%	1%	7%	1%	11%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
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- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES
UpF	UNGERS-MECKESVILLE COMPLEX, 25 TO 50 PERCENT SLOPES, EXTREMELY STONY

SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

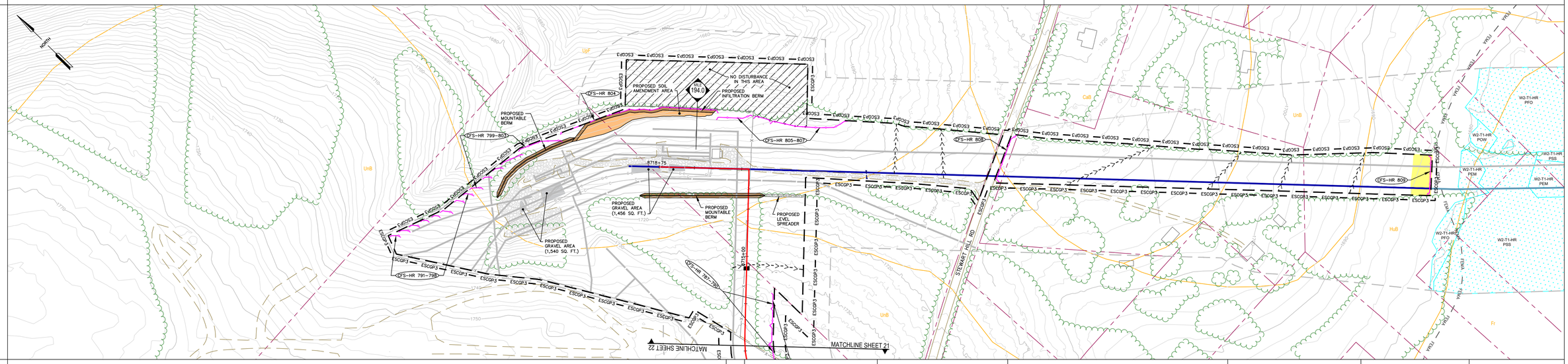
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 21 OF 39

OWNERSHIP & TRACT NUMBER	DOMINION TRANSMISSION INC. HE-PA-CL-0024					DOMINION TRANSMISSION INC. HE-PA-CL-0025		
PROFILE (MIN. PIPE DEPTH)	N/A			3'		N/A		
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS			MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS		DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	TURTLE POINT HOLLOW (EV, MF)						DRURY RUN (EV, MF)	

ALIGNMENT



SOIL TYPE	UpF	HuB	UnB	HuB	CaB	UnB	HuB	
AVERAGE % SLOPE		2%						

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

CaB	CALVIN CHANNERY SILT LOAM, 3 TO 8 PERCENT SLOPES
HuB	HUSTONTOWN SILT LOAM, 3 TO 8 PERCENT SLOPES
UnB	UNGERS LOAM, 3 TO 8 PERCENT SLOPES
UpF	UNGERS-MECKESVILLE COMPLEX, 25 TO 50 PERCENT SLOPES, EXTREMELY STONY

SCALE 0 100 50 100
SCALE 1" =100'

designs, permits, resolutions WHM consulting, INC. BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL ENGINEER KEVIN C. CLARK ENGINEER DATA-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

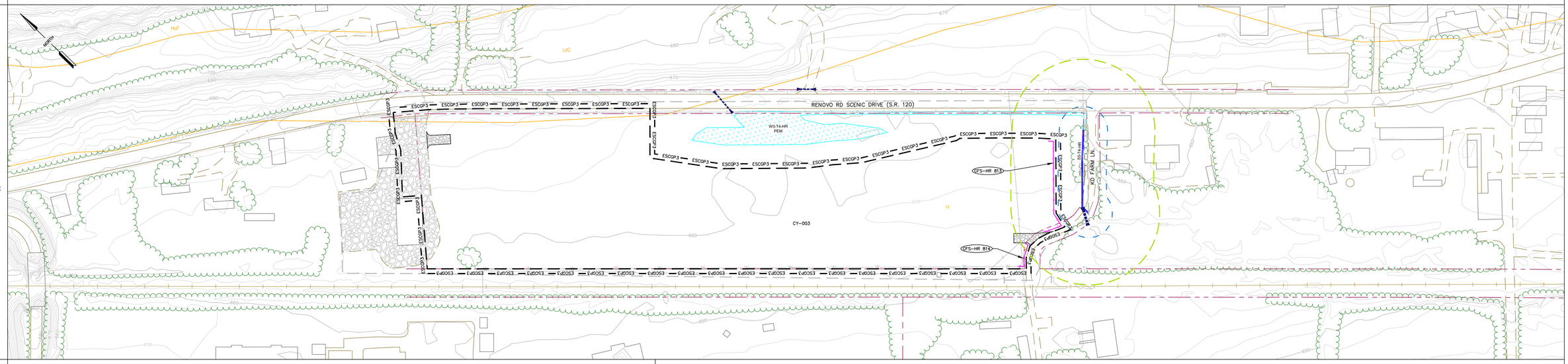
SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 22 OF 39

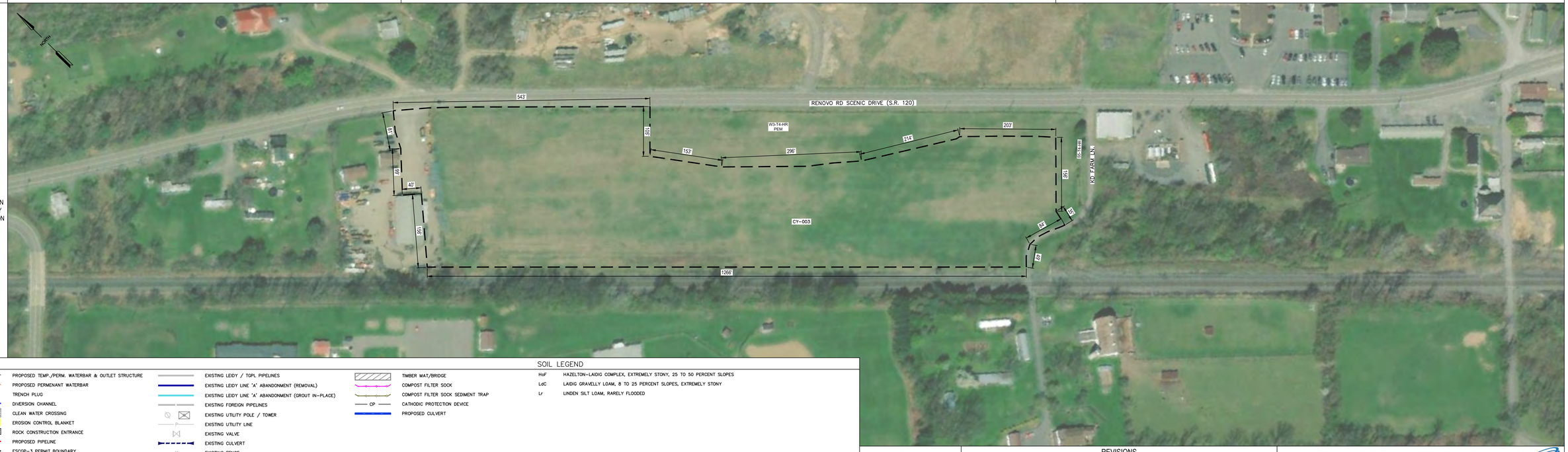
OWNERSHIP & TRACT NUMBER	THOMPSON LOGGING & TRUCKING		LEE E. JR. & TAMERLIE J. THOMPSON HE-PA-CL-0024	KD FARM LN. ROW	VITO A. JR. & WENDY D. JANERELLA
PROFILE (MIN. PIPE DEPTH)	N/A				
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/ MAINTAINED ROW/TRANSITIONAL AREAS/TRANSPORTATION/COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND
RECEIVING WATERS	WEST BRANCH SUSQUEHANNA RIVER (WWF,MF)				

CONTRACTOR YARD



SOIL TYPE	LdC/Lr	Lr
AVERAGE % SLOPE	1%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION



LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
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- MrB2 SOIL BOUNDARY / TYPE
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- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
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- EXISTING ROAD (PAVED)
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- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

HoF	HAZELTON-LAIDIG COMPLEX, EXTREMELY STONY, 25 TO 50 PERCENT SLOPES
LdC	LAIDIG GRAVELLY LOAM, 8 TO 25 PERCENT SLOPES, EXTREMELY STONY
Lr	LINDEN SILT LOAM, RARELY FLOODED

SCALE 0 — 100 50 100
SCALE 1" =100'

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL ENGINEER — KEVIN C. CLARK — ENGINEER — 047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

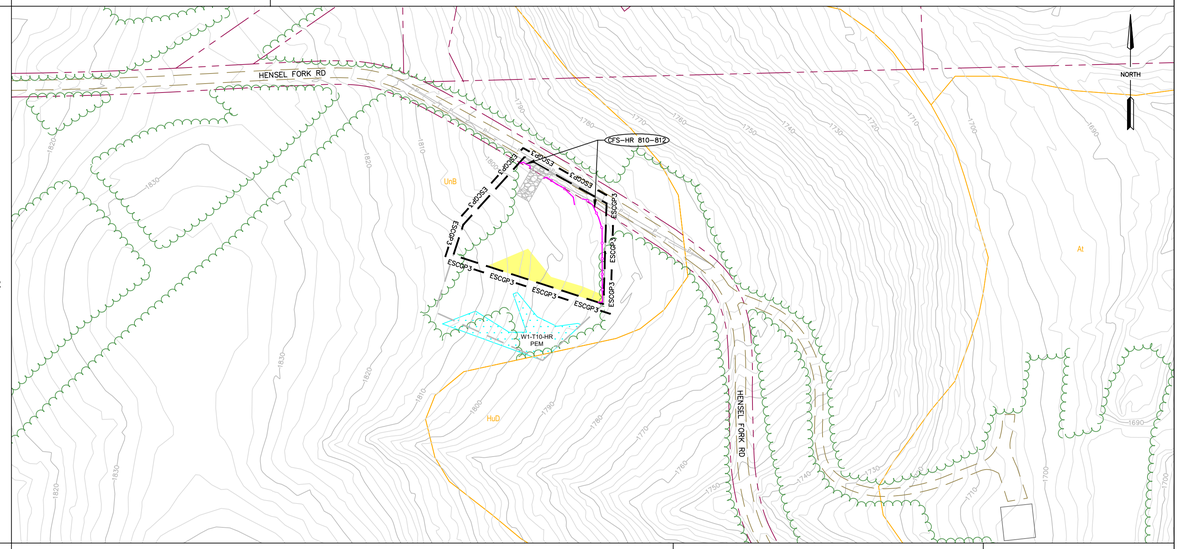
SITE PLAN

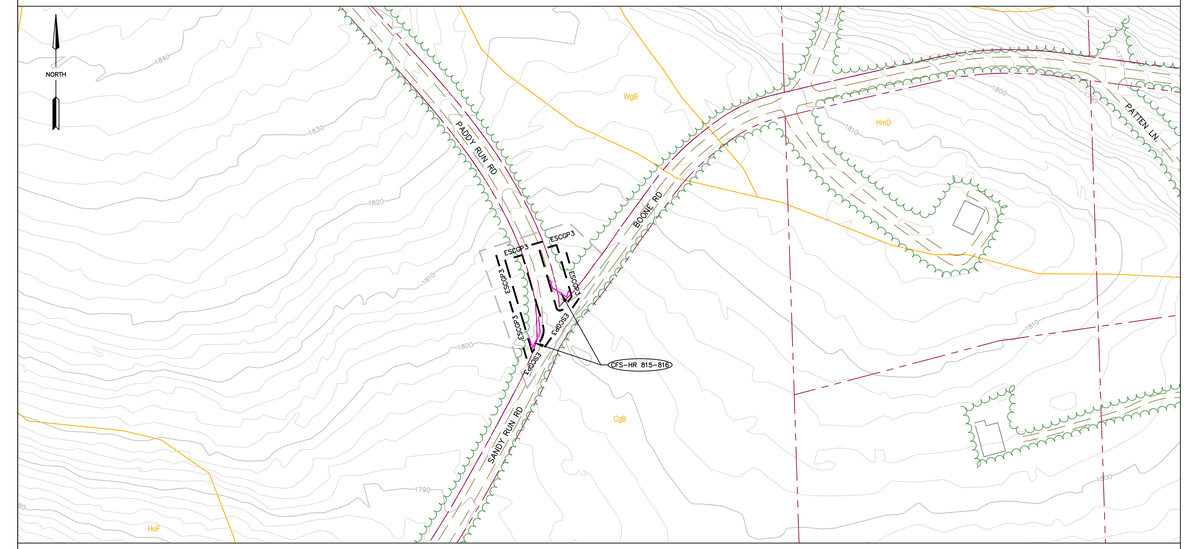
LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 23 OF 39

OWNERSHIP & TRACT NUMBER	JACOB & LAURIE CLEVENGER			DEPARTMENT OF ENVIRONMENTAL RESOURCES	PADDY RUN RD. ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES	BOONE RD. ROW	DEPARTMENT OF ENVIRONMENTAL RESOURCES	DAN L. & MARCIA K. ARNOLD
PROFILE (MIN. PIPE DEPTH)	N/A			N/A					
COVER TYPE	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	DECIDUOUS FOREST LAND / MAINTAINED ROW / TRANSITIONAL AREAS / TRANSPORTATION / COMMUNICATION	DECIDUOUS FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS	MIXED FOREST LAND/MAINTAINED ROW/TRANSITIONAL AREAS			DECIDUOUS FOREST LAND/MAINTAINED ROW/MIXED FOREST LAND		
RECEIVING WATERS	DRURY RUN (EV, MF)	AUSTIN HOLLOW (EV, MF)		SANDY RUN (HQ, CWF, MF)					

CONTRACTOR YARD





SOIL TYPE	UnB		HuD	At	CgB	
AVERAGE % SLOPE		9%			3%	

CONSTRUCTION RIGHT-OF-WAY CONFIGURATION

LEGEND

- PROPOSED TEMP./PERM. WATERBAR & OUTLET STRUCTURE
- PROPOSED PERMENANT WATERBAR
- TRENCH PLUG
- DIVERSION CHANNEL
- CLEAN WATER CROSSING
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- RIPARIAN BUFFER
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- MrB2 SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING LEIDY LINE 'A' ABANDONMENT (REMOVAL)
- EXISTING LEIDY LINE 'A' ABANDONMENT (GROUT IN-PLACE)
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- 1250 EXISTING GRADE MAJOR CONTOURS (2' C.I.)
- 1244 EXISTING GRADE MINOR CONTOURS (10' C.I.)
- 1250 PROPOSED GRADE MAJOR CONTOURS (2' C.I.)
- 1244 PROPOSED GRADE MINOR CONTOURS (10' C.I.)
- TIMBER MAT/BRIDGE
- COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP
- CP CATHODIC PROTECTION DEVICE
- PROPOSED CULVERT

SOIL LEGEND

At	ATKINS SILT LOAM, FREQUENTLY FLOODED, 0 TO 3 PERCENT SLOPES
CgB	CLYMER-COOKPORT CHANNERY LOAMS, 0 TO 8 PERCENT SLOPES, EXTREMELY STONY
HuD	HUSTONTOWN SILT LOAM, 15 TO 25 PERCENT SLOPES

SCALE
100 50 0 100
SCALE 1" =100'

WHM consulting, INC. designs, permits, resolutions | BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

SITE PLAN

LEIDY TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: RHM	DATE: 4/10/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY: KMC	DATE: 9/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 9/20/19		
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 24 OF 39

STANDARD EROSION AND SEDIMENT POLLUTION CONTROL NOTES

1. ALL EARTH DISTURBANCES, INCLUDING CLEARING AND GRUBBING AS WELL AS CUTS AND FILLS SHALL BE DONE IN ACCORDANCE WITH THE APPROVED E&S PLAN. A COPY OF THE APPROVED DRAWINGS (STAMPED, SIGNED AND DATED BY THE REVIEWING AGENCY) MUST BE AVAILABLE AT THE PROJECT SITE AT ALL TIMES. THE REVIEWING AGENCY SHALL BE NOTIFIED OF ANY CHANGES TO THE APPROVED PLAN PRIOR TO IMPLEMENTATION OF THOSE CHANGES. THE REVIEWING AGENCY MAY REQUIRE A WRITTEN SUBMITTAL OF THOSE CHANGES FOR REVIEW AND APPROVAL AT ITS DISCRETION.
2. AT LEAST 7 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, INCLUDING CLEARING AND GRUBBING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS, THE LANDOWNER, APPROPRIATE MUNICIPAL OFFICIALS, THE E&S PLAN PREPARER, THE PCSM PLAN PREPARER, THE LICENSED PROFESSIONAL RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE PCSM PLAN, AND A REPRESENTATIVE FROM THE LOCAL CONSERVATION DISTRICT TO AN ON–SITE PRECONSTRUCTION MEETING.
3. AT LEAST 3 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE PENNSYLVANIA ONE CALL SYSTEM INC. SHALL BE NOTIFIED AT 1–800–242–1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
4. ALL EARTH DISTURBANCE ACTIVITIES SHALL PROCEED IN ACCORDANCE WITH THE SEQUENCE PROVIDED ON THE PLAN DRAWINGS. DEVIATION FROM THAT SEQUENCE MUST BE APPROVED IN WRITING FROM THE LOCAL COUNTY CONSERVATION DISTRICT OR BY THE DEPARTMENT PRIOR TO IMPLEMENTATION.
5. AREAS TO BE FILLED ARE TO BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS AND OTHER OBJECTIONABLE MATERIAL.
6. CLEARING, GRUBBING, AND TOPSOIL STRIPPING SHALL BE LIMITED TO THOSE AREAS DESCRIBED IN EACH STAGE OF THE CONSTRUCTION SEQUENCE. GENERAL SITE CLEARING, GRUBBING AND TOPSOIL STRIPPING MAY NOT COMMENCE IN ANY STAGE OR PHASE OF THE PROJECT UNTIL THE E&S BMPS SPECIFIED BY THE BMP SEQUENCE FOR THAT STAGE OR PHASE HAVE BEEN INSTALLED AND ARE FUNCTIONING AS DESCRIBED IN THIS E&S PLAN.
7. AT NO TIME SHALL CONSTRUCTION VEHICLES BE ALLOWED TO ENTER AREAS OUTSIDE THE LIMIT OF DISTURBANCE BOUNDARIES SHOWN ON THE PLAN MAPS. THESE AREAS MUST BE CLEARLY MARKED AND FENCED OFF BEFORE CLEARING AND GRUBBING OPERATIONS BEGIN.
8. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED AT THE LOCATION(S) SHOWN ON THE PLAN MAPS IN THE AMOUNT NECESSARY TO COMPLETE THE FINISHED GRADING OF ALL EXPOSED AREAS THAT ARE TO BE STABILIZED BY VEGETATION. EACH STOCKPILE SHALL BE PROTECTED IN THE MANNER SHOWN ON THE PLAN DRAWINGS. STOCKPILE HEIGHTS SHALL NOT EXCEED 35 FEET. STOCKPILE SLOPES SHALL BE 2H:1V OR FLATTER. STOCKPILES SHALL BE LOCATED WITHIN THE LIMIT OF DISTURBANCE (LOD). FILTER SOCK OR SILT FENCE SHALL BE PLACED DOWNGRADIENT OF STOCKPILES.
9. IMMEDIATELY UPON DISCOVERING UNFORESEEN CIRCUMSTANCES POSING THE POTENTIAL FOR ACCELERATED EROSION AND/OR SEDIMENT POLLUTION, THE OPERATOR SHALL IMPLEMENT APPROPRIATE BEST MANAGEMENT PRACTICES TO MINIMIZE THE POTENTIAL FOR EROSION AND SEDIMENT POLLUTION AND NOTIFY THE LOCAL CONSERVATION DISTRICT AND/OR THE REGIONAL OFFICE OF THE DEPARTMENT.
10. ALL BUILDING MATERIALS AND WASTES SHALL BE REMOVED FROM THE SITE AND RECYCLED OR DISPOSED OF IN ACCORDANCE WITH THE DEPARTMENT'S SOLID WASTE MANAGEMENT REGULATIONS AT 25 PA. CODE 260.1 ET SEQ., 271.1, AND 287.1 ET. SEQ. NO BUILDING MATERIALS OR WASTES OR UNUSED BUILDING MATERIALS SHALL BE BURNED, BURIED, DUMPED, OR DISCHARGED AT THE SITE.
11. ALL OFF–SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL COUNTY CONSERVATION DISTRICT OR THE DEPARTMENT FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED.
12. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ANY MATERIAL BROUGHT ON SITE IS CLEAN FILL. FORM FP–001 MUST BE RETAINED BY THE PROPERTY OWNER FOR ANY FILL MATERIAL AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE BUT QUALIFYING AS CLEAN FILL DUE TO ANALYTICAL TESTING.
13. ALL PUMPING OF WATER FROM ANY WORK AREA SHALL BE DONE ACCORDING TO THE PROCEDURE DESCRIBED IN THIS PLAN, OVER UNDISTURBED VEGETATED AREAS.
14. VEHICLES AND EQUIPMENT MAY NEITHER ENTER DIRECTLY NOR EXIT DIRECTLY FROM LOTS AND ONTO ROADS AS IDENTIFIED ON THE PLANS.
15. UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPS SHALL BE MAINTAINED PROPERLY. MAINTENANCE SHALL INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT BMPS AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK, INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGARDING, RESEEDING, REMULCHING AND RENETTING MUST BE PERFORMED IMMEDIATELY. IF THE E&S BMPS FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPS, OR MODIFICATIONS OF THOSE INSTALLED WILL BE REQUIRED.
16. A LOG SHOWING DATES THAT E&S BMPS WERE INSPECTED AS WELL AS ANY DEFICIENCIES FOUND AND THE DATE THEY WERE CORRECTED SHALL BE MAINTAINED ON THE SITE AND BE MADE AVAILABLE TO REGULATORY AGENCY OFFICIALS AT THE TIME OF INSPECTION.
17. SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.
18. ALL SEDIMENT REMOVED FROM BMPS SHALL BE DISPOSED OF IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS.
19. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF 3 TO 5 INCHES 6 TO 12 INCHES ON COMPACTED SOILS PRIOR TO PLACEMENT OF TOPSOIL. AREAS TO BE VEGETATED SHALL HAVE A MINIMUM 4 INCHES OF TOPSOIL IN PLACE PRIOR TO SEEDING AND MULCHING. FILL OUTSLOPES SHALL HAVE A MINIMUM OF 2 INCHES OF TOPSOIL.
20. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
21. ALL EARTHEN FILLS SHALL BE PLACED IN COMPACTED LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
22. FILL MATERIALS SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
23. FROZEN MATERIALS OR SOFT, MUCKY, OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED INTO FILLS.
24. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
25. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
26. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY UPON REACHING FINISHED GRADE. CUT SLOPES IN COMPETENT BEDROCK AND ROCK FILLS NEED NOT BE VEGETATED. SEEDED AREAS WITHIN 50 FEET OF A SURFACE WATER, OR AS OTHERWISE SHOWN ON THE PLAN DRAWINGS, SHALL BE BLANKETED ACCORDING TO THE STANDARDS OF THIS PLAN.
27. IMMEDIATELY AFTER EARTH DISTURBANCE ACTIVITIES CEASE IN ANY AREA OR SUBAREA OF THE PROJECT, THE OPERATOR SHALL STABILIZE ALL DISTURBED AREAS. DURING NON–GERMINATING MONTHS, MULCH OR PROTECTIVE BLANKETING SHALL BE APPLIED AS DESCRIBED IN THE PLAN. AREAS NOT AT FINISHED GRADE, WHICH WILL BE REACTIVATED WITHIN 1 YEAR, MAY BE STABILIZED IN ACCORDANCE WITH THE TEMPORARY STABILIZATION SPECIFICATIONS. THOSE AREAS WHICH WILL NOT BE REACTIVATED WITHIN 1 YEAR SHALL BE STABILIZED IN ACCORDANCE WITH THE PERMANENT STABILIZATION SPECIFICATIONS.
28. PERMANENT STABILIZATION IS DEFINED AS A MINIMUM UNIFORM, PERENNIAL 70% VEGETATIVE COVER OR OTHER PERMANENT NON–VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED EROSION. CUT AND FILL SLOPES SHALL BE CAPABLE OF RESISTING FAILURE DUE TO SLUMPING, SLIDING, OR OTHER MOVEMENTS.
29. E&S BMPS SHALL REMAIN FUNCTIONAL AS SUCH UNTIL ALL AREAS TRIBUTARY TO THEM ARE PERMANENTLY STABILIZED OR UNTIL THEY ARE REPLACED BY ANOTHER BMP APPROVED BY THE LOCAL CONSERVATION DISTRICT OR THE DEPARTMENT.
30. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT FOR AN INSPECTION PRIOR TO REMOVAL/CONVERSION OF THE E&S BMPS.
31. AFTER FINAL SITE STABILIZATION HAS BEEN ACHIEVED, TEMPORARY EROSION AND SEDIMENT BMPS MUST BE REMOVED OR CONVERTED TO PERMANENT POST CONSTRUCTION STORMWATER MANAGEMENT BMPS. AREAS DISTURBED DURING REMOVAL OR CONVERSION OF THE BMPS SHALL BE STABILIZED IMMEDIATELY. IN ORDER TO ENSURE RAPID REVEGETATION OF DISTURBED AREAS, SUCH REMOVAL/CONVERSIONS ARE TO BE DONE ONLY DURING THE GERMINATING SEASON.
32. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE OWNER AND/OR OPERATOR SHALL CONTACT THE LOCAL CONSERVATION DISTRICT TO SCHEDULE A FINAL INSPECTION.
33. FAILURE TO CORRECTLY INSTALL E&S BMPS, FAILURE TO PREVENT SEDIMENT–LADEN RUNOFF FROM LEAVING THE CONSTRUCTION SITE, OR FAILURE TO TAKE IMMEDIATE CORRECTIVE ACTION TO RESOLVE FAILURE OF E&S BMPS MAY RESULT IN ADMINISTRATIVE, CIVIL, AND/OR CRIMINAL PENALTIES BEING INSTITUTED BY THE DEPARTMENT AS DEFINED IN SECTION 602 OF THE PENNSYLVANIA CLEAN STREAMS LAW. THE CLEAN STREAMS LAW PROVIDES FOR UP TO $10,000 PER DAY IN CIVIL PENALTIES, UP TO $10,000 IN SUMMARY CRIMINAL PENALTIES, AND UP TO $25,000 IN MISDEMEANOR CRIMINAL PENALTIES FOR EACH VIOLATION.
34. CONCRETE WASH WATER SHALL BE HANDLED IN THE MANNER DESCRIBED ON THE PLAN DRAWINGS. IN NO CASE SHALL IT BE ALLOWED TO ENTER ANY SURFACE WATERS OR GROUNDWATER SYSTEMS.
35. ALL E&S CONVEYANCE CHANNELS SHALL BE KEPT FREE OF OBSTRUCTIONS INCLUDING BUT NOT LIMITED TO FILL, ROCKS, LEAVES, WOODY DEBRIS, ACCUMULATED SEDIMENT, EXCESS VEGETATION, AND CONSTRUCTION MATERIAL/WASTES.
36. UNDERGROUND UTILITIES CUTTING THROUGH ANY ACTIVE E&S CONVEYANCE CHANNELS SHALL BE IMMEDIATELY BACKFILLED AND THE CHANNEL RESTORED TO ITS ORIGINAL CROSS–SECTION AND PROTECTIVE LINING. ANY BASE FLOW WITHIN THE CHANNEL SHALL BE CONVEYED PAST THE WORK AREA IN THE MANNER DESCRIBED IN THIS PLAN UNTIL SUCH RESTORATION IS COMPLETE.
37. E&S CONVEYANCE CHANNELS HAVING RIPRAP, RENO MATTRESS, OR GABION LININGS MUST BE SUFFICIENTLY OVER–EXCAVATED SO THAT THE DESIGN DIMENSIONS WILL BE PROVIDED AFTER PLACEMENT OF THE PROTECTIVE LINING.
38. SEDIMENT BASINS AND/OR TRAPS SHALL BE KEPT FREE OF ALL CONSTRUCTION WASTE, WASH WATER, AND OTHER DEBRIS HAVING POTENTIAL TO CLOG THE BASIN/TRAP OUTLET STRUCTURES AND/OR POLLUTE THE SURFACE WATERS.
39. SEDIMENT BASINS SHALL BE PROTECTED FROM UNAUTHORIZED ACTS BY THIRD PARTIES.
40. ANY DAMAGE THAT OCCURS IN WHOLE OR IN PART AS A RESULT OF BASIN OR TRAP DISCHARGE SHALL BE IMMEDIATELY REPAIRED BY THE PERMITTEE IN A PERMANENT MANNER SATISFACTORY TO THE MUNICIPALITY, LOCAL CONSERVATION DISTRICT, AND THE OWNER OF THE DAMAGED PROPERTY.
41. UPON REQUEST, THE APPLICANT OR HIS CONTRACTOR SHALL PROVIDE AN AS–BUILT (RECORD DRAWING) FOR ANY SEDIMENT BASIN OR TRAP TO THE MUNICIPAL INSPECTOR, LOCAL COUNTY CONSERVATION DISTRICT OR THE DEPARTMENT.
42. EROSION CONTROL BLANKETING SHALL BE INSTALLED ON ALL SLOPES 3H:1V OR STEEPER, WITHIN 100' OF A STREAM OR WETLAND IN A HIGH QUALITY OR EXCEPTIONAL VALUE WATERSHED, WITHIN 50' OF A STREAM OR WETLAND IN A NON–HIGH QUALITY OR EXCEPTIONAL VALUE WATERSHED, AND ON ALL OTHER DISTURBED AREAS SPECIFIED ON THE PLAN MAPS AND/OR DETAIL SHEETS.
43. FILL MATERIAL FOR EMBANKMENTS SHALL BE FREE OF ROOTS, OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIALS.

PIPELINE BMP INSTALLATION SEQUENCE

1. AT LEAST 10 WORKING DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, OR EXPANDING INTO AN AREA PREVIOUSLY UNMARKED, THE PENNSYLVANIA ONE CALL SYSTEM INC. SHALL BE NOTIFIED AT 1–800–242–1776 FOR THE LOCATION OF EXISTING UNDERGROUND UTILITIES.
2. AT LEAST 7 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, INCLUDING CLEARING AND GRUBBING, THE OWNER AND/OR OPERATOR SHALL INVITE ALL CONTRACTORS, ENVIRONMENTAL INSPECTORS, APPROPRIATE MUNICIPAL OFFICIALS, THE E&S PLAN PREPARER, THE PCSM PLAN PREPARER, THE LICENSED PROFESSIONAL RESPONSIBLE FOR OVERSIGHT OF CRITICAL STAGES OF IMPLEMENTATION OF THE PCSM PLAN, AND A REPRESENTATIVE FROM THE LOCAL CONSERVATION DISTRICT TO AN ON–SITE PRECONSTRUCTION MEETING.
3. HOLD PRE–CONSTRUCTION CONFERENCE WITH THE ENVIRONMENTAL INSPECTORS, LOCAL COUNTY CONSERVATION DISTRICT (CCD), PADEP, CONSTRUCTION CHIEF, AND DESIGN ENGINEER.
4. WILLIAMS SURVEY WILL FIELD LOCATE AND STAKE THE LOD.
5. LOCATE PROJECT ACCESS POINTS INCLUDING CONSTRUCTION ENTRANCES.
6. FLAG AND/OR STAKE WETLANDS, STREAMS AND OTHER SENSITIVE RESOURCES THAT WILL BE IMPACTED BY THE PROJECT.
7. INSTALL ORANGE CONSTRUCTION FENCE ALONG LIMITS OF DISTURBANCE IN AREAS ADJACENT TO STREAMS, WETLANDS, OR OTHER SENSITIVE RESOURCE, AS DESIGNATED ON THE PLANS.
8. INSTALL CONSTRUCTION ENTRANCES.
9. REMOVE FELLED TREES, CLEAR AND GRUB AS NECESSARY TO EFFECTIVELY INSTALL PERMANENT AND TEMPORARY ACCESS ROADS AND ASSOCIATED BMPS (VEGETATED ROADSIDE DITCHES, DITCH RELIEF CULVERTS, AND RIPRAP OUTLET PROTECTION, AND SEDIMENT BARRIER).
10. REMOVE FELLED TREES, CLEAR AND GRUB AS NECESSARY TO INSTALL BRIDGE EQUIPMENT CROSSINGS, WETLAND TIMBER MATTING, TIMBER MATTING AIR BRIDGES, AND SEDIMENT BARRIERS AT WETLAND AND WATERBODY CROSSINGS AS INDICATED ON THE PLANS.
11. REMOVE FELLED TREES FOR THE REMAINDER OF THE SITE.
12. CLEAR AND GRUB AS NECESSARY TO EFFECTIVELY INSTALL THE REMAINDER OF PERIMETER CONTROLS.
13. INSTALL PERIMETER CONTROLS.
14. COMPLETE SITE CLEARING AND GRUBBING.
15. AS THE GRUBBING OPERATION CONTINUES, INSTALL THE APPROPRIATE BMPS ASSOCIATED PER THE APPROVED PLANS FOR ITEMS INCLUDING BUT NOT LIMITED TO: ROCK FILTER OUTLETS, WATERBARS, DIVERSIONS, OUTLET STRUCTURES, VEGETATED ROADSIDE DITCHES, DITCH RELIEF CULVERTS, AND RIPRAP OUTLET PROTECTION.
16. STRIP AND STOCKPILE TOPSOIL.
17.
   A. CONTINUE EXCAVATION TO FACILITATE REMOVAL OF LEIDY A LINE
   B. CONTINUE EXCAVATION TO FACILITATE INSTALLATION OF PIPELINE
18. CONTRACTOR SHALL INSTALL TRENCH PLUGS DURING CONSTRUCTION AS IDENTIFIED ON THE APPROVED PLANS.
19. BACKFILL PIPE TRENCH WITHIN 30 DAYS OF EXCAVATING, REPAIR PERMANENT WATERBARS, REMOVE TEMPORARY WATERBARS, RETURN TEMPORARILY GRADED AREAS TO PRE–DEVELOPMENT GRADE, REPAIR/INSTALL EROSION CONTROL BLANKET AS NEEDED, REPLACE TOPSOIL AND SEED AND STABILIZE DISTURBED AREAS (SLOPES, DITCHES AND CHANNELS) AS THEY ARE RETURNED TO FINAL GRADE.
20. CONTRACTOR WILL COMPLETE UPLAND FINAL GRADING, TOPSOIL REPLACEMENT, INSTALLATION OF PERMANENT E&S MEASURES WITHIN 20 DAYS AFTER BACKFILLING THE TRENCH IN ALL AREAS EXCEPT RESIDENTIAL AREAS, WHICH WILL BE COMPLETED WITHIN 10 DAYS.
21. PERFORM HYDROSTATIC PRESSURE TEST OF PIPELINE.
22. DEWATER PIPELINE UTILIZING APPROPRIATE BMPS, COMPLETE FINAL TIE–INS.
23. AN AREA SHALL BE CONSIDERED TO HAVE ACHIEVED FINAL STABILIZATION WHEN IT HAS A MINIMUM UNIFORM 70% PERENNIAL VEGETATIVE COVER OR OTHER PERMANENT NON–VEGETATIVE COVER WITH A DENSITY SUFFICIENT TO RESIST ACCELERATED SURFACE EROSION AND SUBSURFACE CHARACTERISTICS SUFFICIENT TO RESIST SLIDING AND OTHER MOVEMENTS. WHEN CONTROLS ARE TO BE REMOVED IN AGRICULTURAL NON–SENSITIVE AREAS (STREAMS/WETLANDS), AGRICULTURAL LANDOWNERS SHALL MAINTAIN AGRICULTURAL BMPS PER PADEP REGULATIONS.
24. UPON COMPLETION OF ALL EARTH DISTURBANCE ACTIVITIES AND PERMANENT STABILIZATION OF ALL DISTURBED AREAS, THE PERMITTEE AND/OR OPERATORS SHALL CONTACT THE LOCAL CCD AND/OR PADEP FOR AN INSPECTION PRIOR TO THE REMOVAL OF THE E&SC BMPS.
25. REMOVE AND PROPERLY DISPOSE OF/RECYCLE E&SC BMPS. REMOVE STAKES AND ORANGE CONSTRUCTION FENCE. REPAIR AND PERMANENTLY STABILIZE AREAS DISTURBED DURING E&SC BMP REMOVAL.

THERMAL IMPACTS

DUE TO THE OVERALL NATURE OF THE PROJECT, THERMAL IMPACTS TO SURFACE WATERS ARE NOT ANTICIPATED. THE PIPELINE INSTALLATION ACTIVITIES WILL PRIMARILY TAKE PLACE WITHIN AN EXISTING CLEARED AND MAINTAINED PIPELINE RIGHT–OF–WAY. THERE WILL BE NO INCREASE IN STORMWATER DISCHARGE. THE PRIMARY MEANS TO ADDRESS THERMAL IMPACTS ON THIS PROJECT IS TO LIMIT THE SIZE AND DURATION OF EXPOSED EARTH. REVEGETATION PROCEDURES AND THE SEQUENCE OF CONSTRUCTION OUTLINE DISTURBED AREAS BEING IMMEDIATELY REVEGETATED.

STORMWATER RUNOFF ASSOCIATED WITH THE INSTALLATION OF THE MLV'S WILL BE ROUTED THROUGH THE STORMWATER BMP'S DESIGNED TO RETAIN AND INFILTRATE THE FIRST SURGE OF WATER FROM THE SITE. THE FIRST SURGE OF WATER WILL BE THE WARMEST WATER FOR THE DURATION OF THE STORM EVENT AND WILL QUICKLY COOL AS THE STORM EVENT PROGRESSES. THE BMPS ARE DESIGNED TO CAPTURE AND INFILTRATE THIS WARMEST SURGE OF STORMWATER. BASED ON ROUTING CALCULATIONS, STORMWATER IS NOT DISCHARGED FROM THE BMPS FOR THE FIRST 12 HOURS DURING A 100–YEAR/24–HOUR STORM EVENT. THE RETENTION PERIOD IS LONGER FOR LESS INTENSE STORMS. THEREFORE, THROUGH THESE MEASURES, THERE IS NO SIGNIFICANT THERMAL IMPACT TO THE RECEIVING WATERS ANTICIPATED.

TREE CLEARING NOTES

1. TREE FELLING IS TO BEGIN NO EARLIER THAN NOVEMBER 16TH AND END NO LATER THAN MARCH 31 [IF THERE IS A RESTRICTION].
2. THE LOCAL COUNTY CONSERVATION DISTRICT IS TO BE NOTIFIED PRIOR TO ACCESSING THE SITE AND UPON COMPLETION OF TREE FELLING ACTIVITIES.
3. TREES ARE TO BE FELLED BY WORKERS ON FOOT USING CHAIN SAWS.
4. TREE STUMPS WILL NOT BE REMOVED FROM THE RIGHT OF WAY UNTIL FULL SCALE CONSTRUCTION BEGINS.
5. DURING THE TREE FELLING PROCESS THERE WILL BE NO REMOVAL OR GRINDING OF TREE STUMPS.
6. TREES ARE NOT BE HAULED OFF SITE, EXCEPT IN CASES WHERE STEEP SLOPES PRESENT A SAFETY CONCERN, OR IN RESIDENTIAL AREAS WHERE A LANDOWNER INSISTS THAT THE TREES BE MOVED.
7. NO CLEARING OR GRUBBING WILL OCCUR.
8. THE USE OF EQUIPMENT (RUBBER TIRED AND / OR TRACKED) IS TO BE MINIMIZED.
9. IF PASSAGE OF LIGHT–DUTY TRUCKS AND SIMILAR EQUIPMENT IN EXISTING CLEARED PIPELINE RIGHT OF WAY LEADS TO THE CREATION OF ANY RUTS, THEY WILL BE SMOOTHED OVER AND GRASS SEED AND MULCH WILL BE SPREAD AT THE COMPLETION OF TREE FELLING, AS REQUIRED.
10. IF ANY RUTS OR LAND DISTURBANCE RESULTS IN AN EROSIVE CONDITION, THE RUTS WILL BE SMOOTHED OVER IMMEDIATELY AND IF NECESSARY, SEDIMENT BARRIER WILL BE INSTALLED IN THE LOCALIZED AREA OF THE DISTURBANCE.
11. FOLLOWING THE COMPLETION OF TREE FELLING OPERATIONS, DISTURBED AREAS WILL BE SMOOTHED, SEEDED AND MULCHED.
12. IF VEGETATION ALONG THE RIGHT OF WAY IS DISTURBED AND REQUIRES REMEDIAL ACTION, THE DISTURBED AREA(S) ARE TO BE SEEDED AND MULCHED AT THE COMPLETION OF TREE FELLING ACTIVITIES.

RESPONSIBILITIES FOR FILL MATERIALS

IF THE SITE WILL NEED TO HAVE FILL IMPORTED FROM AN OFF SITE LOCATION, THE RESPONSIBILITY FOR PERFORMING ENVIRONMENTAL DUE DILIGENCE AND THE DETERMINATION OF CLEAN FILL WILL IN MOST CASES RESIDE WITH THE OPERATOR.

IF THE SITE WILL HAVE EXCESS FILL THAT WILL NEED TO BE EXPORTED TO AN OFF SITE LOCATION, THE RESPONSIBILITY OF CLEAN FILL DETERMINATION AND ENVIRONMENTAL DUE DILIGENCE RESTS ON THE APPLICANT.

IF ALL CUT AND FILL MATERIALS WILL BE USED ON THE SITE, A CLEAN FILL DETERMINATION IS NOT REQUIRED BY THE OPERATOR UNLESS THERE IS A BELIEF THAT A SPILL OR RELEASE OF A REGULATED SUBSTANCE OCCURRED ON SITE.

APPLICANTS AND/OR OPERATORS MUST USE ENVIRONMENTAL DUE DILIGENCE TO ENSURE THAT THE FILL MATERIAL ASSOCIATED WITH THIS PROJECT QUALIFIES AS CLEAN FILL. DEFINITIONS OF CLEAN FILL AND ENVIRONMENTAL DUE DILIGENCE ARE PROVIDED BELOW. ALL FILL MATERIAL MUST BE USED IN ACCORDANCE WITH THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL," DOCUMENT NUMBER 258 2182 773. A COPY OF THIS POLICY IS AVAILABLE ONLINE AT WWW.DEPWEB.STATE.PA.US.

CLEAN FILL IS DEFINED AS: UNCONTAMINATED, NON–WATER SOLUBLE, NON–DECOMPOSABLE, INERT, SOLID MATERIAL. THE TERM INCLUDES SOIL, ROCK, STONE, DREDGED MATERIAL, USED ASPHALT, AND BRICK, BLOCK OR CONCRETE FROM CONSTRUCTION AND DEMOLITION ACTIVITIES THAT IS SEPARATE FROM OTHER WASTE AND IS RECOGNIZABLE AS SUCH. THE TERM DOES NOT INCLUDE MATERIALS PLACED IN OR ON THE WATERS OF THE COMMONWEALTH UNLESS OTHERWISE AUTHORIZED. (THE TERM "USED ASPHALT" DOES NOT INCLUDE MILLED ASPHALT OR ASPHALT THAT HAS BEEN PROCESSED FOR RE–USE.)

ENVIRONMENTAL DUE DILIGENCE: INVESTIGATIVE TECHNIQUES, INCLUDING, BUT NOT LIMITED TO, VISUAL PROPERTY INSPECTIONS, ELECTRONIC DATA BASE SEARCHES, REVIEW OF PROPERTY OWNERSHIP, REVIEW OF PROPERTY USE HISTORY, SANBORN MAPS, ENVIRONMENTAL QUESTIONNAIRES, TRANSACTION SCREENS, ANALYTICAL TESTING, ENVIRONMENTAL ASSESSMENTS OR AUDITS. ANALYTICAL TESTING IS NOT A REQUIRED PART OF DUE DILIGENCE UNLESS VISUAL INSPECTION AND/OR REVIEW OF THE PAST LAND USE OF THE PROPERTY INDICATES THAT THE FILL MAY HAVE BEEN SUBJECTED TO A SPILL OR RELEASE OF REGULATED SUBSTANCE. IF THE FILL MAY HAVE BEEN AFFECTED BY A SPILL OR RELEASE OF A REGULATED SUBSTANCE, IT MUST BE TESTED TO DETERMINE IF IT QUALIFIES AS CLEAN FILL. TESTING SHOULD BE PERFORMED IN ACCORDANCE WITH APPENDIX A OF THE DEPARTMENT'S POLICY "MANAGEMENT OF FILL."

FILL MATERIAL THAT DOES NOT QUALIFY AS CLEAN FILL IS REGULATED FILL. REGULATED FILL IS WASTE AND MUST BE MANAGED IN ACCORDANCE WITH THE DEPARTMENT'S MUNICIPAL OR RESIDUAL WASTE REGULATIONS BASED ON 25 PA. CODE CHAPTERS 287 RESIDUAL WASTE MANAGEMENT OR 271 MUNICIPAL WASTE MANAGEMENT, WHICHEVER IS APPLICABLE.

PIPELINE WORK SEQUENCE IN WETLANDS

FOR WORK IN WETLANDS, THE FOLLOWING STEPS SHALL BE INSERTED IN THE GENERAL PIPELINE CONSTRUCTION SEQUENCE ABOVE:

1. INSTALL ORANGE SAFETY FENCE AND PERIMETER BMPS AS DESIGNATED ON PLANS.
2. MATS, PADS, OR SIMILAR DEVICES SHALL BE USED DURING THE CROSSINGS OF WETLANDS.
3. DEWATER WORK AREA; WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT TRAP OR A FILTER BAG.
4. SOIL EXCAVATED FROM WETLAND AREAS SHALL BE PROPERLY SEGREGATED WITH UPPER SOIL PROFILE BEING REMOVED WITH THE ROOTS INTACT. THE SEGREGATED SOIL LAYERS SHOULD BE PLACED IN A SEPARATE STOCKPILE TO BE REUSED DURING THE WETLAND SURFACE RESTORATION.
5.
   A.REMOVE LEIDY LINE A (WHERE NECESSARY).
   B.INSTALL PIPE WITH BUOYANCY CONTROL (IF APPLICABLE).
6. INSTALL TRENCH PLUGS AS DESIGNATED ON PLANS TO PREVENT THE TRENCH FROM DRAINING THE WETLAND OR CHANGING ITS HYDROLOGY.
7. BACKFILL PIPE TRENCH WITH PROPERLY SEGREGATE SOILS TO MATCH ORIGINAL SURFACE GRADES. ORIGINAL GRADES THROUGH WETLANDS MUST BE RESTORED AFTER TRENCHING AND BACKFILLING. ANY EXCESS FILL MATERIALS GENERATED BY PIPE INSTALLATION MUST BE REMOVED FROM THE WETLAND.
8. MAINTAIN ALL E&SC DEVICES UNTIL SITE WORK IS COMPLETE AND A MINIMUM UNIFORM 70 PERCENT PERENNIAL VEGETATIVE COVER IS ESTABLISHED.
9. REMOVE ALL SOIL AND E&SC MEASURES UPON ESTABLISHMENT OF A MINIMUM UNIFORM 70 PERCENT PERENNIAL VEGETATIVE COVER OF THE DISTURBED AREA. REGRADE AND REVEGATE AREAS DISTURBED DURING THE REMOVAL OF THE SOIL E&SCS.

PIPELINE WORK SEQUENCE AT STREAM CROSSINGS

FOR STREAM CROSSINGS, THE FOLLOWING STEPS SHALL BE INSERTED IN THE GENERAL PIPELINE CONSTRUCTION SEQUENCE ABOVE:

1. PRIOR TO INITIATING CONSTRUCTION OF A STREAM CHANNEL LARGER THAN 10 FEET CONTRACTORS AND ENVIRONMENTAL INSPECTOR SHALL EVALUATE WEATHER FORECASTS FOR ANTICIPATED INCLEMENT WEATHER WHICH MAY RESULT IN FLOW CONDITIONS UNSUITABLE FOR CONSTRUCTION. BEFORE CONSTRUCTION OF A STREAM CROSSING GREATER THAN 10 FEET, ENVIRONMENTAL INSPECTOR, FOREMAN, AND ANY OTHER RESPONSIBLE INDIVIDUAL SHOULD SIGN–OFF THAT THE CROSSING CAN BE CONSTRUCTED DURING THE SPECIFIC TIME FRAME.
2. IF INCLEMENT WEATHER IS ANTICIPATED, A CONTINGENCY PLAN WILL BE DISCUSSED TO AVOID THE STREAM CROSSING DURING THE POTENTIALLY UNSUITABLE CONDITIONS.
3. AFTER INSTALLATION OF APPROPRIATE E&S BMPS, INSTALL TEMPORARY EQUIPMENT BRIDGE IN ACCORDANCE WITH DETAILS.
4. FOR DRY OPEN CUT CROSSINGS, INSTALL DAM AND PUMP, OR FLUME AS DESCRIBED IN STREAM CROSSING DETAILS.
5. DEWATER WORK AREA. WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT FILTER BAG. WHERE POSSIBLE, EXCAVATION SHALL BE FROM THE TOP OF THE STREAM BANK.
6.
   A. REMOVE LEIDY A LINE (WHERE NECESSARY).
   B. INSTALL PIPE
7. A UTILITY LINE CROSSING OF A STREAM CHANNEL (DITCHING AND STABILIZATION FROM TOP OF BANK TO TOP OF BANK) SHALL BE COMPLETED WITHIN 24 HOURS FOR STREAM CHANNELS 10 FEET OR LESS AND 48 HOURS FOR STREAM CHANNELS BETWEEN 10 – 100 FEET UNLESS SPECIFICALLY OUTLINED IN THE APPROVED PERMIT OR AUTHORIZED BY PADEP.
8. STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.

designs, permits, resolutions | consulting, INC.

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA REGISTERED PROFESSIONAL KEVIN C. CLARK ENGINEER 041211–E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

NOTES SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 3/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 25
WO: 1211227	RID:		OF 39

MEASURES OF RECYCLING & DISPOSAL OF MATERIALS FROM THE PROJECT AREA

THE RESTORATION OF THE PIPELINE RIGHT-OF-WAY WILL REQUIRED THE REMOVAL OF THE TEMPORARY MATERIALS. THE TEMPORARY MATERIALS INCLUDE, BUT MAY NOT BE LIMITED TO, STONE SURFACES AND ASSOCIATED GEOTEXTILES. THE CONTRACTORS ARE REQUIRED TO DISPOSE OF THE MATERIALS AT SUITABLE DISPOSALS OR RECYCLING SITES AND IN COMPLIANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

CONTRACTORS ARE REQUIRED TO INVENTORY AND MANAGE THEIR CONSTRUCTION SITE MATERIALS. THE GOAL IS TO BE AWARE OF THE MATERIALS ON-SITE, ENSURE THEY ARE PROPERLY MAINTAINED, USED, AND DISPOSED OF, AND TO MAKE SURE THE MATERIALS ARE NOT EXPOSED TO STORMWATER.

MATERIALS COVERED

THE FOLLOWING MATERIALS OR SUBSTANCES ARE EXPECTED TO BE PRESENT ON-SITE DURING CONSTRUCTION (NOTE: THIS LIST IS NOT AN ALL-INCLUSIVE LIST AND THE MATERIALS MANAGEMENT PLAN CAN BE MODIFIED TO ADDRESS ADDITIONAL MATERIALS USED ON-SITE):

- ACIDS
- DETERGENTS
- FERTILIZERS (NITROGEN/PHOSPHORUS)
- HYDROSEEDING MIXTURES
- PETROLEUM BASED PRODUCTS
- SANITARY WASTES
- SOIL STABILIZATION ADDITIVES
- SOLDER
- SOLVENTS
- OTHER (LIST HERE):

THESE MATERIALS MUST BE STORED AS APPROPRIATE AND SHALL NOT CONTACT STORM OR NON-STORMWATER DISCHARGES. CONTRACTOR SHALL PROVIDE A WEATHER PROOF CONTAINER TO STORE CHEMICALS OR ERODIBLE SUBSTANCES THAT MUST BE KEPT ON THE SITE. CONTRACTOR IS RESPONSIBLE FOR READING, MAINTAINING, AND MAKING EMPLOYEES AND SUBCONTRACTORS AWARE OF MATERIAL SAFETY DATA SHEETS (MSDSs).

MATERIAL MANAGEMENT PRACTICES

THE FOLLOWING ARE MATERIAL MANAGEMENT PRACTICES THAT WILL BE USED TO REDUCE THE RISK OF SPILLS OR OTHER ACCIDENTAL EXPOSURE OF MATERIALS AND SUBSTANCES TO STORMWATER RUNOFF.

1. GOOD HOUSEKEEPING PRACTICES

   THE FOLLOWING GOOD HOUSEKEEPING PRACTICES WILL BE FOLLOWED ON SITE DURING CONSTRUCTION:
   STORE ONLY ENOUGH MATERIAL REQUIRED TO DO THE JOB.
   STORE MATERIALS IN A NEAT, ORDERLY MANNER.
   STORE CHEMICALS IN WATERTIGHT CONTAINERS OR IN A STORAGE SHED, UNDER A ROOF, COMPLETELY ENCLOSED, WITH APPROPRIATE SECONDARY CONTAINMENT TO PREVENT SPILL OR LEAKAGE. DRIP PANS SHALL BE PROVIDED UNDER DISPENSERS.
   SUBSTANCES WILL NOT BE MIXED WITH ONE ANOTHER UNLESS RECOMMENDED BY THE MANUFACTURER.
   MANUFACTURER'S RECOMMENDATIONS FOR PROPER USE AND DISPOSAL WILL BE FOLLOWED.
   INSPECTIONS WILL BE PERFORMED TO ENSURE PROPER USE AND DISPOSAL OF MATERIALS.
   COVER AND BERM LOOSE STOCKPILED CONSTRUCTION MATERIALS THAT ARE NOT ACTIVELY BEING USED (I.E. SOIL, SPOILS, AGGREGATE, ETC.).
   MINIMIZE EXPOSURE OF CONSTRUCTION MATERIALS TO PRECIPITATION.
   MINIMIZE THE POTENTIAL FOR OFF-SITE TRACKING OF LOOSE CONSTRUCTION AND LANDSCAPE MATERIALS.

2. HAZARDOUS PRODUCTS
   THESE PRACTICES WILL BE USED TO REDUCE THE RISKS ASSOCIATED WITH HAZARDOUS MATERIALS. MSDSS FOR EACH SUBSTANCE WITH HAZARDOUS PROPERTIES THAT IS USED ON THE JOB SITE(S) WILL BE OBTAINED AND USED FOR THE PROPER MANAGEMENT OF POTENTIAL WASTES THAT MAY RESULT FROM THESE PRODUCTS. A MSDS WILL BE POSTED IN THE IMMEDIATE AREA WHERE SUCH PRODUCT IS STORED AND/OR USED AND ANOTHER COPY OF EACH MSDS WILL BE MAINTAINED IN A FILE AT THE JOB SITE CONSTRUCTION TRAILER OFFICE. EACH EMPLOYEE WHO MUST HANDLE A SUBSTANCE WITH HAZARDOUS PROPERTIES WILL BE INSTRUCTED ON THE USE OF MSDS AND THE SPECIFIC INFORMATION IN THE APPLICABLE MSDS FOR THE PRODUCT HE/SHE IS USING, PARTICULARLY REGARDING SPILL CONTROL TECHNIQUES.
   - PRODUCTS WILL BE KEPT IN ORIGINAL CONTAINERS WITH THE ORIGINAL LABELS IN LEGIBLE CONDITION.
   - ORIGINAL LABELS AND MSDS WILL BE PRODUCED AND USED FOR EACH MATERIAL.
   - IF SURPLUS PRODUCT MUST BE DISPOSED OF, MANUFACTURER'S OR LOCAL/STATE/FEDERAL RECOMMENDED METHODS FOR PROPER DISPOSAL WILL BE FOLLOWED.

3. HAZARDOUS WASTES
   ALL HAZARDOUS WASTE MATERIALS WILL BE DISPOSED OF BY THE CONTRACTOR IN THE MANNER SPECIFIED BY LOCAL, STATE, AND/OR FEDERAL REGULATIONS AND BY THE MANUFACTURER OF SUCH PRODUCTS. SITE PERSONNEL WILL BE INSTRUCTED.

4. CONCRETE AND OTHER WASH WATERS
   PREVENT DISPOSAL OF RINSE, WASH WATERS, OR MATERIALS ON IMPERVIOUS OR PERVIOUS SURFACES, INTO STREAMS, WETLANDS OR OTHER WATER BODIES.

   CONCRETE TRUCKS WILL BE ALLOWED TO WASH OUT OR DISCHARGE SURPLUS CONCRETE OR DRUM WASH WATER ON THE SITE, BUT ONLY EITHER (1) SPECIFICALLY DESIGNATED DIKED AREAS WHICH HAVE BEEN PREPARED TO PREVENT CONTACT BETWEEN THE CONCRETE AND/OR WASHOUT AND SOIL AND STORMWATER HAVING THE POTENTIAL TO BE DISCHARGED FROM THE SITE OR (2) IN LOCATIONS WHERE WASTE CONCRETE CAN BE POURED INTO FORMS TO MAKE RIPRAP OR OTHER USEFUL CONCRETE PRODUCTS.

   THE HARDENED RESIDUE FROM THE CONCRETE WASHOUT DIKED AREAS WILL BE DISPOSED OF IN THE SAME MANNER AS OTHER NON-HAZARDOUS CONSTRUCTION WASTE MATERIALS OR MAY BE BROKEN UP AND USED ON THE SITE AS DEEMED APPROPRIATE BY THE CONTRACTOR AND GEOTECHNICAL ENGINEER. THE CONTRACTOR WILL BE RESPONSIBLE FOR SEEING THAT THESE PROCEDURES ARE FOLLOWED.

   ALL CONCRETE WASHOUT AREAS WILL BE LOCATED IN AN AREA WHERE THE LIKELIHOOD OF THE AREA CONTRIBUTING TO STORMWATER DISCHARGE IS NEGLIGIBLE. IF REQUIRED, ADDITIONAL BMPS MUST BE IMPLEMENTED TO PREVENT CONCRETE WASTES FROM CONTRIBUTING TO STORMWATER DISCHARGES. THE LOCATION OF THE CONCRETE WASHOUT AREA(S) MUST BE IDENTIFIED, BY THE CONTRACTOR/JOB SITE SUPERINTENDENT, ON THE JOB SITE COPY OF THE EROSION AND SEDIMENT CONTROL PLAN(S) IN THIS ESCP.

5. SANITARY WASTES
   ALL SANITARY WASTE UNITS WILL BE LOCATED IN AN AREA WHERE THE LIKELIHOOD OF THE UNIT CONTRIBUTING TO STORMWATER DISCHARGES IS NEGLIGIBLE. ADDITIONAL BMPS MUST BE IMPLEMENTED, SUCH AS CONTAINMENT TRAYS (PROVIDED BY THE RENTAL COMPANY) OR SPECIAL CONTAINMENT CREATED WITH 2"X4" LUMBER, IMPERVIOUS PLASTIC, AND GRAVEL. THE LOCATION OF THE SANITARY WASTE UNITS MUST BE IDENTIFIED ON THE JOB SITE COPY OF THE EROSION AND SEDIMENT CONTROL PLAN(S), IN THIS ESCP, BY THE CONTRACTOR/JOB SITE SUPERINTENDENT.

6. SOLID AND CONSTRUCTION WASTES
   ALL WASTE MATERIALS WILL BE COLLECTED AND STORED IN A SECURELY LIDDED METAL DUMPSTER. THE DUMPSTER WILL COMPLY WITH ALL LOCAL AND STATE SOLID WASTE MANAGEMENT REGULATIONS. THE DUMPSTER/CONTAINER LIDS SHALL BE CLOSED AT THE END OF EVERY BUSINESS DAY AND DURING RAIN EVENTS. APPROPRIATE MEASURES SHALL BE TAKEN TO PREVENT DISCHARGES FROM WASTE DISPOSAL CONTAINERS TO THE RECEIVING WATER.

7. CONSTRUCTION ACCESS
   A STABILIZED CONSTRUCTION ENTRANCE WILL BE PROVIDED TO HELP REDUCE VEHICLE TRACKING OF SEDIMENTS, THE PAVED ROADS ADJACENT TO THE SITE ENTRANCE WILL BE INSPECTED DAILY AND SWEPT AS NECESSARY TO REMOVE ANY EXCESS MUD, DIRT, OR ROCK TRACKED FROM THE SITE. DUMP TRUCKS HAULING MATERIAL FROM THE CONSTRUCTION SITE WILL BE COVERED WITH A TARPAULIN AS NECESSARY.

8. PETROLEUM PRODUCTS
   ON-SITE VEHICLES WILL BE MONITORED FOR LEAKS AND RECEIVE REGULAR PREVENTATIVE MAINTENANCE. PETROLEUM PRODUCTS WILL BE STORED IN TIGHTLY SEALED CONTAINERS WHICH ARE CLEARLY LABELED. PETROLEUM STORAGE TANKS ON SITE WILL HAVE A DIKE OR BERM CONTAINMENT STRUCTURE CONSTRUCTED AROUND IT TO CONTAIN SPILLS WHICH MAY OCCUR (CONTAINMENT VOLUME TO BE 110% OF VOLUME STORED). THE DIKE OR BERMED AREA SHALL BE LINED WITH AN IMPERVIOUS MATERIAL SUCH AS A HEAVY DUTY PLASTIC SHEET. DRIP PANS SHALL BE PROVIDED FOR ALL DISPENSERS. ANY ASPHALT SUBSTANCES USED ON THE SITE WILL BE APPLIED ACCORDING TO THE MANUFACTURER'S RECOMMENDATIONS.

9. FERTILIZERS AND LANDSCAPE MATERIALS
   FERTILIZERS WILL BE APPLIED ONLY IN THE MINIMUM AMOUNTS RECOMMENDED BY THE MANUFACTURER. ONCE APPLIED, FERTILIZER WILL BE WORKED INTO THE SOIL TO MINIMIZE THE POTENTIAL FOR EXPOSURE TO STORMWATER. STORAGE WILL BE UNDER COVER. THE CONTENTS OF ANY PARTIALLY USED BAGS OF FERTILIZER WILL BE TRANSFERRED TO A SEALABLE PLASTIC BIN TO MINIMIZE THE POTENTIAL FOR SPILLS. THE BIN SHALL BE LABELED APPROPRIATELY.

   CONTAIN STOCKPILED MATERIALS, SUCH AS BUT NOT LIMITED TO, MULCHES, TOP SOIL, ROCKS AND GRAVEL, AND DECOMPOSED GRANITE, WHEN THEY ARE NOT ACTIVELY BEING USED.

   APPLY ERODIBLE LANDSCAPE MATERIAL AT QUANTITIES AND APPLICATION RATES ACCORDING TO MANUFACTURER RECOMMENDATIONS OR BASED ON WRITTEN SPECIFICATIONS BY KNOWLEDGEABLE AND EXPERIENCE FIELD PERSONNEL. DISCONTINUE THE APPLICATION OF ANY ERODIBLE LANDSCAPE MATERIAL WITHIN TWO DAYS PRIOR TO A FORECASTED RAIN EVENT OR DURING PERIODS OF PRECIPITATION.

10. PAINTS, PAINT SOLVENTS AND CLEANING SOLVENTS
    CONTAINERS WILL BE TIGHTLY SEALED AND STORED WHEN NOT IN USE. EXCESS PAINT AND SOLVENTS WILL BE PROPERLY DISPOSED OF ACCORDING TO MANUFACTURER'S INSTRUCTIONS OR LOCAL/STATE/FEDERAL REGULATIONS.

11. CONTAMINATED SOILS
    ANY CONTAMINATED SOILS (RESULTING FROM SPILLS OF MATERIALS WITH HAZARDOUS PROPERTIES) WHICH MAY RESULT FROM CONSTRUCTION ACTIVITIES WILL BE CONTAINED AND CLEANED UP IMMEDIATELY IN ACCORDANCE WITH APPLICABLE STATE AND FEDERAL REGULATIONS.

12. OFF-SITE WASTE AND BORROW AREAS
    ALL OFF-SITE WASTE AND BORROW AREAS MUST HAVE AN E&S PLAN APPROVED BY THE LOCAL COUNTY CONSERVATION DISTRICT OF PADEP FULLY IMPLEMENTED PRIOR TO BEING ACTIVATED. THE CONTRACTOR WILL BE RESPONSIBLE FOR THE REMOVAL OF ANY EXCESS MATERIAL AND TO DEVELOP A PLAN THAT MEETS THE CONDITIONS OF CHAPTER 102, NPDES PERMIT CONDITIONS, AND/OR OTHER STATE AND FEDERAL REGULATIONS.

GENERAL MAINTENANCE NOTES FOR ALL BMPs:

ROUTINE MAINTENANCE INSPECTIONS WILL BE REQUIRED TO ENSURE THE PERFORMANCE OF ALL THE SEDIMENT CONTROL BMP DEVICES. AT A MINIMUM, ALL STRUCTURES AND DEVICES SHALL BE INSPECTED ONCE EVERY SEVEN (7) CALENDAR DAYS AND WITHIN 24 HOURS AFTER ANY STORM EVENT. THIS INSPECTION SHALL BE FOLLOWED WITH A REPAIR SCHEDULE OF ALL NOTED DEFICIENCIES. VEGETATION PROGRESS SHALL ALSO BE INCLUDED IN THIS INSPECTION. VOID AREAS SHALL PROMPTLY BE RESEEDED AND MULCHED TO ESTABLISH PROTECTION.

UNTIL THE SITE IS STABILIZED, ALL EROSION AND SEDIMENT BMPs MUST BE MAINTAINED PROPERLY. MAINTENANCE MUST INCLUDE INSPECTIONS OF ALL EROSION AND SEDIMENT CONTROL BMPs AFTER EACH RUNOFF EVENT AND ON A WEEKLY BASIS. ALL PREVENTATIVE AND REMEDIAL MAINTENANCE WORK INCLUDING CLEAN OUT, REPAIR, REPLACEMENT, REGRADING, RESEEDING, REMULCHING, AND RENETTING, MUST BE DONE IMMEDIATELY. IF EROSION AND SEDIMENT CONTROL BMPs FAIL TO PERFORM AS EXPECTED, REPLACEMENT BMPs, OR MODIFICATIONS TO THOSE INSTALLED, WILL BE REQUIRED.

SEDIMENT REMOVED FROM BMPs SHALL BE DISPOSED OF WITHIN THE LIMIT OF DISTURBANCE IN LANDSCAPE AREAS OUTSIDE OF STEEP SLOPES, WETLANDS, FLOODPLAINS OR DRAINAGE SWALES AND IMMEDIATELY STABILIZED, OR PLACED IN STOCKPILES AREAS.

ALL CHANNELS MUST BE KEPT FREE OF OBSTRUCTIONS SUCH AS FILL, FALLEN LEAVES & WOODY DEBRIS, ACCUMULATED SEDIMENT, AND CONSTRUCTION MATERIALS/WASTES WITH EXCEPTION TO OTHER REQUIRED BMPs (I.E., CHECK DAMS). CHANNELS SHOULD BE KEPT MOWED AND/OR FREE OF ALL WEEDY, BRUSHY OR WOODY GROWTH. ANY UNDERGROUND UTILITIES RUNNING ACROSS/ THROUGH THE CHANNEL(S) SHALL BE IMMEDIATELY BACKFILLED AND THE CHANNEL(S) REPAIRED AND STABILIZED PER THE CHANNEL SECTION DETAIL.

SEDIMENT TRACKED ONTO ANY PUBLIC ROADWAY OR SIDEWALK SHALL BE RETURNED TO THE CONSTRUCTION SITE BY THE END OF EACH WORK DAY AND DISPOSED IN THE MANNER DESCRIBED IN THIS PLAN. IN NO CASE SHALL THE SEDIMENT BE WASHED, SHOVELED, OR SWEPT INTO ANY ROADSIDE DITCH, STORM SEWER, OR SURFACE WATER.

ALL NECESSARY REPAIRS WILL BE MADE IMMEDIATELY.

MAINTENANCE SCHEDULE

CONTROL MEASURE	INSPECT	PROBLEMS TO LOOK FOR	POSSIBLE REMEDIES
BROAD BASED DIP	DAILY	SEDIMENT/DEBRIS BLOCKING THE NORMAL FLOW OF WATER. WASHOUTS, BULGES, OR SLUMPS.	REPAIR DAMAGED OR NON-FUNCTIONING DIPS.
COMPOST FILTER SOCK	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	BARRIER HAS BEEN UNDERMINED OR TORPED SEDIMENT AT 1/2 HEIGHT OF BARRIER TORN OR DAMAGED FABRIC SOCK IS OLDER THAN PERMITTED RUNOFF ESCAPING AROUND BARRIER	REPLACE WITH A ROCK FILTER OUTLET. INCREASE NUMBER OF STAKES AT AFFECTED AREA. REMOVE SEDIMENT, PLACE ACROSS SITE AS FILL. REPAIR ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACE. EXTEND BARRIER.
CLEAN WATER CROSSING	CONTINUOUSLY. ONCE A WEEK AND AFTER EVERY RUNOFF EVENT. MONTHLY/AS NEEDED	CHANNEL THICKNESS NOT MAINTAINED. EROSION AROUND TRENCH INLETS AND WATERSHEDS. DAMAGED CHANNEL LINING. SEDIMENT/DEBRIS BLOCKING NORMAL FLOW OF WATER. TRASH AND DEBRIS.	RECONSTRUCT CHANNEL. REGRADE AND REPAIR ANY UNDERMINED OR WASHED OUT AREAS. REPLACE CHANNEL LINING. REMOVE SEDIMENT WHEN TOTAL CHANNEL DEPTH IS REDUCED BY 25%. REMOVE TRASH AND DEBRIS.
DIVERSION BERM / DIVERSION TERRACE	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	SEDIMENT/DEBRIS BLOCKING THE NORMAL FLOW OF WATER. WASH OUTS, BULGES OR SLUMPS. UNSTABLE SIDE SLOPES. DAMAGED CHANNEL LINING. REDUCED CAPACITY DUE TO DECREASE IN CHANNEL DIMENSIONS. VEGETATION GROWTH.	REMOVE SEDIMENT/DEBRIS, SPREAD SEDIMENT ACROSS SITE. REPAIR OR REPLACE IMMEDIATELY UPON DISCOVERY. RECONSTRUCT CHANNEL. REPLACE CHANNEL LINING. RE-SEED.
EROSION CONTROL BLANKET	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	TORN OR LOOSE STAPLED AREAS. VEGETATION GROWTH. BLANKET DESTROYED OR DAMAGED.	REMOVE AND REPLACE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS. REGRADE AND REPAIR ANY UNDERMINED OR WASHED OUT AREAS. RE-SEED.
HYDROSTATIC DEWATERING STRUCTURE	DURING DEWATERING ACTIVITIES.	ACCUMULATIONS REACH ½ THE ABOVEGROUND HEIGHT OF THE BARRIER. DAMAGED OR DETERIORATED STRAW BALES.	REMOVE SEDIMENT/DEBRIS. REPLACE STRAW BALES.
PUMPED WATER FILTER BAG	BEFORE AND AFTER EACH USE	TORN FABRIC, TEARS OR BREACHES. SEDIMENT ESCAPING WITH PURGE WATER. MORE THAN 50% FILLED WITH SEDIMENT.	REPLACE FILTER BAG. REMOVE SEDIMENT, SPREAD OVER SITE.
ROCK CONSTRUCTION ENTRANCE	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	STONE THICKNESS NOT CONSTANTLY MAINTAINED. SEDIMENT ON PUBLIC ROADWAY.	ADD ROCK TO BRING TO SPECIFIED DIMENSIONS. SWEEP MATERIAL BACK TO PROJECT SITE. DO NOT WASH ROADWAY WITH WATER.
ROCK FILTER OUTLET	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	LINING WASHED AWAY. SEDIMENT AT 1/3 HEIGHT OF BARRIER. RUNOFF ESCAPING AROUND BARRIER. CLOGGING.	RESHAPE AS NECESSARY AND REPLACE TOP LAYER WITH CLEAN STONE. REPLACE RIPRAP WITH LARGER SIZE RIPRAP. REBUILD/EXTEND BARRIER. WASH OR REPLACE SEDIMENT LADEN STONE.
TRENCH PLUG	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	STORMWATER POOLING WITHIN THE EXCAVATION BEHIND A TRENCH PLUG	PUMP WATER THROUGH A PUMPED WATER FILTER BAG OVER STABLE, UNDISTURBED EARTH.
VEGETATION	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	SEDIMENT AT TOE-OF-SLOPE. RILLS & GULLIES FORMING. BARE SOIL PATCHES.	CHECK FOR TOE-OF-SLOPE DIVERSION & INSTALL, IF NEEDED. FILL RILLS AND RE-GRADE GULLIED SLOPES. RE-SEED, FERTILIZE, LIME AND RE-MULCH.
SEDIMENT TRAP	ONCE A WEEK AND AFTER EVERY RUNOFF EVENT	TRASH AND OTHER DEBRIS. SEDIMENT AT CLEAN-OUT ELEVATION. DAMAGED OR CLOGGED COMPOST FILTER SOCK. EROSION. VEGETATION GROWTH. STANDING WATER MORE THAN 7 DAYS AFTER RAINFALL EVENT.	DISPOSE OF TRASH PROPERLY. REMOVE SEDIMENT, PLACE ACROSS SITE AS FILL. REMOVE CLOGGED MATERIAL. RESTORE TO DESIGN SPECIFICATIONS. PUMP WATER THROUGH A PUMPED WATER FILTER BAG OVER STABLE, UNDISTURBED EARTH.

* REFER TO BMP DETAIL FOR ADDITIONAL MAINTENANCE REQUIREMENTS AND REMEDIES.

RESOLUTIONS TO LIMITING SOIL CHARACTERISTICS

LIMITATION	RESOLUTION
ERODIBLE	PROTECTIVE LINING, SEEDING AND MULCHING, EROSION CONTROL BLANKETS (ROLLS OF HYDRAULICALLY APPLIED), TRACKING SLOPES, UPSTREAM DIVERSIONS, WATERBARS, ETC, TO MINIMIZE EROSION OF THE SOILS.
CUT BANKS CAVE	TO OFFSET THE CAVING OF CUTBANKS, TRENCHING OPERATIONS WILL BE CONDUCTED IN ACCORDANCE WITH THE OSHA TECHNICAL MANUAL FOR TRENCHING (OR "TRENCHES SHALL BE EXCAVATED WITH APPROPRIATE LAYBACK BANKS TO PREVENT CAVE-INS. STOCKPILES SHALL BE LOCATED AT A SUFFICIENT DISTANCE AWAY FROM THE TRENCH."
CORROSIVE TO CONCRETE OR STEEL	PREVENTATIVE COATINGS SHALL BE USED TO PREVENT CORROSION OF CONCRETE AND/OR STEEL.
DROUGHTY	SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
PRONE TO FLOODING, SLOW PERCOLATION, PONDING, WETNESS, HIGH WATER TABLE, OR HYDRIC	DEWATER WITH APPROPRIATE MEANS SUCH AS PUMP WATER FILTER BAGS, SEDIMENT TRAPS, ETC. AS EXCAVATIONS IN SOILS THAT HAVE THESE CHARACTERISTICS WILL LIKELY ENCOUNTER WATER.
HIGH WATER TABLE	PUMPS AND WATER FILTER BAGS SHALL BE UTILIZED IF GROUNDWATER IS ENCOUNTERED.
LOW STRENGTH	PRECAUTIONS WILL BE TAKEN TO PREVENT SLOPE FAILURE WHEN WORKING WITHIN LOW STRENGTH SOILS BY FLATTENING CUT/FILL SLOPES, NOT OVERLOADING, MAINTAINING LATERAL SUPPORT, AND PREVENTING SATURATION OF SOILS. USE OF THESE SOILS WILL BE AVOIDED FOR ROADWAY CONSTRUCTION.
PIPING	TRENCH PLUGS SHALL BE UTILIZED IN ACCORDANCE WITH THE STANDARD DETAIL. WATER SHALL BE DIVERTED AWAY FROM OPEN TRENCHES.
POOR TOPSOIL	SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.
FROST ACTION	SOILS THAT HAVE THE POTENTIAL TO HEAVE DUE TO FROST ACTION MAY CAUSE DAMAGE TO ROADWAYS OR PADS WHERE FOUNDATIONS ARE CRITICAL REMOVAL AND REPLACEMENT SOILS WITH SUITABLE MATERIAL MAY BE REQUIRED.
WETNESS	SOIL TESTING IS ENCOURAGED TO DETERMINE THE APPROPRIATE APPLICATIONS OF SOIL AMENDMENTS TO PROMOTE GROWTH. SOILS ONSITE THAT ARE FAIR SOURCES OF TOPSOIL WILL BE IDENTIFIED, STRIPPED AND STOCKPILED FOR USE DURING RESTORATION.

Limitations of Pennsylvania Soils Pertaining to Earth Disturbance Projects (Erosion and Sediment Control Best Management Practice (BMP) Manual – Technical Guidance Number 363-3134-008/Page 401)

SOIL NAME	SOIL WITH SLOPE CLASS	CUTBANKS CAVE	CORROSIVE TO CONCRETE\STEEL	DROUGHTY	EASILY ERODIBLE	FLOODING	DEPTH TO SATURATED ZONE/ SEASONAL HIGH WATER TABLE	HYDRIC/ HYDRIC INCLUSIONS	LOW STRENGTH / LANDSLIDE PRONE	SLOW PERCOLATION	PIPING	POOR SOURCE OF TOPSOIL	FROST ACTION	SHRINK - SWELL	POTENTIAL SINKHOLE	PONDING	WETNESS
Atkins	At	X	C/S			X	X	X	X	X	X	X	X				X
Barbour	Bb	X	C	X		X	X	X				X	X				X
Calvin	CaB	X	C	X	X			X			X		X				
Cookport	CpB, CpB	X	C/S	X	X		X	X	X	X	X	X	X				X
Freetown	Fr	X	C/S				X	X	X				X			X	
Hazleton	HmD, HoF	X	C	X	X			X	X	X	X	X	X				
Hustonto wn	HuB, HuD	X	C/S	X			X	X		X	X		X				
Laidig	LdC	X	C/S	X	X		X	X	X	X	X	X	X				
Linden	Lr	X	C			X	X	X	X	X	X		X				
Meckesvill e	MhD	X	C/S				X		X	X	X	X	X				X
Ungers	UnB, UpF	X	C		X				X	X			X				
Wharton	WeB, WgB	X	C/S		X		X	X	X	X	X	X	X	X			X

ACID-PRODUCING SOILS AND BEDROCK CONTROL PLAN

THE FOLLOWING ACID PRODUCING SOILS CONTROL PLAN WAS DEVELOPED TO IDENTIFY BMPS AND PROCEDURES FOR MINIMIZING THE POTENTIAL FOR POLLUTION ASSOCIATED WITH THE DISTURBANCE OF THE AREAS WITHIN THE PROPOSED RIGHT-OF-WAY THAT CONTAIN ACID-PRODUCING SOILS WITH A pH LESS THAN 4.0.

ACID-PRODUCING SOILS AND BEDROCK CONTROL PLAN:

1. CONTRACTOR SHALL LIMIT THE EXCAVATION AREA AND EXPOSURE TIME WHEN HIGH ACID-PRODUCING SOILS ARE ENCOUNTERED. LOCATIONS WHERE ACIDIC SOILS ARE ANTICIPATED TO BE PRESENT ALONG THE PIPELINE CORRIDOR ARE PROVIDED IN THE COUNTY-SPECIFIC TABLE INCLUDED AT THE END OF THIS PLAN SET.
2. CONTRACTOR SHALL SEPARATELY STORE TOPSOIL STRIPPED FROM THE SITE AWAY FROM TEMPORARILY STOCKPILED HIGH ACID-PRODUCING SOILS AND BEDROCKS.
3. CONTRACTOR SHALL STOCKPILE HIGH ACID-PRODUCING SOILS AND BEDROCK MATERIAL ON LEVEL GROUND TO MINIMIZE ITS MOVEMENT, ESPECIALLY WHEN THESE MATERIALS HAVE A HIGH CLAY CONTENT.
4. CONTRACTOR SHALL COVER TEMPORARILY STOCKPILED HIGH ACID-PRODUCING SOIL AND BEDROCK MATERIAL TO BE EXPOSED MORE THAN 30 DAYS WITH PROPERLY ANCHORED, HEAVY-GRATE SHEETS OF POLYETHYLENE, WHERE POSSIBLE. IF NOT POSSIBLE, STOCKPILES SHALL BE COVERED WITH A MINIMUM OF THREE TO SIX INCHES OF WOOD CHIPS TO MINIMIZE EROSION OF THE STOCKPILE. IN ADDITION, THE CONTRACTOR SHALL INSTALL SILT FENCE AT THE TOE OF THE STOCKPILE SLOPE TO CONTAIN MOVEMENT OF MATERIAL. CONTRACTOR SHALL NOT APPLY TOPSOIL TO THE HIGH ACID-PRODUCING SOIL OR BEDROCK STOCKPILES TO PREVENT TOPSOIL CONTAMINATION.
5. CONTRACTOR SHALL ULTIMATELY DISPOSE OF HIGH ACID-PRODUCING SOILS OR BEDROCK WITH A pH OF OUR OR LESS, OR CONTAINING IRON SULFIDE (INCLUDING BORROW FROM CUTS) BY PLACING THE MATERIAL COMBINED WITH LIMESTONE AT THE RATE OF 6 TONS PER ACRE (OR 275 POUNDS PER 1,000 SQUARE FEET OF SURFACE AREA) AND COVERING THE MIXTURE WITH A MINIMUM OF 12 INCHES OF SETTLED SOILS WITH A pH OF FIVE OR MORE EXCEPT AS FOLLOWS:
   a. IN THE AREAS WHERE TREES OR SHRUBS ARE TO BE PLANTED, THE CONTRACTOR SHALL COVER THE LIMESTONE/SOIL MIXTURE WITH A MINIMUM OF 24 INCHES OF SOILS WITH A pH OF 5 OR MORE.
   b. CONTRACTOR SHALL NOT LOCATE ANY DISPOSAL AREA WITHIN 24 INCHES OR ANY SURFACE OF A SLOPE OR BANK, SUCH AS BERMS, STREAM BANKS, DITCHES, AND OTHER SURFACE WATERS TO PREVENT POTENTIAL LATERAL LEACHING DAMAGES.
6. AT THE END OF EACH DAY, CONTRACTOR SHALL CLEAN ALL EQUIPMENT USED TO HANDLE HIGH ACID-PRODUCING SOILS OR BEDROCK TO PREVENT SPREADING OF HIGH-ACID MATERIALS TO OTHER PARTS OF THE PROPOSED RIGHT-OF-WAY, INTO STREAMS, OR STORMWATER CONVEYANCES, AND TO PROTECT MACHINERY FROM ACCELERATED CORROSION.
7. CONTRACTOR SHALL PROVIDE AND INSTALL NON-VEGETATIVE EROSION CONTROLS (STONE TRACKING PADS, STRATEGICALLY-PLACED LIMESTONE CHECK DAMS, SILT FENCES, WOOD CHIPS) TO LIMIT THE MOVEMENT OF HIGH ACID-PRODUCING SOILS FROM, AROUND, OR OFF OF THE PROPOSED RIGHT-OF-WAY.
8. FOLLOWING THE BURIAL OR REMOVAL OF HIGH ACID-PRODUCING SOILS AND BEDROCK, TOP SOILING, AND SEEDING OF THE PROPOSED RIGHT-OF-WAY, TRANSCO SHALL MONITOR THE SITE FOR APPROXIMATELY SIX TO 12 MONTHS TO ASSURE THERE IS ADEQUATE STABILIZATION AND THAT NO HIGH-ACID SOIL OR BEDROCK PROBLEMS EMERGE. CONTRACTOR SHALL CORRECT ANY PROBLEMS THAT ARE DISCOVERED WITHIN THIS TIME PERIOD.
9. IF PROBLEMS OCCUR WHERE HIGH ACID-PRODUCING SOILS OR BEDROCK HAVE BEEN PLACED OR BURIED, THE APPLICANT SHALL MONITOR THESE AREAS FOR AT LEAST TWO YEARS TO ASSURE THERE IS NO MIGRATION OF POTENTIAL ACID LEACHATE.

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REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

NOTES SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 3/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 26
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39

TABLE 11.3
Plant Tolerances of Soil Limitation Factors

Species	Growth Habit[1]	Tolerates: Wet Soil	Dry Site	Low Fertility	Acid Soil (pH 5-5.5)[2]	Minimum Seed Specifications[3]: Purity (%)	Ready Germ (%)	Hard Seed (%)	Total Germ (%)	Seeds/lb (1,000s)
Warm-Season Grasses										
Deertongue	bunch	yes	yes	yes	yes	95	75		75	250
Weeping lovegrass	bunch	no	yes	yes	yes	97	75		75	1,500
Switchgrass[4]	bunch	yes	yes	yes	yes		(60 PLS)			390
Big bluestem	bunch	no	yes	yes	yes		(60 PLS)			150
Cool-Season Grasses										
Tall Fescue	bunch	yes	no	yes	no	95	80		80	227
Redtop	sod	yes	yes	yes	yes	92	80		80	5,000
Fine fescues	sod	no	no	yes	no	95	80		80	400
Perennial ryegrass	bunch	yes	no	no	no	95	85		85	227
Annual ryegrass	bunch	yes	no	yes	no	95	85		85	227
Kentucky bluegrass	sod	no	no	no	no	85	75		75	2,200
Reed canarygrass	sod	yes	yes	yes	no	95	70		70	520
Orchardgrass	bunch	yes	yes	yes	yes	95	80		80	654
Timothy	bunch	yes	no	yes	yes	95	80		80	1,230
Smooth bromegrass	sod	no	yes	yes	no	95	80		80	136
Legumes[5]										
Crownvetch	sod	no	yes	yes	no	98	40	30	65	120
Birdsfoot trefoil[6]	bunch	yes	no	yes	yes	98	60	20	80	400
Flatpea	sod	no	no	yes	yes	98	55	20	75	10
Serecia lespedeza	bunch	no	yes	yes	yes	98	60	20	80	335
Cereals										
Winter wheat	bunch	no	no	no	no	98	85		85	15
Winter rye	bunch	no	no	yes	yes	98	85		85	18
Spring oats	bunch	no	no	no	no	98	85		85	13
Sundangrass	bunch	no	yes	no	no	98	85		85	55
Japanese millet	bunch	yes	no	yes	yes	98	80		80	155

[1] Growth habit refers to the ability of the species to either form a dense sod by vegetative means (stolons, rhizomes, or roots) or remain in a bunch or single plant form. If seeded heavily enough, even bunch formers can produce a very dense stand. This is sometimes called a sod, but not in the sense of a sod formed by vegetative means.

[2] Once established, plants may grow at a somewhat lower pH, but cover generally is only adequate at pH 6.0 or above.

[3] *Minimum seed lots are truly minimum, and seed lots to be used for revegetation purposes should equal or exceed these standards.* Thus, deertongue grass should germinate 75% or better. Crownvetch should have at least 40% readily germinable seed and 30% hard seed. Commonly, seed lots are available that equal or exceed minimum specifications. Remember that disturbed sites are adverse for plant establishment. Ready germination refers to seed that germinates during the period of the germination test and that would be expected, if conditions are favorable, to germinate rapidly when planted. The opposite of ready germination is dormant seed, of which hard seed is one type.

[4] Switchgrass seed is sold only on the basis of PLS.

[5] Need specific legume inoculant. Inoculant suitable for garden peas and sweetpeas usually is satisfactory for flatpea.

[6] Birdsfoot trefoil is adapted over the entire state, except in the extreme southeast where crown and root rots may injure stands.

Penn State, "Erosion Control and Conservation Plantings on Noncropland,"

TABLE 11.4
Recommended Seed Mixtures

Mixture Number	Species	Seeding Rate - Pure Live Seed[1]: Most Sites	Adverse Sites
1[2]	Spring oats (spring), or	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	60	75
	Fine fescue, or	35	40
	Kentucky bluegrass, plus	25	30
	Redtop[4], or	3	3
	Perennial ryegrass	15	20
3	Birdsfoot trefoil, plus	6	10
	Tall fescue	30	35
4	Birdsfoot trefoil, plus	6	10
	Reed canarygrass	10	15
8	Flatpea, plus	20	30
	Tall fescue, or	20	30
	Perennial ryegrass	20	25
9[6]	Serecia lespedeza, plus	10	20
	Tall fescue, plus	20	25
	Redtop[4]	3	3
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

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. 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%, 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 2 bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at 1 bushel per acre. If germination is below 90%, 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. Use for highway slopes and similar sites where the desired species after establishment is crownvetch.
6. Use only in extreme southeastern or extreme southwestern Pennsylvania. *Serecia lespedeza* is not well adapted to most of PA.
7. Do not mov shorter than 9 to 10 inches.
8. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

TABLE 11.5
Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	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)		
Well-drained	1 plus	2 or 10
Slopes and Banks (grazed/hay)		
Well-drained	1 plus	2, 3, or 13
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 3 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[2]		
Non-mowed areas		
Well-drained	1 plus	5, 7, 8, 9, or 10
Variable drained	1 plus	3 or 7
Poorly drained	1 plus	3 or 4
Areas mowed several times per year	1 plus	2, 3, or 10
Utility Right-of-way		
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, 9, 11[1], or 12[1]
Severely disturbed areas for grazing/hay	1 plus	3 or 13

Penn State, "Erosion Control and Conservation Plantings on Noncropland"

1. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.
2. Contact the Pennsylvania Department of Transportation district roadside specialist for specific suggestions on treatment techniques and management practices.
3. Seed mixtures containing crown vetch should not be used in areas adjacent to wetlands or stream channels due to the invasive nature of this species.

TEMPORARY AND PERMANENT STABILIZATION:

1. PERMANENT STABILIZATION: UPON FINAL COMPLETION OF AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY, THE SITE SHALL IMMEDIATELY HAVE TOPSOIL RESTORED, REPLACED, OR AMENDED, SEEDED, MULCHED OR OTHERWISE PERMANENTLY STABILIZED AND PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION.

   E&S BMPS SHALL BE IMPLEMENTED AND MAINTAINED UNTIL THE PERMANENT STABILIZATION IS COMPLETED. ONCE PERMANENT STABILIZATION HAS BEEN ESTABLISHED, THE TEMPORARY E&S BMPS SHALL BE REMOVED. ANY AREAS DISTURBED IN THE ACT OF REMOVING TEMPORARY E&S BMPS SHALL BE PERMANENTLY STABILIZED UPON COMPLETION OF THE TEMPORARY E&S BMP REMOVAL ACTIVITY.

   FOR AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY TO BE CONSIDERED PERMANENTLY STABILIZED, THE DISTURBED AREAS SHALL BE COVERED WITH ONE OF THE FOLLOWING:

   - A MINIMUM UNIFORM 70% PERENNIAL VEGETATIVE COVER, WITH A DENSITY CAPABLE OF RESISTING ACCELERATED EROSION AND SEDIMENTATION.
   - AN ACCEPTABLE BMP WHICH PERMANENTLY MINIMIZES ACCELERATED EROSION AND SEDIMENTATION.

   WHEN EROSION AND SEDIMENTATION CONTROLS ARE TO BE REMOVED IN AGRICULTURAL NON–SENSITIVE AREAS (STREAMS/WETLANDS), AGRICULTURAL LANDOWNERS SHALL MAINTAIN AGRICULTURAL BMPS PER PADEP REGULATIONS.

2. TEMPORARY STABILIZATION: UPON TEMPORARY CESSATION OF AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY WHERE A CESSATION OF EARTH DISTURBANCE ACTIVITIES WILL EXCEED 4 DAYS (INCLUDING AGRICULTURAL AREAS), THE SITE SHALL BE IMMEDIATELY SEEDED, MULCHED, OR OTHERWISE PROTECTED FROM ACCELERATED EROSION AND SEDIMENTATION PENDING FUTURE EARTH DISTURBANCE ACTIVITIES.

   FOR AN EARTH DISTURBANCE ACTIVITY OR ANY STAGE OR PHASE OF AN ACTIVITY TO BE CONSIDERED TEMPORARILY STABILIZED, THE DISTURBED AREAS SHALL BE COVERED WITH ONE OF THE FOLLOWING:

   - A MINIMUM UNIFORM COVERAGE OF MULCH AND SEED, WITH A DENSITY CAPABLE OF RESISTING ACCELERATED EROSION AND SEDIMENTATION.
   - AN ACCEPTABLE BMP WHICH TEMPORARILY MINIMIZES ACCELERATED EROSION AND SEDIMENTATION.

3. STABILIZATION DURING NON–GROWING SEASONS

   WHEN UTILITY CONSTRUCTION MUST BE DONE AND IS COMPLETED DURING A NON–GROWING SEASON, INTERIM STABILIZATION BMPS MUST BE IMPLEMENTED AND ADEQUATELY MAINTAINED. THE APPLICATION OF STRAW MULCH AND THE RATE OF 3.0 TONS PER ACRE IS REQUIRED. THE BMPS SHOULD BE INSPECTED WEEKLY (UNLESS SNOW COVERED) AND AFTER EACH RUNOFF EVENT TO IDENTIFY AREAS THAT BECOME BARE.

   BARE AREAS SHALL BE COVERED WITH A PROPERLY INSTALLED EROSION CONTROL BLANKET. ALL TEMPORARY EROSION AND SEDIMENT POLLUTION CONTROLS MUST BE MAINTAINED UNTIL PERMANENT VEGETATION IS ESTABLISHED.

4. WETLAND STABILIZATION. TEMPORARY COVER FOR WETLANDS AREAS WILL INCLUDE ANNUAL RYEGRASS AT 40LBS/ACRE. DO NOT LIME, FERTILIZE OR MULCH WETLAND AREAS. PERMANENT WETLAND MIX IS ERNST 122 FACW MEADOW MIX AT 20 LB/ACRE.

5. RIPARIAN BUFFER STABILIZATION – TEMPORARY COVER FOR RIPARIAN AREAS TO INCLUDE SEE FROM MIXTURE 1 FROM TABLE 11.3, AT THE OUTLINED SEEDING RATE. PERMANENT COVER FOR RIPARIAN AREAS WILL INCLUDE 30LBS/ACRE OF A SEED MIX FROM MIXTURE 1 PLUS 20 LBS/ACRE OF ERNST 178 RIPARIAN BUFFER MIX. WHERE SLOPES EXCEED 10% THE PERMANENT MIX SHALL BE SELECTED FROM TABLE 11.5. EROSION CONTROL BLANKET IS TO BE UTILIZED ALONG STREAM BANKS, AS OUTLINED IN THE ECB DETAIL. ADD LIME AND FERTILIZER AS OUTLINED IN TABLE 11.2.

ERNST - FACW MEADOW MIX (ENST-122)
(Application Rate - 20 pounds per acre)

Percent	*Scientific Name*	*Common Name*
33.20%	*Carex vulpinoidea*	Fox Sedge
20.00%	*Elymus virginicus*	Virginia Wildrye
8.00%	*Carex lupulina*	Hop Sedge
8.00%	*Carex lurida*	Lurid Sedge
8.00%	*Carex scoparia*	Blunt Broom sedge
4.00%	*Verbena hastata*	Blue Vertain
3.00%	*Cinna arundinacea*	Wood Reedgrass
3.00%	*Juncus effusus*	Soft Rush
2.50%	*Asclepias incarnata*	Swamp Milkweed
2.00%	*Heliopsis helianthoides*	Oxeye Sunflower
1.20%	*Aster puniceus*	Purplestem Aster
1.20%	*Aster umbellatus*	Flap Topped White Aster
1.00%	*Eupatorium perfoliatum*	Boneset
1.00%	*Helenium autumnale*	Common Sneezeweed
0.60%	*Aster novae-angliae*	New England Aster
0.50%	*Alisma Subcordatum*	Mud Plantain
0.50%	*Lobelia siphilitica*	Great Blue Lobelia
0.50%	*Penthorum sedoides*	Ditch Stonecrop
0.50%	*Scirpus atrovirens*	Green Bulrush
0.50%	*Scirpus cyperinus*	Woolgrass
0.30%	*Eupatorium fistulosum*	Joe Pye Weed
0.30%	*Onoclea sensibilis*	Sensitive Fern
0.10%	*Chelone glabra*	Turtlehead
0.10%	*Mimulus ringens*	Square Stemmed Monkeyflower

ERNST RIPARIAN BUFFER MIX - ERNMX 178

PERCENTAGE OF MIX COMPOSITION	SCIENTIFIC NAME	COMMON NAME
30.0%	*PANICUM CLANDESTINUM*	DEERTONGUE
20.0%	*ELYMUS VIRGINICUS*	VIRGINIA WILDRYE
11.8%	*ANDROPOGON GERARDII*	BIG BLUESTEM
10.5%	*SORGHASTRUM NUTANS*	INDIANAGRASS
5.0%	*PANICUM VIRGATUM*	SWTCHGRASS
4.0%	*CHAMAECRISTA FASCICULATA*	PARTRIDGE PEA
4.0%	*VERBENA HASTATA*	BLUE VERVAIN
3.0%	*JUNCUS EFFUSUS*	SOFT RUSH
3.0%	*RUDBECKIA HIRTA*	BLACKEYED SUSAN
2.0%	*HELIOPSIS HELIANTHOIDES*	OXEYE SUNFLOWER
1.0%	*ASCLEPIAS INCARNATA*	SWAMP MILKWEED
0.7%	*ASTER NOVAE-ANGLIAE*	NEW ENGLAND ASTER
0.7%	*ASTER UMBELLATUS*	FLAT TOPPED WHITE ASTER
0.7%	*EUPATORIUM PERFOLIATUM*	BONESET
0.5%	*AGROSTIS PERENNANS*	AUTUMN BENTGRASS
0.5%	*HELENIUM AUTUMNALE*	COMMON SNEEZEWEED
0.5%	*MONARDA FISTULOSA*	WILD BERGAMOT
0.5%	*VERNONIA NOVEBORACENSIS*	NEW YORK IRONWEED
0.4%	*PYCNANTHEMUM TENUIFOLIUM*	NARROWLEAF MOUNTAINMINT
0.4%	*SOLIDAGO PATULA*	ROUGHLEAF GOLDENROD
0.3%	*EUPATORIUM FISTULOSUM*	JOE PYE WEED
0.3%	*LOBELIA SIPHILITICA*	GREAT BLUE LOBELIA
0.2%	*ASTER PUNICEUS*	PURPLESTEM ASTER

1. SEEDING RATE: 20 LBS/ACRE WITH A COVER CROP AT 30 LBS/ACRE
2. THIS SEED MIX IS TO BE USED TO REVEGETATE WORKSPACE WITHIN THE DESIGNATED 150' RIPARIAN BUFFER AREA WHERE SLOPES ARE LESS THAN 10% . IF THE SLOPE EXCEEDS 10% , A STANDARD UPLAND ROW MIX SHOULD BE USED.
3. AN ALTERNATIVE SEED MIXTURE THAT CONTAINS SIMILAR SPECIES IS ACCEPTABLE.

TABLE 11.2
Soil Amendment Application Rate Equivalents

Soil Amendment	Permanent Seeding Application Rate: Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	Notes
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-10-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
	Temporary Seeding Application Rate			
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for topsoil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for topsoil stockpiles

Adapted from Penn State, "Erosion Control and Conservation Plantings on Noncropland"

NOTE: A compost blanket which meets the standards of this chapter may be substituted for the soil amendments shown in Table 11.2.

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041211-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

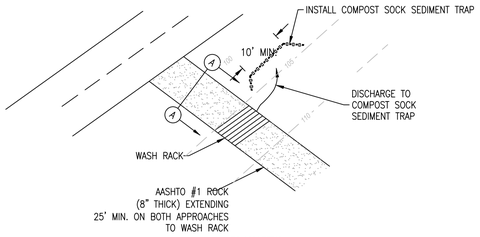
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

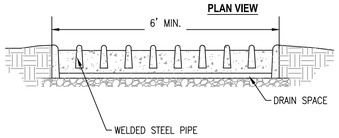
NOTES SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

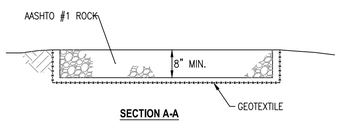
DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 27
WO: 1211227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



PLAN VIEW



WASH RACK

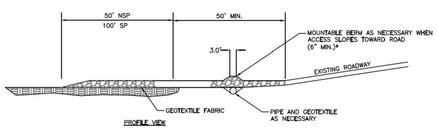


SECTION A-A

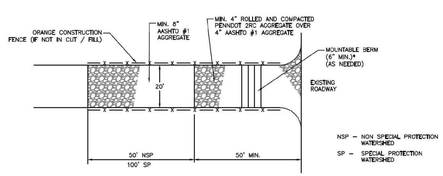
NOTE:
1) WASH RACK SHALL BE 20 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS, WHICHEVER IS GREATER.
2) WASH RACK SHALL BE CONSTRUCTED TO ACCOMMODATE ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.
3) A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL VEHICLES EXITING THE SITE.
4) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE DRAIN SPACE UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. WASHING THE ROADWAYS OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

CONSTRUCTION ENTRANCE
TEMPORARY EROSION CONTROL MEASURE

Example Alternative Rock Construction Entrance



PROFILE VIEW



PLAN VIEW

NOTES:

1) REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2) MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
3) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
4) STREET SWEEPING ON PAVED ROADS
   a. USE A VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT.
   b. AT A MINIMUM – ANY DAY IN WHICH CONSTRUCTION TRAFFIC IS EXITING THE ROCK CONSTRUCTION ENTRANCE, THE VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT SHALL CLEAN THE ROAD WAY AT THE END OF THE WORK DAY AND PRIOR TO ANY FORECASTED RAIN EVENT.
5) STREET SWEEPING ON DIRT OR GRAVEL SURFACE PUBLIC ROADS
   a. RIGOROUS MANUAL REMOVAL OF MUD/DIRT FROM VEHICLE/EQUIPMENT TIRES PRIOR TO EXITING CONSTRUCTION SITE, SUPPLEMENTED BY IMMEDIATE RECOVERY, BY MANUAL OR MECHANICAL MEANS, OF SOIL WHICH MAY BECOME DISCHARGED ONTO PUBLIC ROADWAYS. DUST CONTROL AND/OR COMPACTION VIA ROLLING OF THE DIRT PUBLIC ROAD SURFACE WILL BE IMPLEMENTED AS NEEDED.

CONSTRUCTION ENTRANCE (ALTERNATIVE)
TEMPORARY EROSION CONTROL MEASURE

PENNSYLVANIA

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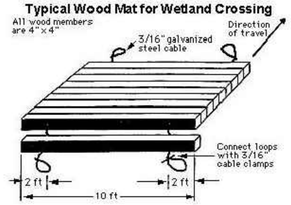
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CE CONSTRUCTION ENTRANCE

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP FIGURE 3.07.

FIGURE 3.7
Typical Wood Mat for Wetland Crossing



University of Minnesota FS 07009
A geotextile underlayment shall be used under the wood mat.

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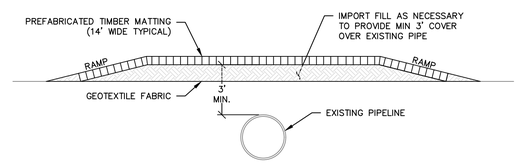
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MAT.1 TIMBER MATTING CONSTRUCTION



NOTES:

1. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER TO DETERMINE THE NUMBER OF EQUIPMENT MATS REQUIRED.

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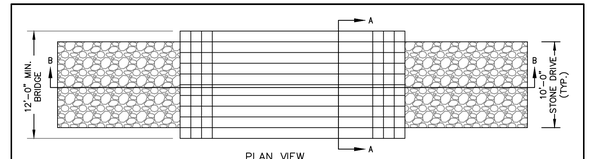
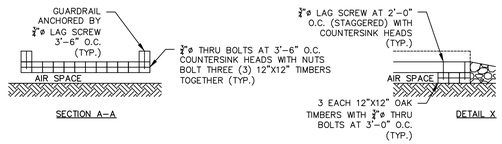
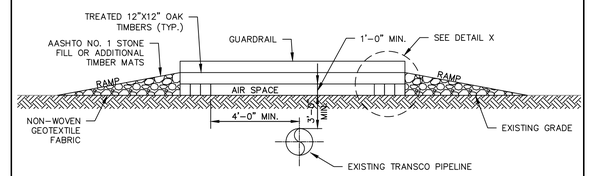
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MAT.2 TIMBER MATTING WITH FILL OVER EXISTING PIPELINES



PLAN VIEW



SECTION A–A DETAIL X



SECTION B–B

NOTES:

1. IF STONE USED FOR RAMP, INSTALL 1 (ONE) LAYER OF NON–WOVEN GEOTEXTILE FABRIC PRIOR TO INSTALLING THE STONE.
2. MINIMUM WIDTH OF BRIDGE IS 12'–0" WITH A 10'–0" WIDE STONE DRIVE.

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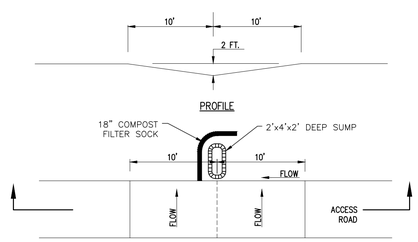
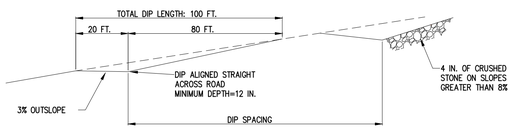
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
MAT.3 TIMBER MATTING AIR BRIDGE



PLAN

BROAD–BASED DIP – LOW GRADIENT (< 5%) ROADWAYS



PROFILE VIEW

BROAD–BASED DIP – HIGH GRADIENT (5% – 10%) ROADWAYS

NOTES:

1. BROAD–BASED DIPS SHALL BE CONSTRUCTED TO THE DIMENSIONS SHOWN AND AT THE LOCATIONS SHOWN ON THE PLAN DRAWINGS.
2. DIPS SHALL BE ORIENTED SO AS TO DISCHARGE TO THE LOW SIDE OF THE ROADWAY.
3. DIPS SHALL BE INSPECTED DAILY. DAMAGED OR NON–FUNCTIONING DIPS SHALL BE REPAIRED BY THE END OF THE WORKDAY.
4. MAXIMUM SPACING OF BROAD–BASED DIPS SHALL BE AS SHOWN IN TABLE 3.2.
5. *INSTALL A 2' WIDE BY 4' LONG BY 2' DEEP SUMP AND 18" COMPOST FILTER SOCK ON THE DOWNHILL SIDE OF THE BROAD BASED DIP. THE ORIENTATION OF THE COMPOST FILTER SOCK WILL VARY BASED ON EXISTING GROUND ELEVATIONS. INSTALL THE COMPOST PARALLEL TO EXISTING CONTOURS.*

TABLE 3.2 – MAXIMUM SPACING OF BROAD–BASED DIPS

PERCENT SLOPE	SPACING BETWEEN BROAD–BASED DIPS (FT)
<2	300
3	235
4	200
5	180
6	165
7	155
8	150
9	145
10	140

USDA FOREST SERVICE

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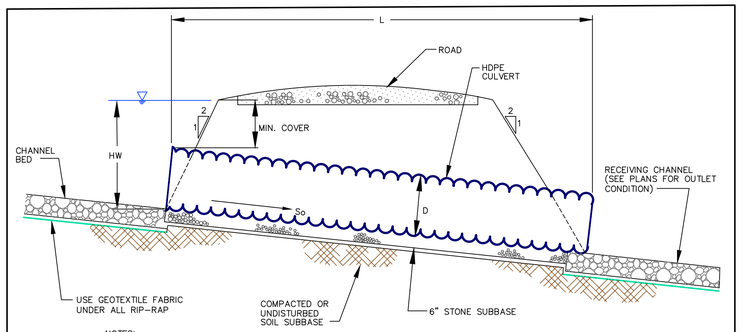
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BBD BROAD–BASED DIP



NOTES:

1. BARRELS SHALL BE PLACED AT THE MINIMUM SLOPE INDICATED FOR THE CHANNEL.
2. AN ADDITIONAL 0.5 OF FREEBOARD SHALL BE PROVIDED IN THE CHANNEL ON THE INVERT SIDE OF THE CULVERT.
3. IF MULTIPLE BARRELS ARE USED, THEY SHALL BE PLACED SUCH THAT THERE IS A MINIMUM OF 1 BARREL WIDTH BETWEEN.
4. CORRUGATED METAL OR HDPE MAY BE USED UPON EVALUATION BY AN ENGINEER.

ID	DRAINAGE AREA (AC)	REQ'D FLOW (CFS)	LENGTH (FT)	SLOPE (FT/FT)	NO. OF PIPES	PIPE DIAMETER (IN)
CULVERT #1	0.14	0.67	37.00	0.048	1	12
CULVERT #2	1.24	0.16	20.00	0.005	1	12
CULVERT #3	0.53	0.04	36.00	0.017	1	12

PENNSYLVANIA

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
RC TYPICAL ACCESS ROAD CULVERT

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047217-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

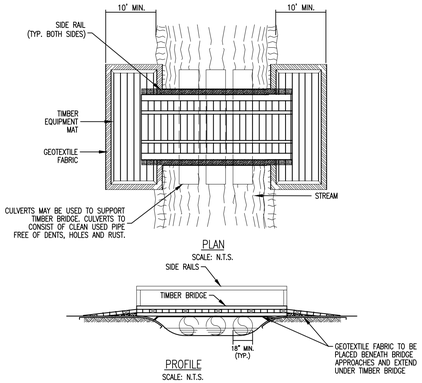
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 28 OF 39

designs, permits, resolutions WHM consulting, INC. BA GROUP



NOTES:

1. TIMBER BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
2. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
3. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
4. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN-UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
5. CULVERTS MAY BE USED TO SUPPORT THE TIMBER BRIDGE TO PREVENT SETTLEMENT OF THE BRIDGE. IF THE GEOMETRY OF THE STREAM ALLOWS FOR SUCH INSTALLATION. THE TIMBER BRIDGE AND GEOTEXTILE FABRIC SHALL REMAIN ABOVE THE WATER SURFACE ELEVATION AT ALL TIMES.
6. SIDE RAILS SHALL BE INSTALLED ON BOTH SIDES OF THE BRIDGE EQUIPMENT CROSSING IN ORDER TO PREVENT SEDIMENT FROM ENTERING THE WATERBODY. SIDE RAILS TO BE CONSTRUCTED OF PLYWOOD NAILED TO THE OUTER EDGES OF THE TIMBER EQUIPMENT MATS.
7. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WATERBODY OR WETLAND BOUNDARIES.
8. PIPES SHALL EXTEND BEYOND THE TOE OF THE ROADWAY.
9. RUNOFF FROM THE ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
10. SUITABLE OUTLET PROTECTION SHOULD BE PROVIDED TO BE PREVENT SCOUR AT THE PIPE OUTLET. WHEREVER SOFT CHANNEL BED CONDITIONS EXIST, RIPRAP PROTECTION SHOULD ALSO BE PROVIDED AT THE CULVERT ENTRANCE.
11. AS SOON AS THE TEMPORARY CROSSING IS NO LONGER NEEDED IT SHALL BE REMOVED. ALL MATERIALS SHOULD BE DISPOSED OF PROPERLY AND DISTURBED AREAS STABILIZED.

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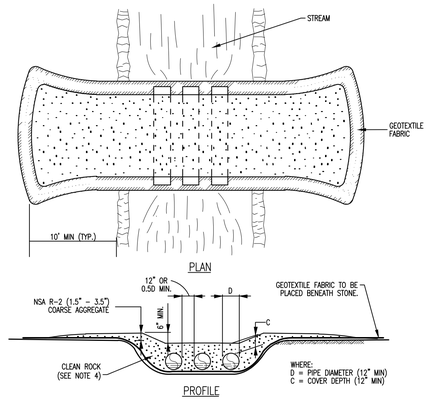
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BEC — BRIDGE EQUIPMENT CROSSING (TIMBER MAT BRIDGE)
Williams

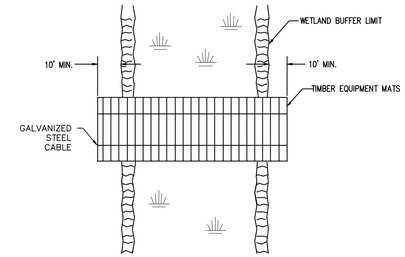


NOTES:

1. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
2. CULVERTS SHALL BE PLACED AT LEAST ONE-HALF (1/2) THEIR DIAMETER APART.
3. MATERIALS PLACED IN STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP-UP. REMOVAL OF THIS ITEM IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
4. RIPRAP (OR ROCK) TO 10" AVERAGE DIAMETER CAN BE USED FOR ALL BUT THE TOP 6" OF STONE FILL. THE TOP 6" MUST CONSIST OF NSA R-2 (1.5" - 3.5") COARSE AGGREGATE.
5. PROVIDE 50' STABILIZED ACCESS TO CROSSING ON BOTH SIDES OF STREAM (SEE DETAIL CE).
6. PIPES SHALL EXTEND BEYOND THE TOE OF THE ROADWAY.
7. RUNOFF FROM THE ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
8. SUITABLE OUTLET PROTECTION SHOULD BE PROVIDED TO BE PREVENT SCOUR AT THE PIPE OUTLET. WHEREVER SOFT CHANNEL BED CONDITIONS EXIST, RIPRAP PROTECTION SHOULD ALSO BE PROVIDED AT THE CULVERT ENTRANCE.
9. AS SOON AS THE TEMPORARY CROSSING IS NO LONGER NEEDED IT SHALL BE REMOVED. ALL MATERIALS SHOULD BE DISPOSED OF PROPERLY AND DISTURBED AREAS STABILIZED.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
CEC — CULVERT EQUIPMENT CROSSING
Williams



NOTES:

1. PERIODICALLY CHECK INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS.
2. MATERIALS PLACED IN WETLANDS SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN-UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
3. IF A WATERBODY IS LOCATED WITHIN A WETLAND SYSTEM, EXTEND TIMBER EQUIPMENT MATS TO THE BRIDGE EQUIPMENT CROSSING (BEC) USED TO CROSS THE WATERBODY IN ORDER TO ALLOW FOR CONTINUOUS TIMBER EQUIPMENT MAT COVERAGE THROUGH THE WETLAND AND WATERBODY AREA.
4. USE ADDITIONAL TIMBER MAT LAYERS TO RAISE CROSSING ABOVE GRADE WHERE POOR SOIL CONDITIONS EXIST.
5. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WETLAND BOUNDARIES.
6. INSTALL EARTHEN RAMP APPROACHES TO TIMBER EQUIPMENT MATS. EARTHEN RAMPS TO BE CONSTRUCTED OF UPLAND MATERIAL, TOP SOIL SHALL NOT BE USED TO CONSTRUCT EARTHEN RAMPS.
7. A GEOTEXTILE UNDERLAYMENT SHALL BE USED UNDER THE WOOD MAT.

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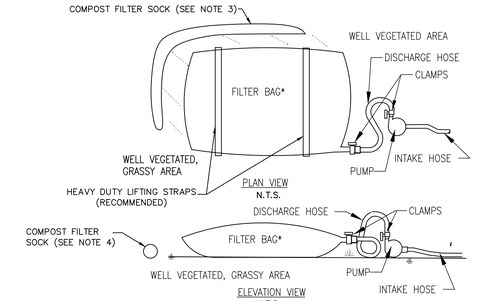
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WEC — WETLAND EQUIPMENT CROSSING
Williams



LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS MAY BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D-4884	60 LB/IN
GRAB TENSILE	ASTM D-4632	205 LB
PUNCTURE	ASTM D-4833	110 LB
MULLEN BURST	ASTM D-3786	350 PSI
UV RESISTANCE	ASTM D-4355	70%
AOS % RETAINED	ASTM D-4751	80 SIEVE

NOTES:

1) A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME ½ FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS TO BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.
2) BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON-ERODIBLE AND NON-POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.
3) NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.
4) THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.
5) THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR ½ THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.
6) FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.
7) CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF USED FILTER BAGS UPON COMPLETION OF DEWATERING OPERATIONS.

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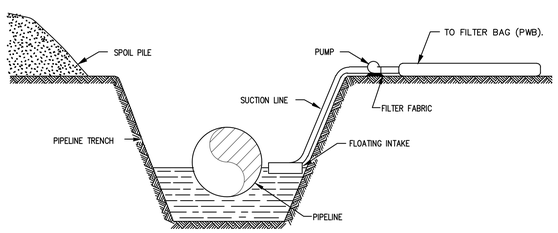
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
PWB — PUMP WATER FILTER BAG
Williams



NOTES:

1. WATER PUMPED OUT OF TRENCH SHALL NOT BE DISCHARGED INTO WATERWAYS. WATER SHALL BE DISCHARGED INTO A FILTER BAG OR DEWATERING STRUCTURE.
2. PUMP SHALL BE CONTROLLED SO THAT DISCHARGE DOES NOT OVERFLOW DEWATERING STRUCTURE.
3. PUMP SUCTION HOSE MUST NOT BE ALLOWED TO COME IN CONTACT WITH TRENCH BOTTOM. PROVISIONS MUST BE MADE TO ELEVATE THE SUCTION HOSE TO AT LEAST ONE FOOT ABOVE THE BOTTOM OF THE PIPE TRENCH UNTIL BOTTOM DEWATERING IS NECESSARY.
4. DEWATERING SHALL NOT OCCUR DURING TIMES OF HEAVY RAINFALL EXCEPT AS REQUIRED TO PREVENT FLOODING OF CONSTRUCTION EQUIPMENT LOCATED IN BORE PITS AND TRENCHES.
5. PUMP WATER FILTER BAG (PWB) SHALL BE PLACED ON A WELL VEGETATED AREA AWAY FROM CONSTRUCTION SO THAT FILTERED WATER IS NOT RETURNED TO THE TRENCH.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TD — TRENCH DEWATERING
Williams

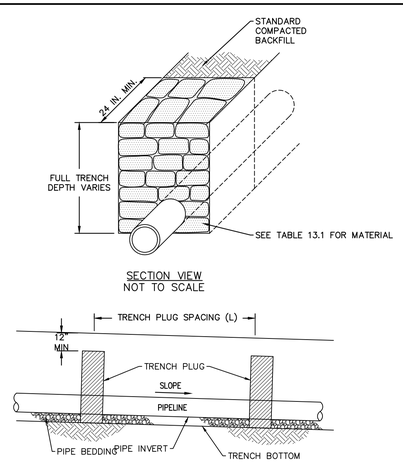


TABLE 13.1
MAXIMUM SPACING AND MATERIALS FOR TRENCH PLUGS

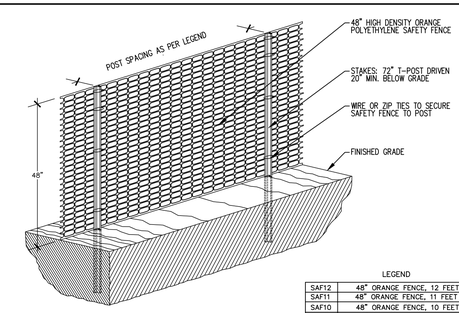
TRENCH SLOPE (%)	SPACING L (FT)	TRENCH PLUG MATERIAL FOR FILLED SACKS
<5	1,000	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
5 – 15	500	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
15 – 25	300	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
25 – 35	200	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
35 – 100	100	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
>100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

*TOPSOIL MAY NOT BE USED TO FILL SACKS.

IMPERVIOUS TRENCH PLUGS ARE REQUIRED FOR ALL STREAM, RIVER, WETLAND, OR OTHER WATER BODY CROSSINGS. FOAM TRENCH PLUGS ARE AN APPROVED ALTERNATE E&S BMP.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TP — TRENCH PLUG INSTALLATION
Williams



LEGEND

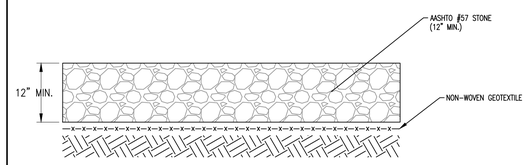
SAF12	48" ORANGE FENCE, 12 FEET O.C.
SAF11	48" ORANGE FENCE, 11 FEET O.C..
SAF10	48" ORANGE FENCE, 10 FEET O.C.
SAF9	48" ORANGE FENCE, 9 FEET O.C.
SAF8	48" ORANGE FENCE, 8 FEET O.C..
SAF7	48" ORANGE FENCE, 7 FEET O.C.
SAF6	48" ORANGE FENCE, 6 FEET O.C.

NOTES:

1. ALL SENSITIVE AREAS SHALL BE PROTECTED AS PER PLAN.
2. SAFETY FENCE SHOULD BE FASTENED SECURELY TO THE T-POSTS.
3. THE FENCING MUST REMAIN IN PLACE DURING ALL PHASES OF CONSTRUCTION; ANY CHANGE OF THE PROTECTIVE FENCING MUST BE APPROVED.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
SF — SAFETY FENCE
Williams



NOTES:

1. CROSS SECTION TO BE APPLIED TO DRY AREAS WITHOUT DRAINAGE CONCERNS.
2. EXISTING MATERIAL TO BE REMOVED AND STOCKPILED IN AN APPROVED LOCATION ONLY.
3. EXISTING DRAINAGE PATTERNS SHALL BE MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION & SEDIMENT POLLUTION CONTROL PLAN FOR THE PROJECT.
4. GRADING AND CROSS SLOPES VARY BY EXISTING CONDITIONS; SEE SPECIFIC DESIGN AND PROFILE FOR MORE DETAIL.
5. WITHIN EXTENTS OF GRADING FOR PERMANENT ACCESS ROADS AND VALVE SITES, COMPACT ALL SOIL FILL/BACKFILL AND COARSE AGGREGATE WITH FINES TO 95% OF MAXIMUM DRY DENSITY AS DETERMINED BY ASTM D-1557. CONTRACTOR SHALL UTILIZE ADEQUATELY SIZED AND CONFIGURED EQUIPMENT TO ACHIEVE SPECIFIED COMPACTION.
6. AS DIRECTED BY ENGINEER AND APPROVED BY OWNER, EXCAVATE AND STABILIZE SOFT SPOTS, UNSATISFACTORY SOILS AND AREAS OF EXCESSIVE PUMPING OR RUTTING.
7. PROOF-ROLLING OF SUBGRADE MAY BE REQUIRED TO DETERMINE PROPER COMPACTION BY OWNER.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
AR — PERMANENT/TEMPORARY STONE ACCESS ROAD
Williams

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

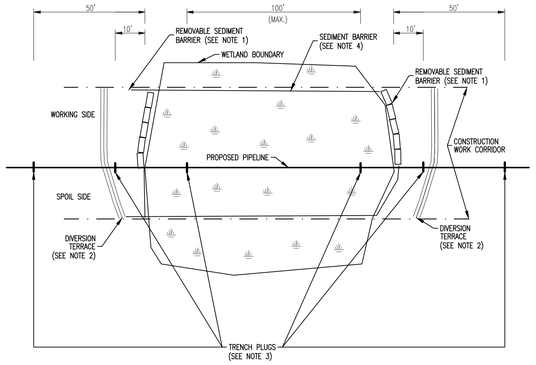
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 29
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39

WHM consulting, inc. — designs, permits, resolutions
BA GROUP

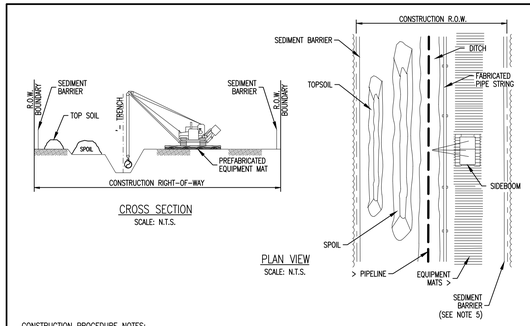


NOTES:

1. INSTALL REMOVABLE SEDIMENT BARRIERS (COMPOST FILTER SOCK) OR DRIVABLE BERMS ACROSS THE TRAVEL LANE AT BOTH WETLAND BOUNDARIES. THE REMOVABLE SEDIMENT BARRIERS CAN BE REMOVED DURING THE CONSTRUCTION DAY, BUT MUST BE RE-INSTALLED AFTER CONSTRUCTION HAS STOPPED FOR THE DAY AND/OR WHEN HEAVY PRECIPITATION IS IMMINENT.
2. INSTALL DIVERSION TERRACES IMMEDIATELY UPSLOPE OF BOTH WETLAND BOUNDARIES TO PREVENT SEDIMENT FROM ENTERING THE WETLAND.
3. INSTALL TRENCH PLUGS TEN (10) FEET FROM THE EDGE OF A WETLAND; FIFTY (50) FEET FROM THE EDGE OF A WETLAND; PLACE A MINIMUM OF ONE (1) TRENCH PLUG AT A MAXIMUM SPACING OF 100 FEET BETWEEN TRENCH PLUGS WITHIN A WETLAND TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED UPLAND TRENCH WATER OUT OF WETLAND. WETLAND CROSSINGS LESS THAN FIFTY (50) FEET DO NOT REQUIRE AN INTERNAL TRENCH PLUG.
4. FOR TYPE II ("SATURATED") AND TYPE III ("FLOODED") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES AND ALONG BOTH WETLAND EDGES. FOR TYPE I ("DRY") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES, ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC WETLAND CROSSING CONFIGURATION TYPE I, II AND III WETLANDS

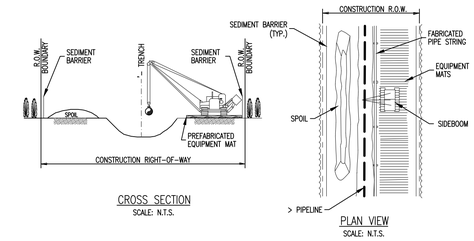


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF THE WETLAND. INSTALL SEDIMENT BARRIERS ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR THROUGH THE WETLAND AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY-RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE SATURATED TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE COMPANY ENVIRONMENTAL INSPECTOR. TOPSOIL AND SATURATED TOPSOIL SHALL BE STOCKPILED SEPARATELY. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEED CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING TRENCH, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE SATURATED TOPSOIL AND TOPSOIL (IF NOT SATURATED) AND INSTALL PERMANENT EROSION CONTROL.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLANDS AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.1 TYPE I "DRY WETLAND" INSTALLATION PROCEDURE

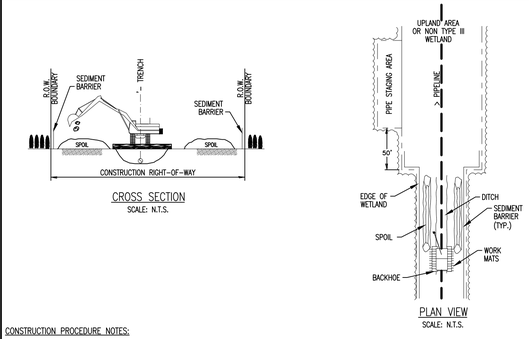


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEED CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION. SEED DISTURBED WETLAND AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.2 TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE



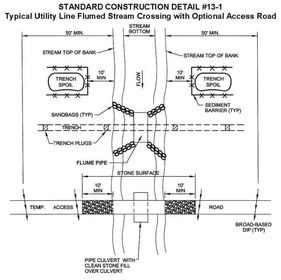
CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL WETLAND BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
5. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
6. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
7. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY PREFABRICATED EQUIPMENT MATS OR FLOATS, TO EXCAVATE TRENCH. IF PREFABRICATED EQUIPMENT MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MATS FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
8. FABRICATE PIPE IN A STAGING AREA OUTSIDE THE TYPE III WETLAND AS INDICATED ON THE CONSTRUCTION DRAWINGS. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
9. LEAVE HARD PLUGS AT THE EDGE OF TYPE III WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER-IN, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, AND BACKFILL.
11. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.
12. REMOVE ANY MATS UTILIZED TO SUPPORT AMPHIBIOUS EQUIPMENT FROM WETLANDS UPON COMPLETION.
13. WETLANDS CROSSED USING PUSH/PULL METHOD TEND TO BE TOO WET FOR EFFECTIVE SEEDING. HOWEVER, IF THE SITE IS DRY ENOUGH AND IF DIRECTED BY THE ENVIRONMENTAL INSPECTOR, THE RIGHT-OF-WAY SHALL BE SEEDED IN ACCORDANCE WITH DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.3 TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE

STANDARD CONSTRUCTION DETAIL #13-1
Typical Utility Line Flumed Stream Crossing with Optional Access Road



PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Pipe culvert for access road and flume pipe may be one continuous pipe.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #13-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized. Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

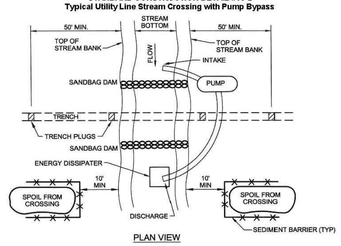
WILLIAMS STANDARD NOTES:

1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIME FRAMES WHERE SPECIFIED.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
FX FLUME STREAM CROSSING

STANDARD CONSTRUCTION DETAIL #13-2
Typical Utility Line Stream Crossing with Pump Bypass



PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Bypass pump intake shall be maintained a sufficient distance from the bottom to prevent pumping of channel bottom materials.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #13-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any receiving surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized.

Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIME FRAMES WHERE SPECIFIED.
4. DAM-AND-PUMPS MAY ONLY BE IN THE STREAM FOR TWO WEEKS.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
DPX DAM AND PUMP STREAM CROSSING

Hensel Replacement - Instream Crossing Duration

Waterway ID	Waterway Name	Milepost	Crossing Length (Linear Ft.)[1]	Crossing Method	Secondary Crossing Method (if trenchless methodology is proposed)	Instream Crossing Duration[2] (hours)	Justification for Exceeding Standard Crossing Window
S12-T6-HR	UNT to Dark Hollow	189.05	20.6	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S9-T6-HR	UNT to Paddy Run	190.36	6	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S7-T7-HR	Paddy Run	190.47	30.6	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S1-T7-HR	Hensel Fork	190.69	39.3	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"
S1-T7-HR	Hensel Fork	190.99	20.4	Dam & Pump / Flume	-	96	Includes Pipeline Installation and Removal of Leidy Line "A"

Notes:

1. Measured from top of bank to top of bank
2. Crossing Window is designated as time within or below top of bank. Duration is determined by length of crossing:
   a. For crossings less than 10 feet in length, the standard crossing window is 24 hours
   b. For crossings that are 10 - 100 feet in length, the standard crossing window is 48 hours
   c. Crossings not referenced in table will meet standard crossing windows

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REGISTERED PROFESSIONAL ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

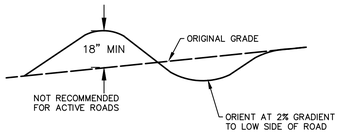
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

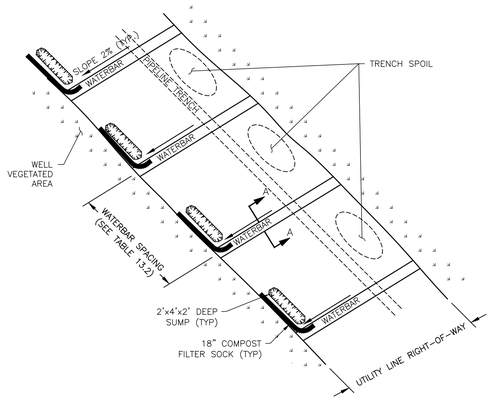
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 03/25/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 30
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



PLAN VIEW
N.T.S.



LAYOUT VIEW
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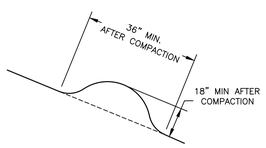

SECTION A–A

NOTES:

1. DURING CONSTRUCTION, WATERBARS SHALL BE PREPARED AT THE END OF EACH WORK DAY AND PRIOR TO STORM EVENTS.
2. AFTER EARTH DISTURBING WORK HAS BEGUN, WATERBARS SHALL BE INSTALLED AT THE SPACING SHOWN IN THE ABOVE TABLE OR AS SHOWN ON THE DRAWINGS. WATERBARS SHALL BE IMMEDIATELY STABILIZED WITH EROSION CONTROL BLANKET.
3. TEMPORARY AND PERMANENT WATERBARS ARE REQUIRED AT ALL WATERBODY CROSSINGS AND UPSLOPE FROM ALL WETLAND BOUNDARIES.
4. THE WATERBAR OUTLET SHALL BE LOCATED WHERE RUNOFF WILL BE RELEASED ONTO AN EXISTING WELL–VEGETATED AREA. AN OUTLET STRUCTURE (OS) MUST BE INSTALLED AT THE WATERBAR OUTLET.
5. WHEREVER EDIBLE SOILS ARE PRESENT, OR WHERE THERE IS NOT A SUFFICIENT VEGETATIVE FILTER STRIP BETWEEN THE WATERBAR AND A RECEIVING SURFACE WATER, THE WATERBAR SHOULD BE PROVIDED WITH A TEMPORARY PROTECTIVE LINER.

TABLE 3.1 – MAXIMUM WATERBAR SPACING

PERCENT SLOPE	SPACING (FT)
<5	250
5–15	150
>15–30	100
>30	50

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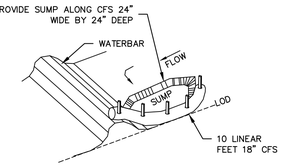
TRANSCONTINENTAL GAS PIPE LINE, LLC
STANDARD ENVIRONMENTAL DETAIL
WB WATERBAR



NOTES:

1. 10 LINEAR FEET OF 18 INCH COMPOST FILTER SOCK (CFS) SHALL BE INSTALLED WITH ONE END RESTING ON THE WATERBAR AS PER DETAIL CFS, ALLOWING FOR 8 FEET OF EFFECTIVE LENGTH AND A SPECIFIED FLOW THROUGH RATE OF 15 GALLONS PER MINUTE PER LINEAR FOOT. A PASS THROUGH FLOW OF 0.26 CUBIC FEET PER SECOND CAN BE ACCOMMODATED THROUGH THE FILTER SOCK. THIS FLOW RATE IS ADEQUATE FOR 20,000 SQUARE FEET OF DRAINAGE AREA FOR THE 2–YEAR, 24–HOUR STORM, 5 MINUTE TIME OF CONCENTRATION (RATIONAL METHOD).
2. CONSTRUCTION OF A 24" WIDE AND 24" DEEP SUMP AT THE DISCHARGE END OF THE WATERBAR WILL REDUCE VELOCITY AND PROVIDE A SHEET FLOW CONDITION TO THE CFS. THE SUMP SHALL BE MAINTAINED AND CLEAN OUT WHEN IT BECOMES A MINIMUM OF 12" DEEP. THE SUMP SHALL BE FILLED AND STABILIZED WHEN THE CFS IS REMOVED AFTER SITE STABILIZATION.
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN ACCORDANCE WITH WILLIAMS STANDARDS. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

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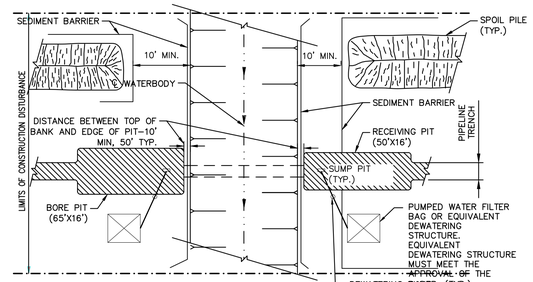
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
OS CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION



PLAN
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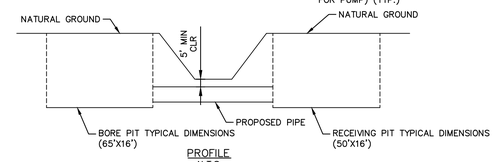

PROFILE
N.T.S

NOTES:

1. SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO ROAD CROSSINGS WHERE VEGETATION IS DISTURBED, TO INTERCEPT SURFACE RUNOFF.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL REMAIN IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. WATER REMOVED FROM BORE PIT AND RECEIVING PIT SHALL BE FILTERED THROUGH A DEWATERING STRUCTURE OR FILTER BAG.
5. IF WELL POINTING IS REQUIRED PRIOR TO EXCAVATING BORE PITS, CONTRACTOR SHALL CONSULT WITH THE ENVIRONMENTAL INSPECTOR PRIOR TO COMMENCEMENT OF WORK IN ORDER TO DETERMINE PROPER DEWATERING LOCATION.
6. CONTRACTOR SHALL BE REQUIRED TO KEEP THE AREA CLEAN OF DEBRIS AT ALL TIMES.
7. CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE BORE PITS.
8. DEPENDING ON TOPOGRAPHY AND STATE REQUIREMENTS, SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY AT THE EDGE OF ROAD. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.

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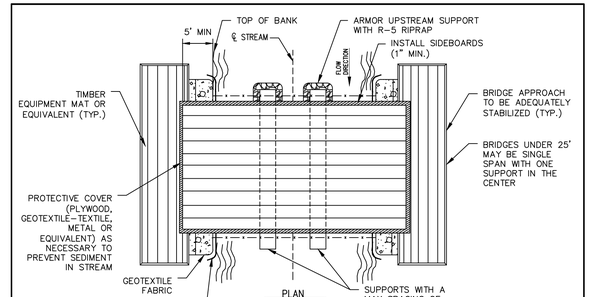
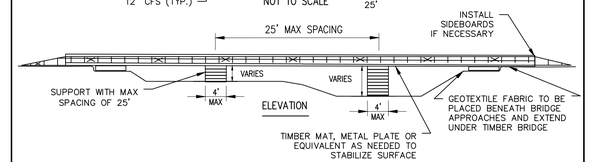
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WBX BORED WATERBODY CROSSING



PLAN
NOT TO SCALE



ELEVATION

NOTES:

1. THIS TYPE OF BRIDGE IS GENERALLY USED FOR INTERMEDIATE TO LARGE STREAM CROSSINGS GREATER THAN 20' IN WIDTH IN COMBINATION WITH A PROPER STREAM BANK CONFIGURATION.
2. BOTTOM CHORD OF BRIDGE STRUCTURE SHALL BE CONSTRUCTED ABOVE ORDINARY HIGH WATER MARK/TOP OF BANK.
3. BRIDGE TO REMAIN IN PLACE UNTIL THE COMPLETION OF FINAL RESTORATION.
4. A "SKIRT" FORMED OF GEOTEXTILE FABRIC OR EQUIVALENT SHALL BE PLACED ON THE SIDES AND BOTTOM OF THE BRIDGE TO TRAP SEDIMENT.
5. INDIVIDUAL MATS SHALL BE ANCHORED AND BUTTED TIGHTLY TO MINIMIZE THE INTRODUCTION OF SEDIMENT TO THE WATER BODY.
6. COMPOST FILTER SOCK WILL BE PLACED AT THE EDGE OF EQUIPMENT BRIDGE AT THE END OF THE WORK DAY TO PREVENT EROSION BUT WILL BE REMOVED DURING CONSTRUCTION ACTIVITY.
7. CONTRACTOR SHALL EXTEND TIMBER MAT BRIDGE A MINIMUM OF 10' BEYOND TOP OF STREAM BANK. ABUTMENTS MAY BE KEYED INTO BANK WHERE NEEDED TO INSURE SAFETY.
8. BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
9. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD–UP OF SEDIMENT OR DEBRIS ON BRIDGE.
10. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
11. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
12. RUNOFF FROM ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
13. INSTALLATION AND REMOVAL OF INSTREAM SUPPORT SHALL ADHERE TO TIME OF YEAR RESTRICTIONS.

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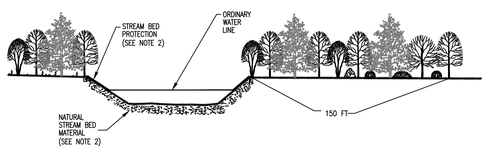
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BCC BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS



NOTES:

1. RESTORE IMPACTED FOREST BUFFER:
   100 FT (OTHER WATERS – PA)
   150 FT (HIGH QUALITY WATERS – PA)

   OR EXISTING WIDTH OF FOREST BUFFER IF LESS THAN THESE MINIMUM REQUIREMENTS.
2. ZONE 1 AND ZONE 2 PLANTING AREAS ARE RECOMMENDED FROM PADEP RIPARIAN FOREST BUFFER GUIDANCE (DOCUMENT NUMBER 394–5600–001, NOVEMBER 27, 2010).
3. NATIVE TREES AND/OR SHRUBS IN ZONE 1 AND ZONE 2 SHOULD BE PLACED 12' APART.
4. EROSION CONTROL BLANKETS SHALL BE PLACED ON RESTORED BANKS TO THE ORDINARY WATER LINE AND IN UPLAND AREAS SHOULD BE INSTALLED A MINIMUM OF 100 FT BEYOND THE TOP OF BANK (MORE AS NEEDED DEPENDING ON SLOPES). EROSION CONTROL BLANKETS SHALL NOT BE PLACED IN WETLANDS. IF STREAMS HAVE EXISTING ROCK BANK PROTECTING GRID PAVERS THESE FEATURES SHOULD BE RESTORED TO PRE–EXISTING CONDITIONS.
5. ERNST MIX 178 (RIPARIAN BUFFER MIX) OR SIMILAR TO BE APPLIED AT 20 LBS PER ACRE OR 1/2 LB PER 1,000 SQ. FT. WITHIN RIPARIAN ZONES UNLESS SLOPE EXCEEDS 10% OR WITHIN WETLANDS.
6. FOR DETAILS REGARDING RECOMMENDED TREES, SHRUBS, LIVE STAKES AND SEED MIX SHOULD BE PLANTED IN ACCORDANCE WITH ONSITE WETLAND AND RIPARIAN RESTORATION PLAN OUTLINED IN CHAPTER 105 PERMIT
7. NO TREES OR SHRUBS ARE TO BE PLANTED IN AN AREA 15 FEET WIDE CENTERED OVER THE PIPE LINE.
8. CONTRACTOR SHALL REPLACE NATURAL SEED BED MATERIAL WITHIN STREAM BED ONLY. CONTRACTOR SHALL ASSUME NO SIGNIFICANT CHANGES IN BED GRADE AND THALWAG ALIGNMENT MEETS PRE–CONSTRUCTION ALIGNMENT.

PENNSYLVANIA

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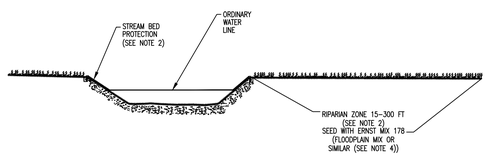
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TYPICAL CHANNEL & VEGETATION RESTORATION – 1
WATER BODIES WITH EXISTING FORESTED RIPARIAN BUFFER



NOTES:

1. RESTORE IMPACTED RIPARIAN ZONE FOR:
   100 FT (OTHER WATERS – PA)
   150 FT (HIGH QUALITY WATERS – PA)

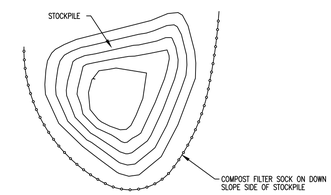
   OR EXISTING WIDTH OF RIPARIAN ZONE IF LESS THAN MINIMUM REQUIREMENTS.
2. EROSION CONTROL BLANKETS SHALL BE PLACED ON RESTORED BANKS TO THE ORDINARY WATER LINE AND IN UPLAND AREAS SHOULD BE INSTALLED A MINIMUM OF 50 FT BEYOND THE TOP OF BANK (MORE AS NEEDED DEPENDING ON SLOPES). EROSION CONTROL BLANKETS SHALL NOT BE PLACED IN WETLANDS. SEE DETAIL ON SHEET 22.

   ERNST MIX 178 (RIPARIAN BUFFER) OR SIMILAR TO BE APPLIED AT 15 LBS PER ACRE OR 1/3–1/2 LB PER 1,000 SQ. FT. ON RESTORED BANKS AND IN RIPARIAN ZONE.
3. EROSION CONTROL BLANKETS SHALL BE PLACED ON RESTORED BANKS TO THE ORDINARY WATER LINE AND IN UPLAND AREAS SHOULD BE INSTALLED A MINIMUM OF 100 FT BEYOND THE TOP OF BANK (MORE AS NEEDED DEPENDING ON SLOPES). EROSION CONTROL BLANKETS SHALL NOT BE PLACED IN WETLANDS. IF STREAMS HAVE EXISTING ROCK BANK PROTECTING GRID PAVERS THESE FEATURES SHOULD BE RESTORED TO PRE–EXISTING CONDITIONS.
4. CONTRACTOR SHALL REPLACE NATURAL SEED BED MATERIAL WITHIN STREAM BED ONLY. CONTRACTOR SHALL ASSUME NO SIGNIFICANT CHANGES IN BED GRADE AND THALWAG ALIGNMENT MEETS PRE–CONSTRUCTION ALIGNMENT.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TYPICAL CHANNEL & VEGETATION RESTORATION – 2
WATER BODIES WITH NON–FORESTED RIPARIAN BUFFER



NOTES:

1. MAXIMUM STOCKPILE HEIGHT IS 35 FEET.
2. STOCKPILE SLOPES MUST BE NO STEEPER THAN 2H:1V.
3. STOCKPILE LOCATIONS SHOWN ON THE PLANS ARE ILLUSTRATIVE AND MAY VARY IN LOCATION AS CONSTRUCTION PROCEEDS.
4. STOCKPILE IS TO BE STABILIZED IN ACCORDANCE WITH TEMPORARY SEEDING SPECIFICATIONS AND MULCH IS TO BE MAINTAINED UNTIL THE STOCKPILE IS STABILIZED.
5. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.

PENNSYLVANIA

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TYPICAL TOPSOIL STOCKPILE

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
042121-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

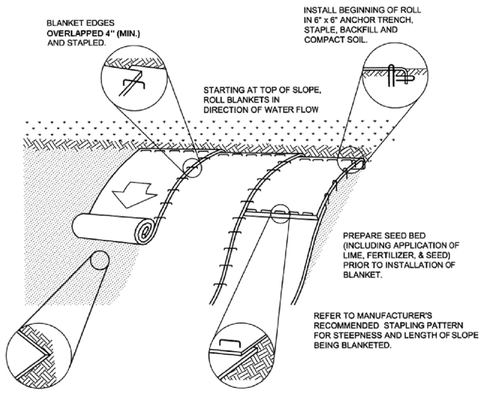
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 31 OF 39
WO:	RID:		



NOT TO SCALE

NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
5. STAPLING OF THE BLANKET SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.
7. BIODEGRADABLE STAPLES SHALL BE USED.

WILLIAMS SUPPLEMENTAL NOTES:

1. CONTRACTOR SHALL USE SINGLE MAT STRAW FOR SLOPES FLATTER THAN 3:1.
2. HYDRAULIC APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF ECB.
3. EROSION CONTROL MATS SHOULD CONSIST OF NATURAL MATERIALS. NO PLASTIC OR SYNTHETIC MATERIALS SHALL BE USED. MATTING SUCH AS NORTH AMERICAN GREEN S150BN OR EQUIVALENT SHALL BE USED.

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP STANDARD CONSTRUCTION DETAIL #11-1.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

ECB — EROSION CONTROL BLANKET

Williams.

HYDRAULICALLY APPLIED BLANKETS

Hydraulically applied blankets should not be used in areas of concentrated flow (e.g. channels).

A **Bonded Fiber Matrix (BFM)** can be an effective method of stabilizing steep slopes when used properly. BFMs make use of a cross-linked hydrocolloid tackifier to bond thermally processed wood fibers. Application rates vary according to site conditions. For slopes up to 3H:1V the BFM should be applied at a rate of 3,000 lb/acre. Steeper slopes may need as much as 4,000 lb/acre. In any case, manufacturer's recommendations should be followed.

BFMs should only be used when no rain is forecast for at least 48 hours following the application. This is to allow the tackifier sufficient time to cure properly. Once properly applied, a BFM is typically 90% effective in preventing accelerated erosion. **Bonded Fiber Matrix should not be applied between September 30 and April 1.**

Other fiber matrices that have been shown to be effective in preventing erosion on disturbed surfaces may be used in accordance with manufacturer's recommendations if sufficient supporting documentation is provided.

A **Flexible Growth Medium (FGM)** has the added component of ½ inch long, crimped organic or manmade fibers which add a mechanical bond to the chemical bond provided by BFMs. This increases the blanket's resistance to both raindrop impact and erosion due to runoff. Unlike BFMs, a flexible growth medium typically does not require a curing time to be effective. Properly applied, an FGM may be as much as 99% effective.

A **Polymer Stabilized Fiber Matrix (PSFM)** can also be an effective method of stabilizing steep slopes when used properly. PSFMs make use of a linear soil stabilizing tackifier that works directly on soil to maintain soil structure, maintain pore space capacity and flocculate dislodged sediment that will significantly reduce runoff turbidity. Properly applied, a PSFM may be as much as 99% effective.

PSFMs can be used in re-vegetation applications and for site winterization and/or dormant seeding — fall planting for spring germination — applications. Application rates vary according to site conditions

and the following application rates are suggested. In any case, manufacturer's recommendations should be followed. The following are typical application rates:

TABLE 11.7
Typical Polymer Stabilized Fiber Matrix Application Rates

Maximum Rainfall of ≤ 20"							
SLOPE	6:1	5:1	4:1	3:1	2:1	1.5:1	1:1
Soil Stabilizer (gals/acre)	4	5	6	7	8	9	10
Fiber (lb/acre)	1,500	1,500	1,500	1,800	2,000	2,500	3,000

Maximum Rainfall of > 20" and for Site Winterization			
SLOPE	≤5:1	4:1	≥3:1
Soil Stabilizer (gals/acre)	6	8	10
Fiber (lb/acre)	2,000	2,500	3,000

Unlike rolled blankets, there is no need to smooth the slope prior to application of hydraulically applied blankets. In fact some roughening of the surface, either natural or mechanically induced, is preferable. However, large rocks, those ≥ 9 inches, and existing rills should be removed prior to application. Tracking or grooving of slopes should be considered to slow water flows during a storm event. Slope interruption devices such as stair step grading or benching should be applied prior to the application. Mixing and application rates should follow manufacturer's recommendations.

Hydraulically applied blankets are typically applied in two stages. Unless specifically recommended to be applied in one application by the manufacturer, the seed mixture and soil amendments should be applied first. If the seed is applied at the same time as the hydraulically applied blanket, the bonded fibers may keep the seed from making sufficient contact with the soil to germinate. After the seed mixture is applied, the BFM, FGM, or PSFM should be sprayed over the area at the required application rate.

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

HYDRAULICALLY APPLIED BLANKETS

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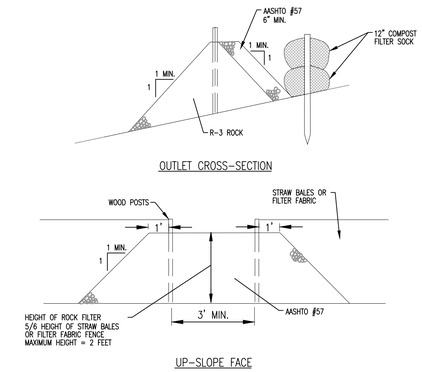

NOTES:

1. ROCK FILTER OUTLETS SHALL BE PLACED ALONG SEDIMENT BARRIERS AS SHOWN ON THE PLAN. THE ROCK FILTER OUTLET IS NOT INTENDED TO BE PLACED IN STREAMS, RIVERS, CREEKS OR DITCHES THAT NORMALLY HAVE FLOWING WATER.
2. ONCE THE DISTURBED AREA IS STABILIZED, THE ROCK FILTER OUTLET SHALL BE REMOVED AND ANY DISTURBED AREAS CAUSED BY REMOVAL SHALL BE RETURNED TO ORIGINAL CONDITION AND REVEGETATED.
3. SEDIMENT MUST BE REMOVED FROM THE ROCK FILTER OUTLET WHEN ACCUMULATIONS REACH 1/3 THE HEIGHT OF THE OUTLET.
4. INSTALL NSA-R3 ROCK AT THE OUTLET SIDE OF THE SEDIMENT BARRIER AS SHOWN IN THE DETAIL. AFTER INSTALLING NSA-R3 ROCK, INSTALL AASHTO #57 ROCK AT THE INLET SIDE OF THE SEDIMENT BARRIER TO CREATE AN ADEQUATE FILTER STONE FACE FOR THE OUTLET STRUCTURE.

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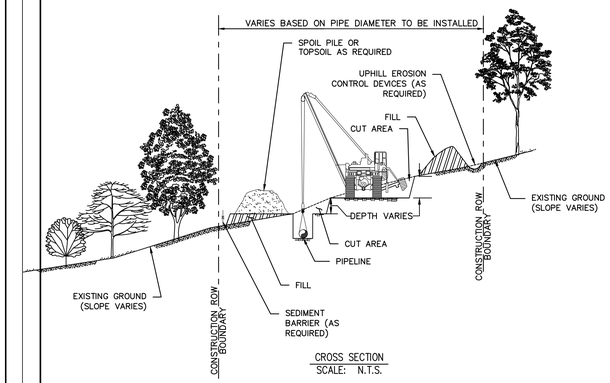
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

RFO — ROCK FILTER OUTLET

Williams.



CROSS SECTION
SCALE: N.T.S.

NOTES:

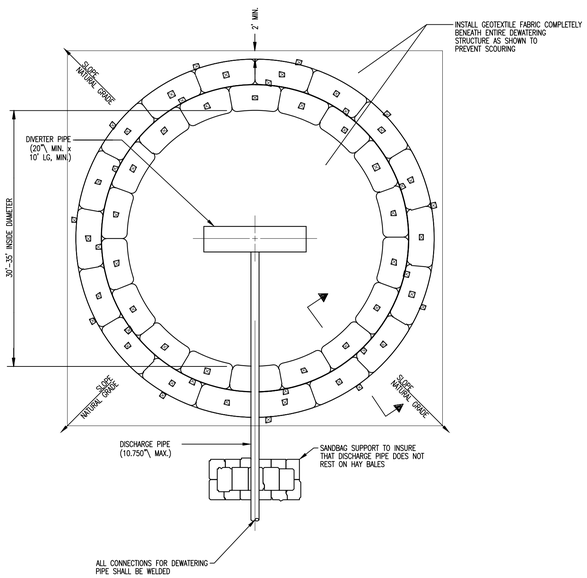
1. TWO-TONE THE RIGHT-OF-WAY TO LIMIT THE NEED FOR DEEP CUTS AND ADDITIONAL RIGHT-OF-WAY ON STEEP SLOPES. THE MINIMUM WORKSPACE WIDTH ALONG STEEP SIDE SLOPES WILL VARY DEPENDING ON THE DIAMETER OF PIPE TO BE INSTALLED. ADDITIONAL TEMPORARY WORKSPACE MAY BE REQUIRED FOR WORKER SAFETY DEPENDING ON THE SEVERITY OF THE GRADE.
2. EMPLOY EROSION CONTROL MEASURES SUCH AS WATERBARS, CROSS DITCHES, TEMPORARY DRAINAGE PIPES, TEMPORARY SWALES, TEMPORARY OUTLET PROTECTION, ETC. AS REQUIRED TO PREVENT EROSION AND SEDIMENTATION OUTSIDE OF THE CONSTRUCTION RIGHT-OF-WAY. CLEAR AND STAKE ATWS TO ALLOW FOR EXTRA SPOIL.
3. ENSURE SIDE BOOM TRACTORS ARE EQUIPPED WITH BOOM EXTENDERS AND COUNTERWEIGHTS IF REQUIRED.
4. USE BACKHOE TO ASSIST BULLDOZERS WITH REPLACING CUTS.
5. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL MEASURES AS REQUIRED.
6. REVEGETATE / SEED DISTURBED AREAS AS NOTED IN THE CONSTRUCTION DOCUMENTS OR AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR.

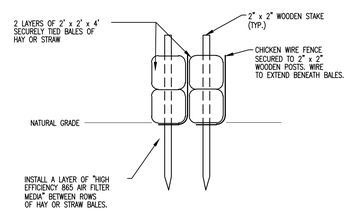
NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

TTS — SIDE SLOPE (TWO-TONE) CONSTRUCTION PROCEDURE

Williams.





SECTION

NOTE:

STAKES SECURING "HIGH EFFICIENCY 865 AIR FILTER MEDIA" AND CHICKEN WIRE FENCE ARE NOT SHOWN FOR CLARITY PURPOSES.

NOTES:

1. STRUCTURE SHALL BE PLACED ON A LEVEL WELL VEGETATED SITE SUCH THAT WATER WILL FLOW AWAY FROM STRUCTURE AND ANY WORK AREAS.
2. FLOW RATES THROUGH DISCHARGE AND DIVERTER PIPES SHALL BE SUCH THAT STRUCTURE WILL NOT OVERFLOW.
3. WHERE CONDITIONS WARRANT A 30' x 30' RECTANGULAR STRUCTURE MAY BE SUBSTITUTED FOR THE CIRCULAR CONFIGURATION SHOWN.
4. DIMENSIONS SHOWN ARE THE MINIMUM ACCEPTABLE VALUES AND MAY BE VARIED DEPENDING UPON SPECIFIC LOCATION.
5. CONTRACTOR SHALL PROPERLY REMOVE AND DISPOSE OF DEWATERING STRUCTURE IMMEDIATELY UPON COMPLETION OF DEWATERING OPERATIONS. UNDER NO CIRCUMSTANCES SHALL USED DEWATERING STRUCTURES BE LEFT IN PLACE FOR A PERIOD OF TIME GREATER THAN 48 HOURS AFTER DEWATERING OPERATIONS ARE COMPLETE.
6. "HIGH EFFICIENCY 865 AIR FILTER MEDIA" CAN BE PURCHASED FROM THE FOLLOWING:
   UNITED AIR FILTER COMPANY
   1000 WEST PALMER STREET
   CHARLOTTE, NORTH CAROLINA 28234
   (704) 334-5311

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

DS.2 — HYDROSTATIC DEWATERING STRUCTURE

Williams.

WHM consulting, INC. — designs, permits, resolutions

BA GROUP

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

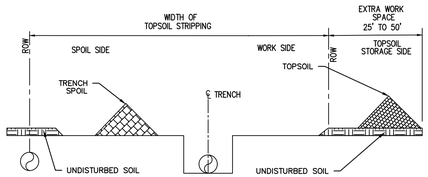
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

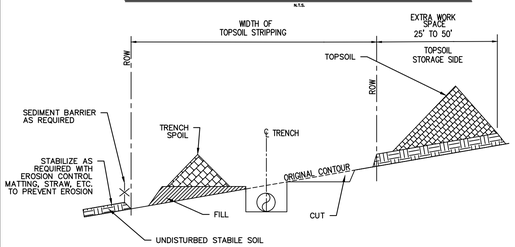
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 32 OF 39
WO: 121227	RID:		



FULL RIGHT-OF-WAY TOPSOIL STRIPPING ADJACENT EXISTING PIPELINE
N.T.S.



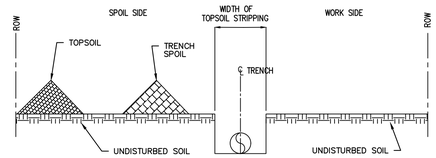
FULL RIGHT-OF-WAY TOPSOIL STRIPPING-SIDE SLOPES
N.T.S.

NOTES:

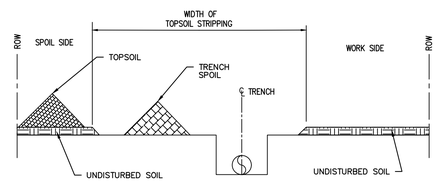
1. ALLOW FOR A SEPARATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT-OF-WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS SHOWN ON PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TS.1 TOPSOIL SEGREGATION (1)



DITCH LINE TOPSOIL STRIPPING
N.T.S.
ALSO USED IN NON-SATURATED WETLANDS



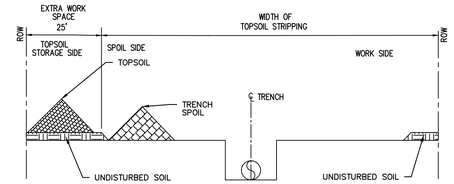
DITCH PLUS SPOIL SIDE SEGREGATION
N.T.S.

NOTES:

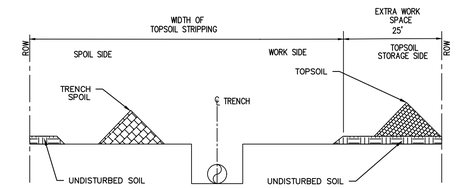
1. ALLOW FOR A SEPARATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED.
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT-OF-WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS SHOWN ON PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TS.2 TOPSOIL SEGREGATION (2)



FULL RIGHT-OF-WAY TOPSOIL STRIPPING - A
N.T.S.



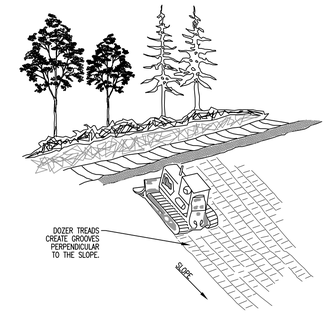
FULL RIGHT-OF-WAY TOPSOIL STRIPPING - B
N.T.S.

NOTES:

1. ALLOW FOR A SEPARATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED.
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT-OF-WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS SHOWN ON PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TS.3 TOPSOIL SEGREGATION (3)



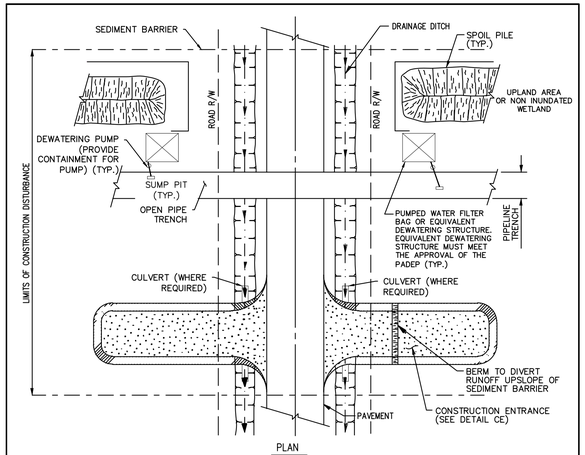
NOTES:

1. SURFACE ROUGHENING SHOULD BE APPLIED TO ALL SLOPES STEEPER THAN 3:1 UNLESS A STABLE ROCK FACE IS PROVIDED.
2. TRACKING SLOPES IS DONE BY RUNNING TRACKED MACHINERY UP AND DOWN THE SLOPE, LEAVING TREAD MARKS PARALLEL TO THE CONTOUR. CARE SHOULD BE EXERCISED ON SOILS HAVING A HIGH CLAY CONTENT TO AVOID OVER-COMPACTION.
3. IF A BULLDOZER IS USED, THE BLADE SHOULD BE UP.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
SR SURFACE ROUGHENING
TEMPORARY EROSION CONTROL MEASURE



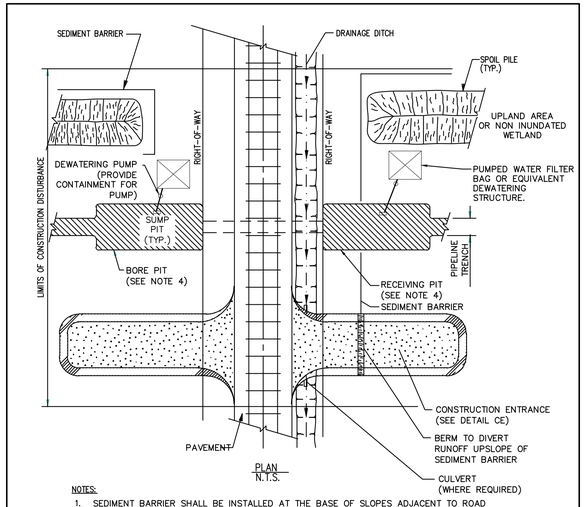
PLAN
N.T.S.

NOTES:

1. SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO ROAD CROSSINGS WHERE VEGETATION IS DISTURBED, TO INTERCEPT SURFACE RUNOFF. TEMPORARILY RELOCATE SEDIMENT BARRIERS WITHIN LIMITS OF TRENCH OPENING AS NEEDED TO INSTALL PIPE. IMMEDIATELY REPLACE BARRIERS AFTER BACKFILLING TRENCH.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL REMAIN IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. CULVERTS TO BE SIZED AND PLACED WHERE REQUIRED TO MAINTAIN WATER FLOW.
5. CONTRACTOR SHALL BE REQUIRED TO KEEP THE ROAD CLEAN OF DEBRIS AT ALL TIMES.
6. CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE PIPE TRENCH.
7. CONTRACTOR MAY ELECT TO UTILIZE WELL-POINTS IN ORDER TO REDUCE THE WATER TABLE PRIOR TO COMMENCING EXCAVATION.
8. DEPENDING ON TOPOGRAPHY AND STATE REQUIREMENTS, SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT-OF-WAY AT THE EDGE OF ROAD. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.
9. CONSTRUCTION ENTRANCE NEEDED AS SHOWN ON SPECIFIC PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TRC TRENCHED ROAD CROSSING



PLAN
N.T.S.

NOTES:

1. SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO ROAD CROSSINGS WHERE VEGETATION IS DISTURBED, TO INTERCEPT SURFACE RUNOFF.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL REMAIN IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. WATER REMOVED FROM BORE PIT AND RECEIVING PIT SHALL BE FILTERED THROUGH A DEWATERING STRUCTURE OR FILTER BAG.
5. IF WELL POINTING IS REQUIRED PRIOR TO EXCAVATING BORE PITS, CONTRACTOR SHALL CONSULT WITH COMPANY'S ENVIRONMENTAL INSPECTOR PRIOR TO COMMENCEMENT OF WORK IN ORDER TO DETERMINE PROPER DEWATERING LOCATION.
6. CONTRACTOR SHALL BE REQUIRED TO KEEP THE CROSSING CLEAN OF DEBRIS AT ALL TIMES.
7. CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE BORE PITS.
8. DEPENDING ON TOPOGRAPHY AND STATE REQUIREMENTS, SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY AT THE EDGE OF ROAD. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
BRC BORED ROAD CROSSING

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
041231-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

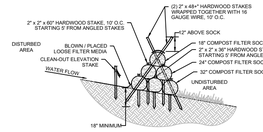
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

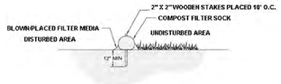
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

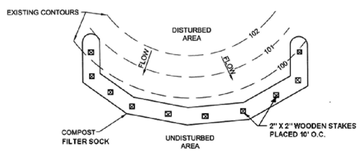
DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 33
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



TRIPLE STACK SOCK TRAP SECTION
N.T.S.



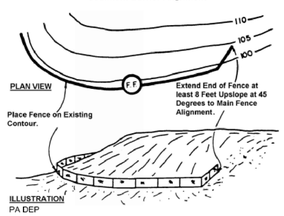
SECTION VIEW
NTS



PLAN VIEW

NOT TO SCALE

FIGURE 4.1
Sediment Barrier Alignment



NOT TO SCALE

NOTES:

1. ALL MATERIAL TO MEET MANUFACTURER SPECIFICATIONS.
2. COMPOST FILTER SOCK FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY CONSTRUCTION CONTRACTOR.
4. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.
5. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
6. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
7. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION WITH ADDITIONAL SOCK OR ROCK FILTER.
8. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
9. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

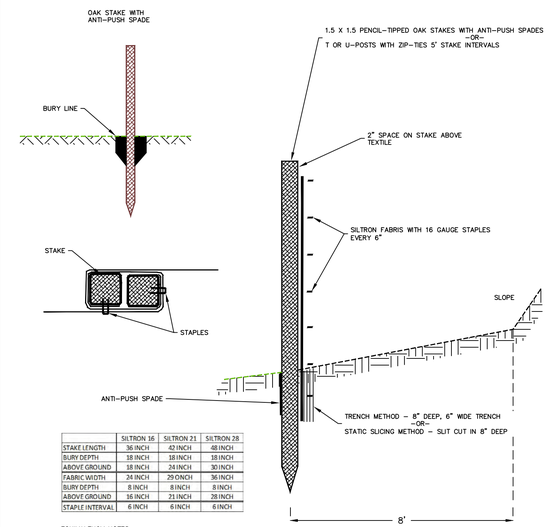
ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.5
MOISTURE CONTENT	30% – 60%
PARTICLE SIZE	30% – 50% PASS THROUGH 3/8" SIEVE
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

MATERIAL TYPE	3 mil HDPE	5 mil HDPE	5 mil HDPE	MULTI-FILAMENT POLYPROPYLENE (MFPP)	HEAVY-DUTY MULTI-FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE	BIO-DEGRADABLE	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 psi	26 psi	44 psi	202 psi
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS
TWO-PLY SYSTEMS					
INNER CONTAINMENT NETTING			HDPE BIAXIAL NET		
			CONTINUOUSLY WOUND		
			FUSION-WELDED JUNCTURES		
			3/4" x 3/4" MAX. APERTURE SIZE		
OUTER FILTRATION MESH			COMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON-WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH)		
			3/16" MAX. APERTURE SIZE		
SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.					

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

CFS COMPOST FILTER SOCK



	SILTRON 16	SILTRON 21	SILTRON 28
STAKE LENGTH	36 INCH	42 INCH	48 INCH
BURY DEPTH	18 INCH	18 INCH	18 INCH
ABOVE GROUND	18 INCH	24 INCH	30 INCH
FABRIC WIDTH	24 INCH	29 ONCH	36 INCH
BURY DEPTH	8 INCH	8 INCH	8 INCH
ABOVE GROUND	16 INCH	21 INCH	28 INCH
STAPLE INTERVAL	6 INCH	6 INCH	6 INCH

EQUIVALENCY NOTES:
THE 16" FILTER FENCE WILL USE SLOPE LENGTHS EQUIVALENT TO AND 18" COMPOST FILTER SOCK; THE 21" FILTER FENCE WILL USE SLOPE LENGTHS EQUIVALENT TO A 24" COMPOST FILTER SOCK; THE 28" FILTER FENCE WILL USE SLOPE LENGTHS EQUIVALENT TO A 32" COMPOST FILTER SOCK.

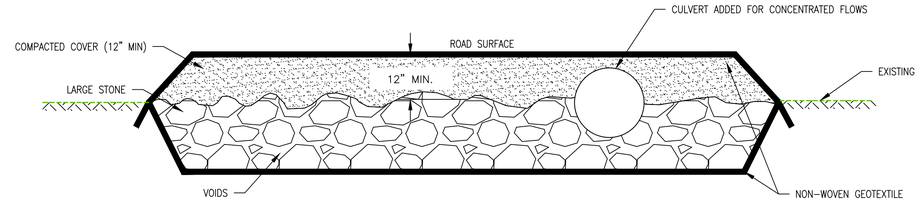
NOTES:
MAINTENANCE:
SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH HALF THE ABOVE GROUND HEIGHT OF THE FENCE.
ANY SECTION OF FENCE WHICH HAS BEEN COMPROMISED THROUGH PHYSICAL DAMAGE OR IS BLINDED WITH SEDIMENT OR HYDROCARBONS SHALL BE IMMEDIATELY REPLACED WITH EITHER A ROCK FILTER OUTLET CONFIGURATION, OR FILTER SOCK (COMPOST OR SWITCHGRASS).
IF UNDERCUTTING OCCURS, FILL MUST BE ADDED TO TRENCH AND AREA RE-COMPACTED.

REMOVAL:
FENCE SHALL BE REMOVED AND PROPERLY DISPOSED OF WHEN TRIBUTARY AREA IS PERMANENTLY STABILIZED.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC

SPF SILTRON POLLUTION PREVENTION FENCE
TEMPORARY EROSION CONTROL MEASURE



CONSTRUCTION SEQUENCE:

1. EXCAVATE THE MATTRESS TO DESIRED DEPTH & SLOPE, ALLOWING FOR A MINIMUM OF 12 INCHES OF COMPACTED COVER OVER THE MATTRESS. PLACE THE GEOTEXTILE FABRIC IN THE TRENCH. ALLOW ENOUGH FABRIC ON THE ENDS TO OVERLAP THE TOP PIECE OF GEOTEXTILE IN THE FINISHED MATTRESS.
2. PLACE POROUS AASHTO 1 STONE ON TOP OF THE FABRIC AND SPREAD INTO A UNIFORM BED OF THE DESIRED DEPTH.
3. PLACE A PIECE OF FABRIC OVERTOP OF THE INSTALLED STONE. BE SURE TO OVERLAP ALL FABRIC JOINTS BY AT LEAST 12 INCHES. LEAVE THE STONE EXPOSED ALONG ANY ROAD EDGES.
4. SHAPE AND COMPACT FILL OVERTOP OF THE FINISHED MATTRESS. ESTABLISH THE DESIRED ROAD SURFACE SHAPE IN THE FILL. PLACE ENOUGH FILL TO ENSURE A MINIMUM OF 12" COMPACTED COVER ONCE THE FILL AND SURFACE AGGREGATE ARE INSTALLED.

IMPORTANT CONSIDERATIONS:

1. MATTRESSES ARE NOT SUITABLE REPLACEMENTS FOR ROAD DRAINAGE PIPES, OR ANYWHERE CONCENTRATED OVERLAND FLOW CARRIES SEDIMENT. THESE FLOWS WILL CLOG THE MATTRESS OVER TIME AND ARE TO BE HANDLED BY DRAINAGE PIPES.
2. MATTRESS SIZE IS FLEXIBLE. SMALLER MATTRESS ALLOWS ROADSIDE SPRINGS TO BLEED THROUGH THE ROAD BASE WHILE MAINTAINING ROAD STABILITY. THE LARGER MATTRESS CREATED A STABLE FOUNDATION FOR THE ROAD THROUGH AN AREA OF SOFT WET SOILS.
3. A FRENCH MATTRESS SHOULD BE COVERED BY A MINIMUM IF 12" OF COMPACTED FILL MATERIAL.
4. IN MOST SITUATIONS, THE MATTRESS SHOULD BE LEVEL END TO END (WITH ROAD ALIGNMENT).
5. A FRENCH MATTRESS SHOULD PROVIDE UNRESTRICTED FLOW THROUGH THE ROAD. IN WETLAND SITUATIONS, THE SIDE SLOPE MAY BE FLAT OR MINIMAL. IN SLOPED AREAS, A 1–2 PERCENT FALL FROM INLET TO OUTLET WILL AID IN DRAINAGE.
6. THE MATTRESS MUST BE FREE DRAINING AT THE OUTLET TO AVOID PONDING WATER BENEATH THE ROAD.

MATERIALS REQUIRED FOR CONSTRUCTION:

1. GEOTEXTILE FABRIC (CLASS 1 NON-WOVEN). SEPARATION FABRIC AROUND THE MATTRESS ALLOWS WATER TO PASS THROUGH WHILE BLOCKING FINE SILT AND CLAY, WHICH WOULD EVENTUALLY CLOG THE STRUCTURE.
2. CLEAN STONE. IT IS IMPORTANT TO USE CLEAN STONE. CLEAN STONE IS RELATIVELY UNIFORM IN SIZE WITH NO FINE MATERIAL. TYPICALLY 3 TO 4 INCH DIAMETER STONE IS USED. SMALLER STONE SHOULD BE AVOIDED AS IT REQUIRES LATERAL CONFINEMENT TO STABILIZE. ADDITIONALLY, LARGER STONE WILL INCREASE THE BRIDGING POTENTIAL AND THE FLOW CAPACITY OF THE MATTRESS.

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL

FRENCH MATTRESS

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

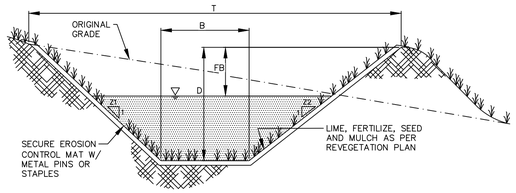
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

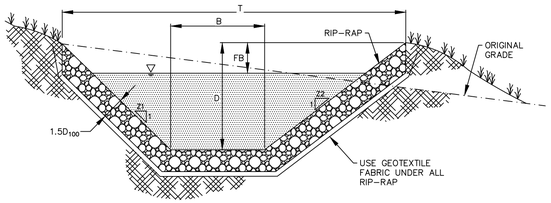
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 34 OF 39
WO: 121227	RID:		



GRASS LINED CHANNEL
NO SCALE



ROCK LINED CHANNEL
NO SCALE

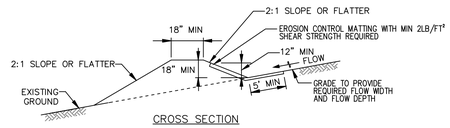
GENERAL NOTES:

AT THE DIRECTION OF THE OWNER OR THEIR DESIGNATED REPRESENTATIVE, A MOUNTABLE EARTHEN BERM AS SHOWN BELOW MAY BE UTILIZED IN PLACE OF A DIVERSION CHANNEL.

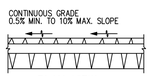
HENSEL REPLACEMENT CHANNEL SCHEDULE

Channel ID	LENGTH [FT]	SLOPE [%]	BASE WIDTH [FT]	DEPTH [FT]	SIDE SLOPES [Z1/Z2]	TOP WIDTH [FT]	LINING	OUTLET
HR1-1	21	3.5	4	2.25	3/1	17.50	R-6 Riprap	HR1-C1
HR1-2	18	4.0	4	2.25	3/1	17.50	R-6 Riprap	HR1-C1
HR2	134	6.2	2	0.75	2/1	5	ECB	HR2-C2
HR3-1	302	2.3	2	1	2/1	6	ECB	HR3-C3
HR3-2	300	1.0	2	1.25	2/1	7	ECB	HR3-C3
HR4	65	1.6	2	1.25	2/1	7	ECB	HR4-C4
HR5-1	108	2.3	2	1.25	2/1	7	ECB	HR5-C5
HR5-2	94	1.5	2	1.25	2/1	7	ECB	HR5-C5
HR6	368	4.1	2	1	2/1	6	ECB	HR6-C6
HR7	364	2.2	2	1	2/1	6	ECB	HR7-C7
HR8	186	12.0	2	0.75	2/1	5	ECB	HR8-C8
HR9	181	12.0	2	0.75	2/1	5	ECB	HR9-C9
HR10	548	8.9	6	1.25	2/1	11	R-6 Riprap	HR10-C10
HR11	201	14.4	2.5	0.75	2/1	5.5	ECB	HR11-C11
HR12	138	8.8	2	0.75	2/1	5	ECB	HR12-C12
HR13	759	2.6	2	1.25	2/1	7	ECB	HR13-C13
HR14	682	2.5	2	1.25	2/1	7	ECB	HR14-C14
HR15	787	4.9	2	1	2/1	6	ECB	HR15-C15
HR16-1	456	1.6	2	1.25	2/1	7	ECB	HR16-C16
HR16-2	13	9.2	2	1	2/1	6	ECB	HR16-C16
HR17	231	7.3	5	1	2/1	9	ECB	HR17-C17
HR18-1	260	4.9	2	1	2/1	6	ECB	HR18-C18
HR18-2	160	5.0	2	1	2/1	6	ECB	HR18-C18
HR19	193	8.3	2	0.75	2/1	5	ECB	HR19-C19
HR20	240	7.1	2	0.75	2/1	5	ECB	HR20-C20
HR21-1	762	1.0	2	0.75	2/1	5	ECB	HR21-C21
HR21-2	67	7.5	2	0.75	2/1	5	ECB	HR21-C21
HR22	528	1.3	2	1.25	2/1	7	ECB	HR22-C22
HR23	254	3.4	2	1	2/1	6	ECB	HR23-C23
HR24	189	1.1	2	1	2/1	6	ECB	HR24-C24
HR25	229	9.7	2	1	2/1	6	ECB	HR25-C25
HR26	370	3.4	2	0.75	2/1	5	ECB	HR26-C26
HR27	179	2.5	2	0.75	2/1	5	ECB	HR27-C27

TYPICAL MOUNTABLE EARTHEN BERM
NO SCALE



CROSS SECTION



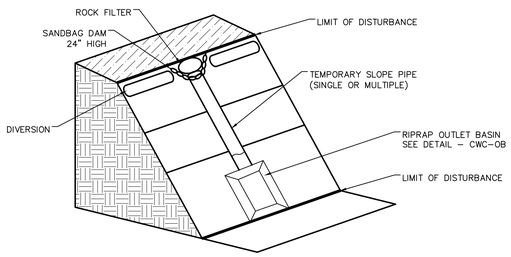
PLAN VIEW

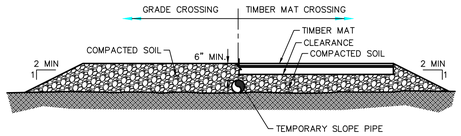
CONSTRUCTION SPECIFICATIONS

1. REMOVE AND DISPOSE OF ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SO AS NOT TO INTERFERE WITH PROPER FUNCTION OF EARTHDIKE.
2. EXCAVATE OR SHAPE EARTH DIKE TO LINE, GRADE, AND CROSS SECTION AS SPECIFIED. BANK PROJECTIONS OR OTHER IRREGULARITIES ARE NOT ALLOWED.
3. COMPACT FILL.
4. CONSTRUCT FLOW CHANNEL ON AN UNINTERRUPTED, CONTINUOUS GRADE, ADJUSTING THE LOCATION DUE TO FIELD CONDITIONS AS NECESSARY TO MAINTAIN POSITIVE DRAINAGE.
5. PROVIDE OUTLET PROTECTION AS REQUIRED ON APPROVED PLAN.
6. STABILIZE EARTH DIKE WITHIN THREE DAYS OF INSTALLATION. STABILIZE FLOW CHANNEL FOR CLEAR WATER DIVERSION WITHIN 24 HOURS OF INSTALLATION.
7. MAINTAIN LINE, GRADE, AND CROSS SECTION. REMOVE ACCUMULATED SEDIMENT AND DEBRIS, AND MAINTAIN POSITIVE DRAINAGE. KEEP EARTH DIKE AND POINT OF DISCHARGE FREE OF EROSION, AND CONTINUOUSLY MEET REQUIREMENTS FOR ADEQUATE VEGETATIVE ESTABLISHMENT IN ACCORDANCE WITH SECTION B-4 VEGETATIVE STABILIZATION.
8. UPON REMOVAL OF EARTH DIKE, GRADE AREA FLUSH WITH EXISTING GROUND. WITHIN 24 HOURS OF REMOVAL STABILIZE DISTURBED AREA WITH TOPSOIL, SEED, AND MULCH, OR AS SPECIFIED ON APPROVED PLAN.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
DC — TYPICAL DIVERSION CHANNEL (ROCK-LINED/GRASS-LINED)
Williams





TEMPORARY SLOPE PIPE CROSSING
NO SCALE

NOTES:

CLEARWATER CROSSING TO BE INSPECTED WEEKLY OR AFTER MEASURABLE RAINFALL EVENT AND SHALL BE MAINTAINED IN GOOD CONDITION AT ALL TIMES.

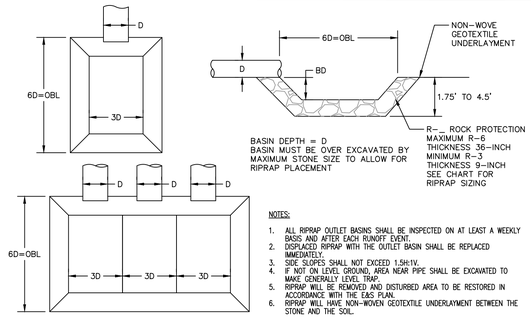
Hensel Replacement - CWC's Schedule

I.D.	Drainage Area [ac]	Req'd Flow [cfs]	Length (ft)	Slope [ft/ft]	No. of Pipes	Pipe Diameter [in]
HR1-C1	112.42	118.7	86.00	0.105	4	18
HR2-C2	0.24	0.2	138.0	0.085	1	12
HR3-C3	14.72	7.7	91.00	0.066	1	18
HR4-C4	7.42	4.1	86.0	0.047	1	12
HR5-C5	28.97	9.8	89.0	0.096	1	18
HR6-C6	7.55	2.4	88.0	0.125	1	12
HR7-C7	2.79	1.3	139.0	0.266	1	12
HR8-C8	0.45	0.2	139.0	0.130	1	12
HR9-C9	0.56	0.3	123.0	0.390	1	12
HR10-C10	8.12	13.0	93.0	0.247	1	18
HR11-C11	1.63	3.1	92.0	0.641	1	12
HR12-C12	0.92	0.54	74.0	0.197	1	12
HR13-C13	9.90	4.49	90.0	0.378	1	12
HR14-C14	14.02	6.60	100.0	0.374	1	12
HR15-C15	14.31	5.43	100.0	0.150	1	12
HR16-C16	25.89	14.94	100	0.170	1	12
HR17-C17	19.18	11.10	100	0.135	1	18
HR18-C18	14.09	10.36	85	0.148	1	18
HR19-C19	2.99	1.07	85	0.330	1	12
HR20-C20	0.97	0.5	85	0.160	1	12
HR21-C21	14.89	18.3	74	0.160	1	12
HR22-C22	3.56	4.6	135	0.045	1	18
HR23-C23	4.22	1.74	73	0.152	1	12
HR24-C24	1.2	0.52	72	0.155	1	12
HR25-C25	6.1	2.6	106	0.149	1	12
HR26-C26	2.38	0.93	98	0.051	1	12
HR27-C27	1.14	0.46	98	0.060	1	12

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CWC — CLEAN WATER CROSSING
Williams



NOTES:

1. ALL RIPRAP OUTLET BASINS SHALL BE INSPECTED ON AT LEAST A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT.
2. DISPLACED RIPRAP WITH THE OUTLET BASIN SHALL BE REPLACED IMMEDIATELY.
3. SIDE SLOPES SHALL NOT EXCEED 1.5H:1V.
4. IF NOT ON LEVEL GROUND, AREA NEAR PIPE SHALL BE EXCAVATED TO MAKE GENERALLY LEVEL TRAP.
5. RIPRAP WILL BE REMOVED AND DISTURBED AREA TO BE RESTORED IN ACCORDANCE WITH THE E&S PLAN.
6. RIPRAP WILL HAVE NON-WOVEN GEOTEXTILE UNDERLAYMENT BETWEEN THE STONE AND THE SOIL.

Clean Water Crossing Outlet Basin

Pipe Diameter (D)	Basin Length (6D)	Basin Inside Width (3D)	Basin Depth (BD)
12"	6'	3'	1'
18"	9'	4.5'	1.5'
24"	12'	6'	2'

PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
CWC-OB — CLEAN WATER CROSSING (RIP RAP OUTLET BASIN)
STANDARD CONSTRUCTION DETAIL #8-6
Williams

WHM consulting, INC. — designs, permits, resolutions
BA GROUP

KEVIN C. CLARK, P.E.
COMMONWEALTH OF PENNSYLVANIA — REGISTERED PROFESSIONAL — KEVIN C. CLARK — ENGINEER — DATE
PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

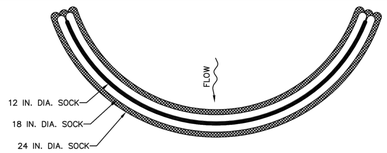
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

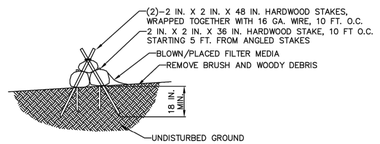
DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 35 OF 39
WO: 121227	RID:		



PLAN VIEW



STAKING DETAIL

NOT TO SCALE

DESIGN NOTES:

1. COMPOST SOCK SEDIMENT TRAP SHALL BE SIZED TO PROVIDE 2000 CUBIC FEET OF STORAGE CAPACITY FOR EACH ACRE TRIBUTARY TO THE TRAP.
2. MINIMUM BASE WIDTH IS EQUAL TO THE HEIGHT.
3. SEDIMENT ACCUMULATION SHALL NOT EXCEED 1/3 THE TOTAL HEIGHT OF THE TRAP.
4. SOCKS SHALL BE OF LARGER DIAMETER AT THE BASE OF THE TRAP AND DECREASE IN DIAMETER FOR SUCCESSIVE LAYERS AS SHOWN ON THE PLAN VIEW.
5. ENDS OF THE TRAP SHALL BE A MINIMUM OF 1 FOOT HIGHER IN ELEVATION THAN THE MID–SECTION, WHICH SHALL BE LOCATED AT THE POINT OF DISCHARGE.

NOTES:

SOCK MATERIAL SHALL MEET THE STANDARDS OF TABLE 4.1 OF THE PA DEP EROSION CONTROL MANUAL. COMPOST SHALL MEET THE STANDARDS OF TABLE 4.2 OF THE PA DEP EROSION CONTROL MANUAL.

COMPOST SOCK SEDIMENT TRAPS SHALL NOT EXCEED THREE SOCKS IN HEIGHT AND SHALL BE STACKED IN PYRAMIDAL FORM AS SHOWN ABOVE. MINIMUM TRAP HEIGHT IS ONE 24" DIAMETER SOCK. ADDITIONAL STORAGE MAY BE PROVIDED BY MEANS OF AN EXCAVATED SUMP 12" DEEP EXTENDING 1 TO 3 FEET UPSLOPE OF THE SOCKS ALONG THE LOWER SIDE OF THE TRAP.

COMPOST SOCK SEDIMENT TRAPS SHALL PROVIDE 2,000 CUBIC FEET STORAGE CAPACITY WITH 12" FREEBOARD FOR EACH TRIBUTARY DRAINAGE ACRE. (SEE MANUFACTURER FOR ANTICIPATED SETTLEMENT.)

THE MAXIMUM TRIBUTARY DRAINAGE AREA IS 5.0 ACRES. SINCE COMPOST SOCKS ARE "FLOW–THROUGH," NO SPILLWAY IS REQUIRED.

COMPOST SOCK SEDIMENT TRAPS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/3 THE HEIGHT OF THE SOCKS.

PHOTODEGRADABLE AND BIODEGRADABLE SOCKS SHALL NOT BE USED FOR MORE THAN 1 YEAR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

CST COMPOST SOCK SEDIMENT TRAP

Williams.

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 1	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 2	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 3	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 4	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 5	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 6	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 7	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 8	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 9	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 10	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 11	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 12	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 13	18	see map, Lucky Leap Valve Yard and CSA018	7	243
CFS-HR 14	18	see map	4	384
CFS-HR 15	18	see map	4	384
CFS-HR 16	18	see map	4	384
CFS-HR 17	18	see map	4	384
CFS-HR 18	18	see map	4	384
CFS-HR 19	18	see map	4	384
CFS-HR 20	18	see map	4	384
CFS-HR 21	18	see map	4	384
CFS-HR 22	18	see map	4	384
CFS-HR 23	18	see map	4	384
CFS-HR 24	18	see map	4	384
CFS-HR 25	18	see map	4	384
CFS-HR 26	18	see map	3	459
CFS-HR 27	18	see map	3	459
CFS-HR 28	18	see map	3	459
CFS-HR 29	18	see map	3	459
CFS-HR 30	18	see map	3	459
CFS-HR 31	18	see map	3	459
CFS-HR 32	18	see map	3	459
CFS-HR 33	18	see map	3	459
CFS-HR 34	12	see map	12	100
CFS-HR 35	12	see map	12	100
CFS-HR 36	12	see map	12	100
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CFS-HR 39	12	see map	12	100
CFS-HR 40	12	see map	12	100
CFS-HR 41	12	see map	12	100
CFS-HR 42	32	see map, CSA018	6	566
CFS-HR 43	32	see map, CSA019	6	567
CFS-HR 44	32	see map, CSA019	6	567
CFS-HR 45	32	see map, CSA019	6	567
CFS-HR 46	32	see map, CSA019	6	567
CFS-HR 47	32	see map, CSA019	6	567
CFS-HR 48	32	see map, CSA019	6	567
CFS-HR 49	12	see map	12	100
CFS-HR 50	12	see map	12	100
CFS-HR 51	24	see map	6	376
CFS-HR 52	24	see map	6	376
CFS-HR 53	24	see map	6	376
CFS-HR 54	24	see map	6	376
CFS-HR 55	24	see map	6	376
CFS-HR 56	12	see map	9	127
CFS-HR 57	12	see map	9	127
CFS-HR 58	12	see map	9	127
CFS-HR 59	12	see map	9	127
CFS-HR 60	12	see map	9	127
CFS-HR 61	12	see map	9	127
CFS-HR 62	12	see map	9	127
CFS-HR 63	12	see map	9	127
CFS-HR 64	18	see map	16	104
CFS-HR 65	18	see map	16	104
CFS-HR 66	18	see map	16	104
CFS-HR 67	18	see map	16	104
CFS-HR 68	18	see map	16	104
CFS-HR 69	18	see map	16	104
CFS-HR 70	18	see map	16	104
CFS-HR 71	12	see map	7	88
CFS-HR 72	18	see map	16	104
CFS-HR 73	18	see map	22	72
CFS-HR 74	18	see map	22	72
CFS-HR 75	18	see map	22	72
CFS-HR 76	18	see map	22	72
CFS-HR 77	18	see map	22	72
CFS-HR 78	12	see map	27	37
CFS-HR 79	12	see map	27	37
CFS-HR 79A	12	see map	17	30
CFS-HR 79B	18	see map	16	93
CFS-HR 79C	18	see map	16	93
CFS-HR 79D	18	see map	16	39
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CFS-HR 83	12	see map	7	140
CFS-HR 84	12	see map	7	140
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CFS-HR 87	12	see map	7	140
CFS-HR 88	12	see map	7	140
CFS-HR 89	12	see map	7	140
CFS-HR 90	12	see map	7	140
CFS-HR 91	12	see map	7	140
CFS-HR 92	12	see map	7	140
CFS-HR 93	12	see map	7	140
CFS-HR 94	12	see map	6	131
CFS-HR 95	12	see map	6	131
CFS-HR 96	12	see map	6	131
CFS-HR 97	12	see map	6	131
CFS-HR 98	12	see map	6	131
CFS-HR 99	12	see map	3	126
CFS-HR 100	12	see map	3	126
CFS-HR 101	12	see map	3	126
CFS-HR 102	12	see map	9	89
CFS-HR 103	12	see map	9	89
CFS-HR 104	12	see map	9	89
CFS-HR 105	12	see map	9	89
CFS-HR 106	12	see map	9	89
CFS-HR 107	12	see map	9	89
CFS-HR 108	12	see map	9	89
CFS-HR 109	12	see map	9	89
CFS-HR 110	12	see map	9	89
CFS-HR 111	12	see map	9	89
CFS-HR 112	12	see map	9	89
CFS-HR 113	12	see map	9	89
CFS-HR 114	12	see map	9	89
CFS-HR 115	12	see map	10	135
CFS-HR 116	12	see map	10	135
CFS-HR 117	12	see map	10	135
CFS-HR 118	12	see map	3	126
CFS-HR 119	12	see map	3	126
CFS-HR 120	12	see map	3	126
CFS-HR 121	12	see map	9	89
CFS-HR 122	12	see map	9	89
CFS-HR 123	12	see map	9	89
CFS-HR 124	12	see map	9	89
CFS-HR 125	12	see map	9	89
CFS-HR 126	12	see map	9	89
CFS-HR 127	12	see map	9	89
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CFS-HR 129	12	see map	9	89
CFS-HR 130	12	see map	9	89
CFS-HR 131	12	see map	9	89
CFS-HR 132	12	see map	12	121
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CFS-HR 134	12	see map	12	121
CFS-HR 135	12	see map	12	121
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CFS-HR 138	12	see map	12	121
CFS-HR 139	12	see map	12	121
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CFS-HR 141	12	see map	12	121
CFS-HR 142	12	see map	11	85
CFS-HR 143	12	see map	11	85
CFS-HR 144	12	see map	11	85
CFS-HR 145	12	see map	11	85
CFS-HR 145A	24	see map	24	143
CFS-HR 145B	24	see map	24	143
CFS-HR 145C	24	see map	24	143
CFS-HR 145D	12	see map	20	41
CFS-HR 145E	12	see map	20	41
CFS-HR 146	12	see map	11	85
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CFS-HR 148	12	see map	11	85
CFS-HR 149	24	see map	24	143
CFS-HR 150	24	see map	24	143
CFS-HR 145	12	see map	11	85
CFS-HR 145A	24	see map	24	143
CFS-HR 145B	24	see map	24	143
CFS-HR 145C	24	see map	24	143
CFS-HR 145D	12	see map	20	41
CFS-HR 145E	12	see map	20	41
CFS-HR 146	12	see map	11	85
CFS-HR 147	12	see map	11	85
CFS-HR 148	12	see map	11	85
CFS-HR 149	24	see map	24	143
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CFS-HR 151	24	see map	24	143
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CFS-HR 161	18	see map	20	137
CFS-HR 162	18	see map	20	137
CFS-HR 163	24	see map	37	65
CFS-HR 164	24	see map	37	65
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CFS-HR 206A	24	see map	37	73
CFS-HR 206B	24	see map	37	73
CFS-HR 206C	24	see map	37	73
CFS-HR 206D	24	see map	37	73
CFS-HR 207	12	see map	34	35
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CFS-HR 213	12	see map	34	35
CFS-HR 214	24	see map	36	84
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CFS-HR 218	24	see map	44	66
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CFS-HR 220	24	see map	44	66
CFS-HR 221	24	see map	44	66
CFS-HR 222	24	see map	44	66
CFS-HR 223	24	see map	33	90
CFS-HR 224	24	see map	33	90
CFS-HR 224A	24	see map	22	88
CFS-HR 224B	24	see map	22	88
CFS-HR 225	24	see map	33	90
CFS-HR 226	24	see map	33	90
CFS-HR 227	24	see map	33	90
CFS-HR 228	24	see map	33	90
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CFS-HR 230	24	see map	33	90
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CFS-HR 232	24	see map	33	90
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CFS-HR 234	18	see map	20	118
CFS-HR 235	18	see map	20	118
CFS-HR 236	18	see map	20	118
CFS-HR 237	18	see map	20	118
CFS-HR 238	18	see map	18	111
CFS-HR 239	18	see map	18	111
CFS-HR 240	18	see map	18	111
CFS-HR 241	18	see map	18	111
CFS-HR 242	18	see map	18	111
CFS-HR 243	18	see map	18	111
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CFS-HR 250	18	see map	18	111
CFS-HR 251	32	see map, CSA020	18	120
CFS-HR 252	32	see map, CSA020	18	120
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CFS-HR 254	18	see map	18	111
CFS-HR 255	18	see map	18	111
CFS-HR 256	18	see map	18	111
CFS-HR 257	18	see map	18	111
CFS-HR 257A	12	see map	30	30
CFS-HR 257B	12	see map	30	30
CFS-HR 257C	24	see map	wetland protection	
CFS-HR 257D	24	see map	wetland protection	
CFS-HR 257E	24	see map	wetland protection	
CFS-HR 258	24	see map	41	64
CFS-HR 259	24	see map	41	64
CFS-HR 260	24	see map	41	64
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CFS-HR 267	24	see map	41	64
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CFS-HR 282	18	see map	33	72
CFS-HR 283	18	see map	33	72
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CFS-HR 287	18	see map	33	72
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CFS-HR 297	18	see map	33	72
CFS-HR 298	18	see map	33	72
CFS-HR 299	18	see map	33	72
CFS-HR 300	24	see map	33	86
CFS-HR 301	18	see map	41	58
CFS-HR 302	18	see map	41	58
CFS-HR 303	18	see map	41	58
CFS-HR 304	18	see map	41	58
CFS-HR 305	18	see map	41	58
CFS-HR 306	12	see map	11	79
CFS-HR 307	12	see map	11	79
CFS-HR 308	12	see map	11	79
CFS-HR 309	12	see map	11	79
CFS-HR 310	12	see map	11	79
CFS-HR 311	12	see map	11	79
CFS-HR 312	12	see map	11	79
CFS-HR 313	12	see map	11	79
CFS-HR 314	12	see map	11	79
CFS-HR 315	12	see map	11	79
CFS-HR 316	12	see map	11	79

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
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KEVIN C. CLARK
ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

WHM designs, permits, resolutions consulting, INC.

BA GROUP

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	SHEET 36 OF 39

SOCK NO.	Dia. In.	LOCATION	SLOPE PERCENT	SLOPE LENGTH ABOVE BARRIER (FT)
CFS-HR 317	18	see map	35	60
CFS-HR 318	18	see map	35	60
CFS-HR 319	18	see map	35	60
CFS-HR 320	18	see map	35	60
CFS-HR 321	18	see map	35	60
CFS-HR 322	18	see map	35	60
CFS-HR 323	18	see map	35	60
CFS-HR 324	18	see map	35	60
CFS-HR 325	18	see map	35	60
CFS-HR 326	24	see map	29	90
CFS-HR 327	24	see map	29	90
CFS-HR 328	24	see map	29	90
CFS-HR 329	24	see map	29	90
CFS-HR 330	24	see map	29	90
CFS-HR 331	24	see map	29	90
CFS-HR 332	24	see map	29	90
CFS-HR 333	24	see map	29	90
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CFS-HR 335	24	see map	29	90
CFS-HR 336	24	see map	29	90
CFS-HR 337	24	see map	29	90
CFS-HR 338	24	see map	29	90
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CFS-HR 340	24	see map	29	90
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CFS-HR 342	24	see map	29	90
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CFS-HR 344	24	see map	29	90
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CFS-HR 347	24	see map	29	90
CFS-HR 348	24	see map	29	90
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CFS-HR 356	24	see map	29	90
CFS-HR 357	24	see map	29	90
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CFS-HR 375	24	see map	29	90
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CFS-HR 388	24	see map	29	90
CFS-HR 389	24	see map	29	90
CFS-HR 390	24	see map	29	90
CFS-HR 391	32	see map	34	99
CFS-HR 392	32	see map	34	99
CFS-HR 393	32	see map	34	99
CFS-HR 394	32	see map	34	99
CFS-HR 395	32	see map	34	99
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CFS-HR 397	32	see map	34	99
CFS-HR 398	32	see map	34	99
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CFS-HR 426	32	see map	34	99
CFS-HR 427	32	see map	34	99
CFS-HR 428	24	see map	29	90
CFS-HR 429	18	see map	15	98
CFS-HR 430	18	see map	15	98
CFS-HR 431	18	see map	15	98
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CFS-HR 433	18	see map	15	98
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CFS-HR 539	18	see map	5	256
CFS-HR 540	18	see map	17	132
CFS-HR 541	18	see map	17	132
CFS-HR 542	18	see map	17	132
CFS-HR 543	18	see map	17	132
CFS-HR 544	18	see map	17	132
CFS-HR 545	18	see map	17	132
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CFS-HR 550	18	see map	17	132
CFS-HR 551	18	see map	17	132
CFS-HR 552	18	see map	17	132
CFS-HR 553	18	see map	17	132
CFS-HR 554	18	see map	17	132
CFS-HR 555	18	see map	17	132
CFS-HR 556	18	see map	17	132
CFS-HR 557	18	see map	17	132
CFS-HR 558	18	see map	17	132
CFS-HR 559	18	see map	17	132
CFS-HR 560	18	see map	17	132
CFS-HR 560A	18	see map	25	32
CFS-HR 560B	18	see map	25	32
CFS-HR 560C	18	see map	25	32
CFS-HR 561	18	see map	26	69
CFS-HR 562	18	see map	26	69
CFS-HR 563	18	see map	26	69
CFS-HR 564	18	see map	26	69
CFS-HR 564A	18	see map	25	56
CFS-HR 564B	18	see map	25	56
CFS-HR 564C	18	see map	25	56
CFS-HR 564D	18	see map	25	56
CFS-HR 565	18	see map	26	69
CFS-HR 566	18	see map	26	69
CFS-HR 567	18	see map	26	69
CFS-HR 568	18	see map	26	69
CFS-HR 569	18	see map	26	69
CFS-HR 570	18	see map	26	69
CFS-HR 571	18	see map	26	69
CFS-HR 572	18	see map	26	69
CFS-HR 573	18	see map	26	69
CFS-HR 574	12	see map	5	111
CFS-HR 575	12	see map	5	111
CFS-HR 576	12	see map	5	111
CFS-HR 577	12	see map	5	111
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CFS-HR 578	12	see map	5	111
CFS-HR 579	12	see map	5	111
CFS-HR 580	12	see map	5	111
CFS-HR 581	12	see map	7	98
CFS-HR 582	12	see map	7	98
CFS-HR 583	12	see map	7	98
CFS-HR 584	12	see map	7	98
CFS-HR 585	12	see map	7	98
CFS-HR 586	12	see map	7	98
CFS-HR 587	12	see map	7	98
CFS-HR 587A	12	see map	wetland protection	
CFS-HR 587B	12	see map	wetland protection	
CFS-HR 587C	24	see map	wetland protection	
CFS-HR 587D	24	see map	wetland protection	
CFS-HR 587E	24	see map	wetland protection	
CFS-HR 587F	12	see map	wetland protection	
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CFS-HR 589	12	see map	7	99
CFS-HR 590	12	see map	7	90
CFS-HR 591	12	see map	12	117
CFS-HR 592	12	see map	12	117
CFS-HR 593	12	see map	12	117
CFS-HR 594	12	see map	12	117
CFS-HR 595	12	see map	12	117
CFS-HR 596	12	see map	12	117
CFS-HR 597	12	see map	12	117
CFS-HR 598	12	see map	12	117
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CFS-HR 600	12	see map	12	117
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CFS-HR 603	12	see map	12	117
CFS-HR 604	12	see map	12	117
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CFS-HR 606	12	see map	12	117
CFS-HR 607	12	see map	12	117
CFS-HR 608	12	see map	12	117
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CFS-HR 610	12	see map	12	117
CFS-HR 611	12	see map	12	117
CFS-HR 612	12	see map	12	117
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CFS-HR 622	18	see map	42	52
CFS-HR 623	18	see map	42	52
CFS-HR 624	18	see map	42	52
CFS-HR 625	18	see map	42	52
CFS-HR 626	18	see map	42	52
CFS-HR 627	18	see map	42	52
CFS-HR 628	18	see map	42	52
CFS-HR 629	18	see map	42	52
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CFS-HR 639	18	see map	28	71
CFS-HR 640	18	see map	28	71
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CFS-HR 643	18	see map	28	71
CFS-HR 644	18	see map	28	71
CFS-HR 645	18	see map	28	71
CFS-HR 646	18	see map	28	71
CFS-HR 647	18	see map	28	71
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CFS-HR 657	24	see map	29	90
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CFS-HR 660	24	see map	29	90
CFS-HR 661	24	see map	29	90
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CFS-HR 670	18	see map	41	54
CFS-HR 671	18	see map	41	54
CFS-HR 672	18	see map	41	54
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CFS-HR 674	18	see map	41	54
CFS-HR 675	18	see map	41	54
CFS-HR 676	18	see map	41	54
CFS-HR 677	18	see map	41	54
CFS-HR 678	18	see map	41	54
CFS-HR 679	18	see map	41	54
CFS-HR 680	18	see map	41	54
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CFS-HR 682	18	see map	41	54
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CFS-HR 684	18	see map	41	54
CFS-HR 685	18	see map	41	54
CFS-HR 686	18	see map	41	54
CFS-HR 687	18	see map	41	54
CFS-HR 688	18	see map	41	54
CFS-HR 689	18	see map	41	54
CFS-HR 690	18	see map	41	54
CFS-HR 691	18	see map	41	54
CFS-HR 692	18	see map	41	54
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CFS-HR 702	18	see map	41	54
CFS-HR 703	18	see map	41	54
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CFS-HR 706	18	see map	41	54
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CFS-HR 709	18	see map	41	54
CFS-HR 710	18	see map	41	54
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CFS-HR 719	18	see map	41	54
CFS-HR 720	18	see map	41	54
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CFS-HR 727	18	see map	16	137
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CFS-HR 765	32	see map	16	281
CFS-HR 766	32	see map	16	281
CFS-HR 767	32	see map	16	281
CFS-HR 768	32	see map	16	281
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CFS-HR 772	32	see map	16	281
CFS-HR 773	32	see map	16	281
CFS-HR 774	32	see map	16	281
CFS-HR 775	32	see map	16	281
CFS-HR 776	32	see map	16	281
CFS-HR 777	32	see map	16	281
CFS-HR 778	32	see map	16	281
CFS-HR 779	32	see map, CSA021	5	546
CFS-HR 780	32	see map, CSA021	5	546
CFS-HR 781	32	see map, CSA021	5	546
CFS-HR 782	32	see map, CSA021	5	546
CFS-HR 783	32	see map, CSA021	5	546
CFS-HR 784	32	see map, CSA021	5	546
CFS-HR 785	18	see map	wetland protection	
CFS-HR 786	18	see map	wetland protection	
CFS-HR 787	32	see map	5	546
CFS-HR 788	32	see map	5	546
CFS-HR 789	32	see map	5	546
CFS-HR 790	32	see map	5	546
CFS-HR 791	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 792	18	see map, Western Terminus Valve Yard	12	115
CFS-HR 793	18	see map, Western Terminus Valve Yard	12	115
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CFS-HR 795	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 796	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 797	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 798	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 799	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 800	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 801	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 802	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 803	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 804	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 805	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 806	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 807	18	see map, Western Terminus Valve Yard	15	119
CFS-HR 808	12	see map	2	45
CFS-HR 809	12	see map	6	152
CFS-HR 810	24	see map	8	340
CFS-HR 811	24	see map	8	340
CFS-HR 812	24	see map	8	340
CFS-HR 813	24	Along the west of Paddy Run Road	6	226
CFS-HR 814	24	Along the east of Paddy Run Road	4	486
CFS-HR 815	24	Along the eastern LOD	1	983
CFS-HR 816	24	Along the eastern LOD	1	983

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
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PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

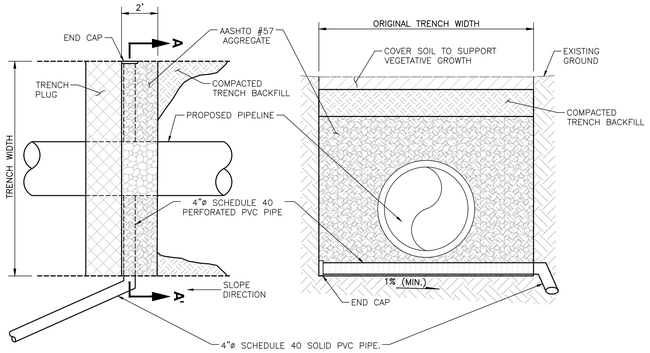
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

DETAILS SHEET

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

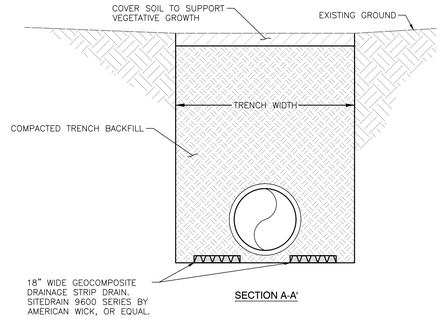
DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19		SHEET 37
WO: 121227	RID:	DRAWING NUMBER: 26-1000-70-28-D	OF 39



NOTE:

1. DAYLIGHT DISCHARGE PIPE TO RIPRAP EMBEDMENT TERMINUS (SEE DETAIL 9).
2. SLOPE BASE OF PIPE TRENCH, AT THE UPSLOPE SIDE OF TRENCH PLUG TOWARDS THE OUTLET PIPE AT A MINIMUM 1% GRADE.

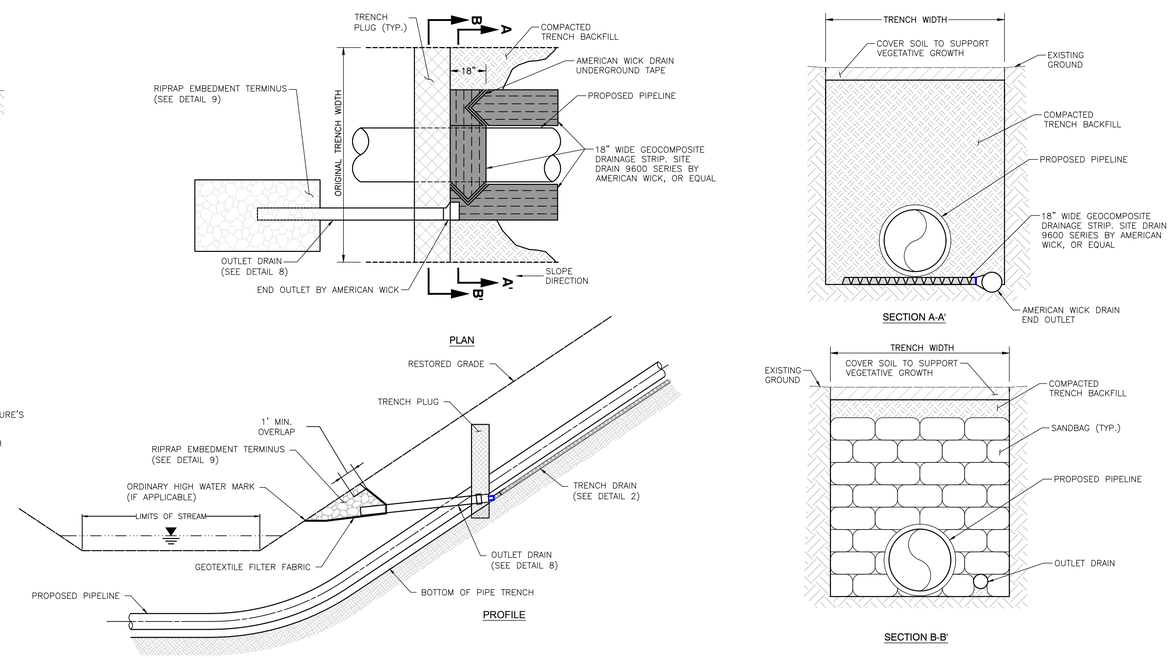
DETAIL 1
DRAINED TRENCH PLUG
NOT TO SCALE



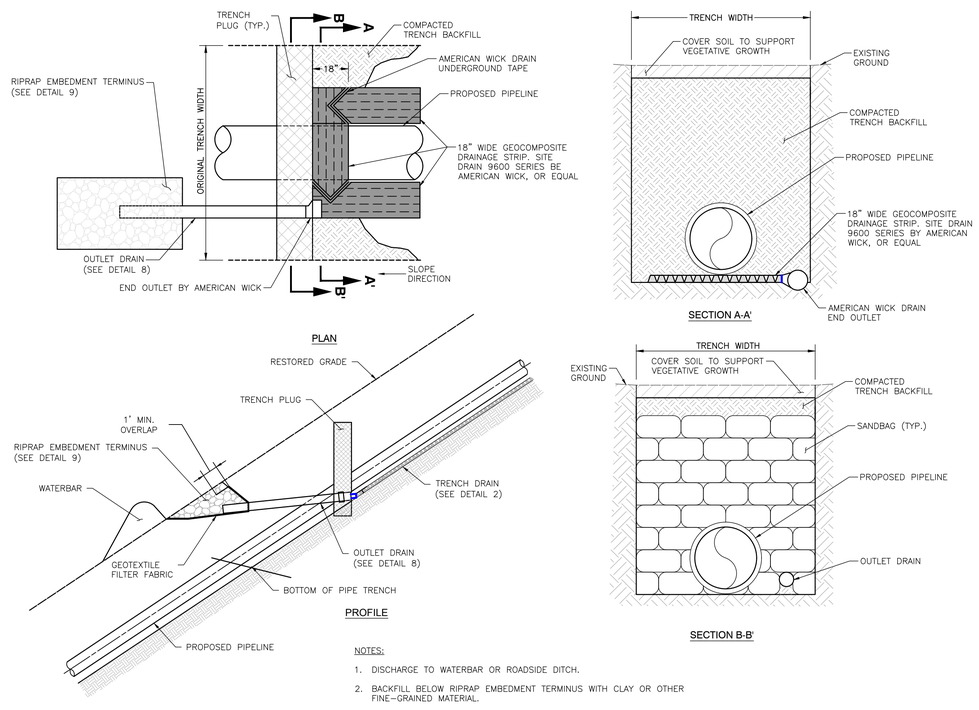
NOTES:

1. SPLICE GEOCOMPOSITE DRAINAGE STRIPS IN ACCORDANCE WITH THE MANUFACTURE'S RECOMMENDATIONS.
2. PLACE GEOCOMPOSITE DRAINAGE STRIPS AT THE BOTTOM OF THE PIPE TRENCH PRIOR TO BACKFILLING. DO NOT CRUSH DRAIN WITH CRIBBING.

DETAIL 2
TRENCH DRAIN
NOT TO SCALE



DETAIL 3
SLOPE TOE TRENCH DRAIN OUTLET
NOT TO SCALE



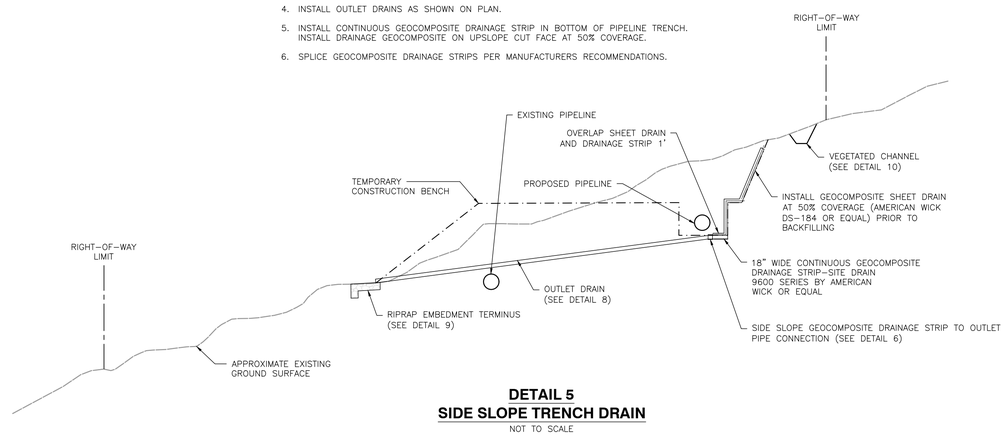
NOTES:

1. DISCHARGE TO WATERBAR OR ROADSIDE DITCH.
2. BACKFILL BELOW RIPRAP EMBEDMENT TERMINUS WITH CLAY OR OTHER FINE-GRAINED MATERIAL.

DETAIL 4
WATERBAR TRENCH DRAIN OUTLET
NOT TO SCALE

SIDE SLOPE DETAIL NOTES

1. INSTALL TOP OF PIPELINE AT 8' BELOW THE EXISTING GROUND SURFACE. EVALUATE ACTUAL LANDSLIDE/COLLUVIUM DEPTH PRIOR TO TRENCHING BY EXCAVATING TEST PITS UNDER THE DIRECTION OF A CEC GEOTECHNICAL REPRESENTATIVE. CONSIDER DEEPENING/SHALLOWING PIPELINE BASED ON FINDINGS.
2. MONITOR AREAS UPSLOPE AND DOWNSLOPE FROM TRENCH FOR MOVEMENT DURING PIPELINE TRENCHING AND INSTALLATION.
3. SLOPE TEMPORARY EXCAVATION AWAY FROM PIPELINE TRENCH.
4. INSTALL OUTLET DRAINS AS SHOWN ON PLAN.
5. INSTALL CONTINUOUS GEOCOMPOSITE DRAINAGE STRIP IN BOTTOM OF PIPELINE TRENCH. INSTALL DRAINAGE GEOCOMPOSITE ON UPSLOPE CUT FACE AT 50% COVERAGE.
6. SPLICE GEOCOMPOSITE DRAINAGE STRIPS PER MANUFACTURERS RECOMMENDATIONS.



DETAIL 5
SIDE SLOPE TRENCH DRAIN
NOT TO SCALE

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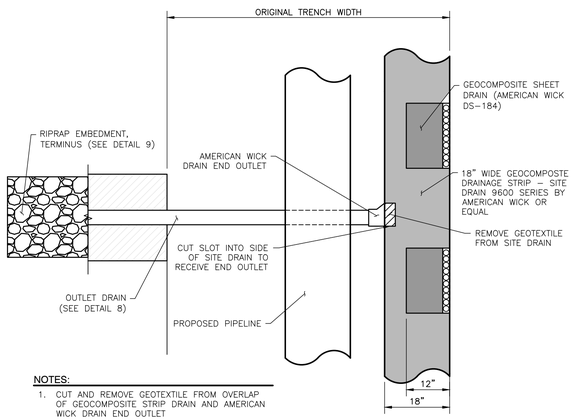
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

Williams.

GEOHAZARD MITIGATION MEASURES - SHEET 1

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

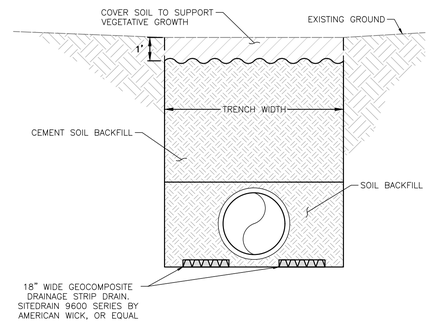
DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 38 OF 39
WO: 121227	RID:		



NOTES:

1. CUT AND REMOVE GEOTEXTILE FROM OVERLAP OF GEOCOMPOSITE STRIP DRAIN AND AMERICAN WICK DRAIN END OUTLET

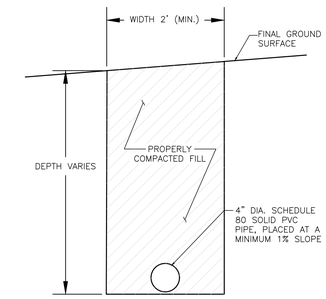
DETAIL 6
SIDE SLOPE GEOCOMPOSITE DRAINAGE STRIP TO OUTLET PIPE CONNECTION
NOT TO SCALE



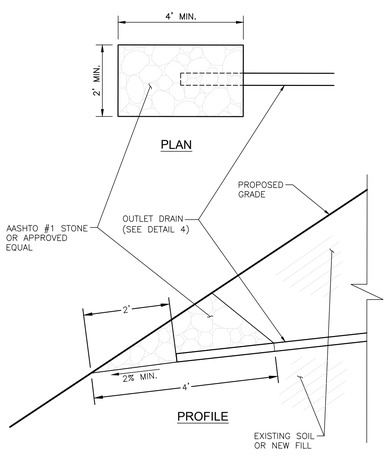
NOTES:

1. CEMENT SOIL BACKFILL SHALL BE THOROUGHLY MIXED WITH 8% CEMENT. BREAK ALL CLUMPS AND CLODS DURING MIXING. ADD WATER DURING MIXING AS NECESSARY TO PROPERLY HYDRATE.
2. LEAVE SURFACE OF BACKFILL ROUGHENED AND COVER WITH 1 FOOT OF SOIL FOR VEGETATION.

DETAIL 7
PIPELINE TRENCH CEMENT SOIL BACKFILL
NOT TO SCALE



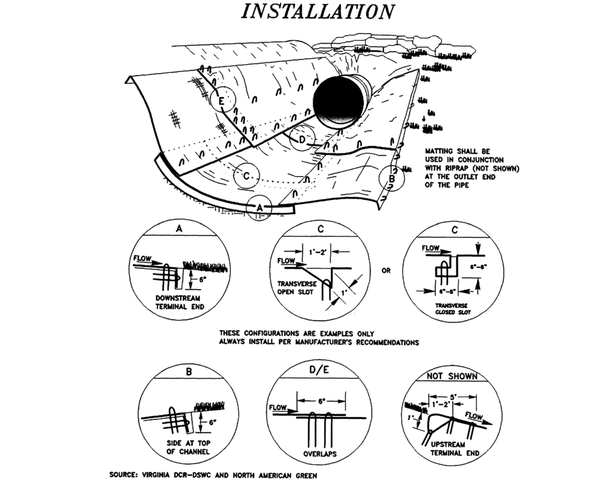
DETAIL 8
OUTLET DRAIN
NOT TO SCALE

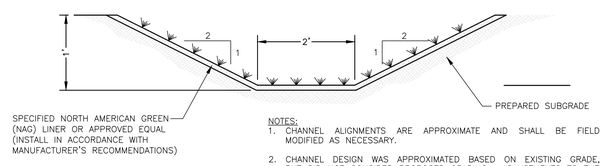


DETAIL 9
RIPRAP EMBEDMENT TERMINUS
NOT TO SCALE

FIGURE 3.13.1

TYPICAL RECP CHANNEL INSTALLATION





NOTES:

1. CHANNEL ALIGNMENTS ARE APPROXIMATE AND SHALL BE FIELD MODIFIED AS NECESSARY.
2. CHANNEL DESIGN WAS APPROXIMATED BASED ON EXISTING GRADE, BUT DID NOT CONSIDER PROPOSED GRADING. ADJUSTMENTS TO THE OVERALL DIMENSIONS OF THE CHANNEL MAY BE NECESSARY TO AVOID GRADING OUTSIDE OF THE LIMITS OF DISTURBANCE, AND CONFLICT WITH THE PROPOSED PIPELINE.
3. THE CONTRACTOR SHALL NOTIFY CEC OF ANY DEVIATION FROM THE DESIGNED CHANNELS AS INDICATED ON THE PLAN SHEETS AND IN THE STANDARD DETAIL FOR REVIEW BEFORE CONSTRUCTING.
4. CHANNEL LINER STAPLE PATTERN PER FIGURE 3.13.1 ABOVE.

DETAIL 10
VEGETATED CHANNEL
NOT TO SCALE

GEOHAZARD MITIGATION MEASURES

Area of Interest	Geohazard Identified	Mitigation Measure(s)
MP 188.9 to 189.04	Surface erosion through waterbar, Steep slope	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 189.09 to 189.15	Possible toe, Possible scarp, Surface erosion, Steep slope	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 190.2 to 190.31	Side slope alignment	Drained Trench Plug, Waterbar Trench Drain Outlet, Pipeline Trench Cement Soil Backfill
MP 190.37 to 190.39	Side slope alignment	Drained Trench Plug, Slope Toe Trench Drain Outlet
MP 190.44 to 190.48	Sandstone outcrop	Drained Trench Plug, Slope Toe Trench Drain Outlet
MP 190.83 to 190.91	Steep slope	Side Slope Trench Drain, Pipeline Trench Cement Soil Backfill
MP 191.05 to 191.96	Creep along travel lane berm, Existing travel lane/Steep fill slope	Side Slope Trench Drain
MP 192.09 to 192.15	Existing travel lane/Steep fill slope	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 192.2 to 192.3	Hummocky (Signs of movement)	Drained Trench Plug, Waterbar Trench Drain Outlet
MP 193.45 to 193.48	Hummocky (Potential movement)	Side Slope Trench Drain

Note: Please refer to Attachment D of ESCGP-3 application for the detailed Geohazard Mitigation Plan

KEVIN C. CLARK, P.E.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
KEVIN C. CLARK
ENGINEER
047271-E

PENNSYLVANIA PROFESSIONAL ENGINEER

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HENSEL REPLACEMENT
SOIL EROSION & SEDIMENT CONTROL AND SITE RESTORATION PLAN

GEOHAZARD MITIGATION MEASURES - SHEET 2

LEIDY & CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: CMB	DATE: 03/22/19	ISSUED FOR BID:	SCALE: 1 = 1
CHECKED BY: KMC	DATE: 09/15/19	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE: 09/20/19	DRAWING NUMBER: 26-1000-70-28-D	SHEET 39 OF 39
WO: 121227	RID:		

designs, permits, resolutions WHM consulting, INC. BA GROUP

REQUIREMENT N

HYDROLOGY AND HYDRAULICS ANALYSIS STATEMENT

Transcontinental Gas Pipe Line Company, LLC

Requirement N – Hydrologic and Hydraulic Analysis

Leidy South Project – Hensel Replacement and Hilltop Loop

September 2019

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2.0 Basis of Hydrologic and Hydraulic Analysis

3.0 Hydrology

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6.0 Conclusion

Attachment

1 HECRAS Calculation

2 StreamStats Report

1. Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. proposes to install and maintain a 36-inch diameter natural gas pipeline (Hilltop Loop) under Young Womans Creek in Chapman Township, Clinton County. The proposed temporary stream crossing is located at Latitude 41°22'11.04"N, Longitude 77°42'1.85"W on the Renovo East, Pennsylvania USGS 7.5 Minute Topographic Quadrangles

In respect to the streams and/or floodways crossings, the crossings will result in temporary impacts due to dewatering best management practices (BMP's) being installed (i.e. dam and pump, flume, cofferdam) and temporary bridges for access during construction only. Crossings will be restored to pre-construction contours once construction is completed. Because construction impacts will be temporary in nature and crossings will be restored to pre-construction contours, there will be no changes will occur from pre to post construction conditions as a result of the Project.

The temporary equipment bridge has an approximate length of 150 feet across the stream and a width of 16 feet along the stream. The piers are approximately 5 feet in height and 4 feet wide and are located at a maximum spacing of 25 feet. Young Womans Creek is included in a Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Clinton County. In the vicinity of the project, the FIS has established floodway and floodplain limits. The proposed temporary bridge is currently in an FIS Zone AE floodway.

2. Basis of Hydrologic and Hydraulic Analysis

The proposed temporary bridge crossing is a temporary structure. This Hydrologic and Hydraulic Analysis (H&H) analysis focuses on the 1-, 2-, 5-, and 10-year, 24-hour storms were examined for this report. Site specific topographic data taken from LIDAR mapping was utilized to analyze the flow regime of the stream for existing and temporary conditions.

3. Hydrology

The USGS StreamStats website was utilized to calculate the flows in the stream at the project site. The website provided a baseflow of 55.5 cubic feet per second (cfs), the 1-year, 24-hour storm flow of 1,800 cfs, 2-year, 24-hour storm flow of 2,450 cfs, 5-year, 24-hour storm flow of 3,840 cfs, and 10-year 24-hour storm flow of 4,860 cfs for Young Womans Creek (StreamStats report attached). These computed flow rates were used in the HEC-RAS analysis of Young Womans Creek.

4. Hydraulic Analysis

The existing and temporary stream conditions were modeled with the USCOE HEC-RAS software. The software calculated the flood conditions before and after the proposed temporary bridge and instream support (piers) were installed and the impacts of pier scouring. In addition, the modeling data will be used to minimize impacts to water surface elevations and velocities in the stream channel. The following sections present the findings of the HEC-RAS analyses for the proposed temporary site conditions.

5. Depiction of Proposed Conditions

HEC-RAS analyses were performed for the flow of 55.5 cfs, 1,800 cfs, 2,450 cfs, 3,840 cfs, and 4,860 cfs. The results were then analyzed to determine depth of flow and the depth of scouring for the selected storm events. Figure 1 and Table 1 represent the water elevation in the bridge section under different flow conditions. Table 2 is the pier scour calculations under selected flow conditions. Detailed results for conditions with and without the bridge are given in the Appendix A.

Figure 1. Upstream bridge section review under selected flow conditions.

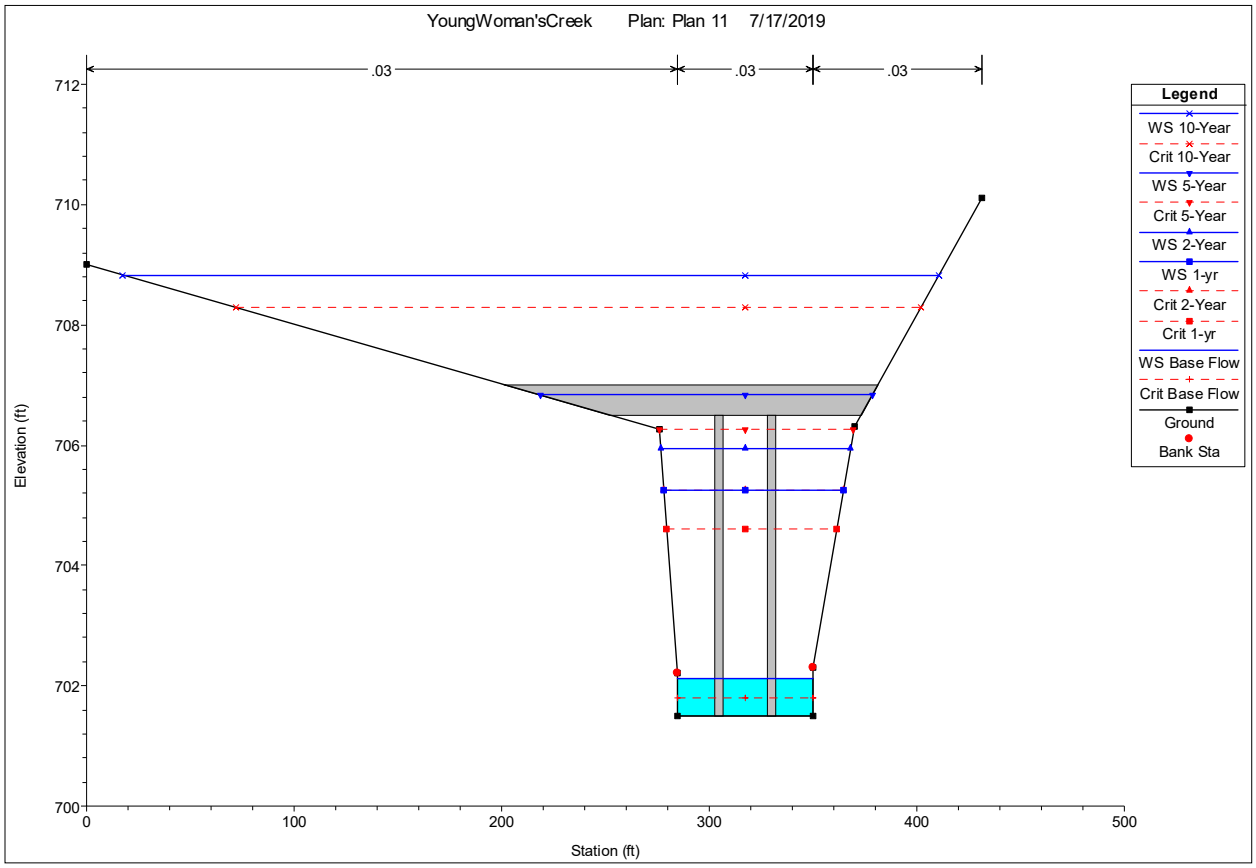


Table 1.
Surface water elevation and flow conditions of the proposed temporary bridge in Young Womans Creek.

Reach	River Station	Profile	Water Surface Elevation (ft)	Top Width (ft)	Q in Left overbank (cfs)	Q in Channel (cfs)	Q in Right overbank (cfs)	Velocity in Channel (ft/s)
CWC	197 BR U	Base Flow	702.12	57.75		55.5		1.57
CWC	197 BR U	1-year	705.28	78.71	44.06	1653.57	102.37	7.56
CWC	197 BR U	2-Year	705.98	83.55	77.7	2188.79	183.51	8.45
CWC	197 BR U	5-Year	706.88		75.08	3463.23	301.69	11.98
CWC	197 BR U	10-Year	708.89	400.73	1530.95	2721.08	607.97	6.58
CWC	197 BR D	Base Flow	702.07	57.69		55.5		1.69
CWC	197 BR D	1-year	704.99	76.71	38.86	1672.23	88.92	8.29
CWC	197 BR D	2-Year	705.62	81.08	68.88	2220.6	160.52	9.33
CWC	197 BR D	5-Year	706.55		80.47	3458.27	301.26	11.96
CWC	197 BR D	10-Year	708.25	329.86	1032.01	3276.6	551.39	8.81

Table 2.
Pier Scouring and Abutment Scouring under selected flow conditions

	Pier Scour		Abutment Scour Left		Abutment Scour Right	
	Ys (ft)	Froude #	Ys (ft)	Froude #	Ys (ft)	Froude #
Base Flow	1.1	0.3	N/A	N/A	N/A	N/A
1-year	6.81	0.54	N/A	N/A	N/A	N/A
2-Year	7.37	0.57	N/A	N/A	N/A	N/A
5-Year	7.21	0.39	9.90	0.23	11.12	0.33
10-Year	7.88	0.47	11.03	0.28	12.34	0.39

6. Conclusion

Based on the HEC-RAS analysis of proposed conditions, the temporary bridge equipment stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

References

FEMA Flood Map Service Center
https://msc.fema.gov/portal/search?AddressQuery=clinton#searchresultsanchor

ATTACHMENT 1
HECRAS CALCULATIONS

ATTACHMENT 1 – HECRAS CALCULATION

Table 1.
HECRAS results for existing conditions without the bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005655	10.01	272.95	76.18	0.83
CWC	700	5-Year	3840.00	703.50	708.84	708.84	711.00	0.007197	12.68	338.76	79.10	0.97
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005070	8.68	231.09	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.92		709.19	0.005236	9.68	284.62	80.68	0.80
CWC	675.00*	5-Year	3840.00	703.40	708.80	708.68	710.76	0.006502	12.14	356.62	84.03	0.92
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004812	8.47	238.68	78.46	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.03	0.004964	9.45	293.95	85.08	0.78
CWC	650.00*	5-Year	3840.00	703.30	708.75	708.54	710.56	0.005944	11.69	373.47	88.98	0.88
CWC	650.00*	10-Year	4860.00	703.30	709.27	709.26	711.55	0.006682	13.17	420.30	91.19	0.95
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004646	8.33	244.56	82.57	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.75		708.89	0.004721	9.24	302.94	89.50	0.76
CWC	625.00*	5-Year	3840.00	703.20	708.70	708.40	710.37	0.005461	11.28	390.17	93.99	0.85
CWC	625.00*	10-Year	4860.00	703.20	709.20	708.96	711.34	0.006258	12.79	437.97	98.73	0.92
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004501	8.20	249.94	86.66	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004565	9.09	309.90	93.84	0.75
CWC	600.00*	5-Year	3840.00	703.10	708.64	708.30	710.21	0.005105	10.96	404.77	99.00	0.82
CWC	600.00*	10-Year	4860.00	703.10	709.14	708.78	711.15	0.005888	12.46	455.56	107.46	0.89
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004432	8.14	253.39	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.56		708.64	0.004435	8.97	316.05	98.14	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.56	708.21	710.06	0.004902	10.76	416.45	105.23	0.81
CWC	575.00*	10-Year	4860.00	703.00	709.09	708.83	710.97	0.005470	12.08	475.27	115.55	0.86
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004387	8.09	255.90	94.50	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.46		708.52	0.004346	8.88	320.80	102.32	0.73

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.47	708.07	709.93	0.004746	10.60	427.22	112.49	0.79
CWC	550.00*	10-Year	4860.00	702.90	709.04	708.77	710.80	0.005079	11.71	495.29	122.99	0.83
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004376	8.06	257.10	98.20	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.36		708.41	0.004280	8.81	324.53	106.47	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.38	707.92	709.79	0.004579	10.43	438.17	119.25	0.78
CWC	525.00*	10-Year	4860.00	702.80	708.99	708.68	710.65	0.004748	11.39	514.76	130.97	0.81
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004407	8.07	256.74	101.79	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004234	8.76	327.15	110.51	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.29	707.88	709.66	0.004431	10.28	448.31	125.68	0.77
CWC	500.00*	10-Year	4860.00	702.70	708.91	708.60	710.51	0.004589	11.22	529.86	140.74	0.79
CWC	500.00*	1-yr	1800.00	702.70	706.57		707.51	0.004531	8.13	253.54	105.01	0.73
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.15		708.20	0.004226	8.74	327.99	114.38	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.20	707.84	709.54	0.004306	10.14	457.33	131.69	0.76
CWC	475.00*	10-Year	4860.00	702.60	708.81	708.50	710.39	0.004517	11.14	542.17	151.43	0.79
CWC	475.00*	1-yr	1800.00	702.60	706.35	706.05	707.39	0.005088	8.44	240.30	105.01	0.77
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.03		708.09	0.004254	8.75	327.50	118.81	0.73
CWC	450.00*	5-Year	3840.00	702.50	708.11	707.77	709.42	0.004176	10.01	466.30	137.52	0.75
CWC	450.00*	10-Year	4860.00	702.50	708.72	708.36	710.26	0.004431	11.04	554.48	162.31	0.78
CWC	450.00*	1-yr	1800.00	702.50	706.19	705.86	707.26	0.005349	8.55	232.68	100.08	0.79
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.89	706.60	707.99	0.004374	8.83	323.55	122.89	0.73
CWC	425.00*	5-Year	3840.00	702.40	708.03	707.68	709.30	0.004056	9.88	474.54	143.17	0.73
CWC	425.00*	10-Year	4860.00	702.40	708.63	708.23	710.15	0.004339	10.93	566.34	173.30	0.77
CWC	425.00*	1-yr	1800.00	702.40	706.04	705.47	707.13	0.005443	8.56	228.46	94.77	0.79
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004286	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.69	706.33	707.87	0.004792	9.09	310.11	125.22	0.77
CWC	400.00*	5-Year	3840.00	702.30	707.94	707.60	709.19	0.003946	9.76	482.14	149.02	0.73
CWC	400.00*	10-Year	4860.00	702.30	708.54	708.13	710.03	0.004234	10.81	578.42	184.66	0.76

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	705.91	705.43	706.99	0.005454	8.51	226.13	88.29	0.79
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004261	1.99	27.83	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.50	706.12	707.75	0.005121	9.27	298.13	121.99	0.79
CWC	375.00*	5-Year	3840.00	702.20	707.85	707.51	709.09	0.003874	9.68	488.10	156.00	0.72
CWC	375.00*	10-Year	4860.00	702.20	708.45	708.06	709.91	0.004115	10.68	591.01	196.68	0.75
CWC	375.00*	1-yr	1800.00	702.20	705.79	705.32	706.85	0.005339	8.39	226.70	80.89	0.78
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004226	1.97	28.14	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.37	705.64	707.62	0.005113	9.23	294.59	116.03	0.79
CWC	350.00*	5-Year	3840.00	702.10	707.76	707.39	708.99	0.003809	9.61	492.89	162.60	0.71
CWC	350.00*	10-Year	4860.00	702.10	708.37	707.96	709.80	0.003991	10.54	603.22	208.81	0.74
CWC	350.00*	1-yr	1800.00	702.10	705.71		706.70	0.004941	8.11	232.24	73.80	0.75
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004164	1.95	28.50	59.42	0.50
CWC	325.00*	2-Year	2450.00	702.00	706.25	705.65	707.49	0.005007	9.11	294.15	109.07	0.78
CWC	325.00*	5-Year	3840.00	702.00	707.66	707.25	708.89	0.003737	9.53	497.48	169.16	0.71
CWC	325.00*	10-Year	4860.00	702.00	708.30	707.89	709.68	0.003835	10.36	617.74	222.20	0.73
CWC	325.00*	1-yr	1800.00	702.00	705.62		706.56	0.004688	7.92	238.07	75.58	0.73
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.004025	1.91	29.03	60.65	0.49
CWC	300.00*	2-Year	2450.00	701.90	706.17	705.56	707.34	0.004766	8.91	297.99	102.19	0.76
CWC	300.00*	5-Year	3840.00	701.90	707.58	707.13	708.78	0.003638	9.42	503.13	176.02	0.70
CWC	300.00*	10-Year	4860.00	701.90	708.24	707.75	709.57	0.003635	10.13	636.16	237.32	0.71
CWC	300.00*	1-yr	1800.00	701.90	705.54		706.43	0.004429	7.72	244.61	77.94	0.71
CWC	275.00*	Base Flow	55.50	701.80	702.29		702.34	0.003637	1.84	30.17	61.90	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.11		707.21	0.004389	8.61	306.30	94.78	0.73
CWC	275.00*	5-Year	3840.00	701.80	707.50	706.97	708.69	0.003547	9.32	507.42	182.91	0.69
CWC	275.00*	10-Year	4860.00	701.80	708.20	707.56	709.46	0.003404	9.87	658.24	254.31	0.69
CWC	275.00*	1-yr	1800.00	701.80	705.47		706.31	0.004116	7.49	252.70	80.26	0.69
CWC	250.00*	Base Flow	55.50	701.70	702.21		702.26	0.003007	1.72	32.20	63.16	0.43
CWC	250.00*	2-Year	2450.00	701.70	706.08		707.07	0.003898	8.20	318.96	88.44	0.69
CWC	250.00*	5-Year	3840.00	701.70	707.42	706.66	708.59	0.003424	9.19	513.34	190.47	0.68
CWC	250.00*	10-Year	4860.00	701.70	708.17	707.49	709.36	0.003145	9.56	685.12	272.61	0.66
CWC	250.00*	1-yr	1800.00	701.70	705.41		706.19	0.003789	7.24	261.89	82.56	0.66

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.15		702.19	0.002234	1.56	35.50	64.44	0.37
CWC	225.00*	2-Year	2450.00	701.60	706.04		706.96	0.003533	7.88	331.75	89.70	0.66
CWC	225.00*	5-Year	3840.00	701.60	707.35	706.14	708.49	0.003297	9.05	519.11	199.51	0.67
CWC	225.00*	10-Year	4860.00	701.60	708.16	707.52	709.25	0.002877	9.22	716.40	292.72	0.64
CWC	225.00*	1-yr	1800.00	701.60	705.36		706.08	0.003460	6.98	272.10	84.79	0.63
CWC	200	Base Flow	55.50	701.50	702.11		702.14	0.001527	1.38	40.13	65.75	0.31
CWC	200	2-Year	2450.00	701.50	706.01		706.85	0.003213	7.59	344.88	91.72	0.63
CWC	200	5-Year	3840.00	701.50	707.30	706.11	708.40	0.003137	8.87	528.21	214.63	0.65
CWC	200	10-Year	4860.00	701.50	708.15	707.47	709.16	0.002604	8.86	753.42	314.30	0.61
CWC	200	1-yr	1800.00	701.50	705.31		705.98	0.003143	6.72	283.10	86.94	0.61
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.25	706.22	707.74	0.005327	10.81	587.88	211.94	0.83
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

Table 2
HECRAS results for proposed conditions with the temporary bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005645	10.00	273.10	76.18	0.83
CWC	700	5-Year	3840.00	703.50	709.07	708.84	711.01	0.006156	12.05	356.65	79.88	0.90
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005066	8.67	231.15	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.93		709.19	0.005226	9.67	284.79	80.69	0.80
CWC	675.00*	5-Year	3840.00	703.40	709.07	708.68	710.80	0.005373	11.41	379.88	85.09	0.85
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004807	8.47	238.75	78.47	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.04	0.004953	9.44	294.16	85.09	0.78
CWC	650.00*	5-Year	3840.00	703.30	709.06		710.62	0.004790	10.89	401.35	90.30	0.80
CWC	650.00*	10-Year	4860.00	703.30	709.38	709.26	711.55	0.006224	12.87	430.43	91.72	0.92
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004641	8.33	244.66	82.58	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.76		708.89	0.004709	9.23	303.21	89.52	0.76
CWC	625.00*	5-Year	3840.00	703.20	709.05		710.47	0.004297	10.42	422.89	95.62	0.76
CWC	625.00*	10-Year	4860.00	703.20	709.33	708.96	711.36	0.005791	12.48	450.74	101.76	0.89
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004495	8.20	250.06	86.67	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004550	9.08	310.24	93.86	0.75
CWC	600.00*	5-Year	3840.00	703.10	709.00		710.34	0.004008	10.13	441.35	104.63	0.74
CWC	600.00*	10-Year	4860.00	703.10	709.30	708.78	711.18	0.005298	12.04	473.56	110.95	0.85
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004425	8.13	253.53	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.57		708.64	0.004418	8.96	316.47	98.16	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.97		710.21	0.003687	9.79	462.11	113.33	0.71
CWC	575.00*	10-Year	4860.00	703.00	709.29	708.83	711.00	0.004810	11.57	498.30	119.35	0.81
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004378	8.08	256.08	94.51	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.47		708.52	0.004326	8.87	321.30	102.35	0.73

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.95		710.10	0.003380	9.46	483.75	121.28	0.68
CWC	550.00*	10-Year	4860.00	702.90	709.22	708.77	710.86	0.004625	11.38	516.78	130.62	0.80
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004364	8.06	257.34	98.22	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.37		708.41	0.004257	8.80	325.15	106.52	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.93		709.99	0.003097	9.13	506.08	128.83	0.65
CWC	525.00*	10-Year	4860.00	702.80	709.14	708.68	710.73	0.004488	11.24	534.30	143.48	0.79
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004389	8.06	257.11	101.82	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004207	8.74	327.92	110.56	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.90		709.90	0.002877	8.87	527.93	139.27	0.63
CWC	500.00*	10-Year	4860.00	702.70	709.06	708.60	710.61	0.004335	11.08	552.45	156.94	0.78
CWC	500.00*	1-yr	1800.00	702.70	706.59		707.52	0.004463	8.09	255.01	105.12	0.72
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.16		708.20	0.004192	8.72	328.98	114.46	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.84		709.82	0.002785	8.77	546.80	154.69	0.62
CWC	475.00*	10-Year	4860.00	702.60	708.99	708.50	710.49	0.004172	10.91	570.72	170.55	0.76
CWC	475.00*	1-yr	1800.00	702.60	706.40	706.05	707.40	0.004854	8.31	245.05	106.73	0.75
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.04		708.10	0.004210	8.72	328.85	119.01	0.72
CWC	450.00*	5-Year	3840.00	702.50	708.80		709.74	0.002660	8.63	567.88	171.05	0.61
CWC	450.00*	10-Year	4860.00	702.50	708.93	708.36	710.37	0.003979	10.70	591.08	185.22	0.74
CWC	450.00*	1-yr	1800.00	702.50	706.27	705.86	707.28	0.004898	8.31	241.35	103.64	0.76
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.93		708.00	0.004237	8.73	327.77	123.51	0.72
CWC	425.00*	5-Year	3840.00	702.40	708.76		709.66	0.002513	8.44	591.18	188.37	0.59
CWC	425.00*	10-Year	4860.00	702.40	708.88	708.23	710.25	0.003763	10.45	613.57	200.99	0.72
CWC	425.00*	1-yr	1800.00	702.40	706.15	705.47	707.16	0.004883	8.26	238.86	99.64	0.75
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004282	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.81	706.33	707.90	0.004243	8.72	326.37	127.63	0.72
CWC	400.00*	5-Year	3840.00	702.30	708.74		709.59	0.002345	8.22	617.56	206.79	0.57
CWC	400.00*	10-Year	4860.00	702.30	708.84	708.13	710.14	0.003519	10.17	639.49	218.20	0.70

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	706.03	705.43	707.03	0.004809	8.18	237.73	94.68	0.75
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004254	1.99	27.85	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.71	706.12	707.79	0.004216	8.69	325.05	131.16	0.72
CWC	375.00*	5-Year	3840.00	702.20	708.72		709.52	0.002164	7.96	647.42	226.39	0.55
CWC	375.00*	10-Year	4860.00	702.20	708.81	708.06	710.03	0.003252	9.85	669.58	237.05	0.68
CWC	375.00*	1-yr	1800.00	702.20	705.94		706.90	0.004637	8.04	239.22	88.96	0.73
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004208	1.97	28.17	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.61	705.64	707.68	0.004133	8.60	324.18	131.41	0.71
CWC	350.00*	5-Year	3840.00	702.10	708.71		709.45	0.001983	7.69	679.90	246.62	0.53
CWC	350.00*	10-Year	4860.00	702.10	708.80	707.96	709.92	0.002980	9.51	702.81	256.84	0.65
CWC	350.00*	1-yr	1800.00	702.10	705.85		706.77	0.004389	7.84	243.25	82.84	0.71
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004137	1.94	28.56	59.43	0.49
CWC	325.00*	2-Year	2450.00	702.00	706.53	705.65	707.57	0.003957	8.44	326.29	127.78	0.70
CWC	325.00*	5-Year	3840.00	702.00	708.70		709.38	0.001801	7.40	716.24	267.68	0.50
CWC	325.00*	10-Year	4860.00	702.00	708.79	707.89	709.83	0.002702	9.14	740.97	277.93	0.62
CWC	325.00*	1-yr	1800.00	702.00	705.80		706.65	0.003971	7.53	251.75	77.78	0.68
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.003936	1.90	29.22	60.66	0.48
CWC	300.00*	2-Year	2450.00	701.90	706.46	705.56	707.46	0.003723	8.23	331.26	124.19	0.68
CWC	300.00*	5-Year	3840.00	701.90	708.70		709.32	0.001624	7.10	756.72	289.44	0.48
CWC	300.00*	10-Year	4860.00	701.90	708.79		709.73	0.002428	8.75	784.25	300.07	0.59
CWC	300.00*	1-yr	1800.00	701.90	705.75		706.53	0.003635	7.26	261.20	79.67	0.65
CWC	275.00*	Base Flow	55.50	701.80	702.30		702.35	0.003511	1.82	30.50	61.91	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.41		707.35	0.003442	7.98	338.81	119.52	0.66
CWC	275.00*	5-Year	3840.00	701.80	708.70		709.27	0.001462	6.80	799.40	311.50	0.46
CWC	275.00*	10-Year	4860.00	701.80	708.79		709.65	0.002177	8.37	830.01	322.57	0.56
CWC	275.00*	1-yr	1800.00	701.80	705.70		706.43	0.003313	7.00	271.59	82.08	0.62
CWC	250.00*	Base Flow	55.50	701.70	702.22		702.27	0.002828	1.69	32.81	63.17	0.41
CWC	250.00*	2-Year	2450.00	701.70	706.38		707.25	0.003143	7.69	349.00	114.52	0.63
CWC	250.00*	5-Year	3840.00	701.70	708.70		709.22	0.001313	6.51	844.90	333.67	0.43
CWC	250.00*	10-Year	4860.00	701.70	708.80		709.57	0.001947	8.00	878.90	345.27	0.53
CWC	250.00*	1-yr	1800.00	701.70	705.66		706.33	0.003001	6.73	282.98	84.46	0.60

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

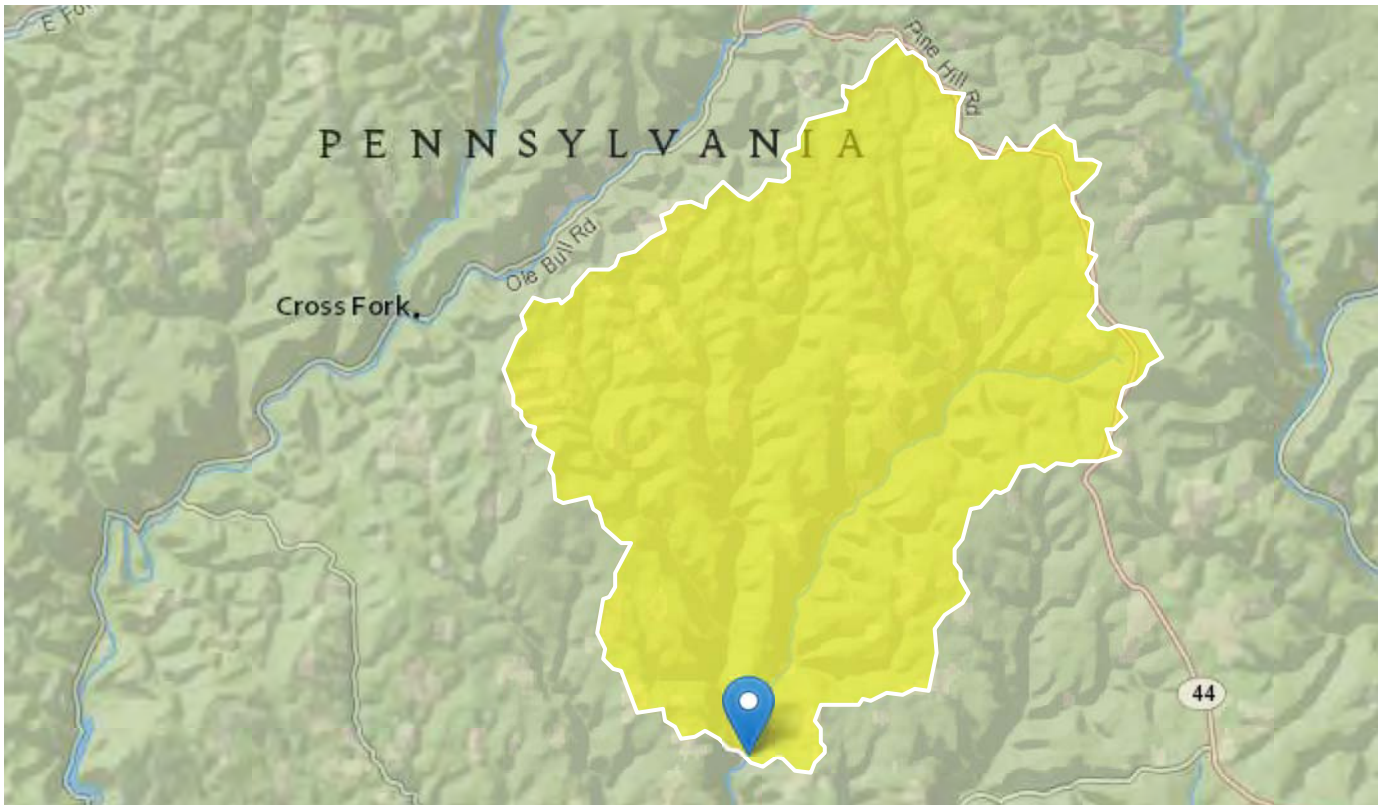
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.17		702.20	0.002052	1.52	36.43	64.46	0.36
CWC	225.00*	2-Year	2450.00	701.60	706.35		707.15	0.002840	7.39	361.13	108.03	0.60
CWC	225.00*	5-Year	3840.00	701.60	708.70		709.17	0.001176	6.22	893.69	356.38	0.41
CWC	225.00*	10-Year	4860.00	701.60	708.81		709.50	0.001738	7.63	931.41	368.50	0.50
CWC	225.00*	1-yr	1800.00	701.60	705.63		706.25	0.002704	6.46	295.27	86.73	0.57
CWC	200	Base Flow	55.50	701.50	702.13	701.78	702.16	0.001385	1.34	41.33	65.77	0.30
CWC	200	2-Year	2450.00	701.50	706.33	704.96	707.06	0.002543	7.07	375.41	101.49	0.57
CWC	200	5-Year	3840.00	701.50	708.71	706.11	709.13	0.001051	5.94	946.20	379.36	0.39
CWC	200	10-Year	4860.00	701.50	708.81	707.47	709.44	0.001547	7.27	988.01	392.04	0.47
CWC	200	1-yr	1800.00	701.50	705.60	704.34	706.17	0.002430	6.20	308.23	88.92	0.54
CWC	197		Bridge									
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.22	706.22	707.74	0.005454	10.90	581.93	210.49	0.84
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

ATTACHMENT 2
STREAMSTATS REPORT

StreamStats Report

Region ID: PA
Workspace ID: PA20190506151156786000
Clicked Point (Latitude, Longitude): 41.36948, -77.70108
Time: 2019-05-06 11:12:11 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	84.1	square miles
ELEV	Mean Basin Elevation	1765	feet
CARBON	Percentage of area of carbonate rock	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0	percent

Peak-Flow Statistics Parameters [100 Percent (83.9 square miles) Peak Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	84.1	square miles	1.44	1610
ELEV	Mean Basin Elevation	1765	feet	457	2150
CARBON	Percent Carbonate	0	percent	0	99
STORAGE	Percent Storage	0	percent	0	22.6

Peak-Flow Statistics Flow Report [100 Percent (83.9 square miles) Peak Flow Region 3]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	2450	ft^3/s	31	31	3
5 Year Peak Flood	3840	ft^3/s	28	28	5
10 Year Peak Flood	4860	ft^3/s	28	28	7
50 Year Peak Flood	7320	ft^3/s	31	31	11
100 Year Peak Flood	8460	ft^3/s	36	36	11
500 Year Peak Flood	11400	ft^3/s	43	43	11

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2008, Regression equations for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2008-5102, 57p. (http://pubs.usgs.gov/sir/2008/5102/)

USGS Data Disclaimer: Unless otherwise stated, all data, metadata and related materials are considered to satisfy the quality standards relative to the purpose for which the data were collected. Although these data and associated metadata have been reviewed for accuracy and completeness and approved for release by the U.S. Geological Survey (USGS), no warranty expressed or implied is made regarding the display or utility of the data for other purposes, nor on all computer systems, nor shall the act of distribution constitute any such warranty.

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Application Version: 4.3.0

REQUIREMENT O

STORMWATER MANAGEMENT ANALYSIS STATEMENT

STORMWATER MANAGEMENT ANALYSIS

The proposed project is located within Chapman and Leidy Townships, Clinton County, Pennsylvania; which does not have an approved Act 167 Plan. Therefore, Stormwater Management Plan Analysis and an Act 167 Consistency Letter are not required.

REQUIREMENT P

FLOODPLAIN MANAGEMENT ANALYSIS

FLOODPLAIN MANAGEMENT ANALYSIS

The Hilltop Loop is located near the town of North Bend, with portions of the project being located within the FEMA Floodway of Young Womans Creek. The scope of the Hilltop Loop consists of installing approximately 2.4 miles of 36-inch pipeline loop. Of the overall disturbance area, 1.8 acres is located with the defined FEMA floodway.

All permanent aboveground facilities will be located outside of FEMA floodplains and floodways. Restoration of pre-construction contours along the FEMA floodplain and floodway associated with the Hilltop Loop will preserve the existing condition of the FEMA floodway and floodplain; therefore, no increases in 100-year flood elevation are anticipated as a result of the installation of the pipeline.

A Hydrologic and Hydraulic (H&H) analysis was performed for the proposed stream crossing (Requirement N). Due to the temporary nature of the bridge and pier proposed at the crossing, the H&H analysis focused on smaller storm events. Specifically, the low flow- 1-, 2-, 5-, and 10-year, 24-hour storms were examined for the H&H report. Based on the HEC-RAS analysis of proposed conditions, the temporary stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

September 19, 2019

<u>UPS TRACKING</u> (1Z8797VV0396509907)
Chapman Township Supervisors
196 Main Street
North Bend, PA 17760

RE: Transcontinental Gas Pipe Line Company, LLC
Leidy South Project –Hilltop Loop
Floodplain Management Analysis
Chapman Township, Clinton County, Pennsylvania

Dear Township Supervisors,

On behalf of Transcontinental Gas Pipe Line Company, LLC. (Transco), WHM Consulting, Inc. is requesting a Floodplain Management Analysis Consistency Letter for the Hilltop Loop (Project) located in Chapman Township, Clinton County, Pennsylvania. The scope of the Hilltop Loop consists of installing approximately 2.4 miles of 36-inch pipeline loop. The Project has been co-located with Transco's existing gas pipeline system. Of the overall disturbance area, 1.8 acres is located with the defined FEMA floodway of Young Womans Creek near the town of North Bend.

There will be no aboveground facilities located within FEMA floodplains and floodways. Restoration of pre-construction contours along the FEMA floodplain and floodway associated with the Hilltop Loop will preserve the existing condition of the FEMA floodway and floodplain; therefore, no increases in 100-year flood elevation are anticipated as a result of temporary impacts for construction activities to install the pipeline.

A Hydrologic and Hydraulic (H&H) analysis was performed for the proposed stream crossing. Due to the temporary nature of the bridge and supports proposed at the crossing, the H&H analysis focused on smaller storm events. Specifically, the low flow- 1-, 2-, 5-, and 10-year, 24-hour storms were examined for the H&H report. Based on the HEC-RAS analysis of proposed conditions, the temporary stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

Enclosed you will find a USGS Project Location Map, PADEP Chapter 105 Plan Drawings for the FEMA Floodway Crossing, and a Hydrologic & Hydraulic Analysis. Please review the provided plan drawings and above analysis with respect to your township's floodplain management ordinances and provide comments and/or a consistency letter. Should you have any questions or require additional information, please do not hesitate to contact me at 814-689-1650 or kevinc@whmgroup.com.

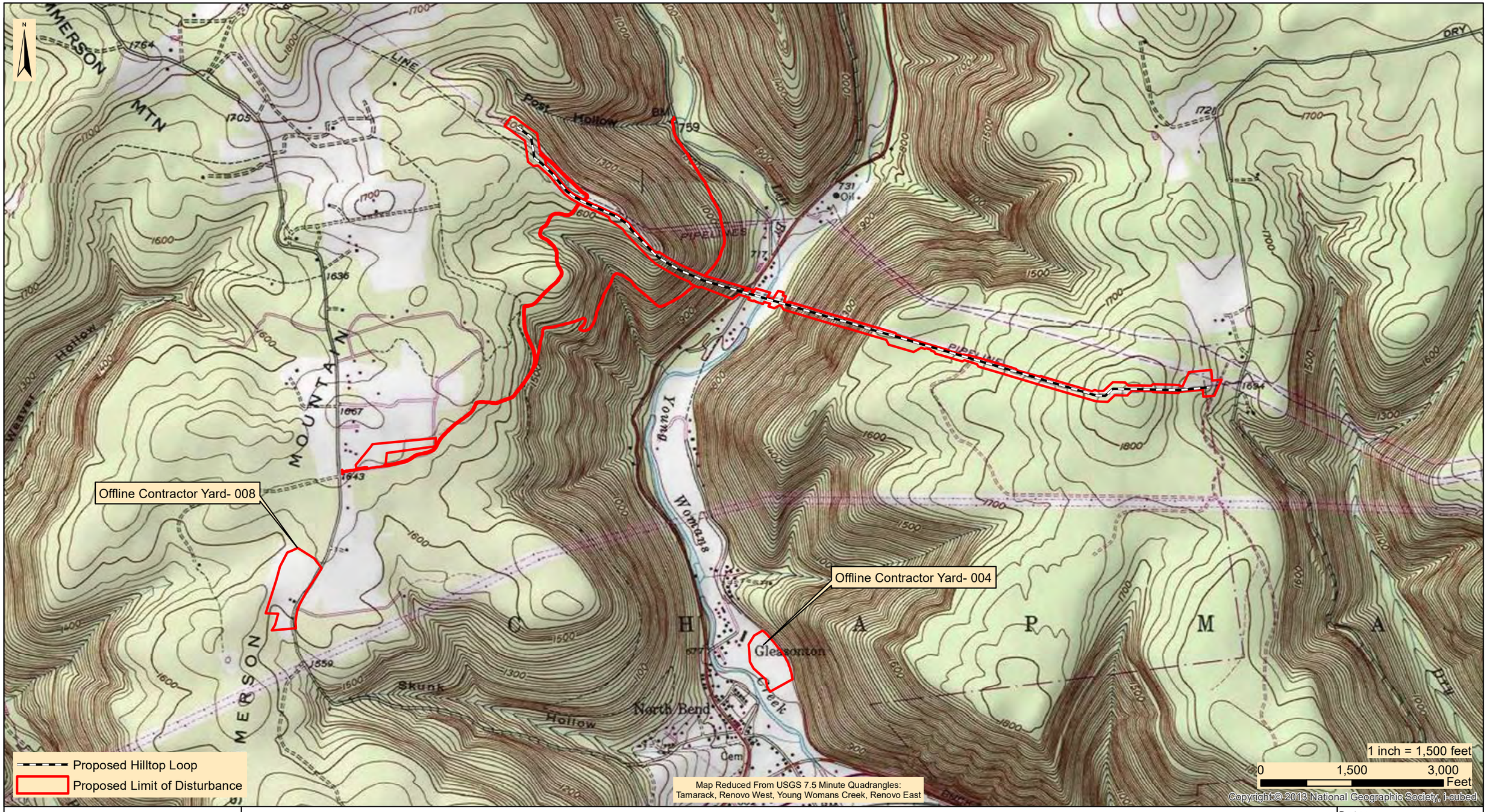
Sincerely,

WHM Consulting, Inc.

Kevin Clark, PWS
Project Manager

cc: Josh Henry, Transco
Enclosures

USGS PROJECT LOCATION MAP



designs, permits, resolutions | consulting, INC.
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

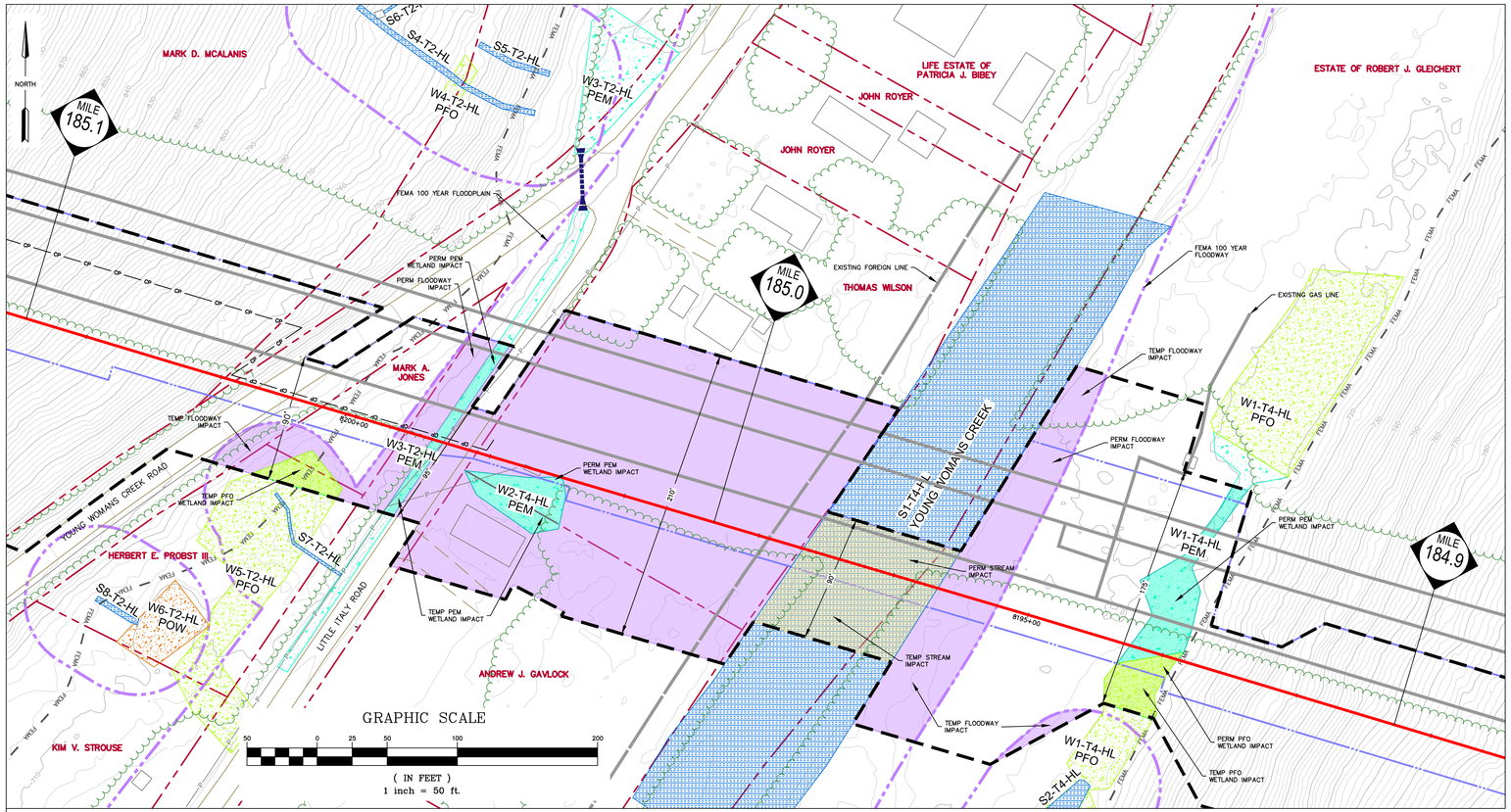
LEIDY SOUTH PROJECT

LEIDY LINE D 36" HILLTOP LOOP
PROJECT LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	8/21/2019
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	FTN
Figure Number:	2-1

PADEP CHAPTER 105 PLAN DRAWING FOR FEMA FLOODWAY CROSSING



Crossing Name [1]	Resource Name [2]	Resource Type [3]	Cowardin Classification [4]	Stream Type [5]	Impact Type [6]	Impact Area (ac) [7]
HL-3	S1-T4-HL	Floodway	-	-	Permanent	0.91
	S1-T4-HL	Floodway	-	-	Temporary	0.61
	S1-T4-HL	Stream	-	Perennial	Permanent	0.10
	S1-T4-HL	Stream	-	Perennial	Temporary	0.10
	S2-T4-HL	Floodway	-	-	Temporary	0.01
	S7-T2-HL	Floodway	-	-	Temporary	0.05
	W1-T4-HL	Wetland	PEM	-	Permanent	0.07
	W1-T4-HL	Wetland	PFO	-	Permanent	0.01
	W1-T4-HL	Wetland	PFO	-	Temporary	0.03
	W2-T4-HL	Wetland	PEM	-	Permanent	0.001
	W2-T4-HL	Wetland	PEM	-	Temporary	0.05
	W3-T2-HL	Wetland	PEM	-	Permanent	0.02
	W3-T2-HL	Wetland	PEM	-	Temporary	0.01
	W5-T2-HL	Wetland	PFO	-	Temporary	0.02

TABLE NOTES:

1) UNIQUE IDENTIFIER FOR THE SINGLE AND COMPLETE CROSSING
2) UNIQUE NAME FOR IMPACTED RESOURCE
3) TYPE OF IMPACTED RESOURCE (STREAM/WETLAND/FLOODWAY).
4) COWARDIN CLASSIFICATION OF IMPACTED WETLAND, APPLIES TO WETLANDS ONLY.
5) FLOW REGIME OF THE IMPACTED STREAM, APPLIES TO STREAMS ONLY.
6) IMPACT TYPE IS EITHER PERMANENT OR TEMPORARY.
TEMPORARY IMPACTS
PIPELINE IMPACTS - TEMPORARY IMPACTS INCLUDE AREAS MEASURED OUTSIDE THE PERMANENTLY MAINTAINED PIPELINE RIGHT-OF-WAY. THESE RESOURCES WILL BE RESTORED TO PRE-EXISTING CONTOURS. PSS AND PFO WETLANDS WILL BE REVEGETATED TO THEIR PRE-EXISTING COVER TYPE.

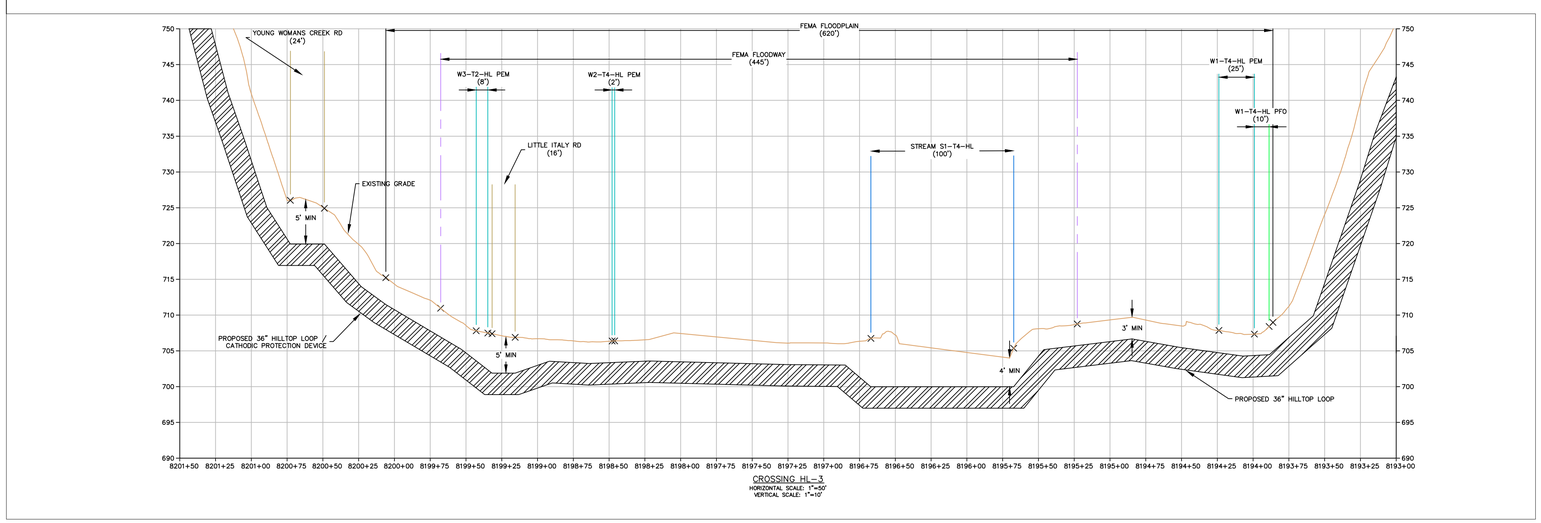
ACCESS ROAD IMPACTS - TEMPORARY IMPACTS INCLUDE AREAS WITHIN THE PROJECT LIMITS OF DISTURBANCE ON THE ACCESS ROADS. THESE RESOURCES WILL BE RESTORED TO PRE-EXISTING CONDITION.
PERMANENT IMPACTS
PIPELINE IMPACTS - PERMANENT IMPACTS INCLUDE THE AREA MEASURED WITHIN THE PERMANENTLY MAINTAINED PIPELINE RIGHT-OF-WAY (PROW), WHICH INCLUDES EXISTING AND PROPOSED ADDITIONAL PROW. THERE IS NO PERMANENT LOSS OF RESOURCES IN THE PROW AND THESE AREAS WILL BE RESTORED TO PRE-EXISTING CONTOURS. FOR PSS AND PFO WETLANDS WITHIN THE PROW, THE PERMANENT IMPACT VALUE REPRESENTS THE FUNCTIONAL CONVERSION AREA OF THESE RESOURCES.

ACCESS ROAD IMPACTS - PERMANENT IMPACTS INCLUDE AREAS ON THE ACCESS ROADS THAT WILL BE INDEFINITELY FILLED, RESULTING IN A PERMANENT LOSS OF THE RESOURCE AS THE AREA WILL NOT BE RESTORED TO PRE-EXISTING CONDITIONS.

7) THE AREA OF THE RESOURCE IMPACTED, IN ACRES. FOR AREAS WHERE THE WETLANDS AND FLOODWAY OVERLAP, FLOODWAY IMPACTS ARE INCLUDED WITHIN THE WETLAND IMPACT AREA (I.E. WETLAND AND FLOODWAY IMPACTS WERE NOT COUNTED IN DUPLICATE).

GENERAL NOTES:

1. STREAM CROSSING METHODS WILL BE COMPLETED VIA OPEN CUT CONSTRUCTION METHODS. EITHER COFFER DAM (CD) OR DAM AND PUMP (DPX) DRY-CROSSING METHOD WILL BE UTILIZED BASED ON FIELD CONDITIONS DURING TIME OF CONSTRUCTION. A BRIDGE EQUIPMENT CROSSING WITH INSTREAM SUPPORT WILL BE INSTALLED AT YOUNG WOMANS CREEK.
2. WETLAND CROSSING METHODS WILL COMPLETED VIA OPEN CUT CONSTRUCTION METHODS AS OUTLINED IN WETLAND CROSSING CONFIGURATION (WCC.1, WCC.2, WCC.3), BASED ON FIELD CONDITIONS DURING THE TIME OF CONSTRUCTION. WETLANDS WILL BE CROSSED FOR ACCESS UTILIZING TIMBER MATS AS OUTLINED IN THE WETLAND EQUIPMENT CROSSING (WEC) CONSTRUCTION DETAIL.
3. ALL TYPICAL CONSTRUCTION DETAILS FOR PROPOSED CROSSING METHODS ARE LOCATED WITHIN THE EROSION AND SEDIMENTATION CONTROL PLAN AND NARRATIVE.
4. THE PROPOSED PIPELINE WILL BE INSTALLED WITH 3-FEET MINIMUM COVER THROUGH WETLANDS AND 4-FEET MINIMUM COVER THROUGH STREAM CHANNELS.
8. CATHODIC PROTECTION CONSISTING OF 1.5" DIAMETER CABLE WILL BE INSTALLED BETWEEN THE LEIDY LINE A AND LEIDY LINE B FROM MP 185.03 TO MP 185.37. WHERE THE CABLE IS BEING INSTALLED THROUGH WETLANDS, STREAMS, AND FLOODWAYS THE CABLE WILL BE LOCATED IN THE SAME TRENCH AS THE PROPOSED HILLTOP LOOP.



Crossing Name	Latitude	Longitude	Location (Milepost/Access Road)
HL-3	41.369747	-77.700541	185

LEGEND

- EXISTING / PROPOSED PERMANENT MAINTAINED TGPL RIGHT OF WAY WITHIN PROPOSED LOD
- PROPOSED LIMITS OF DISTURBANCE (LOD)
- PROPOSED 36" HILLTOP LOOP
- EXISTING PIPELINE
- EXISTING ROADWAY (PAVED)
- EXISTING ROADWAY (UNPAVED)
- PARCEL BOUNDARY
- EXISTING CONTOUR (10' C.I.)
- EXISTING CONTOUR (2' C.I.)
- UTILITY LINE/POLE
- EXISTING FENCE
- TREELINE
- CP CATHODIC PROTECTION DEVICE
- EXISTING BUILDING
- EXISTING CULVERT
- EXISTING FOREIGN PIPELINE

WETLANDS
- EMERGENT WETLAND (PEM)
- SCRUB SHRUB WETLAND (PSS)
- FORESTED WETLAND (PFO)
- OPEN WATER WETLAND (POW)
- PROPOSED PEM WETLAND IMPACT
- PROPOSED PSS WETLAND IMPACT
- PROPOSED PFO WETLAND IMPACT

STREAMS
- STREAM CHANNEL
- PROPOSED STREAM CHANNEL IMPACT

FLOODWAY
- FLOODWAY
- PROPOSED FLOODWAY IMPACT
- FEMA FEMA FLOODPLAIN

SURVEY NOTES:

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/18). EXISTING CONTOURS FOR OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HUNT, GUILLOT & ASSOCIATES.

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
WATER OBSTRUCTION AND ENCROACHMENT IMPACT MAPS

CROSSING HL-3

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: FTN	DATE: 08/07/2019	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY: RJN	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE:	DRAWING NUMBER: 26-1000-70-09-20-D	SHEET 5 OF 10
WO: 1211227	RID:		

HYDROLOGIC & HYDRAULIC ANALYSIS

Transcontinental Gas Pipe Line Company, LLC

Hydrologic and Hydraulic Analysis

Leidy South Project – Hilltop Loop

September 2019

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1. Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. proposes to install and maintain a 36-inch diameter natural gas pipeline (Hilltop Loop) under Young Womans Creek in Chapman Township, Clinton County. The proposed temporary stream crossing is located at Latitude 41°22'11.04"N, Longitude 77°42'1.85"W on the Renovo East, Pennsylvania USGS 7.5 Minute Topographic Quadrangles

In respect to the streams and/or floodways crossings, the crossings will result in temporary impacts due to dewatering best management practices (BMP's) being installed (i.e. dam and pump, flume, cofferdam) and temporary bridges for access during construction only. Crossings will be restored to pre-construction contours once construction is completed. Because construction impacts will be temporary in nature and crossings will be restored to pre-construction contours, there will be no changes will occur from pre to post construction conditions as a result of the Project.

The temporary equipment bridge has an approximate length of 150 feet across the stream and a width of 16 feet along the stream. The piers are approximately 5 feet in height and 4 feet wide and are located at a maximum spacing of 25 feet. Young Womans Creek is included in a Federal Emergency Management Agency (FEMA) Flood Insurance Study (FIS) for Clinton County. In the vicinity of the project, the FIS has established floodway and floodplain limits. The proposed temporary bridge is currently in an FIS Zone AE floodway.

2. Basis of Hydrologic and Hydraulic Analysis

The proposed temporary bridge crossing is a temporary structure. This Hydrologic and Hydraulic Analysis (H&H) analysis focuses on the 1-, 2-, 5-, and 10-year, 24-hour storms were examined for this report. Site specific topographic data taken from LIDAR mapping was utilized to analyze the flow regime of the stream for existing and temporary conditions.

3. Hydrology

The USGS StreamStats website was utilized to calculate the flows in the stream at the project site. The website provided a baseflow of 55.5 cubic feet per second (cfs), the 1-year, 24-hour storm flow of 1,800 cfs, 2-year, 24-hour storm flow of 2,450 cfs, 5-year, 24-hour storm flow of 3,840 cfs, and 10-year 24-hour storm flow of 4,860 cfs for Young Womans Creek (StreamStats report attached). These computed flow rates were used in the HEC-RAS analysis of Young Womans Creek.

4. Hydraulic Analysis

The existing and temporary stream conditions were modeled with the USCOE HEC-RAS software. The software calculated the flood conditions before and after the proposed temporary bridge and instream support (piers) were installed and the impacts of pier scouring. In addition, the modeling data will be used to minimize impacts to water surface elevations and velocities in the stream channel. The following sections present the findings of the HEC-RAS analyses for the proposed temporary site conditions.

5. Depiction of Proposed Conditions

HEC-RAS analyses were performed for the flow of 55.5 cfs, 1,800 cfs, 2,450 cfs, 3,840 cfs, and 4,860 cfs. The results were then analyzed to determine depth of flow and the depth of scouring for the selected storm events. Figure 1 and Table 1 represent the water elevation in the bridge section under different flow conditions. Table 2 is the pier scour calculations under selected flow conditions. Detailed results for conditions with and without the bridge are given in the Appendix A.

Figure 1. Upstream bridge section review under selected flow conditions.

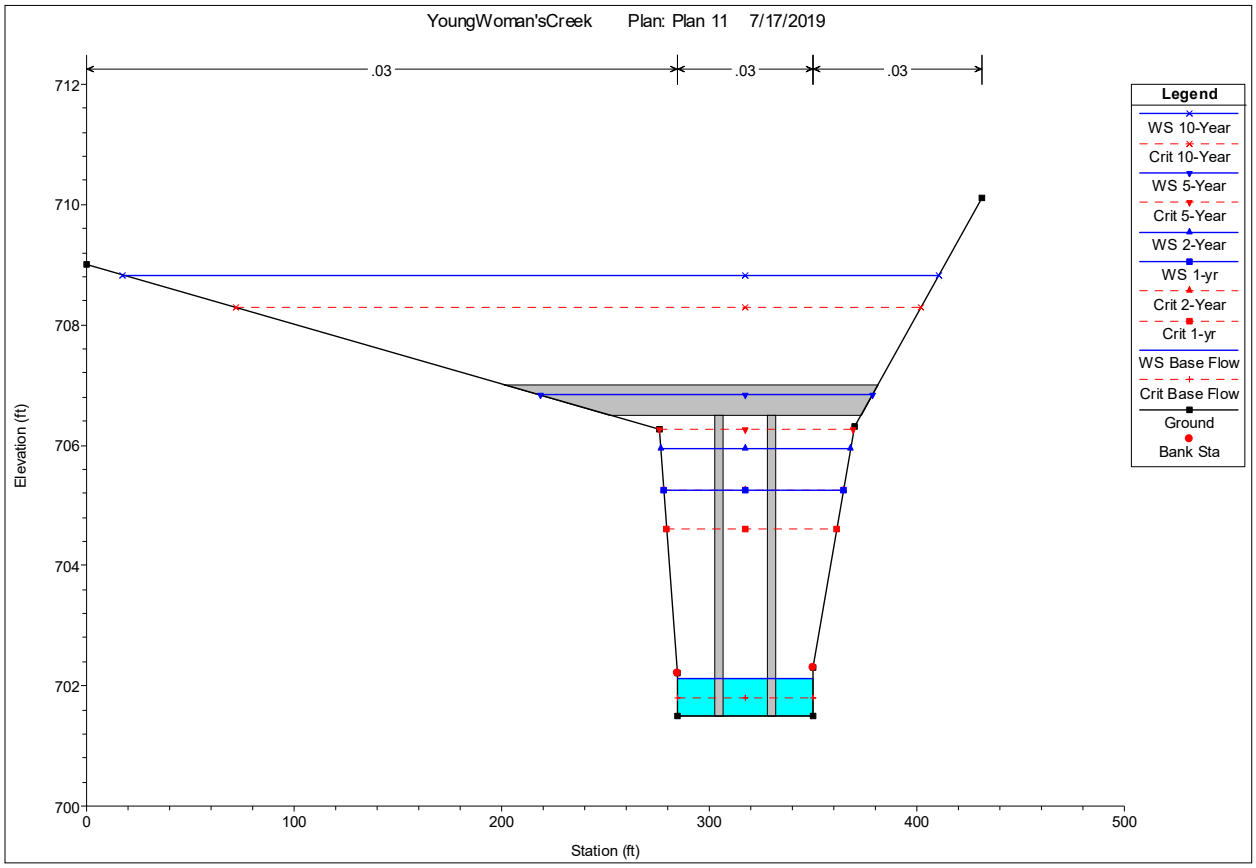


Table 1.
Surface water elevation and flow conditions of the proposed temporary bridge in Young Womans Creek.

Reach	River Station	Profile	Water Surface Elevation (ft)	Top Width (ft)	Q in Left overbank (cfs)	Q in Channel (cfs)	Q in Right overbank (cfs)	Velocity in Channel (ft/s)
CWC	197 BR U	Base Flow	702.12	57.75		55.5		1.57
CWC	197 BR U	1-year	705.28	78.71	44.06	1653.57	102.37	7.56
CWC	197 BR U	2-Year	705.98	83.55	77.7	2188.79	183.51	8.45
CWC	197 BR U	5-Year	706.88		75.08	3463.23	301.69	11.98
CWC	197 BR U	10-Year	708.89	400.73	1530.95	2721.08	607.97	6.58
CWC	197 BR D	Base Flow	702.07	57.69		55.5		1.69
CWC	197 BR D	1-year	704.99	76.71	38.86	1672.23	88.92	8.29
CWC	197 BR D	2-Year	705.62	81.08	68.88	2220.6	160.52	9.33
CWC	197 BR D	5-Year	706.55		80.47	3458.27	301.26	11.96
CWC	197 BR D	10-Year	708.25	329.86	1032.01	3276.6	551.39	8.81

Table 2.
Pier Scouring and Abutment Scouring under selected flow conditions

	Pier Scour		Abutment Scour Left		Abutment Scour Right	
	Ys (ft)	Froude #	Ys (ft)	Froude #	Ys (ft)	Froude #
Base Flow	1.1	0.3	N/A	N/A	N/A	N/A
1-year	6.81	0.54	N/A	N/A	N/A	N/A
2-Year	7.37	0.57	N/A	N/A	N/A	N/A
5-Year	7.21	0.39	9.90	0.23	11.12	0.33
10-Year	7.88	0.47	11.03	0.28	12.34	0.39

6. Conclusion

Based on the HEC-RAS analysis of proposed conditions, the temporary bridge equipment stream crossing will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

References

FEMA Flood Map Service Center
https://msc.fema.gov/portal/search?AddressQuery=clinton#searchresultsanchor

ATTACHMENT 1
HECRAS CALCULATIONS

ATTACHMENT 1 – HECRAS CALCULATION

Table 1.
HECRAS results for existing conditions without the bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005655	10.01	272.95	76.18	0.83
CWC	700	5-Year	3840.00	703.50	708.84	708.84	711.00	0.007197	12.68	338.76	79.10	0.97
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005070	8.68	231.09	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.92		709.19	0.005236	9.68	284.62	80.68	0.80
CWC	675.00*	5-Year	3840.00	703.40	708.80	708.68	710.76	0.006502	12.14	356.62	84.03	0.92
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004812	8.47	238.68	78.46	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.03	0.004964	9.45	293.95	85.08	0.78
CWC	650.00*	5-Year	3840.00	703.30	708.75	708.54	710.56	0.005944	11.69	373.47	88.98	0.88
CWC	650.00*	10-Year	4860.00	703.30	709.27	709.26	711.55	0.006682	13.17	420.30	91.19	0.95
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004646	8.33	244.56	82.57	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.75		708.89	0.004721	9.24	302.94	89.50	0.76
CWC	625.00*	5-Year	3840.00	703.20	708.70	708.40	710.37	0.005461	11.28	390.17	93.99	0.85
CWC	625.00*	10-Year	4860.00	703.20	709.20	708.96	711.34	0.006258	12.79	437.97	98.73	0.92
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004501	8.20	249.94	86.66	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004565	9.09	309.90	93.84	0.75
CWC	600.00*	5-Year	3840.00	703.10	708.64	708.30	710.21	0.005105	10.96	404.77	99.00	0.82
CWC	600.00*	10-Year	4860.00	703.10	709.14	708.78	711.15	0.005888	12.46	455.56	107.46	0.89
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004432	8.14	253.39	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.56		708.64	0.004435	8.97	316.05	98.14	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.56	708.21	710.06	0.004902	10.76	416.45	105.23	0.81
CWC	575.00*	10-Year	4860.00	703.00	709.09	708.83	710.97	0.005470	12.08	475.27	115.55	0.86
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004387	8.09	255.90	94.50	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.46		708.52	0.004346	8.88	320.80	102.32	0.73

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.47	708.07	709.93	0.004746	10.60	427.22	112.49	0.79
CWC	550.00*	10-Year	4860.00	702.90	709.04	708.77	710.80	0.005079	11.71	495.29	122.99	0.83
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004376	8.06	257.10	98.20	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.36		708.41	0.004280	8.81	324.53	106.47	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.38	707.92	709.79	0.004579	10.43	438.17	119.25	0.78
CWC	525.00*	10-Year	4860.00	702.80	708.99	708.68	710.65	0.004748	11.39	514.76	130.97	0.81
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004407	8.07	256.74	101.79	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004234	8.76	327.15	110.51	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.29	707.88	709.66	0.004431	10.28	448.31	125.68	0.77
CWC	500.00*	10-Year	4860.00	702.70	708.91	708.60	710.51	0.004589	11.22	529.86	140.74	0.79
CWC	500.00*	1-yr	1800.00	702.70	706.57		707.51	0.004531	8.13	253.54	105.01	0.73
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.15		708.20	0.004226	8.74	327.99	114.38	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.20	707.84	709.54	0.004306	10.14	457.33	131.69	0.76
CWC	475.00*	10-Year	4860.00	702.60	708.81	708.50	710.39	0.004517	11.14	542.17	151.43	0.79
CWC	475.00*	1-yr	1800.00	702.60	706.35	706.05	707.39	0.005088	8.44	240.30	105.01	0.77
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.03		708.09	0.004254	8.75	327.50	118.81	0.73
CWC	450.00*	5-Year	3840.00	702.50	708.11	707.77	709.42	0.004176	10.01	466.30	137.52	0.75
CWC	450.00*	10-Year	4860.00	702.50	708.72	708.36	710.26	0.004431	11.04	554.48	162.31	0.78
CWC	450.00*	1-yr	1800.00	702.50	706.19	705.86	707.26	0.005349	8.55	232.68	100.08	0.79
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.89	706.60	707.99	0.004374	8.83	323.55	122.89	0.73
CWC	425.00*	5-Year	3840.00	702.40	708.03	707.68	709.30	0.004056	9.88	474.54	143.17	0.73
CWC	425.00*	10-Year	4860.00	702.40	708.63	708.23	710.15	0.004339	10.93	566.34	173.30	0.77
CWC	425.00*	1-yr	1800.00	702.40	706.04	705.47	707.13	0.005443	8.56	228.46	94.77	0.79
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004286	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.69	706.33	707.87	0.004792	9.09	310.11	125.22	0.77
CWC	400.00*	5-Year	3840.00	702.30	707.94	707.60	709.19	0.003946	9.76	482.14	149.02	0.73
CWC	400.00*	10-Year	4860.00	702.30	708.54	708.13	710.03	0.004234	10.81	578.42	184.66	0.76

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	705.91	705.43	706.99	0.005454	8.51	226.13	88.29	0.79
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004261	1.99	27.83	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.50	706.12	707.75	0.005121	9.27	298.13	121.99	0.79
CWC	375.00*	5-Year	3840.00	702.20	707.85	707.51	709.09	0.003874	9.68	488.10	156.00	0.72
CWC	375.00*	10-Year	4860.00	702.20	708.45	708.06	709.91	0.004115	10.68	591.01	196.68	0.75
CWC	375.00*	1-yr	1800.00	702.20	705.79	705.32	706.85	0.005339	8.39	226.70	80.89	0.78
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004226	1.97	28.14	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.37	705.64	707.62	0.005113	9.23	294.59	116.03	0.79
CWC	350.00*	5-Year	3840.00	702.10	707.76	707.39	708.99	0.003809	9.61	492.89	162.60	0.71
CWC	350.00*	10-Year	4860.00	702.10	708.37	707.96	709.80	0.003991	10.54	603.22	208.81	0.74
CWC	350.00*	1-yr	1800.00	702.10	705.71		706.70	0.004941	8.11	232.24	73.80	0.75
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004164	1.95	28.50	59.42	0.50
CWC	325.00*	2-Year	2450.00	702.00	706.25	705.65	707.49	0.005007	9.11	294.15	109.07	0.78
CWC	325.00*	5-Year	3840.00	702.00	707.66	707.25	708.89	0.003737	9.53	497.48	169.16	0.71
CWC	325.00*	10-Year	4860.00	702.00	708.30	707.89	709.68	0.003835	10.36	617.74	222.20	0.73
CWC	325.00*	1-yr	1800.00	702.00	705.62		706.56	0.004688	7.92	238.07	75.58	0.73
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.004025	1.91	29.03	60.65	0.49
CWC	300.00*	2-Year	2450.00	701.90	706.17	705.56	707.34	0.004766	8.91	297.99	102.19	0.76
CWC	300.00*	5-Year	3840.00	701.90	707.58	707.13	708.78	0.003638	9.42	503.13	176.02	0.70
CWC	300.00*	10-Year	4860.00	701.90	708.24	707.75	709.57	0.003635	10.13	636.16	237.32	0.71
CWC	300.00*	1-yr	1800.00	701.90	705.54		706.43	0.004429	7.72	244.61	77.94	0.71
CWC	275.00*	Base Flow	55.50	701.80	702.29		702.34	0.003637	1.84	30.17	61.90	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.11		707.21	0.004389	8.61	306.30	94.78	0.73
CWC	275.00*	5-Year	3840.00	701.80	707.50	706.97	708.69	0.003547	9.32	507.42	182.91	0.69
CWC	275.00*	10-Year	4860.00	701.80	708.20	707.56	709.46	0.003404	9.87	658.24	254.31	0.69
CWC	275.00*	1-yr	1800.00	701.80	705.47		706.31	0.004116	7.49	252.70	80.26	0.69
CWC	250.00*	Base Flow	55.50	701.70	702.21		702.26	0.003007	1.72	32.20	63.16	0.43
CWC	250.00*	2-Year	2450.00	701.70	706.08		707.07	0.003898	8.20	318.96	88.44	0.69
CWC	250.00*	5-Year	3840.00	701.70	707.42	706.66	708.59	0.003424	9.19	513.34	190.47	0.68
CWC	250.00*	10-Year	4860.00	701.70	708.17	707.49	709.36	0.003145	9.56	685.12	272.61	0.66
CWC	250.00*	1-yr	1800.00	701.70	705.41		706.19	0.003789	7.24	261.89	82.56	0.66

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.15		702.19	0.002234	1.56	35.50	64.44	0.37
CWC	225.00*	2-Year	2450.00	701.60	706.04		706.96	0.003533	7.88	331.75	89.70	0.66
CWC	225.00*	5-Year	3840.00	701.60	707.35	706.14	708.49	0.003297	9.05	519.11	199.51	0.67
CWC	225.00*	10-Year	4860.00	701.60	708.16	707.52	709.25	0.002877	9.22	716.40	292.72	0.64
CWC	225.00*	1-yr	1800.00	701.60	705.36		706.08	0.003460	6.98	272.10	84.79	0.63
CWC	200	Base Flow	55.50	701.50	702.11		702.14	0.001527	1.38	40.13	65.75	0.31
CWC	200	2-Year	2450.00	701.50	706.01		706.85	0.003213	7.59	344.88	91.72	0.63
CWC	200	5-Year	3840.00	701.50	707.30	706.11	708.40	0.003137	8.87	528.21	214.63	0.65
CWC	200	10-Year	4860.00	701.50	708.15	707.47	709.16	0.002604	8.86	753.42	314.30	0.61
CWC	200	1-yr	1800.00	701.50	705.31		705.98	0.003143	6.72	283.10	86.94	0.61
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.25	706.22	707.74	0.005327	10.81	587.88	211.94	0.83
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

Table 2
HECRAS results for proposed conditions with the temporary bridge

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	700	Base Flow	55.50	703.50	704.09		704.18	0.004475	2.30	24.11	41.12	0.53
CWC	700	2-Year	2450.00	703.50	707.99	707.66	709.35	0.005645	10.00	273.10	76.18	0.83
CWC	700	5-Year	3840.00	703.50	709.07	708.84	711.01	0.006156	12.05	356.65	79.88	0.90
CWC	700	10-Year	4860.00	703.50	709.64	709.64	712.08	0.006799	13.53	403.25	81.86	0.96
CWC	700	1-yr	1800.00	703.50	707.44		708.46	0.005066	8.67	231.15	74.26	0.77
CWC	675.00*	Base Flow	55.50	703.40	703.98		704.06	0.004455	2.27	24.42	42.33	0.53
CWC	675.00*	2-Year	2450.00	703.40	707.93		709.19	0.005226	9.67	284.79	80.69	0.80
CWC	675.00*	5-Year	3840.00	703.40	709.07	708.68	710.80	0.005373	11.41	379.88	85.09	0.85
CWC	675.00*	10-Year	4860.00	703.40	709.45	709.45	711.80	0.006722	13.32	412.35	86.54	0.96
CWC	675.00*	1-yr	1800.00	703.40	707.35		708.32	0.004807	8.47	238.75	78.47	0.75
CWC	650.00*	Base Flow	55.50	703.30	703.87		703.95	0.004435	2.24	24.73	43.55	0.53
CWC	650.00*	2-Year	2450.00	703.30	707.84		709.04	0.004953	9.44	294.16	85.09	0.78
CWC	650.00*	5-Year	3840.00	703.30	709.06		710.62	0.004790	10.89	401.35	90.30	0.80
CWC	650.00*	10-Year	4860.00	703.30	709.38	709.26	711.55	0.006224	12.87	430.43	91.72	0.92
CWC	650.00*	1-yr	1800.00	703.30	707.25		708.19	0.004641	8.33	244.66	82.58	0.74
CWC	625.00*	Base Flow	55.50	703.20	703.77		703.84	0.004417	2.22	25.03	44.76	0.52
CWC	625.00*	2-Year	2450.00	703.20	707.76		708.89	0.004709	9.23	303.21	89.52	0.76
CWC	625.00*	5-Year	3840.00	703.20	709.05		710.47	0.004297	10.42	422.89	95.62	0.76
CWC	625.00*	10-Year	4860.00	703.20	709.33	708.96	711.36	0.005791	12.48	450.74	101.76	0.89
CWC	625.00*	1-yr	1800.00	703.20	707.15		708.07	0.004495	8.20	250.06	86.67	0.73
CWC	600.00*	Base Flow	55.50	703.10	703.66		703.73	0.004398	2.19	25.33	45.98	0.52
CWC	600.00*	2-Year	2450.00	703.10	707.66		708.76	0.004550	9.08	310.24	93.86	0.75
CWC	600.00*	5-Year	3840.00	703.10	709.00		710.34	0.004008	10.13	441.35	104.63	0.74
CWC	600.00*	10-Year	4860.00	703.10	709.30	708.78	711.18	0.005298	12.04	473.56	110.95	0.85
CWC	600.00*	1-yr	1800.00	703.10	707.05		707.95	0.004425	8.13	253.53	90.63	0.72
CWC	575.00*	Base Flow	55.50	703.00	703.55		703.62	0.004384	2.17	25.61	47.19	0.52
CWC	575.00*	2-Year	2450.00	703.00	707.57		708.64	0.004418	8.96	316.47	98.16	0.74
CWC	575.00*	5-Year	3840.00	703.00	708.97		710.21	0.003687	9.79	462.11	113.33	0.71
CWC	575.00*	10-Year	4860.00	703.00	709.29	708.83	711.00	0.004810	11.57	498.30	119.35	0.81
CWC	575.00*	1-yr	1800.00	703.00	706.94		707.84	0.004378	8.08	256.08	94.51	0.72
CWC	550.00*	Base Flow	55.50	702.90	703.44		703.51	0.004368	2.14	25.90	48.42	0.52
CWC	550.00*	2-Year	2450.00	702.90	707.47		708.52	0.004326	8.87	321.30	102.35	0.73

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	550.00*	5-Year	3840.00	702.90	708.95		710.10	0.003380	9.46	483.75	121.28	0.68
CWC	550.00*	10-Year	4860.00	702.90	709.22	708.77	710.86	0.004625	11.38	516.78	130.62	0.80
CWC	550.00*	1-yr	1800.00	702.90	706.83		707.73	0.004364	8.06	257.34	98.22	0.72
CWC	525.00*	Base Flow	55.50	702.80	703.33		703.40	0.004354	2.12	26.18	49.64	0.51
CWC	525.00*	2-Year	2450.00	702.80	707.37		708.41	0.004257	8.80	325.15	106.52	0.73
CWC	525.00*	5-Year	3840.00	702.80	708.93		709.99	0.003097	9.13	506.08	128.83	0.65
CWC	525.00*	10-Year	4860.00	702.80	709.14	708.68	710.73	0.004488	11.24	534.30	143.48	0.79
CWC	525.00*	1-yr	1800.00	702.80	706.71		707.62	0.004389	8.06	257.11	101.82	0.72
CWC	500.00*	Base Flow	55.50	702.70	703.22		703.29	0.004341	2.10	26.46	50.86	0.51
CWC	500.00*	2-Year	2450.00	702.70	707.26		708.30	0.004207	8.74	327.92	110.56	0.72
CWC	500.00*	5-Year	3840.00	702.70	708.90		709.90	0.002877	8.87	527.93	139.27	0.63
CWC	500.00*	10-Year	4860.00	702.70	709.06	708.60	710.61	0.004335	11.08	552.45	156.94	0.78
CWC	500.00*	1-yr	1800.00	702.70	706.59		707.52	0.004463	8.09	255.01	105.12	0.72
CWC	475.00*	Base Flow	55.50	702.60	703.12		703.18	0.004327	2.08	26.74	52.08	0.51
CWC	475.00*	2-Year	2450.00	702.60	707.16		708.20	0.004192	8.72	328.98	114.46	0.72
CWC	475.00*	5-Year	3840.00	702.60	708.84		709.82	0.002785	8.77	546.80	154.69	0.62
CWC	475.00*	10-Year	4860.00	702.60	708.99	708.50	710.49	0.004172	10.91	570.72	170.55	0.76
CWC	475.00*	1-yr	1800.00	702.60	706.40	706.05	707.40	0.004854	8.31	245.05	106.73	0.75
CWC	450.00*	Base Flow	55.50	702.50	703.01		703.08	0.004312	2.05	27.01	53.30	0.51
CWC	450.00*	2-Year	2450.00	702.50	707.04		708.10	0.004210	8.72	328.85	119.01	0.72
CWC	450.00*	5-Year	3840.00	702.50	708.80		709.74	0.002660	8.63	567.88	171.05	0.61
CWC	450.00*	10-Year	4860.00	702.50	708.93	708.36	710.37	0.003979	10.70	591.08	185.22	0.74
CWC	450.00*	1-yr	1800.00	702.50	706.27	705.86	707.28	0.004898	8.31	241.35	103.64	0.76
CWC	425.00*	Base Flow	55.50	702.40	702.90		702.97	0.004300	2.03	27.28	54.52	0.51
CWC	425.00*	2-Year	2450.00	702.40	706.93		708.00	0.004237	8.73	327.77	123.51	0.72
CWC	425.00*	5-Year	3840.00	702.40	708.76		709.66	0.002513	8.44	591.18	188.37	0.59
CWC	425.00*	10-Year	4860.00	702.40	708.88	708.23	710.25	0.003763	10.45	613.57	200.99	0.72
CWC	425.00*	1-yr	1800.00	702.40	706.15	705.47	707.16	0.004883	8.26	238.86	99.64	0.75
CWC	400.00*	Base Flow	55.50	702.30	702.80		702.86	0.004282	2.01	27.55	55.74	0.51
CWC	400.00*	2-Year	2450.00	702.30	706.81	706.33	707.90	0.004243	8.72	326.37	127.63	0.72
CWC	400.00*	5-Year	3840.00	702.30	708.74		709.59	0.002345	8.22	617.56	206.79	0.57
CWC	400.00*	10-Year	4860.00	702.30	708.84	708.13	710.14	0.003519	10.17	639.49	218.20	0.70

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	400.00*	1-yr	1800.00	702.30	706.03	705.43	707.03	0.004809	8.18	237.73	94.68	0.75
CWC	375.00*	Base Flow	55.50	702.20	702.69		702.75	0.004254	1.99	27.85	56.97	0.50
CWC	375.00*	2-Year	2450.00	702.20	706.71	706.12	707.79	0.004216	8.69	325.05	131.16	0.72
CWC	375.00*	5-Year	3840.00	702.20	708.72		709.52	0.002164	7.96	647.42	226.39	0.55
CWC	375.00*	10-Year	4860.00	702.20	708.81	708.06	710.03	0.003252	9.85	669.58	237.05	0.68
CWC	375.00*	1-yr	1800.00	702.20	705.94		706.90	0.004637	8.04	239.22	88.96	0.73
CWC	350.00*	Base Flow	55.50	702.10	702.59		702.65	0.004208	1.97	28.17	58.19	0.50
CWC	350.00*	2-Year	2450.00	702.10	706.61	705.64	707.68	0.004133	8.60	324.18	131.41	0.71
CWC	350.00*	5-Year	3840.00	702.10	708.71		709.45	0.001983	7.69	679.90	246.62	0.53
CWC	350.00*	10-Year	4860.00	702.10	708.80	707.96	709.92	0.002980	9.51	702.81	256.84	0.65
CWC	350.00*	1-yr	1800.00	702.10	705.85		706.77	0.004389	7.84	243.25	82.84	0.71
CWC	325.00*	Base Flow	55.50	702.00	702.48		702.54	0.004137	1.94	28.56	59.43	0.49
CWC	325.00*	2-Year	2450.00	702.00	706.53	705.65	707.57	0.003957	8.44	326.29	127.78	0.70
CWC	325.00*	5-Year	3840.00	702.00	708.70		709.38	0.001801	7.40	716.24	267.68	0.50
CWC	325.00*	10-Year	4860.00	702.00	708.79	707.89	709.83	0.002702	9.14	740.97	277.93	0.62
CWC	325.00*	1-yr	1800.00	702.00	705.80		706.65	0.003971	7.53	251.75	77.78	0.68
CWC	300.00*	Base Flow	55.50	701.90	702.38		702.44	0.003936	1.90	29.22	60.66	0.48
CWC	300.00*	2-Year	2450.00	701.90	706.46	705.56	707.46	0.003723	8.23	331.26	124.19	0.68
CWC	300.00*	5-Year	3840.00	701.90	708.70		709.32	0.001624	7.10	756.72	289.44	0.48
CWC	300.00*	10-Year	4860.00	701.90	708.79		709.73	0.002428	8.75	784.25	300.07	0.59
CWC	300.00*	1-yr	1800.00	701.90	705.75		706.53	0.003635	7.26	261.20	79.67	0.65
CWC	275.00*	Base Flow	55.50	701.80	702.30		702.35	0.003511	1.82	30.50	61.91	0.46
CWC	275.00*	2-Year	2450.00	701.80	706.41		707.35	0.003442	7.98	338.81	119.52	0.66
CWC	275.00*	5-Year	3840.00	701.80	708.70		709.27	0.001462	6.80	799.40	311.50	0.46
CWC	275.00*	10-Year	4860.00	701.80	708.79		709.65	0.002177	8.37	830.01	322.57	0.56
CWC	275.00*	1-yr	1800.00	701.80	705.70		706.43	0.003313	7.00	271.59	82.08	0.62
CWC	250.00*	Base Flow	55.50	701.70	702.22		702.27	0.002828	1.69	32.81	63.17	0.41
CWC	250.00*	2-Year	2450.00	701.70	706.38		707.25	0.003143	7.69	349.00	114.52	0.63
CWC	250.00*	5-Year	3840.00	701.70	708.70		709.22	0.001313	6.51	844.90	333.67	0.43
CWC	250.00*	10-Year	4860.00	701.70	708.80		709.57	0.001947	8.00	878.90	345.27	0.53
CWC	250.00*	1-yr	1800.00	701.70	705.66		706.33	0.003001	6.73	282.98	84.46	0.60

HEC-RAS Plan: Plan 17 River: YWC Reach: CWC (Continued)

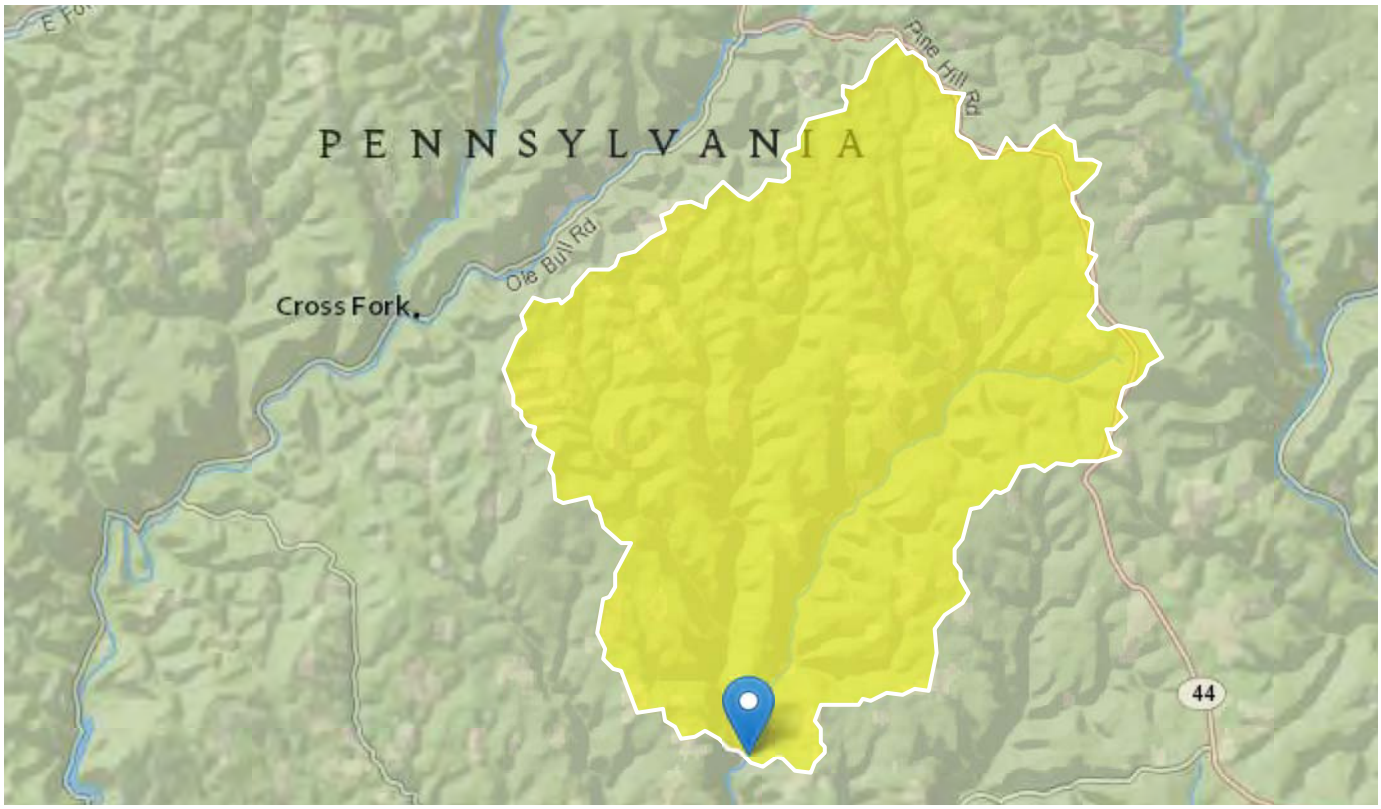
Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	225.00*	Base Flow	55.50	701.60	702.17		702.20	0.002052	1.52	36.43	64.46	0.36
CWC	225.00*	2-Year	2450.00	701.60	706.35		707.15	0.002840	7.39	361.13	108.03	0.60
CWC	225.00*	5-Year	3840.00	701.60	708.70		709.17	0.001176	6.22	893.69	356.38	0.41
CWC	225.00*	10-Year	4860.00	701.60	708.81		709.50	0.001738	7.63	931.41	368.50	0.50
CWC	225.00*	1-yr	1800.00	701.60	705.63		706.25	0.002704	6.46	295.27	86.73	0.57
CWC	200	Base Flow	55.50	701.50	702.13	701.78	702.16	0.001385	1.34	41.33	65.77	0.30
CWC	200	2-Year	2450.00	701.50	706.33	704.96	707.06	0.002543	7.07	375.41	101.49	0.57
CWC	200	5-Year	3840.00	701.50	708.71	706.11	709.13	0.001051	5.94	946.20	379.36	0.39
CWC	200	10-Year	4860.00	701.50	708.81	707.47	709.44	0.001547	7.27	988.01	392.04	0.47
CWC	200	1-yr	1800.00	701.50	705.60	704.34	706.17	0.002430	6.20	308.23	88.92	0.54
CWC	197		Bridge									
CWC	175.00*	Base Flow	55.50	701.50	702.06		702.10	0.002020	1.51	36.87	65.69	0.35
CWC	175.00*	2-Year	2450.00	701.50	705.83		706.76	0.003706	7.94	328.87	90.54	0.67
CWC	175.00*	5-Year	3840.00	701.50	707.09	706.00	708.31	0.003604	9.28	496.49	199.37	0.69
CWC	175.00*	10-Year	4860.00	701.50	708.06	707.47	709.09	0.002724	8.98	741.32	307.94	0.62
CWC	175.00*	1-yr	1800.00	701.50	705.16		705.89	0.003657	7.04	269.33	85.87	0.65
CWC	150	Base Flow	55.50	701.50	701.99		702.04	0.003259	1.74	31.91	65.59	0.44
CWC	150	2-Year	2450.00	701.50	705.57		706.64	0.004639	8.51	305.25	88.73	0.74
CWC	150	5-Year	3840.00	701.50	706.37	705.99	708.15	0.006133	11.04	384.52	128.03	0.88
CWC	150	10-Year	4860.00	701.50	707.45	707.45	708.97	0.004291	10.56	587.91	245.99	0.76
CWC	150	1-yr	1800.00	701.50	704.92		705.78	0.004621	7.57	249.43	84.26	0.72
CWC	125.00*	Base Flow	55.50	701.38	701.90		701.95	0.003523	1.80	30.91	64.42	0.46
CWC	125.00*	2-Year	2450.00	701.38	705.36		706.51	0.005168	8.81	296.91	91.95	0.78
CWC	125.00*	5-Year	3840.00	701.38	706.25	706.25	707.97	0.006067	10.94	406.19	156.03	0.88
CWC	125.00*	10-Year	4860.00	701.38	707.24	707.24	708.70	0.004366	10.50	606.69	252.14	0.77
CWC	125.00*	1-yr	1800.00	701.38	704.76		705.66	0.004998	7.75	244.25	84.97	0.75
CWC	100.00*	Base Flow	55.50	701.27	701.80		701.85	0.004358	1.89	29.31	66.13	0.50
CWC	100.00*	2-Year	2450.00	701.27	704.97	704.66	706.34	0.006880	9.61	274.66	101.95	0.89
CWC	100.00*	5-Year	3840.00	701.27	706.22	706.22	707.74	0.005497	10.47	445.81	183.02	0.84
CWC	100.00*	10-Year	4860.00	701.27	706.99	706.99	708.43	0.004571	10.53	613.43	250.37	0.78
CWC	100.00*	1-yr	1800.00	701.27	704.57		705.52	0.005579	8.00	237.29	85.67	0.79

Reach	River Sta	Profile	Q Total	Min Ch El	W.S. Elev	Crit W.S.	E.G. Elev	E.G. Slope	Vel Chnl	Flow Area	Top Width	Froude # Chl
			(cfs)	(ft)	(ft)	(ft)	(ft)	(ft/ft)	(ft/s)	(sq ft)	(ft)	
CWC	75.00*	Base Flow	55.50	701.15	701.68		701.74	0.004937	1.96	28.28	66.36	0.53
CWC	75.00*	2-Year	2450.00	701.15	704.79	704.74	706.17	0.007232	9.70	277.98	113.85	0.91
CWC	75.00*	5-Year	3840.00	701.15	706.03	706.03	707.49	0.005497	10.33	459.49	189.02	0.83
CWC	75.00*	10-Year	4860.00	701.15	706.74	706.74	708.16	0.004759	10.54	611.91	242.54	0.79
CWC	75.00*	1-yr	1800.00	701.15	704.29	704.00	705.36	0.006797	8.49	225.72	94.77	0.86
CWC	50.00*	Base Flow	55.50	701.03	701.55		701.61	0.005234	1.99	27.83	66.59	0.54
CWC	50.00*	2-Year	2450.00	701.03	704.64	704.64	705.97	0.007129	9.57	287.74	120.27	0.90
CWC	50.00*	5-Year	3840.00	701.03	705.81	705.81	707.25	0.005698	10.35	462.28	186.40	0.84
CWC	50.00*	10-Year	4860.00	701.03	706.47	706.47	707.93	0.005090	10.69	600.36	228.82	0.82
CWC	50.00*	1-yr	1800.00	701.03	704.11	703.98	705.19	0.007112	8.56	227.77	102.63	0.88
CWC	25.00*	Base Flow	55.50	700.92	701.40		701.47	0.006140	2.09	26.56	66.77	0.58
CWC	25.00*	2-Year	2450.00	700.92	704.47	704.41	705.76	0.007141	9.50	292.69	120.26	0.90
CWC	25.00*	5-Year	3840.00	700.92	705.57	705.57	707.04	0.006013	10.47	455.83	176.90	0.86
CWC	25.00*	10-Year	4860.00	700.92	706.22	706.22	707.74	0.005454	10.90	581.93	210.49	0.84
CWC	25.00*	1-yr	1800.00	700.92	703.93	703.83	705.00	0.007244	8.54	231.61	106.27	0.88
CWC	0	Base Flow	55.60	700.80	701.23	701.13	701.31	0.007001	2.17	25.60	66.96	0.62
CWC	0	2-Year	2450.00	700.80	704.32	704.19	705.58	0.007014	9.40	297.32	121.73	0.89
CWC	0	5-Year	3840.00	700.80	705.35	705.35	706.87	0.006322	10.62	443.02	161.68	0.88
CWC	0	10-Year	4860.00	700.80	706.08	706.08	707.60	0.005420	10.87	571.52	187.64	0.84
CWC	0	1-yr	1800.00	700.80	703.78	703.64	704.81	0.007010	8.40	236.68	105.22	0.87

ATTACHMENT 2
STREAMSTATS REPORT

StreamStats Report

Region ID: PA
Workspace ID: PA20190506151156786000
Clicked Point (Latitude, Longitude): 41.36948, -77.70108
Time: 2019-05-06 11:12:11 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	84.1	square miles
ELEV	Mean Basin Elevation	1765	feet
CARBON	Percentage of area of carbonate rock	0	percent
STORAGE	Percentage of area of storage (lakes ponds reservoirs wetlands)	0	percent

Peak-Flow Statistics Parameters [100 Percent (83.9 square miles) Peak Flow Region 3]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	84.1	square miles	1.44	1610
ELEV	Mean Basin Elevation	1765	feet	457	2150
CARBON	Percent Carbonate	0	percent	0	99
STORAGE	Percent Storage	0	percent	0	22.6

Peak-Flow Statistics Flow Report [100 Percent (83.9 square miles) Peak Flow Region 3]

PIl: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	SE	SEp	Equiv. Yrs.
2 Year Peak Flood	2450	ft^3/s	31	31	3
5 Year Peak Flood	3840	ft^3/s	28	28	5
10 Year Peak Flood	4860	ft^3/s	28	28	7
50 Year Peak Flood	7320	ft^3/s	31	31	11
100 Year Peak Flood	8460	ft^3/s	36	36	11
500 Year Peak Flood	11400	ft^3/s	43	43	11

Peak-Flow Statistics Citations

Roland, M.A., and Stuckey, M.H.,2008, Regression equations for estimating flood flows at selected recurrence intervals for ungaged streams in Pennsylvania: U.S. Geological Survey Scientific Investigations Report 2008-5102, 57p. (http://pubs.usgs.gov/sir/2008/5102/)

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Application Version: 4.3.0

From: UPS Quantum View
To: Kevin Clark
Subject: UPS Delivery Notification, Tracking Number 1Z8797VV0396509907
Date: Friday, September 20, 2019 1:17:44 PM

Your package has been delivered.

Delivery Date: Friday, 09/20/2019
Delivery Time: 11:46 AM

At the request of WHM CONSULTING, INC this notice alerts you that the status of the shipment listed below has changed.

Shipment Detail

Tracking Number:	1Z8797VV0396509907
Ship To:	Township Supervisors Chapman Township Supervisors 196 MAIN ST NORTH BEND, PA 17760 US
UPS Service:	UPS GROUND
Number of Packages:	1
Weight:	1.0 LBS
Delivery Location:	RECEIVER ROWE
Reference Number 1:	Williams 202

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REQUIREMENT Q

RISK ASSESSMENT ANALYSIS

RISK ASSESSMENT

A Risk Assessment was conducted for the Hensel Replacement and Hilltop Loop, as part of Leidy South Project. The assessment has taken into consideration the Floodplain Management Analysis and Stormwater Management Analysis included within Requirements O and P of the Permit Application.

In respect to the Stormwater Management, no increase in peak rates of stormwater runoff is proposed. The Erosion and Sediment Plan and Post Construction Stormwater Management (PCSM) Plan are designed to mitigate against an increase in peak rates, as discussed in Requirement O of the permit application.

In respect to the streams and/or floodways crossings, the crossings will result in temporary impacts due to dewatering best management practices (BMP's) being installed (i.e. dam and pump, flume, cofferdam) and temporary bridges for access during construction only. Crossings will be restored to pre-construction contours once construction is completed. Because construction impacts will be temporary in nature and crossings will be restored to pre-construction contours, there will be no changes will occur from pre to post construction conditions as a result of the Project.

Based on the Hydrologic and Hydraulic Analysis in Requirement N, the proposed temporary bridge equipment stream crossing across Young Womans Creek will not result in any significant flood elevation changes up to and including the 5-year, 24-hour storm. With proper design features, i.e. rock riprap protection, the proposed temporary pier(s) will not experience excessive scour during larger storm events. Due to the limited duration of the project, the temporary crossing does not pose significant risk to the area of the crossing.

REQUIREMENT R

PROFESSIONAL'S SEAL

The professional engineer's seal has been included on the cover of the Chapter 105 Impact drawings included in Requirement H.

REQUIREMENT S

ALTERNATIVE ANALYSIS

Transcontinental Gas Pipe Line Company, LLC

Requirement S – Alternatives Analysis

Leidy South Project – Hensel Replacement and Hilltop Loop

September 2019

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ALTERNATIVE ANALYSIS

1.0 Introduction

Transco is proposing the Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland. The Project consists of the following components:

- 6.3 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hensel Replacement) and the related abandonment of 5.8 miles of existing 23.375-inch pipeline on Leidy Line A;
- 2.4 miles of 36-inch pipeline loop along Transco's Leidy Line in Clinton County, Pennsylvania (Hilltop Loop);
- 3.5 miles of 42-inch pipeline loop along Transco's Leidy Line in Lycoming County, Pennsylvania (Benton Loop);
- Existing Compressor Station 605 (Wyoming County, Pennsylvania);
    - Increase the total certificated horsepower of the two electric motor-driven units from 30,000 horsepower (HP) to 42,000 HP and modifications to existing coolers;
- New Compressor Station 607 (Luzerne County, Pennsylvania);
    - Install two gas turbine-driven compressor units (23,465 nominal HP at International Organization for Standardization [ISO] conditions each, 46,930 HP total) and gas coolers;
- Existing Compressor Station 610 (Columbia County, Pennsylvania);
    - Add one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions) and gas cooling;

  - Increase the total certificated horsepower of the two electric motor-driven units from 40,000 HP to 42,000 HP and re-wheel the existing compressors;
- New Compressor Station 620 (Schuylkill County, Pennsylvania);
  - Install one gas turbine-driven compressor unit (31,871 nominal HP at ISO conditions);
- Ancillary facilities, such as mainline valves (MLVs), communication facilities, cathodic protection and pig launchers and receivers in Pennsylvania.

Subject to FERC approval of the Project and receipt of the necessary permits and authorizations, Transco anticipates that construction of the Project will commence in winter 2020/2021 to meet a target in-service date of December 1, 2021.

This alternatives analysis is consistent with the Federal Energy Regulatory Commission's (FERC) regulatory requirements as set forth in 18 Code of Federal Regulations 380.15 and 25 PA. Code § 105.13(e)(viii). Thus, it contains a detailed analysis of alternatives to the proposed action, including alternative locations, routings or designs to avoid or minimize environmental impacts.

2.0 No-Action Alternative

Under the No-Action Alternative, the Project would not be constructed or operated. The potential environmental impacts of construction and operation of the Project would not occur; however, this alternative would not meet the purpose and need for the Project.

The No-Action Alternative would prevent Transco from providing 582,400 Dth/d of incremental firm transportation capacity to Transco's River Road Regulator Station in Lancaster County, Pennsylvania. In addition, this alternative would prevent Transco from providing additional takeaway capacity from the Marcellus and Utica Shale production areas to support future gas production, and from supporting the overall reliability and diversification of energy infrastructure along the Atlantic seaboard.

The No-Action Alternative would not meet the purpose of the Project, which is to alleviate the constrained takeaway capacity from the Marcellus and Utica Shale production areas and support the overall reliability and diversification of energy infrastructure along the Atlantic seaboard. This assessment is based, in part, on an analysis of existing Transco facilities in or

near the Project area, which do not provide adequate pipeline takeaway capacity for transportation of natural gas to meet current transportation demand (see Section 10.4).

If the No-Action Alternative is selected, Transco's customers will need to:

- Seek other transportation services;
- Forgo meeting their natural gas demand until energy conservation measures stabilize or decrease demand, possibly limiting their growth and the growth of the local economies they serve; and
- Depend on other future development projects with unpredictable schedules and undetermined environmental impacts.

Because existing alternative sources of energy, conservation, and other projects are currently impractical, not available, and/or insufficient to meet the transportation demand addressed by the Project, the No-Action Alternative cannot be the proposed alternative. The No-Action Alternative does not meet the Project objectives of providing the additional transportation capacity of natural gas requested by its customers within the required time frame.

3.0 Design Alternatives

Transco's Precedent Agreements with Seneca Resources Corporation, Cabot Oil & Gas Corporation and UGI Utilities require Transco to provide the requested incremental capacity from the existing Leidy Hub and Zick Receipt Point to Transco's River Road Regulator Station in Lancaster County, Pennsylvania. Transco completed hydraulic modeling to identify the scope of facilities and facility modifications required to meet the Project's purpose and need. Then, as outlined in the following sections, evaluated these alternatives to determine which set of facilities provided the best opportunity to avoid and minimize environmental impacts while still meeting the contractual obligations of the project.

3.1 System Alternatives

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed pipeline systems to meet the purpose and need of the proposed Project. A system alternative would make it unnecessary to construct all or part of the proposed Project, although some modifications or additions to another existing pipeline system may be required to increase its capacity, or another entirely new system may need to be constructed. Such modifications or additions would result in environmental impacts that could be less than, similar to, or potentially greater than those associated with the proposed Project.

In order to be a viable system alternative to the proposed Project, potential system alternatives must meet three criteria:

- The system must be capable of transporting up to 582,400 Dth/d of natural gas to growing markets in Transco's Zone 6;
- The system alternative must be capable of transporting the required volumes within the same schedule as the proposed Project;
- Use of an alternative system must be able to meet the criteria above and at the same time result in reduced environmental impacts when compared to the proposed Project.

3.1.1 Existing Pipeline Systems

Transco operates the Transco Leidy Line system, Central Penn Line (CPL) system, and the Mainline system within the Project area. Transco's existing systems do not have any available unsubscribed capacity to service the volume under contract for the Project. Therefore, Transco's systems currently are not capable of providing an incremental 582,400 Dth/d of year-round firm transportation capacity from the Marcellus and Utica Shale production areas in northern and western Pennsylvania to Transco's Mainline at the River Road Regulator Station in Lancaster County, Pennsylvania.

Transco has identified four other existing interstate natural gas transmission pipeline systems in the Project area: Columbia Gas Transmission, LLC; Dominion Energy Transmission, Inc.; Tennessee Gas Pipeline; and Texas Eastern Transmission, LP. Based on review of unsubscribed capacity, none of these existing pipeline systems are presently capable of transporting the 582,400 Dth/d without expansion of their existing systems or construction of new systems (Columbia Gas Transmission, LLC 2019; Dominion Energy, Inc. 2019; Tennessee Gas Pipeline Company L.L.C. 2019; Texas Eastern Transmission, LP 2019).

Transco does not have access to the proprietary design criteria and operational data of other pipeline operators' respective systems; however, enough public information is available to estimate the systems capabilities. Using this information, Transco concludes that these existing pipeline systems are not presently capable of transporting the required volumes without expansion of their existing system or construction of a new system to meet the Project objective of providing an incremental 582,400 Dth/d of year-round firm transportation capacity from the Marcellus and Utica Shale production areas in northern and western Pennsylvania to Transco's

Mainline at the River Road Regulator Station in Lancaster County, Pennsylvania. Furthermore, modifications to any other company's pipeline system would likely require an interconnect with, and expansion of, Transco's Mainline system to transport incremental volumes to Transco's existing market areas. Such modifications or additions would result in environmental impacts that could be equal to or greater than those associated with the proposed Project.

3.1.2 System Alternatives Analysis Conclusion

Without the expansion and modifications proposed for the Project, Transco's existing facilities lack the capacity to transport additional volumes needed while maintaining the delivery volume commitments to its existing customers. Transco's proposed Project can achieve its objectives and maintain the overall system integrity, safety, and reliability for both new and existing customers. Transco believes that its design is as efficient as, or more efficient than, system alternatives that could be proposed to provide the same service. Since Transco can construct its facilities with construction and mitigation measures that would minimize environmental impacts, likely comparable to or less than system alternatives, system alternatives were not considered to be preferable to this Project.

3.2 Route Alternatives

Transco's Precedent Agreements with Seneca Resources Corporation, Cabot Oil & Gas Corporation, and UGI Utilities require Transco to provide the requested incremental capacity from the existing Leidy Hub and Zick Receipt Point to Transco's River Road Regulator Station. Transco completed hydraulic modeling to identify the segments on its existing Leidy Line system that will require upgrades to achieve the Project's purpose and need:

- MP 183.55 to MP 186.01 (Proposed Hilltop Loop);
- MP 188.51 to Leidy Hub at MP 194.00 (Proposed Hensel Replacement); and
- MP 116.95 to MP 120.44 (Proposed Benton Loop).

The locations of the pipeline loops and replacements were selected in areas that will allow Transco to install the proposed Leidy Line D from the Leidy Hub to MP 116.95 while co-locating with Transco's existing right-of-way (ROW). Hydraulic models were analyzed from an efficiency and effectiveness point of view to confirm and minimize the necessary pipeline lengths and diameters to meet the Project purpose and need. Based on the results, the proposed 36-inch and 42-inch diameter pipelines are required to meet the necessary Project demand. Further, the diameters of the proposed pipeline loops and replacement match the diameters of the existing

Leidy Line, thereby reducing the need for additional MLV facilities containing pig launchers/receivers and minimizing the need for further aboveground facilities.

3.2.1 Hilltop Loop

The Hilltop Loop is co-located with the existing Leidy Line ROW. Once constructed and in operation, Transco will refer to the Hilltop Loop as Leidy Line D. Typically, deviations from existing ROW result in additional construction impacts, additional installation costs, and additional operating procedures (e.g., two separate ROWs to maintain instead of one). Pipeline loops are usually shorter and more hydraulically efficient than deviations because of their placement adjacent to the existing pipeline. For these reasons, Transco has not developed any route alternatives for the Hilltop Loop.

3.2.2 Hensel Replacement

The Hensel Replacement involves replacement of the capacity of the existing 23.375-inch Leidy Line A with 6.3 miles of 36-inch pipe. Transco proposes to abandon and remove 5.8 miles of the existing 23.375-inch Leidy Line A except for the section within the Tamarack Swamp Natural Area and adjacent wetlands (approximately 0.8 mile), which will be abandoned in place and grouted to limit impacts to the Tamarack Swamp Natural Area and adjacent wetlands.

The Hensel Replacement crosses Sproul State Forest for 5.5 miles. Transco developed the proposed alignment of the Hensel Replacement to minimize overall impacts within the Sproul State Forest and based on input received from the DCNR during the pre-survey meeting held April 19, 2019. Beginning at MP 188.51, the proposed Hensel Replacement follows Transco's ROW for Leidy Lines A, B, and C to MP 190.59, where Leidy Line C crosses over Leidy Lines A and B and runs along its own ROW to the southwest. From here, the Hensel Replacement continues along the A and B Lines' ROW to MP 192.93. The Hensel Replacement exits the Leidy Lines A and B ROW at this location and follows an electric transmission line ROW to the south for approximately 0.3 mile, where it joins the Leidy Line C ROW at MP 193.10. The purpose of this deviation from the Leidy Lines A and B ROW is to avoid disturbance of the Tamarack Swamp Natural Area. Per the Clinton County Natural Heritage Inventory, maintenance or removal of the existing pipelines through this natural area is unadvised as doing so could lead to disruption of the biological community (Western Pennsylvania Conservancy 2019). The Hensel Replacement then follows the Leidy Line C ROW to its terminus at MP 194.00.

As part of the proposed Hensel Replacement, and as requested by the DCNR, Transco also plans to regrade, where necessary, the portion of the Leidy Line A and Leidy Line B ROW from MPs 190.60 to 192.93. The ROW in this area is "two-toned," with the grade over Leidy Line A ranging approximately 20 to 40 feet higher in elevation than the grade over the Leidy Line B. Transco will regrade the ROW in this area to restore approximate original contours.

Transco considered five alternative routes to the proposed Hensel Replacement to further minimize impacts on environmental resources within Sproul State Forest (see Figure 10A-6).

3.2.2.1 Hensel Replacement Alternative 1

Hensel Replacement Alternative 1 is a lift and lay alternative that would remove 5.8 miles of the existing Leidy Line A and replace it with 5.8 miles of a new 36-inch pipe within the existing Leidy Line A trench. This was Transco's initial planned alignment as it is the straightest and shortest route between the Hensel Replacement start and end points. Table 2-5 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 1. This alternative would require construction of 0.5 mile less pipeline than the proposed Hensel Replacement. In addition, the alternative would cross approximately 2.8 miles less forested land than the proposed route. However, Hensel Replacement Alternative 1 would involve surface disturbance (i.e., open cut) along 0.8 mile of the Tamarack Swamp Natural Area and adjacent wetlands. The surface disturbance associated with crossing the Tamarack Swamp Natural Area and adjacent wetlands would also require ATWS south of the existing Leidy Line B, resulting in additional tree clearing.

Table 2-5
Hensel Replacement Alternative 1 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 1	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	5.8	+0.5
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.8	+0.2
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.8	+0.5

Table 2-5
Hensel Replacement Alternative 1 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 1	Difference between Proposed Route and Alternative Route
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	55.9	+15.8
Pipeline Operation Requirements (acres)[b]	6.0	0.0	+6.0
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0	0.5	-0.5
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	3.3	-3.3
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	2.9	-2.9
Land Use			
Forested Land Crossed (miles)[c]	4.6	1.8	+2.8
Forested Land Construction Impacts (acres)[c]	52.3	20.9	+31.4
Forested Land Operation Impacts (acres)[c]	3.6	0.0	+3.6
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, i]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.6	-0.5
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	0.7	-0.6
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	0.2	-0.2
Sensitive Wetlands Crossed (number) [i]	3	1	+2

Table 2-5
Hensel Replacement Alternative 1 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 1	Difference between Proposed Route and Alternative Route
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	8	+3
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	0.0

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on a preliminary permanent ROW developed for comparison of alternatives.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

3.2.2.2 Hensel Replacement Alternative 2

Hensel Replacement Alternative 2 makes use of a horizontal directional drill (HDD) to avoid trenching through the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 2 includes replacement of approximately 4.7 miles of

the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximate MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 2, Transco would complete a 0.8-mile HDD installation of 36-inch pipe from MP 192.93 to MP 193.74 near the current alignment of Leidy Line A across the Tamarack Swamp Natural Area. From MP 193.74 to the Leidy Hub, Transco would replace the remaining 0.3 mile within the existing Leidy Line A ROW. Table 2-6 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 2.

Table 2-6
Hensel Replacement Alternative 2 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 2	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	5.9	+0.4
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.4	+0.6
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.4	+0.7
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	63.3	+8.4
Pipeline Operation Requirements (acres)[b]	6.0	35.6	-29.6
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.5	-0.5
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			
Forested Land Crossed (miles)[c]	4.6	2.2	+2.4
Forested Land Construction Impacts (acres)[c]	52.3	30.2	+22.1
Forested Land Operation Impacts (acres)[c]	3.6	13.8	-10.2
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0

Table 2-6
Hensel Replacement Alternative 2 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 2	Difference between Proposed Route and Alternative Route
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.3	-0.2
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	0.7	-0.6
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	0.5	-0.5
Sensitive Wetlands Crossed (number) [l]	5	4	+1
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	7	+4
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

Table 2-6
Hensel Replacement Alternative 2 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 2	Difference between Proposed Route and Alternative Route

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 2 would require construction of 0.4 mile less pipeline than the proposed Hensel Replacement. Additionally, Hensel Replacement Alternative 2 would avoid surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands. No tree clearing within the Tamarack Swamp Natural Area would be required for construction of Hensel Replacement Alternative 2. However, tree clearing and wetland impacts would be unavoidable to complete the geotechnical studies necessary to determine the feasibility of an HDD associated with this alternative. PADCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for this alternative; as such, Transco did not pursue additional analysis related to the impacts associated with the geotechnical studies.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 2 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the Tamarack Swamp Natural Area. In order to complete the HDD, ATWS would be required for staging of the HDD

equipment and a pullback area for the pipe. The workspaces would require tree clearing outside of Transco's existing ROW.

Transco performed a preliminary HDD feasibility analysis for the Hensel Replacement Alternative 2 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells., and a gas storage well facility operated by Dominion Energy, Inc. Transco typically avoids siting HDD alignments near existing water and gas storage wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered noise-sensitive areas (NSAs). Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The HDD feasibility analysis used desktop information from the Natural Resource Conservation Service (NRCS) and USGS to evaluate geologic conditions (NRCS 2018). The desktop analysis indicated that the likelihood of encountering challenging soils, such as glacial till, in the Project area is very high. Glacial till consists of variable soil types—specifically, interbedded gravel, cobbles, and boulders. The presence of glacial till deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns, ultimately putting the HDD at risk for failure.

3.2.2.3 Hensel Replacement Alternative 3

Hensel Replacement Alternative 3 makes use of an HDD to avoid trenching through the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 3 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximate MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 3, Transco would complete an HDD across the Tamarack Swamp Natural Area westward for approximately 0.7 mile from MP 192.93 to MP 193.55. From the end of the HDD, Alternative 3 would follow the alignment of the proposed Hensel Replacement for 0.7 mile to its terminus at the Leidy Hub. Table 2-7 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 3.

Table 2-7
Hensel Replacement Alternative 3 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 3	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	6.1	+0.2
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.5	+0.5
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.5	+0.8
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	60.1	+11.6
Pipeline Operation Requirements (acres)[b]	6.0	37.1	-31.1
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 4.8	0 / +0.7
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.3	-0.3
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			
Forested Land Crossed (miles)[c]	4.6	2.2	+2.4
Forested Land Construction Impacts (acres)[c]	52.3	26.6	+25.7
Forested Land Operation Impacts (acres)[c]	3.6	14.8	-11.2
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0

Table 2-7
Hensel Replacement Alternative 3 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 3	Difference between Proposed Route and Alternative Route
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	<0.1	0.0
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	1.9	-1.8
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	1.8	-1.8
Sensitive Wetlands Crossed (number) [l]	3	1	+2
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	9	+2
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

Table 2-7
Hensel Replacement Alternative 3 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 3	Difference between Proposed Route and Alternative Route

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 3 would require construction of 0.2 mile less pipeline than the proposed Hensel Replacement. Hensel Replacement Alternative 3 avoids pipeline trenching within the Tamarack Swamp Natural Area by utilizing an HDD through this area. However, Transco would need to collect geotechnical bores within the natural area and adjacent wetlands to further investigate the feasibility of an HDD crossing. The HDD alignment through the natural area is a mixture of Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS) and Palustrine Forested (PFO) wetlands. Consequently, in order to gain access to geotechnical bore locations, approximately 1.1 acres of wetlands within Tamarack Swamp Natural Area would be impacted. In comparison, the proposed Hensel Replacement would not require any geotechnical studies or tree clearing within the Tamarack Swamp Natural Area.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 3 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the swamp. In order to

complete the HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. Similar to Hensel Replacement Alternative 2 above, the workspace needed would require tree clearing outside of Transco's existing ROW. While no permanently cleared ROW would be needed through the Tamarack Swamp Natural Area, Transco would need to obtain a License for Right-of-Way on State Forest Land for the pipeline.

Due to the alignment of the HDD of Hensel Replacement Alternative 3, Transco could use the existing Leidy Lines A and B ROW for the HDD pullback area. The workspaces would require tree clearing outside of Transco's existing ROW. Hensel Replacement Alternative 3 would require new permanent ROW across the Tamarack Swamp Natural Area and adjacent wetlands, and within the natural area portion of the Foley Tract[1], a USFWS migratory bird habitat area.

Transco performed a preliminary HDD feasibility analysis for Alternative 3 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells. Transco typically avoids siting HDD alignments near existing water wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered NSAs. Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The desktop analysis of the HDD alternatives used information from NRCS and USGS to evaluate geologic conditions (NRCS 2018). Based on the information from NRCS and USGS, the likelihood of challenging soils, such as glacial till, is very high. Glacial till consists of variable soil types, specifically interbedded gravel, cobbles, and boulders. The presence of glacial till

[1] The Foley Tract was acquired by the DCNR in 2003, and portions of the tract are proposed for inclusion in the Tamarack Swamp Natural Area. Transco's existing easement across the Foley Tract is 75 feetwide, with rights for an additional 25 feet of temporary workspace for the construction of an additional line. Transco is not seeking modifications to its existing easement.

deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns; ultimately putting the HDD at risk for failure.

3.2.2.4 Hensel Replacement Alternative 4

Hensel Replacement Alternative 4 makes use of an HDD to avoid trenching through to the Tamarack Swamp Natural Area and maximize use of the Leidy Line A ROW. Hensel Replacement Alternative 4 includes replacement of approximately 4.7 miles of the existing 23.375-inch Leidy Line A with 36-inch pipe within the Leidy Line A ROW from MP 188.15 to approximately MP 192.93 near the entrance to the Tamarack Swamp Natural Area.

Under Hensel Replacement Alternative 4, Transco would complete an HDD across the Tamarack Swamp Natural Area northwestward for approximately 0.7 mile from MP 192.93 to MP 193.78. From the end of the HDD, Alternative 4 would parallel Leidy Line A and Leidy Line B for 0.3 mile its terminus at the Leidy Hub. Table 2-8 provides a comparison between the proposed Hensel Replacement and Hensel Replacement Alternative 4.

Table 2-8
Hensel Replacement Alternative 4 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 4	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	5.8	+0.5
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	5.2	+0.8
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.0	0.0
Total Length Co-located (miles)	6.3	5.2	+1.1
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	62.8	+8.9
Pipeline Operation Requirements (acres)[b]	6.0	35.0	-29.0
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.5	-0.5
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			

Table 2-8
Hensel Replacement Alternative 4 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 4	Difference between Proposed Route and Alternative Route
Forested Land Crossed (miles)[c]	4.6	1.8	+2.8
Forested Land Construction Impacts (acres)[c]	52.3	23.7	+28.6
Forested Land Operation Impacts (acres)[c]	3.6	11.7	-8.1
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	0.0	+1.9
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	0	0
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	4	+1
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	4	+1
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.6	-0.5
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	3.5	-3.4
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	3.3	-3.3
Sensitive Wetlands Crossed (number) [l]	3	1	+2
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	8	+3
Railroad Crossings (number)	0	0	0
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	2.3	-1.4
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

Table 2-8
Hensel Replacement Alternative 4 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 4	Difference between Proposed Route and Alternative Route

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement will be further refined through agency consultations and field surveys.

[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.

[c] Forested land crossed and impacted based on USGS NLCD.

[d] Agricultural land crossed and impacted based on USGS NLCD.

[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.

[f] Waterbodies identified based on NHD.

[g] Major waterbodies identified based on review of aerial photographs.

[h] Wetlands identified using the NWI.

[i] National Registered sites were identified using desktop data.

[j] Length determined perpendicular to slope contour.

[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.

[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:

NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

Hensel Replacement Alternative 4 would require construction of 0.5 mile less pipeline than the proposed Hensel Replacement. Additionally, Alternative 4 would avoid surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands. No tree clearing within the Tamarack Swamp Natural Area would be required for construction of Hensel Replacement Alternative 4. However, tree clearing and wetland impacts would be unavoidable to complete the geotechnical studies necessary to determine the feasibility of an HDD associated with this alternative. PADCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for this alternative. As such, Transco did not pursue additional analysis related to the impacts associated with the geotechnical studies.

Because of the bend in the existing Leidy Line A ROW in the Tamarack Swamp Natural Area, Hensel Replacement Alternative 4 would need to deviate from the existing ROW to set up straight sections of pipeline where an HDD could be completed across the Tamarack Swamp Natural Area. Similar to Hensel Replacement Alternative 2 and 3 above, in order to complete the

HDD, ATWS would be required for staging of the HDD equipment and a pullback area for the pipe. The workspaces would require tree clearing outside of Transco's existing ROW. Hensel Replacement Alternative 4 would create a new ROW across the Tamarack Swamp Natural Area and adjacent wetlands. While no permanently cleared ROW would be needed through the Tamarack Swamp Natural Area, Transco would need to obtain a License for Right-of-Way on State Forest Land for the pipeline.

Transco performed a preliminary HDD feasibility analysis for the Alternative 4 using desktop data. The analysis used publicly available information to assess surrounding land uses, including residential areas and geologic conditions. The HDD would require HDD equipment set-up and staging at the western drill terminus near residences along PA Route 144, due to existing utility pipelines. The proximity of an HDD alignment to adjacent residences could result in noise impacts related to drill activity. Transco anticipates that this large diameter HDD would result in longer construction duration in that area, magnifying the potential noise impacts. Additionally, the alignment has the potential to pose a risk to adjacent residential private water wells, and a gas storage well facility operated by Dominion Energy, Inc. Transco typically avoids siting HDD alignments near existing water wells and gas storage wells to avoid impacts on these features. In addition, the contractor staging areas for drilling, reaming, and pull-back equipment would be near residences, which are considered NSAs. Unlike typical pipeline construction methodology, HDD construction would require approximately four to six months of continuous work to complete the HDD, increasing impact duration within Sproul State Forest and to potential nearby residences.

The HDD feasibility analysis used desktop information from the NRCS and USGS to evaluate geologic conditions (NRCS 2018). The desktop analysis indicated that the likelihood of encountering challenging soils, such as glacial till, in the Project area is very high. Glacial till consists of variable soil types, specifically interbedded gravel, cobbles, and boulders. The presence of glacial till deposits can contribute to HDD hole instability, drill bit steering issues, hydraulic fracture, and inadvertent returns, ultimately putting the HDD at risk for failure.

3.2.2.5 Hensel Replacement Alternative 5

Hensel Replacement Alternative 5 is primarily located on the Sproul State Forest (see Table S3.F-9 and Figure 10A-6). Hensel Replacement Alternative 5 would follow Transco's Leidy Line A, Leidy Line B, and Leidy Line C ROW for approximately 3.1 miles, from MP 188.51 to 190.58. From here, Hensel Replacement Alternative 5 would deviate from the Leidy Line A and

Leidy Line B ROW and follow Transco's Leidy Line C ROW for approximately 3.0 miles before terminating at the Leidy Hub

Transco considered this alternative to avoid the Tamarack Swamp Natural Area, which crosses the Leidy Line A and Leidy Line B ROW from MP 192.93 to 193.74. This alternative would require construction of 0.2 mile less pipeline than the proposed Hensel Replacement. Both routes would have similar impacts to forested areas, wetlands and waterbodies.

Table 2-9
Hensel Replacement Alternative 5 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 5	Difference between Proposed Route and Alternative Route
Length of Corresponding Segment (miles)	6.3	6.1	+0.2
Co-location			
Length Adjacent to Interstate Pipeline ROW (miles)	6.0	6.1	-0.1
Length Adjacent to Midstream Pipeline ROW (miles)	0.0	0.0	0.0
Length Adjacent to Electric Transmission Line ROW (miles)	0.3	0.0	+0.3
Length Adjacent to Roadway (miles)	0.0	0.6	-0.6
Total Length Co-located (miles)	6.3	6.1	+0.2
ROW Requirements			
Pipeline Construction Requirements (acres)[a]	71.7	93.1	21.4
Pipeline Operation Requirements (acres)[b]	6.0	37.0	-31.0
Federal and State Land			
Federal Lands Crossed (number/miles)	0 / 0.0	0 / 0.0	0 / 0.0
State Lands Crossed (number/miles)	1 / 5.5	1 / 5.3	0 / +0.2
Tamarack Swamp Natural Area Crossed (miles)	0.0	0.0	0.0
Tamarack Swamp Natural Area Construction Impacts (acres)	0.0	0.0	0.0
Tamarack Swamp Natural Area Operation Impacts (acres)	0.0	0.0	0.0
Land Use			
Forested Land Crossed (miles)[c]	4.6	2.8	+1.8
Forested Land Construction Impacts (acres)[c]	52.3	51.5	+0.8
Forested Land Operation Impacts (acres)[c]	3.6	17.5	-13.9
Agricultural Land Crossed (miles)[d]	0.2	0.0	+0.2
Agricultural Land Construction Impacts (acres)[d]	1.9	2.2	-0.3
Agricultural Land Operation Impacts (acres)[d]	0.4	0.0	+0.4
Residences within 50 feet of the construction workspace[e]	0	1	-1

Table 2-9
Hensel Replacement Alternative 5 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 5	Difference between Proposed Route and Alternative Route
Landfills, quarries, and other mining operations within 0.25 mile (number)	0	0	0
Waterbodies			
Waterbodies Crossed (number)[f]	5	3	+2
Major Waterbody Crossings (number >100 feet)[g]	0	0	0
Sensitive Waterbodies Crossed (number) [f, l]	5	3	+2
Wetlands			
Total Wetland Complexes Crossed (number)[h]	3	1	+2
Total Wetland Crossed (miles)[h]	<0.1	0.1	-0.1
Palustrine Forested Wetland Complex Construction Impacts (acres)[h]	0.1	0.2	-0.1
Palustrine Forested Wetland Complex Operation Impacts (acres)[h]	0.0	0.1	-0.1
Sensitive Wetlands Crossed (number) [l]	3	1	+2
Cultural Resources			
National Register of Historic Places Eligible or Potentially Eligible Cultural Resources Sites Crossed (number)[i]	0	0	0
Other Physical Features			
Road Crossings (number)	11	8	+3
Railroad Crossings (number)	0	0	0

Table 2-9
Hensel Replacement Alternative 5 Comparison

Factor	Proposed Hensel Replacement	Hensel Replacement Alternative 5	Difference between Proposed Route and Alternative Route
Other Environmental Features			
Steep Slopes Crossed (30 degrees or greater) (miles)[j]	0.9	0.9	0.0
Side Slope Construction (miles)[k]	0.0	0.2	-0.2

[a] Pipeline construction requirements based on a preliminary temporary construction ROW developed for comparison of alternatives. Temporary construction ROW for the Hensel Replacement Alternative 5 includes potential workspace needed for abandonment of Leidy Line A.
[b] Pipeline operation requirements based on an assumed 50-foot-wide corridor.
[c] Forested land crossed and impacted based on USGS NLCD.
[d] Agricultural land crossed and impacted based on USGS NLCD.
[e] Residences identified based on review of aerial photographs; in cases where it was not clear if a structure was a residence or other structure (e.g., barn and storage facility), the structure was assumed to be a residence.
[f] Waterbodies identified based on NHD.
[g] Major waterbodies identified based on review of aerial photographs.
[h] Wetlands identified using the NWI.
[i] National Registered sites were identified using desktop data.
[j] Length determined perpendicular to slope contour.
[k] Length determined parallel with slope contour. Developed using USGS 10-foot contours.
[l] See RR 2, Section 2.3.4 for additional detail on sensitive water resources.

Key:
NHD = National Hydrography Dataset
NLCD = National Land Cover Data
NWI = National Wetland Inventory
ROW = right of way
SSURGO = Soil Survey Geographic Database
USGS = U.S. Geological Survey

The proposed Hensel Replacement was selected over Hensel Replacement Alternative 5 because it provides the opportunity to install the proposed Leidy Line D and remove a portion of the existing Leidy Line A within the same proposed workspaces, reducing overall impacts within Sproul State Forest. Transco is also able to meet DCNR's request to regrade a portion of the Leidy Line A and Leidy Line B ROW to approximate original contours within the workspace of the proposed alignment, which would not be possible under Hensel Replacement Alternative 5.

3.2.2.6 Hensel Replacement Conclusion

Transco used desktop analysis and identified the need to avoid disturbance to the Tamarack Swamp Natural Area, adjacent wetlands, and other resources including Sproul State Forest. Transco subsequently considered a number of route alternatives which avoided and/or

minimized impacts to these resources, both through the use of HDD technology (Alternatives 2, 3, and 4), and by deviating from the Leidy Line A ROW (Alternative 5). Transco coordinated with DCNR throughout the final route selection process and ultimately identified a proposed alignment that avoids the Tamarack Swamp Natural Area while also minimizing overall impacts to the Sproul State Forest. Additional discussion regarding Transco's final evaluation of each Hensel Replacement alternative is provided below

Hensel Replacement Alternative 1 was eliminated due to the required surface disturbance within the Tamarack Swamp Natural Area and adjacent wetlands.

Hensel Replacement Alternatives 2, 3, and 4, each of which include an HDD crossing of the Tamarack Swamp Natural Area and adjacent wetlands, were eliminated for a number of reasons. As previously discussed, desktop data indicate a risk of encountering problematic soils and bedrock along the HDD alignment of each alternative, which increases the risk of drill failure and/or inadvertent returns. Further investigation to determine drill feasibility would include geotechnical studies within the Tamarack Swamp Natural Area. These geotechnical studies would require surface disturbance and tree removal within the Tamarack Swamp Natural Area and adjacent wetlands. As such, Transco does not propose geotechnical studies to further investigate the HDD alternatives.

An HDD crossing of the Tamarack Swamp Natural Area would also result in greater impacts to residential areas compared to the proposed Hensel Replacement due to the HDD workspace requirements, while the HDD alignment itself would pose a risk to residential private water wells. Furthermore, the HDD alignments for Hensel Replacement Alternatives 2 and 4 would be in proximity to a gas storage well facility operated by Dominion Energy, Inc. Finally, the DCNR expressed concerns related to the length of HDD required across the Tamarack Swamp Natural Area for Alternatives 2 and 4. While the DCNR did not express concerns related to the length of the Alternative 3 HDD, Transco eliminated this alternative from further consideration based on the additional impacts associated with the required geotechnical studies.

In conclusion, based on the above analysis, Transco believes that the proposed Hensel Replacement provides the greatest opportunity to avoid and minimize environmental impacts to Sproul State Forest in comparison to any of the HDD alternatives.

3.2.3 Leidy A Line Abandonment Alternatives

Transco considered three methodologies for abandonment of the existing Leidy Line A associated with the Hensel Replacement. All options would be designed in accordance with USDOT regulations in 49 CFR Part 192, *Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards.* The three alternative methodologies are:

- **Removal** – physical removal of the abandoned portion of the pipeline;
- **Nitrogen Purge** – leave the pipeline in place, and purge the abandoned portion of pipeline of gas using nitrogen; and
- **Grouting** – filling the abandoned portion of the pipeline with grout.

Removal of the pipeline would require excavation along the entire abandonment. All environmental resources within the section of abandonment would be temporarily impacted, including the Tamarack Swamp Natural Area. If the pipeline was removed, a portion of the existing ROW could be reforested.

Nitrogen purging would require the least amount of disturbance initially during abandonment; however, purging would require Transco to continue maintaining the existing pipeline and associated cathodic protection system. In addition, the nitrogen purging reduces the ability for the existing ROW to be reforested.

Grouting the pipeline would require temporary excavation in various locations along the abandonment for installation of grout. The proposed locations for excavation would be selected following a field survey and would be sited to minimize impacts on environmentally sensitive resources to the extent practical. Once the pipeline is grouted, the pipeline would no longer require maintenance or cathodic protection. This alternative also provides the ability for a portion of the existing ROW to be reforested since the pipeline would no longer be maintained and would require less disturbance than a full pipeline removal.

3.2.3.1 Leidy A Line Abandonment Conclusion

In order to minimize impacts to the extent practicable and through coordination with PADCNR during the License for ROW on State Forest Land permitting process, Transco selected a combination of removal and grouting as the proposed methodology for the Leidy Line A abandonment. Prior to the abandonment, Leidy line A will be cleaned internally with cleaning pigs outfitted with magnets & brushes designed to scrub the inside of the pipe and collect lose ferrous

material. The cleaning process with be documented. Once the pipe has been cleaned, the line will be purged of natural gas and either removed in sections or abandoned in place. The sections of Leidy line A abandoned in place will be sealed on each end and purged with grout.

As requested by the DCNR, Transco plans to regrade the portion of the Leidy Lines A and B ROW from MP 191.10 to 192.55. The ROW in this area is "two-toned," with the grade over Leidy Line A ranging approximately 20 to 40 feet higher in elevation than the grade over Leidy Line B. Transco will regrade the ROW in this area to restore approximate original contours along this portion of the ROW. Because Transco will already be conducting ground-disturbing activities in this area to meet the DCNR's request, Transco is proposing to remove the existing Leidy Line A, with the exception of the portion of the Leidy Line A within the Tamarack Swamp Natural Area and adjacent wetlands (approximately 0.8 mile), which will be abandoned in place and grouted. In addition, the DCNR expressed a preference for pipeline removal or grouting during a pre-survey meeting and site visit with the DCNR on April 19, 2019.

4.0 Impact Minimization of the Proposed Alternative

4.1 Pipeline Workspace

Construction of the pipeline facilities will require the acquisition of temporary construction ROWs, additional temporary workspace (ATWS), and permanent (operational) easements along the entire length of each pipeline route. Transco proposes to utilize the following nominal ROWs during construction of the pipeline facilities:

- A 90-foot-wide construction ROW for installation of the 36-inch-diameter Hensel Replacement, including removal of a portion of Leidy Line A;
- A 90-foot-wide construction ROW for installation of the 36-inch-diameter Hilltop Loop; and

The Hilltop Loop is entirely co-located with the existing Transco Leidy Line System. The Hensel Replacement is co-located for 95 percent of its length. Transco proposes the construction ROWs to provide for safe and efficient construction of large diameter pipeline facilities in accordance with OSHA regulations (29 CFR 1926.650-1926.652, Subpart P) and Interstate Natural Gas Association of America's (INGAA's) workspace guidelines (INGAA 1999). Reductions or "neck-downs" of the construction ROW at resource crossings were employed to avoid and minimize resource impacts.

In wetlands, a 75-foot-wide construction ROW will be used, except where Transco has requested provided site-specific justification, as outlined in Table 3-1. During pipeline

construction, machinery operates on one side of the trench (working side), and excavated materials is stockpiled on the other side (non-working side). At most wetland crossings, this workspace has been necked down to 75 feet. In a reduced 75-foot-wide ROW, the proposed working side of the ROW is typically 45 feet wide.

Table 3-1
Site-Specific Justification for Exceeding 75-foot Nominal Workspace in Wetlands

Facility	Wetland Feature ID	Approximate Milepost	Feature Type	ROW Width	Justification
Hensel Replacement					
	W3-T1-HR	193.64	Wetland	90	This particular wetland crossing is at a location along the Hensel Replacement alignment where the proposed route is between two active pipelines, one being a foreign pipeline. Due to length of wetland crossing and being between the two active pipelines the full 90' nominal workspace is necessary to facilitate a safe and efficient wetland crossing.
Hilltop Loop					
	W3-T7a-HL	183.55	Wetland	315	This wetland crossing abuts an existing valve site which is proposed for removal located at the eastern terminus of Hilltop Loop. Due to limited access, the proximity of the wetland to the eastern terminus of the project, and the proposed removal of the location existing valve site, the wetland impact is unavoidable.
	W1-T4-HL	184.93	Wetland	175	Due to being located at toe of steep slope and adjacent to large stream crossings (Young Womans Creek) and associated foreign lines, additional workspace is required due to limited space between these restricting features.
	W3-T2-HL	185.05	Wetland	145	Due to the location of the roadside wetland swale feature associated with Little Italy Road, additional workspace is required due to limited usable workspace between steep slopes, including two road crossings, additional workspace is needed for stockpiling of excavated materials and installing BMPs to facilitate safe and efficient crossings at this location.

Within the top of bank (TOB) of streams, a 50-foot-wide construction ROW will be used, and a 75-foot-wide construction ROW will be used in floodways, except where Transco has provided site-specific justification, as outlined in Table 3-2. During pipeline construction, machinery operates on one side of the trench (working side), and excavated materials is stockpiled on the other side (non-working side). At most stream crossings, this workspace has been necked down to 50 feet within the TOB and 75 feet in the floodway. Within TOB, in a reduced 50-foot-wide ROW, the proposed working side of the ROW is typically 32 feet wide. Within floodways, in a reduced 75-foot-wide ROW, the proposed working side of the ROW is typically 45 feet wide.

Table 3-2
Site-Specific Justification for Exceeding 50-foot Nominal Workspace in the Top of Bank of Streams and 75-foot in Floodways

Facility	Watercourse Feature ID	Approximate Milepost	Feature Type	ROW Width	Justification
Hensel Replacement					
	S12-T6-HR	189.05	Stream	75	Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing.
	S9-T6-HR	190.36	Stream	75	Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing.
	S7-T7-HR	190.47	Stream	75	Due to steep terrain, installation of Hensel Replacement, and removal of Leidy Line A. Additional workspace is needed to facilitate a safe and efficient watercourse crossing.
	S1-T7-HR	190.69	Stream & Floodway	90	Due to steep terrain including side slope construction, associated wetlands crossing and associated BMPs, installation of Hensel Replacement, and removal of Leidy Line A, additional workspace is needed to facilitate a safe and efficient watercourse crossing.

Table 3-2
Site-Specific Justification for Exceeding 50-foot Nominal Workspace in the Top of Bank of Streams and 75-foot in Floodways

Facility	Watercourse Feature ID	Approximate Milepost	Feature Type	ROW Width	Justification
	S1-T7-HR	190.99	Stream & Floodway	75 (Stream) 115 (Floodway)	Due to steep terrain including side slope construction, associated wetlands crossing and associated BMPs, installation of Hensel Replacement, and removal of Leidy Line A, additional workspace is needed to facilitate a safe and efficient watercourse and floodway crossing.
	S1-T1-HR	193.88	Stream	75	This particular stream crossing is at a location along the Hensel Replacement alignment where the proposed route is adjacent to other active pipelines, and the crossing of associated large wetland complex (W1-T1-HR) to the south, additional workspace is needed to facilitate a safe and efficient watercourse crossing.
Hilltop Loop					
	S1-T4-HL	184.97	Stream & Floodway	90 (Stream) 300 (Floodway)	Due to steep terrain on either side of crossing location, existing infrastructure, foreign lines, two road crossings, size of Young Womans Creek, associated wetland crossings, and lack of available usable workspace, additional workspace is needed to facilitate a safe and efficient watercourse crossing.

These wetland, stream, and floodway workspace neck downs are the most reasonable neck downs for pipeline installation within these resources, as it will still allow for required workspace to complete the construction activities while minimizing environmental impacts. These reductions to the workspace are considered the maximum reductions for the safe operation and passage of equipment and personnel while minimizing the length of time required to cross the features.

4.1.1 Construction Technique Alternatives

Transco evaluated the feasibility of implementing trenchless construction techniques to cross sensitive areas. These techniques may be used in an attempt to reduce impacts associated with construction in comparison with using conventional (trenching) construction techniques.

While use of trenchless methods can reduce impacts on or avoid sensitive areas, these methods have limitations that must be considered before a method is selected as the proposed construction method for a given crossing. The following sections outline the factors that will be evaluated when selecting the proposed construction method for a given crossing.

4.1.1.1 Trenchless Analysis

A trenchless analysis was conducted for each wetland and watercourse crossing to determine if conventional bore (bore) or horizontal directional drill (HDD) would be feasible construction method. Each crossing was first assessed to determine if conventional bore would be the suitable construction method. The conventional bore is first reviewed since it is a lower cost and lower risk trenchless method than the HDD. If a conventional bore is feasible, a review for HDD suitability was not completed. If it was determined that conventional boring was not feasible, an assessment was then completed to determine if an HDD would be a feasible construction method. Should neither trenchless method has been found suitable, it was then determined that a dry-open cut methodology would be completed. Below is a summary of the trenchless analysis for both the conventional bore and HDD. Attachment 1 includes a flow chart that is utilized during the trenchless analysis.

<u>Conventional Bore Analysis</u>

Conventional bores are not practical for avoiding wetland resources. To complete a conventional bore, a significant amount of workspace required for the activity. Clearing within the permanent ROW is required during pipeline operation to ensure that root systems of trees do not compromise the pipe coating, and to allow for aerial inspection of the alignment, whether an open cut or conventional bore is used. Additionally, wetlands would need to be cleared during construction for a travel lane to facilitate movement of construction equipment along the ROW. Therefore, even if a conventional bore were completed, there would be minimal impact reductions to the resource by utilizing the conventional bore installation method versus an open-cut and there would be significant increases in impacts to resources outside of the wetlands to accommodate the workspace required for a conventional bore. Therefore, conventional bores are not practical for avoiding wetland resources and Transco did not select the conventional bore crossing technique for wetland crossings associated with this Project.

For streams, the conventional bore assessment occurred in phases, as shown in Attachment 1. Phase I of the stream assessment included a topography evaluation that considered the bore length and depth of each crossing, in addition to proximity to adjacent

infrastructure, such as roads. If the bore was less than 300 feet in length, it was considered potentially feasible. The typical maximum length that a conventional bore can be successfully completed is 300 feet. Should the length be longer than 300 feet, the crossing moved on to the HDD assessment. The 300 feet includes the stream, wetland, and floodway widths, with 20 feet offset, in addition to the bore pit dimensions, which are generally 40 feet by 60 feet in size.

The bore pit depth was evaluated, as special considerations must occur if a bore pit exceeds 20 feet. At depths greater than 20 feet, standard trench boxes are not tall enough to protect the integrity of the pit walls, and significant benching and spoil storage will be required, thereby necessitating a significantly larger footprint for workspace. Therefore, conventional bores were not considered for crossings where the depth of the bore pit would be greater than 20 feet.

If a feature is in the immediate vicinity of existing infrastructure, such as roadways that are proposed for boring, a conventional bore is considered appropriate. The construction method can be completed for both crossings (stream and/or wetland and infrastructure) as the boring can capture both features within the same bore, given their close proximity and that the adjacent roadway must be bored.

Streams and wetlands associated with the Hensel Replacement and Hilltop Loop were not deemed feasible for the conventional bore.

Horizontal Directional Drilling Analysis

Phase I of the wetland assessment involved feature characteristic review of the wetlands as well as the total acreage of PFO wetland impacted at the crossing. There were two qualifiers for HDD workspace to be developed related to wetland impacts: the wetlands are either to be located within a special protection watershed or classified as Exceptional Value (EV) in 25 PA Code Chapter 105.17. Due to the temporary nature of impacts, wetlands located outside of special protection watersheds or not classified as EV were not considered in Phase I of the wetland assessment. The qualifying wetlands were then reviewed for their acreage of PFO wetland impact. Crossings with PFO wetland impacts exceeding one acre, along with location in a special protection watershed or an EV wetland status move on to the Phase III of the assessment (there is no Phase II of the wetland assessment) and potential HDD workspace would be developed. Wetlands designated either PEM or PSS were not identified for potential HDD workspace development as no vegetative cover type change occurs in PEM wetlands and only minimal changes occur PSS wetlands due to the 10-foot corridor over the pipe being maintained as

emergent cover to allow for pipeline inspection. PFO wetland crossings with impacts of less than one acre were not identified for Phase III or Phase IV consideration because the risks and impacts (i.e. workspace requirements, noise, and inadvertent returns) associated with an HDD crossing categorically outweigh the benefits in these wetlands. Additionally, the ROW is allowed to revert to pre-existing condition within 15 feet of the pipeline and impacts to PFO wetlands have been minimized to the extent practicable with the workspace, as designed. No wetlands continued past Phase I of the HDD assessment as no wetlands had PFO impacts greater than one acre.

Phase I of the stream assessment involved a feature characteristic review of the streams. Streams located within special protection watersheds were identified for Phase II consideration. All streams crossed by the Project are located within special protection watersheds and were therefore included in the Phase II assessment.

Phase II of the stream assessment considered the width of the streams that passed the Phase I review. Streams greater than 30 feet in width were considered feasible for workspace development to complete an HDD and identified for Phase III and Phase IV consideration. Smaller streams were not identified for Phase III or Phase IV consideration because the risks and impacts (i.e. workspace requirements, noise) associated with an HDD crossing categorically outweigh the benefits in these smaller streams. The dry-open cut methodology is an effective construction methodology that minimizes crossing time and avoids the risk of an inadvertent return. Based on the Phase II review, Young Womans Creek (S1-T4-HL), Drury Run (S2 T7a-HR), Paddy Run (S1-T7-HR), and Hensel Fork (S1-T7-HR at MP.190.69) were identified for Phase III and Phase IV consideration.

Phase III-A of the analysis included a desktop analysis of the following items related to workspace required for the HDD:

- Impacted Wetland Acreage
  - PFO
  - PEM
  - PSS
- Impacted Upland Acreage
- Land Use
- Water Consumption
- Noise generated by construction equipment
- Air emissions generated by construction equipment

- Anticipated construction durations

Phase III-B included a risk assessment for the completion of the HDD. The assessment provides an analysis of the following risk factors:

- Site Constraints and Topographic Considerations
- Elevation Differential and Dry Hole
- Hole Stability
- Obstructions
- Pilot Hole Steering
- Drilling Fluid Loss, Hydraulic Fracture and Inadvertent Returns
- Poor Cuttings Removal
- Hole Obstructions and Flushing
- Downhole Tooling Failure/Loss
- Time of Installation

Based on the Phase III assessment, crossings were not considered infeasible and were not identified for Phase IV consideration, as outlined in Attachment 2 – Trenchless Analysis Feasibility Study. As a result of the HDD component of the Trenchless Analysis, all crossings qualified for the dry-open cut construction.

5.0 Summary

An alternatives analysis has been prepared for the proposed Project, consistent with the requirements of PA Code 105.13(e)(vii). The alternatives analysis has taken a multi-tier approach, first looking at the system alternatives for Project design options, and then taking the selected system design and evaluating the alternatives, avoidance and minimization measures, and construction techniques associated with the proposed alternative design. The Project as proposed has minimized impacts to environmental resources, while meeting the Project goals. Construction measures and methods were thoroughly evaluated to minimize effects to environmental resources, including streams and wetlands. The Project is considered water dependent, as it requires siting within water to fulfill the basic purposes of the Project, as defined by PA Code 105.13(e)(x)(C). Based upon the results of the analysis, the proposed Project meets the Project goals and is consistent with state antidegradation requirements.

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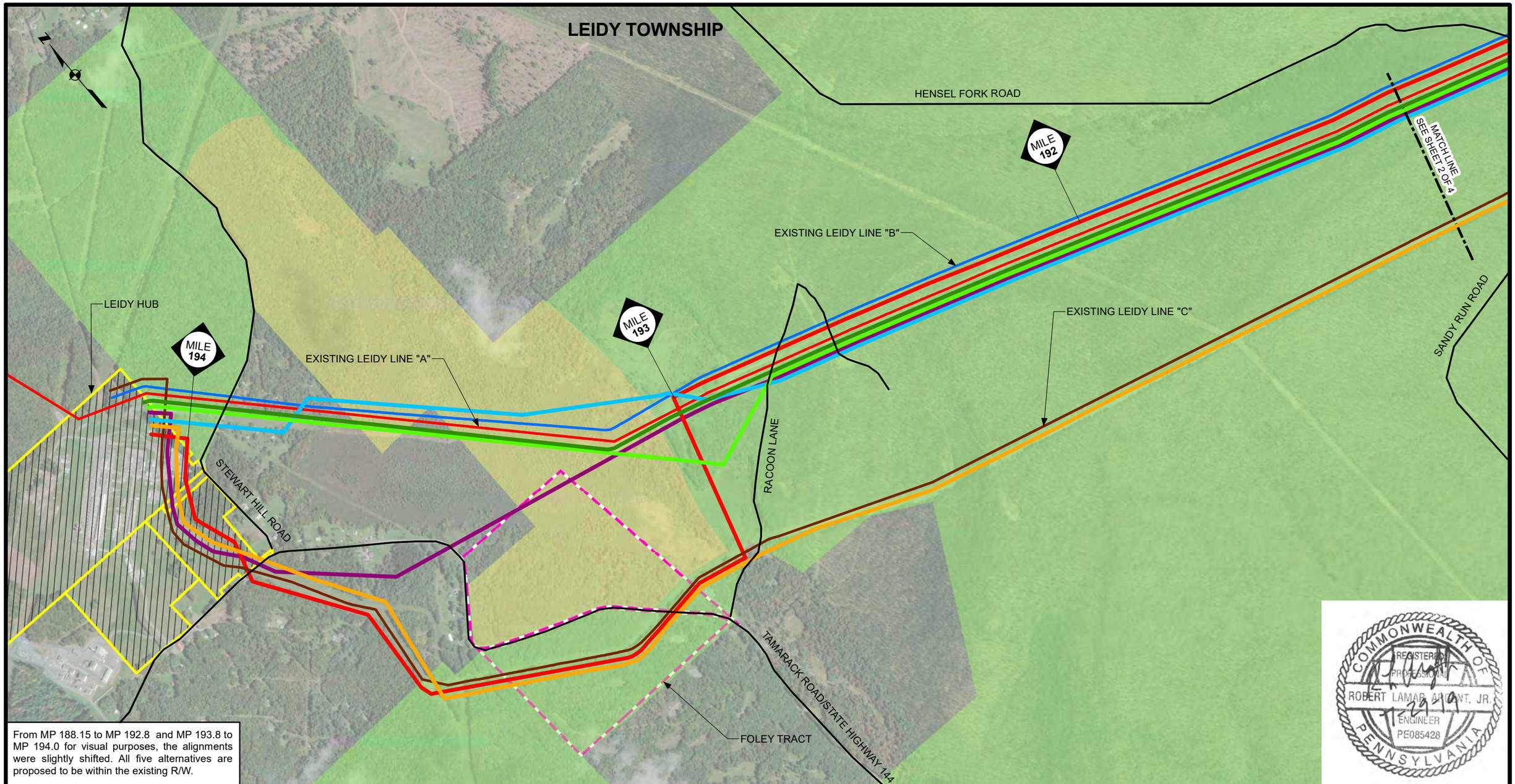
FIGURES



From MP 188.15 to MP 192.8 and MP 193.8 to MP 194.0 for visual purposes, the alignments were slightly shifted. All five alternatives are proposed to be within the existing R/W.

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT LAMAR ARGANT, JR.
ENGINEER
PE085428
2-29-19

Legend

- PROPOSED 36" HENSEL REPLACEMENT
- HENSEL REPLACEMENT ALTERNATIVE 1
- HENSEL REPLACEMENT ALTERNATIVE 2
- HENSEL REPLACEMENT ALTERNATIVE 3
- HENSEL REPLACEMENT ALTERNATIVE 4
- HENSEL REPLACEMENT ALTERNATIVE 5
- LEIDY HUB
- TAMARACK SWAMP NATURAL AREA
- SPROUL STATE FOREST BOUNDARY
- EXISTING LEIDY LINE "A"
- EXISTING LEIDY LINE "B"
- EXISTING LEIDY LINE "C"
- EXISTING LEIDY LINE "D"
- FOLEY TRACT

0 500 1000 1,500 2,000
SCALE IN FEET

0 0.1 0.2 0.4
SCALE IN MILES

HGA
HUNT, GUILLOT & ASSOCIATES, LLC
ONE METROPLEX DRIVE, SUITE 100
BIRMINGHAM, AL 35209
PHONE: 205-970-4977

DRAWING NO.	REFERENCE TITLE
	Figure 10A-6

TRANSCONTINENTAL GAS PIPE LINE, LLC
ROUTE VARIATION MAP-AERIAL
LEIDY SOUTH PROJECT
PROPOSED 36" HENSEL REPLACEMENT
M.P 188.51 TO M.P 194.00
CLINTON COUNTY, PENNSYLVANIA

Williams

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.
A	03/01/2019	HGA	ISSUED FOR REVIEW	1211223		
B	04/12/2019	HGA	ISSUED FOR FERC DRAFT	1211223		
C	04/12/2019	HGA	RE-ISSUED FOR FERC DRAFT	1211223		
D	07/02/2019	HGA	ISSUED FOR FERC FILING	1211223		
E	07/29/2019	HGA	RE-ISSUED FOR FERC FILING	1211223		

DRAWN BY: HGA	DATE: 01/03/2019	ISSUED FOR BID:	SCALE: 1" = 1000'
CHECKED BY: HGA	DATE: 01/03/2019	ISSUED FOR CONSTRUCTION:	REVISION: E
APPROVED BY: HGA	DATE: 01/03/2019	NUMBER: FP-HENS-D_EX	SHEET 1 OF 4
W.O 1211223	RID: 02/11/2019		

LEIDY TOWNSHIP

CHAPMAN TOWNSHIP

EXISTING LEIDY LINE "A"

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "D"

MILE 189

BIG RIDGE TRAIL

EXISTING LEIDY LINE "C"

MILE 190

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "B"

EXISTING LEIDY LINE "A"

MILE 191

CHAPMAN TOWNSHIP

LEIDY TOWNSHIP

HENSEL FORK ROAD

MATCH LINE SEE SHEET 1 OF 4

SANDY RUN ROAD

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT LAMAR ALLGANT, JR.
ENGINEER
PE085428

From MP 188.15 to MP 192.8 and MP 193.8 to MP 194.0 for visual purposes, the alignments were slightly shifted. All five alternatives are proposed to be within the existing R/W.

Legend

- PROPOSED 36" HENSEL REPLACEMENT
- HENSEL REPLACEMENT ALTERNATIVE 1
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- EXISTING LEIDY LINE "C"
- EXISTING LEIDY LINE "D"
- FOLEY TRACT

0 500 1000 1,500 2,000
SCALE IN FEET

0 0.1 0.2 0.4
SCALE IN MILES

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TRANSCONTINENTAL GAS PIPE LINE, LLC
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PROPOSED 36" HENSEL REPLACEMENT
M.P 188.51 TO M.P 194.00
CLINTON COUNTY, PENNSYLVANIA

Williams

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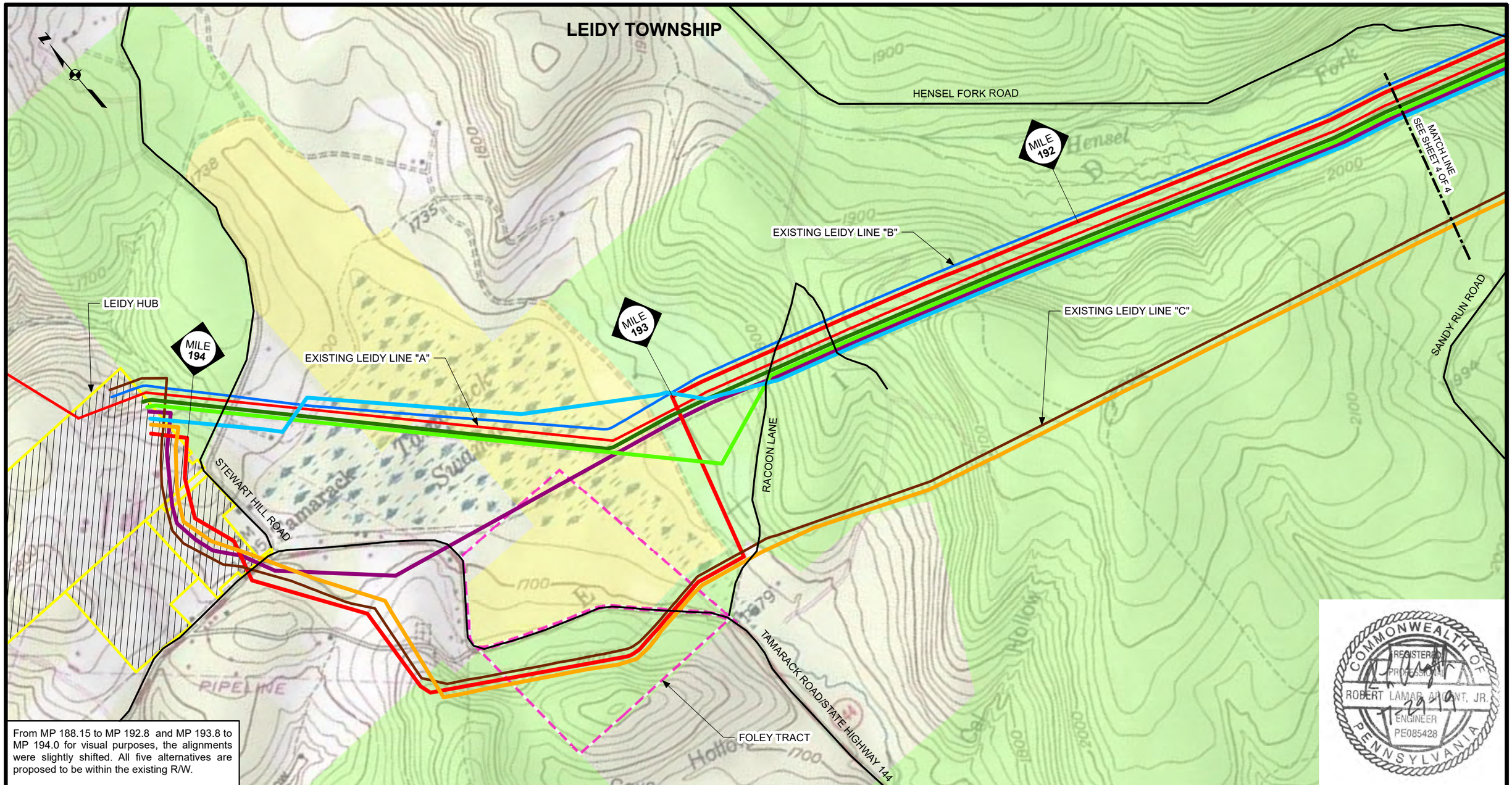
W.O 1211223	RID: 02/11/2019		



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COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
ROBERT LAMAR ARGENT, JR.
ENGINEER
PE085428
7-29-19

Legend

- PROPOSED 36" HENSEL REPLACEMENT
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- FOLEY TRACT

0 500 1000 1,500 2,000
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TRANSCONTINENTAL GAS PIPE LINE, LLC
ROUTE VARIATION MAP-TOPOGRAPHIC
LEIDY SOUTH PROJECT
PROPOSED 36" HENSEL REPLACEMENT
M.P 188.51 TO M.P 194.00
CLINTON COUNTY, PENNSYLVANIA

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APPROVED BY: HGA	DATE: 01/03/2019	NUMBER: FP-HENS-D_EX	SHEET 3 OF 4
W.O 1211223	RID: 02/11/2019		

LEIDY TOWNSHIP

CHAPMAN TOWNSHIP

EXISTING LEIDY LINE "A"

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "D"

MILE 189

BIG RIDGE TRAIL

EXISTING LEIDY LINE "C"

MILE 190

PFOUTZ VALLEY ROAD

EXISTING LEIDY LINE "B"

EXISTING LEIDY LINE "A"

MILE 191

HENSEL FORK ROAD

CHAPMAN TOWNSHIP

LEIDY TOWNSHIP

MATCH LINE SEE SHEET 3 OF 4

SANDY RUN ROAD

Devils Elbow

COMMONWEALTH OF PENNSYLVANIA
REGISTERED PROFESSIONAL
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M.P 188.51 TO M.P 194.00
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Williams

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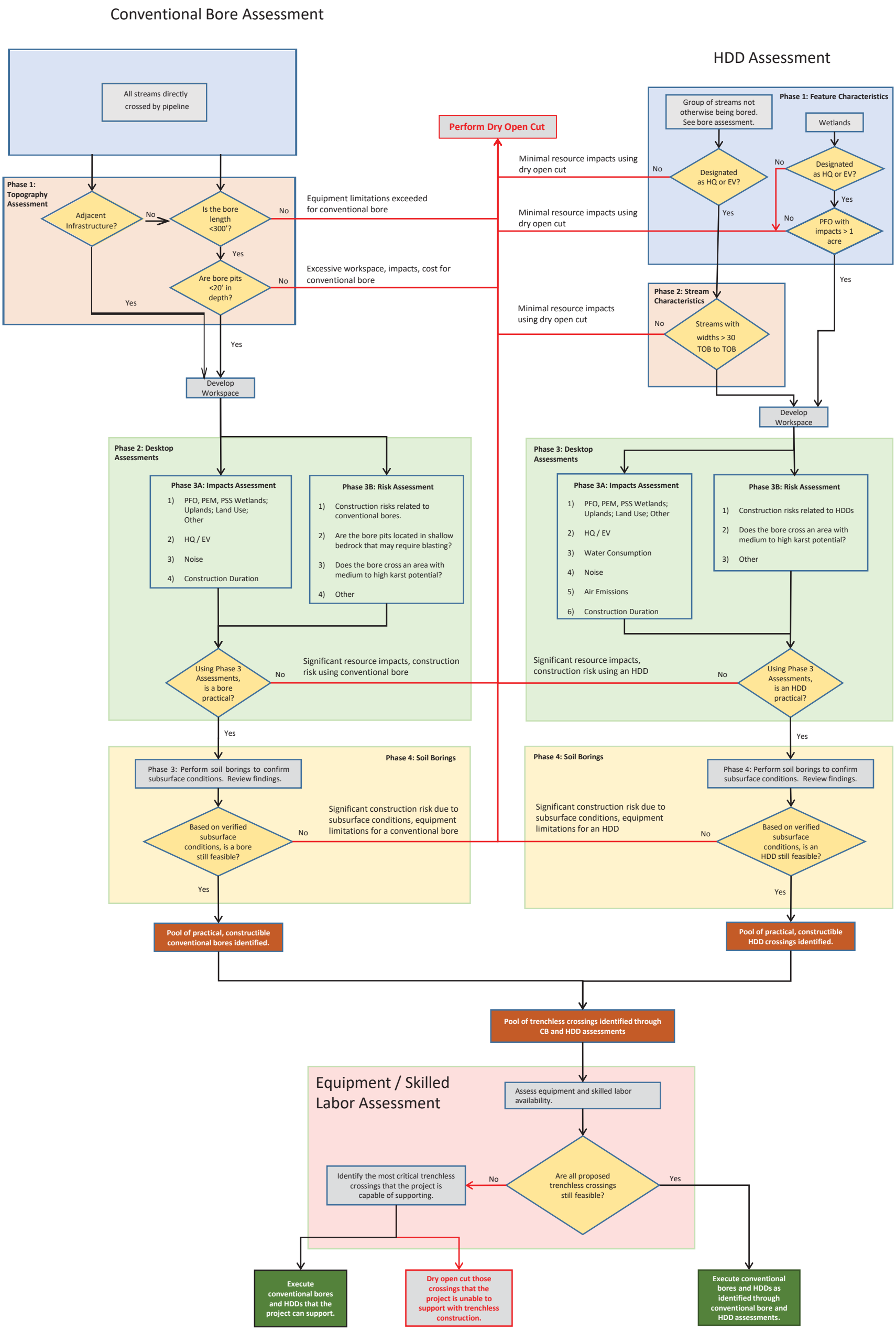
APPROVED BY: HGA	DATE: 01/03/2019	NUMBER: FP-HENS-D_EX	SHEET 4 OF 4
W.O 1211223	RID: 02/11/2019		

ATTACHMENT 1

TRENCHLESS ANALYSIS FLOWCHART

Leidy South Project - Trenchless Analysis Flow Chart



ATTACHMENT 2

TRENCHLESS ANALYSIS FEASIBILITY STUDY

Williams has requested that CCI perform a desktop study to evaluate the feasibility of using the HDD method of construction at three separate locations. The carrier pipe at each proposed crossing is specified to be 36-inch-diameter pipeline used to transport natural gas. A KMZ file has been provided to identify the approximate locations and surface constraints of each crossing.

Hensel Fork Rd HDD (MP 190.5 to MP 190.7) crosses beneath Hensel Fork Rd and multiple minor streams. In accordance with Williams' specifications and industry best management practices (BMPs), it is recommended that a design radius of 3,600 ft be utilized with the current pipe specifications. Taking into consideration the current proposed length along the alignment, the depth of cover would need to be sufficient to geometrically coincide with the design radius. It has not been determined where the rig will be placed but MP 190.5 is approximately 120 ft away from Hensel Fork Rd and appears to sit directly on top of a stream. MP 190.7 also appears to be on top of or near a stream. These conditions may create complications associated with the temporary workspace requirements for the contractor.

Drury Run Creek HDD crosses Drury Run Creek, associated wetland area and Tamarack Rd. it is recommended that a design radius of 3,600 ft be utilized with the current pipe specifications following standard industry BMPs. Taking into consideration the design radius, it appears that there is not sufficient ROW to accommodate the horizontal length that would be required to remain within geometrical tolerances. The HDD would encounter a terrain that slopes along the entry and exit angles required to achieve a recommended profile depth of cover beneath the creek. This scenario creates shallow cover and increases the likely hood of inadvertent fluid release to the surface near entry and exit as well as HDD equipment setup outside of typical industry practice. Conceptual design has the profile of that includes a horizontal curve that will likely overlap one or both vertical curves creating a combination curve.

The Young Woman Creek HDD crosses beneath Young Woman Creek, and due to the present constraints, would most likely cross beneath Young Woman Creek Rd and Little Italy Rd as well. As mentioned above, it is highly recommended that a design radius of 3,600 ft be utilized due to industry BMPs. Taking into consideration the design radius, it appears that there is not sufficient ROW to accommodate the horizontal length that would be required to remain within geometrical tolerances. The HDD could follow the alignment if the length to the west of Young Woman Creek was increased and a horizontal curve was introduced; however, this would increase the risk of steering outside of tolerances. Also, the alignment along this section is heavily wooded and would require clearing and grading.

These proposed crossings would most likely benefit environmentally, financially and have an increased chance of success using a open cut method of construction. The pipe strings for these HDDs would be placed along slopes ranging from 15 to 40%, increasing the installation risk. Due to these reasons listed above and unknown geotechnical conditions, HDDs (Drury Run Creek, Hensel Fork Rd HDD and Young Woman Creek HDD) are considered high risk and CCI has classified these locations as not feasible for the HDD method of construction.

REQUIREMENT T

MITIGATION PLAN

An onsite Wetland and Riparian Reforestation Plan has been provided in Requirement L-5, Module S4, Appendix S4-2. A Compensatory Offsite Mitigation Plan has been provided in Requirement L-5, Module S4, Appendix S4-3.

.

APPENDIX 1

PUBLIC WATER SUPPLY REPORT

Transcontinental Gas Pipe Line Company, LLC

Appendix 1 - Public Water Supply Report

Leidy South Project – Hensel Replacement and Hilltop Loop

August 2019

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2.0 METHODS USED TO IDENTIFY PUBLIC WATER SUPPLIES

3.0 RESULTS OF ANALYSIS

4.0 REFERENCES

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1 GROUNDWATER WELLS EMAPPA REVIEW

2 SURFACE WATER INTAKES EMAPPA REVIEW

1. Introduction

The purpose of the Public Water Supplies Summary Report (Report) is to identify all public water supplies within one mile of waterbody or wetland crossings associated with the Leidy South Project – Hensel Replacement and Hilltop Loop (Project).

2. Methods Used to Identify Public Water Supplies

As part of the permit application, a review of the public water supplies located within one mile of a waterbody or wetland crossing was conducted. Groundwater wells and surface water intakes were identified for each crossing proposed as part of the Project using the PADEP eMapPA online tool. The buffer tool was used to create a one-mile buffer around each crossing. The surface water intakes and groundwater wells within that buffer were identified. The contact information for the official responsible for the water supply as well as the system name was obtained if a surface water intake or groundwater well is identified.

3. Summary of Findings

Groundwater wells and surface water intakes were identified for each Project crossing using eMapPA. The results, as generated by eMapPA, are included in Appendices 1 and 2. The location of the crossings proposed is provided in Figure 1. There were no surface water intakes identified within one mile of a proposed crossings associated with the Project. Groundwater wells were identified within one mile of three of the proposed crossings, as summarized in Table 3-1.

TABLE 3-1: GROUNDWATER WELLS WITHIN ONE MILE OF A CROSSING

Crossing	Public Water Supply ID	SYSTEM NAME	AREA CITY	RESPONSIBLE OFFICIER	PHONE	ID
HR-10	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134624
	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134623
HR-11	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134624
	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134623
HR-12	4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN ZINK	(570)923-0800	134623

References

Pennsylvania Department of Environmental Protection. 2019. eMapPA. Accessed August 20, 2019. http://www.depgis.state.pa.us/emappa/

FIGURES

designs, permits, resolutions | consulting, INC.
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTINENTAL GAS PIPELINE COMPANY, LLC

LEIDY SOUTH PROJECT -HILLTOP LOOP

CROSSING LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/29/19
WHM DRAWING NUMBER:	WILLIAMS201B001
Drawn By:	PJF
Figure Number:	1

designs, permits, resolutions | consulting, INC.
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTINENTAL GAS PIPELINE COMPANY, LLC

LEIDY SOUTH PROJECT - HENSEL REPLACEMENT

CROSSING LOCATION MAP

LEIDY AND CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/29/19
WHM DRAWING NUMBER:	WILLIAMS200B001
Drawn By:	PJF
Figure Number:	2

APPENDIX 1

Groundwater Wells

Crossing HL-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

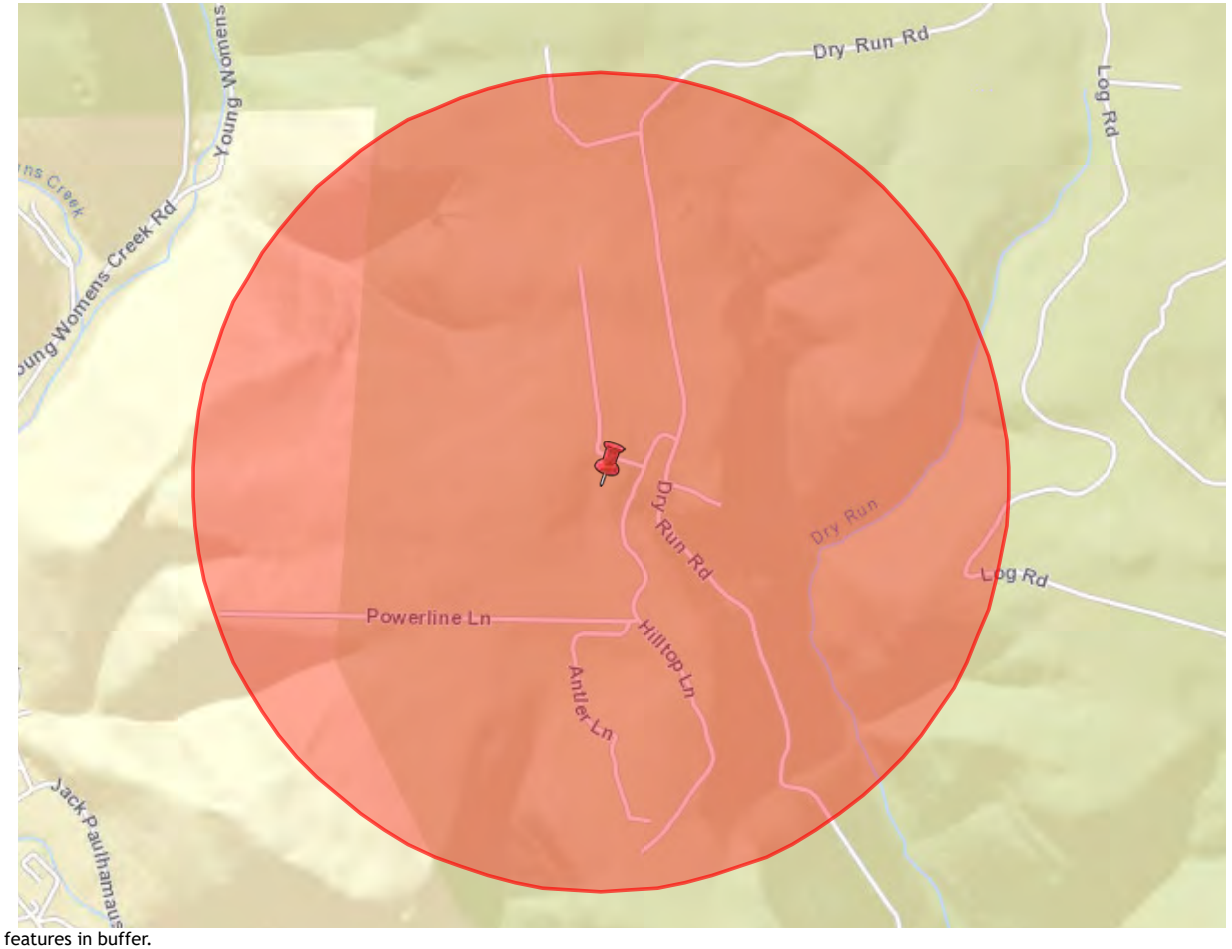
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

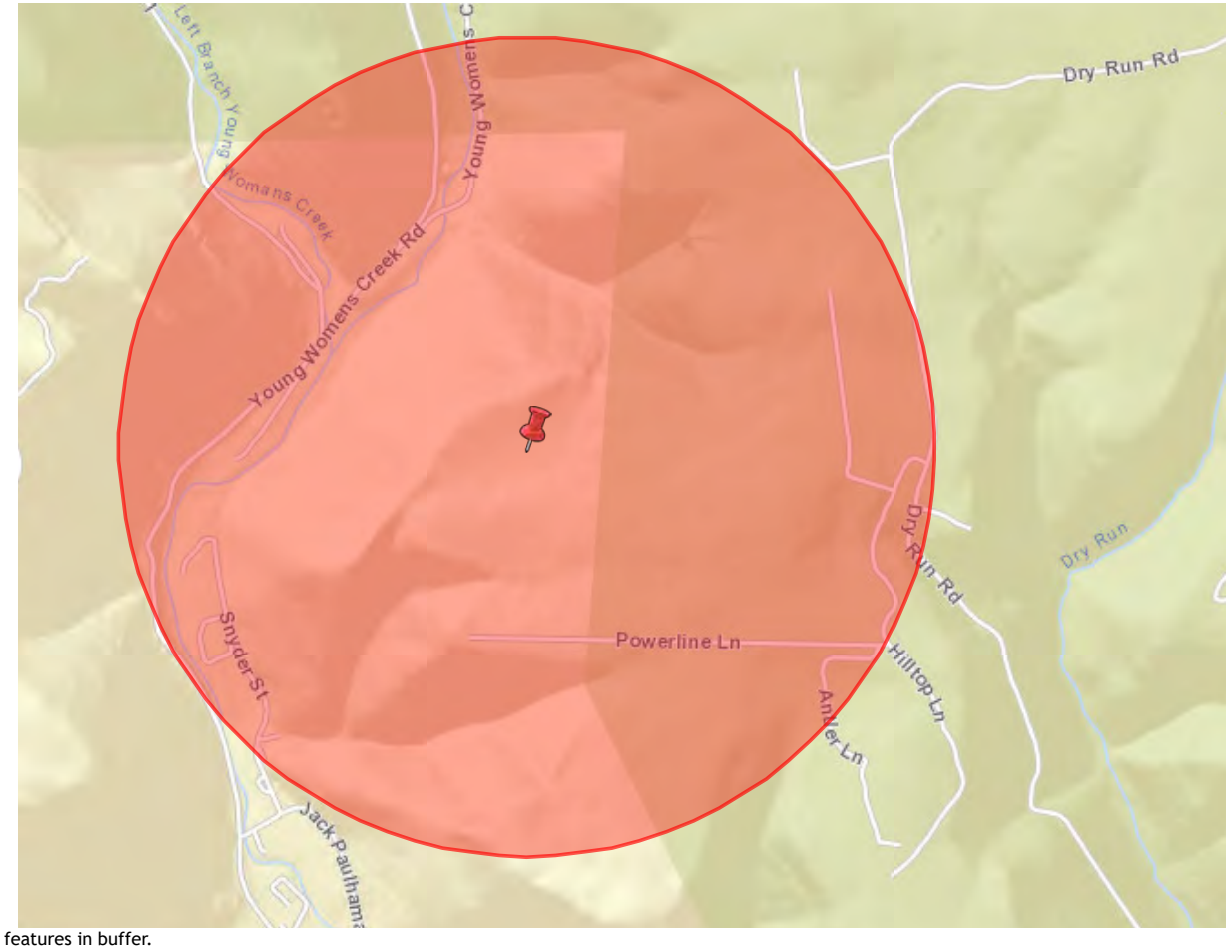
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

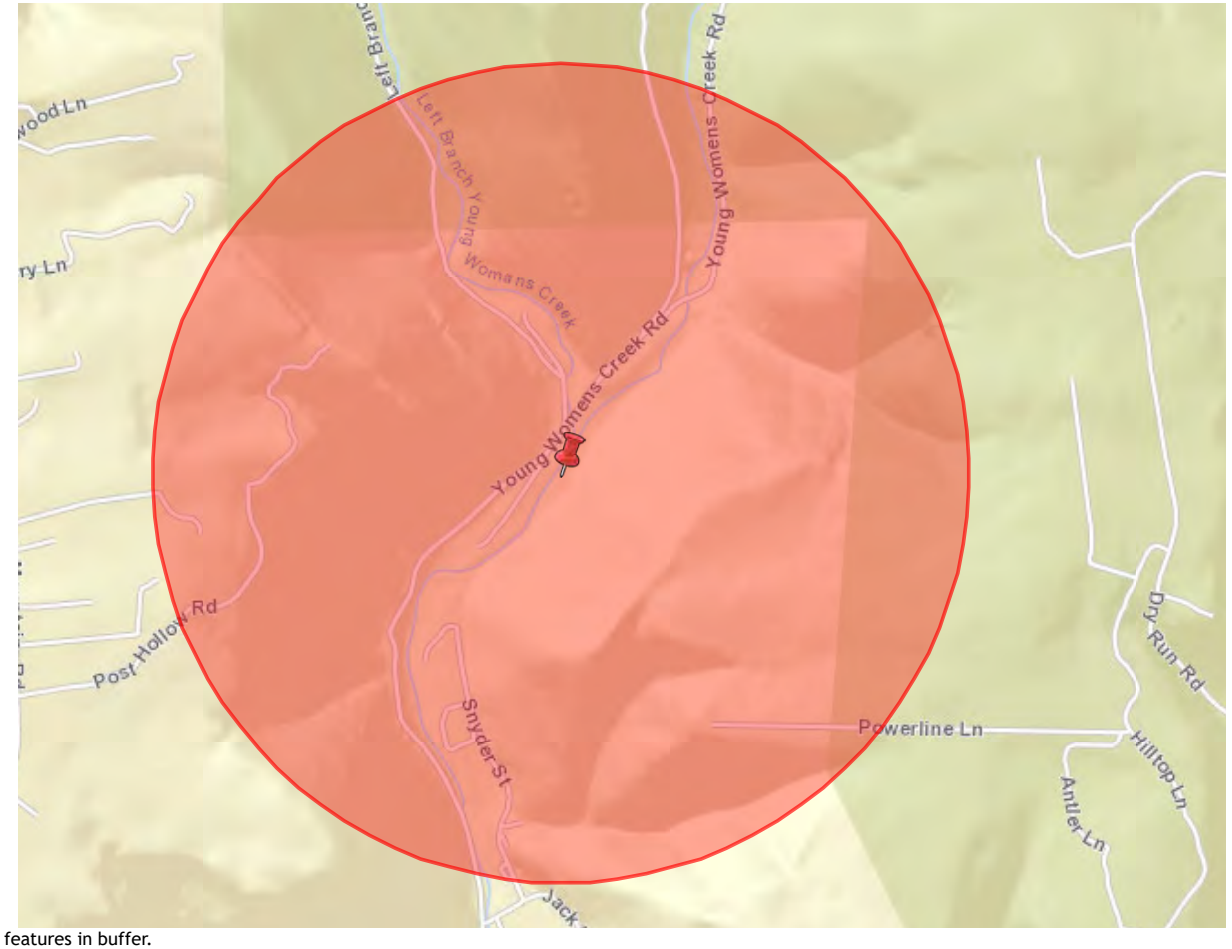
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

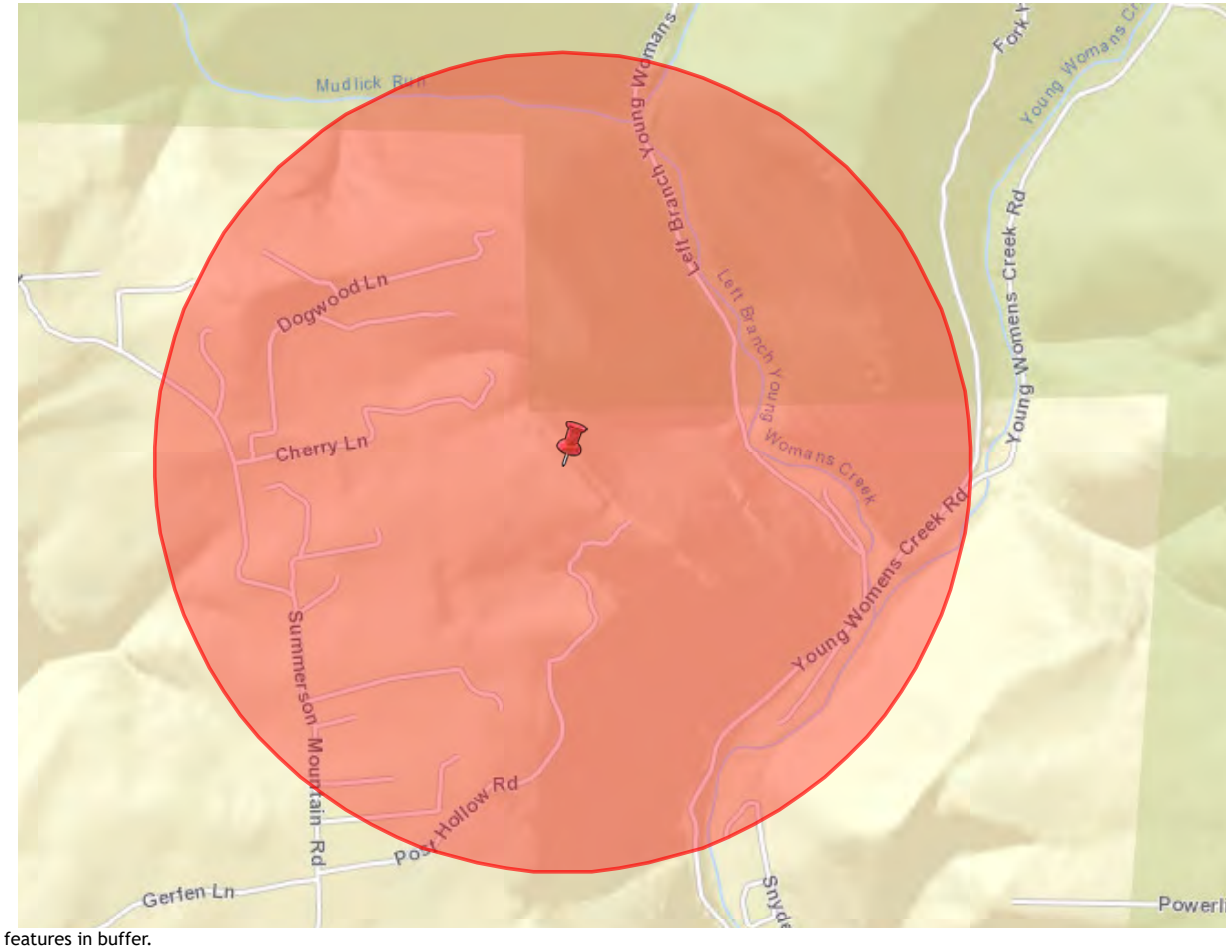
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

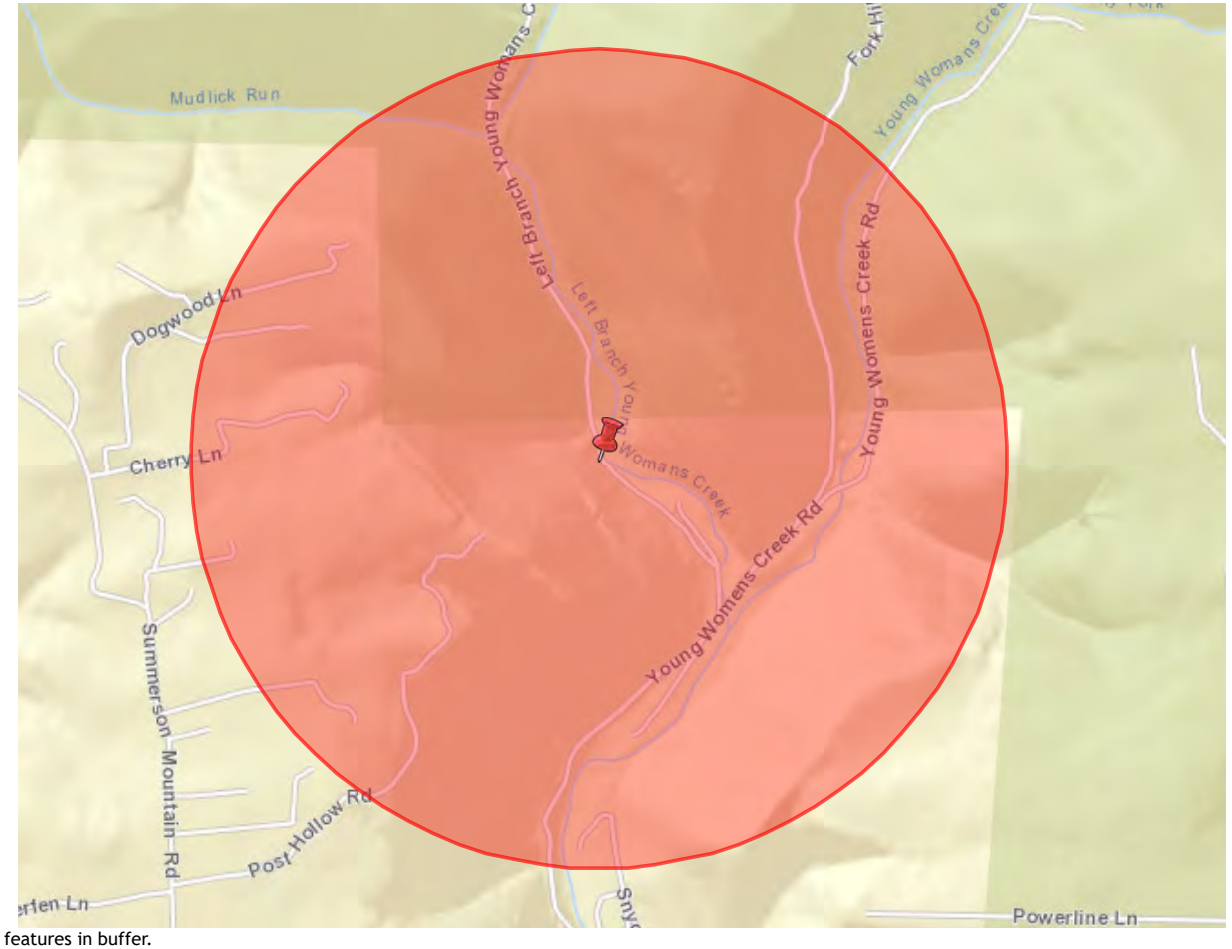
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

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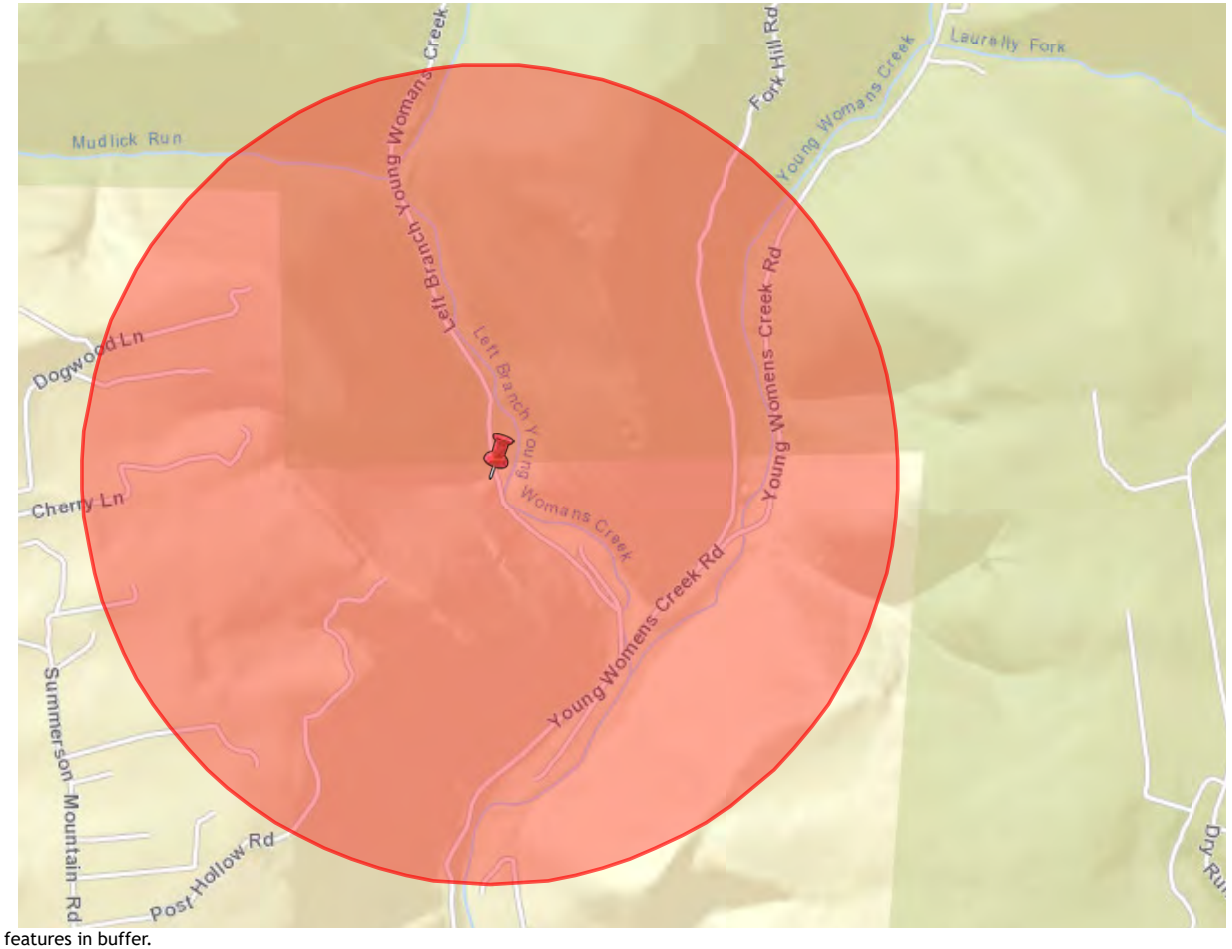
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

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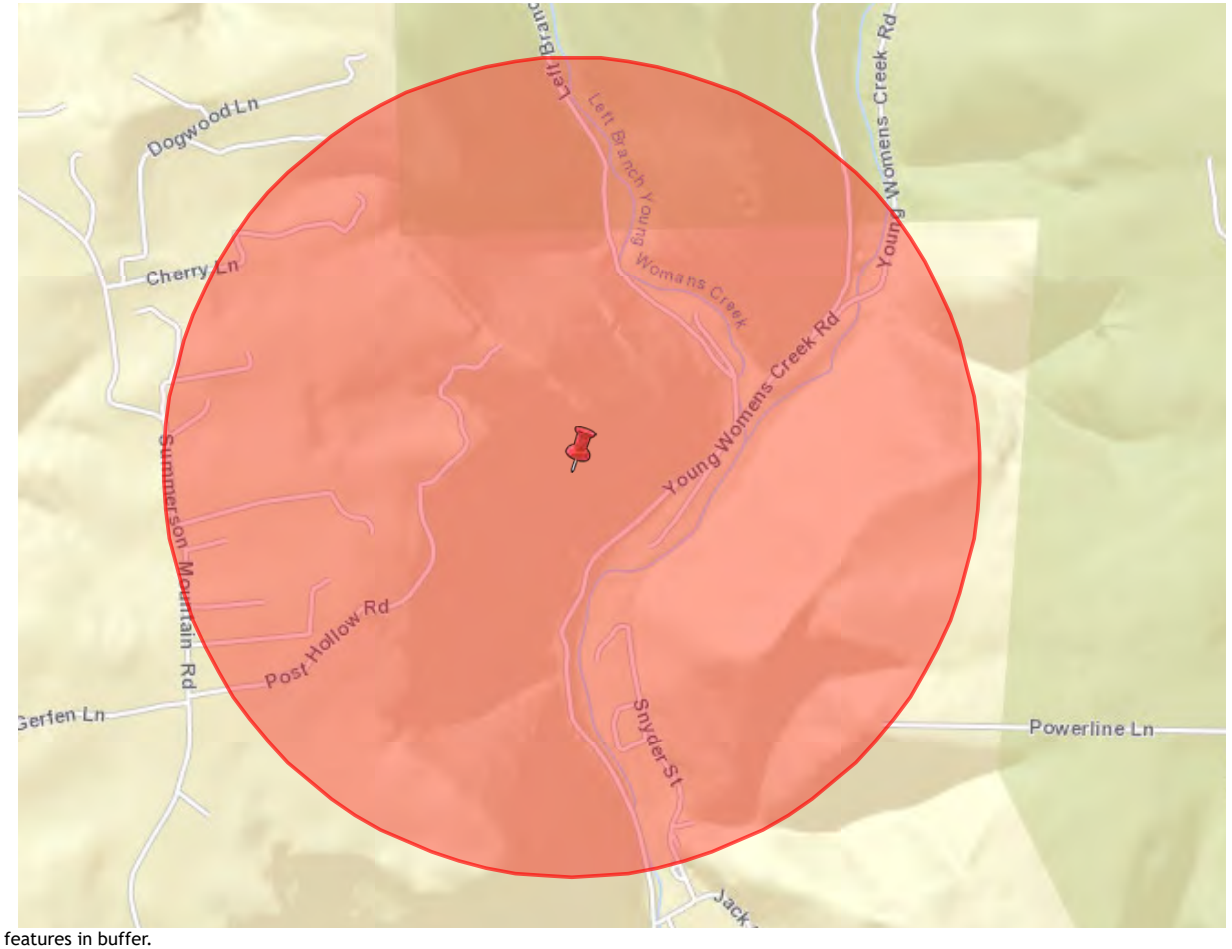

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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

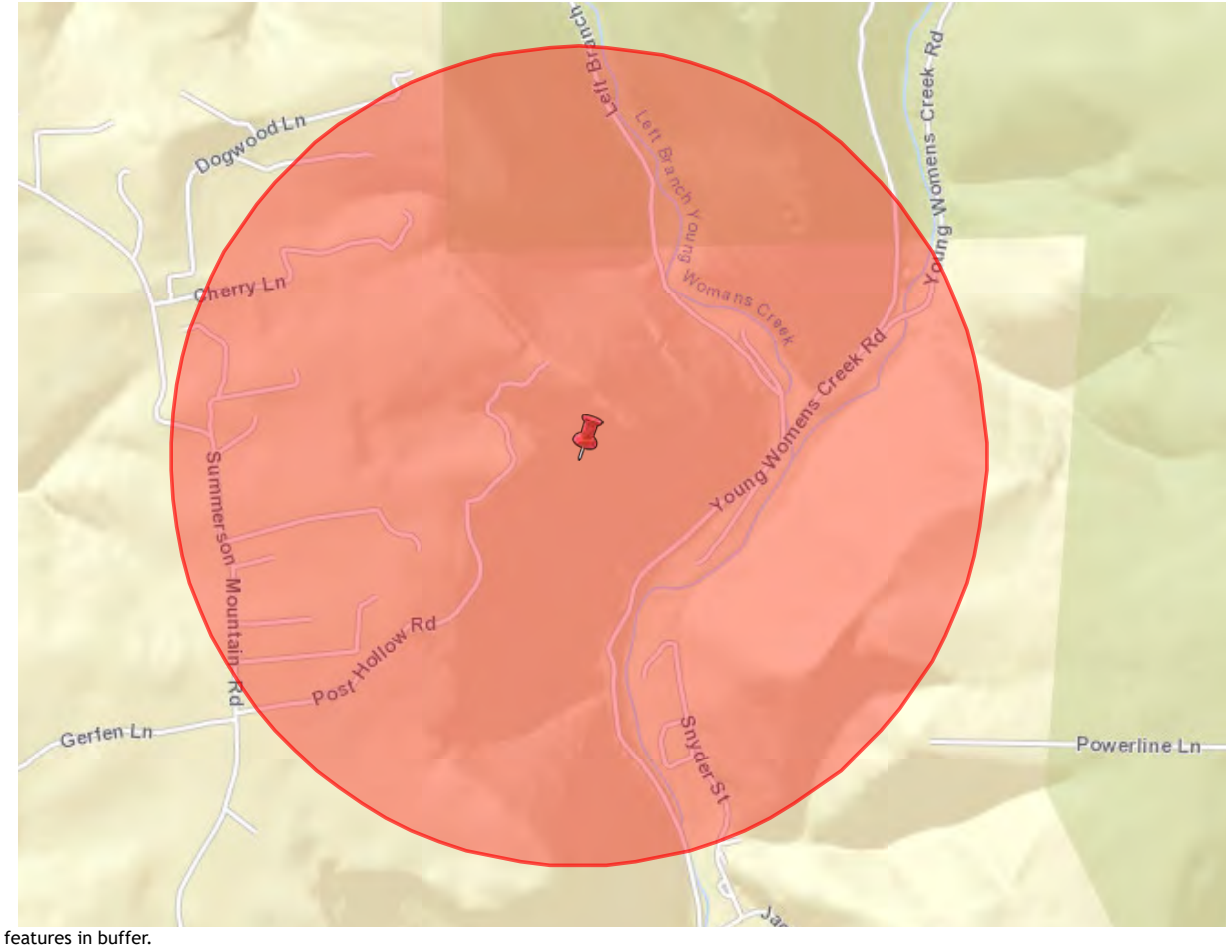
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-5

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

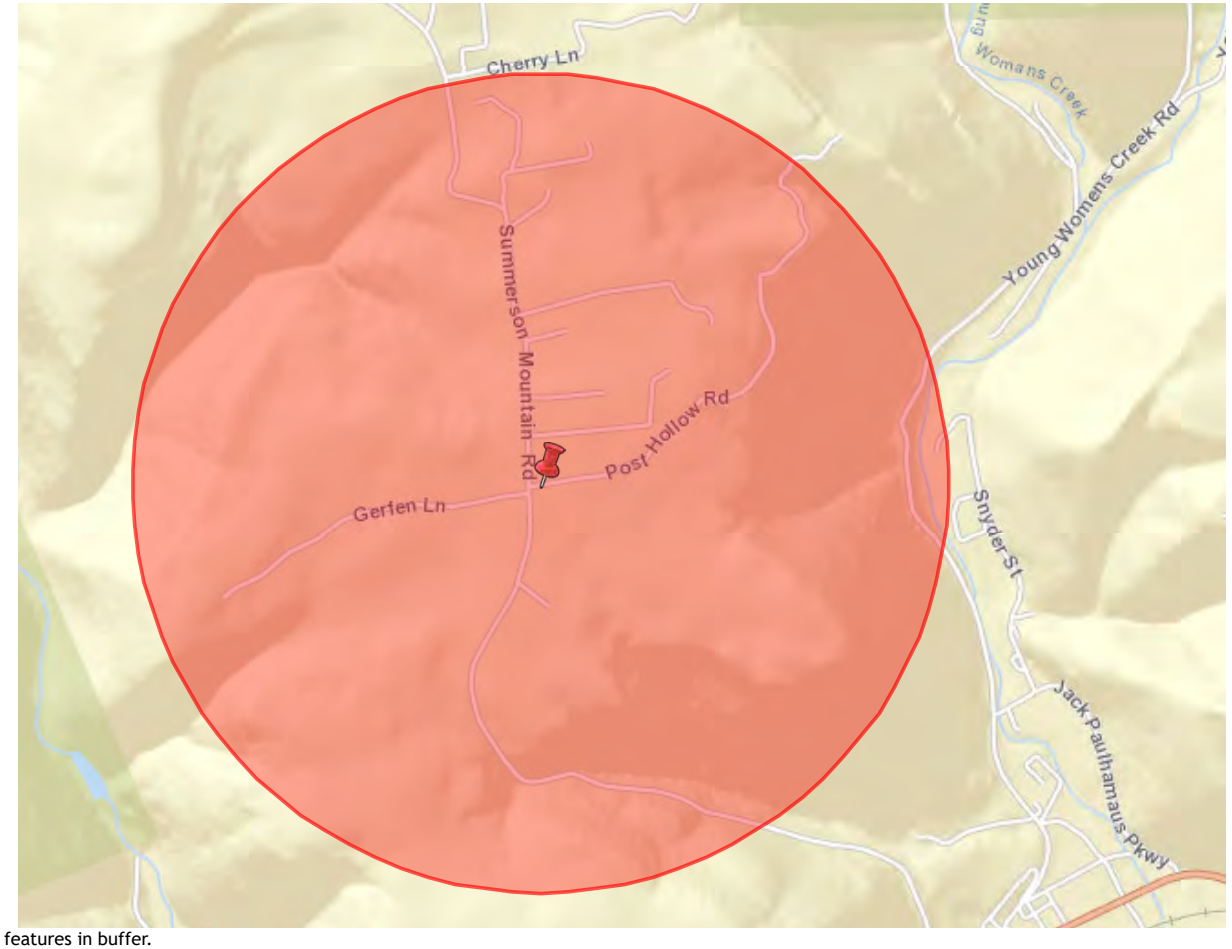
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-6

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

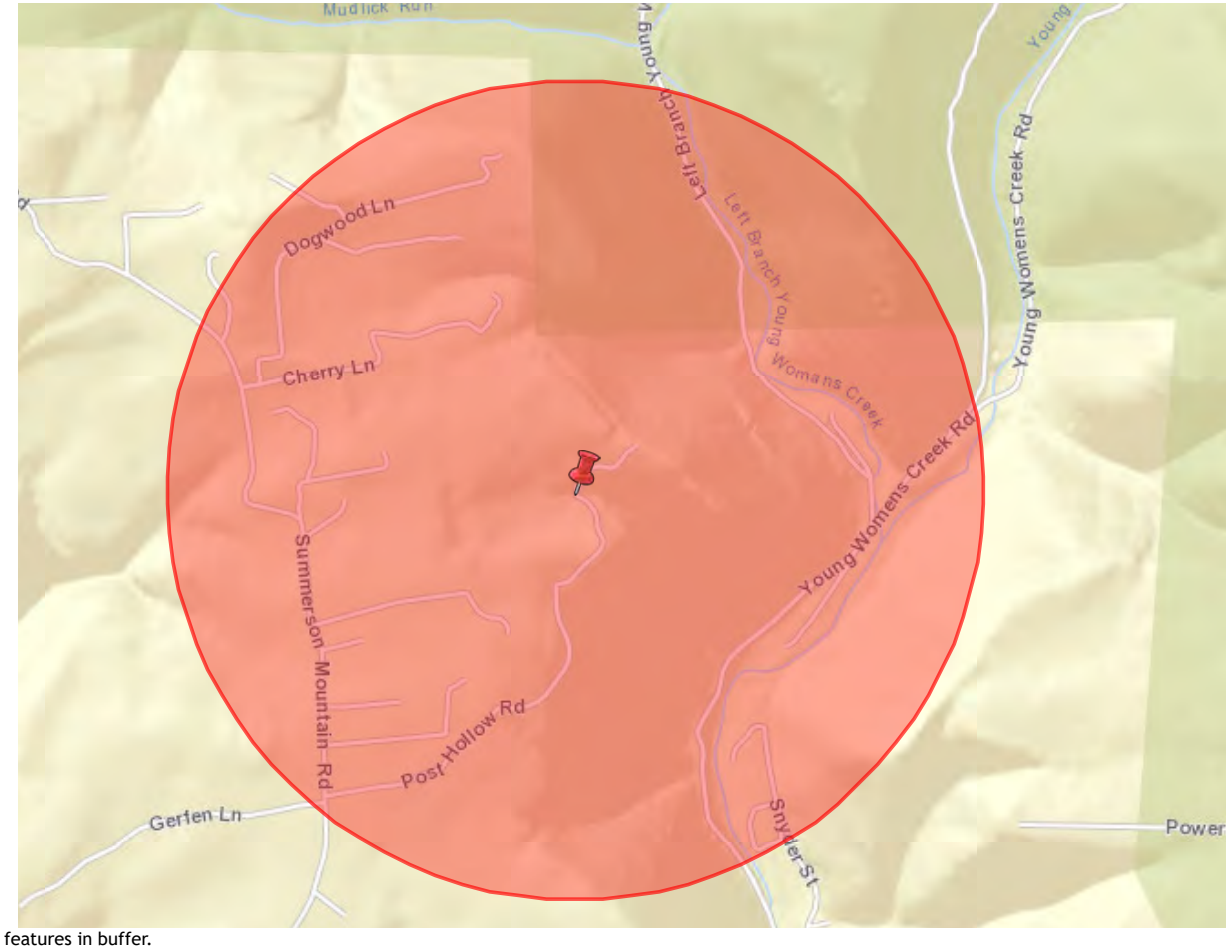
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

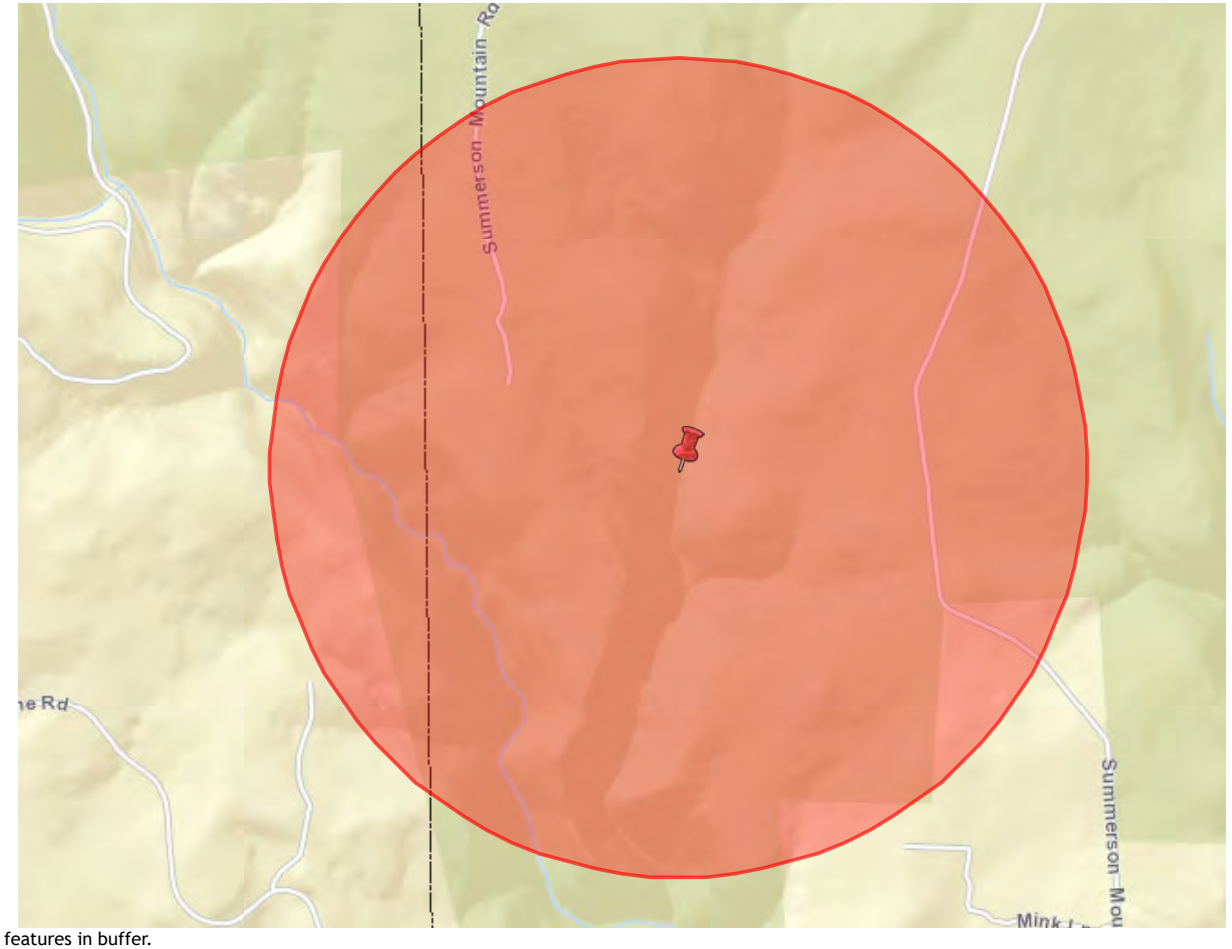
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

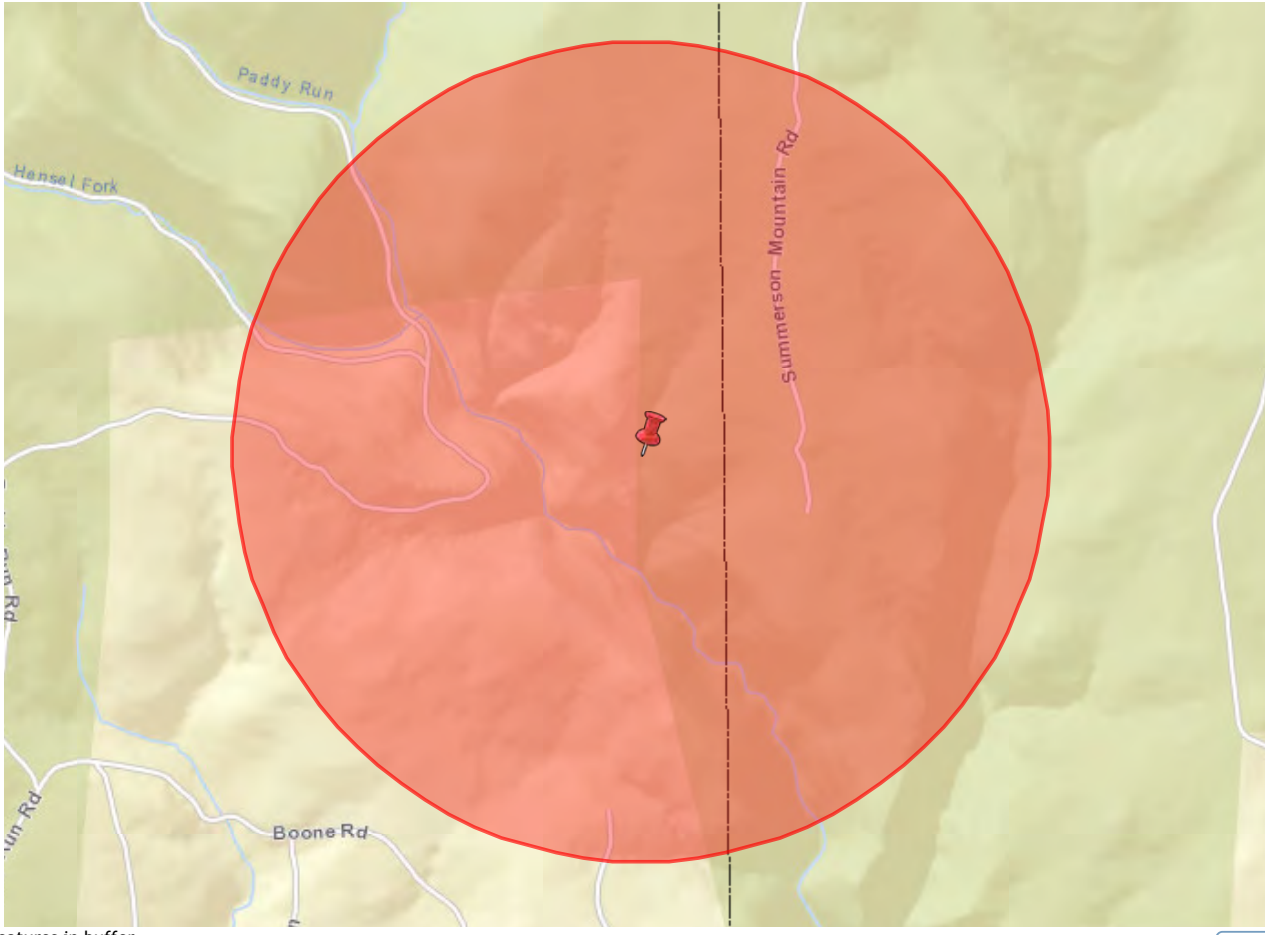
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

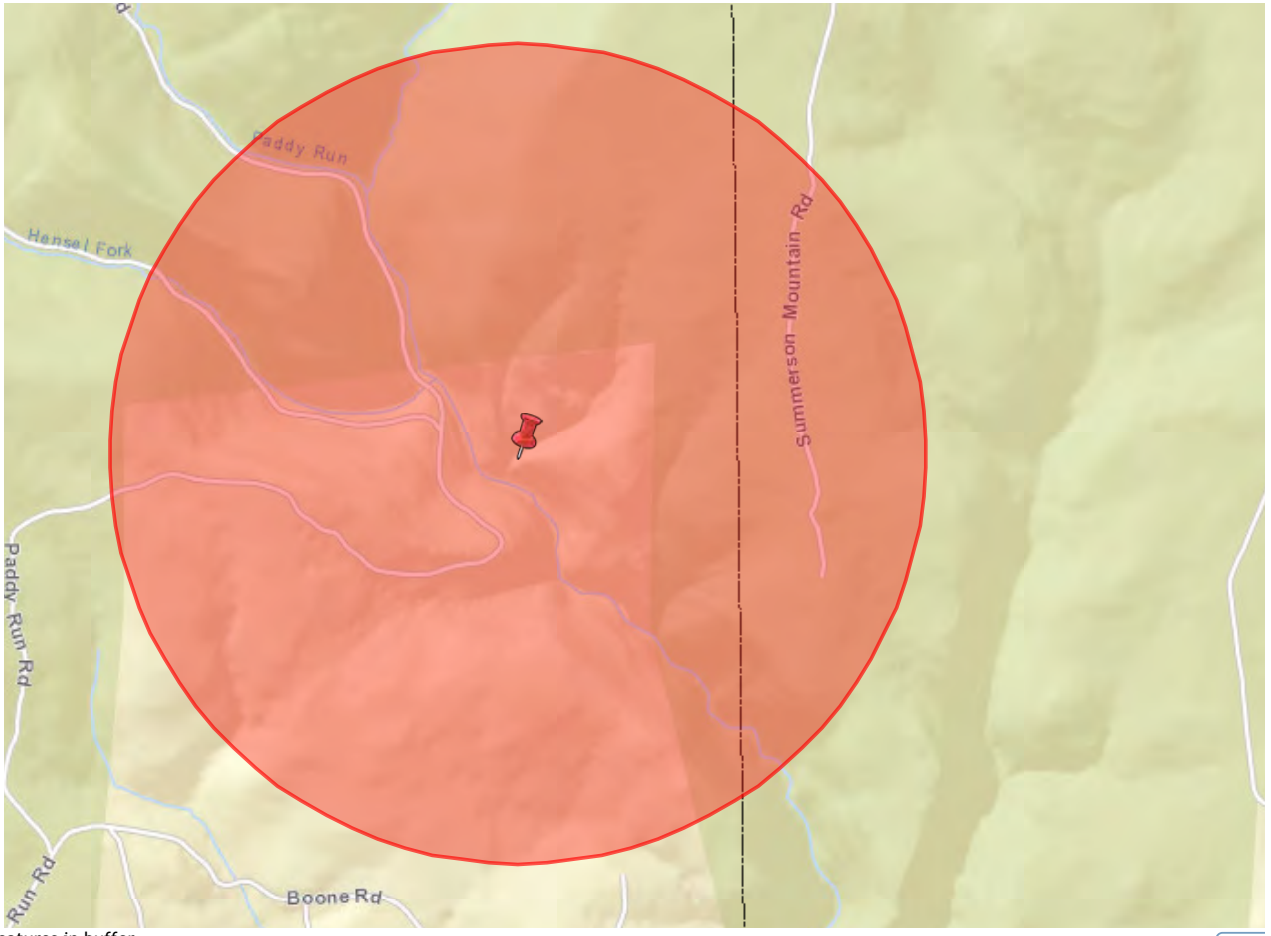
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

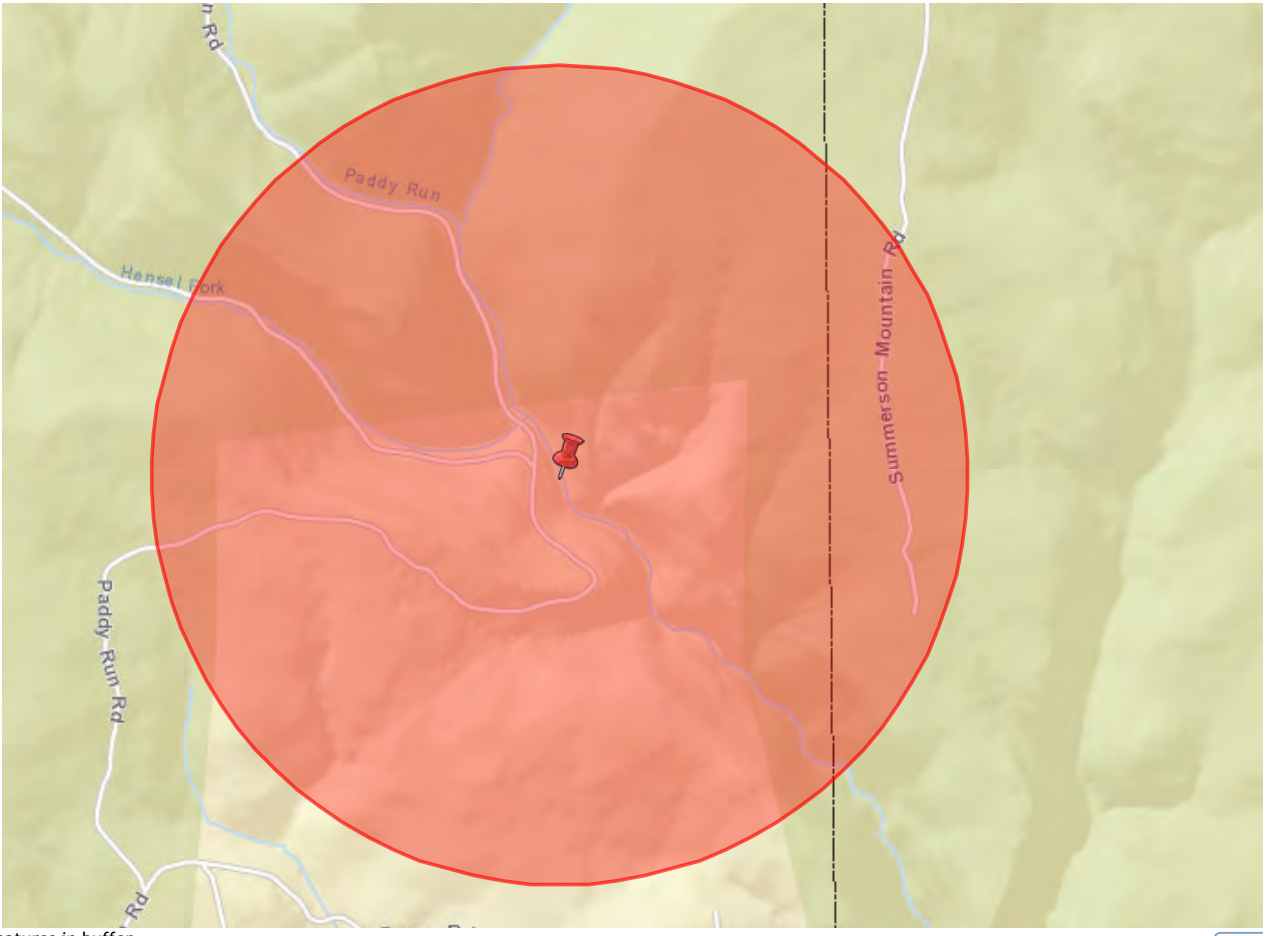
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-5

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

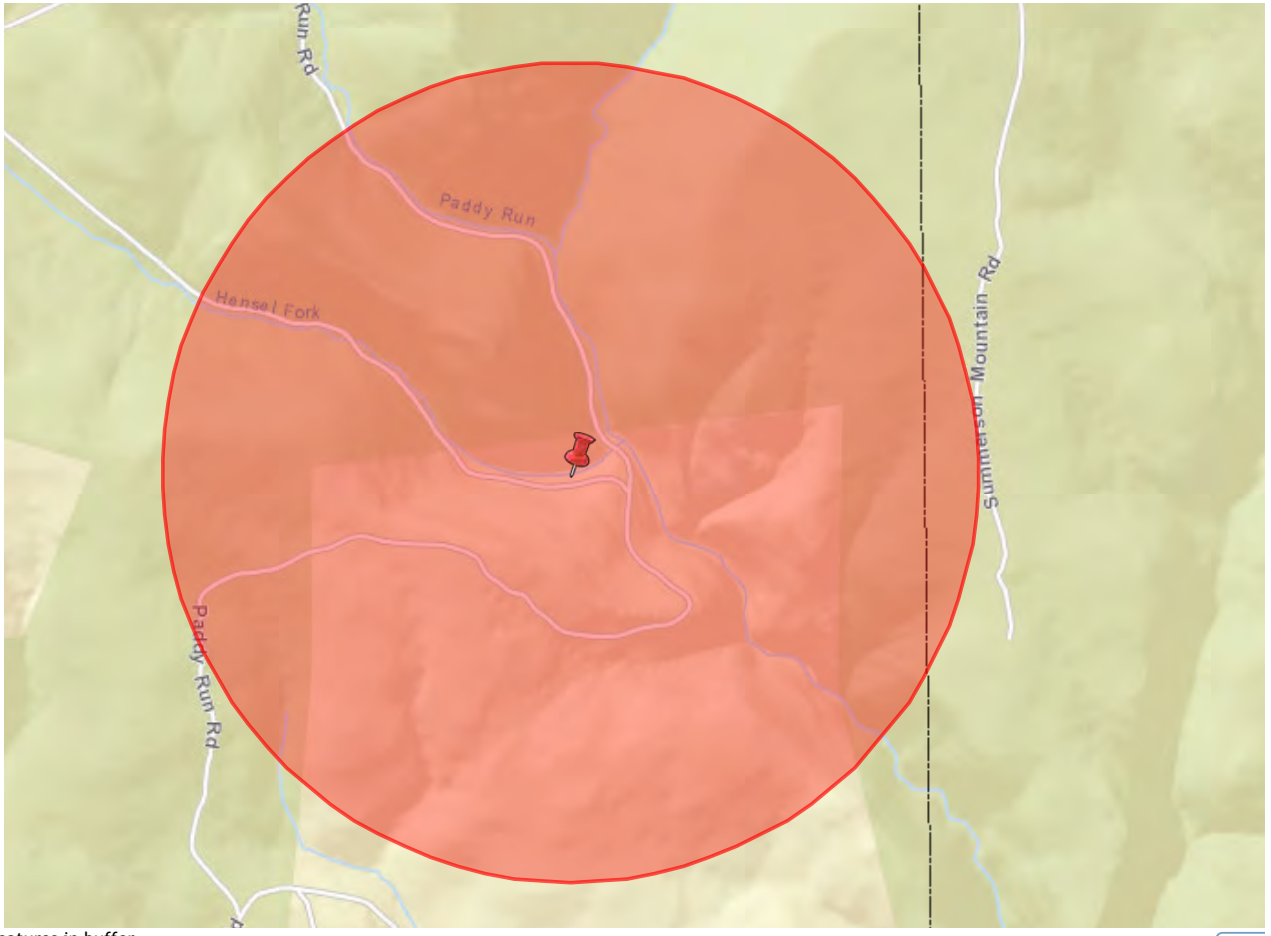
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-6

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

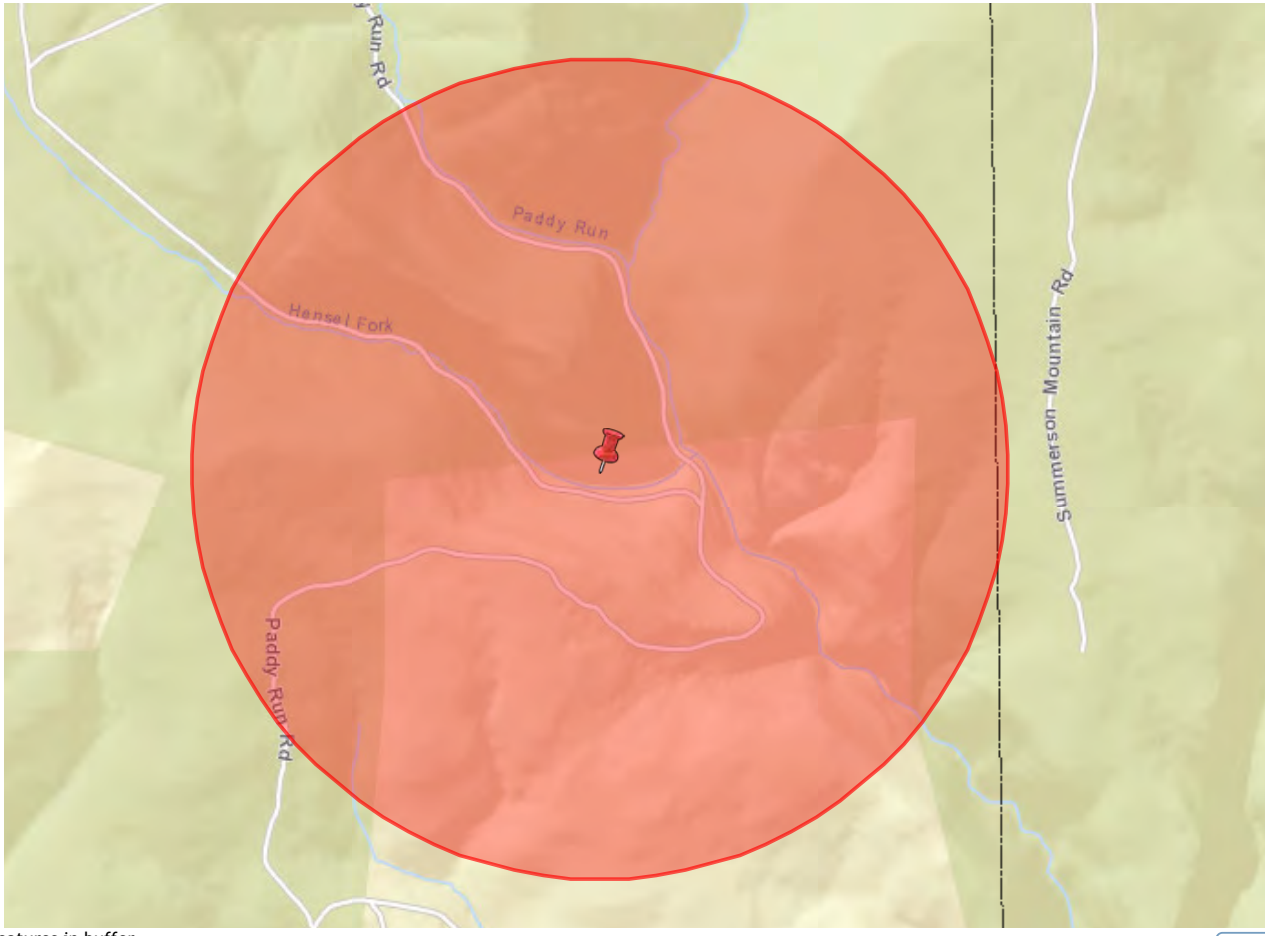
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-7

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

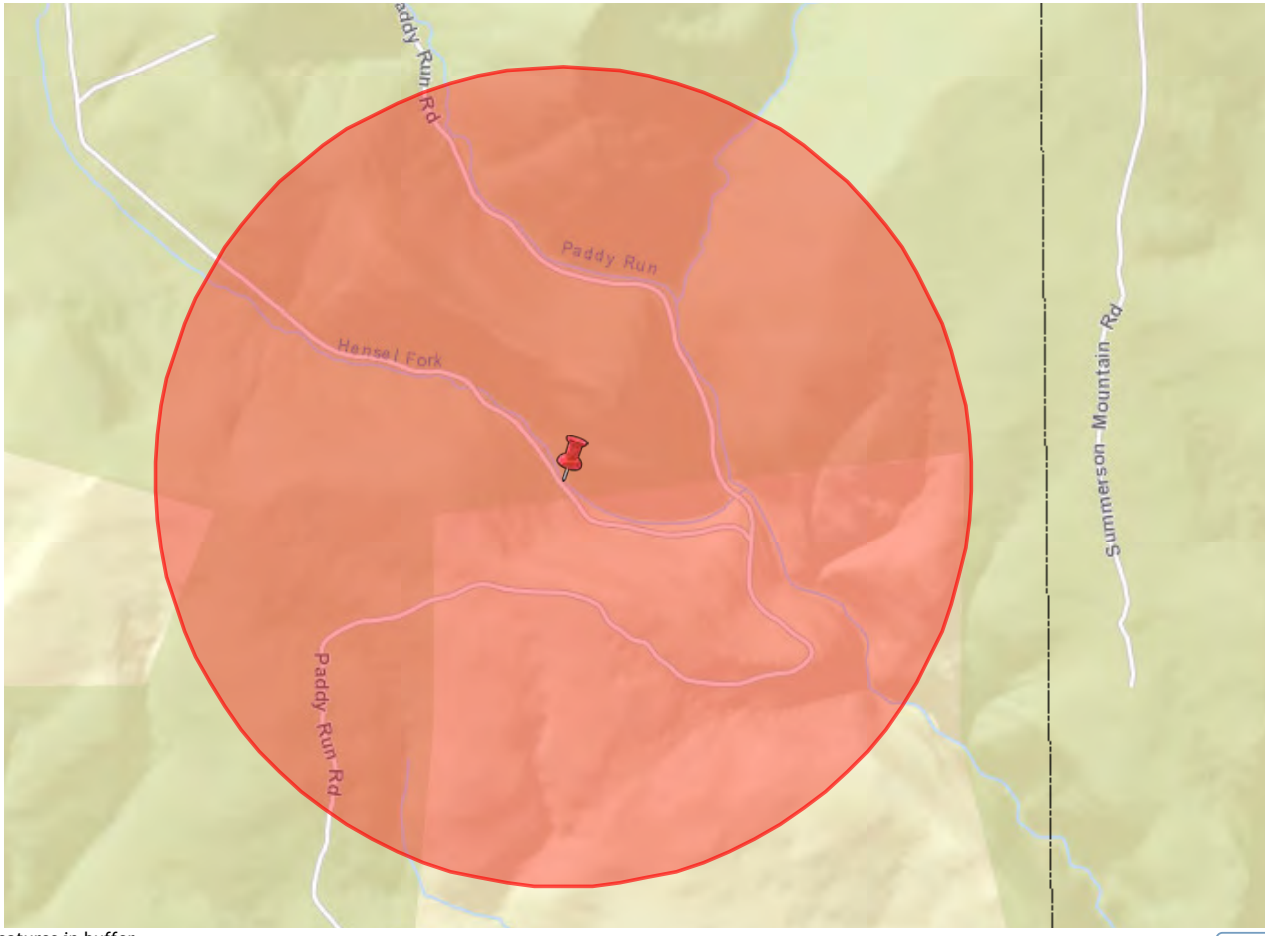
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-8

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

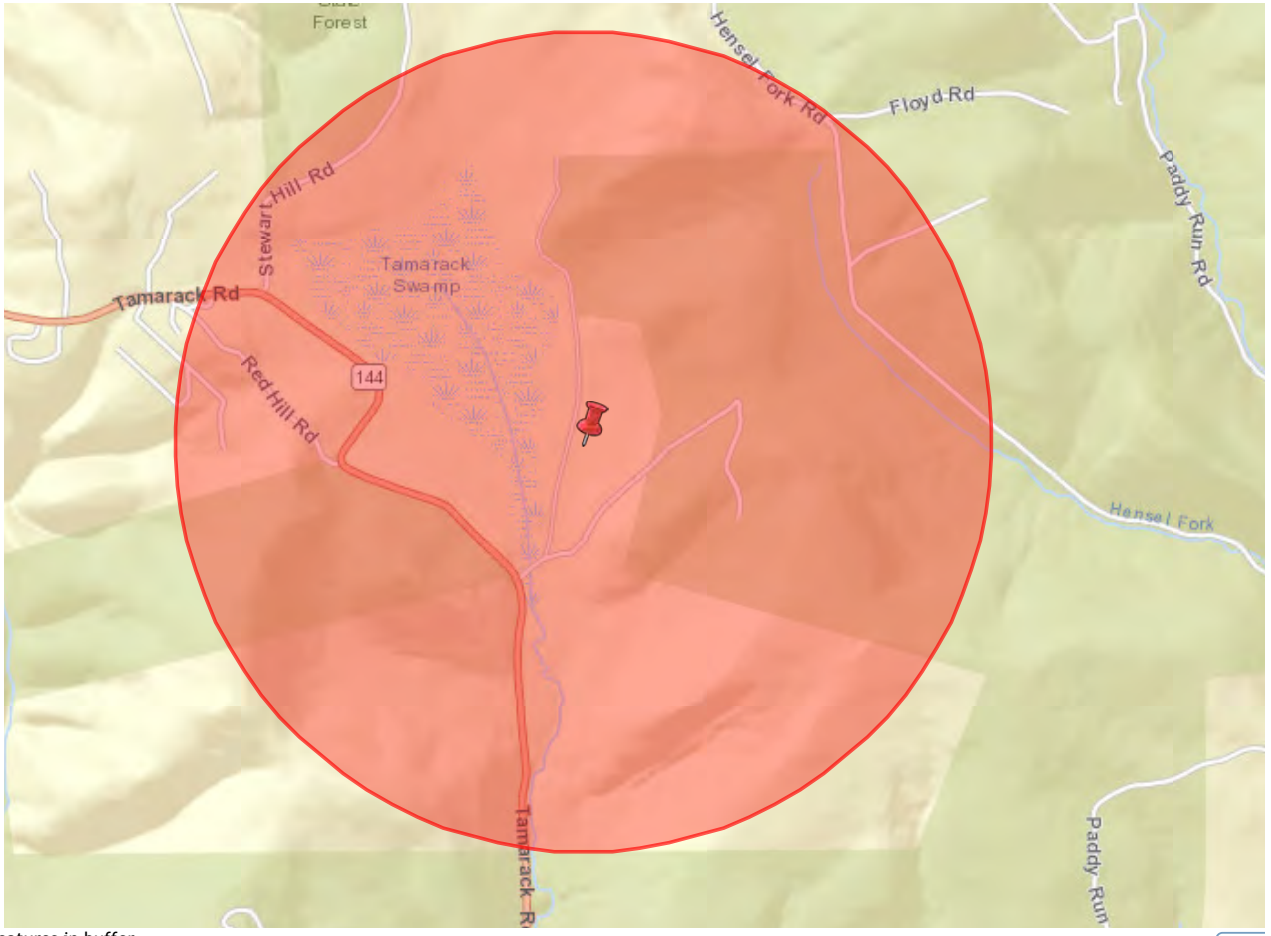
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-9

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

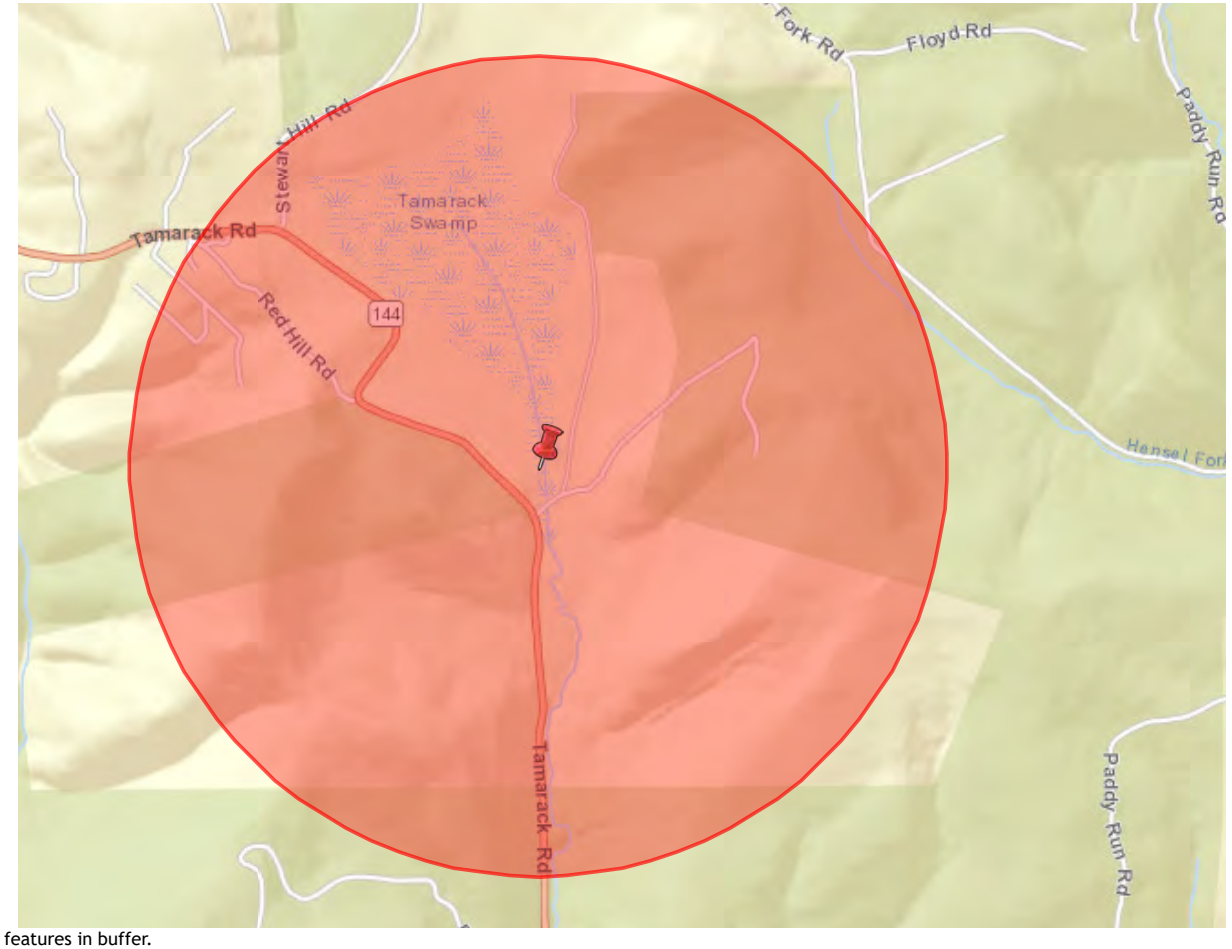
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-10

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

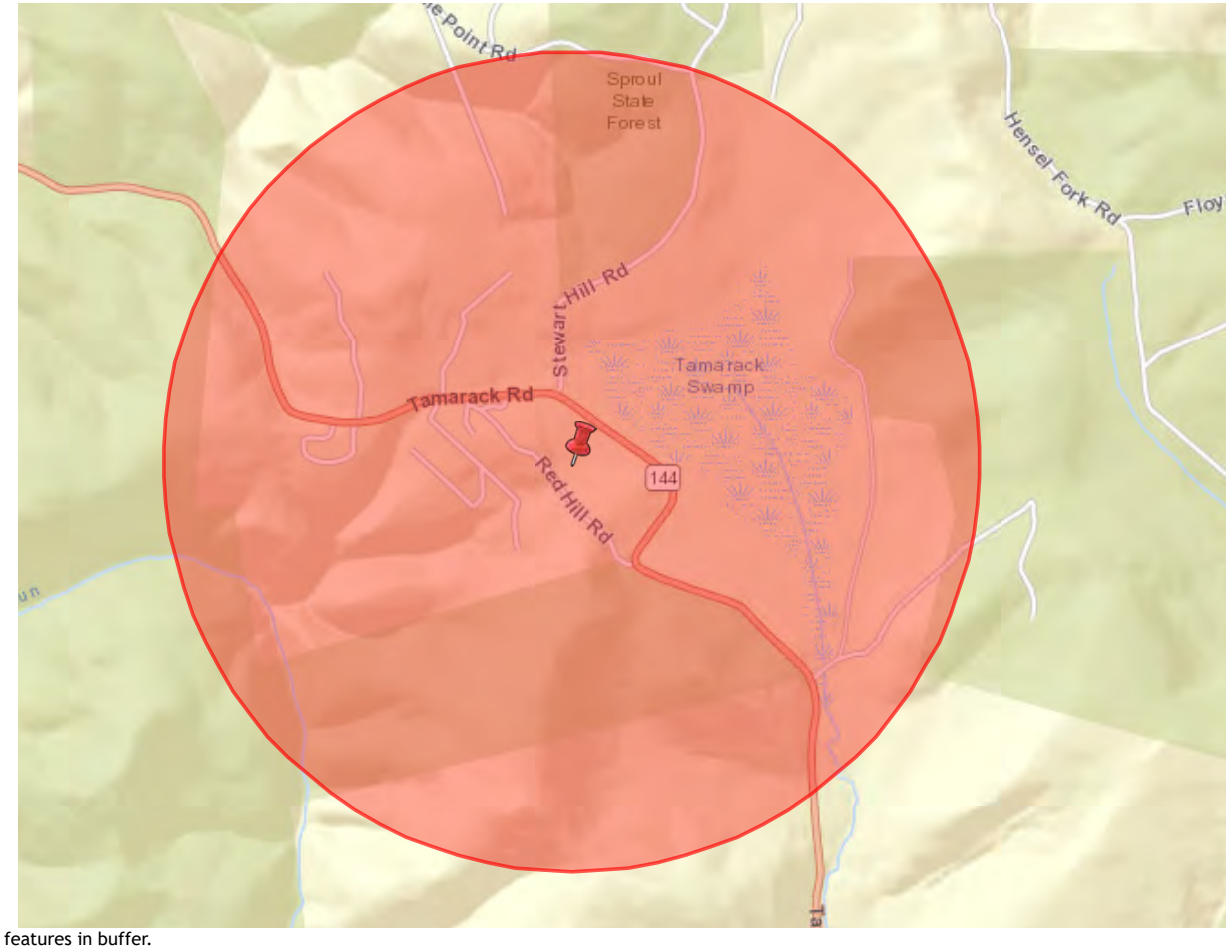
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



2 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN

Crossing HR-11

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

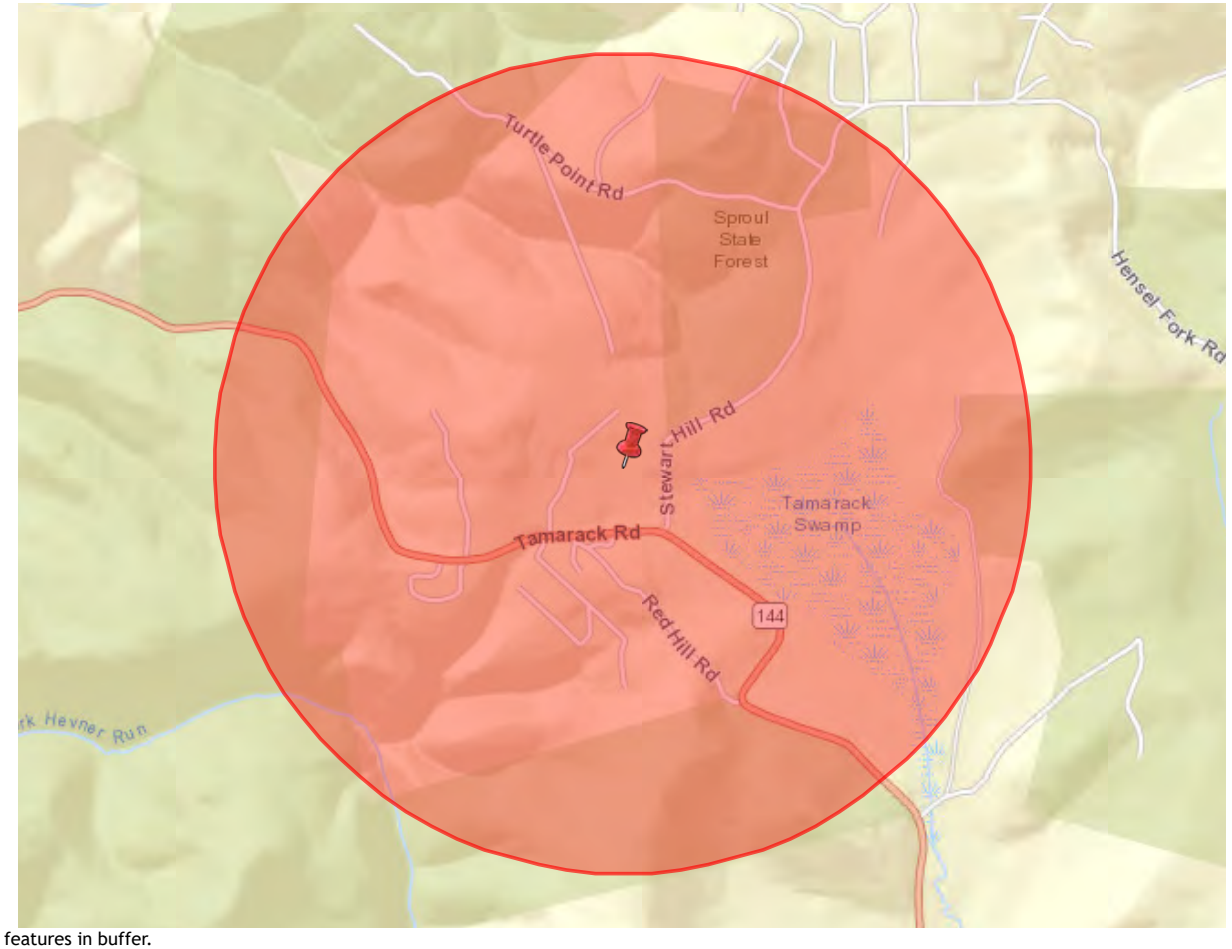
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



2 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN

Crossing HR-12

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

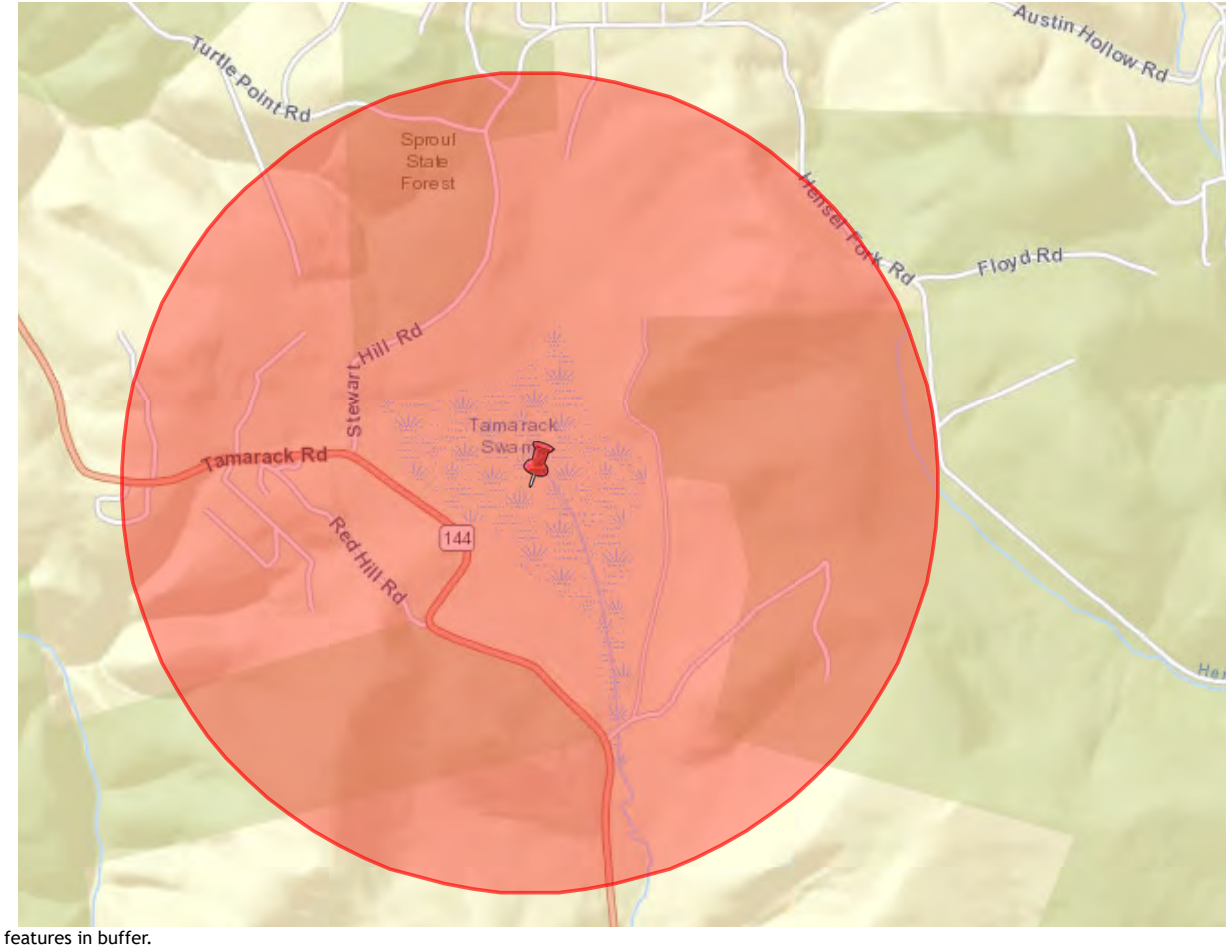
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



1 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO
4180031	DOMINION TRANS LEIDY STATION	LEIDY TWP	KEVIN

Crossing HR-AR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

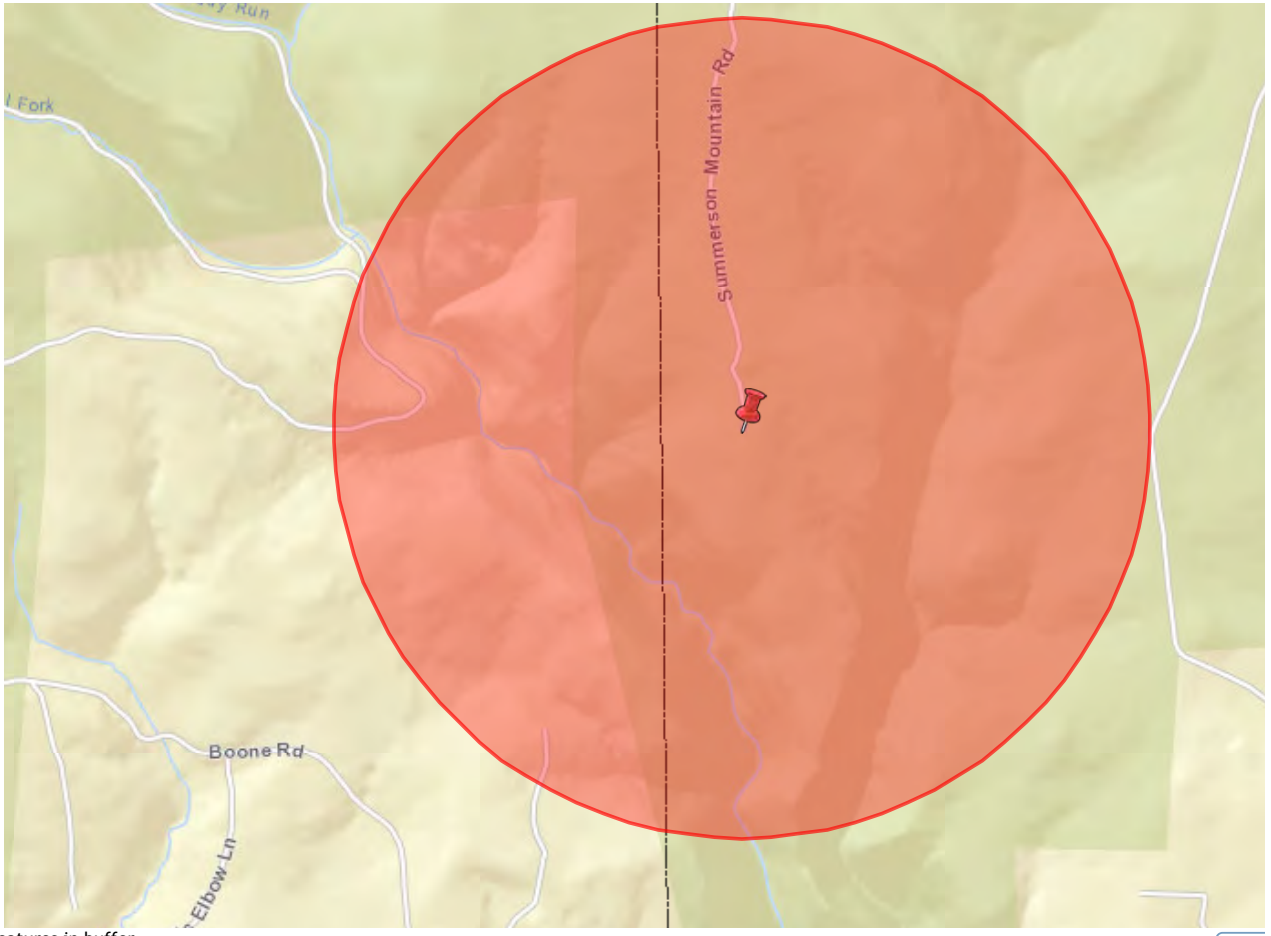
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-AR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

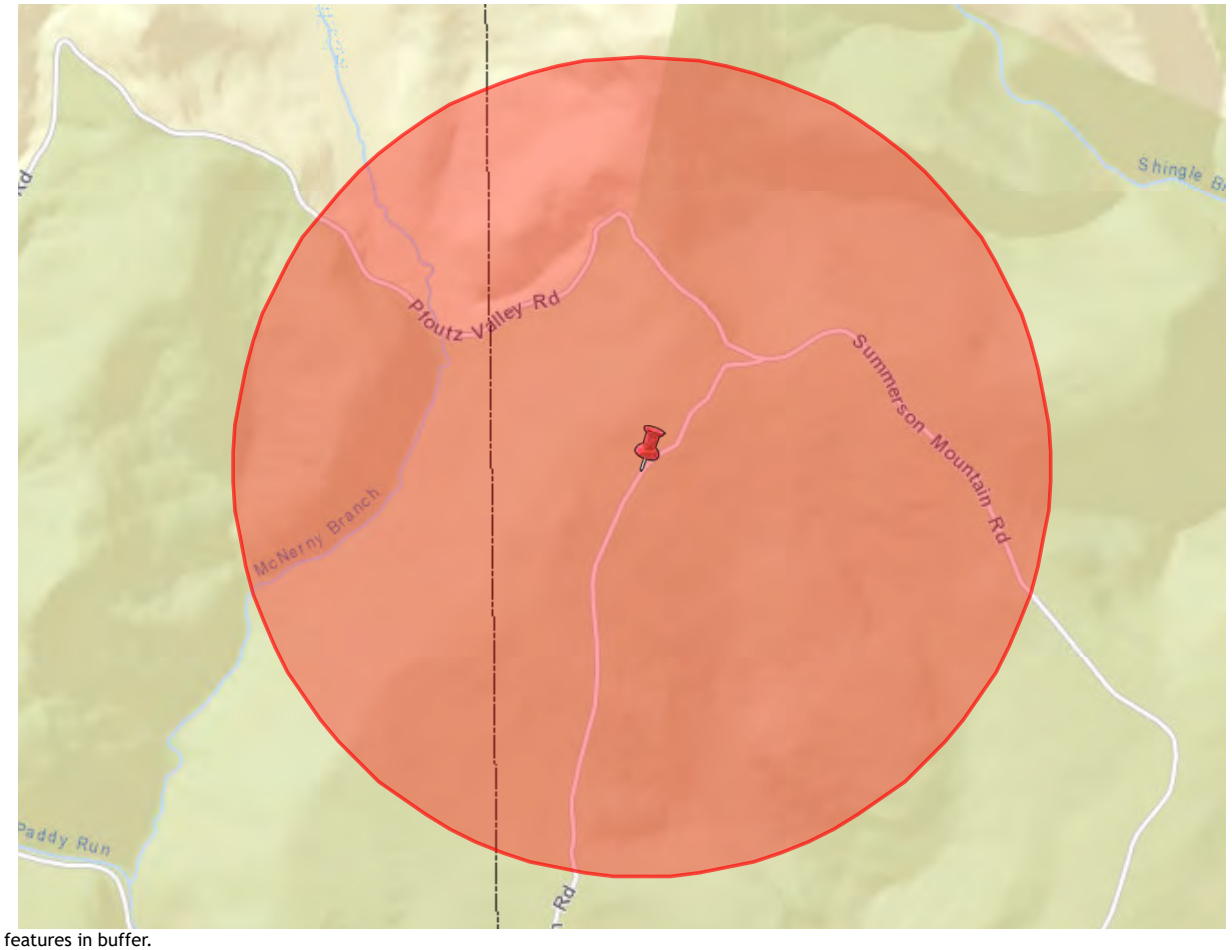
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-AR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

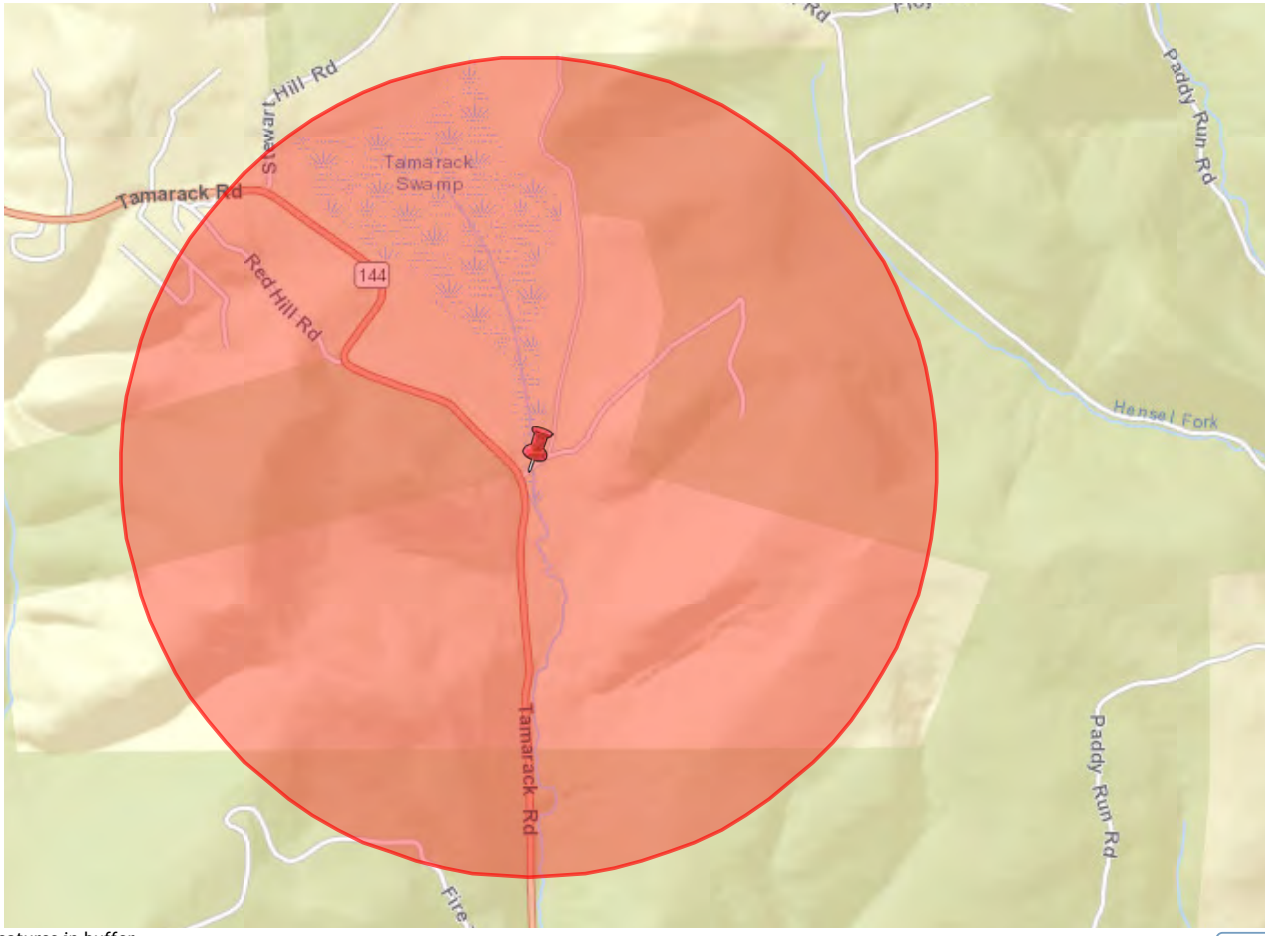
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HR-AR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer a
Point Polyline Polygon

Enter buffer distance
Miles

Layer to buffer
No layer

Create Buffer Clear

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

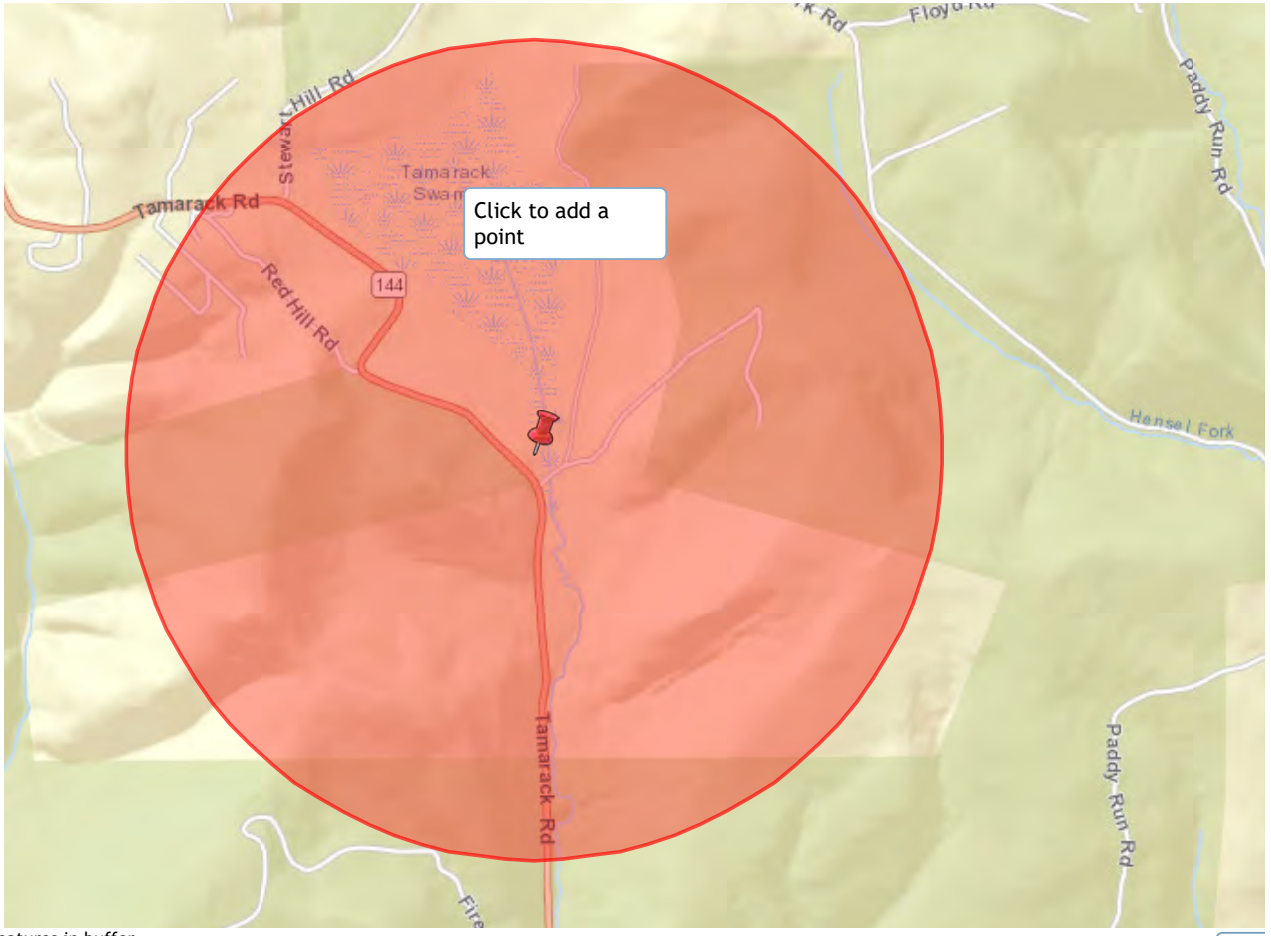
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

Expo

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPONSIB

Crossing HL-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

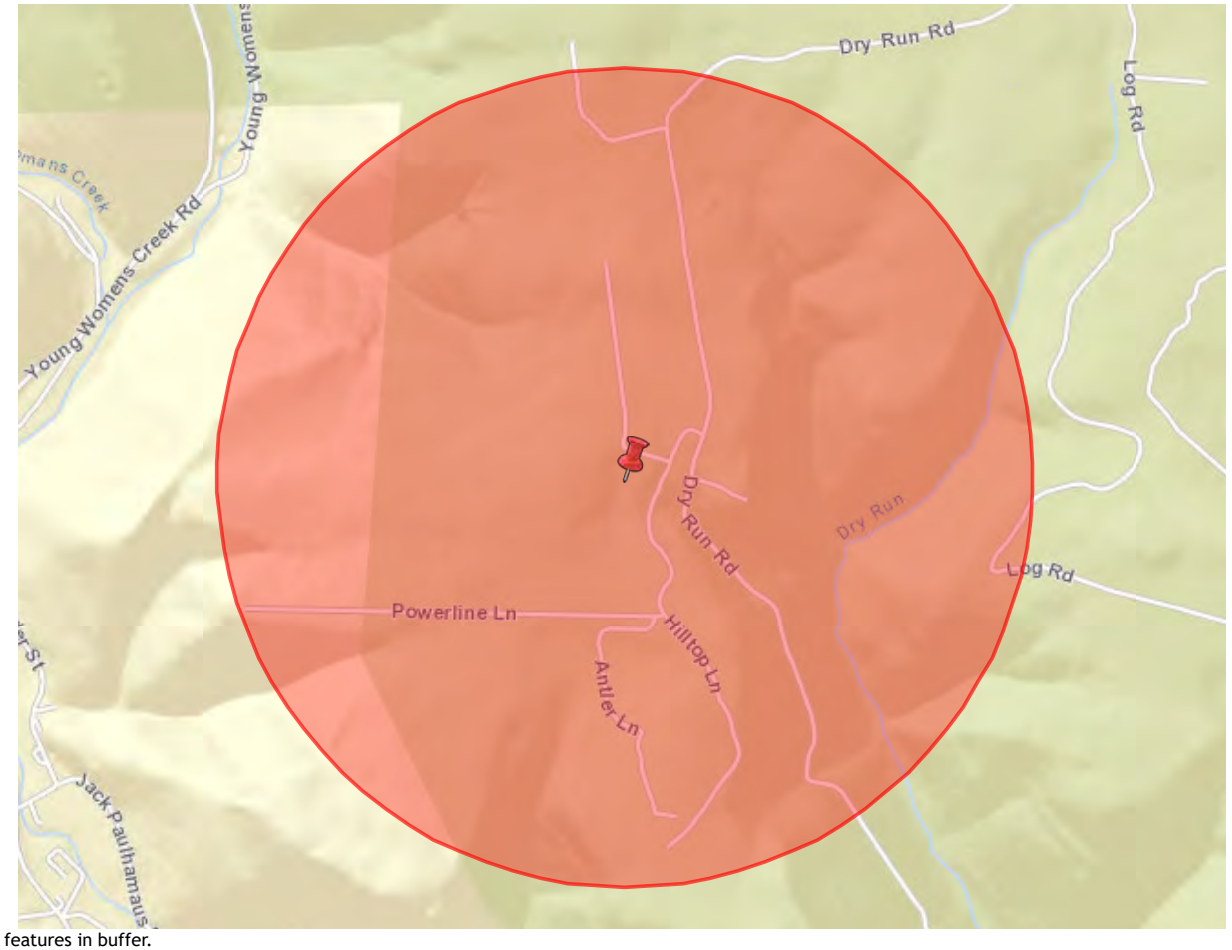
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

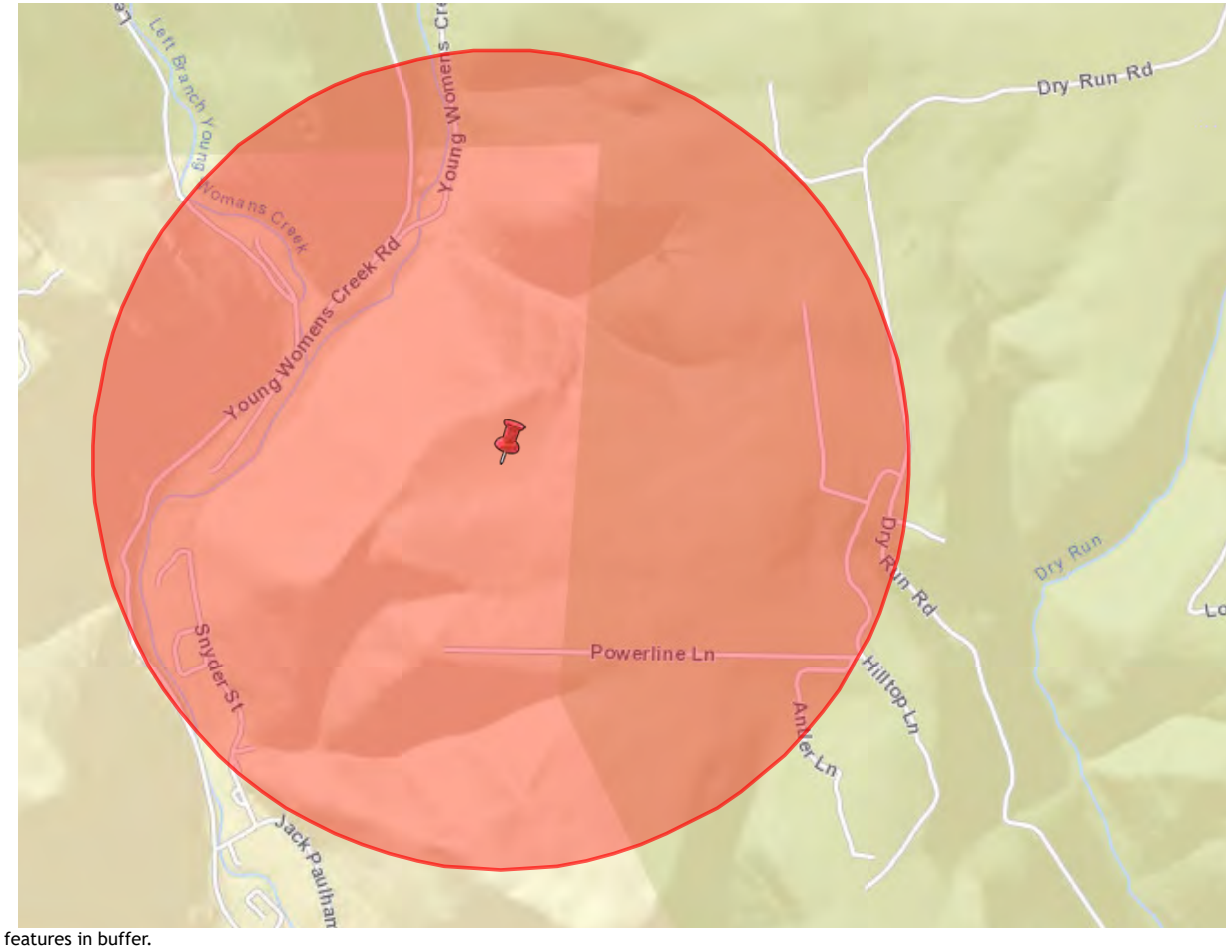
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

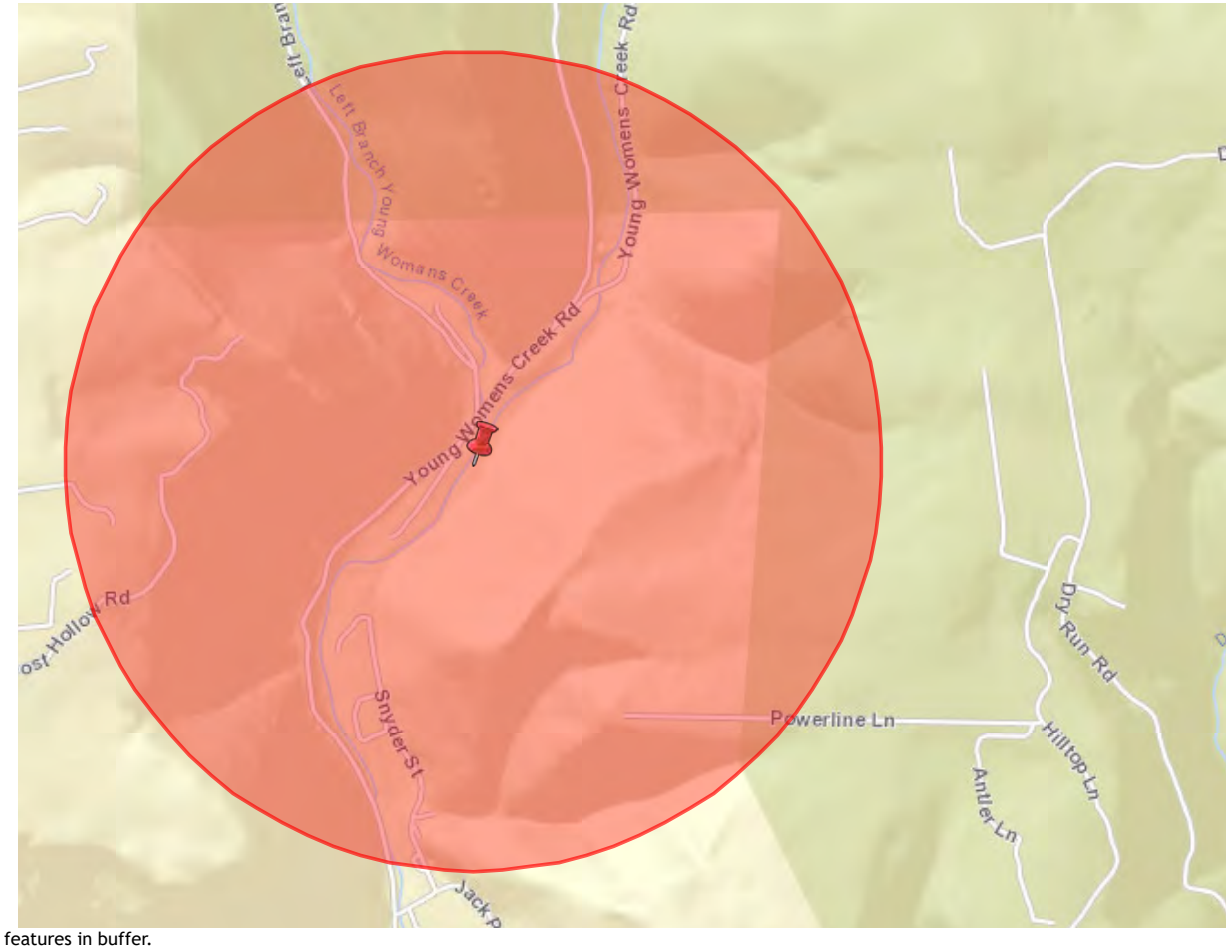
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

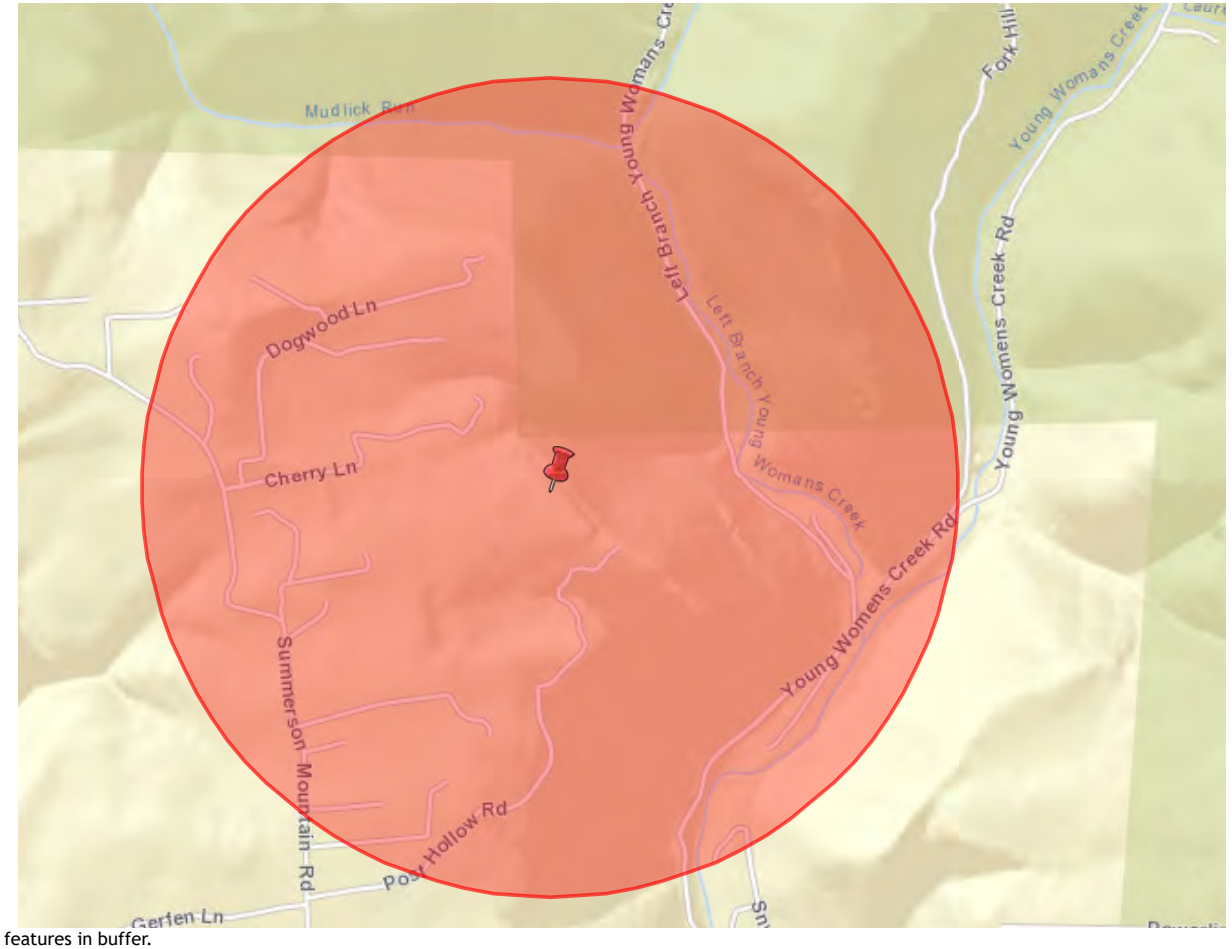
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-1

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Groundwater Wells

Create Buffer Clear

Extract Data

Locate

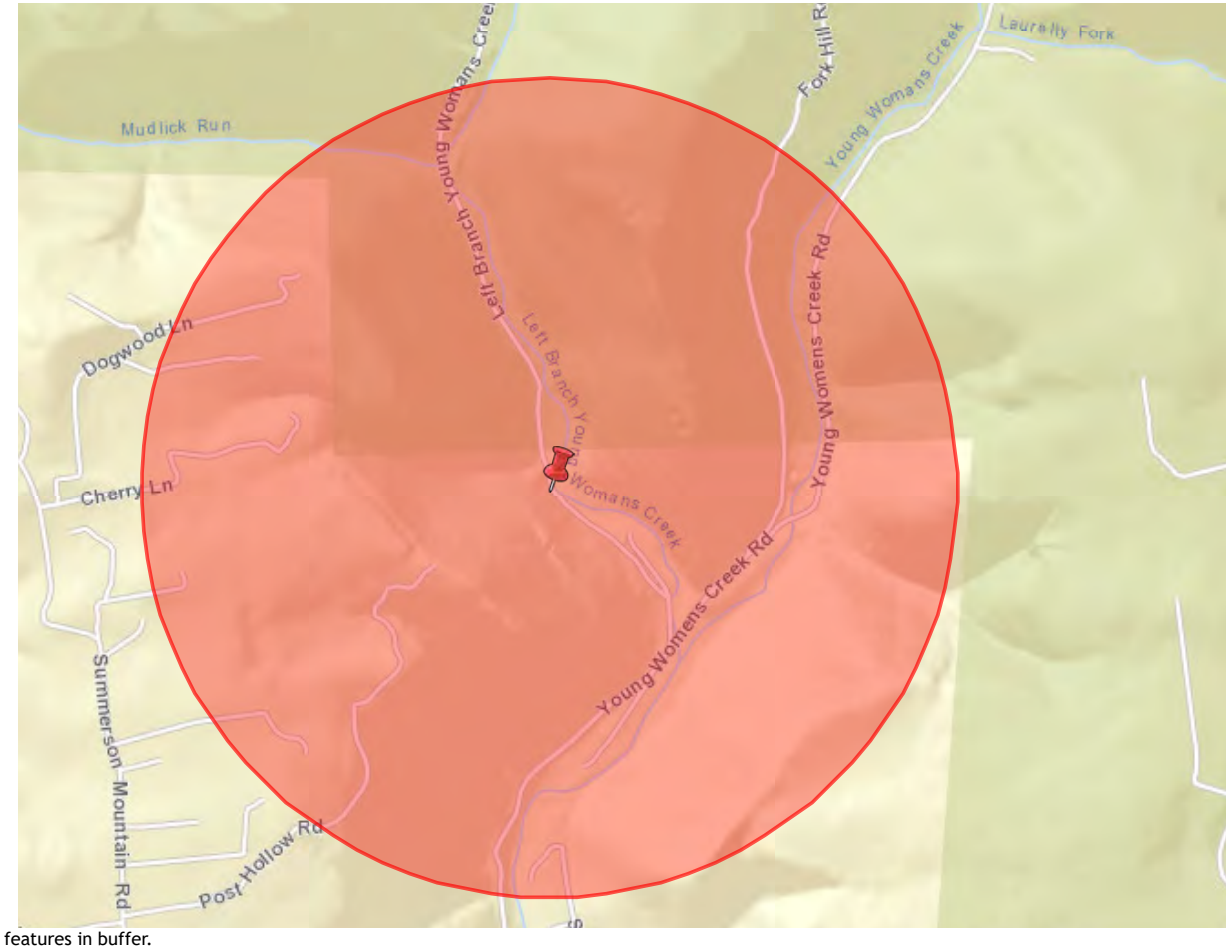
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-2

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

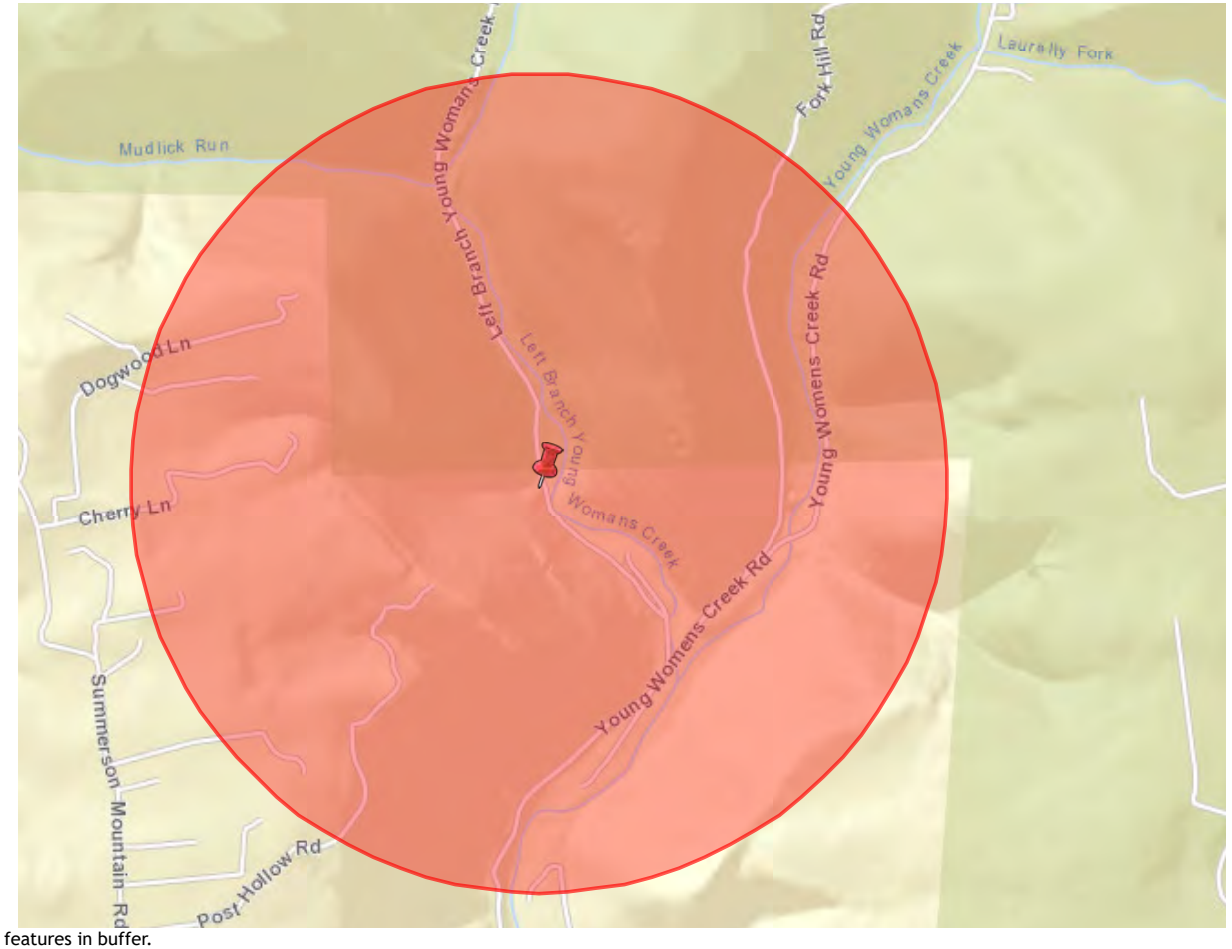
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-3

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

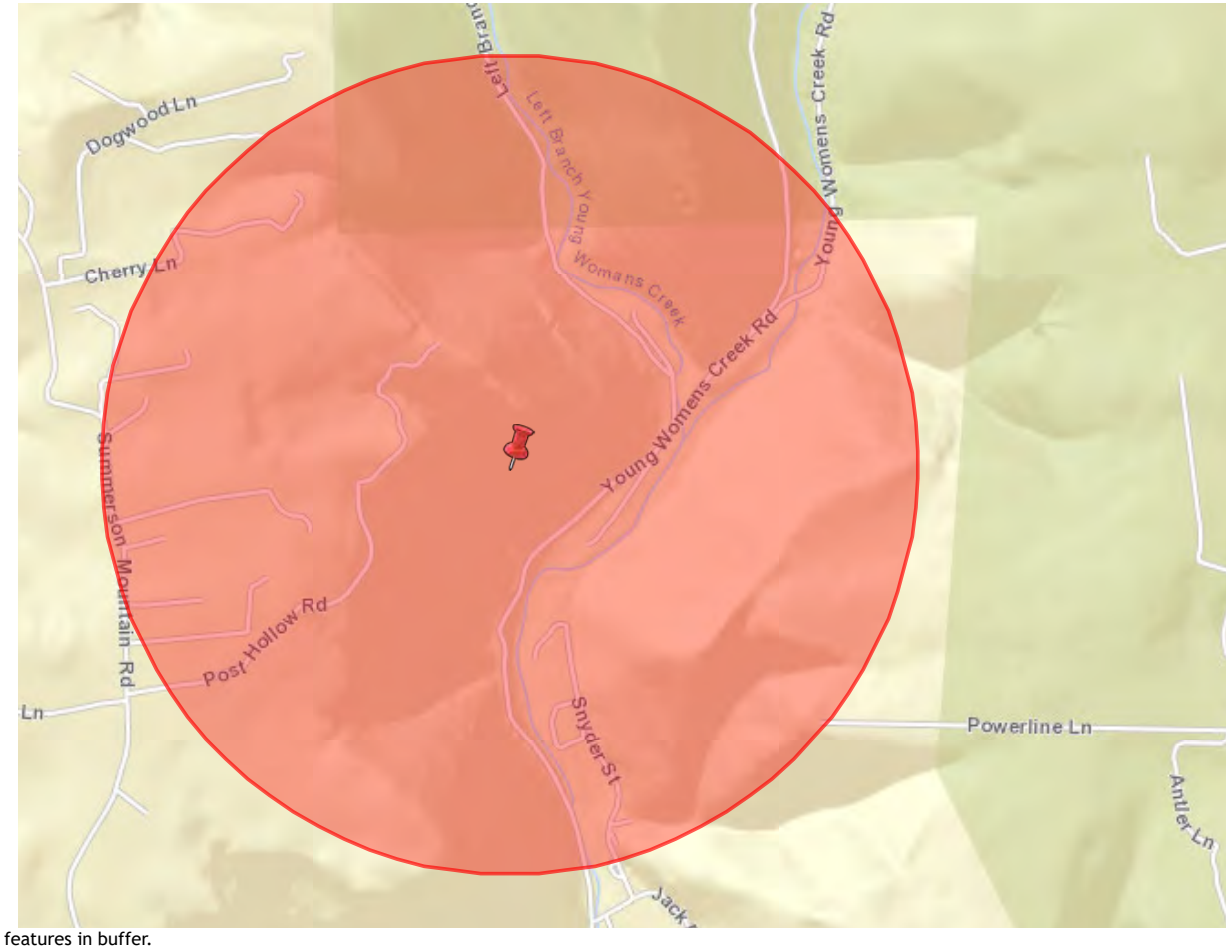
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



0 features in buffer.

PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HL-AR-4

eMapPA

Layers | Legend | Tasks | Links

Buffer a Layer

Buffer Sensitive Layer (Data Only)

Buffer a
Point Polyline Polygon

Enter buffer distance
1 Miles

Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

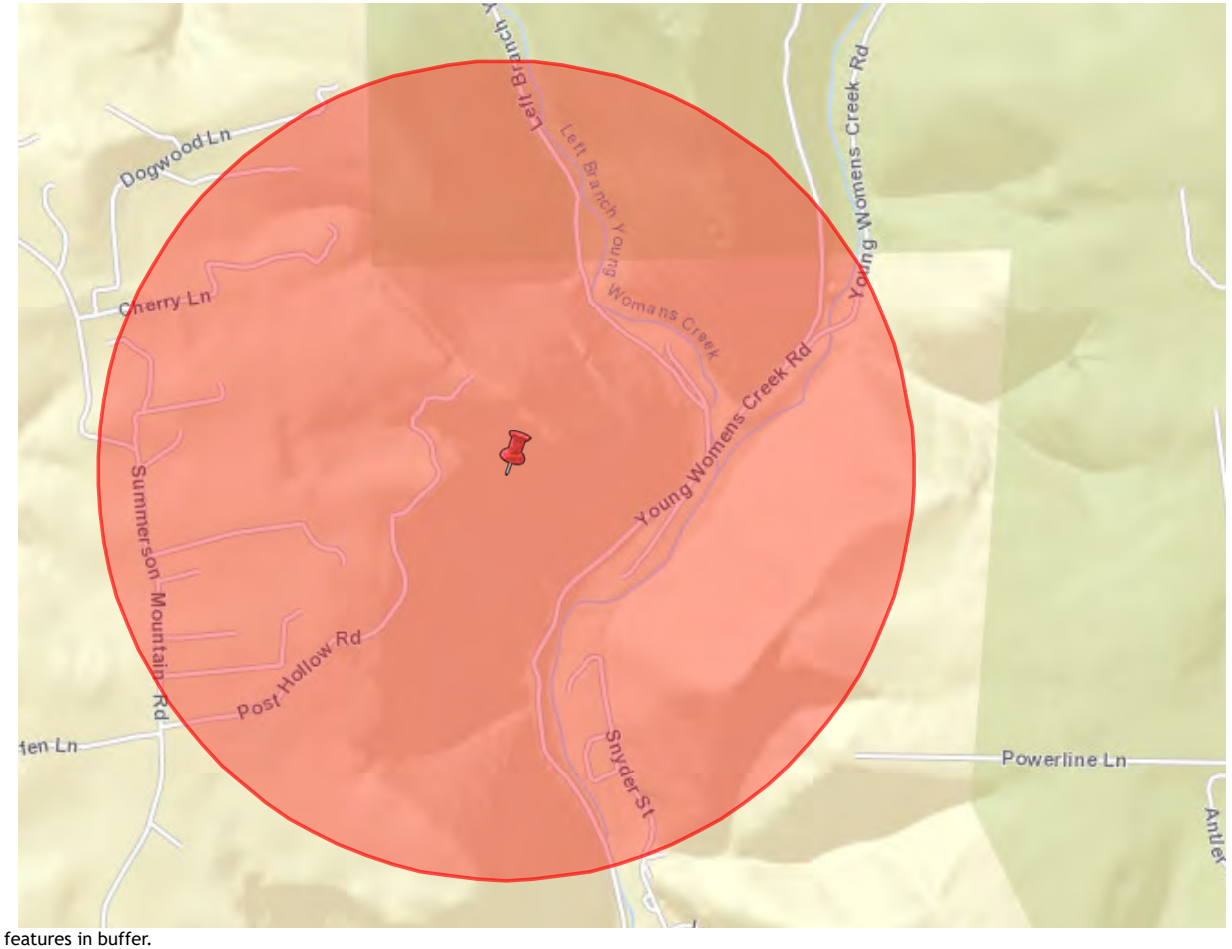
Measurement

Print

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Enter buffer distance
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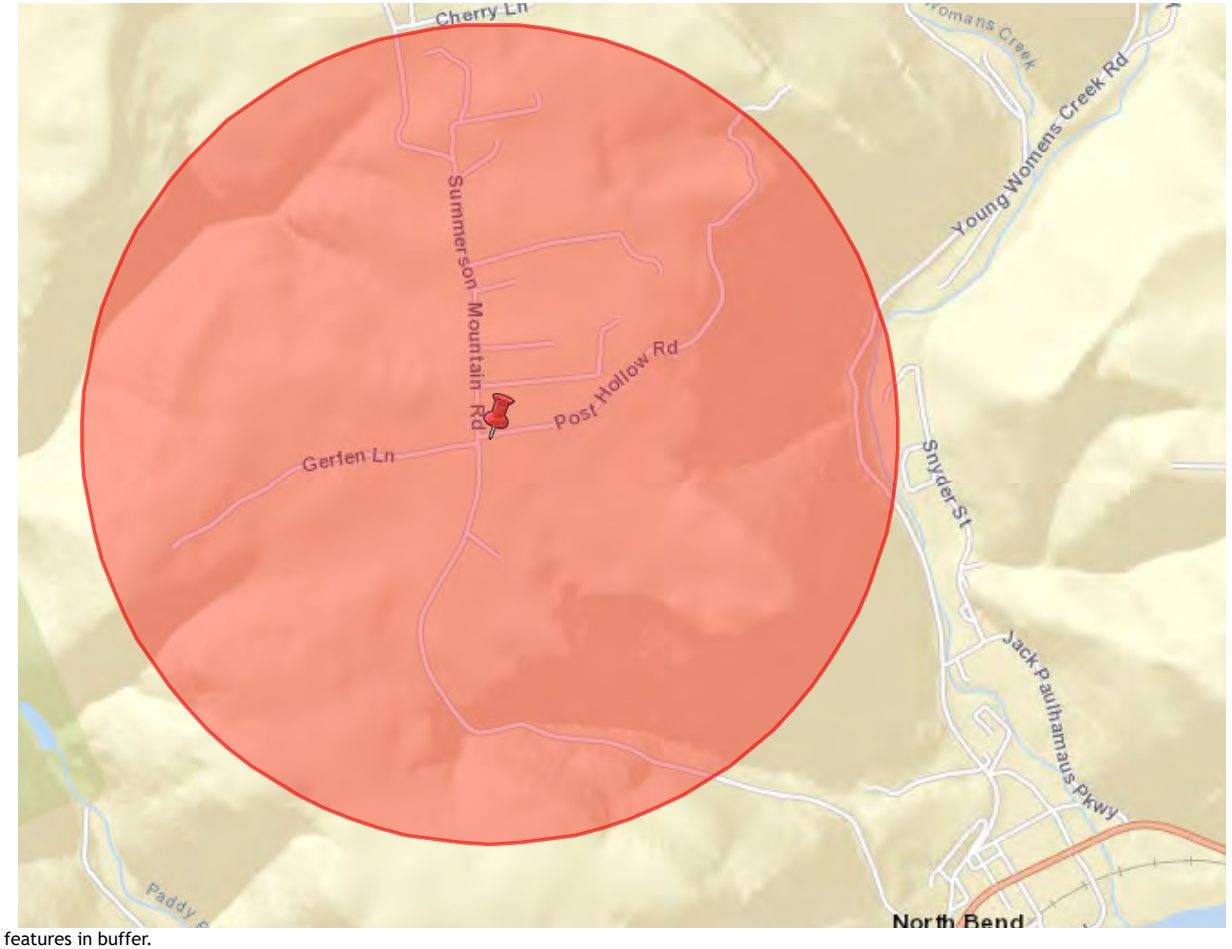
ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Measurement

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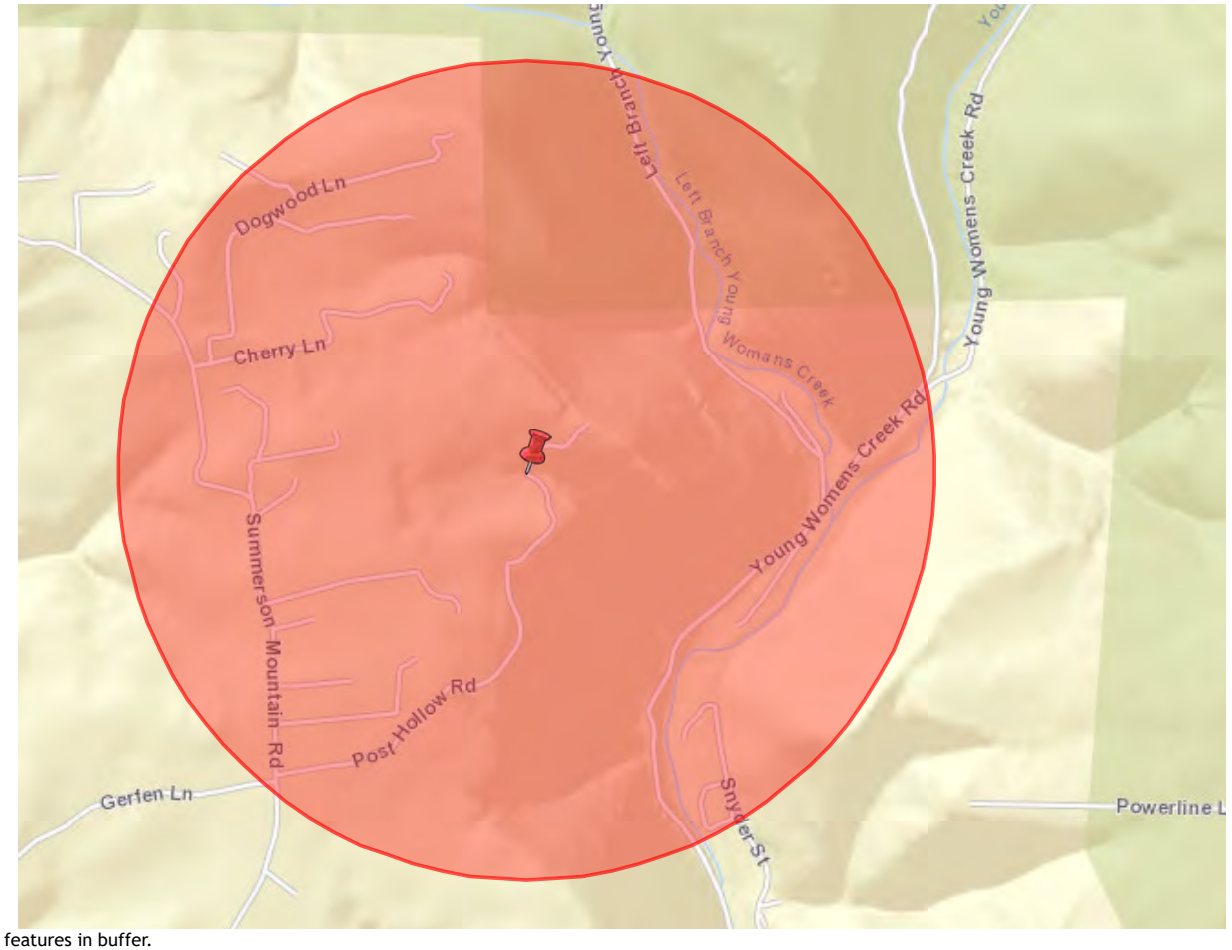
ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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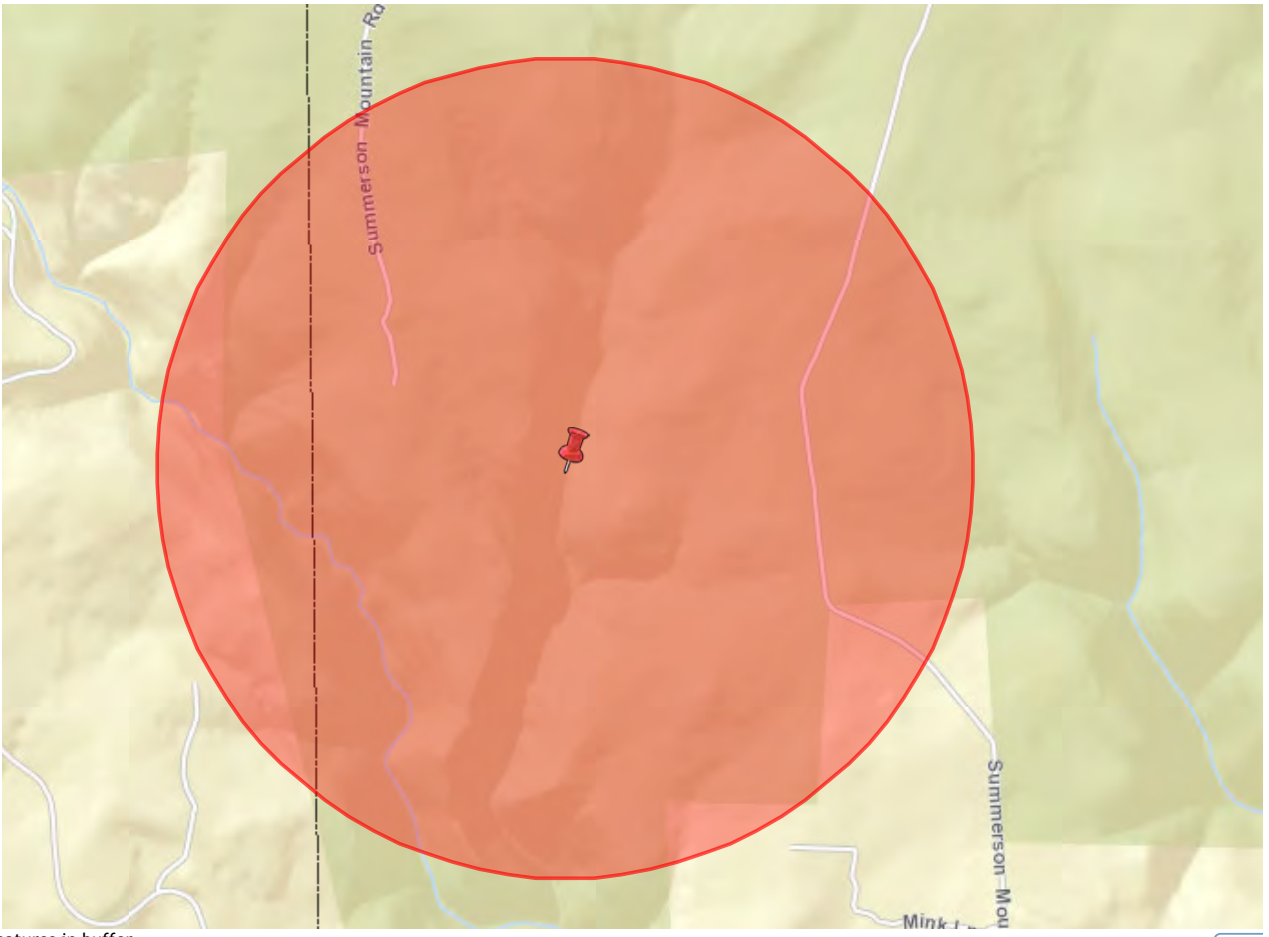
Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Surface Water Intakes

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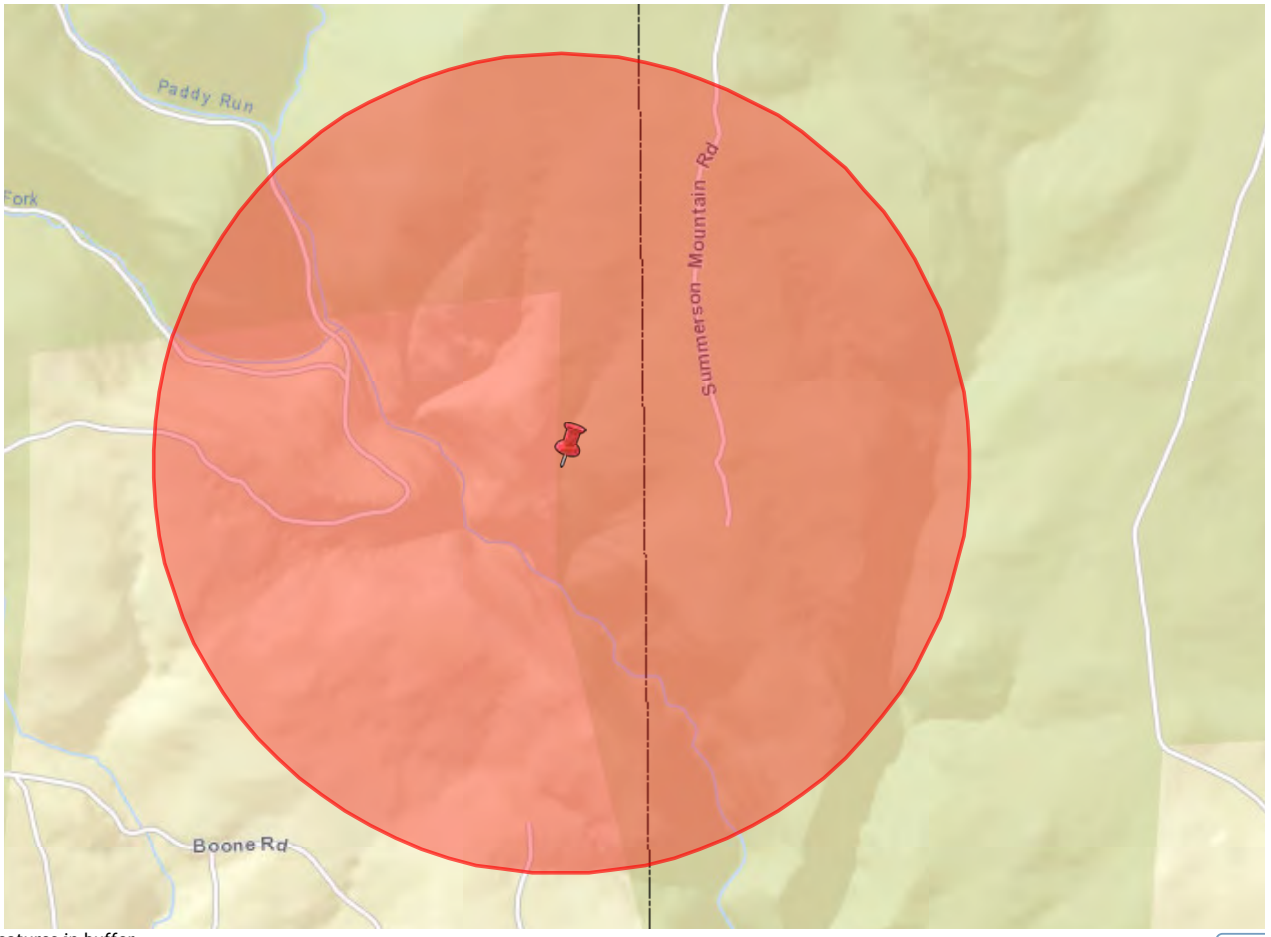
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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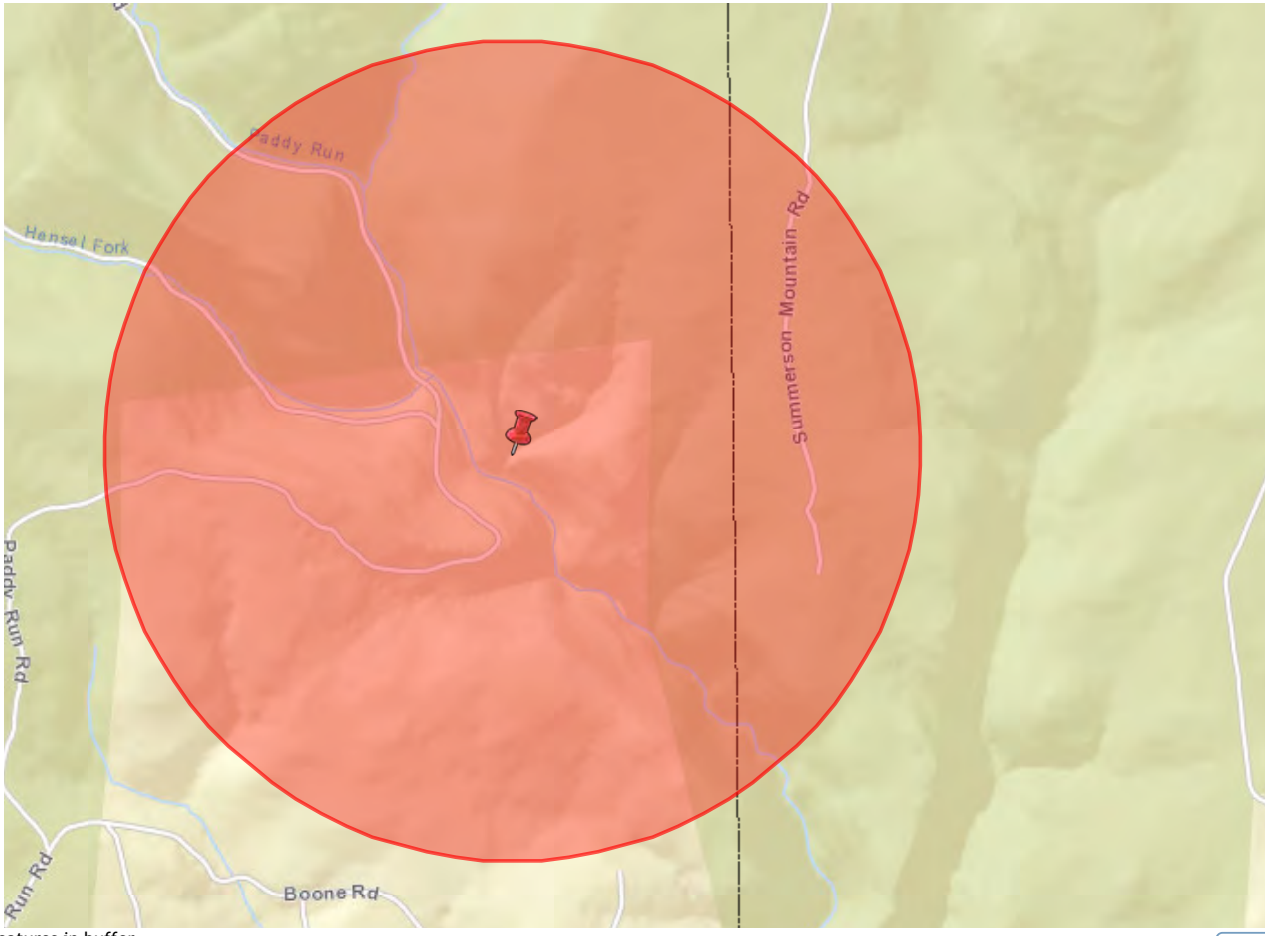
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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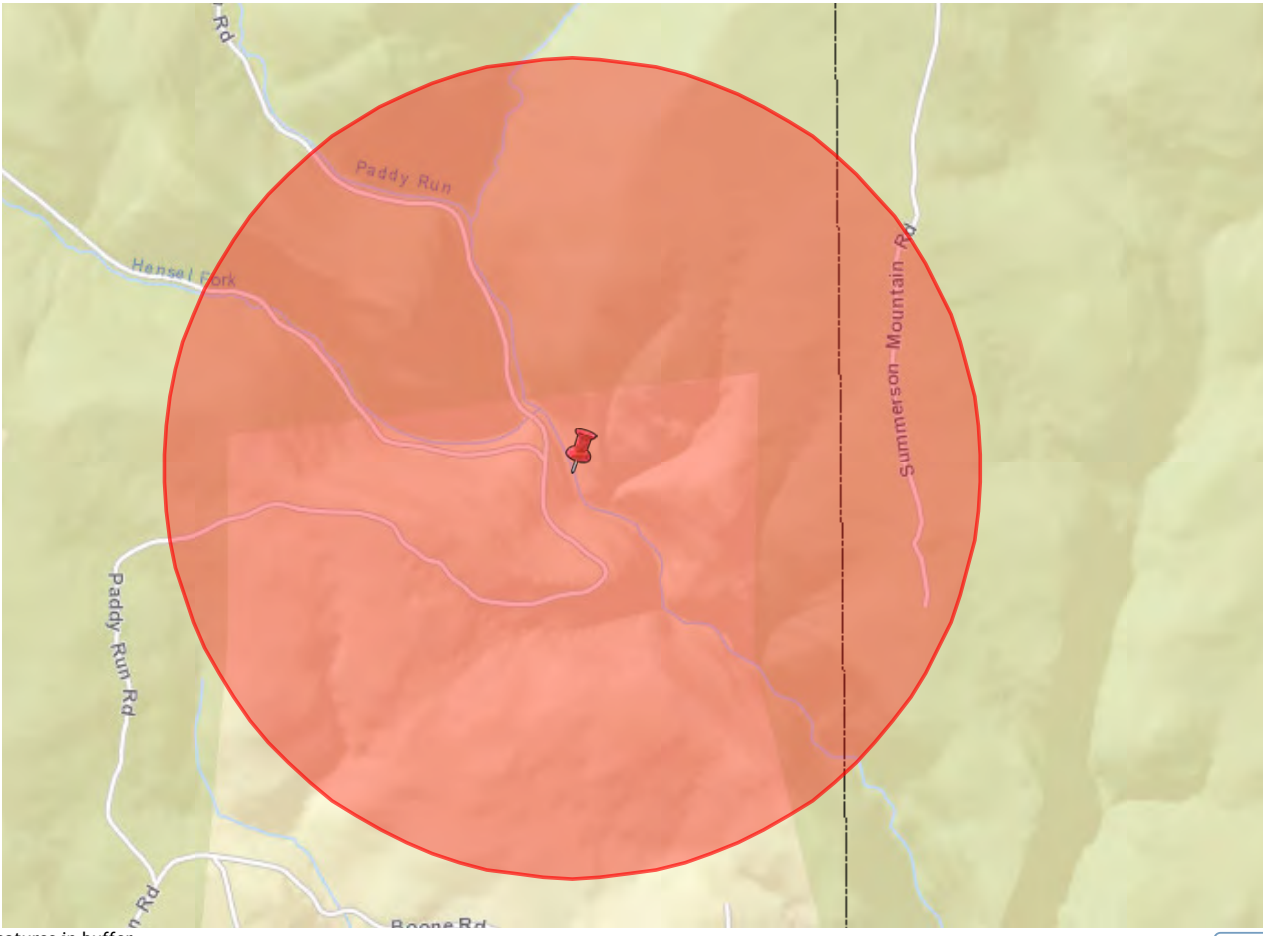
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Surface Water Intakes

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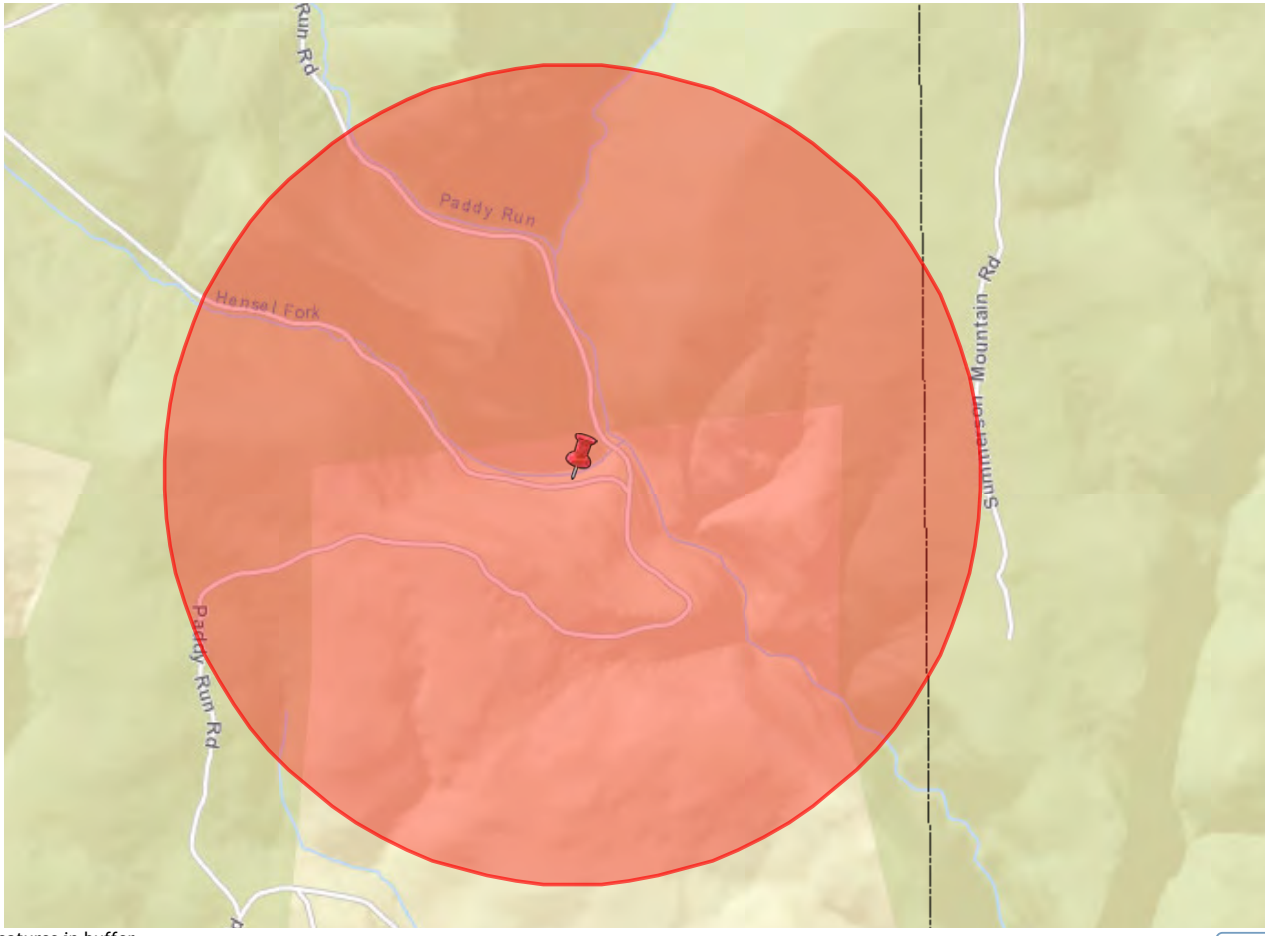
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-6

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Layer to buffer
Surface Water Intakes

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Extract Data

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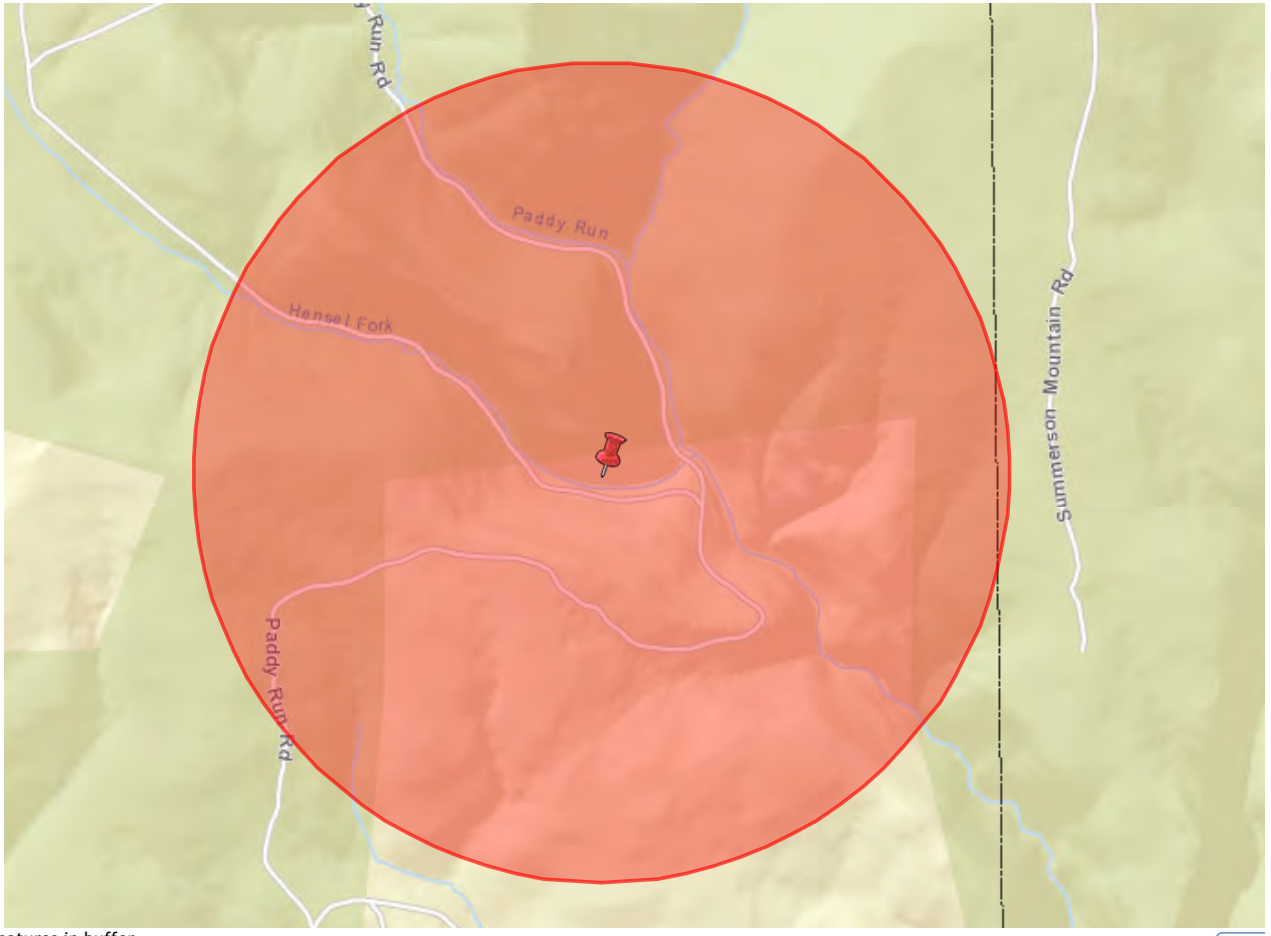
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-7

eMapPA

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Layer to buffer
Surface Water Intakes

Create Buffer Clear

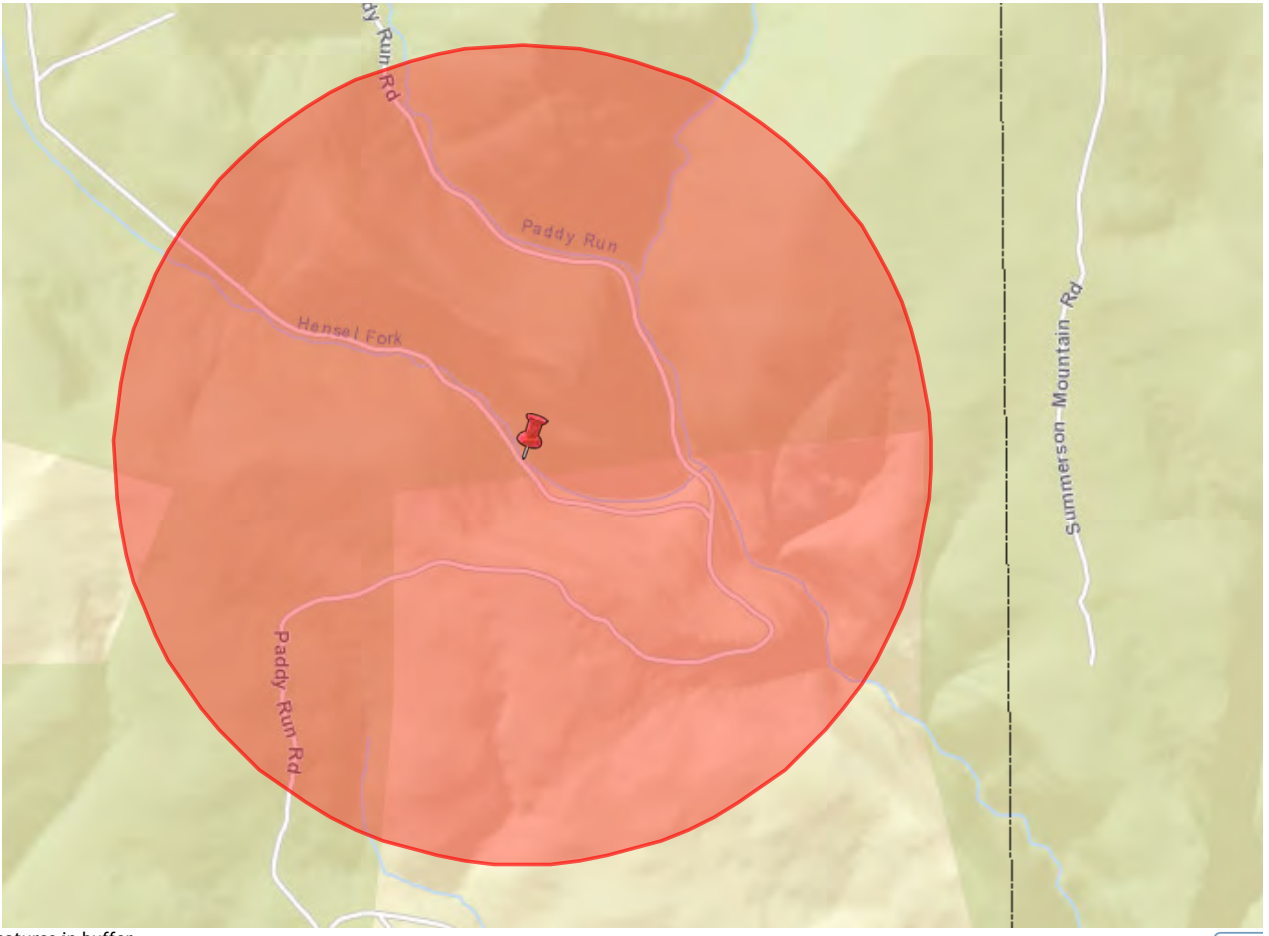
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-8

eMapPA

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Layer to buffer
Surface Water Intakes

Create Buffer Clear

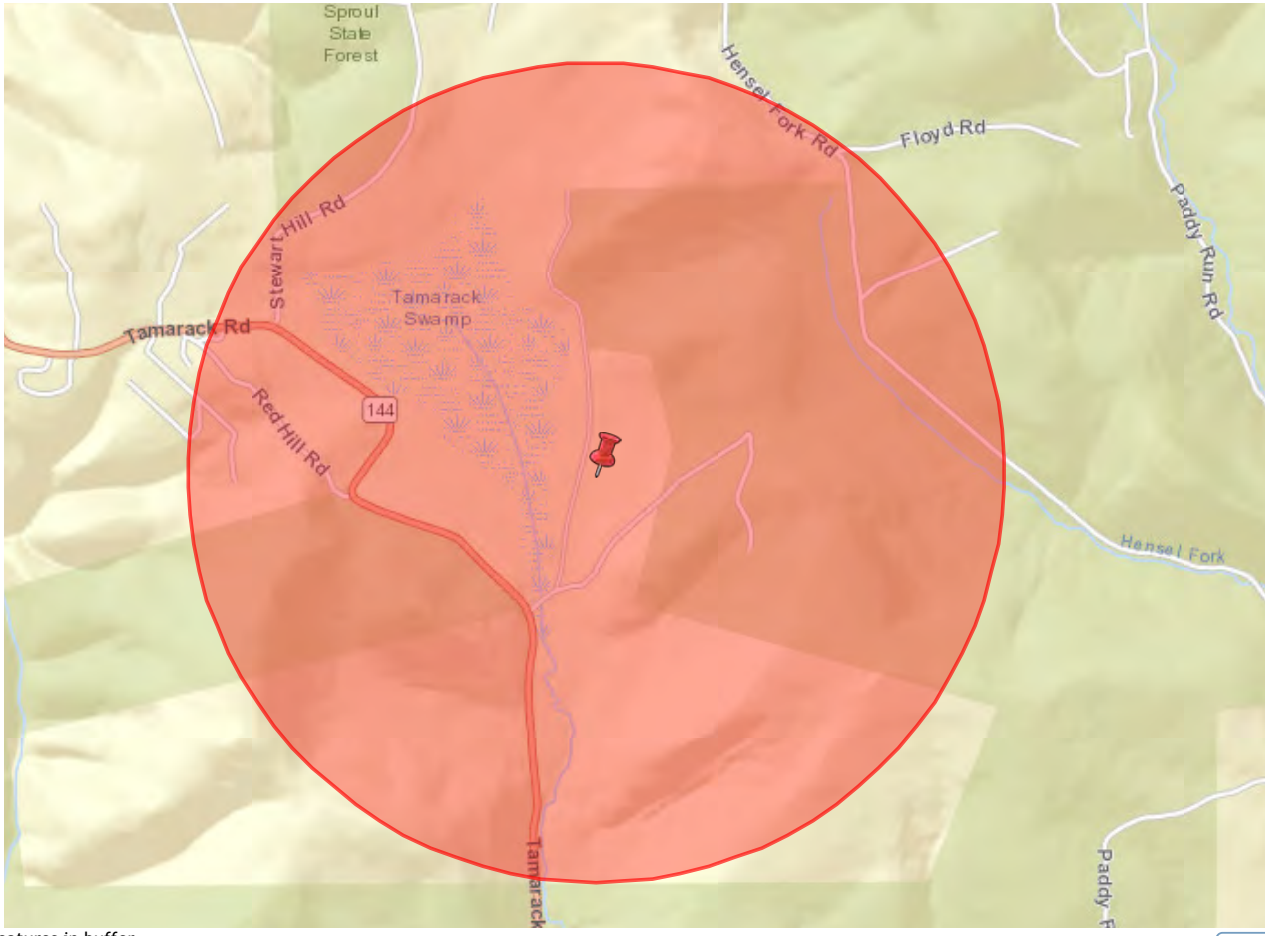
Extract Data

Locate

Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-9

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Enter buffer distance
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Layer to buffer
Surface Water Intakes

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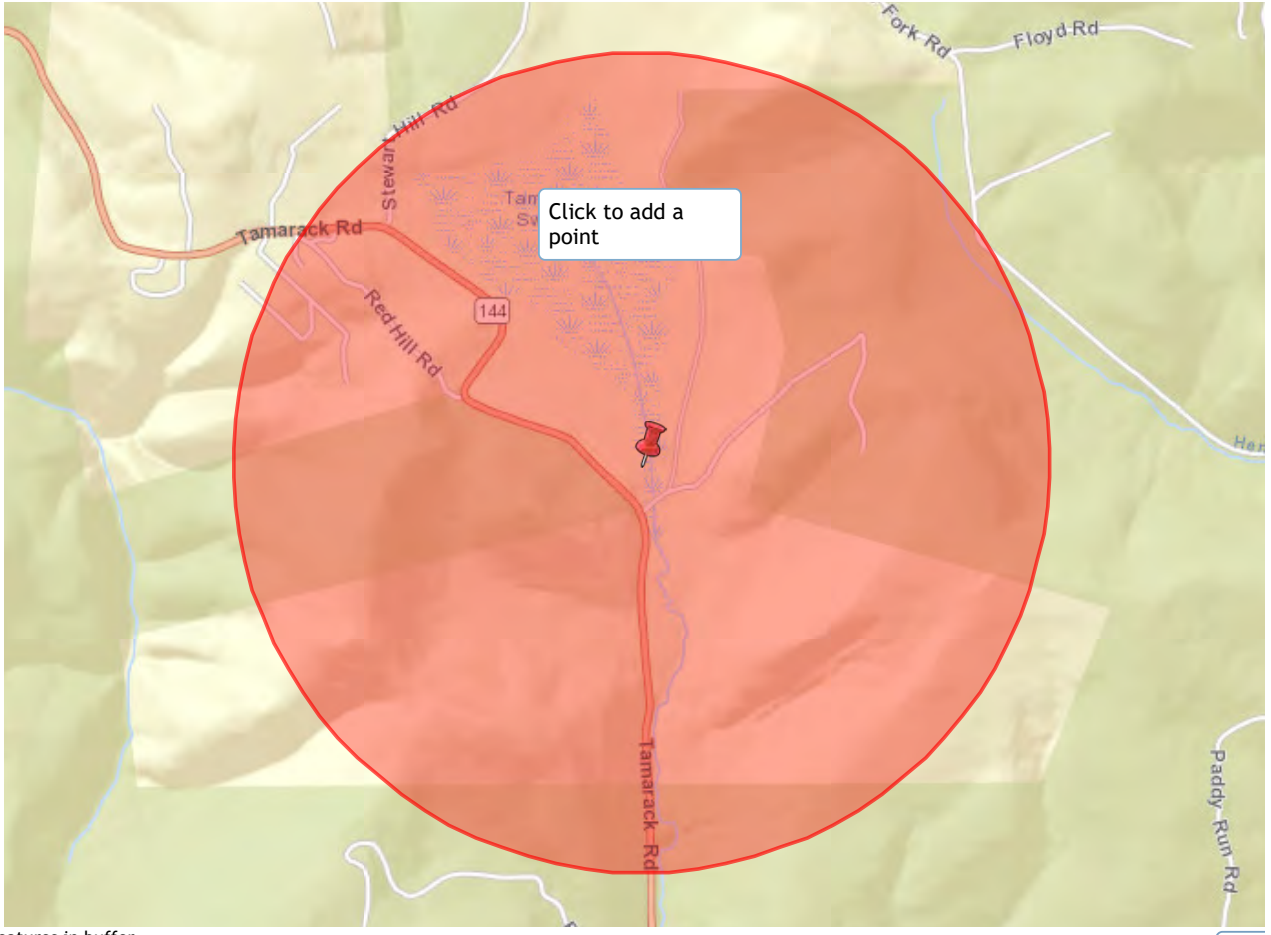
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-10

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Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

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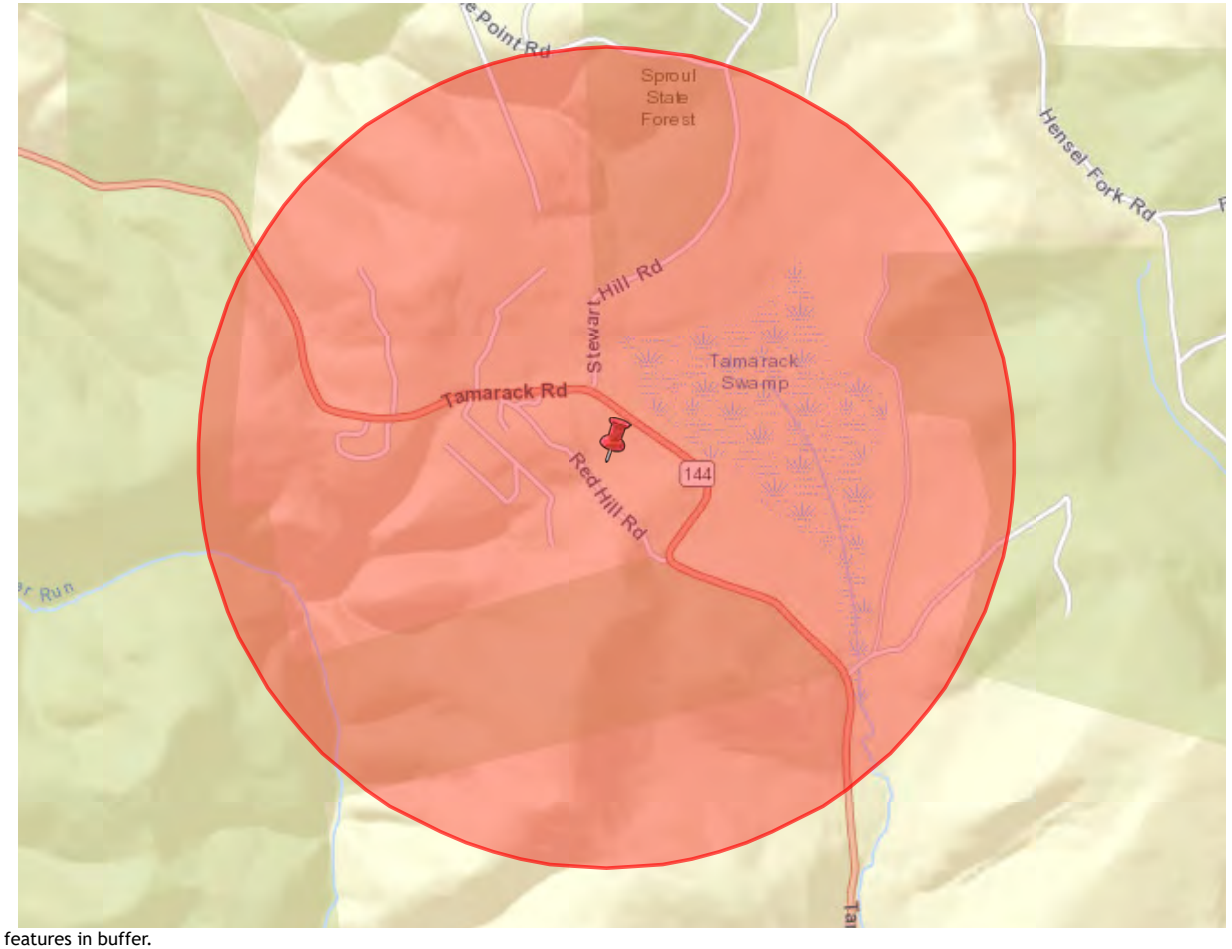
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-11

eMapPA

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Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

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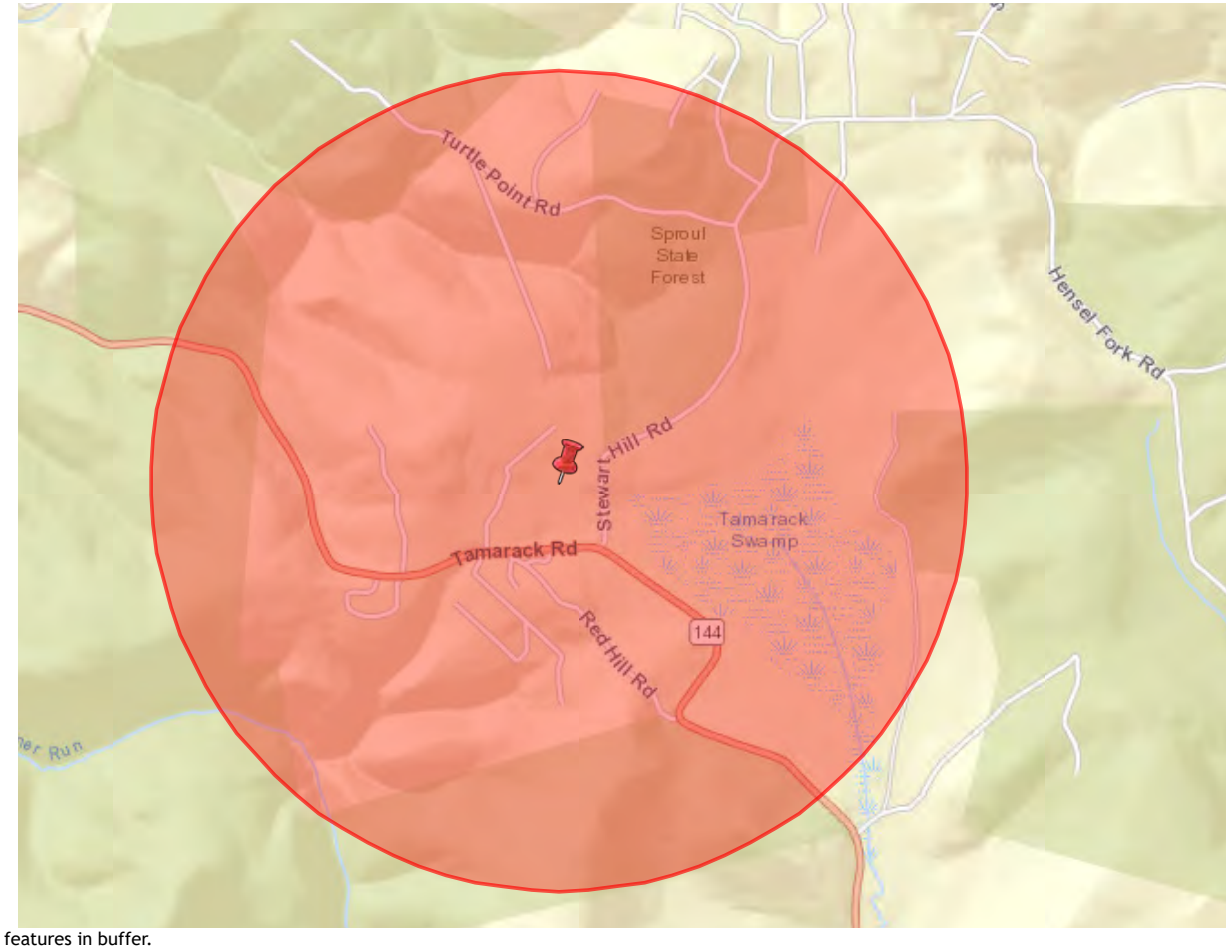
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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Crossing HR-12

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Enter buffer distance
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Layer to buffer
Surface Water Intakes

Create Buffer Clear

Extract Data

Locate

Measurement

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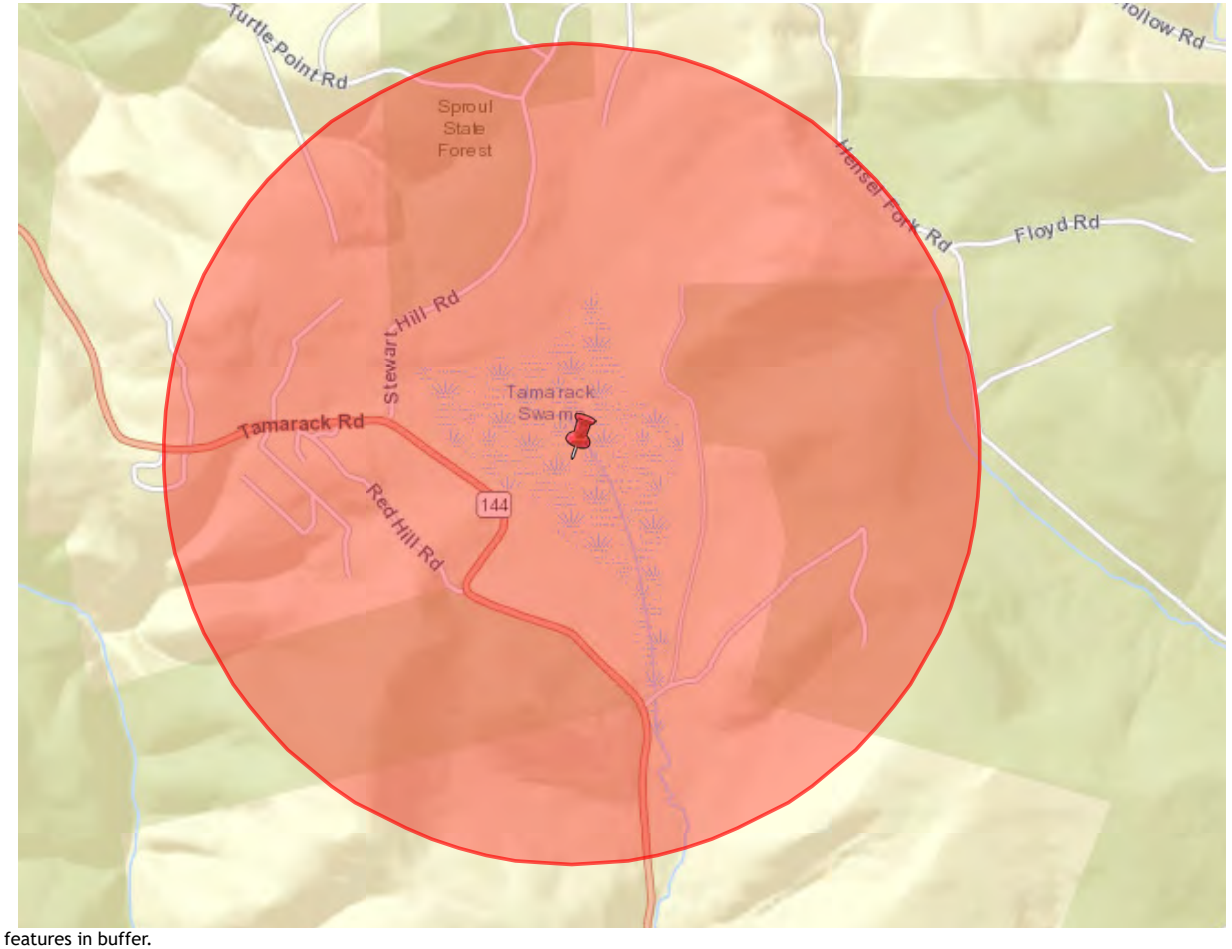
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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PWS_ID	SYSTEM_NAME	AREA_CITY	RESPO

Crossing HR-AR-1

eMapPA

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Create Buffer Clear

Buffer Sensitive Layer (Data Only)

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Enter buffer distance
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Layer to buffer
Surface Water Intakes

Create Buffer Clear

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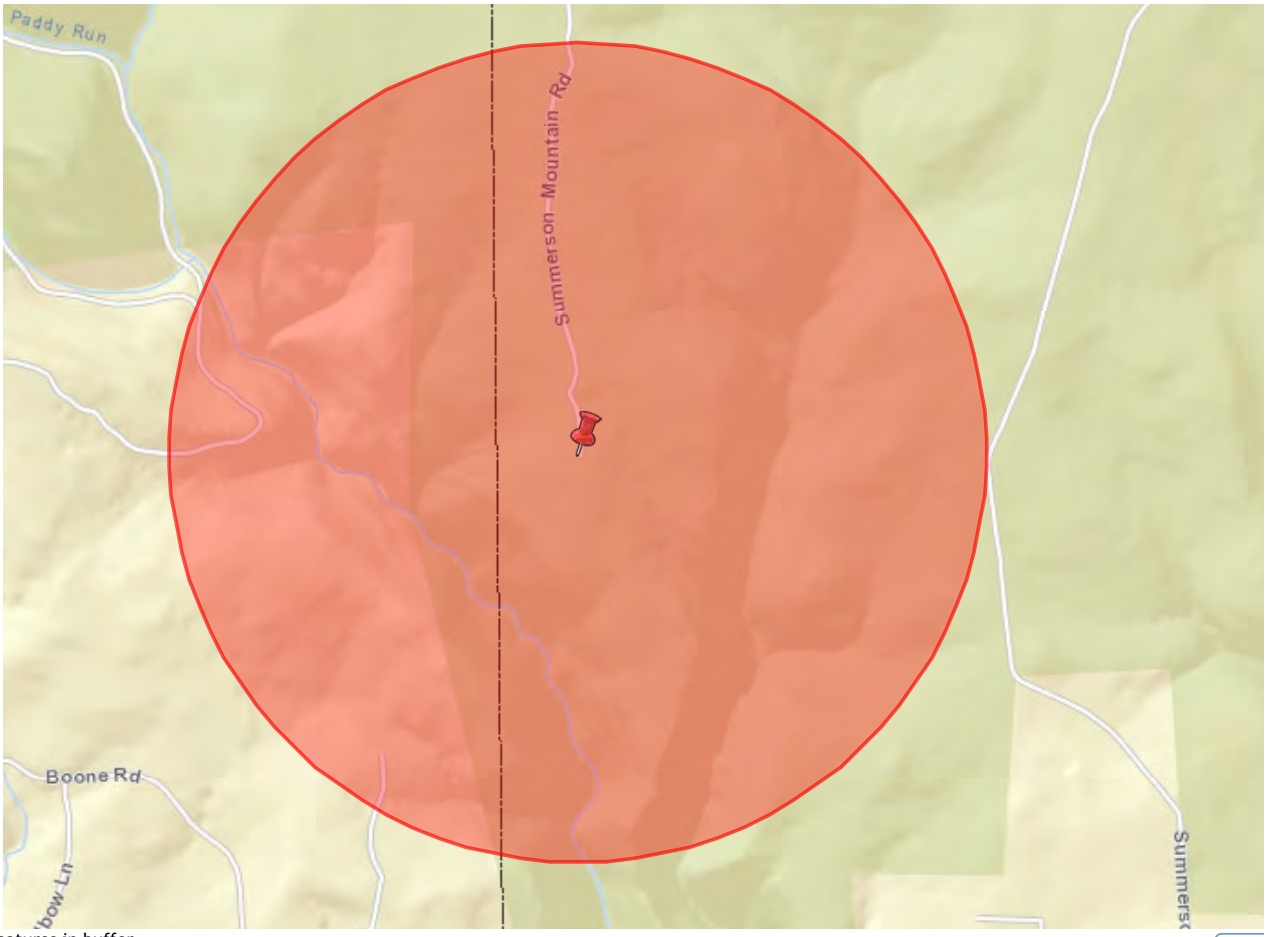
Map | eFacts Query | Advanced Query

ESRI Streets & Imagery Topographic National Geographic

Streets Imagery



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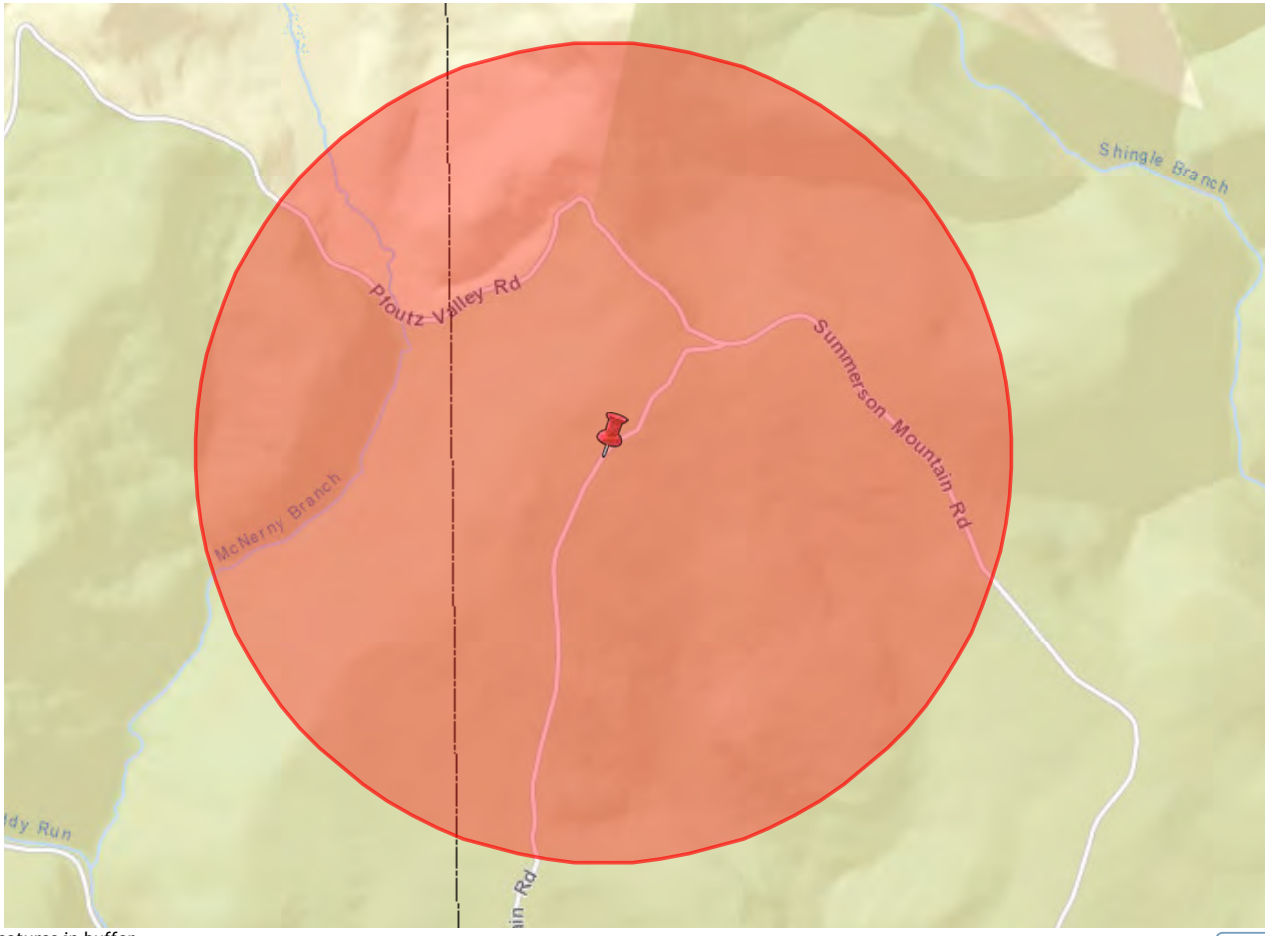

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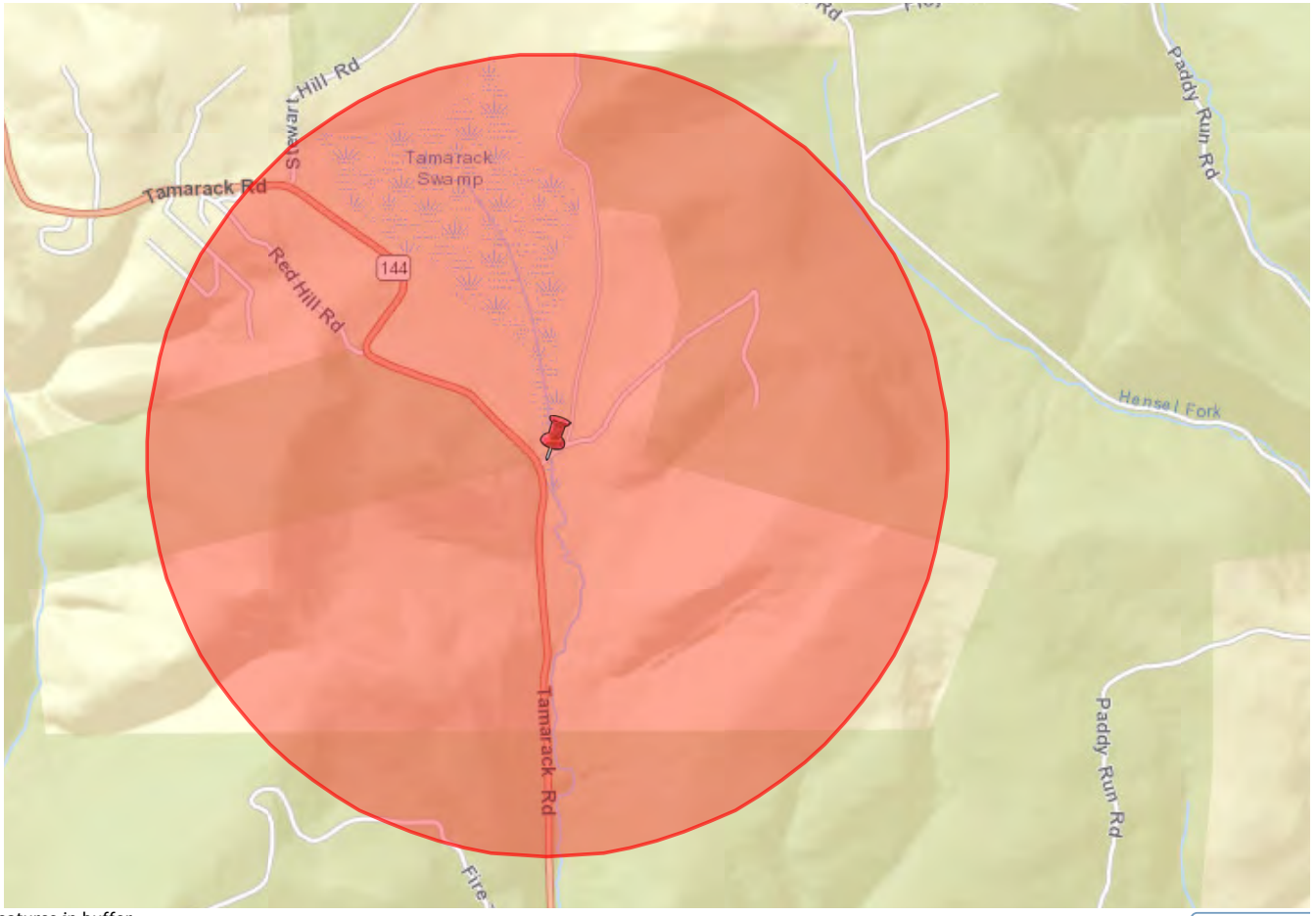
ESRI Streets & Imagery | Topographic | National Geographic

Streets Imagery



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ESRI Streets & Imagery Topographic National Geographic

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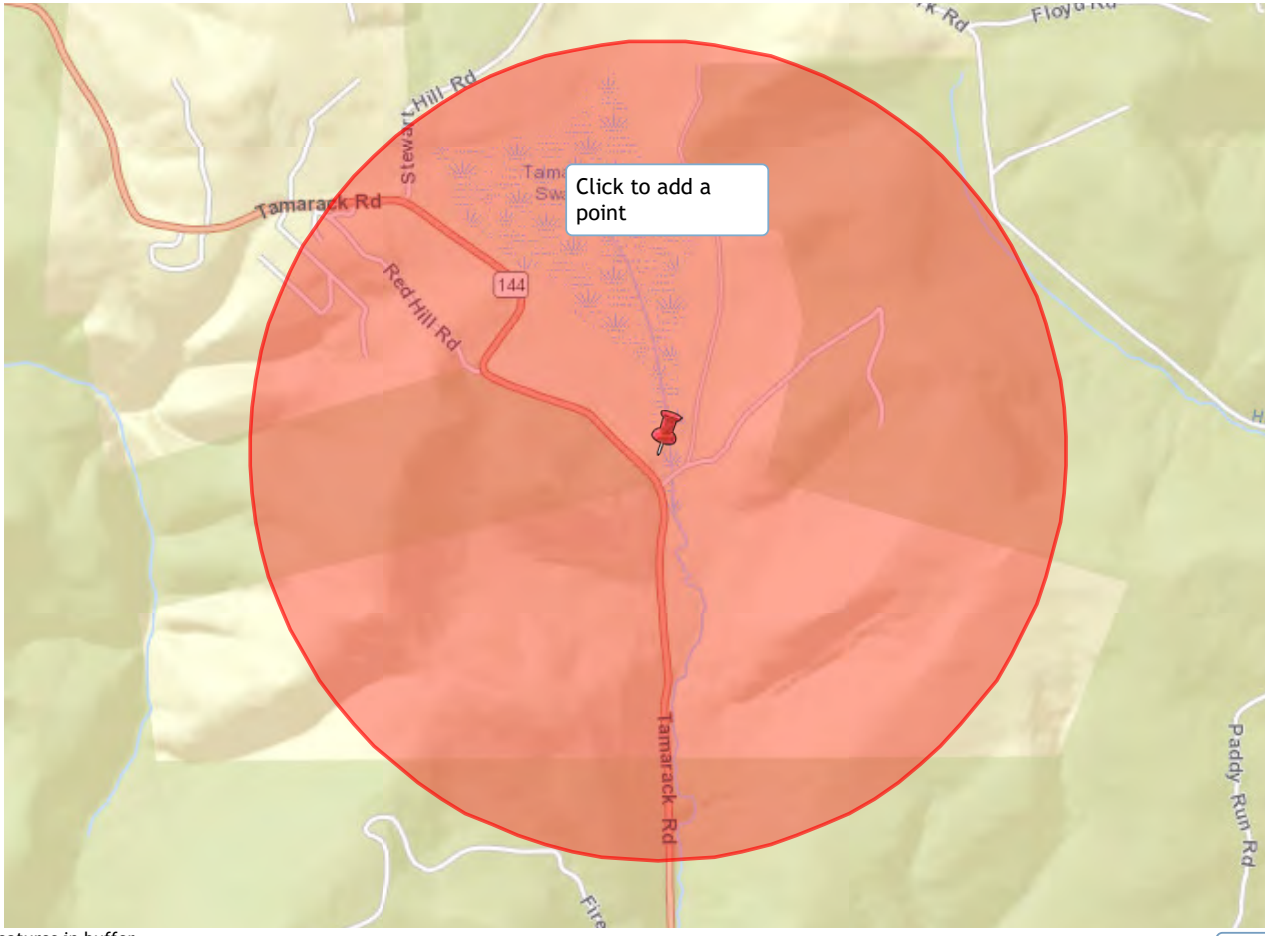

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APPENDIX 2

AIDS TO NAVIGATION PLAN

Pennsylvania Fish & Boat Commission

established 1866

August 6, 2019

WHM Consulting, Inc
ATTN Paul Fisher, PWS
2525 Green Tech Drive, Suite B
State College, PA 16803

I have reviewed the recently submitted Aids to Navigation Plan for the Leidy South Project, Young Woman's Creek, Chapman Twp., Clinton County. The Plan is acceptable as submitted and has been approved. All signage/buoys must be installed prior to construction and inspected frequently to ensure it is always visible to boaters. Any changes to this plan must be submitted directly to this office for further review. If buoys are to be utilized PFBC-277 Application to Install Floating Structures/Private Aids to Navigation must be submitted and approved prior to installation.

I will share the approved ATON plan with the PA Fish & Boat Commission Division of Environmental Services and the Regional Law Enforcement Office to ensure they are aware of the project. Please advise the contractor that the project site may be inspected at any time by Bureau of Law Enforcement personnel for compliance with this plan. A copy of the approved plan along with this letter should be available for inspection if requested.

Please feel free to contact me if you have any questions concerning this project or the PA Fish & Boat Commission Aids to Navigation program in general.

Sincerely,

Clyde Warner, Captain
Bureau of Law Enforcement

Cc: (electronic) SE Region BLE-DES

Transcontinental Gas Pipe Line Company, LLC

AIDS TO NAVIGATION PLAN
Young Womans Creek (S1-T4-HL)

LEIDY SOUTH PROJECT

Chapman Township

Clinton County, Pennsylvania

Submitted to:
Pennsylvania Fish and Boat Commission
P.O. Box 67000
Harrisburg PA 17106

August 2019

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ATTACHMENT A –

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ATTACHMENT B –

Project Crossing Location Map

ATTACHMENT C –

Photographs

ATTACHMENT D –

Site-Specific Plan Drawing

ATTACHMENT E –

Signage Examples

ATTACHMENT A

PROJECT NARRATIVE

Project Description

Transcontinental Gas Pipe Line Company, LLC (Transco), a subsidiary of The Williams Companies, Inc. (Williams) is proposing the Leidy South Project (Project). The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6

Per Chapter 113.1 of the Pennsylvania Administrative Code (Title 58 Recreation), the Pennsylvania Fish and Boat Commission regulates the placement of aids to navigation (ATON) within waters not marked by the United States Coast Guard. The Pennsylvania Fish and Boat Commission requires, "persons, including clubs, individuals, State agencies, municipalities and other groups, wishing to establish an aid shall apply for permission from the Commission." To that end, Transco is submitting this application for the placement of aids to navigation within Young Womans Creek (S1-T4-HL) associated with the construction of the Project.

A component of the Project is the Hilltop Loop. The Hilltop Loop will cross S1-T4-HL between mile post 184.9 and 185.0 in Chapman Township, Clinton County. Attachment B includes a United States Geologic Survey 7.5-Minute topographic map depicting the location of the Project's crossing. S1-T4-HL is approximately 100 feet wide at the proposed crossing location. Photographs of the proposed crossing are shown in Attachment C. Construction activities include the installation of a 36-inch natural gas pipeline with a minimum of four feet of cover over the pipeline, below the streambed, unless in shallow bedrock.

Construction Schedule

Construction of the Project is anticipated to commence in winter 2020/2021. A final construction schedule for the Project has not been determined at this time. The Pennsylvania Fish and Boat Commission will be notified 60 days prior to the start of construction activities at the crossing of S1-T4-HL. Aid to Navigation Plan (ATON), Sign Details, and Timing

Construction Methods

Transco proposes to utilize a dry-crossing construction method (Dam-and-Pump or Cofferdam) at the S1-T4-HL crossing. Dry-crossing construction methods are described as follows:

Dam-and-Pump

The dam-and-pump construction method is employed to temporarily divert stream flow around the construction area and discharge the water downstream. This method allows downstream flow to be maintained at all times, while also creating a dry work area. Multiple discharge pumps may be required to keep the area dry and maintain adequate flow, to avoid flooding upstream. Pumps and hoses will be sized to accommodate flow, in accordance with the applicable regulations. After the pump or pumps are installed, damming structures such as concrete jersey barriers, water bladders, port-a-dams, steel plates, and/or sand bags, are installed upstream and downstream of the proposed pipeline trench. At the time of construction, the stream will be evaluated and depending on the stream's depth, flow velocity, channel width, streambed material, and flow type, one of the above damming structures will be used.

Once the dam-and-pump and damming structures are in place, the trench will be excavated, and the pipe installed in the dry ditch. Following the installation of the pipeline, the trench will be backfilled with natural streambed material to pre-existing elevations and the dam-and-pump will be removed to allow natural flow to resume within the stream channel.

Cofferdam

The cofferdam construction method involves the installation of temporary dam that extends from one stream bank to approximately the center of the stream channel, which allows for the diversion of stream flow to the opposite half of the stream channel; thereby, maintaining downstream flow at all times. Prior to excavation, sandbags, sandbag/plastic sheeting diversion structures, metal road plates or the equivalent, will be used to develop an effective seal, and to divert stream flow through to the opposite side of the stream channel.

During excavation, equipment will only work within the dry area behind the cofferdam, while regular flow is maintained outside of this area within the remaining portion of the stream channel. The pipeline will be place approximately halfway across the stream, and the trench will be

backfilled to pre-existing elevations with natural streambed material. The coffer dam will remain in place and be maintained until restoration of the waterbody is complete for that portion of the installation. Following restoration, the cofferdam will be removed and installed from the opposite bank for the remaining half of the pipeline installation, which will follow the above-referenced procedures.

The Young Womans Creek, at the project location, is not large enough for motorized boats, therefore the plan is developed to provide safety for non-motorized boats (canoes and kayaks) which will travel in a southwestern direction with flow. To enable navigation safely around the work area, signage will be placed as shown on the attached plan and will include warning, portage, and exit signs (as needed). Details for each sign are attached. Signs will be placed at least two weeks prior to commencement of the crossing and will remain in place for the duration of the construction. Upon completion of all work, the signs will be removed.

<u>Signage / Plan Routing Details</u>

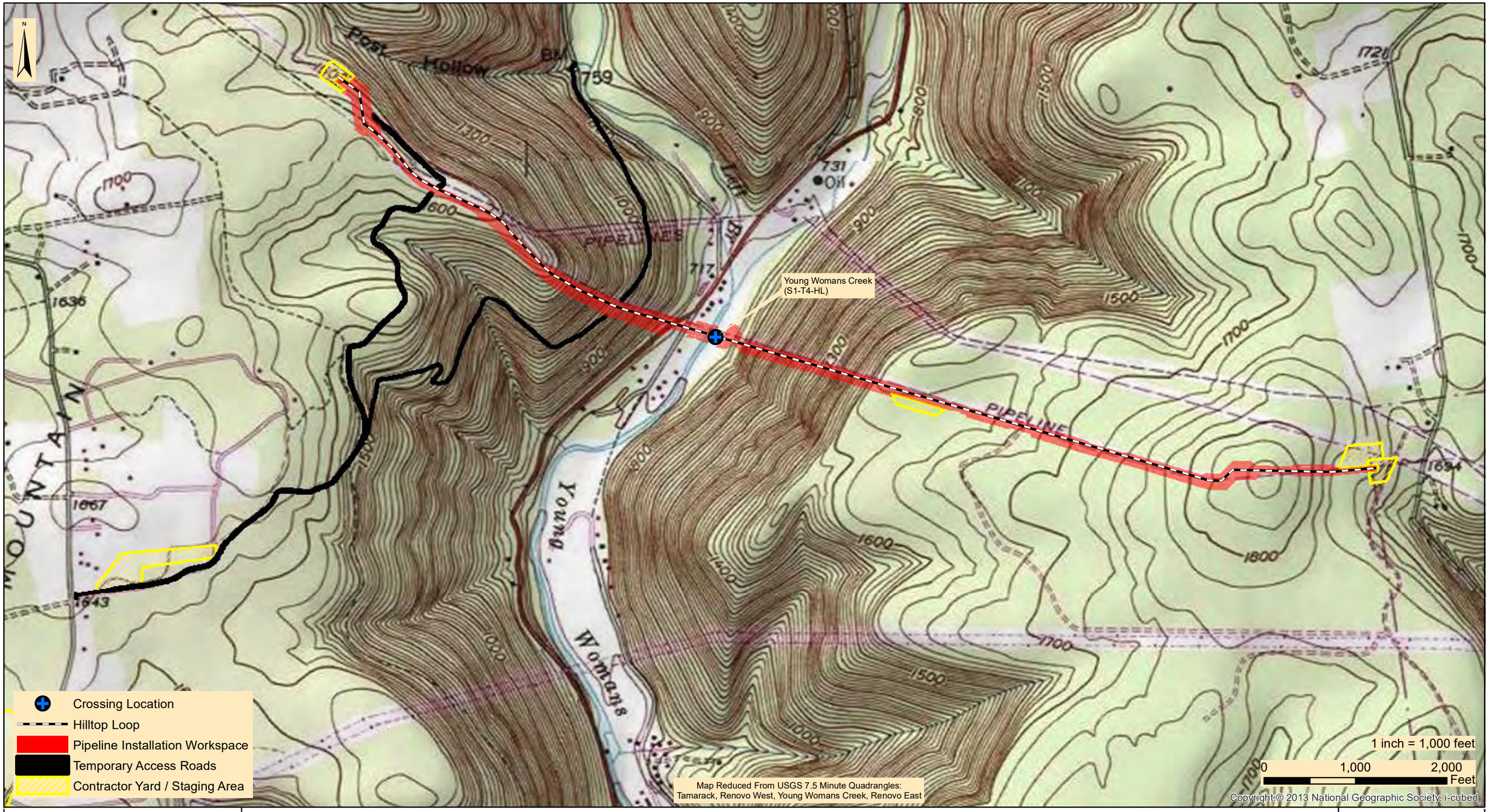
Proposed signage will be placed in accordance with U.S. Coast Guard and Pennsylvania Fish and Boat Commission specifications and will consist of rectangular information signs showing the location of the submerged pipeline and the portage area. Signage will be placed at least two weeks prior to the commencement of the crossing and will remain in place for the duration of construction. Canoers and kayakers will be instructed to exit on the right side facing downstream of the creek above and below the project area.

A plan view of the proposed signage locations are shown in Attachments D & E. Signs will be worded as follows:

1. WARNING – PIPELINE CONSTRUCTION USE EXTREME CAUTION WHEN BOATING IN THIS AREA.
2. PORTAGE 200 FEET AHEAD
3. PORTAGE – ALL BOATS EXIT HERE
4. BOATS KEEP OUT
5. PORTAGE – ALL BOATS RE-ENTER HERE

ATTACHMENT B

PROJECT CROSSING LOCATION MAP



WHM consulting, INC.
designs, permits, resolutions
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT

LEIDY LINE D 36" HILLTOP LOOP
AIDS TO NAVIGATION PLAN
PROJECT CROSSING LOCATION MAP

CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	07/30/19
WHM DRAWING NUMBER:	WILLIAMS201B002
Drawn By:	KMC
Figure Number:	1

ATTACHMENT C
PHOTOGRAPHS

ID: Photo 1

Date: 4/04/2019

Taken by: DW

Comments: This photo depicts a northwestern view looking across Young Womans Creek.

ID: Photo 2

Date: 4/04/2019

Taken by: DW

Comments: This photo shows a southwestern view looking downstream of Young Womans Creek

ID: Photo 3

Date: 4/04/2019

Taken by: DW

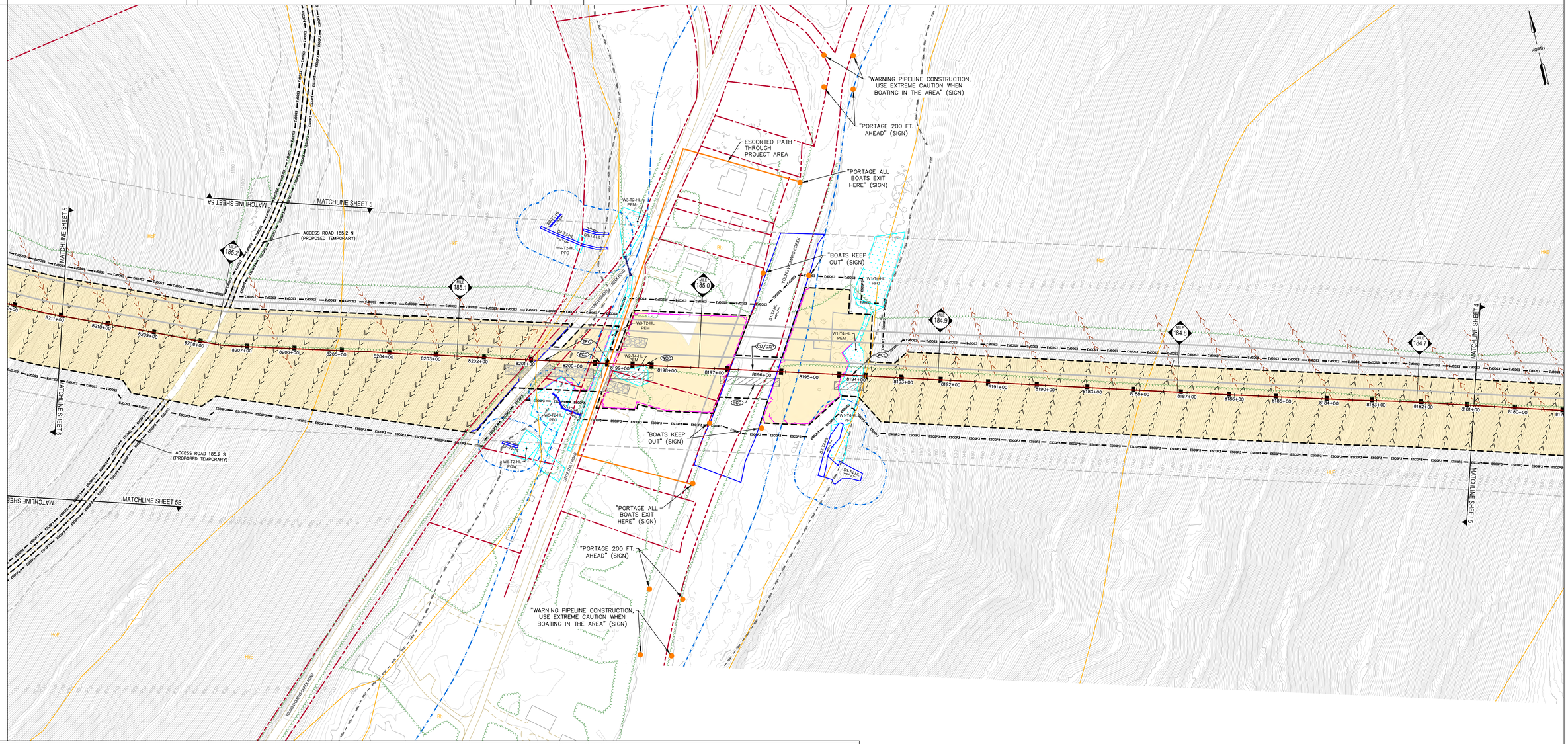
Comments: This photo depicts a northern view looking upstream of Young Womans Creek.

ATTACHMENT D

SITE SPECIFIC PLAN DRAWING

OWNERSHIP & TRACT NUMBER	MARK D. MCALANIS 7-25915	MARK A. JONES 7-3928-33	MARK A. JONES 7-3928-33	THOMAS WILSON 7-3934	MUNICIPAL BOUNDARY	ESTATE OF ROBERT J. GLEICHERT 7-4063
PROFILE (MIN. PIPE DEPTH)	3'	5'	3'	5' 3'	4'	3'
COVER TYPE	MIXED FOREST LAND/MAINTAINED ROW			WETLAND/RESIDENTIAL AREA/MAINTAINED ROW	OPEN WATER	MIXED FOREST LAND/MAINTAINED ROW
SOIL TYPE	HoF	HkE		Bb		HoF HkE
AVERAGE % SLOPE	60%	21% 53%		<2%		55%

ALIGNMENT



LEGEND

- PROPOSED WATERBAR AND OUTLET STRUCTURE
- TRENCH PLUG
- EROSION CONTROL BLANKET
- ROCK CONSTRUCTION ENTRANCE
- RIPARIAN PLANTING AREAS
- PROPOSED PIPELINE
- ESCGP-3 PERMIT BOUNDARY
- LIMITS OF DISTURBANCE
- APPROX. ENVIRONMENTAL STUDY LIMITS
- DELINEATED WETLAND
- DELINEATED WATERWAY / STREAM (TOP OF BANK)
- STREAM FLOW DIRECTION
- 50'/FEMA FLOODWAY
- FEMA 100-YEAR FLOODPLAIN
- SOIL BOUNDARY / TYPE
- EXISTING TREELINE / TREE/SHRUB
- APPROXIMATE EXISTING WATERBAR
- TIMBER MAT/BRIDGE
- PROPERTY LINE
- EXISTING LEIDY / TGPL PIPELINES
- EXISTING FOREIGN PIPELINES
- EXISTING UTILITY POLE / TOWER
- EXISTING UTILITY LINE
- EXISTING VALVE
- EXISTING CULVERT
- EXISTING FENCE
- PROPOSED FENCE
- EXISTING STRUCTURE
- EXISTING ROAD (GRAVEL)
- EXISTING ROAD (PAVED)
- EXISTING GRAVEL AREAS
- PROPOSED GRAVEL
- EXISTING GRADE CONTOURS (10' C.I.)
- EXISTING GRADE CONTOURS (2' C.I.)
- 12" COMPOST FILTER SOCK
- 18" COMPOST FILTER SOCK
- 24" COMPOST FILTER SOCK
- 32" COMPOST FILTER SOCK
- COMPOST FILTER SOCK SEDIMENT TRAP

SOIL LEGEND

Bb	BARBOUR-CRAIGSVILLE COMPLEX
HkE	HAZLETON CHANNERY SANDY LOAM, RUBBLY, 25 TO 80% SLOPES
HoF	HAZELTON-LAIDIG GRAVELLY LOAM, EXTREMELY STONY, 25 TO 50% SLOPES

0 100 200 300
SCALE IN FEET
1" = 100'

WHM consulting, INC. — designs, permits, resolutions

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

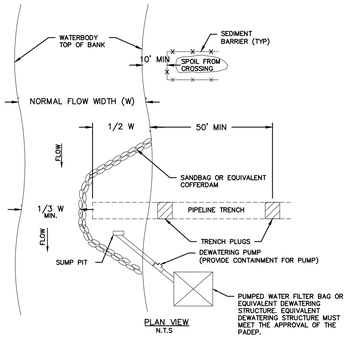
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN

CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 100'
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 1 OF 5
WO: 1211227	RID:		

PIPELINE WORK SEQUENCE AT YOUNG WOMAN CREEK CROSSING

1. MAKE NOTIFICATIONS TO THE PA FISH AND BOAT COMMISSION A MINIMUM OF 10 DAYS PRIOR TO CONSTRUCTION.
2. INSTALL APPROPRIATE PFBC AID TO NAVIGATION SIGNAGE.
3. PRIOR TO INITIATING CONSTRUCTION OF A STREAM CHANNEL LARGER THAN 10 FEET CONTRACTORS AND ENVIRONMENTAL INSPECTOR SHALL EVALUATE WEATHER FORECASTS FOR ANTICIPATED INCLEMENT WEATHER WHICH MAY RESULT IN FLOW CONDITIONS UNSUITABLE FOR CONSTRUCTION. BEFORE CONSTRUCTION OF A STREAM CROSSING GREATER THAN 10 FEET, ENVIRONMENTAL INSPECTOR, FOREMAN, AND ANY OTHER RESPONSIBLE INDIVIDUAL SHOULD SIGN-OFF THAT THE CROSSING CAN BE CONSTRUCTED DURING THE SPECIFIC TIME FRAME.
4. IF INCLEMENT WEATHER IS ANTICIPATED, A CONTINGENCY PLAN WILL BE DISCUSSED TO AVOID THE STREAM CROSSING DURING THE POTENTIALLY UNSUITABLE CONDITIONS."
5. AFTER INSTALLATION OF APPROPRIATE E&S BMPS, INSTALL TEMPORARY EQUIPMENT BRIDGE IN ACCORDANCE WITH DETAILS.
6. FOR DRY OPEN CUT CROSSINGS, INSTALL DAM AND PUMP OR COFFERDAM AS DESCRIBED IN STREAM CROSSING DETAILS.
7. DEWATER WORK AREA. WATER FROM THE EXCAVATION SHALL BE PUMPED TO A SEDIMENT FILTER BAG. WHERE POSSIBLE, EXCAVATION SHALL BE FROM THE TOP OF THE STREAM BANK.
8. INSTALL PIPE.
9. A UTILITY LINE CROSSING OF A STREAM CHANNEL (DITCHING AND STABILIZATION FROM TOP OF BANK TO TOP OF BANK) SHALL BE COMPLETED WITHIN 24 HOURS FOR STREAM CHANNELS 10 FEET OR LESS AND 48 HOURS FOR STREAM CHANNELS BETWEEN 10 – 100 FEET UNLESS SPECIFICALLY OUTLINED IN THE APPROVED PERMIT OR AUTHORIZED BY PADEP.
10. STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.



PLAN VIEW
N.T.S

PADEP STANDARD NOTES:

1. GRUBBING SHALL NOT TAKE PLACE WITHIN 50 FEET OF TOP-OF-BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE AN PIPE IS READY FOR INSTALLATION.
2. TRENCH PLUG SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE WATERBODY CHANNEL.
3. WATER ACCUMULATING WITHIN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.
4. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM THE TOP OF WATERBODY BANK.
5. ALL EXCESS EXCAVATED MATERIAL SHALL BE IMMEDIATELY REMOVED FROM THE WATERBODY CROSSING AREA.
6. ALL DISTURBED AREAS WITHIN 50 FEET OF TOP-OF-BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR WATERBODIES OR 48 HOURS OF INITIAL DISTURBANCE FOR INTERMEDIATE WATERBODIES UNLESS OTHERWISE AUTHORIZED (SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

1. THE WATERBODY CROSSING WILL GENERALLY BE COMPLETED IN 2 STAGES. THE DETAIL DEPICTS STAGE 1. STAGE 2 WILL GENERALLY BE COMPLETED USING THE SAME CONFIGURATION FROM THE OPPOSITE BANK;
2. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
3. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
4. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIMEFRAMES WHERE SPECIFIED.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

CD COFFERDAM STREAM CROSSING

Williams

WARNING

PIPELINE CONSTRUCTION
USE EXTREME CAUTION WHEN BOATING IN THIS AREA

PORTAGE
200 FEET AHEAD

PORTAGE
ALL BOATS EXIT HERE

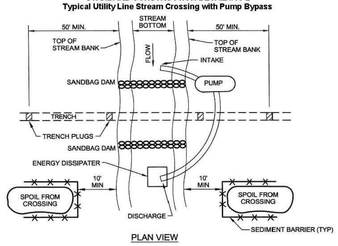
BOATS KEEP OUT

PORTAGE
ALL BOATS RE-ENTER HERE

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

ATON AID TO NAVIGATION (ATON) SIGNAGE

STANDARD CONSTRUCTION DETAIL #13-2
Typical Utility Line Stream Crossing with Pump Bypass



PLAN VIEW

PA DEP

Grubbing shall not take place within 50 feet of top-of-bank until all materials required to complete crossing are on site and pipe is ready for installation.

Bypass pump intake shall be maintained a sufficient distance from the bottom to prevent pumping of channel bottom materials.

Trench plugs shall be installed within the trench on both sides of the stream channel (Standard Construction Detail #13-4).

Water accumulating within the work area shall be pumped to a pumped water filter bag or sediment trap prior to discharging into any receiving surface water.

Hazardous or pollutant material storage areas shall be located at least 100 feet back from the top of streambank.

All excess excavated material shall be immediately removed from the stream crossing area.

All disturbed areas within 50 feet of top-of-bank shall be blanketed or matted within 24 hours of initial disturbance for minor streams or 48 hours of initial disturbance for major streams unless otherwise authorized.

Appropriate streambank protection shall be provided within the channel.

(SEE INSTREAM CROSSING DURATION TABLE).

WILLIAMS STANDARD NOTES:

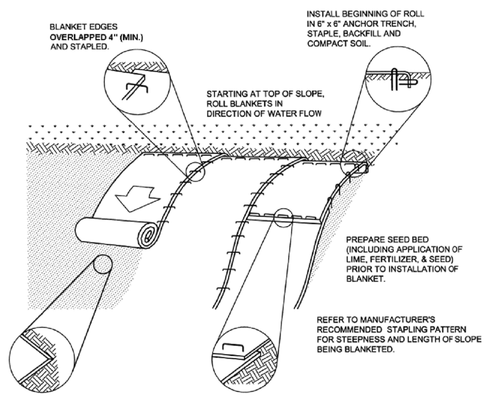
1. CONSTRUCTION OF THE STREAM CROSSING (FROM CLEARING OF VEGETATION TO FINAL RESTORATION) SHOULD BE CONDUCTED "AS QUICKLY AS POSSIBLE";
2. THE 24-48 HOUR TIMEFRAME FOR MINOR AND MAJOR WATERBODY CROSSINGS BEGINS WHEN DITCHING OCCURS WITHIN THE STREAM TOP OF BANK;
3. THE PROVIDED "INSTREAM CROSSING DURATION" TABLE OUTLINES STREAM CROSSING ASSOCIATED WITH THE PROJECT AND SPECIFIES CERTAIN CROSSINGS WHERE DITCHING IN STREAMS IS EXPECTED TO TAKE LONGER THAN THE 24 OR 48 HOURS. APPROVAL OF THIS PERMIT INCLUDES THE AUTHORIZATION TO EXCEED 24-48 HOUR TIMEFRAMES WHERE SPECIFIED.
4. DAM-AND-PUMPS MAY ONLY BE IN THE STREAM FOR TWO WEEKS.
5. SANDBAG DAM MAY BE SUBSTITUTED WITH METAL/ROAD PLATE(S) OR EQUIVALENT.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

DPX DAM AND PUMP STREAM CROSSING

Williams



NOT TO SCALE

NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
5. STAPLING OF THE BLANKET SHALL BE DONE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.
7. BIODEGRADABLE STAPLES SHALL BE USED.

WILLIAMS SUPPLEMENTAL NOTES:

1. CONTRACTOR SHALL USE SINGLE MAT STRAW FOR SLOPES FLATTER THAN 3:1.
2. HYDRAULIC APPLIED EROSION CONTROL BLANKETS MAY BE USED IN LIEU OF ECB.
3. EROSION CONTROL MATS SHOULD CONSIST OF NATURAL MATERIALS. NO PLASTIC OR SYNTHETIC MATERIALS SHALL BE USED. MATTING SUCH AS NORTH AMERICAN GREEN S150BN OR EQUIVALENT SHALL BE USED.

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP STANDARD CONSTRUCTION DETAIL #11-1.

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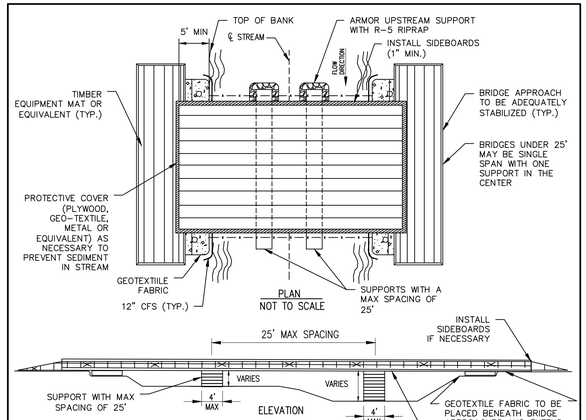
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

ECB EROSION CONTROL BLANKET

Williams



PLAN
NOT TO SCALE

ELEVATION

NOTES:

1. THIS TYPE OF BRIDGE IS GENERALLY USED FOR INTERMEDIATE TO LARGE STREAM CROSSINGS GREATER THAN 20' IN WIDTH IN COMBINATION WITH A PROPER STREAM BANK CONFIGURATION.
2. BOTTOM CHORD OF BRIDGE STRUCTURE SHALL BE CONSTRUCTED ABOVE ORDINARY HIGH WATER MARK/TOP OF BANK.
3. BRIDGE TO REMAIN IN PLACE UNTIL THE COMPLETION OF FINAL RESTORATION.
4. A "SKIRT" FORMED OF GEOTEXTILE FABRIC OR EQUIVALENT SHALL BE PLACED ON THE SIDES AND BOTTOM OF THE BRIDGE TO TRAP SEDIMENT.
5. INDIVIDUAL MATS SHALL BE ANCHORED AND BUTTED TIGHTLY TO MINIMIZE THE INTRODUCTION OF SEDIMENT TO THE WATER BODY.
6. COMPOST FILTER SOCK WILL BE PLACED AT THE EDGE OF EQUIPMENT BRIDGE AT THE END OF THE WORK DAY TO PREVENT EROSION BUT WILL BE REMOVED DURING CONSTRUCTION ACTIVITY.
7. CONTRACTOR SHALL EXTEND TIMBER MAT BRIDGE A MINIMUM OF 10' BEYOND TOP OF STREAM BANK. ABUTMENTS MAY BE KEYED INTO BANK WHERE NEEDED TO INSURE SAFETY.
8. BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
9. PERIODICALLY CHECK BRIDGE INSTALLATION AND REMOVE BUILD-UP OF SEDIMENT OR DEBRIS ON BRIDGE.
10. BRIDGE APPROACHES SHALL BE TIMBER EQUIPMENT MATS.
11. MATERIALS PLACED ALONG STREAM CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEANUP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
12. RUNOFF FROM ROADWAY SHALL BE DIVERTED OFF THE ROADWAY AND INTO A SEDIMENT REMOVAL BMP BEFORE IT REACHES THE ROCK APPROACH TO THE CROSSING.
13. INSTALLATION AND REMOVAL OF INSTREAM SUPPORT SHALL ADHERE TO TIME OF YEAR RESTRICTIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL

BCC BRIDGE EQUIPMENT CROSSING WITH CENTERED OR MULTIPLE SUPPORTS

Williams

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

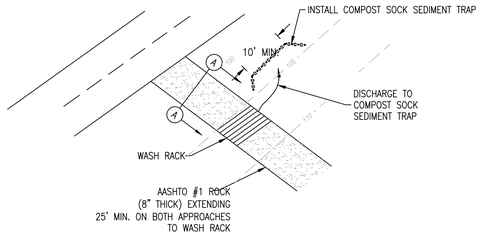
NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

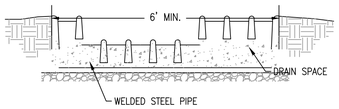
Williams

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 2 OF 5
WO: 1211227	RID:		

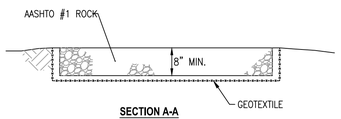
designs, permits, resolutions consulting, inc. | BA GROUP



PLAN VIEW



WASH RACK

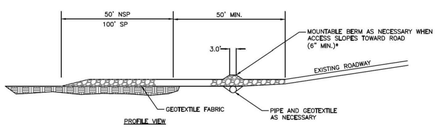


SECTION A-A

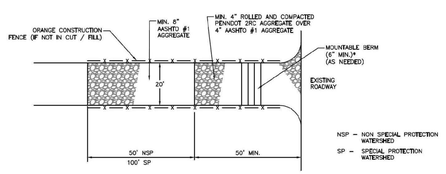
NOTE:
1) WASH RACK SHALL BE 20 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS, WHICHEVER IS GREATER.
2) WASH RACK SHALL BE CONSTRUCTED TO ACCOMMODATE ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.
3) A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL VEHICLES EXITING THE SITE.
4) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE DRAIN SPACE UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. WASHING THE ROADWAYS OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

CONSTRUCTION ENTRANCE (CE)
TEMPORARY EROSION CONTROL MEASURE

Example Alternative Rock Construction Entrance



PROFILE VIEW



*MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

PLAN VIEW

NOTES:

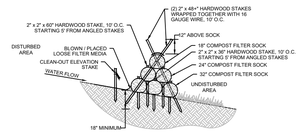
1) REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2) MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
3) MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
4) STREET SWEEPING ON PAVED ROADS
   a. USE A VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT.
   b. AT A MINIMUM – ANY DAY IN WHICH CONSTRUCTION TRAFFIC IS EXITING THE ROCK CONSTRUCTION ENTRANCE, THE VACUUM TRUCK SWEEPER OR SWEEPER WITH A CATCH BIN ATTACHMENT SHALL CLEAN THE ROAD WAY AT THE END OF THE WORK DAY AND PRIOR TO ANY FORECASTED RAIN EVENT.
5) STREET SWEEPING ON DIRT OR GRAVEL SURFACE PUBLIC ROADS
   a. RIGOROUS MANUAL REMOVAL OF MUD/DIRT FROM VEHICLE/EQUIPMENT TIRES PRIOR TO EXITING CONSTRUCTION SITE, SUPPLEMENTED BY IMMEDIATE RECOVERY, BY MANUAL OR MECHANICAL MEANS, OF SOIL WHICH MAY BECOME DISCHARGED ONTO PUBLIC ROADWAYS. DUST CONTROL AND/OR COMPACTION VIA ROLLING OF THE DIRT PUBLIC ROAD SURFACE WILL BE IMPLEMENTED AS NEEDED.

CONSTRUCTION ENTRANCE (ALTERNATIVE) (CE)
TEMPORARY EROSION CONTROL MEASURE

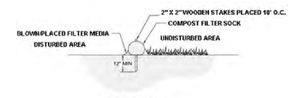
PENNSYLVANIA

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

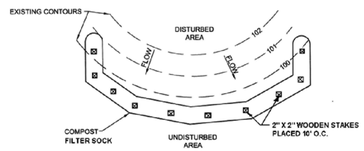
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(CE) CONSTRUCTION ENTRANCE
Williams GAS PIPELINE



TRIPLE STACK SOCK TRAP SECTION
N.T.S.

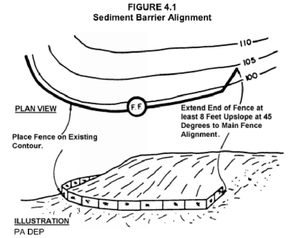


SECTION VIEW
NTS



PLAN VIEW
NOT TO SCALE

FIGURE 4.1
Sediment Barrier Alignment



NOT TO SCALE

NOTES:

1. ALL MATERIAL TO MEET MANUFACTURER SPECIFICATIONS.
2. COMPOST FILTER SOCK FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY CONSTRUCTION CONTRACTOR.
4. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT.
5. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
6. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.
7. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION WITH ADDITIONAL SOCK OR ROCK FILTER.
8. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.
9. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.

ORGANIC MATTER CONTENT	25% – 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5 – 8.5
MOISTURE CONTENT	30% – 60%
PARTICLE SIZE	30% – 50% PASS THROUGH 3/8" SIEVE
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

MATERIAL TYPE	3 mil HDPE	5 mil HDPE	5 mil HDPE	MULTI-FILAMENT POLYPROPYLENE (MFPP)	HEAVY-DUTY MULTI-FILAMENT POLYPROPYLENE (HDMFPP)
MATERIAL CHARACTERISTICS	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE	BIO-DEGRADABLE	PHOTO-DEGRADABLE	PHOTO-DEGRADABLE
SOCK DIAMETERS	12" 18"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"	12" 18" 24" 32"
MESH OPENING	3/8"	3/8"	3/8"	3/8"	1/8"
TENSILE STRENGTH		26 psi	26 psi	44 psi	202 psi
ULTRAVIOLET STABILITY % ORIGINAL STRENGTH (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
MINIMUM FUNCTIONAL LONGEVITY	6 MONTHS	9 MONTHS	6 MONTHS	1 YEAR	2 YEARS
TWO-PLY SYSTEMS					
INNER CONTAINMENT NETTING				HDPE BIAXIAL NET CONTINUOUSLY WOUND FUSION-WELDED JUNCTURES 3/4" x 3/4" MAX. APERTURE SIZE	
OUTER FILTRATION MESH				COMPOSITE POLYPROPYLENE FABRIC (WOVEN LAYER AND NON-WOVEN FLEECE MECHANICALLY FUSED VIA NEEDLE PUNCH) 3/16" MAX. APERTURE SIZE	
SOCK FABRICS COMPOSED OF BURLAP MAY BE USED ON PROJECTS LASTING 6 MONTHS OR LESS.					

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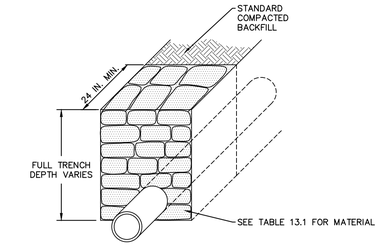
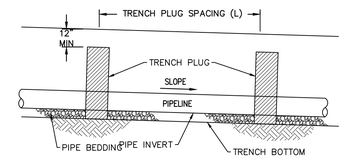
TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(CFS) COMPOST FILTER SOCK
Williams GAS PIPELINE



SECTION VIEW
NOT TO SCALE



PROFILE VIEW
NOT TO SCALE

TABLE 13.1
MAXIMUM SPACING AND MATERIALS FOR TRENCH PLUGS

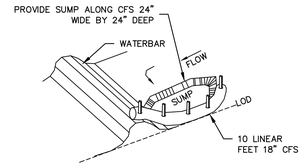
TRENCH SLOPE (%)	SPACING L (FT)	TRENCH PLUG MATERIAL FOR FILLED SACKS
<5	1,000	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
5 – 15	500	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
15 – 25	300	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
25 – 35	200	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
35 – 100	100	* CLAY, BENTONITE, OR CONCRETE FILLED SACKS
>100	50	CEMENT FILLED BAGS (WETTED) OR MORTARED STONE

*TOPSOIL MAY NOT BE USED TO FILL SACKS.

IMPERVIOUS TRENCH PLUGS ARE REQUIRED FOR ALL STREAM, RIVER, WETLAND, OR OTHER WATER BODY CROSSINGS. FOAM TRENCH PLUGS ARE AN APPROVED ALTERNATE E&S BMP.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
(TP) TRENCH PLUG INSTALLATION
Williams



NOTES:

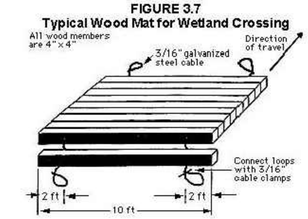
1. 10 LINEAR FEET OF 18 INCH COMPOST FILTER SOCK (CFS) SHALL BE INSTALLED WITH ONE END RESTING ON THE WATERBAR AS PER DETAIL CFS, ALLOWING FOR 8 FEET OF EFFECTIVE LENGTH AND A SPECIFIED FLOW THROUGH RATE OF 15 GALLONS PER MINUTE PER LINEAR FOOT. A PASS THROUGH FLOW OF 0.26 CUBIC FEET PER SECOND CAN BE ACCOMMODATED THROUGH THE FILTER SOCK. THIS FLOW RATE IS ADEQUATE FOR 20,000 SQUARE FEET OF DRAINAGE AREA FOR THE 2–YEAR, 24–HOUR STORM, 5 MINUTE TIME OF CONCENTRATION (RATIONAL METHOD).
2. CONSTRUCTION OF A 24" WIDE AND 24" DEEP SUMP AT THE DISCHARGE END OF THE WATERBAR WILL REDUCE VELOCITY AND PROVIDE A SHEET FLOW CONDITION TO THE CFS. THE SUMP SHALL BE MAINTAINED AND CLEANEDOUT WHEN IT BECOMES A MINIMUM OF 12" DEEP. THE SUMP SHALL BE FILLED AND STABILIZED WHEN THE CFS IS REMOVED AFTER SITE STABILIZATION.
3. TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE ABOVEGROUND HEIGHT OF THE SOCK AND DISPOSED IN ACCORDANCE WITH WILLIAMS STANDARDS. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
(OS) CFS AT WATERBAR DISCHARGE FOR ABACT LEVEL PROTECTION
Williams

FIGURE 3.7
Typical Wood Mat for Wetland Crossing

NOTE: THIS WILLIAMS STANDARD DETAIL IS BASED ON PADEP FIGURE 3.07.



University of Minnesota FS 07009
A geotextile underlayment shall be used under the wood mat.

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TRANSCONTINENTAL GAS PIPE LINE CORPORATION
STANDARD ENVIRONMENTAL DETAIL
(MAT.1) TIMBER MATTING CONSTRUCTION
Williams

KEVIN CLARK, P.E.
PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E. NO. _____

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
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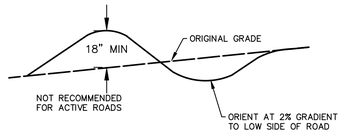
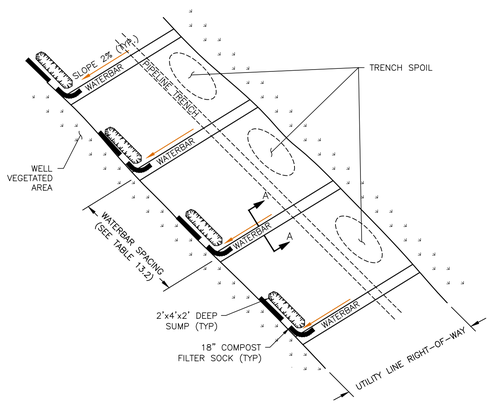
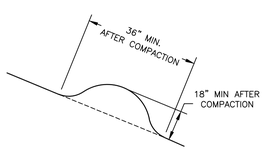
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 3 OF 5
WO: 1211227	RID:		



PLAN VIEW
N.T.S.



LAYOUT VIEW
N.T.S.



SECTION A–A

NOTES:

1. DURING CONSTRUCTION, WATERBARS SHALL BE PREPARED AT THE END OF EACH WORK DAY AND PRIOR TO STORM EVENTS.
2. AFTER EARTH DISTURBING WORK HAS BEGUN, WATERBARS SHALL BE INSTALLED AT THE SPACING SHOWN IN THE ABOVE TABLE OR AS SHOWN ON THE DRAWINGS. WATERBARS SHALL BE IMMEDIATELY STABILIZED WITH EROSION CONTROL BLANKET.
3. TEMPORARY AND PERMANENT WATERBARS ARE REQUIRED AT ALL WATERBODY CROSSINGS AND UPSLOPE FROM ALL WETLAND BOUNDARIES.
4. THE WATERBAR OUTLET SHALL BE LOCATED WHERE RUNOFF WILL BE RELEASED ONTO AN EXISTING WELL–VEGETATED AREA. AN OUTLET STRUCTURE (OS) MUST BE INSTALLED AT THE WATERBAR OUTLET.
5. WHEREVER EDIBLE SOILS ARE PRESENT, OR WHERE THERE IS NOT A SUFFICIENT VEGETATIVE FILTER STRIP BETWEEN THE WATERBAR AND A RECEIVING SURFACE WATER, THE WATERBAR SHOULD BE PROVIDED WITH A TEMPORARY PROTECTIVE LINER.

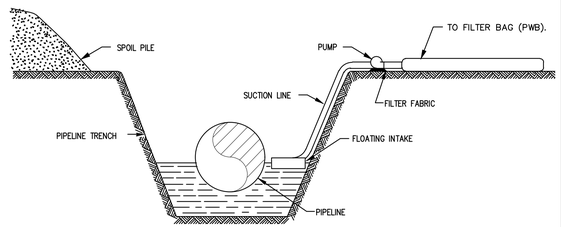
TABLE 3.1 – MAXIMUM WATERBAR SPACING

PERCENT SLOPE	SPACING (FT)
<5	250
5–15	150
>15–30	100
>30	50

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE, LLC
STANDARD ENVIRONMENTAL DETAIL
WB WATERBAR

Williams GAS PIPELINE



ELEVATION
N.T.S.

NOTES:

1. WATER PUMPED OUT OF TRENCH SHALL NOT BE DISCHARGED INTO WATERWAYS. WATER SHALL BE DISCHARGED INTO A FILTER BAG OR DEWATERING STRUCTURE.
2. PUMP SHALL BE CONTROLLED SO THAT DISCHARGE DOES NOT OVERFLOW DEWATERING STRUCTURE.
3. PUMP SUCTION HOSE MUST NOT BE ALLOWED TO COME IN CONTACT WITH TRENCH BOTTOM. PROVISIONS MUST BE MADE TO ELEVATE THE SUCTION HOSE TO AT LEAST ONE FOOT ABOVE THE BOTTOM OF THE PIPE TRENCH UNTIL BOTTOM DEWATERING IS NECESSARY.
4. DEWATERING SHALL NOT OCCUR DURING TIMES OF HEAVY RAINFALL EXCEPT AS REQUIRED TO PREVENT FLOODING OF CONSTRUCTION EQUIPMENT LOCATED IN BORE PITS AND TRENCHES.
5. PUMP WATER FILTER BAG (PWB) SHALL BE PLACED ON A WELL VEGETATED AREA AWAY FROM CONSTRUCTION SO THAT FILTERED WATER IS NOT RETURNED TO THE TRENCH.

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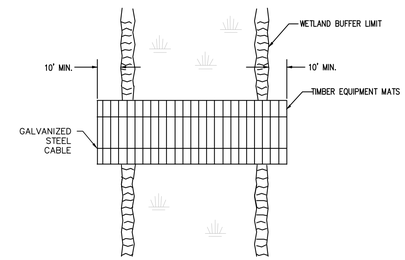
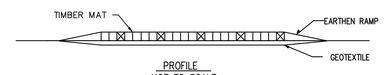
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
TD TRENCH DEWATERING

Williams



PLAN
NOT TO SCALE



PROFILE
NOT TO SCALE

NOTES:

1. PERIODICALLY CHECK INSTALLATION AND REMOVE BUILD–UP OF SEDIMENT OR DEBRIS.
2. MATERIALS PLACED IN WETLANDS SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN–UP. REMOVAL OF THIS STRUCTURE IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
3. IF A WATERBODY IS LOCATED WITHIN A WETLAND SYSTEM, EXTEND TIMBER EQUIPMENT MATS TO THE BRIDGE EQUIPMENT CROSSING (BEC) USED TO CROSS THE WATERBODY IN ORDER TO ALLOW FOR CONTINUOUS TIMBER EQUIPMENT MAT COVERAGE THROUGH THE WETLAND AND WATERBODY AREA.
4. USE ADDITIONAL TIMBER MAT LAYERS TO RAISE CROSSING ABOVE GRADE WHERE POOR SOIL CONDITIONS EXIST.
5. TIMBER EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WETLAND BOUNDARIES.
6. INSTALL EARTHEN RAMP APPROACHES TO TIMBER EQUIPMENT MATS. EARTHEN RAMPS TO BE CONSTRUCTED OF UPLAND MATERIAL, TOP SOIL SHALL NOT BE USED TO CONSTRUCT EARTHEN RAMPS.
7. A GEOTEXTILE UNDERLAYMENT SHALL BE USED UNDER THE WOOD MAT.

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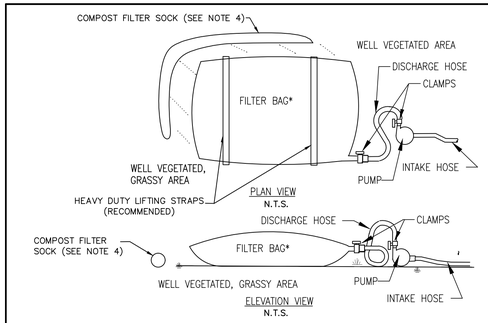
TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WEC WETLAND EQUIPMENT CROSSING

Williams



LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON–WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED 'J' TYPE. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. HIGH VOLUME FILTER BAGS MAY BE MADE FROM WOVEN GEOTEXTILES THAT MEET THE FOLLOWING STANDARDS:

PROPERTY	TEST METHOD	MINIMUM STANDARD
AVG. WIDE WIDTH STRENGTH	ASTM D–4884	60 LB/IN
GRAB TENSILE	ASTM D–4632	205 LB
PUNCTURE	ASTM D–4833	110 LB
MULLEN BURST	ASTM D–3786	350 PSI
UV RESISTANCE	ASTM D–4355	70%
AOS % RETAINED	ASTM D–4751	80 SIEVE

NOTES:

1) A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES MUST BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME ½ FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS TO BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.
2) BAGS SHALL BE LOCATED IN WELL–VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON–ERODIBLE AND NON–POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.
3) NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.
4) THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.
5) THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR ½ THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.
6) FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.
7) CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF USED FILTER BAGS UPON COMPLETION OF DEWATERING OPERATIONS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
PWB PUMP WATER FILTER BAG

Williams

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E.NO. _____

REVISIONS

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TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

Williams

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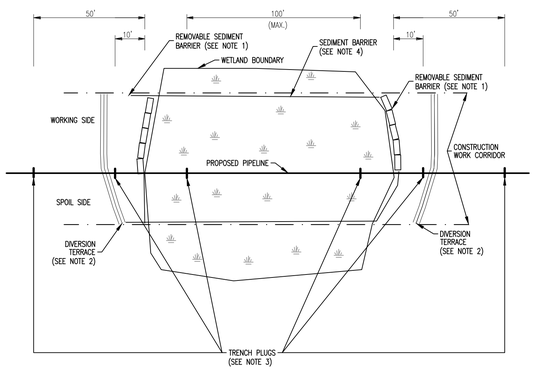
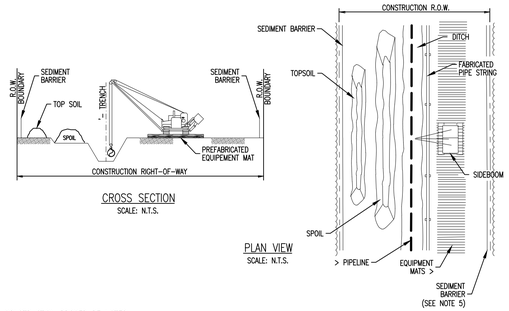


NOTES:

1. INSTALL REMOVABLE SEDIMENT BARRIERS (COMPOST FILTER SOCK) OR DRIVEABLE BERMS ACROSS THE TRAVEL LANE AT BOTH WETLAND BOUNDARIES. THE REMOVABLE SEDIMENT BARRIERS CAN BE REMOVED DURING THE CONSTRUCTION DAY, BUT MUST BE RE-INSTALLED AFTER CONSTRUCTION HAS STOPPED FOR THE DAY AND/OR WHEN HEAVY PRECIPITATION IS IMMINENT.
2. INSTALL DIVERSION TERRACES IMMEDIATELY UPSLOPE OF BOTH WETLAND BOUNDARIES TO PREVENT SEDIMENT FROM ENTERING THE WETLAND.
3. INSTALL TRENCH PLUGS TEN (10) FEET FROM THE EDGE OF A WETLAND; FIFTY (50) FEET FROM THE EDGE OF A WETLAND; PLACE A MINIMUM OF ONE (1) TRENCH PLUG AT A MAXIMUM SPACING OF 100 FEET BETWEEN TRENCH PLUGS WITHIN A WETLAND TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED UPLAND TRENCH WATER OUT OF WETLAND. WETLAND CROSSINGS LESS THAN FIFTY (50) FEET DO NOT REQUIRE AN INTERNAL TRENCH PLUG.
4. FOR TYPE II ("SATURATED") AND TYPE III ("FLOODED") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES AND ALONG BOTH WETLAND EDGES. FOR TYPE I ("DRY") WETLANDS, INSTALL SEDIMENT BARRIERS AT WETLAND BOUNDARIES, ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC — WETLAND CROSSING CONFIGURATION TYPE I, II AND III WETLANDS

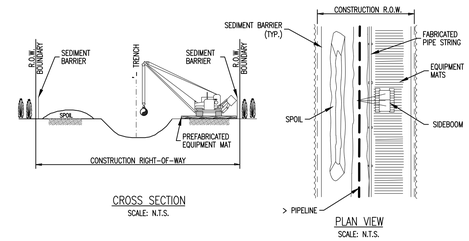


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF THE WETLAND. INSTALL SEDIMENT BARRIERS ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR THROUGH THE WETLAND AND ALONG THE DOWNSLOPE EDGE OF THE WETLAND. IF THE DOWNSLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFTY-RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED). SALVAGE SATURATED TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE COMPANY ENVIRONMENTAL INSPECTOR. TOPSOIL AND SATURATED TOPSOIL SHALL BE STOCKPILED SEPARATELY. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEDE WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING TRENCH, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE SATURATED TOPSOIL AND TOPSOIL (IF NOT SATURATED) AND INSTALL PERMANENT EROSION CONTROL.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLANDS AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.1 — TYPE I "DRY WETLAND" INSTALLATION PROCEDURE

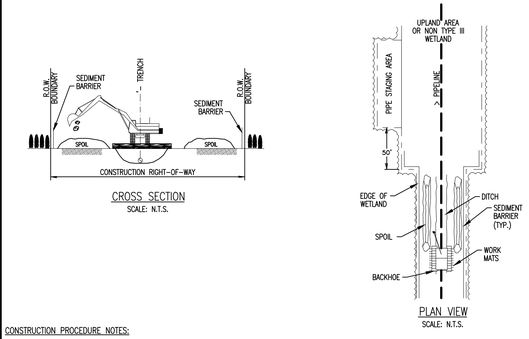


CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEDE WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACKFILLING, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION. SEED DISTURBED WETLAND AREA AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.2 — TYPE II "SATURATED WETLAND" INSTALLATION PROCEDURE



CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL WETLAND BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY DIVERSION TERRACES UPSLOPE OF WETLAND BOUNDARIES AS SHOWN ON DRAWINGS AND SPECIFICATIONS.
4. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
5. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFTY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
6. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
7. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY PREFABRICATED EQUIPMENT MATS OR FLOATS, TO EXCAVATE TRENCH. IF PREFABRICATED EQUIPMENT MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MATS FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
8. FABRICATE PIPE IN A STAGING AREA OUTSIDE THE TYPE III WETLAND AS INDICATED ON THE CONSTRUCTION DRAWINGS. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
9. LEAVE HARD PLUGS AT THE EDGE OF TYPE III WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER-IN, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, AND BACKFILL.
11. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.
12. REMOVE ANY MATS UTILIZED TO SUPPORT AMPHIBIOUS EQUIPMENT FROM WETLANDS UPON COMPLETION.
13. WETLANDS CROSSED USING PUSH/PULL METHOD TEND TO BE TOO WET FOR EFFECTIVE SEEDING. HOWEVER, IF THE SITE IS DRY ENOUGH AND IF DIRECTED BY THE ENVIRONMENTAL INSPECTOR, THE RIGHT-OF-WAY SHALL BE SEEDED IN ACCORDANCE WITH DRAWINGS.

NO.	DATE	BY	REVISION DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
STANDARD ENVIRONMENTAL DETAIL
WCC.3 — TYPE III "FLOODED WETLAND" INSTALLATION PROCEDURE

KEVIN CLARK, P.E.

PENNSYLVANIA PROFESSIONAL ENGINEERS NO.
P.E. NO. _____

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
YOUNG WOMANS CREEK
SITE SPECIFIC CONSTRUCTION PLAN
DETAILS
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY:	DATE: 7/22/19	ISSUED FOR BID:	SCALE: 1" = 1"
CHECKED BY:	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY:	DATE:	DRAWING NUMBER:	SHEET 5 OF 5
WO: 1211227	RID:		

ATTACHMENT E

SIGNAGE EXAMPLES

WARNING

PIPELINE CONSTRUCTION

USE EXTREME CAUTION WHEN BOATING IN THIS AREA

PORTAGE

200 FEET

AHEAD

PORTAGE

ALL BOATS EXIT HERE

PORTAGE

ALL BOATS RE-ENTER HERE

BOATS KEEP OUT

APPENDIX 3

SUBMERGED LAND LICENSE AGREEMENT

SUBMERGED LAND LICENSE AGREEMENT SUBMITTAL INFORMATION:

LEIDY SOUTH PROJECT – HILLTOP LOOP

1. **JPA #:**
2. **Legal Name of Client:** Transcontinental Gas Pipe Line Company, LLC, a subsidiary of The Williams Companies, Inc.

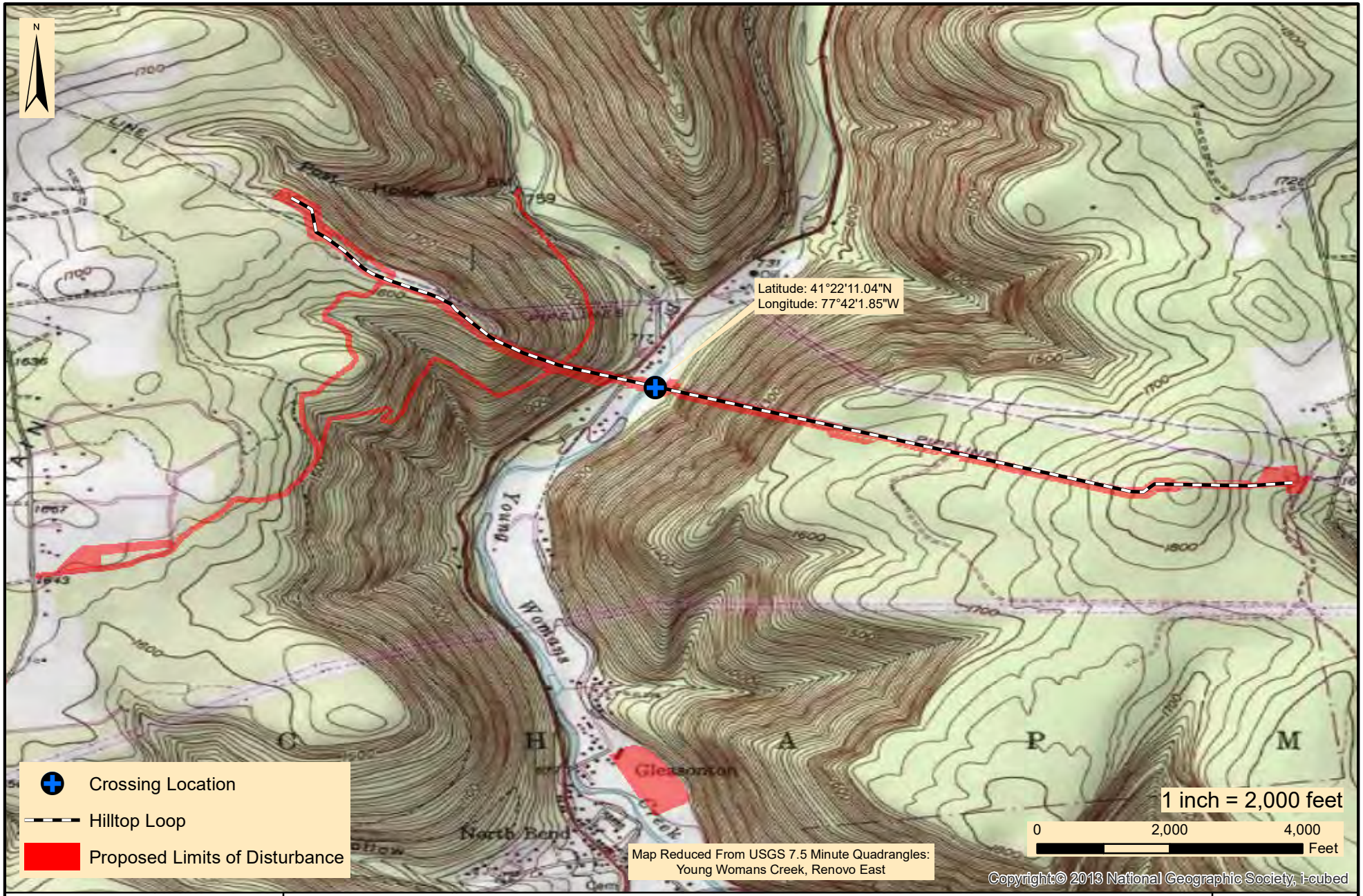
   State of Incorporation: Delaware
3. **Principal place of business:** 2800 Post Oak Blvd, Level 11; Houston, TX 77056

   Employer ID#: 74-1079400
4. **Client's contact person & contact info.**: Joseph Dean, Environmental Manager | (713) 215-3427 | Joseph.Dean@williams.com
5. **Company's Preferred Address for reoccurring Invoicing/billing of the annual SLLA fee:** 2800 Post Oak Blvd, Level 11; Houston, TX 77056
6. **Consultant's name & contact info:** Kevin M. Clark | WHM Consulting, Inc | (814)689-1650 | kevinc@whmgroup.com
7. **This IS NOT in conjunction with a PennDOT Project.**
8. **County (Counties) and Municipality (ties) projects, encroachments or crossings are located in.** Chapman Township, Clinton County
9. **Agreement Type:** Commercial
10. **Locational Mapping of the Facilities:** See Attachment I -
11. **Project Drawing:** See Attached Project Location Map
12. **Description:** To install and maintain a 36-inch diameter natural gas pipeline. The Project is an expansion of Transco's existing natural gas transmission system and an extension of Transco's system through a capacity lease with National Fuel Gas Supply Corporation. The Project will enable Transco to provide 582,400 dekatherms per day (Dth/d) of incremental firm transportation capacity for abundant supplies of natural gas from northern and western Pennsylvania to existing and growing markets in Transco's Zone 6. Transco's Zone 6 includes the portion of the Transco system in Pennsylvania, New York, New Jersey, and Maryland.

    Transco proposes to utilize a dry-crossing construction method (Dam-and-Pump or Cofferdam) to cross under Young Womans Creek (Latitude 41°22'11.04"N, Longitude 77°42'1.85"W), in Chapman Township, Clinton County.

ATTACHMENT 1

SLLA Location Map: Young Womans Creek



WHM consulting, INC.
designs, permits, resolutions
2525 Green Tech Drive, Suite B,
State College, PA 16803
Tele: 814.689.1650 Fax: 814.689.1557

TRANSCONTNENTAL GAS PIPE LINE COMPANY, LLC

LEIDY SOUTH PROJECT - LEIDY LINE D 36" HILLTOP LOOP

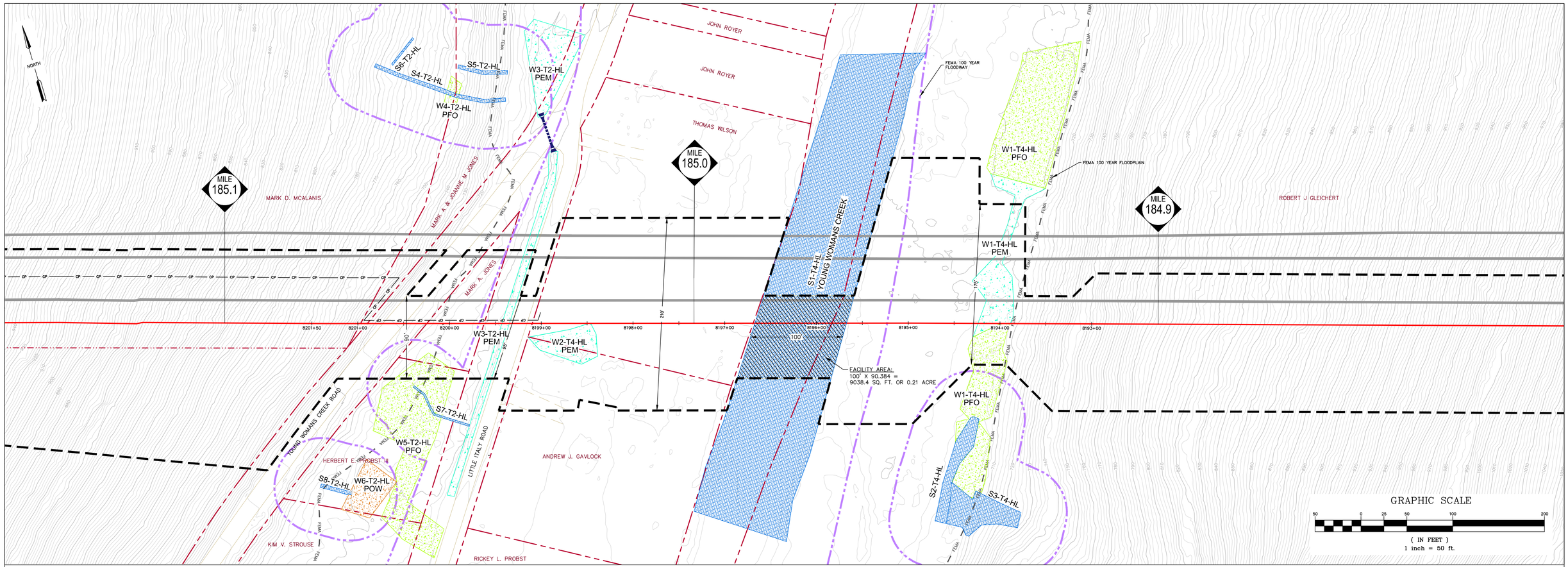
SUBMERGED LAND LICENSE AGREEMENT LOCATION MAP
YOUNG WOMANS CREEK

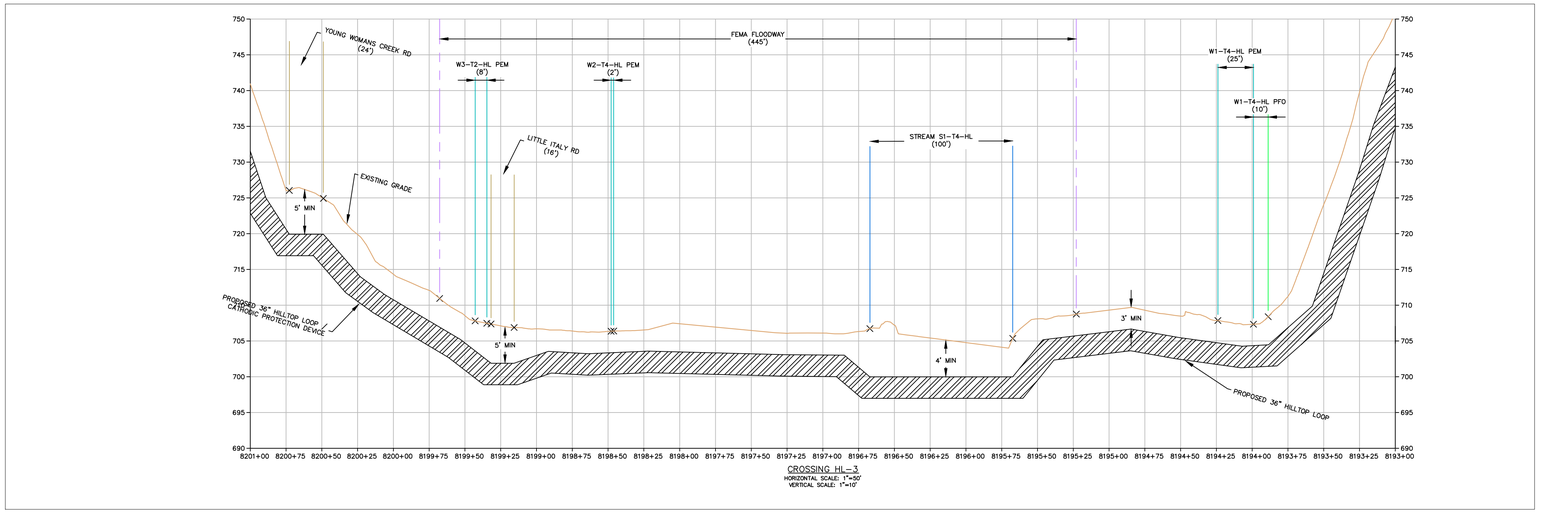
CHAPMAN TOWNSHIP | CLINTON COUNTY | PENNSYLVANIA

Date:	08/30/19
WHM Drawing Number:	WILLIAMS201A001
Drawn By:	KMC
Attachment:	1

ATTACHMENT 2

SLLA Location Site Plan & Profile: Young Womans Creek





CROSSING HL-3
HORIZONTAL SCALE: 1"=50'
VERTICAL SCALE: 1"=10'

SLLA NOTES:

1. TRANSCO HAS AN OPEN AND UNDEFINED EASEMENT ON PARCELS WITHIN AND ADJACENT TO YOUNG WOMANS CREEK.

LEGEND

- FACILITY AREA
- PROPOSED LIMITS OF DISTURBANCE
- PROPOSED 42" BENTON LOOP
- EXISTING ROADWAY (PAVED)
- EXISTING ROADWAY (UNPAVED)
- PARCEL BOUNDARY
- EXISTING CONTOUR (10' C.I.)
- EXISTING CONTOUR (2' C.I.)
- EXISTING LEIDY / TGPL PIPELINES
- CULVERT
- UTILITY LINE/POLE
- EXISTING FENCE
- TREELINE
- CP — CATHODIC PROTECTION DEVICE

WETLANDS

- EMERGENT WETLAND (PEM)
- SCRUB SHRUB WETLAND (PSS)
- FORESTED WETLAND (PFO)
- OPEN WATER WETLAND (POW)

STREAMS

- STREAM CHANNEL

FLOODWAY

- FLOODWAY
- FEMA — FEMA FLOODPLAIN

SURVEY NOTES:

1. EXISTING CONTOURS WITHIN AND SURROUNDING THE PIPELINE RIGHT-OF-WAY PROVIDED BY QUANTUM (5/24/19). EXISTING CONTOURS FOR OFFLINE CONTRACTOR STAGING AREAS AND ACCESS ROADS OUTSIDE THE PIPELINE RIGHT-OF-WAY WERE DERIVED FROM PAMAP PROGRAM 3.2 FT DIGITAL ELEVATION MODEL OF PENNSYLVANIA; DEVELOPED BY PAMAP PROGRAM, PA DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY DATED DECEMBER 2006.
2. EXISTING ROADWAYS ARE DERIVED FROM A FIELD SURVEY PERFORMED BY TRANSCO BETWEEN OCTOBER 2018 TO JULY 2019.
3. PROPERTY BOUNDARIES BASED EITHER ON TAX PARCEL INFORMATION PROVIDED BY TRANSCO OR A COMBINATION OF DEED REFERENCE AND FIELD LOCATED EVIDENCE. PROPERTY BOUNDARY LOCATIONS BASED ON TAX PARCEL INFORMATION ARE APPROXIMATE.
4. THE FLOODWAY/FLOODPLAIN LINE AS SHOWN ON THE PLANS WAS DEVELOPED FROM AVAILABLE FEMA FLOODWAY MAPPING, FEMA FLOODPLAIN MAPPING, AND THE PA CHAPTER 105 DEFINITION.
5. PIPELINE ALIGNMENTS AND LIMITS OF DISTURBANCE PROVIDED BY TRANSCO.
6. STREAM AND WETLAND BOUNDARIES BASED ON SURVEYS CONDUCTED BY WHM CONSULTING FROM OCTOBER 2018 TO JUNE 2019.
7. DATUM BASED ON PENNSYLVANIA STATE PLANE COORDINATE SYSTEM, NAD 83 NORTH ZONE, NAVD88, ELEVATION MSL, DERIVED FROM GPS OBSERVATION.
8. OTHER EXISTING INFORMATION SHOWN IN PLANS, PROVIDED BY A COMBINATION OF TRANSCO AND HGA.

REVISIONS

NO.	DATE	BY	DESCRIPTION	W.O. NO.	CHK.	APP.

TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC
LEIDY SOUTH PROJECT - HILLTOP LOOP
SUBMERGED LAND LICENSE AGREEMENT
SITE PLAN AND PROFILE
YOUNG WOMANS CREEK
CHAPMAN TOWNSHIP, CLINTON COUNTY, PENNSYLVANIA

DRAWN BY: BWH	DATE: 09/04/2019	ISSUED FOR BID:	SCALE: 1" = 50'
CHECKED BY: KMC	DATE:	ISSUED FOR CONSTRUCTION:	REVISION:
APPROVED BY: KCC	DATE:		
WO: 1211227	RID:	DRAWING NUMBER:	ATTACHMENT 2