POST CONSTRUCTION STORMWATER MANAGEMENT REPORT

COMPRESSOR STATION 165
TRANSCO VILLAGE, PITTSYLVANIA COUNTY, VIRGINIA

Prepared for:

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CEC Project 341-132

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Attachments

1.0 PURPOSE

The purpose of this report is to document compliance of proposed stormwater management Best Management Practices (BMPs) with Commonwealth of Virginia regulations (effective July 1, 2024), including sections 9VAC25-875-600.B and 9VAC25-875-600.C, respectively, regarding channel protection and flood protection, as well as 9VAC25-875-580 and 9VAC25-875-590, regarding the removal of pollutants from stormwater runoff. Supporting calculations can be found in the appendices following this narrative.

2.0 PROJECT DESCRIPTION, EXISTING AND PROPOSED SITE CONDITIONS

Transcontinental Gas Pipe Line Company, LLC (Transco) is proposing the construction of the Compressor Station 165 project located in Pittsylvania County, Virginia. The project boundary is divided by State Route (S.R.) 692 (Transco Road). The overall Limit of Disturbance (LOD) for this project is 97.86 acres.

The site is comprised of an existing facility and will remain mostly undisturbed/unimproved throughout the duration of this project. The largest portion of disturbance activity will occur north of Transco Road. This portion of the project includes the construction of a proposed compressor station pad, substation pad, launcher pad, access roads, utilities, and stormwater BMPs. The existing ground cover within this portion of the project is primarily forest. There is minimal existing development within this portion of the site, and it is limited to a gravel driveway, a dirt trail, and an abandoned house. Soils within this portion of the project are mostly hydrologic soil group (HSG) B, except for a small area to the southeast, which is made up of HSG D Soils. According to soil classification information compiled from the USDA Web Soil Survey, there are two types of soils in this portion of the project. A copy of the USDA Web Soil Survey Report can be found in **Appendix A.** NOAA rainfall data can be found in **Appendix B**. Slopes within the northern portion of the project are generally between 2% and 15%, and there are no streams or wetlands within the confines of the LOD. These areas have been protected from development and appropriate 50’ boundary offset was used when establishing the LOD adjacent to aquatic resources. The northern portion of the site drains to the Banister River-Shockoe Creek watershed (HUC 030101050203). This area of the site makes up 27.33 acres of the total LOD.

The project area south of Transco Road primarily consists of an existing Transco facility and encompasses the remaining 70.53 acres of LOD. The land cover in this portion of the site mainly consists of existing gravel and maintained grass, both of which are to remain. The only land cover change proposed in this section of the project is the conversion of a 0.15-acre existing grass area to gravel. The southern portion of the site drains into the Cherrystone Creek watershed (HUC 030101050104). Due to the minimal amount of gravel being added to this section of the site and the fact that runoff from the limited improved area will result in no change in the overall curve number, with the flow leaving the site as sheet flow, no Stormwater BMPs are proposed in this watershed as a result of this project. Additionally, water quality calculations specific to this change have been included in this report and can be found in Appendix C. The project will be constructed in phases. Phase 1 includes the development of the entire launcher pad and part of the

compressor and substation pads, during which time no trees will be cleared. The pads will remain earthen in Phase 1 except for the areas designated as gravel in the plans. In Phase 2, trees will be cleared, and the remainder of the improvements will be made. The pads will be gravel in Phase 2.

3.0 SITE DRAINAGE AND HYDROLOGY

The site contains existing impervious cover, which will be modified in the post-construction condition and are therefore classified as re-development activity. The project site crosses two 6th-order (twelve-digit Hydrologic Unit Code (HUC)) boundaries as outlined below. The pre-development and post-development land cover total acreages for each are as follows:

HUC 030101050203 (Banister River-Shockoe Creek Watershed)

Pre Re-development Land Cover					
	A Soils	B Soils	C Soils	D Soils	Totals
Forest (Acres)	-	7.56	-	-	7.56
Mixed Open (Acres)	-	18.74	-	0.02	18.76
Managed Turf (Acres)	-	-	-	-	0.00
Impervious Cover (Acres)	-	1.01	-	-	1.01
Totals	-	27.31	0.00	0.02	27.33

Post Re-development Land Cover					
	A Soils	B Soils	C Soils	D Soils	Totals
Forest (Acres)	-	-	-	-	0.00
Mixed Open (Acres)	-	14.12	-	0.02	14.14
Managed Turf (Acres)	-	0.23	-	-	0.23
Impervious Cover (Acres)	-	12.96	-	-	12.96
Totals	-	27.31	-	0.02	27.33

HUC 030101050104 (Cherrystone Creek Watershed)

Pre Re-development Land Cover					
	A Soils	B Soils	C Soils	D Soils	Totals
Forest (Acres)	-	-	-	-	-
Mixed Open (Acres)	-	0.15	-	-	0.15
Managed Turf (Acres)	-	-	-	-	-
Impervious Cover (Acres)	-	-	-	-	-
Totals	-	0.15	-	-	0.15

Post Re-development Land Cover					
	A Soils	B Soils	C Soils	D Soils	Totals
Forest (Acres)	-	-	-	-	-
Mixed Open (Acres)	-	-	-	-	-
Managed Turf (Acres)	-	-	-	-	-
Impervious Cover (Acres)	-	0.15	-	-	0.15
Totals	-	0.15	-	-	0.15

The Banister River-Shockoe Creek will experience an increase in water quantity and is further broken out into four (4) primary points of analysis (POA) as shown on the next two pages.

PRE-DEVELOPMENT DRAINAGE AREAS

HUC 030101050203 (Banister River-Shockoe Creek Watershed)

POINT OF ANALYSIS	DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)	Weighted Curve Number	Time of Concentration (Min.)
POA#1	DA-1 (ON-SITE)	WOODS	B	55	0.265	**56**	**12.5**
		PASTURE	B	61	0.071		
	DA-1 (OFF-SITE)	WOODS	B	55	1.234	**61**	**13.6**
		WOODS	D	77	0.256		
		MEADOW	B	58	0.515		
		MEADOW	D	78	0.042		
		GRAVEL ROADS	B	98	0.069		
		IMPERVIOUS	N/A	98	0.071		
POA#2	DA-2 (ON-SITE)	WOODS	B	55	4.355	**60**	**25.5**
		MEADOW	B	58	0.07		
		PASTURE	B	61	10.742		
		PASTURE	D	80	0.02		
		GRAVEL ROADS	B	98	0.077		
		IMPERVIOUS	N/A	98	0.049		
	DA-2 (OFF-SITE)	WOODS	B	55	18.151	**56**	**17.9**
		WOODS	D	77	0.115		
		MEADOW	B	58	4.483		
		MEADOW	D	78	0.219		
		IMPERVIOUS	N/A	98	0.317		
POA#3	DA-3 (ON-SITE)	WOODS	B	55	2.838	**60**	**26.9**
		MEADOW	B	58	4.772		
		PASTURE	B	61	1.455		
		GRAVEL ROADS	B	98	0.573		
	DA-3 (OFF-SITE)	WOODS	B	55	2.234	**57**	**9.6**
		MEADOW	B	58	2.556		
POA#4	DA-4 (ON-SITE)	WOODS	B	55	0.101	**64**	**10.7**
		MEADOW	B	58	1.562		
		PASTURE	B	61	0.061		
		GRAVEL ROADS	B	98	0.29		
		IMPERVIOUS	N/A	98	0.026		
	DA-4 (OFF-SITE)	MEADOW	B	58	0.066	**80**	**10.7**
		IMPERVIOUS	N/A	98	0.078		

WOODS AND PASTURE LAND COVER ARE MODELED IN GOOD CONDITION.
MEADOW LAND COVER IS MODELED AS NON-GRAZED.

Following full build-out of the site, the site retains four (4) POAs that exist at the same location as in the pre-development condition.

POST-DEVELOPMENT DRAINAGE AREAS

HUC 030101050203 (Banister River-Shockoe Creek Watershed)

POINT OF ANALYSIS	DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)	WEIGHTED CURVE NUMBER	TIME OF CONCENTRATION (MIN)
POA #1	DA-1 DETAINED (ON-SITE)	BRUSH*	B**	55	0.297	**55**	**10.1**
	DA-1 UNDETAINED (OFF-SITE)	WOOD	B	55	1.234	**61**	**13.6**
		WOOD	D	77	0.256		
		MEADOW	B	58	0.515		
		MEADOW	D	78	0.042		
		GRAVEL ROADS	B	98	0.069		
		IMPERVIOUS	N/A	98	0.071		
POA #2	DA-2 DETAINED (ON-SITE)	BRUSH*	B	55	1.116	**83**	**7.9**
		BRUSH*	C	70	1.362		
		BRUSH*	D	77	0.02		
		MEADOW	B	58	2.396		
		MEADOW	C	71	0.775		
		LAWN (TURF)	C	74	0.092		
		GRAVEL ROADS	B	98	3.439		
		GRAVEL ROADS	C	98	4.026		
		IMPERVIOUS	N/A	98	0.079		
	DA-2 DETAINED (OFF-SITE)	WOODS	B	55	0.019	**76**	**7.9**
		WOODS	D	77	0.066		
		MEADOW	B	58	0.198		
		MEADOW	D	78	0.041		
		IMPERVIOUS	N/A	98	0.166		
	DA-2 UNDETAINED (ON-SITE)	BRUSH*	B	55	1.1	**57**	**10.6**
		BRUSH*	B**	55	0.434		
		MEADOW	B	58	1.208		
		MEADOW	C	71	0.407		
		LAWN (TURF)	C	74	0.042		
		GRAVEL ROADS	B	98	0.006		
		GRAVEL ROADS	C	98	0.074		
		IMPERVIOUS	N/A	98	0.041		
	DA-2 UNDETAINED (OFF-SITE)	WOODS	B	55	18.132	**56**	**17.9**
		WOODS	D	77	0.049		
		MEADOW	B	58	4.286		
		MEADOW	D	78	0.178		
		IMPERVIOUS	N/A	98	0.147		

POST-DEVELOPMENT DRAINAGE AREAS

HUC 030101050203 (Banister River-Shockoe Creek Watershed)

POINT OF ANALYSIS	DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)	WEIGHTED CURVE NUMBER	TIME OF CONCENTRATION (MIN)
POA #3	DA-3 DETAINED (ON-SITE)	BRUSH*	B**	55	0.118	88	6
		MEADOW	B	58	0.799		
		MEADOW	C	71	0.231		
		GRAVEL ROADS	B	98	1.777		
		GRAVEL ROADS	C	98	1.328		
	DA-3 UNDETAINED (ON-SITE)	BRUSH*	B**	55	0.516	59	21.1
		BRUSH*	C	70	0.343		
		MEADOW	B	58	2.556		
		LAWN (TURF)	B	61	0.079		
		GAVEL ROADS	C	98	0.041		
	DA-3 UNDETAINED (OFF-SITE)	WOODS	B	55	2.234	57	9.6
		MEADOW	B	58	2.548		
POA #4	DA-4 DETAINED (ON-SITE)	MEADOW	B	58	0.585	87	10.8
		MEADOW	C	71	0.382		
		TURF (LAWN)	B	61	0.017		
		GRAVEL ROADS	B	98	0.917		
		GRAVEL ROADS	C	98	1.308		
		IMPERVIOUS	N/A	98	0.026		
	DA-4 DETAINED (OFF-SITE)	MEADOW	B	58	0.047	80	10.8
		IMPERVIOUS	N/A	98	0.058		
	DA-4 UNDETAINED (ON-SITE)	BRUSH*	B	55	0.252	57	8.2
		BRUSH*	B**	55	0.140		
		MEADOW	B	58	0.400		
		GRAVEL ROADS	B	98	0.01		
	DA-4 UNDETAINED (OFF-SITE)	MEADOW	B	58	0.026	77	8.2
		IMPERVIOUS	N/A	98	0.024		

As discussed earlier, water quantity increases are not predicted to occur in the Cherrystone Creek Watershed.

PRE-DEVELOPMENT DRAINAGE AREA SUMMARY

HUC 030101050104 (Cherrystone Creek Watershed)

POINT OF ANALYSIS	DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)	Weighted Curve Number	Time of Concentration (Min.)
POA#5	DA-5 (OFFSITE)	WOODS	B	55	1.802	71	6
		WOODS	D	77	5.548		
		MEADOW	B	58	5.5		
		MEADOW	D	78	3.208		
		IMPERVIOUS	N/A	98	1.615		
WOODS AND PASTURE LAND COVER ARE MODELED IN GOOD CONDITION. MEADOW LAND COVER IS MODELED AS NON-GRAZED.							

POST-DEVELOPMENT DRAINAGE AREAS

HUC 030101050104 (Cherrystone Creek Watershed)

POINT OF ANALYSIS	DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)	Weighted Curve Number	Time of Concentration (Min.)
POA#5	DA-5 (OFFSITE)	WOODS	B	55	1.802	71	6
		WOODS	D	77	5.548		
		MEADOW	B	58	5.352		
		MEADOW	D	78	3.208		
		IMPERVIOUS	N/A	98	1.763		
WOODS LAND COVER ARE MODELED IN GOOD CONDITION. MEADOW LAND COVER IS MODELED AS NON-GRAZED.							

3.1 WATER QUALITY REQUIREMENTS

The Virginia Runoff Reduction Method (VRRM) Spreadsheet, Version 4.1 for re-development was used to estimate the total phosphorous loads from the proposed site. The increase in loading is primarily from the change of forested area to impervious surfaces. Sediment forebays were designed for each of the proposed extended detention basins to minimize sediment leaving the site. The information in the tables on the next page have been excerpted from the VRRM Summary Pages for each watershed. Printouts of the VRRM worksheets for both watersheds can be found in **Appendix D.**

HUC 030101050203 (Banister River-Shockoe Creek Watershed)

Total Runoff Volume Reduction (ft^3)	0
Total TP Load Reduction Achieved (lb/yr)	0.00
Total TN Load Reduction Achieved (lb/yr)	0.00
Remaining Post Development TP Load (lb/yr)	16.10
Remaining TP Load Reduction (lb/yr) Required	**8.41**

HUC 030101050104 (Cherrystone Creek Watershed)

Total Runoff Volume Reduction (ft^3)	0
Total TP Load Reduction Achieved (lb/yr)	0.00
Total TN Load Reduction Achieved (lb/yr)	0.00
Remaining Post Development TP Load (lb/yr)	0.13
Remaining TP Load Reduction (lb/yr) Required	**0.09**

Due to the complexity of the project, its classification as a hot spot, and the fact that re-development and soil testing has confirmed that infiltration on site is either undesirable or not possible, mitigation credits will be purchased to offset the increase in phosphorous loading for the project.

3.2 Water Quantity Requirements

Stormwater analyses and BMP designs were performed to meet Virginia state regulation 9VAC25-875-600 and confirm that the following has been satisfied:

1. Concentrated stormwater discharges that are released into a natural or manmade stormwater conveyance system will be in compliance with 9VAC25-875-600.B (Channel Protection) and 9VAC25-875-600.C (Flood Protection).

2. If there is not a defined receiving channel, it will be demonstrated that either existing sheet flow conditions are maintained following construction or that the proposed outlet structure re-distributes discharge for the 10-year storm as sheet flow; a sheet flow discharge condition for a proposed outlet structure (i.e. spillway, level spreader, riprap apron, etc.) is defined as less than or equal to 0.1-ft of head on the outlet structure. Increased volumes of sheet flow will be evaluated in accordance with 9VAC25-875-600.D

The Natural Resource Conservation Service (NRCS; formerly Soil Conservation Service [SCS]) Technical Release 55 (TR-55) method was used to analyze site hydrology, and HydroCAD Version 10.20 software was used to model the peak rate of the 1- and 10-year 24-hour storm events. Input parameters for HydroCAD are as follows:

1. Rainfall Event
   a. Rainfall Distribution: SCS Type II 24-hour rainfall distribution is representative of the site area per TR-55.
   b. Rainfall depth corresponding to the 1- and 10-year 24-hour storm events. The rainfall depths for the subject site area were obtained from the Precipitation-Frequency Atlas of the United States, Atlas 14, Volume 2 (NOAA Atlas 14) and shown in the table below. Supporting NOAA data can be found in **Appendix B.**

Storm Event (Year)	Rainfall Depth (inches)
1	2.78
10	5.08

2. Subbasin/Subcatchment Nodes
   a. Drainage Areas: Drainage areas for the pre- and post-development conditions are provided on Sheets C403 and C404, respectively, in **Appendix E.**
   b. Curve Number (CN): Soil and land use mapping for the project site are provided on Sheets C403 and C404, respectively, in **Appendix E**. A breakdown of land uses, soil types, and corresponding CNs for each subbasin/subcatchment node is included in the HydroCAD Output Report (**Appendix E**.)
   c. Time of Concentration (T_c): The time of concentration for each drainage area was calculated to the respective point of analysis (POA). The Tc was computed based on the NRCS TR-55 methodology using the HydroCAD computer software. The Tc represents the estimated travel time of stormwater runoff from the most hydrologically distant point to the POA in each drainage area. Tc flow paths for the project site are shown on Sheets C403 and C404 in Attachment #6. Details pertaining to the calculated time of concentration for each subbasin/subcatchment node are included in the HydroCAD Output Report **(Appendix E).**

The portion of the site north of Transco Road drains to the Banister River-Shockoe Creek watershed. The northern part of the site is sub-divided into four overall drainage areas (DA-1, DA-2, DA-3, and DA-4). The four drainage areas drainage areas are further broken down into on-site detained, on-site undetained, off-site detained, and off-site undetained in the post-development analysis where applicable. Runoff from the detained drainage areas are captured by extended detention basins where the proposed impervious area on site is captured and treated. Drainage Area 2 is captured by extended detention basin No. 1 where the impervious cover from the compressor station pad is treated. Drainage Area No. 3 is captured by extended detention basin No. 2 where the impervious area from the substation pad and portion of the access road is treated. Drainage Area No. 4 (detained) is captured by extended detention basin No. 3 where the impervious area from the launcher pad and portion of the access road is treated. There is no proposed impervious area within Drainage Area 1.

Runoff from the site is either concentrated runoff to manmade stormwater conveyance system, natural stormwater conveyance system, or sheet flow. The drainage areas, point of analysis, and means of discharging are described in the table that follows.

Point of Ana;ysis (POA)	Discharge To
POA#1	N/A – Sheet flow
POA#2	Sheet flow via level spreader to E2-L138-VA
POA #3	Sheet flow via level spreader to E2-L158-VA & E2-L159-VA
POA #4	Sheet flow via level spreader to E2-L161-VA
POA#5	N/A-Sheet Flow

Discharges to POA #1 and POA #5 are considered sheet flow per TR-55, which defines flow with very shall depth of about 0.1-ft. as sheet flow. For drainage areas that discharge to natural stormwater conveyance systems, the energy balance equation was used for channel protection analysis (1-year storm). Based on the analysis, stormwater BMPs are implemented for peak flow rate control to meet 9VAC-875-600.B and C requirements. For each point of analysis, the following calculations were completed to demonstrate that the site meets the requirements associated with water quantity:

Energy Balance Equation with Run-On:

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

Where:

q_{1post} = 1-year allowable post-development peak discharge from site (includes offsite run-on)

q_{1pre} = 1-year pre-development peak discharge from site ($q_{1pre,site}$) or offsite area ($q_{1pre,offsite}$)

RV_{1pre} = 1-year pre-development peak runoff volume from site ($RV_{1pre,site}$) or offsite area ($RV_{1pre,offsite}$)

RV_{1post} = 1-year post-development peak runoff volume from site ($RV_{1post,site}$) or offsite area ($RV_{1post,offsite}$)s

IF = Improvement Factor (0.8 for sites > 1 acre)

Additionally, under no condition do the following occur :

$$Q_{1-yr-Developed} > Q_{1-yr-Pre-Developed}$$

$$Q_{1-yr-Developed} < \left(Q_{1-yr-Forest} * RV_{1-yr-Forest}\right)/RV_{1-yr-Developed}$$

Where:

$Q_{1\text{-}yr\text{-}Developed}$ = the allowable peak flow rate of runoff from the developed site

$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ = the peak flow rate of runoff from the site in the pre-developed conditions

$Q_{1\text{-}yr\text{-}Forest}$ = the peak flow rate of runoff from the site in a forested condition

$RV_{1\text{-}yr\text{-}Developed}$ = the volume of runoff from the site in the developed condition

$RV_{1\text{-}yr\text{-}Forest}$ = the volume of runoff from the site in a forested condition

A summary table for each point of analysis, respective to the energy balance equation, can be found below with detailed calculations provided in **Attachment 6.**

Point of Analysis	**q_{1post}** (CFS)	**$q_{1pre\text{-}site}$** (CFS)	**$q_{1pre\text{-}offsite}$** (CFS)	**$Rv_{1pre,site}$** (CF)	**$Rv_{1post,site}$** (CF)
POA #1	0.47	0.02	0.46	197	151
POA #2	1.35	1.72	1.05	14,339	62,687
POA #3	0.71	1.05	0.45	9,025	28,046
POA #4	0.23	0.83	0.23	2,786	18,719

An improvement factor of 0.8 was applied to each POA respective to meeting condition 1.

Point of Analysis	$Q_{1\text{-}Yr}$ Developed (CFS)	$Q_{1\text{-}Yr}$ Forest (CFS)	$Q_{1\text{-}Yr\ Pre\text{-}}$ Developed (CFS)	$Rv_{1\text{-}yr}$ Developed (CF)	$Rv_{1\text{-}yr\ Forest}$ (CF)
POA #1	0.01	0.02	0.01	151	171
POA #2	0.38	1.72	0.42	62,687	7,796
POA #3	0.43	1.05	0.26	28,046	4,907
POA #4	0.16	0.83	0.06	18,719	1,039

Point of Analysis	Condition 1	Condition 2	Condition 3	Are the Stormwater Quantity Requirements satisfied?
POA #1	**0.47 ≤ 0.48**	**0.01 ≤ 0.02**	**0.01 ≥ 0.01**	Requirements Satisfied
POA #2	**1.35 ≤ 1.36**	**0.38 ≤ 1.72**	**0.38 ≥ 0.05**	Requirements Satisfied
POA #3	**0.71 ≤ 0.72**	**0.43 ≤ 1.05**	**0.44≥ 0.05**	Requirements Satisfied
POA #4	**0.23 ≤ 0.33**	**0.16 ≤ 0.83**	**0.16≥ 0.00**	Requirements Satisfied

For the drainage areas that discharge as sheet flow from the site, the results indicates that for the 1- and 10-year storm events, no increases in peak flow rates or volumes are expected to occur in the watershed. Therefore, increased volumes of sheet flow that will cause or contribute to erosion, sedimentation, or flooding of down gradient properties or resources are also not expected to occur, and the requirements of 9VAC25-875-600.D are met.

Based on the results presented in the tables above, it is confirmed that the project satisfies the applicable Virginia state stormwater quantity regulations.

Anti-seep collars were designed for basin outfall pipes and calculations for these can be found in **Appendix G.**

3.3 Stormwater Conveyance Designs and Calculations

Other remaining stormwater conveyance designs on site, as well as calculations associated with outlet protection from the extended detention basins, are presented in **Appendix H.** A synopsis of the design methodology used for each respective item is included below.

Channel Design

Proposed stormwater conveyance channels are designed in accordance with the criteria of BMP C-ECM-09 of the Virginia Stormwater Management Handbook. Channel flows are calculated using the rational method and are designed to convey the 10-year 24-hour peak flow with 0.5' of freeboard, and so that the velocity of the 2-year 24-hour peak flow does not exceed the permissible velocity/shear for the proposed channel lining. Flow depth is calculated using the minimum channel slope condition to be conservative when verifying adequate channel capacity for the 10-year 24-hour peak flow, and shear and velocity are calculated using the maximum channel slope condition to be conservative when sizing the lining for the 2-year 24-hour peak flow.

Temporary Diversion Dike Design

Temporary diversion dikes are designed in accordance with BMP CECM-04 in the Virginia Stormwater Management Handbook. Temporary diversion dikes are designed to handle the 10-year storm event with 0.5 feet of freeboard.

Culvert & Storm Pipe Design

Culverts and storm pipes are sized to safely convey the 10-year 24-hour design flow. The 10-year 24-hour design flow for each culvert is calculated using the rational method equation. Culvert capacities are calculated using HY-8 software. The proposed storm sewer network is evaluated using the AutoCAD Civil 3D Storm Sewers extension.

Outlet Protection Design

Outlet protection is designed in accordance with Minimum Standard (MS)-11 and BMP C-ECM-15 as outlined in the Virginia Stormwater Management Handbook to prevent erosion at stormwater conveyance outfalls.

Level Spreader

There are three structural level spreaders specified on the project located at the pond outfalls. The level spreaders are used to intercept concentrated flows coming from the pond outfalls and convert it to sheet flow to mitigate the potential for downslope erosion. The level spreaders are designed in accordance with C-ECM in the Virginia Stormwater Management Handbook.

4.0 CALCULATION METHODOLOGY

Due to the site's location and proximity to forested areas and aquatic resources within the property, consideration was given to the protection of these resources, and the overall limit of disturbance was lessened in order to minimize the need for water quality and quantity control on site. Areas where grading occurred were downgraded with respect to post-development analysis of their hydrologic soil group, due to the assumption that compaction would lessen the soil's ability to infiltrate once construction had been completed. In areas where necessary, revegetation of open spaces to brush, as well as decompaction of the soils, was specified to further promote infiltration. These areas are specified in the landscaping plans on C700-703 contained in **Appendix I.** While these areas are to be revegetated using a brush seeding mixture, the areas were analyzed as Forested in the post-development condition to remain conservative within the analysis.

The peak runoff calculations were performed for the 1- and 10-year events and the 100-year water surface elevations for the peak flow from the 100-year event is reviewed to confirm that the emergency spillways function without overtopping of the detention basin embankments. Calculations were completed in accordance with TR-55 methodology within the HydroCAD computer program was used to determine the pre- and post-development stormwater runoff peak discharge rates. The rate of runoff is based on the relationships between the amount of rainfall, soil type, land cover, travel time, and the size of the watershed area. The NRCS Type II storm was utilized in the runoff model for precipitation in accordance with the direction provided by NRCS for this region.

5.0 PROJECT RUNOFF SUMMARY

Using the design criteria outlined in the Virginia Stormwater Management Handbook, the project area was divided into points of analysis. Each area was then analyzed to determine the change in the peak rate of runoff from the pre-development to post-development conditions for the 1-, and 10-year/24-hour storm events.

Using the design criteria from the VSMH, stormwater runoff from the pre-development and post-development areas were analyzed at the points of analysis shown in the drainage area maps. The results of the analyses are presented in the table below.

SUMMARY OF PEAK FLOW STORMWATER ANALYSIS

Point of Analysis	1-year Pre-Development Rate (CFS)	1- year Post Development Rate (CFS)	1-year Difference in Rate	10-year Pre-Development Rate (CFS)	10- year Post Development Rate (CFS)	10-year Difference in Rate
POA #1	0.48	0.47	-0.01	4.41	4.34	-0.07
POA #2	2.74	1.35	-1.39	41.19	31.88	-9.31
POA #3	1.28	0.71	-0.57	13.39	12.95	-0.44

POA #4	1.06	0.23	-0.83	5.51	3.31	-2.20

6.0 PCSM BEST MANAGEMENT PRACTICES

Due to the proposed uses for the site and inability to infiltrate, it was determined that extended detention basins with forebays for additional water quality treatment would be used to mitigate water quantity for the development. Per the VSMH, an extended detention basin is an earthen structure constructed by either excavation of existing soil or the impoundment of a natural depression. The extended detention pond near the proposed compressor station, which drains to POA#2, will be lined with an impermeable membrane due to its designation as a hot spot.

Additionally, media has been specified to be placed at the bottom of each basin due to the relatively small drawdown orifices required in combination with the proposed dewatering times for each basin. This will allow the basin to remain free of standing water as the detention facility empties after each storm event.

7.0 COMPLIANCE SUMMARY

Compliance Summary			
Point of Analysis	**Water Quality**	**Channel Protection**	**Flood Protection**
POA #1	Water quality will be met through mitigation for the increased loading associated with the proposed development due to lack of infiltration potential and soil testing results	N/A	Reducing the 10-Year Storm
POA #2		Energy Balance	Reducing the 10-Year Storm
POA #3		Energy Balance	Reducing the 10-Year Storm
POA #4		Energy Balance	Reducing the 10-Year Storm
POA #5		N/A	Reducing the 10-Year Storm

In order to remain conservative, an approach was developed to assess and provide compliance using both channel and flood protection methodologies on all areas where detention facilities are proposed. At the edges of the proposed limits of disturbance complexes of aquatic resources and wetlands exist and can be considered as existing flooded areas. These wetland and stream complexes are being protected throughout development. The calculations provided in this report show that the post-development peak flow rate for the 10-year 24-hour storm event is less than the pre-development peak flow rate from the 10-year 24-hour storm event, and therefore, no additional analysis is provided with respect to flood protection criteria.

8.0 INFILTRATION AND SOIL TESTING RESULTS

A comprehensive geotechnical evaluation was completed for the site and boring locations can be found on the map in **Appendix J**. The geotechnical report associated with the site is currently being finalized. Infiltration testing was also conducted in the areas of Extended Detention Pond #2 and #3, as they are not considered hot spots and have the potential to provide infiltration. Although the testing shows that some marginal infiltration may be feasible in these locations, infiltration was not accounted for as the likelihood of infiltrative properties remaining after construction will be reduced. A summary table of the infiltration testing results follows and the full results can be found in **Appendix K**.

Infiltration Test Number	Latitude	Longitude	Design infiltration Rate (in/hr)
1	36°50'3.30"N	79°20'15.20"W	0.01
2	36°50'4.11"N	79°20'14.68"W	0.14
3	36°50'9.94"N	79°20'8.18"W	0.09
4	36°50'10.16"N	79°20'9.00"W	0.02

APPENDIX A
WEB SOIL SURVEY

United States Department of Agriculture

NRCS

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 Pittsylvania County and the City of Danville, Virginia

April 24, 2025

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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Contents

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.

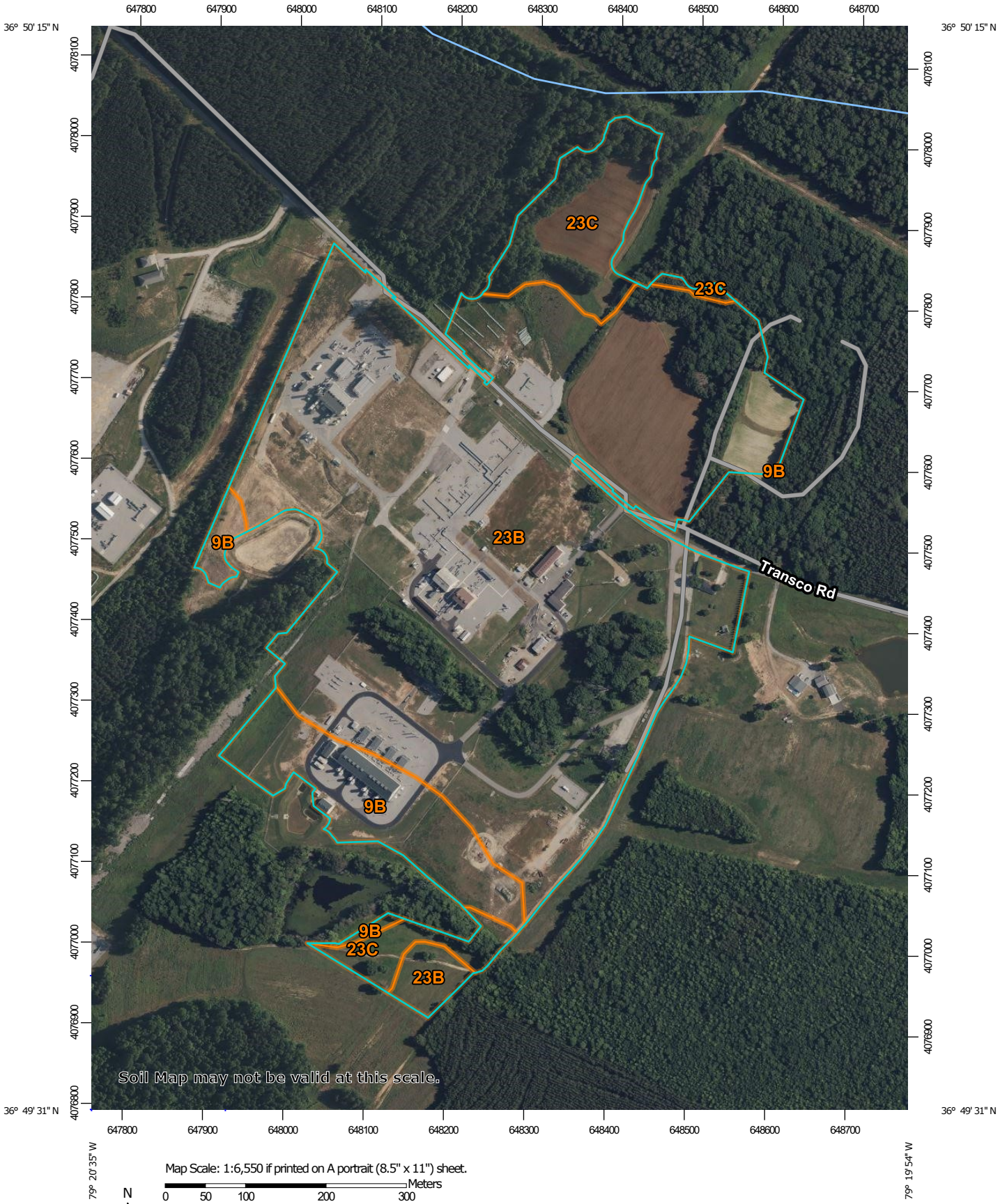
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

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: 1:6,550 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N 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.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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: Pittsylvania County and the City of Danville, Virginia
Survey Area Data: Version 17, Aug 30, 2024

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

Date(s) aerial images were photographed: Apr 2, 2022—Jun 18, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background

MAP LEGEND

MAP INFORMATION

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
9B	Lackstown fine sandy loam, 2 to 7 percent slopes	10.1	9.5%
23B	Clover fine sandy loam, 2 to 7 percent slopes	86.2	81.5%
23C	Clover fine sandy loam, 7 to 15 percent slopes	9.6	9.0%
Totals for Area of Interest		**105.8**	**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.

Pittsylvania County and the City of Danville, Virginia

9B—Lackstown fine sandy loam, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: 2yzrp
Elevation: 400 to 1,000 feet
Frost-free period: 179 to 222 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Lackstown and similar soils: 85 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lackstown

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Triassic residuum weathered from igneous and sedimentary rock

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bt - 10 to 65 inches: sandy clay

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 12 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: D
Ecological site: F136XY410NC - Triassic basin upland forest, seasonally wet
Hydric soil rating: No

Minor Components

Wet spots

Percent of map unit: 5 percent
Landform: Depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Convex
Across-slope shape: Convex

Hydric soil rating: Yes

Leaksville

Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

23B—Clover fine sandy loam, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: 2yzsf
Elevation: 400 to 1,000 feet
Frost-free period: 179 to 222 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Clover and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clover

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 9 inches: fine sandy loam
Bt - 9 to 39 inches: clay
C - 39 to 65 inches: sandy clay loam

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F136XY420NC - Triassic basin upland forest, moist
Hydric soil rating: No

Minor Components

Leaksville

Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

23C—Clover fine sandy loam, 7 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2yzsg
Elevation: 400 to 1,000 feet
Frost-free period: 179 to 222 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Clover and similar soils: 85 percent
Minor components: 3 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Clover

Setting

Landform: Hillslopes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Residuum weathered from granite and gneiss

Typical profile

Ap - 0 to 9 inches: fine sandy loam
Bt - 9 to 39 inches: clay
C - 39 to 65 inches: sandy clay loam

Properties and qualities

Slope: 7 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Moderate (about 8.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: B
Ecological site: F136XY420NC - Triassic basin upland forest, moist
Hydric soil rating: No

Minor Components

Leaksville

Percent of map unit: 3 percent
Landform: Depressions
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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APPENDIX B
NOAA DATA

NOAA Atlas 14, Volume 2, Version 3
Location name: Chatham, Virginia, USA*
Latitude: 36.833°, Longitude: -79.3352°
Elevation: 673 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

G.M. Bonnin, D. Martin, B. Lin, T. Parzybok, M.Yekta, and D. Riley

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.360** (0.327-0.393)	**0.430** (0.391-0.470)	**0.509** (0.463-0.557)	**0.566** (0.513-0.618)	**0.634** (0.574-0.691)	**0.679** (0.613-0.741)	**0.725** (0.650-0.790)	**0.764** (0.681-0.834)	**0.811** (0.716-0.888)	**0.845** (0.741-0.929)
10-min	**0.575** (0.522-0.628)	**0.687** (0.625-0.751)	**0.816** (0.741-0.893)	**0.905** (0.821-0.988)	**1.01** (0.915-1.10)	**1.08** (0.976-1.18)	**1.15** (1.03-1.26)	**1.21** (1.08-1.32)	**1.28** (1.13-1.40)	**1.33** (1.17-1.46)
15-min	**0.718** (0.653-0.785)	**0.864** (0.786-0.945)	**1.03** (0.938-1.13)	**1.14** (1.04-1.25)	**1.28** (1.16-1.40)	**1.37** (1.24-1.49)	**1.46** (1.30-1.59)	**1.53** (1.36-1.67)	**1.61** (1.43-1.77)	**1.67** (1.46-1.84)
30-min	**0.985** (0.895-1.08)	**1.19** (1.09-1.30)	**1.47** (1.33-1.60)	**1.66** (1.50-1.81)	**1.90** (1.72-2.07)	**2.06** (1.86-2.25)	**2.23** (2.00-2.43)	**2.38** (2.12-2.60)	**2.57** (2.27-2.81)	**2.71** (2.37-2.97)
60-min	**1.23** (1.12-1.34)	**1.50** (1.36-1.64)	**1.88** (1.71-2.06)	**2.16** (1.96-2.36)	**2.53** (2.29-2.75)	**2.80** (2.52-3.05)	**3.07** (2.75-3.35)	**3.34** (2.97-3.64)	**3.68** (3.26-4.04)	**3.95** (3.46-4.34)
2-hr	**1.46** (1.32-1.60)	**1.77** (1.60-1.95)	**2.24** (2.02-2.46)	**2.60** (2.34-2.85)	**3.09** (2.76-3.38)	**3.47** (3.09-3.79)	**3.86** (3.41-4.21)	**4.25** (3.74-4.65)	**4.80** (4.17-5.25)	**5.22** (4.50-5.72)
3-hr	**1.56** (1.42-1.72)	**1.90** (1.73-2.10)	**2.41** (2.18-2.65)	**2.79** (2.52-3.07)	**3.32** (2.97-3.63)	**3.72** (3.32-4.07)	**4.14** (3.67-4.53)	**4.56** (4.01-4.99)	**5.14** (4.47-5.63)	**5.58** (4.81-6.12)
6-hr	**1.92** (1.74-2.14)	**2.33** (2.12-2.59)	**2.94** (2.66-3.27)	**3.43** (3.09-3.80)	**4.11** (3.68-4.55)	**4.67** (4.14-5.15)	**5.26** (4.63-5.79)	**5.87** (5.12-6.45)	**6.75** (5.81-7.40)	**7.45** (6.33-8.17)
12-hr	**2.32** (2.11-2.58)	**2.82** (2.56-3.13)	**3.58** (3.24-3.96)	**4.21** (3.79-4.64)	**5.11** (4.57-5.62)	**5.87** (5.20-6.43)	**6.70** (5.87-7.31)	**7.58** (6.56-8.27)	**8.88** (7.55-9.70)	**9.96** (8.32-10.9)
24-hr	**2.78** (2.56-3.04)	**3.37** (3.10-3.67)	**4.30** (3.95-4.69)	**5.08** (4.66-5.53)	**6.23** (5.67-6.76)	**7.22** (6.52-7.82)	**8.29** (7.44-8.97)	**9.47** (8.42-10.2)	**11.2** (9.81-12.1)	**12.7** (11.0-13.8)
2-day	**3.29** (3.03-3.58)	**3.98** (3.68-4.33)	**5.05** (4.66-5.49)	**5.92** (5.45-6.43)	**7.19** (6.57-7.79)	**8.24** (7.50-8.94)	**9.38** (8.47-10.2)	**10.6** (9.50-11.5)	**12.4** (11.0-13.5)	**13.9** (12.1-15.2)
3-day	**3.47** (3.20-3.78)	**4.20** (3.88-4.58)	**5.33** (4.91-5.80)	**6.25** (5.75-6.80)	**7.58** (6.93-8.24)	**8.69** (7.90-9.44)	**9.88** (8.92-10.7)	**11.2** (10.0-12.1)	**13.0** (11.5-14.2)	**14.6** (12.8-16.0)
4-day	**3.66** (3.37-3.98)	**4.43** (4.09-4.83)	**5.61** (5.17-6.11)	**6.58** (6.05-7.17)	**7.97** (7.29-8.68)	**9.13** (8.30-9.94)	**10.4** (9.37-11.3)	**11.7** (10.5-12.8)	**13.7** (12.1-14.9)	**15.3** (13.4-16.7)
7-day	**4.19** (3.89-4.55)	**5.04** (4.68-5.47)	**6.29** (5.82-6.81)	**7.31** (6.75-7.92)	**8.77** (8.06-9.49)	**9.98** (9.12-10.8)	**11.3** (10.2-12.2)	**12.6** (11.4-13.7)	**14.6** (13.0-15.9)	**16.2** (14.3-17.7)
10-day	**4.76** (4.44-5.12)	**5.70** (5.32-6.13)	**7.02** (6.54-7.56)	**8.10** (7.53-8.71)	**9.61** (8.89-10.3)	**10.8** (9.98-11.6)	**12.1** (11.1-13.0)	**13.5** (12.3-14.5)	**15.4** (13.9-16.6)	**17.0** (15.2-18.3)
20-day	**6.40** (6.01-6.85)	**7.63** (7.17-8.16)	**9.21** (8.64-9.84)	**10.4** (9.78-11.2)	**12.1** (11.3-12.9)	**13.5** (12.5-14.4)	**14.8** (13.7-15.8)	**16.2** (14.9-17.3)	**18.0** (16.5-19.4)	**19.5** (17.7-21.0)
30-day	**7.91** (7.48-8.38)	**9.38** (8.86-9.92)	**11.1** (10.5-11.7)	**12.4** (11.7-13.1)	**14.0** (13.2-14.8)	**15.3** (14.4-16.2)	**16.6** (15.5-17.5)	**17.8** (16.6-18.9)	**19.4** (18.0-20.6)	**20.6** (19.0-22.0)
45-day	**9.96** (9.44-10.5)	**11.8** (11.1-12.4)	**13.7** (13.0-14.5)	**15.2** (14.4-16.0)	**17.1** (16.1-18.0)	**18.5** (17.4-19.5)	**19.8** (18.7-20.9)	**21.1** (19.8-22.3)	**22.8** (21.3-24.1)	**24.0** (22.3-25.5)
60-day	**11.9** (11.3-12.5)	**13.9** (13.3-14.7)	**16.1** (15.3-16.9)	**17.7** (16.8-18.6)	**19.7** (18.7-20.7)	**21.2** (20.1-22.3)	**22.6** (21.4-23.8)	**24.0** (22.6-25.2)	**25.7** (24.1-27.0)	**26.9** (25.2-28.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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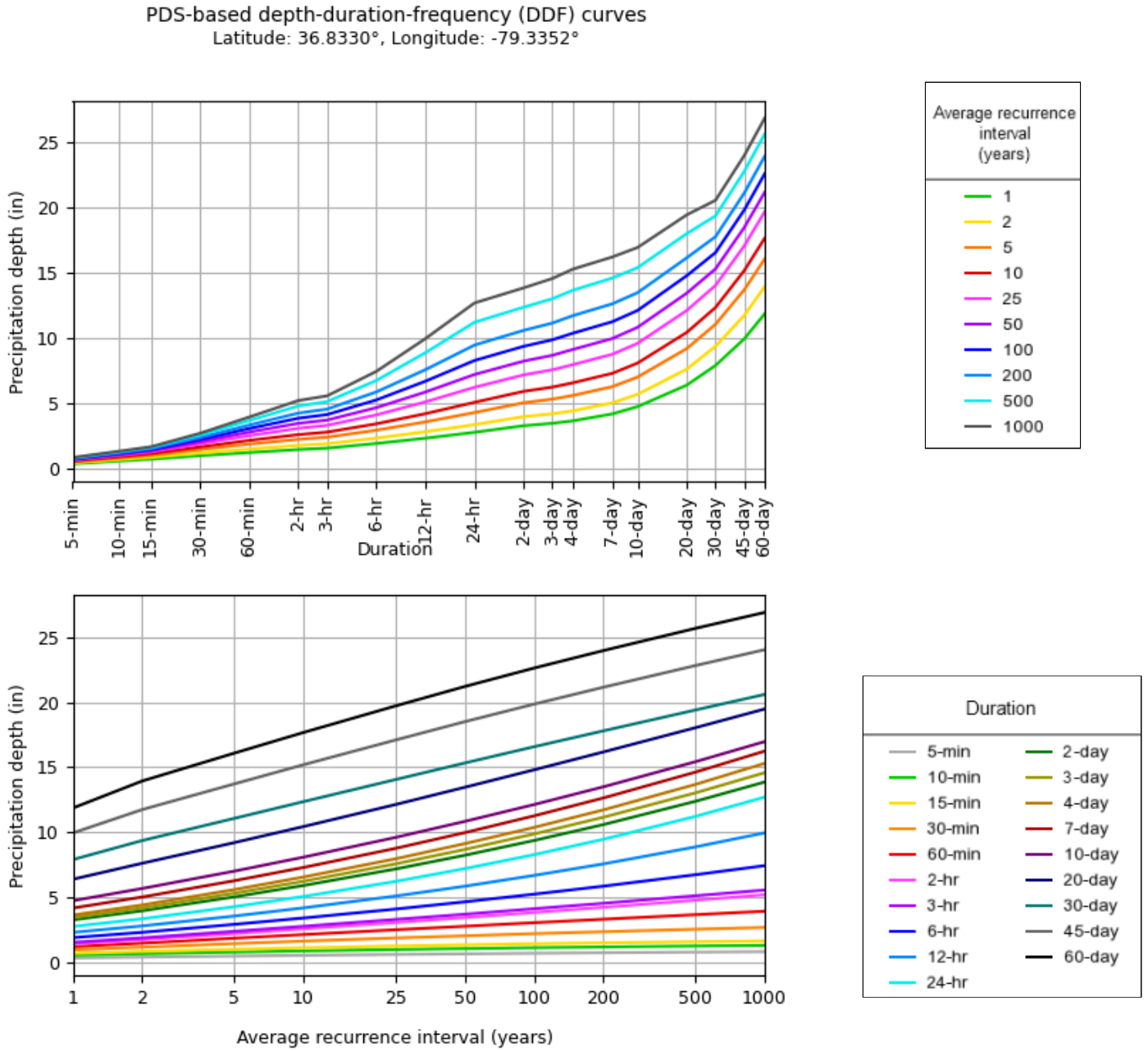
PF graphical



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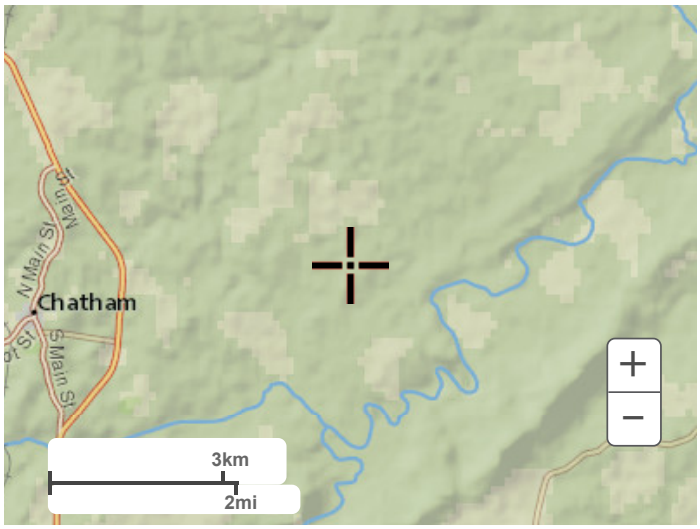
Maps & aerials

Small scale terrain



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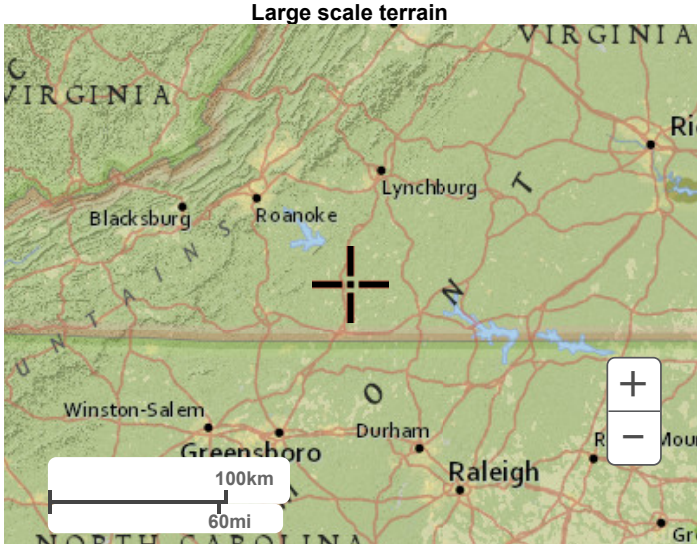

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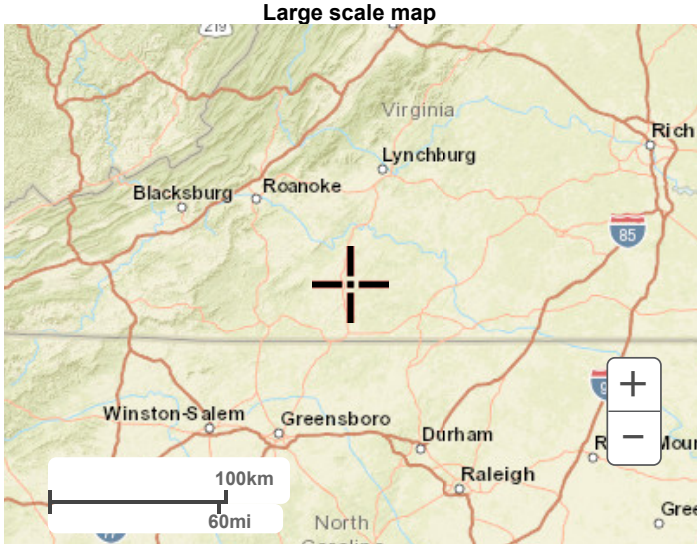
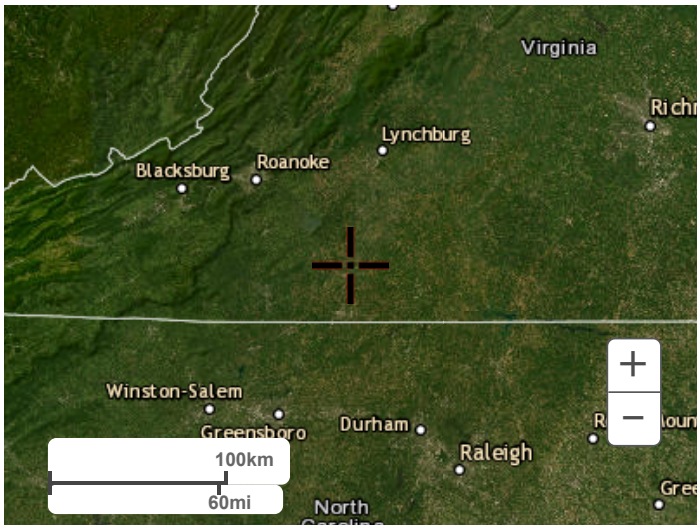


Large scale aerial



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NOAA Atlas 14, Volume 2, Version 3
Location name: Chatham, Virginia, USA*
Latitude: 36.833°, Longitude: -79.3352°
Elevation: 673 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches/hour)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**4.32** (3.92-4.72)	**5.16** (4.69-5.64)	**6.11** (5.56-6.68)	**6.79** (6.16-7.42)	**7.61** (6.89-8.29)	**8.15** (7.36-8.89)	**8.70** (7.80-9.48)	**9.17** (8.17-10.0)	**9.73** (8.59-10.7)	**10.1** (8.89-11.1)
10-min	**3.45** (3.13-3.77)	**4.12** (3.75-4.51)	**4.90** (4.45-5.36)	**5.43** (4.93-5.93)	**6.06** (5.49-6.61)	**6.49** (5.86-7.08)	**6.91** (6.19-7.53)	**7.27** (6.48-7.94)	**7.69** (6.80-8.43)	**7.99** (7.00-8.77)
15-min	**2.87** (2.61-3.14)	**3.46** (3.14-3.78)	**4.13** (3.75-4.52)	**4.58** (4.15-5.00)	**5.12** (4.64-5.58)	**5.48** (4.94-5.98)	**5.82** (5.22-6.34)	**6.11** (5.45-6.68)	**6.46** (5.70-7.07)	**6.68** (5.86-7.34)
30-min	**1.97** (1.79-2.15)	**2.39** (2.17-2.61)	**2.93** (2.66-3.21)	**3.32** (3.01-3.62)	**3.79** (3.44-4.14)	**4.13** (3.72-4.50)	**4.46** (4.00-4.86)	**4.76** (4.24-5.20)	**5.14** (4.54-5.63)	**5.41** (4.75-5.94)
60-min	**1.23** (1.12-1.34)	**1.50** (1.36-1.64)	**1.88** (1.71-2.06)	**2.16** (1.96-2.36)	**2.53** (2.29-2.75)	**2.80** (2.52-3.05)	**3.07** (2.75-3.35)	**3.34** (2.97-3.64)	**3.68** (3.26-4.04)	**3.95** (3.46-4.34)
2-hr	**0.728** (0.658-0.802)	**0.886** (0.800-0.976)	**1.12** (1.01-1.23)	**1.30** (1.17-1.43)	**1.54** (1.38-1.69)	**1.73** (1.54-1.89)	**1.93** (1.71-2.11)	**2.13** (1.87-2.32)	**2.40** (2.09-2.62)	**2.61** (2.25-2.86)
3-hr	**0.520** (0.471-0.573)	**0.634** (0.575-0.699)	**0.801** (0.724-0.882)	**0.930** (0.839-1.02)	**1.10** (0.989-1.21)	**1.24** (1.10-1.36)	**1.38** (1.22-1.51)	**1.52** (1.34-1.66)	**1.71** (1.49-1.88)	**1.86** (1.60-2.04)
6-hr	**0.320** (0.290-0.357)	**0.389** (0.353-0.433)	**0.490** (0.444-0.545)	**0.572** (0.516-0.635)	**0.686** (0.614-0.759)	**0.779** (0.692-0.860)	**0.878** (0.773-0.966)	**0.980** (0.855-1.08)	**1.13** (0.969-1.24)	**1.24** (1.06-1.36)
12-hr	**0.192** (0.175-0.213)	**0.234** (0.212-0.259)	**0.296** (0.269-0.328)	**0.349** (0.314-0.385)	**0.424** (0.378-0.466)	**0.487** (0.431-0.533)	**0.556** (0.486-0.606)	**0.629** (0.544-0.686)	**0.737** (0.626-0.804)	**0.827** (0.690-0.903)
24-hr	**0.115** (0.106-0.126)	**0.140** (0.129-0.153)	**0.178** (0.164-0.195)	**0.211** (0.194-0.230)	**0.259** (0.236-0.281)	**0.300** (0.271-0.325)	**0.345** (0.309-0.373)	**0.394** (0.350-0.426)	**0.467** (0.408-0.505)	**0.529** (0.457-0.573)
2-day	**0.068** (0.063-0.074)	**0.082** (0.076-0.090)	**0.105** (0.096-0.114)	**0.123** (0.113-0.133)	**0.149** (0.136-0.162)	**0.171** (0.156-0.186)	**0.195** (0.176-0.211)	**0.220** (0.197-0.239)	**0.257** (0.228-0.280)	**0.288** (0.252-0.315)
3-day	**0.048** (0.044-0.052)	**0.058** (0.053-0.063)	**0.073** (0.068-0.080)	**0.086** (0.079-0.094)	**0.105** (0.096-0.114)	**0.120** (0.109-0.131)	**0.137** (0.123-0.149)	**0.155** (0.138-0.168)	**0.180** (0.160-0.197)	**0.202** (0.177-0.221)
4-day	**0.038** (0.035-0.041)	**0.046** (0.042-0.050)	**0.058** (0.053-0.063)	**0.068** (0.062-0.074)	**0.083** (0.075-0.090)	**0.095** (0.086-0.103)	**0.108** (0.097-0.117)	**0.122** (0.109-0.133)	**0.142** (0.126-0.155)	**0.159** (0.139-0.174)
7-day	**0.024** (0.023-0.027)	**0.029** (0.027-0.032)	**0.037** (0.034-0.040)	**0.043** (0.040-0.047)	**0.052** (0.047-0.056)	**0.059** (0.054-0.064)	**0.067** (0.060-0.072)	**0.075** (0.067-0.081)	**0.087** (0.077-0.094)	**0.096** (0.085-0.105)
10-day	**0.019** (0.018-0.021)	**0.023** (0.022-0.025)	**0.029** (0.027-0.031)	**0.033** (0.031-0.036)	**0.040** (0.037-0.042)	**0.045** (0.041-0.048)	**0.050** (0.046-0.054)	**0.056** (0.051-0.060)	**0.064** (0.057-0.069)	**0.070** (0.063-0.076)
20-day	**0.013** (0.012-0.014)	**0.015** (0.014-0.017)	**0.019** (0.017-0.020)	**0.021** (0.020-0.023)	**0.025** (0.023-0.026)	**0.028** (0.026-0.029)	**0.030** (0.028-0.032)	**0.033** (0.031-0.036)	**0.037** (0.034-0.040)	**0.040** (0.036-0.043)
30-day	**0.010** (0.010-0.011)	**0.013** (0.012-0.013)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.023** (0.021-0.024)	**0.024** (0.023-0.026)	**0.026** (0.024-0.028)	**0.028** (0.026-0.030)
45-day	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.012** (0.012-0.013)	**0.014** (0.013-0.014)	**0.015** (0.014-0.016)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)	**0.019** (0.018-0.020)	**0.021** (0.019-0.022)	**0.022** (0.020-0.023)
60-day	**0.008** (0.007-0.008)	**0.009** (0.009-0.010)	**0.011** (0.010-0.011)	**0.012** (0.011-0.012)	**0.013** (0.013-0.014)	**0.014** (0.013-0.015)	**0.015** (0.014-0.016)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.018** (0.017-0.019)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

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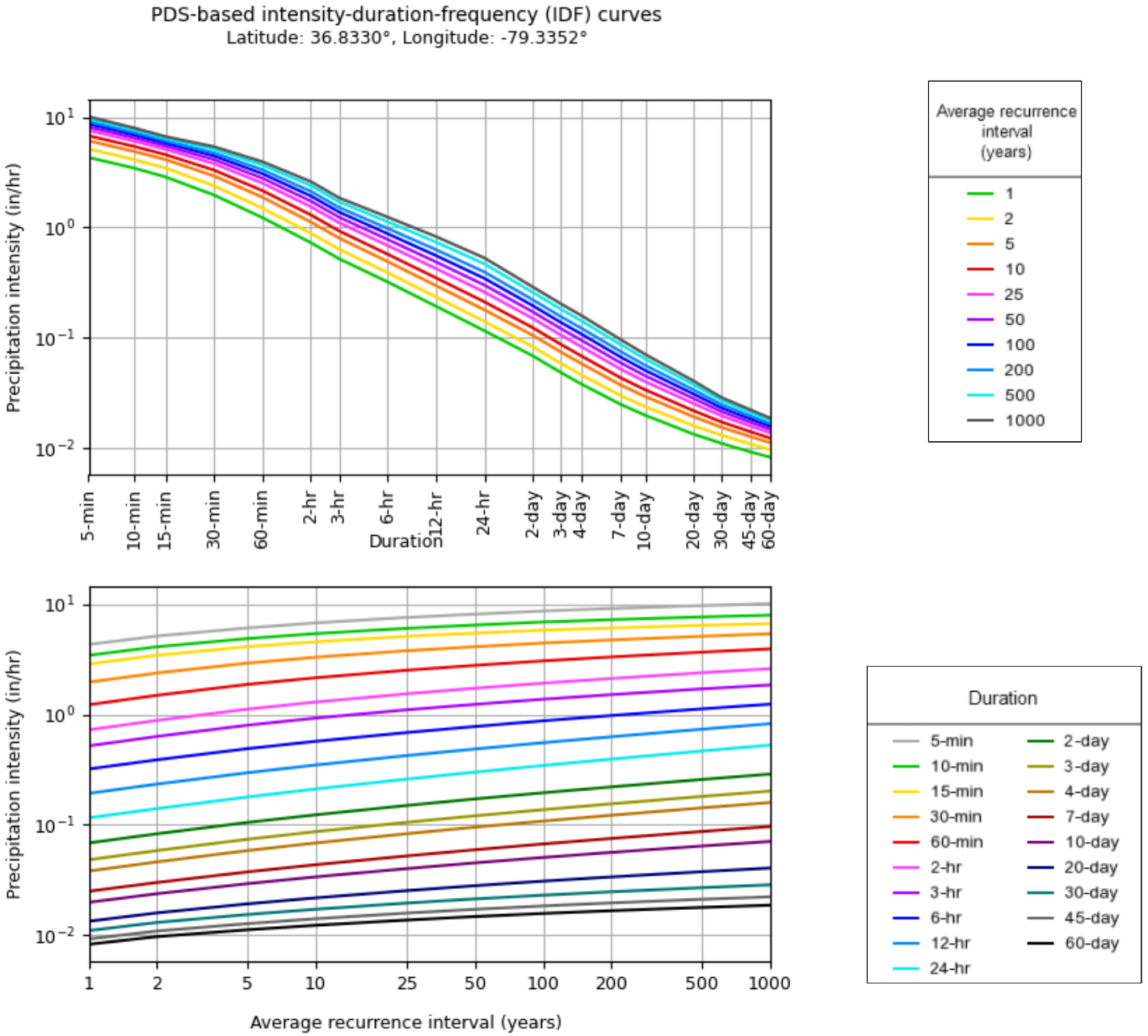
PF graphical



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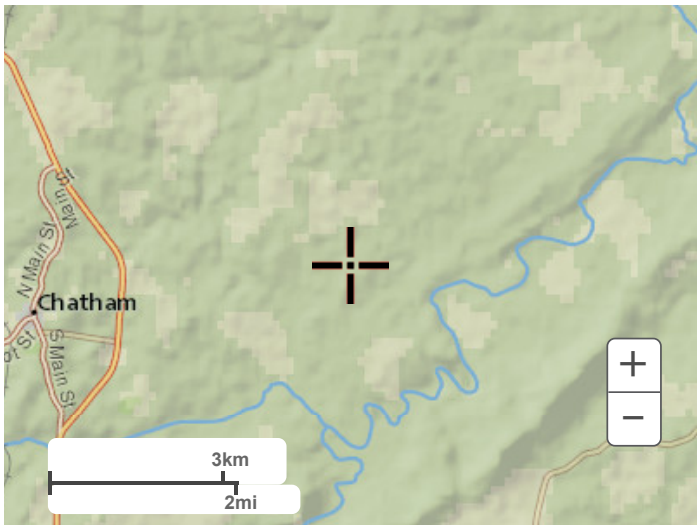
Maps & aerials

Small scale terrain



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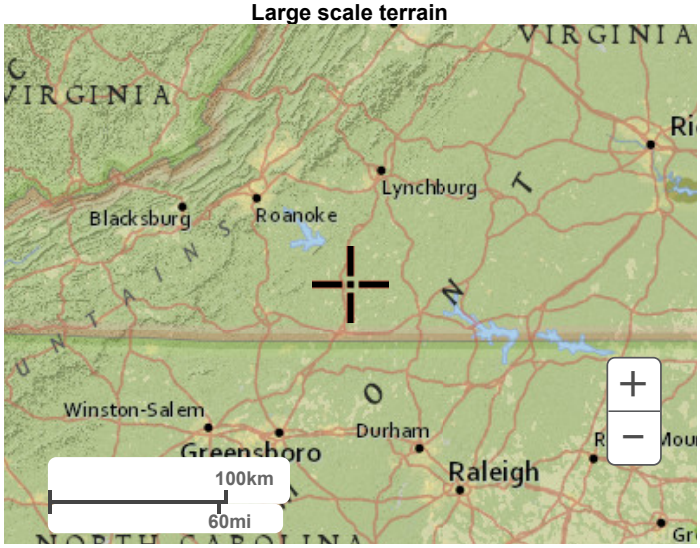

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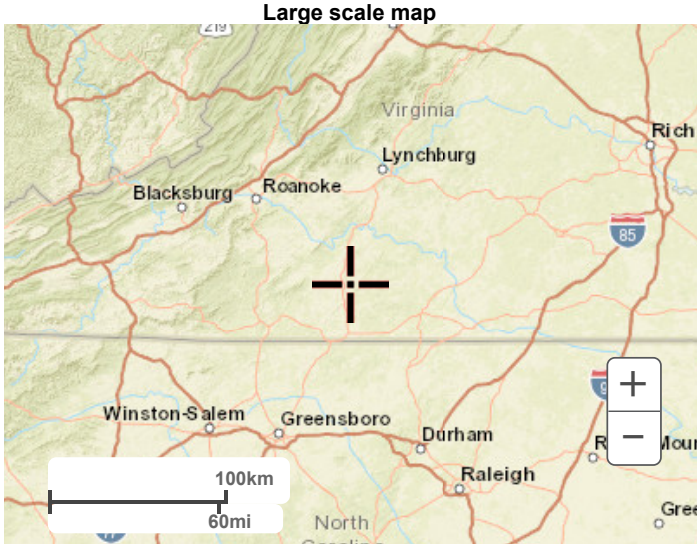

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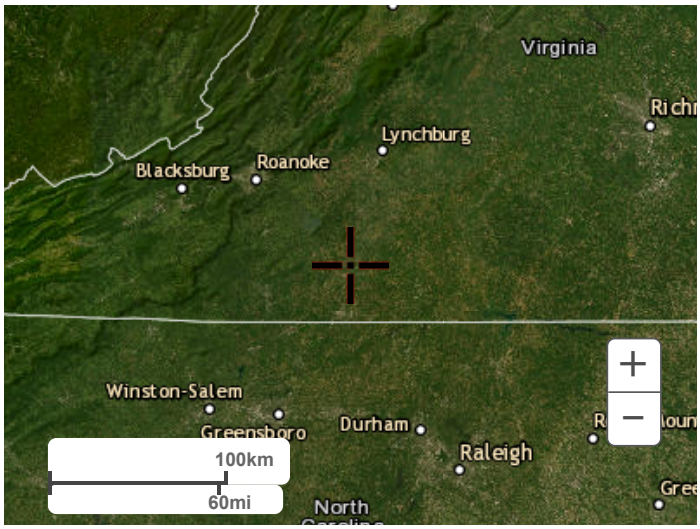

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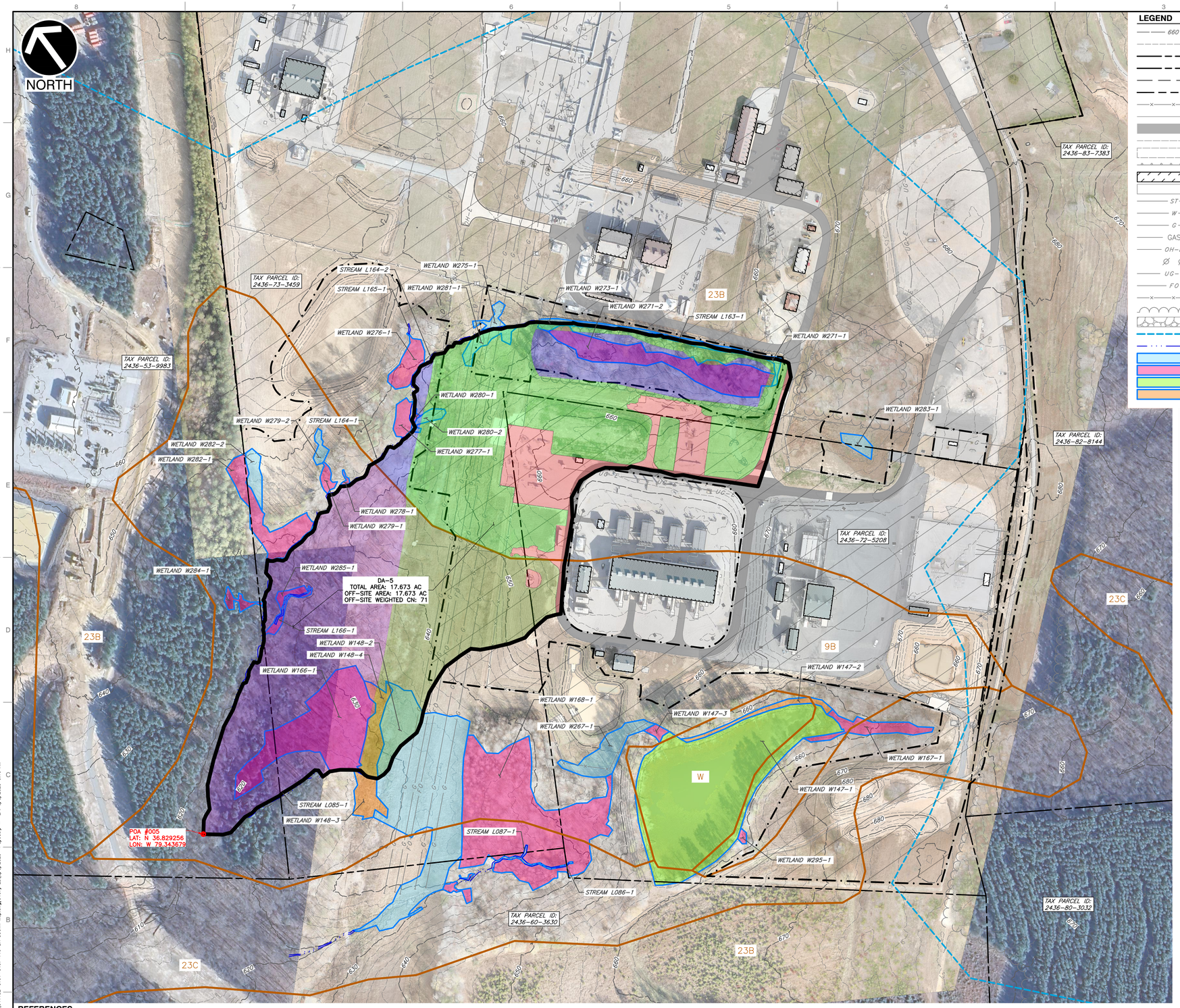
APPENDIX C
PRE-DEVELOPMENT AND POST-DEVELOPMENT CALCULATIONS AND DRAINAGE AREA MAPS FOR CHERRYSTONE CREEK WATERSHED (HUC 030101050104)



LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING GAS LINE (BY OTHERS)
- EXISTING OVERHEAD WIRE
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- PROPOSED LIMIT OF DISTURBANCE
- SOIL BOUNDARY
- 23B SOIL ID
- WOODS LAND COVER (B)
- WOODS LAND COVER (D)
- MEADOW LAND COVER (B)
- MEADOW LAND COVER (D)
- IMPERVIOUS LAND COVER
- DRAINAGE AREA BOUNDARY
- POINT OF ANALYSIS

POST-DEVELOPMENT DRAINAGE AREAS				
DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)
DA-5 (OFF-SITE)	WOODS	B	55	1.802
	WOODS	D	77	5.548
	MEADOW	B	58	5.500
	MEADOW	D	78	3.208
	GRAVEL	N/A	98	1.615

WOODS AND PASTURE LAND COVER ARE MODELED IN GOOD CONDITION.
MEADOW LAND COVER IS MODELED AS NON-GRAZED.

NOTE: CURVE NUMBERS ARE CONSISTENT BETWEEN PRE-DEVELOPMENT AND POST-DEVELOPMENT. THEREFORE, STORMWATER CALCULATIONS BEYOND THIS ANALYSIS ARE NOT NECESSARY AS THE GRAVEL AREA ADDED TO THIS DRAINAGE AREA WILL HAVE MINIMAL IMPACT ON THE OVERALL DRAINAGE AREA.

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
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4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN-D_1413_06-1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com
Civil & Environmental Consultants, Inc.

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLVYANIA COUNTY, VIRGINIA

PRE-DEVELOPMENT DRAINAGE AREA MAP (HUC12 030101050104)

DATE:	MAY 2025
DRAWN BY:	JMP
DWG SCALE:	1"=80'
CHECKED BY:	MEA
PROJECT NO:	341-132
APPROVED BY:	LCW

DRAWING NO.: C407
SHEET 19 OF 61

P:\340-001\341-132\-CAD\Dwg\CIVIL\341132-CIV01-C407-Pre-DA SOUTH Map.dwg[C407] LS(5/9/2025 - byeder) - LPL 6/3/2025 9:10 AM

Pre-Development DA-5 (Undetained)

Subcat Reach Pond Link

Routing Diagram for 341-132-CV01-PCSM_South
Prepared by CEC Inc, Printed 5/29/2025

Summary for Subcatchment 5A: Pre-Development DA-5 (Undetained)

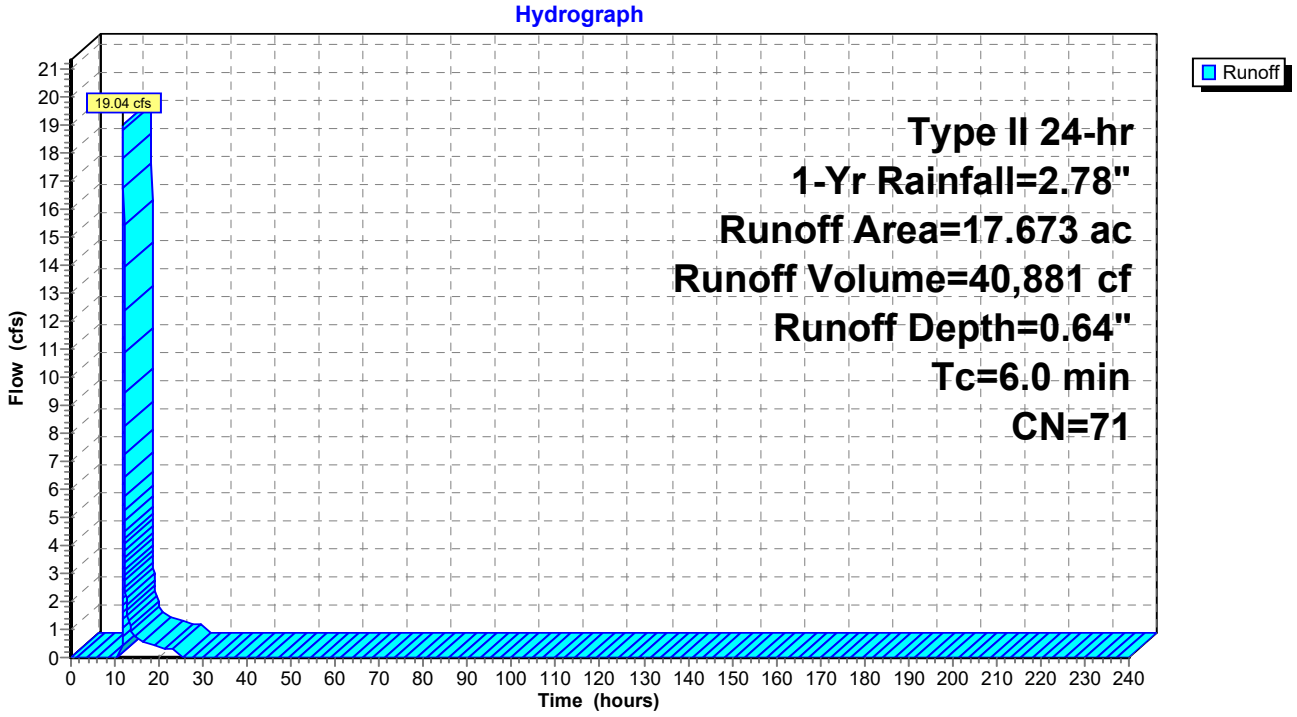
Runoff = 19.04 cfs @ 11.99 hrs, Volume= 40,881 cf, Depth= 0.64"
Routed to nonexistent node 16

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	1.802	55	Woods, Good, HSG B
	5.548	77	Woods, Good, HSG D
	5.500	58	Meadow, non-grazed, HSG B
	3.208	78	Meadow, non-grazed, HSG D
*	1.615	98	Impervious, HSG B
	17.673	71	Weighted Average
	16.058		90.86% Pervious Area
	1.615		9.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Assume 6 Minutes**

Subcatchment 5A: Pre-Development DA-5 (Undetained)



Summary for Subcatchment 5A: Pre-Development DA-5 (Undetained)

Runoff = 69.01 cfs @ 11.98 hrs, Volume= 139,671 cf, Depth= 2.18"
Routed to nonexistent node 16

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.802	55	Woods, Good, HSG B
	5.548	77	Woods, Good, HSG D
	5.500	58	Meadow, non-grazed, HSG B
	3.208	78	Meadow, non-grazed, HSG D
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	17.673	71	Weighted Average
	16.058		90.86% Pervious Area
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
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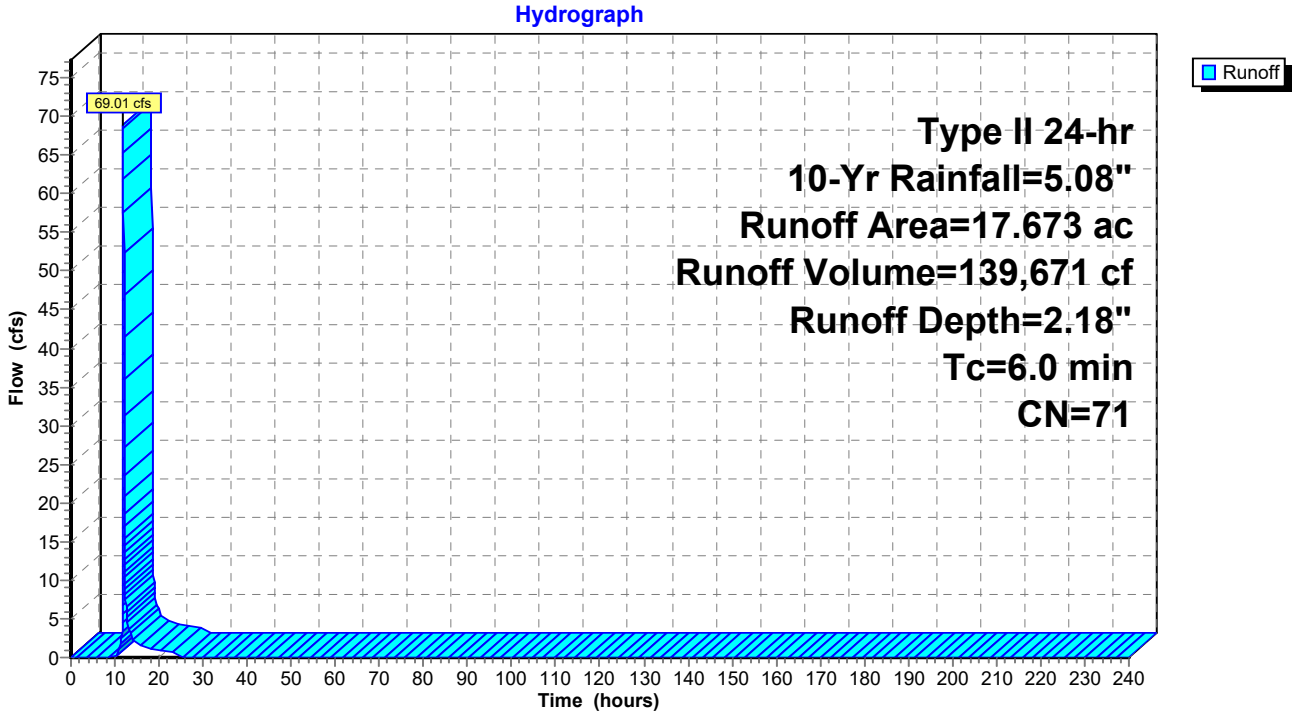

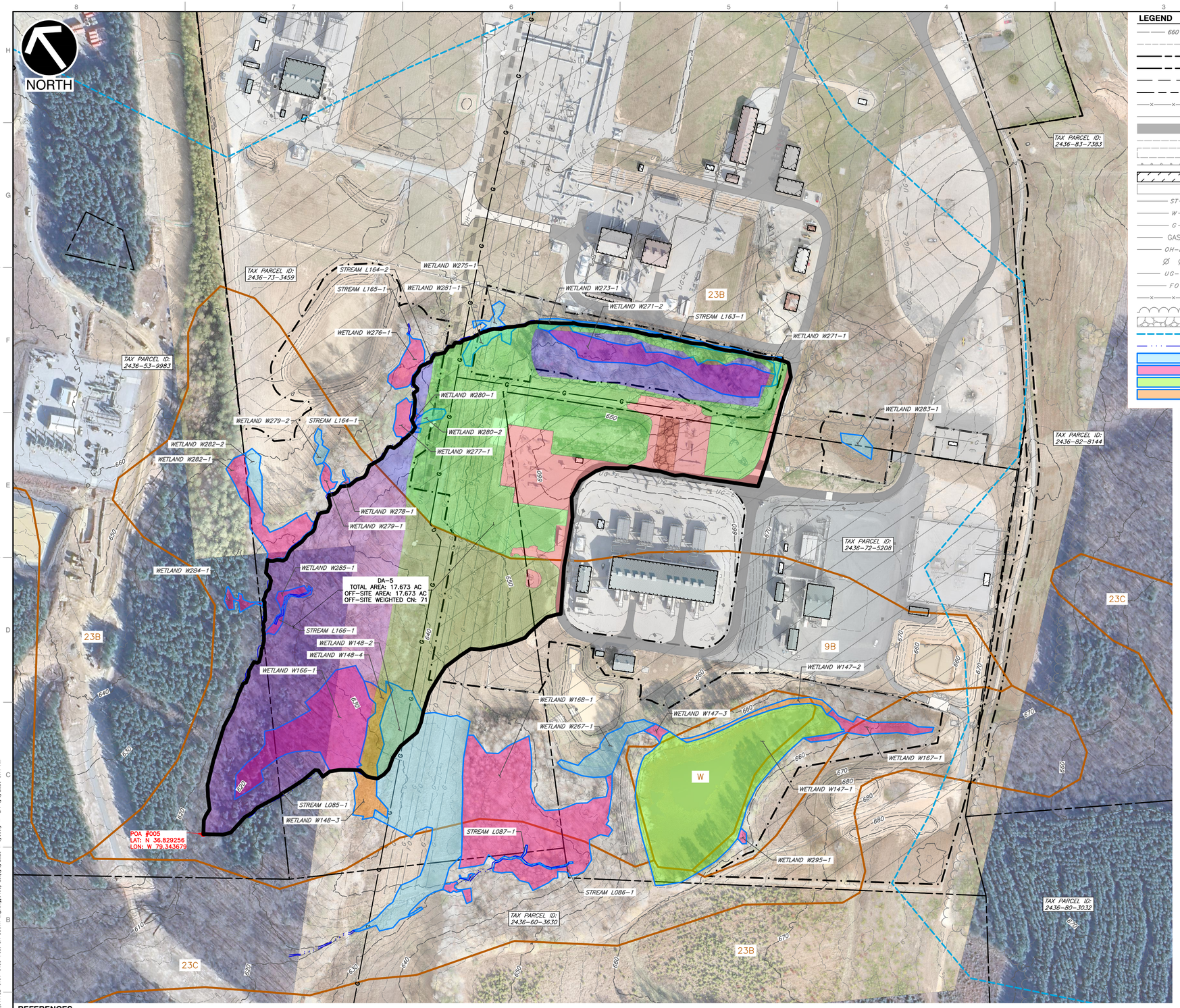

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- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE
- EXISTING WATER LINE
- EXISTING GAS LINE
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- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- PROPOSED LIMIT OF DISTURBANCE
- SOIL BOUNDARY
- SOIL ID
- PROPOSED GAS PIPELINE
- WOODS LAND COVER (B)
- WOODS LAND COVER (D)
- MEADOW LAND COVER (B)
- MEADOW LAND COVER (D)
- IMPERVIOUS LAND COVER
- DRAINAGE AREA BOUNDARY
- POINT OF ANALYSIS

POST-DEVELOPMENT DRAINAGE AREAS

DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)
DA-5 (OFF-SITE)	WOODS	B	55	1.802
	WOODS	D	77	5.548
	MEADOW	B	58	5.352
	MEADOW	D	78	3.208
	GRAVEL	N/A	98	1.763

ANALYZED ASSUMING NO CHANGE TO CN FROM PRE- TO POST-DEVELOPMENT CONDITIONS.
WOODS LAND COVER ARE MODELED IN GOOD CONDITION.
MEADOW LAND COVER IS MODELED AS NON-GRAZED.

NOTE: CURVE NUMBERS ARE CONSISTENT BETWEEN PRE-DEVELOPMENT AND POST-DEVELOPMENT. THEREFORE, STORMWATER CALCULATIONS BEYOND THIS ANALYSIS ARE NOT NECESSARY AS THE GRAVEL AREA ADDED TO THIS DRAINAGE AREA WILL HAVE MINIMAL IMPACT ON THE OVERALL DRAINAGE AREA.

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SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
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6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
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www.cecinc.com

CEC
Civil & Environmental Consultants, Inc.

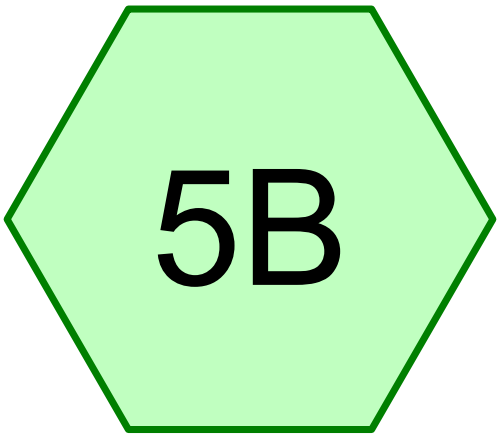
TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLVYANIA COUNTY, VIRGINIA

POST-DEVELOPMENT DRAINAGE AREA MAP (HUC12 030101050104)

DATE:	MAY 2025
DRAWN BY:	JMP
CHECKED BY:	MEA
DWG SCALE:	1"=120'
PROJECT NO:	341-132
APPROVED BY:	LCW

DRAWING NO.: C408
SHEET 20 OF 61

P:\340-001\341-132\-CAD\Dwg\C101\341132-C101-C408-Post-04 SOUTH.dwg(C408) LS(5/9/2025 - tjoslin) - LP: 6/3/2025 9:11 AM



Post-Development DA-5 (Undetained)

Subcat Reach Pond Link

Routing Diagram for 341-132-CV01-PCSM_South
Prepared by CEC Inc, Printed 5/29/2025

Summary for Subcatchment 5B: Post-Development DA-5 (Undetained)

Runoff = 19.04 cfs @ 11.99 hrs, Volume= 40,881 cf, Depth= 0.64"
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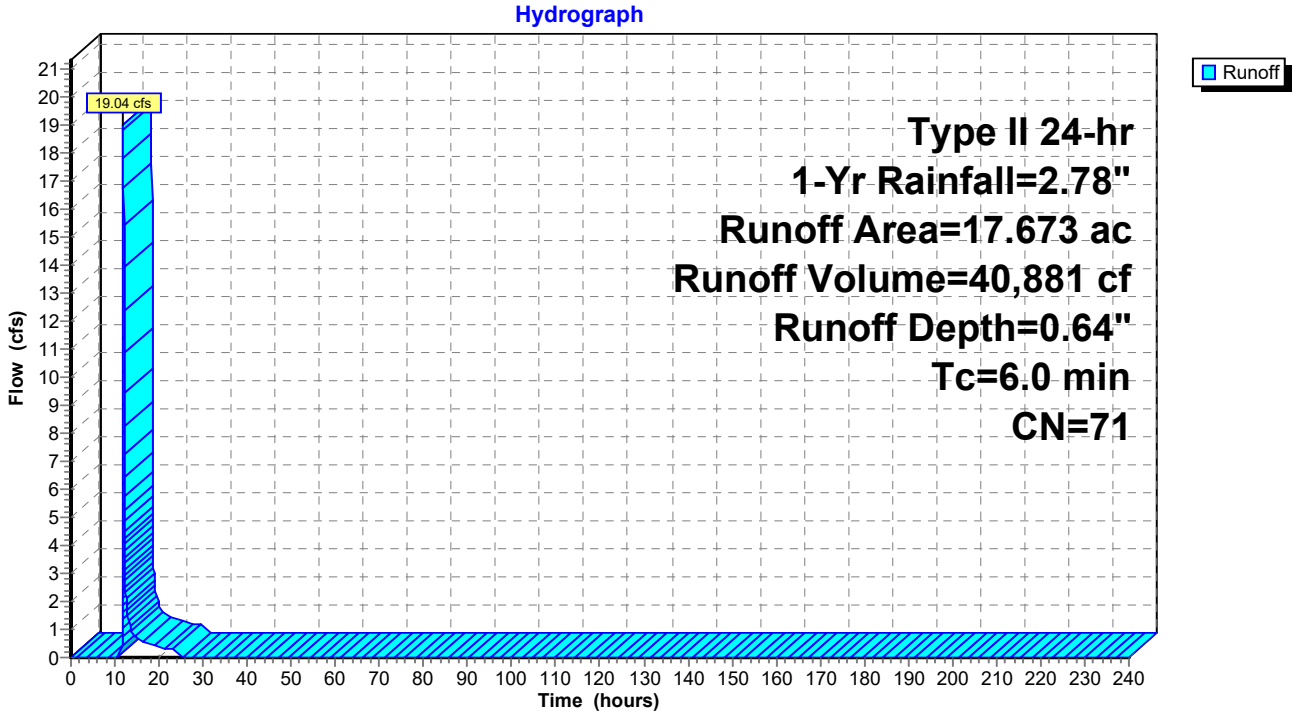
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	1.802	55	Woods, Good, HSG B
	5.548	77	Woods, Good, HSG D
	5.352	58	Meadow, non-grazed, HSG B
	3.208	78	Meadow, non-grazed, HSG D
*	1.763	98	Impervious, HSG B
	17.673	71	Weighted Average
	15.910		90.02% Pervious Area
	1.763		9.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Assume 6 minutes**

Subcatchment 5B: Post-Development DA-5 (Undetained)



Summary for Subcatchment 5B: Post-Development DA-5 (Undetained)

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Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
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	15.910		90.02% Pervious Area
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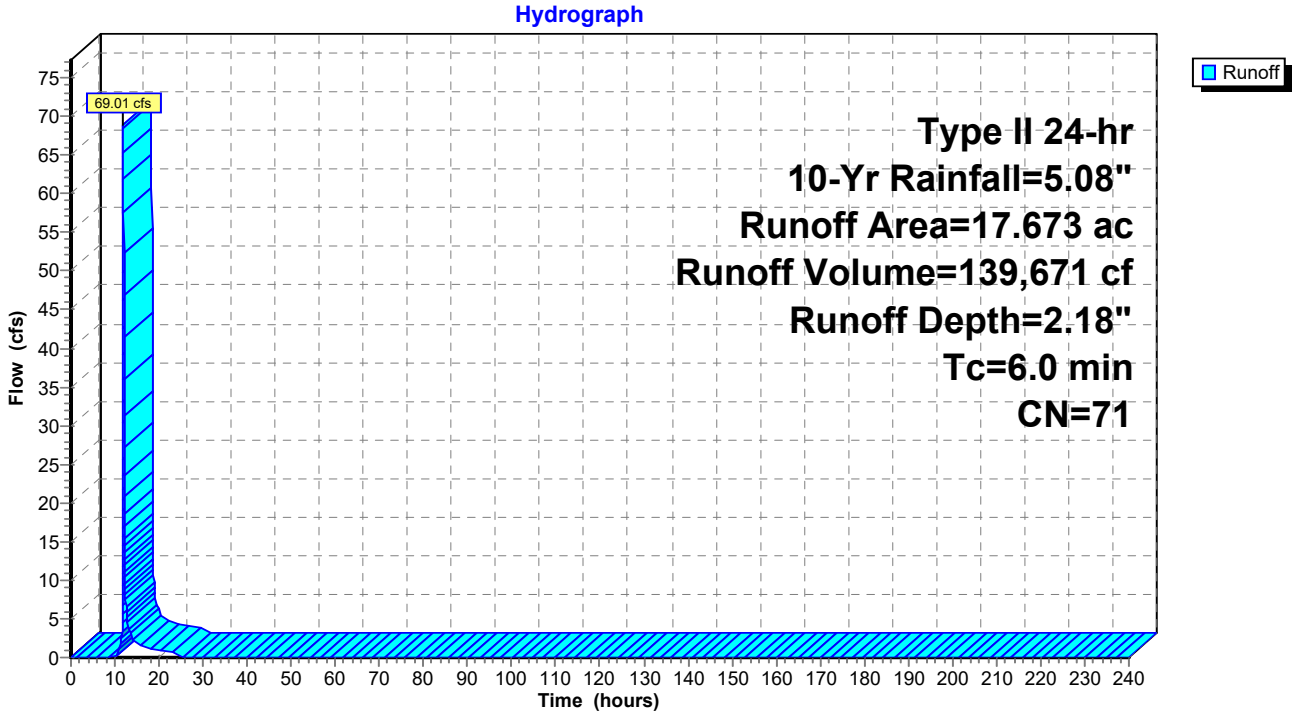
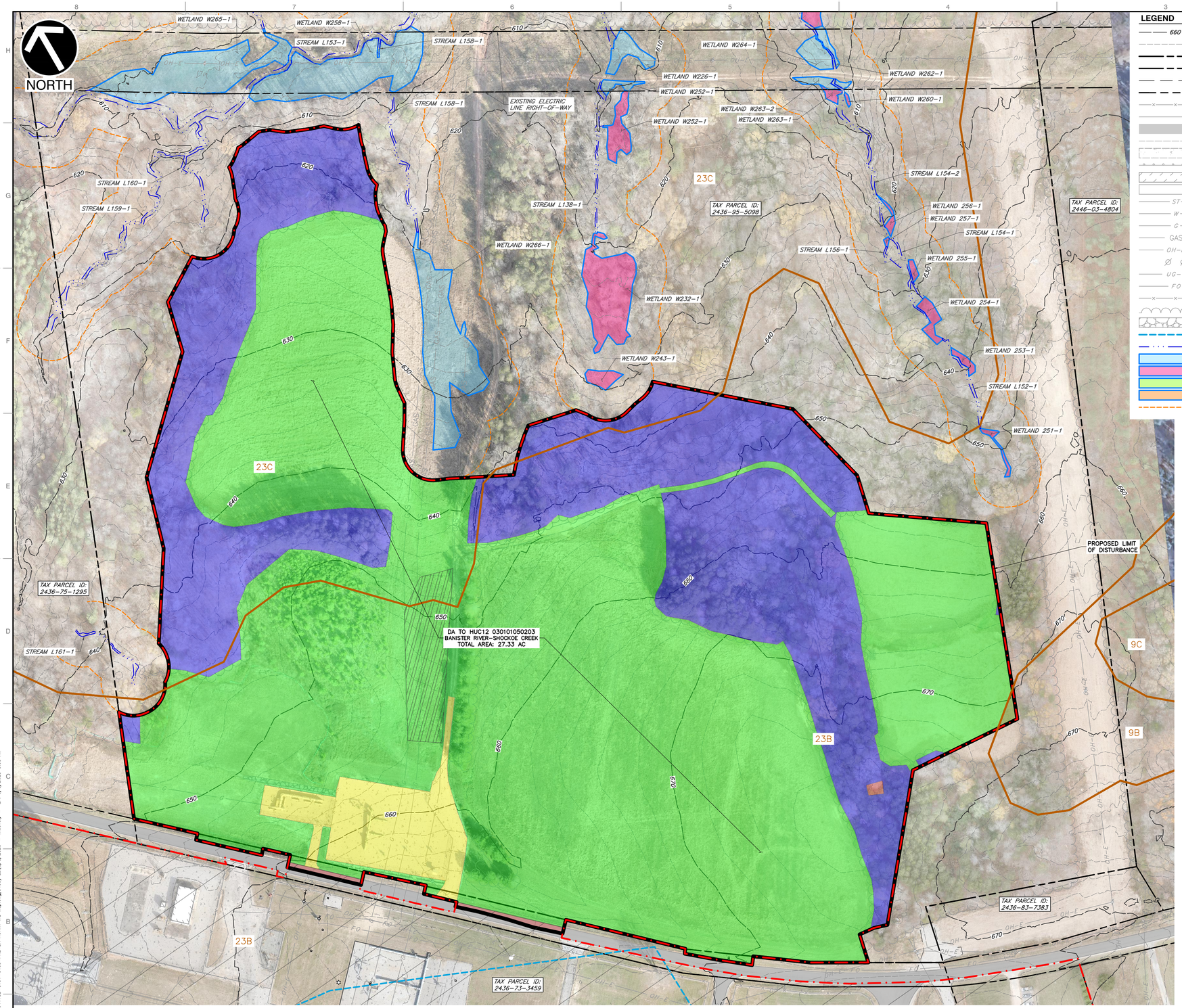
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Assume 6 minutes**

Subcatchment 5B: Post-Development DA-5 (Undetained)



APPENDIX D
WATER QUALITY CALCULATIONS (VRRM)



LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT–OF–WAY
- EXISTING RIGHT–OF–WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
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- EXISTING TREE LINE
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- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED AREA TO REMAIN UNDISTURBED
- PREVIOUSLY DISTURBED AREA
- FOREST LAND COVER (B)
- FOREST LAND COVER (D)
- MIXED OPEN LAND COVER (B)
- MIXED OPEN LAND COVER (D)
- IMPERVIOUS (GRAVEL) LAND COVER (B)
- IMPERVIOUS LAND COVER
- DRAINAGE AREA BOUNDARY

PRE–DEVELOPMENT LAND COVER (ACRES)

	A SOILS	B SOILS	C SOILS	D SOILS	TOTALS
FOREST (ACRES) –– UNDISTURBED, PROTECTED FOREST OR REFORESTED LAND		7.56			7.56
MIXED OPEN (ACRES) –– UNDISTURBED/INFREQUENTLY MAINTAINED GRASS OR SHRUB LAND		18.74		0.02	18.76
MANAGED TURF (ACRES) –– DISTURBED, GRADED FOR YARDS OR OTHER TURF TO BE MOWED/MANAGED					
IMPERVIOUS COVER (ACRES)		1.01			1.01
				TOTAL LAND COVER	27.33

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
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SCALE IN FEET
0 80 160

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
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REVISION RECORD

NO	DATE	DESCRIPTION

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Civil & Environmental Consultants, Inc.

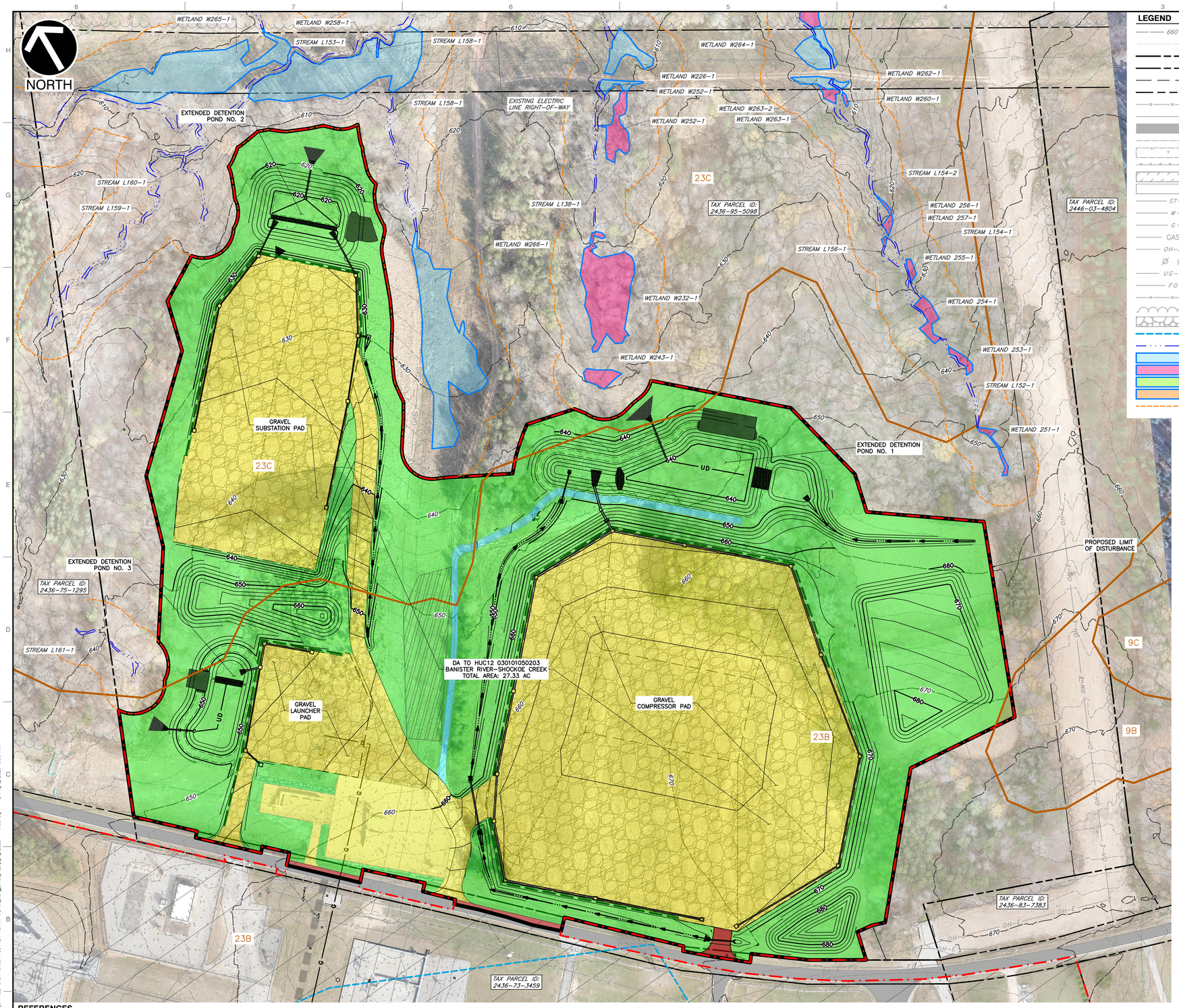
TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

PRE-DEVELOPMENT
WATER QUALITY MAP
(HUC12 030101050203)

DATE:	MAY 2025
DRAWN BY:	JMP
DWG SCALE:	1"=80'
CHECKED BY:	MEA
PROJECT NO:	341-132
APPROVED BY:	LCW

DRAWING NO.: C405
SHEET 17 OF 61

P:\340-0001\341-132\-0400\Dwg\Civil\341132-CIVIL-C405-PRE-DA NORTH WQ Map.dwg[C405] LS:6/6/2025 - vfarmer) - LP: 6/3/2025 9:08 AM



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- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
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- PROPOSED FLAT PAD LIMITS
- PROPOSED BERM
- PROPOSED EDGE OF UNPAVED DIRT ROAD
- PROPOSED EDGE OF UNPAVED GRAVEL ROAD
- PROPOSED EDGE OF PAVED ROAD
- PROPOSED TEMPORARY EXCAVATED SPILLWAY
- PROPOSED CHANNEL
- PROPOSED STORM PIPE
- PROPOSED RIPRAP APRON
- MIXED OPEN LAND COVER (B SOIL)
- MIXED OPEN LAND COVER (D SOIL)
- MANAGED TURF LAND COVER (B SOIL)
- IMPERVIOUS (GRAVEL) LAND COVER (B SOIL)
- IMPERVIOUS LAND COVER
- DRAINAGE AREA BOUNDARY

POST-DEVELOPMENT LAND COVER (ACRES)

	A SOILS	B SOILS	C SOILS	D SOILS	TOTALS
FOREST (ACRES) -- UNDISTURBED, PROTECTED FOREST OR REFORESTED LAND					
MIXED OPEN (ACRES) -- UNDISTURBED/INFREQUENTLY MAINTAINED GRASS OR SHRUB LAND		14.12		0.02	14.14
MANAGED TURF (ACRES) -- DISTURBED, GRADED FOR YARDS OR OTHER TURF TO BE MOWED/MANAGED		0.23			0.23
IMPERVIOUS COVER (ACRES)		12.96			12.96
				TOTAL LAND COVER	27.33

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN-D_1413_06-1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 80 160

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

POST-DEVELOPMENT
WATER QUALITY MAP
(HUC12 030101050203)

DATE:	MAY 2025
DWG SCALE:	1"=80'
PROJECT NO:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

DRAWING NO.: C406
SHEET 18 OF 61

P:\140-000\341-132\1-CAD\1wg\CIVIL\341-132-CVL-C406-POST-04 WORTH MD Map.mxd[2406] 15/5/8/2025 - vfischer - LP: 6/3/2025 8:59 AM

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 4.1

CLEAR ALL (Ctrl+Shift+R)

data input cells
constant values
calculation cells
final results

Project Name: Transcontinental Gas Pipe Line, LLC - Compressor Station 165 (North)
Date: 1/31/2025
Linear Development Project? No

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 27.33

Maximum reduction required: 20%
The site's net increase in impervious cover (acres) is: 11.95
Post-Development TP Load Reduction for Site (lb/yr): 8.41

Check:
BMP Design Specifications List: 2024 Stds & Specs
Linear project? No
Land cover areas entered correctly? ✓
Total disturbed area entered? ✓

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest (acres) -- undisturbed, protected forest or reforested land		7.56			7.56
Mixed Open (acres) -- undisturbed/infrequently maintained grass or shrub land		18.74		0.02	18.76
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed					0.00
Impervious Cover (acres)		1.01			1.01
					27.33

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest or reforested land					0.00
Mixed Open (acres) -- undisturbed/infrequently maintained grass or shrub land		14.12		0.02	14.14 *
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed		0.23			0.23
Impervious Cover (acres)		12.96			12.96
Area Check	OK.	OK.	OK.	OK.	27.33

** Forest & Mixed Open areas must be protected in accordance with the Virginia Runoff Reduction Method or other applicable DEQ guidelines*

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	8.41

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	49.68

Final Post-Development TN Load	183.56

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre Pre-ReDevelopment	Listed	Adjusted[1]
Forest Cover (acres)	7.56	0.14
Weighted Rv(forest)	0.03	0.03
Weighted Loading Rate(forest)	0.06	0.06
% Forest	28%	1%
Mixed Open Cover (acres)	18.76	14.23
Weighted Rv(mixed)	0.11	0.11
Weighted Loading Rate(mixed)	0.34	0.34
% Mixed Open	69%	93%
Managed Turf Cover (acres)	0.00	0.00
Weighted Rv(turf)	0.00	0.00
Weighted Loading Rate(turf)	0.00	0.00
% Managed Turf	0%	0%
Impervious Cover (acres)	1.01	1.01
Rv(impervious)	0.95	0.95
Weighted Loading Rate(impervious)	0.86	0.86
% Impervious	4%	7%
Total Site Area (acres)	**27.33**	**15.38**
Site Rv	**0.12**	**0.16**

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.2709	0.2108
Pre-ReDevelopment Treatment Volume (cubic feet)	11,800	9,182
Pre-ReDevelopment TP Load (lb/yr)	**7.73**	**5.73**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	0.28	0.37
Baseline TP Load (lb/yr) (0.26 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*4.00*

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final) Post ReDev. & New Impervious	
Forest Cover (acres)	0.00
Weighted Rv(forest)	0.00
Wgt. Ld. Rate(forest)	0.00
% Forest	0%
Mixed Open Cover (acres)	14.14
Weighted Rv(mixed)	0.11
Wgt. Ld. Rate(mixed)	0.34
% Mixed Open	52%
Managed Turf Cover (acres)	0.23
Weighted Rv (turf)	0.20
Wgt. Ld. Rate(turf)	0.68
% Managed Turf	1%
Impervious Cover (acres)	12.96
Rv(impervious)	0.95
Wgt. Ld. Rate(imperv.)	0.86
% Impervious	47%
Final Site Area (acres)	**27.33**
Final Post Dev Site Rv	**0.51**

Land Cover Summary-Post Post-ReDevelopment	
Forest Cover (acres)	0.00
Weighted Rv(forest)	0.00
Wgt. Ld. Rate(forest)	0.00
% Forest	0%
Mixed Open Cover (acres)	14.14
Weighted Rv(mixed)	0.11
Wgt. Ld. Rate(mixed)	0.34
% Mixed Open	92%
Managed Turf Cover (acres)	0.23
Weighted Rv (turf)	0.20
Wgt. Ld. Rate(turf)	0.68
% Managed Turf	1%
ReDev. Impervious Cover (acres)	1.01
Rv(impervious)	0.95
Wgt. Ld. Rate(imperv.)	0.86
% Impervious	7%
Total ReDev. Site Area (acres)	**15.38**
ReDev Site Rv	**0.17**

Land Cover Summary-Post Post-Development New Impervious	
New Impervious Cover (acres)	11.95
Rv(impervious)	0.95

Treatment Volume and Nutrient Load

Final Post-Development Treatment Volume (acre-ft)	1.1595	Post-ReDevelopment Treatment Volume (acre-ft)	0.2135	Post-Development Treatment Volume (acre-ft)	0.9460
Final Post-Development Treatment Volume (cubic feet)	50,509	Post-ReDevelopment Treatment Volume (cubic feet)	9,299	Post-Development Treatment Volume (cubic feet)	41,210
Final Post-Development TP Load (lb/yr)	**16.10**	Post-ReDevelopment TP Load (TP) (lb/yr)*	**5.85**	Post-Development TP Load (lb/yr)	**10.25**
Final Post-Development TP Load per acre (lb/acre/yr)	0.59	Post-ReDevelopment TP Load per acre (lb/acre/yr)	0.38		
		Max. Reduction Required (Below Pre-ReDevelopment Load)	20%		
		TP Load Reduction Required for Redeveloped Area (lb/yr)	**1.26**	TP Load Reduction Required for New Impervious Area (lb/yr)	**7.15**

[1] *Adjusted Land Cover Summary:*
Pre ReDevelopment land cover minus pervious land cover (forest, mixed open or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requriement for new impervious cover (based on new development load limit, 0.26 lbs/acre/year).

Drainage Area A

VRRM 4.1, 2024

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv	Composite Loading P
Forest (acres)					0.00	0.00	0.00
Mixed Open (acres)		14.12		0.02	14.14	0.11	0.34
Managed Turf (acres)		0.23			0.23	0.20	0.68
Impervious Cover (acres)		12.96			12.96	0.95	0.86
				Total	27.33		

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr): 16.10

Post Development Treatment Volume in D.A. A (ft³): 50,509

Composite Loading N
0.00
1.56
7.21
12.33

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Mixed Open Credit Area (acres)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft³)	Runoff Reduction (ft³)	Remaining Runoff Volume (ft³)	Total BMP Treatment Volume (ft³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)																			
1.a. Vegetated Roof #1 (P-FIL-02)	45					0	0	0	0		0.00	0.00	0.00		0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (P-FIL-02)	60					0	0	0	0		0.00	0.00	0.00		0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)																			
2.a. Simple Disconnection to A/B Soils (P-FIL-01)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (P-FIL-01)	25				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (P-FIL-08)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (P-FIL-04)	50				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (P-FIL-04)	90				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (P-FIL-05)	40				0	0	0	0	25	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (P-FIL-05)	80				0	0	0	0	50	0.00	0.00	0.00	0.00		60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (P-BAS-04)	0				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (P-FIL-05)	40				0	0	0	0	25	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)																			
3.a. Permeable Pavement #1 (P-FIL-03)	45				0	0	0	0	25	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (P-FIL-03)	75					0	0	0	25		0.00	0.00	0.00		25		0.00	0.00	0.00
4. Grass Channel (RR)																			
4.a. Grass Channel A/B Soils (P-CNV-01)	20				0	0	0	0	15	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (P-CNV-01)	10				0	0	0	0	15	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (P-FIL-08)	20				0	0	0	0	15	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)																			
5.a. Dry Swale #1 (P-CNV-02)	40				0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (P-CNV-02)	60				0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
6. Bioretention (RR)																			
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (P-FIL-05)	40				0	0	0	0	25	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (P-FIL-05)	80				0	0	0	0	50	0.00	0.00	0.00	0.00		60	0.00	0.00	0.00	0.00
7. Infiltration (RR)																			
7.a. Infiltration #1 (P-FIL-04)	50				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (P-FIL-04)	90				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)																			
8.a. ED #1 (P-BAS-03)	0	0.00	0.00	0.00	0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
8.b. ED #2 (P-BAS-03)	15				0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)																			
9.a. Sheetflow to Conservation Area, A/B Soils (P-FIL-07)	75				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (P-FIL-07)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec P-FIL-07 & P-FIL-08)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
10. Regenerative Stormwater Conveyance																			
10.a. Regenerative Stormwater Conveyance (P-CNV-04)	0				0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
10.b. Regenerative Stormwater Conveyance (P-CNV-04)	0				0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
11. Tree BMP																			
11.a. Trees over Pervious, A/B (P-FIL-09)	16				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
11.b. Trees over Pervious, C/D (P-FIL-09)	12				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
11.c. Trees over Impervious (P-FIL-09)	3.5				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL MIXED OPEN TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft³)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	16.10	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	16.10	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft³)	0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

Practice	Runoff Reduction Credit (%)	Mixed Open Credit Area (acres)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft³)	Runoff Reduction (ft³)	Remaining Runoff Volume (ft³)	Total BMP Treatment Volume (ft³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
12. Wet Swale (no RR)																			
12.a. Wet Swale #1 (P-CNV-03)	0				0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
12.b. Wet Swale #2 (P-CNV-03)	0				0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
13. Filtering Practices (no RR)																			
13.a.Filtering Practice #1 (P-FIL-06)	0				0	0	0	0	60	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
13.b. Filtering Practice #2 (P-FIL-06)	0				0	0	0	0	65	0.00	0.00	0.00	0.00		45	0.00	0.00	0.00	0.00
14. Constructed Wetland (no RR)																			
14.a.Constructed Wetland #1 (P-BAS-01)	0				0	0	0	0	50	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
14.b. Constructed Wetland #2 (P-BAS-01)	0				0	0	0	0	75	0.00	0.00	0.00	0.00		55	0.00	0.00	0.00	0.00
15. Wet Ponds (no RR)																			
15.a. Wet Pond #1 (P-BAS-02)	0				0	0	0	0	50	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
15.b. Wet Pond #1 (Coastal Plain) (P-BAS-02)	0				0	0	0	0	45	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
15.c. Wet Pond #2 (P-BAS-02)	0				0	0	0	0	75	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
15.d. Wet Pond #2 (Coastal Plain) (P-BAS-02)	0				0	0	0	0	65	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
16. Manufactured Treatment Devices (no RR)																			
16.a. Manufactured Treatment Device-Hydrodynamic	0				0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
16.b. Manufactured Treatment Device-Filtering	0				0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
16.c. Manufactured Treatment Device-Generic	0				0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL MIXED OPEN TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac)	0.00	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	0.00	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	16.10	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	16.10	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	0.00

Site Results (Water Quality Compliance) VRRM 4.1, 2024

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST (ac)	0.00	0.00	0.00	0.00	0.00	OK.
MIXED OPEN (ac)	14.14	0.00	0.00	0.00	0.00	OK.
MIXED OPEN AREA TREATED(ac)	0.00	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	0.23	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	12.96	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	0.00	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	50,509

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	16.10	0.00	0.00	0.00	0.00	16.10
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00
TP LOAD REMAINING (lb/yr)	16.10	0.00	0.00	0.00	0.00	16.10
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	16.10
TP LOAD REDUCTION REQUIRED (lb/yr)	8.41
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.00
TP LOAD REMAINING (lb/yr):	16.10
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	8.41

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	183.56
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	0.00
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	183.56

Runoff Volume and Curve Number Calculations, VRRM 4.1, 2024

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.78	3.37	5.08

Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths*

Drainage Area A		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	14.12	0.00	0.02
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.23	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	12.96	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	27.33
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ A)}$ = **78**

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.97	1.40	2.78
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.97	1.40	2.78
Adjusted CN*	78	78	78

**See Notes above*

Drainage Area B		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ B)}$ = **0**

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

Drainage Area C		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ C)}$
0

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

Drainage Area D		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ D)}$
0

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

Drainage Area E		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ E)}$
0

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 4.1

BMP Design Specifications List: **2024 Stds & Specs**

Site Summary

Project Title: Transcontinental Gas Pipe Line, LLC - Compressor Station 165 (North)
Date: 45688

Total Disturbed Acreage:	27.33

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest (acres)	0.00	7.56	0.00	0.00	7.56	28
Mixed Open (acres)	0.00	18.74	0.00	0.02	18.76	69
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	1.01	0.00	0.00	1.01	4
					27.33	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0
Mixed Open (acres)	0.00	14.12	0.00	0.02	14.14	52
Managed Turf (acres)	0.00	0.23	0.00	0.00	0.23	1
Impervious Cover (acres)	0.00	12.96	0.00	0.00	12.96	47
* Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method					27.33	100

Site Tv and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-ReDevelopment
Site Rv	0.51	0.17	0.00	0.16
Treatment Volume (ft^3)	50,509	9,299	41,210	9,182
TP Load (lb/yr)	16.10	5.85	10.25	5.73

Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
0.37	**0.59**	**0.38**

Total TP Load Reduction Required (lb/yr)	**8.41**	1.26	7.15

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	183.56	49.68

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%

Total Runoff Volume Reduction (ft^3)	0
Total TP Load Reduction Achieved (lb/yr)	0.00
Total TN Load Reduction Achieved (lb/yr)	0.00
Remaining Post Development TP Load (lb/yr)	16.10
Remaining TP Load Reduction (lb/yr) Required	**8.41**

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Mixed Open (acres)	14.14	0.00	0.00	0.00	0.00	14.14
Managed Turf (acres)	0.23	0.00	0.00	0.00	0.00	0.23
Impervious Cover (acres)	12.96	0.00	0.00	0.00	0.00	12.96
Total Area (acres)	**27.33**	**0.00**	**0.00**	**0.00**	**0.00**	**27.33**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00
TN Load Reduced (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00

Drainage Area A Summary

Land Cover Summary

0

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0
Mixed Open (acres)	0.00	14.12	0.00	0.02	14.14	52
Managed Turf (acres)	0.00	0.23	0.00	0.00	0.23	1
Impervious Cover (acres)	0.00	12.96	0.00	0.00	12.96	47
					27.33	

BMP Selections

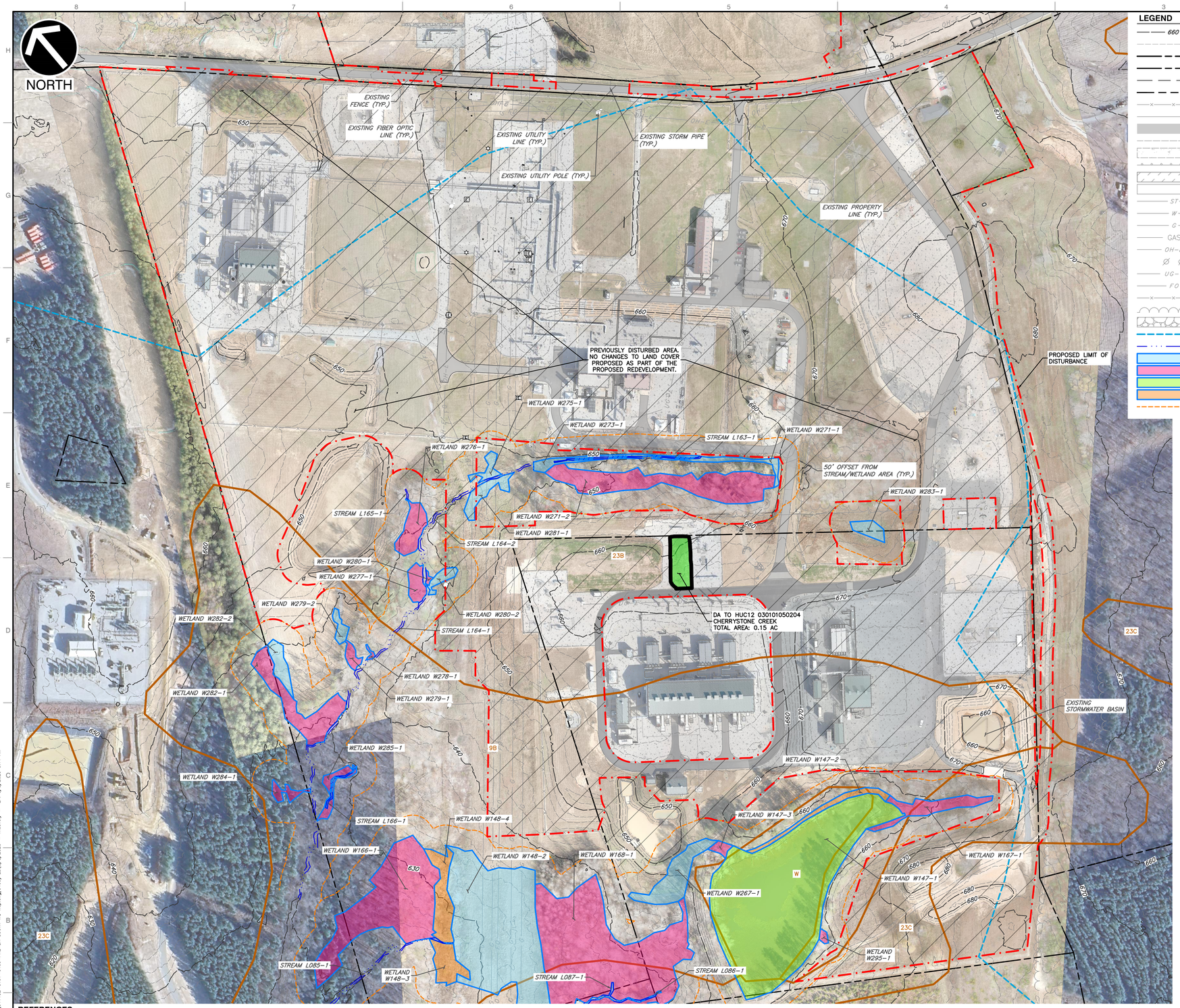
Practice	Open Mixed Area (acres)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total Mixed Open Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.78	3.37	5.08

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		78	0	0	0	0
RR (ft^3)		0	0	0	0	0
1-year return period	RV wo RR (ws-in)	0.97	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	0.97	0.00	0.00	0.00	0.00
	CN adjusted	78	0	0	0	0
2-year return period	RV wo RR (ws-in)	1.40	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	1.40	0.00	0.00	0.00	0.00
	CN adjusted	78	0	0	0	0
10-year return period	RV wo RR (ws-in)	2.78	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	2.78	0.00	0.00	0.00	0.00
	CN adjusted	78	0	0	0	0



LEGEND

- EXISTING INDEX CONTOUR (660)
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE (ST)
- EXISTING WATER LINE (W)
- EXISTING GAS LINE (G)
- EXISTING GAS LINE (BY OTHERS) (GAS)
- EXISTING OVERHEAD WIRE (OH-E)
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE (UG-E)
- EXISTING UNDERGROUND ELECTRIC LINE (FO)
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED AREA TO REMAIN UNDISTURBED
- PREVIOUSLY DISTURBED AREA
- SOIL BOUNDARY
- 23B SOIL ID
- MEADOW LAND COVER (B SOIL)
- DRAINAGE AREA BOUNDARY

PRE-DEVELOPMENT LAND COVER (ACRES)

	A SOILS	B SOILS	C SOILS	D SOILS	TOTALS
FOREST (ACRES) -- UNDISTURBED, PROTECTED FOREST OR REFORESTED LAND					
MIXED OPEN (ACRES) -- UNDISTURBED/INFREQUENTLY MAINTAINED GRASS OR SHRUB LAND		0.15			0.15
MANAGED TURF (ACRES) -- DISTURBED, GRADED FOR YARDS OR OTHER TURF TO BE MOWED/MANAGED					
IMPERVIOUS COVER (ACRES)					
				TOTAL LAND COVER	0.15

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN-D_1413_06-1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com
Civil & Environmental Consultants, Inc.

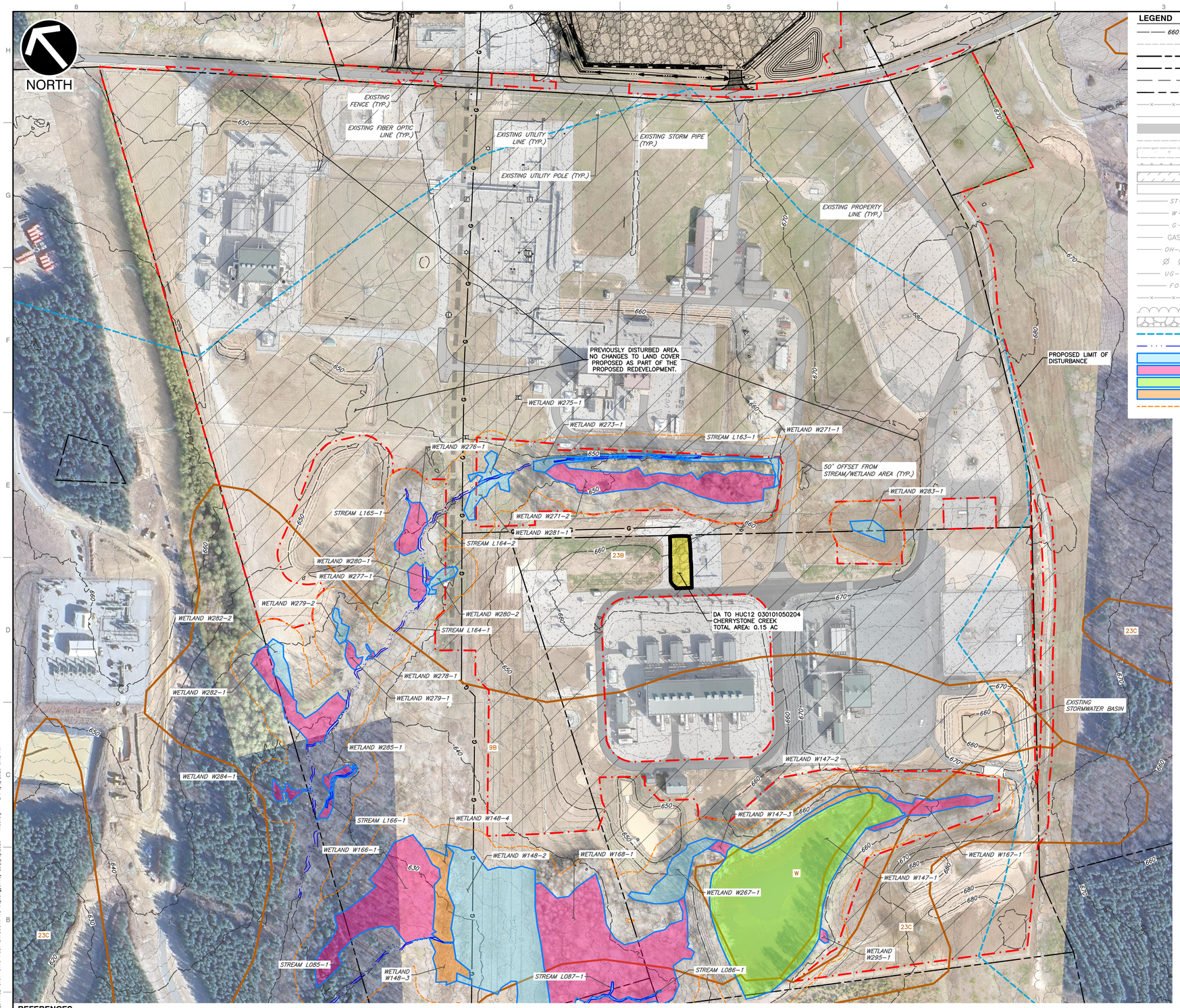
TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

PRE-DEVELOPMENT
WATER QUALITY MAP
(HUC12 030101050104)

DATE:	MAY 2025
DWG SCALE:	1"=120'
PROJECT NO:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

DRAWING NO.: C409
SHEET 21 OF 61

P:\340-060\341-132\-CAD\Dwg\C401\341132-C401-C409-PRE-04 SOUTH WQ Map.dwg(C409) LS:(5/9/2025 - vfischer) - LP: 6/3/2025 9:11 AM



LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
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- EXISTING GRAVEL LIMITS
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- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED AREA TO REMAIN UNDISTURBED
- PREVIOUSLY DISTURBED AREA
- SOIL BOUNDARY
- 23B SOIL ID
- GRAVEL LAND COVER (B SOIL)
- DRAINAGE AREA BOUNDARY

POST-DEVELOPMENT LAND COVER (ACRES)

	A SOILS	B SOILS	C SOILS	D SOILS	TOTALS
FOREST (ACRES) -- UNDISTURBED, PROTECTED FOREST OR REFORESTED LAND					
MIXED OPEN (ACRES) -- UNDISTURBED/INFREQUENTLY MAINTAINED GRASS OR SHRUB LAND					
MANAGED TURF (ACRES) -- DISTURBED, GRADED FOR YARDS OR OTHER TURF TO BE MOWED/MANAGED					
IMPERVIOUS COVER (ACRES)		0.15			0.15
TOTAL LAND COVER					0.15

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
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6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSLYVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com
Civil & Environmental Consultants, Inc.

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

POST-DEVELOPMENT WATER QUALITY MAP (HUC12 030101050104)

DATE:	MAY 2025
DWG SCALE:	1"=120'
PROJECT NO:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

DRAWING NO.: C410
SHEET 22 OF 61

P:\340-060\341-132\-CAD\Dwg\C410\341132-C401-C410-POST-DA SOUTH WQ Map.dwg[C410] LS(8/8/2025 - vfischer) - LP: 6/3/2025 8:12 AM

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - **Version 4.1**

CLEAR ALL (Ctrl+Shift+R)

data input cells
constant values
calculation cells
final results

Project Name: Transcontinental Gas Pipe Line, LLC - Compressor Station 165 (South)
Date: 1/31/2025
Linear Development Project? No

Site Information

Post-Development Project (Treatment Volume and Loads)

Enter Total Disturbed Area *(acres)* → 0.15

Check:
BMP Design Specifications List: 2024 Stds & Specs
Linear project? No
Land cover areas entered correctly? ✓
Total disturbed area entered? ✓

Maximum reduction required:	*10%*
The site's net increase in impervious cover (acres) is:	*0.15*
Post-Development TP Load Reduction for Site (lb/yr):	*0.09*

Pre-ReDevelopment Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest (acres) -- undisturbed, protected forest or reforested land					0.00
Mixed Open (acres) -- undisturbed/infrequently maintained grass or shrub land		0.15			0.15
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed					0.00
Impervious Cover (acres)					0.00
					0.15

Post-Development Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) -- undisturbed, protected forest or reforested land					0.00
Mixed Open (acres) -- undisturbed/infrequently maintained grass or shrub land					0.00
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed					0.00
Impervious Cover (acres)		0.15			0.15
Area Check	**OK.**	**OK.**	**OK.**	**OK.**	0.15

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**0.09**

Nitrogen Loads (Informational Purposes Only)

Pre-ReDevelopment TN Load (lb/yr)	0.23

Final Post-Development TN Load	1.85

LAND COVER SUMMARY -- PRE-REDEVELOPMENT

Land Cover Summary-Pre

Pre-ReDevelopment	Listed	Adjusted[1]
Forest Cover (acres)	0.00	0.00
Weighted Rv(forest)	0.00	0.00
Weighted Loading Rate(forest)	0.00	0.00
% Forest	0%	0%
Mixed Open Cover (acres)	0.15	0.00
Weighted Rv(mixed)	0.11	0.00
Weighted Loading Rate(mixed)	0.34	0.00
% Mixed Open	100%	0%
Managed Turf Cover (acres)	0.00	0.00
Weighted Rv(turf)	0.00	0.00
Weighted Loading Rate(turf)	0.00	0.00
% Managed Turf	0%	0%
Impervious Cover (acres)	0.00	0.00
Rv(impervious)	0.95	0.95
Weighted Loading Rate(impervious)	0.00	0.00
% Impervious	0%	0%
Total Site Area (acres)	**0.15**	**0.00**
Site Rv	**0.11**	**0.00**

Treatment Volume and Nutrient Load

Pre-ReDevelopment Treatment Volume (acre-ft)	0.0014	0.0000
Pre-ReDevelopment Treatment Volume (cubic feet)	60	0
Pre-ReDevelopment TP Load (lb/yr)	**0.05**	**0.00**
Pre-ReDevelopment TP Load per acre (lb/acre/yr)	0.34	
Baseline TP Load (lb/yr) (0.26 lbs/acre/yr applied to pre-redevelopment area excluding pervious land proposed for new impervious cover)		*0.00*

[1] *Adjusted Land Cover Summary:*
Pre ReDevelopment land cover minus pervious land cover (forest, mixed open or managed turf) acreage proposed for new impervious cover.

Adjusted total acreage is consistent with Post-ReDevelopment acreage (minus acreage of new impervious cover).

Column I shows load reduction requirement for new impervious cover (based on new development load limit, 0.26 lbs/acre/year).

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary-Post (Final)

Post ReDev. & New Impervious	
Forest Cover (acres)	0.00
Weighted Rv(forest)	0.00
Wgt. Ld. Rate(forest)	0.00
% Forest	0%
Mixed Open Cover (acres)	0.00
Weighted Rv(mixed)	0.00
Wgt. Ld. Rate(mixed)	0.00
% Mixed Open	0%
Managed Turf Cover (acres)	0.00
Weighted Rv (turf)	0.00
Wgt. Ld. Rate(turf)	0.00
% Managed Turf	0%
Impervious Cover (acres)	0.15
Rv(impervious)	0.95
Wgt. Ld. Rate(imperv.)	0.86
% Impervious	100%
Final Site Area (acres)	**0.15**
Final Post Dev Site Rv	**0.95**

Final Post-Development Treatment Volume (acre-ft)	0.0119
Final Post-Development Treatment Volume (cubic feet)	517
Final Post-Development TP Load (lb/yr)	**0.13**
Final Post-Development TP Load per acre (lb/acre/yr)	0.86

Land Cover Summary-Post

Post-ReDevelopment	
Forest Cover (acres)	0.00
Weighted Rv(forest)	0.00
Wgt. Ld. Rate(forest)	0.00
% Forest	0%
Mixed Open Cover (acres)	0.00
Weighted Rv(mixed)	0.00
Wgt. Ld. Rate(mixed)	0.00
% Mixed Open	0%
Managed Turf Cover (acres)	0.00
Weighted Rv (turf)	0.00
Wgt. Ld. Rate(turf)	0.00
% Managed Turf	0%
ReDev. Impervious Cover (acres)	0.00
Rv(impervious)	0.95
Wgt. Ld. Rate(imperv.)	0.00
% Impervious	0%
Total ReDev. Site Area (acres)	**0.00**
ReDev Site Rv	**0.00**

Treatment Volume and Nutrient Load

Post-ReDevelopment Treatment Volume (acre-ft)	0.0000
Post-ReDevelopment Treatment Volume (cubic feet)	0
Post-ReDevelopment Load (TP) (lb/yr)*	**0.00**
Post-ReDevelopment TP Load per acre (lb/acre/yr)	
Max. Reduction Required (Below Pre-ReDevelopment Load)	10%

TP Load Reduction Required for Redeveloped Area (lb/yr)	0.00

Land Cover Summary-Post

Post-Development New Impervious	
New Impervious Cover (acres)	0.15
Rv(impervious)	0.95

Post-Development Treatment Volume (acre-ft)	0.0119
Post-Development Treatment Volume (cubic feet)	517
Post-Development TP Load (lb/yr)	**0.13**

TP Load Reduction Required for New Impervious Area (lb/yr)	**0.09**

Drainage Area A

VRRM 4.1, 2024

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv	Composite Loading P
Forest (acres)					0.00	0.00	0.00
Mixed Open (acres)					0.00	0.00	0.00
Managed Turf (acres)					0.00	0.00	0.00
Impervious Cover (acres)		0.15			0.15	0.95	0.86
				Total	0.15		

CLEAR BMP AREAS

Total Phosphorus Available for Removal in D.A. A (lb/yr) 0.13

Post Development Treatment Volume in D.A. A (ft^3) 517

Composite Loading N
0.00
0.00
0.00
12.33

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Mixed Open Credit Area (acres)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
1. Vegetated Roof (RR)																			
1.a. Vegetated Roof #1 (P-FIL-02)	45					0	0	0	0		0.00	0.00	0.00		0		0.00	0.00	0.00
1.b. Vegetated Roof #2 (P-FIL-02)	60					0	0	0	0		0.00	0.00	0.00		0		0.00	0.00	0.00
2. Rooftop Disconnection (RR)																			
2.a. Simple Disconnection to A/B Soils (P-FIL-01)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.b. Simple Disconnection to C/D Soils (P-FIL-01)	25				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.c. To Soil Amended Filter Path as per specifications (existing C/D soils) (P-FIL-08)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.d. To Dry Well or French Drain #1, Micro-Infiltration #1 (P-FIL-04)	50				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
2.e. To Dry Well or French Drain #2, Micro-Infiltration #2 (P-FIL-04)	90				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
2.f. To Rain Garden #1, Micro-Bioretention #1 (P-FIL-05)	40				0	0	0	0	25	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
2.g. To Rain Garden #2, Micro-Bioretention #2 (P-FIL-05)	80				0	0	0	0	50	0.00	0.00	0.00	0.00		60	0.00	0.00	0.00	0.00
2.h. To Rainwater Harvesting (P-BAS-04)	0				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
2.i. To Stormwater Planter, Urban Bioretention (P-FIL-05)	40				0	0	0	0	25	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
3. Permeable Pavement (RR)																			
3.a. Permeable Pavement #1 (P-FIL-03)	45				0	0	0	0	25	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
3.b. Permeable Pavement #2 (P-FIL-03)	75					0	0	0	25		0.00	0.00	0.00		25		0.00	0.00	0.00
4. Grass Channel (RR)																			
4.a. Grass Channel A/B Soils (P-CNV-01)	20				0	0	0	0	15	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
4.b. Grass Channel C/D Soils (P-CNV-01)	10				0	0	0	0	15	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
4.c. Grass Channel with Compost Amended Soils as per specs (P-FIL-08)	20				0	0	0	0	15	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
5. Dry Swale (RR)																			
5.a. Dry Swale #1 (P-CNV-02)	40				0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
5.b. Dry Swale #2 (P-CNV-02)	60				0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
6. Bioretention (RR)																			
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (P-FIL-05)	40				0	0	0	0	25	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
6.b. Bioretention #2 or Micro-Bioretention #2 (P-FIL-05)	80				0	0	0	0	50	0.00	0.00	0.00	0.00		60	0.00	0.00	0.00	0.00
7. Infiltration (RR)																			
7.a. Infiltration #1 (P-FIL-04)	50				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
7.b. Infiltration #2 (P-FIL-04)	90				0	0	0	0	25	0.00	0.00	0.00	0.00		15	0.00	0.00	0.00	0.00
8. Extended Detention Pond (RR)																			
8.a. ED #1 (P-BAS-03)	0				0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
8.b. ED #2 (P-BAS-03)	15				0	0	0	0	15	0.00	0.00	0.00	0.00		10	0.00	0.00	0.00	0.00
9. Sheetflow to Filter/Open Space (RR)																			
9.a. Sheetflow to Conservation Area, A/B Soils (P-FIL-07)	75				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.b. Sheetflow to Conservation Area, C/D Soils (P-FIL-07)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
9.c. Sheetflow to Vegetated Filter Strip, A Soils or Compost Amended B/C/D Soils (Spec P-FIL-07 & P-FIL-08)	50				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
10. Regenerative Stormwater Conveyance																			
10.a. Regenerative Stormwater Conveyance (P-CNV-04)	0				0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
10.b. Regenerative Stormwater Conveyance (P-CNV-04)	0				0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
11. Tree BMP																			
11.a. Trees over Pervious, A/B (P-FIL-09)	16				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
11.b. Trees over Pervious, C/D (P-FIL-09)	12				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
11.c. Trees over Impervious (P-FIL-09)	3.5				0	0	0	0	0	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac	0.00	AREA CHECK: OK.
TOTAL MIXED OPEN TREATED (ac	0.00	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac	0.00	AREA CHECK: OK.
TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	0.13	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.13	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

TOTAL RUNOFF REDUCTION IN D.A. A (ft^3)	0
NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00

SEE WATER QUALITY COMPLIANCE TAB FOR SITE CALCULATIONS (Information Only)

Practice	Runoff Reduction Credit (%)	Mixed Open Credit Area (acres)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft^3)	Runoff Reduction (ft^3)	Remaining Runoff Volume (ft^3)	Total BMP Treatment Volume (ft^3)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed	Nitrogen Removal Efficiency (%)	Nitrogen Load from Upstream Practices (lbs)	Untreated Nitrogen Load to Practice (lbs)	Nitrogen Removed By Practice (lbs)	Remaining Nitrogen Load (lbs)
12. Wet Swale (no RR)																			
12.a. Wet Swale #1 (P-CNV-03)	0				0	0	0	0	20	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
12.b. Wet Swale #2 (P-CNV-03)	0				0	0	0	0	40	0.00	0.00	0.00	0.00		35	0.00	0.00	0.00	0.00
13. Filtering Practices (no RR)																			
13.a.Filtering Practice #1 (P-FIL-06)	0				0	0	0	0	60	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
13.b. Filtering Practice #2 (P-FIL-06)	0				0	0	0	0	65	0.00	0.00	0.00	0.00		45	0.00	0.00	0.00	0.00
14. Constructed Wetland (no RR)																			
14.a.Constructed Wetland #1 (P-BAS-01)	0				0	0	0	0	50	0.00	0.00	0.00	0.00		25	0.00	0.00	0.00	0.00
14.b. Constructed Wetland #2 (P-BAS-01)	0				0	0	0	0	75	0.00	0.00	0.00	0.00		55	0.00	0.00	0.00	0.00
15. Wet Ponds (no RR)																			
15.a. Wet Pond #1 (P-BAS-02)	0				0	0	0	0	50	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
15.b. Wet Pond #1 (Coastal Plain) (P-BAS-02)	0				0	0	0	0	45	0.00	0.00	0.00	0.00		20	0.00	0.00	0.00	0.00
15.c. Wet Pond #2 (P-BAS-02)	0				0	0	0	0	75	0.00	0.00	0.00	0.00		40	0.00	0.00	0.00	0.00
15.d. Wet Pond #2 (Coastal Plain) (P-BAS-02)	0				0	0	0	0	65	0.00	0.00	0.00	0.00		30	0.00	0.00	0.00	0.00
16. Manufactured Treatment Devices (no RR)																			
16.a. Manufactured Treatment Device-Hydrodynamic	0				0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
16.b. Manufactured Treatment Device-Filtering	0				0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00
16.c. Manufactured Treatment Device-Generic	0				0	0	0	0	20	0.00	0.00	0.00	0.00		0	0.00	0.00	0.00	0.00

TOTAL IMPERVIOUS COVER TREATED (ac	0.00	AREA CHECK: OK.
TOTAL MIXED OPEN TREATED (ac	0.00	AREA CHECK: OK.
TOTAL MANAGED TURF AREA TREATED (ac	0.00	AREA CHECK: OK.
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	0.00	
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	0.13	
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	0.00	
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	0.13	

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	0.00

Site Results (Water Quality Compliance) VRRM 4.1, 2024

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST (ac)	0.00	0.00	0.00	0.00	0.00	OK.
MIXED OPEN (ac)	0.00	0.00	0.00	0.00	0.00	OK.
MIXED OPEN AREA TREATED(ac)	0.00	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	0.00	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	0.15	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	0.00	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3)	517

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	0	0	0	0	0	0
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	0.13	0.00	0.00	0.00	0.00	0.13
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00
TP LOAD REMAINING (lb/yr)	0.13	0.00	0.00	0.00	0.00	0.13
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	0.13
TP LOAD REDUCTION REQUIRED (lb/yr)	0.09
TP LOAD REDUCTION ACHIEVED (lb/yr)	0.00
TP LOAD REMAINING (lb/yr):	0.13
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.09

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	1.85
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	0.00
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	1.85

Runoff Volume and Curve Number Calculations, VRRM 4.1, 2024

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.78	3.37	5.08

Use NOAA Atlas 14 (http://hdsc.nws.noaa.gov/hdsc/pfds/)

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths*

Drainage Area A		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.15	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.15
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ A)}$ = **98**

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	2.55	3.14	4.84
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	2.55	3.14	4.84
Adjusted CN*	**98**	**98**	**98**

**See Notes above*

Drainage Area B		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ B)}$ = **0**

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	**0**	**0**	**0**

**See Notes above*

Drainage Area C		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ C)}$
0

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

Drainage Area D		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ D)}$
0

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

Drainage Area E		A Soils	B Soils	C Soils	D Soils
Forest -- undisturbed, protected forest or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Mixed Open -- undisturbed/infrequently maintained grass or shrub land	Area (acres)	0.00	0.00	0.00	0.00
	CN	34	59	72	79
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.00	0.00	0.00
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	0.00	0.00	0.00
	CN	98	98	98	98

Total Area (acres):	0.00
Runoff Reduction Volume (ft^3):	0

$CN_{(D.A.\ E)}$
0

	1-year storm	2-year storm	10-year storm
$RV_{Developed}$ *(watershed-inch)* with no Runoff Reduction*	0.00	0.00	0.00
$RV_{Developed}$ *(watershed-inch)* with Runoff Reduction*	0.00	0.00	0.00
Adjusted CN*	0	0	0

**See Notes above*

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 4.1

BMP Design Specifications List: **2024 Stds & Specs**

Site Summary

Project Title: Transcontinental Gas Pipe Line, LLC - Compressor Station 165 (South)
Date: 45688

Total Disturbed Acreage:	0.15

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0
Mixed Open (acres)	0.00	0.15	0.00	0.00	0.15	100
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.00	0.00	0.00	0
					0.15	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0
Mixed Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.15	0.00	0.00	0.15	100
* Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method					0.15	100

Site Tv and Land Cover Nutrient Loads

	Final Post-Development (Post-ReDevelopment & New Impervious)	Post-ReDevelopment	Post-Development (New Impervious)	Adjusted Pre-ReDevelopment
Site Rv	0.95	0.00	0.00	0.00
Treatment Volume (ft^3)	517	0	517	0
TP Load (lb/yr)	0.13	0.00	0.13	0.00
Total TP Load Reduction Required (lb/yr)	**0.09**	0.00	0.09	

Pre-ReDevelopment TP Load per acre (lb/acre/yr)	Final Post-Development TP Load per acre (lb/acre/yr)	Post-ReDevelopment TP Load per acre (lb/acre/yr)
	0.86	

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	1.85	0.23

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	10%

Total Runoff Volume Reduction (ft^3)	0
Total TP Load Reduction Achieved (lb/yr)	0.00
Total TN Load Reduction Achieved (lb/yr)	0.00
Remaining Post Development TP Load (lb/yr)	0.13
Remaining TP Load Reduction (lb/yr) Required	**0.09**

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Mixed Open (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Impervious Cover (acres)	0.15	0.00	0.00	0.00	0.00	0.15
Total Area (acres)	**0.15**	**0.00**	**0.00**	**0.00**	**0.00**	**0.15**

Drainage Area Compliance Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
TP Load Reduced (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00
TN Load Reduced (lb/yr)	0.00	0.00	0.00	0.00	0.00	0.00

Drainage Area A Summary

Land Cover Summary

0

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest (acres)	0.00	0.00	0.00	0.00	0.00	0
Mixed Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.15	0.00	0.00	0.15	100
					0.15	

BMP Selections

Practice	Open Mixed Area (acres)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	BMP Treatment Volume (ft^3)	TP Load from Upstream Practices (lbs)	Untreated TP Load to Practice (lbs)	TP Removed (lb/yr)	TP Remaining (lb/yr)	Downstream Treatment to be Employed

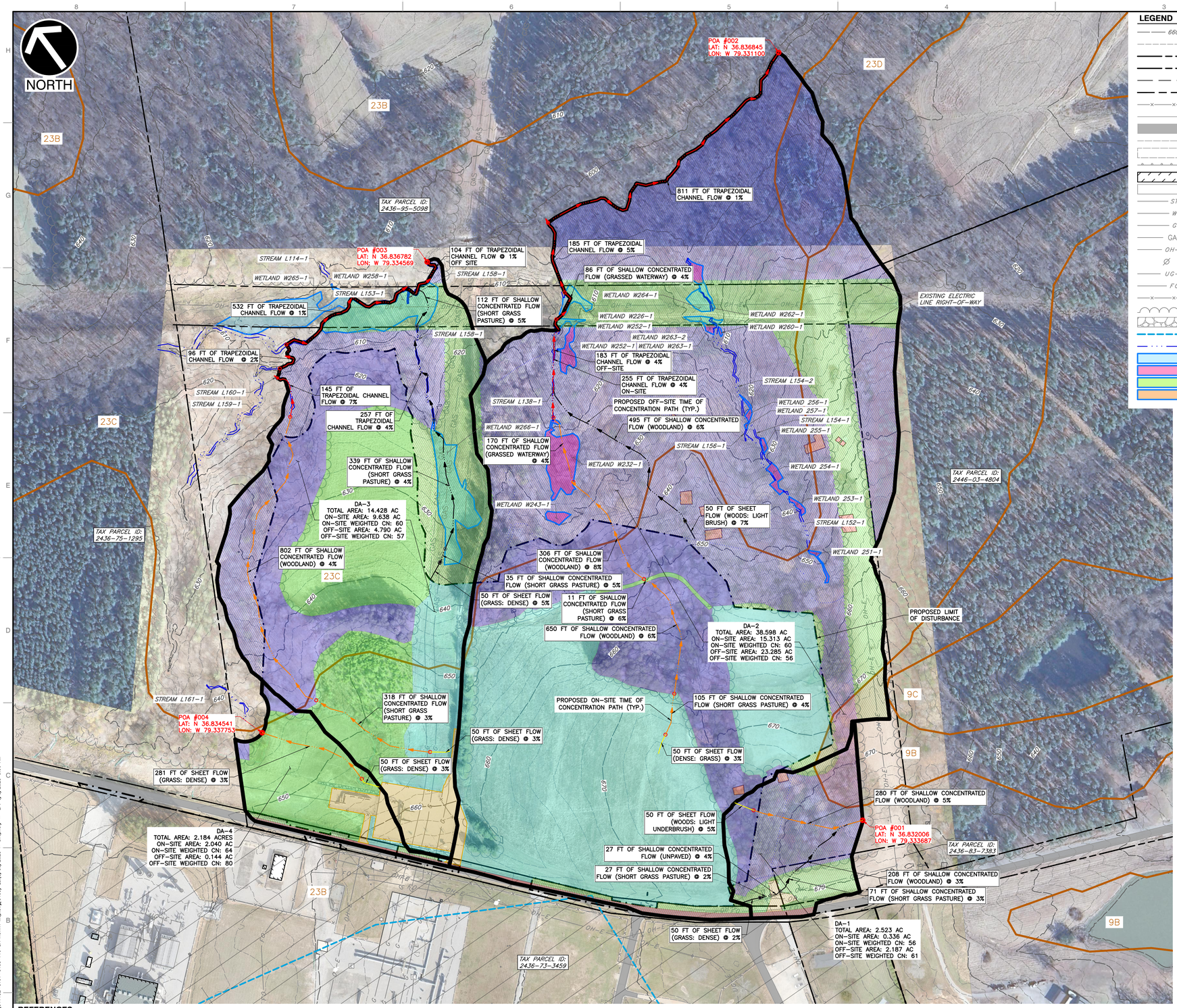
Total Impervious Cover Treated (acres)	0.00
Total Turf Area Treated (acres)	0.00
Total Mixed Open Area Treated (acres)	0.00
Total TP Load Reduction Achieved in D.A. (lb/yr)	0.00
Total TN Load Reduction Achieved in D.A. (lb/yr)	0.00

Runoff Volume and CN Calculations

	1-year storm	2-year storm	10-year storm
Target Rainfall Event (in)	2.78	3.37	5.08

Drainage Areas	RV & CN	Drainage Area A	Drainage Area B	Drainage Area C	Drainage Area D	Drainage Area E
CN		98	0	0	0	0
RR (ft^3)		0	0	0	0	0
1-year return period	RV wo RR (ws-in)	2.55	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	2.55	0.00	0.00	0.00	0.00
	CN adjusted	98	0	0	0	0
2-year return period	RV wo RR (ws-in)	3.14	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	3.14	0.00	0.00	0.00	0.00
	CN adjusted	98	0	0	0	0
10-year return period	RV wo RR (ws-in)	4.84	0.00	0.00	0.00	0.00
	RV w RR (ws-in)	4.84	0.00	0.00	0.00	0.00
	CN adjusted	98	0	0	0	0

APPENDIX E
PRE-DEVELOPMENT AND POST-DEVELOPMENT HYDROLOGY CALCULATIONS AND DRAINAGE AREA MAPS FOR BANISTER RIVER-SHOCKOE CREEK WATERSHED (HUC 030101050203)



LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING GAS LINE (BY OTHERS)
- EXISTING OVERHEAD WIRE
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- PROPOSED LIMIT OF DISTURBANCE
- SOIL BOUNDARY
- SOIL ID
- WOODS LAND COVER (B, ON-SITE)
- WOODS LAND COVER (D, ON-SITE)
- WOODS LAND COVER (B, OFF-SITE)
- WOODS LAND COVER (D, OFF-SITE)
- MEADOW LAND COVER (B, ON-SITE)
- MEADOW LAND COVER (B, OFF-SITE)
- MEADOW LAND COVER (D, OFF-SITE)
- PASTURE LAND COVER (B, ON-SITE)
- PASTURE LAND COVER (D, ON-SITE)
- PASTURE LAND COVER (B, OFF-SITE)
- GRAVEL LAND COVER (B, ON-SITE)
- GRAVEL LAND COVER (B, ON-SITE)
- IMPERVIOUS LAND COVER (ON-SITE)
- IMPERVIOUS LAND COVER (OFF-SITE)
- DRAINAGE AREA BOUNDARY
- TC PATH (OFF-SITE)
- TC PATH (ON-SITE SHEET FLOW)
- TC PATH (ON-SITE CONCENTRATED FLOW)
- TC PATH (ON-SITE CHANNEL FLOW)
- POINT OF ANALYSIS

PRE-DEVELOPMENT DRAINAGE AREAS

DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)
DA-1 (ON-SITE)	WOODS	B	55	0.265
	PASTURE	B	61	0.071
DA-1 (OFF-SITE)	WOODS	B	55	1.234
	WOODS	D	77	0.256
	MEADOW	B	58	0.515
	MEADOW	D	78	0.042
	GRAVEL ROADS	B	98	0.069
	IMPERVIOUS	N/A	98	0.071
DA-2 (ON-SITE)	WOODS	B	55	4.355
	MEADOW	B	58	0.070
	PASTURE	B	61	10.742
	PASTURE	D	80	0.020
	GRAVEL ROADS	B	98	0.077
	IMPERVIOUS	N/A	98	0.049
DA-2 (OFF-SITE)	WOODS	B	55	18.151
	WOODS	D	77	0.115
	MEADOW	B	58	4.483
	MEADOW	D	78	0.219
	IMPERVIOUS	N/A	98	0.317
DA-3 (ON-SITE)	WOODS	B	55	2.838
	MEADOW	B	58	4.772
	PASTURE	B	61	1.455
	GRAVEL ROADS	B	98	0.573
DA-3 (OFF-SITE)	WOODS	B	55	2.234
	MEADOW	B	58	2.556
DA-4 (ON-SITE)	WOODS	B	55	0.101
	MEADOW	B	58	1.562
	PASTURE	B	61	0.061
	GRAVEL ROADS	B	98	0.290
	IMPERVIOUS	N/A	98	0.026
DA-4 (OFF-SITE)	MEADOW	B	58	0.066
	IMPERVIOUS	N/A	98	0.078

WOODS AND PASTURE LAND COVER ARE MODELED IN GOOD CONDITION.
MEADOW LAND COVER IS MODELED AS NON-GRAZED.

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN-D_1413_06-1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com
Civil & Environmental Consultants, Inc.

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

PRE-DEVELOPMENT DRAINAGE AREA MAP (HUC12 030101050203)

DRAWN BY:	JMP
DATE:	MAY 2025
CHECKED BY:	MEA
DWG SCALE:	1" = 80'
PROJECT NO.:	341-132
APPROVED BY:	LCW

DRAWING NO.: C403
SHEET 15 OF 61

P:\340-0001\341-132\-CAD\Dwg\C101\341132-C101-C403-Pre-DA NORTH Map.dwg[C403] 5/30/2025 - bhayman - LM 6/3/2025 9:05 AM

NORTH

POA #002
LAT: N 36.836845
LON: W 79.331100

POA #003
LAT: N 36.836782
LON: W 79.334569

POA #004
LAT: N 36.834533
LON: W 79.337881

POA #001
LAT: N 36.832006
LON: W 79.333687

811 FT OF TRAPEZOIDAL CHANNEL FLOW @ 1%

185 FT OF TRAPEZOIDAL CHANNEL FLOW @ 5%

86 FT OF SHALLOW CONCENTRATED FLOW (GRASSED WATERWAY) @ 4%

112 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 5%

532 FT OF TRAPEZOIDAL CHANNEL FLOW @ 1%

96 FT OF FLOW TRAPEZOIDAL CHANNEL FLOW @ 2%

DA-3 (UNDETAINED)
TOTAL AREA: 8.317 ACRES
ON-SITE AREA: 3.535
ON-SITE WEIGHTED CN: 59
OFF-SITE AREA: 4.782 AC
OFF-SITE WEIGHTED CN: 57

145 FT OF TRAPEZOIDAL CHANNEL FLOW @ 7%

EXTENDED DETENTION POND NO. 2

51 FT OF SHALLOW CONCENTRATED FLOW @ 2% (WOODLAND)

158 FT OF SHALLOW CONCENTRATED FLOW @ 4% SHORT GRASS PASTURE)

DA-3 (DETAINED)
TOTAL AREA (ON-SITE): 4.253 AC
WEIGHTED CN: 88

374 FT OF SHALLOW CONCENTRATED FLOW @ 3% (WOODLAND)

257 FT OF TRAPEZOIDAL CHANNEL FLOW @ 4%

100 FT OF PIPE CHANNEL FLOW (PD-23) @ 5%

183 FT OF TRAPEZOIDAL CHANNEL FLOW @ 4% OFF-SITE

255 FT OF TRAPEZOIDAL CHANNEL FLOW @ 4% ON-SITE

PROPOSED OFF-SITE TIME OF CONCENTRATION PATH (TYP.)

495 FT OF SHALLOW CONCENTRATED FLOW (WOODLAND) @ 6%

100 FT OF PIPE CHANNEL FLOW (PD-22) @ 1%

110 FT OF PIPE CHANNEL FLOW (PD-20) @ .5%

170 FT OF SHALLOW CONCENTRATED FLOW (WOODLAND) @ 4%

339 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 4%

35 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 5%

240 FT OF SHALLOW CONCENTRATED FLOW (WOODLAND) @ 8%

88 FT OF SHALLOW CONCENTRATED FLOW (WOODLAND) @ 6%

50 FT OF SHEET FLOW (WOODLAND) @ 7%

50 FT OF SHEET FLOW (GRASS: DENSE) @ 10%

263 FT OF SHALLOW CONCENTRATED FLOW (UNPAVED) @ 1%

EXTENDED DETENTION POND NO. 1

40 FT OF PIPE CHANNEL FLOW (PD-13) @ 27%

40 FT OF PIPE CHANNEL FLOW (PD-13A) @ 2.5%

50 FT OF SHEET FLOW (GRASS: DENSE) @ 5%

50 FT OF SHEET FLOW (UNPAVED) @ 1%

50 FT OF SHEET FLOW (GRASS: DENSE) @ 4%

205 FT OF SHALLOW CONCENTRATED FLOW @ 4% (SHORT GRASS PASTURE)

90 FT OF PIPE CHANNEL FLOW (PD-15) @ .5%

20 FT OF PIPE CHANNEL FLOW (PD-18) @ .5%

148 FT OF PIPE CHANNEL FLOW (PD-6) @ .5%

192 FT OF PIPE CHANNEL FLOW (PD-5) @ .5%

DA-2 (DETAINED)
TOTAL AREA: 13.797 AC
ON-SITE AREA: 13.307 AC
ON-SITE WEIGHTED CN: 83
OFF-SITE AREA: 0.490 AC
OFF-SITE WEIGHTED CN: 76

272 FT OF SHALLOW CONCENTRATED FLOW (UNPAVED) @ 2%

192 FT OF PIPE CHANNEL FLOW (PD-4) @ .5%

30 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 3%

50 FT OF SHEET FLOW (GRASS: DENSE) @ 2%

50 FT OF SHEET FLOW (SMOOTH SURFACES) @ .5%

380 FT OF SHALLOW CONCENTRATED FLOW (UNPAVED) @ 1%

127 FT OF PIPE CHANNEL FLOW (PD-3) @ .5%

50 FT OF SHEET FLOW (BRUSH) @ 4%

27 FT OF SHALLOW CONCENTRATED FLOW (UNPAVED) @ 4%

27 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 2%

153 FT OF PIPE CHANNEL FLOW (PD-2) @ .5%

DA-2 (UNDETAINED)
TOTAL AREA: 24.690 ACRES
ON-SITE AREA: 1.898 AC
ON-SITE WEIGHTED CN: 57
OFF-SITE AREA: 22.792 AC
OFF-SITE WEIGHTED CN: 56

DA-4 (UNDETAINED)
TOTAL AREA: 0.852 ACRES
ON-SITE AREA: 0.802 AC
ON-SITE WEIGHTED CN: 57
OFF-SITE AREA: 0.050 AC
OFF-SITE WEIGHTED CN: 77

179 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 4%

50 FT OF SHEET FLOW (GRASS: DENSE) @ 4%

DA-4 (DETAINED)
TOTAL AREA: 3.340 ACRES
ON-SITE AREA: 3.235 AC
ON-SITE WEIGHTED CN: 87
OFF-SITE AREA: 0.105 AC
OFF-SITE WEIGHTED CN: 80

50 FT OF SHEET FLOW (GRASS: DENSE) @ 3%

DA-1
TOTAL AREA: 2.484 ACRES
ON-SITE AREA: 0.297 AC
ON-SITE WEIGHTED CN: 55
OFF-SITE AREA: 2.187 AC
OFF-SITE WEIGHTED CN: 61

62 FT OF SHALLOW CONCENTRATED FLOW (SHORT GRASS PASTURE) @ 7%

205 FT OF SHALLOW CONCENTRATED FLOW (WOODLAND) @ 4%

208 FT OF SHALLOW CONCENTRATED FLOW (WOODLAND) @ 3%

71 FT OF SHALLOW CONCENTRATED FLOW SHORT GRASS PASTURE) @ 3%

PROPOSED LIMIT OF DISTURBANCE

EXISTING ELECTRIC LINE RIGHT-OF-WAY

TAX PARCEL ID: 2436-95-5098

TAX PARCEL ID: 2436-75-1295

TAX PARCEL ID: 2436-73-3459

TAX PARCEL ID: 2445-03-4804

TAX PARCEL ID: 2436-83-7383

STREAM L114–1
STREAM L153–1
STREAM L158–1
STREAM L160–1
STREAM L159–1
STREAM L138–1
STREAM L156–1
STREAM L154–2
STREAM L154–1
STREAM L152–1
STREAM L161–1

WETLAND W265–1
WETLAND W258–1
WETLAND W264–1
WETLAND W226–1
WETLAND W252–1
WETLAND W263–2
WETLAND W252–1
WETLAND W263–1
WETLAND W262–1
WETLAND W260–1
WETLAND W266–1
WETLAND W232–1
WETLAND W243–1
WETLAND 256–1
WETLAND 257–1
WETLAND 255–1
WETLAND 254–1
WETLAND 253–1
WETLAND 251–1

23B
23C
23D
9B
9C

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT–OF–WAY
- EXISTING RIGHT–OF–WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING GAS LINE (BY OTHERS)
- EXISTING OVERHEAD WIRE
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- PROPOSED LIMIT OF DISTURBANCE
- SOIL BOUNDARY
- SOIL ID
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED EDGE OF GRAVEL PAD
- PROPOSED FLAT PAD LIMITS
- PROPOSED BERM
- PROPOSED EDGE OF UNPAVED DIRT ROAD
- PROPOSED EDGE OF UNPAVED GRAVEL ROAD
- PROPOSED EDGE OF PAVED ROAD
- PROPOSED CHANNEL
- PROPOSED STORM PIPE
- PROPOSED RIPRAP APRON
- WOODS LAND COVER (ON–SITE, B SOIL)
- WOODS LAND COVER (OFF–SITE, B SOIL)
- WOODS LAND COVER (OFF–SITE, D SOIL)
- GRASS LAND COVER (ON–SITE, B SOIL)
- GRASS LAND COVER (ON–SITE, C SOIL)
- GRASS LAND COVER (ON–SITE, D SOIL)
- GRASS LAND COVER (OFF–SITE, B SOIL)
- GRASS LAND COVER (OFF–SITE, D SOIL)
- TURF LAND COVER (ON–SITE, C SOIL)
- BRUSH LAND COVER (ON–SITE, B SOIL)
- BRUSH LAND COVER (ON–SITE, B SOIL, DECOMPACTED)
- BRUSH LAND COVER (ON–SITE, C SOIL)
- BRUSH LAND COVER (ON–SITE, D SOIL)
- GRAVEL LAND COVER (ON–SITE, B SOIL)
- GRAVEL LAND COVER (ON–SITE, C SOIL)
- GRAVEL LAND COVER (OFF–SITE, B SOIL)
- IMPERVIOUS LAND COVER (ON–SITE)
- IMPERVIOUS LAND COVER (OFF–SITE)
- DRAINAGE AREA BOUNDARY
- TC PATH (OFF–SITE)
- TC PATH (ON–SITE SHEET FLOW)
- TC PATH (ON–SITE CONCENTRATED FLOW)
- TC PATH (ON–SITE CHANNEL FLOW)
- POINT OF ANALYSIS

POST–DEVELOPMENT DRAINAGE AREAS

DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)
DA–1 DETAINED (ON–SITE)	BRUSH*	B**	55	0.297
DA–1 UNDETAINED (OFF–SITE)	WOOD	B	55	1.234
	WOOD	D	77	0.256
	MEADOW	B	58	0.515
	MEADOW	D	78	0.042
	GRAVEL ROADS	B	98	0.069
	IMPERVIOUS	N/A	98	0.071
DA–2 DETAINED (ON–SITE)	BRUSH*	B	55	1.116
	BRUSH*	C	70	1.362
	BRUSH*	D	77	0.020
	MEADOW	B	58	2.398
	MEADOW	C	71	0.775
	LAWN (TURF)	C	74	0.092
	GRAVEL ROADS	B	98	3.439
	GRAVEL ROADS	C	98	4.026
	IMPERVIOUS	N/A	98	0.079
DA–2 DETAINED (OFF–SITE)	WOODS	B	55	0.019
	WOODS	D	77	0.066
	MEADOW	B	58	0.198
	MEADOW	D	78	0.041
	IMPERVIOUS	N/A	98	0.166
DA–2 UNDETAINED (ON–SITE)	BRUSH*	B	55	1.037
	BRUSH*	B**	55	0.306
	MEADOW	B	58	0.476
	MEADOW	C	71	0.028
	LAWN (TURF)	C	74	0.042
	GRAVEL ROADS	C	98	0.009
DA–2 UNDETAINED (OFF–SITE)	WOODS	B	55	18.132
	WOODS	D	77	0.049
	MEADOW	B	58	4.286
	MEADOW	D	78	0.178
	IMPERVIOUS	N/A	98	0.147

* – BRUSH LAND COVER IS MODELED WITH A CN CONSISTENT WITH THAT OF WOODS IN GOOD CONDITION.
** – FILL AREAS SHALL BE DECOMPACTED AND HAVE BEEN ANALYZED ASSUMING NO CHANGE TO CN FROM PRE– TO POST–DEVELOPMENT CONDITIONS.
WOODS LAND COVER ARE MODELED IN GOOD CONDITION.
MEADOW LAND COVER IS MODELED AS NON–GRAZED.

POST–DEVELOPMENT DRAINAGE AREAS

DRAINAGE AREA	LAND USE	HSG	CN	AREA (AC)
DA–3 DETAINED (ON–SITE)	BRUSH*	B**	55	0.118
	MEADOW	B	58	0.799
	MEADOW	C	71	0.231
	GRAVEL ROADS	B	98	1.777
	GRAVEL ROADS	C	98	1.328
DA–3 UNDETAINED (ON–SITE)	BRUSH*	B**	55	0.516
	BRUSH*	C	70	0.343
	MEADOW	B	58	2.556
	LAWN (TURF)	B	61	0.079
	GAVEL ROADS	C	98	0.041
DA–3 UNDETAINED (OFF–SITE)	WOODS	B	55	2.234
	MEADOW	B	58	2.548
DA–4 DETAINED (OFF–SITE)	MEADOW	B	58	0.585
	MEADOW	C	71	0.382
	TURF (LAWN)	B	61	0.017
	GRAVEL ROADS	B	98	0.917
	GRAVEL ROADS	C	98	1.308
	IMPERVIOUS	N/A	98	0.026
DA–4 DETAINED (OFF–SITE)	MEADOW	B	58	0.047
	IMPERVIOUS	N/A	98	0.058
DA–4 UNDETAINED (ON–SITE)	BRUSH*	B	55	0.252
	BRUSH*	B**	55	0.140
	MEADOW	B	58	0.400
	GRAVEL ROADS	C	98	0.010
DA–4 UNDETAINED (OFF–SITE)	MEADOW	B	58	0.026
	IMPERVIOUS	N/A	98	0.024

* – BRUSH LAND COVER IS MODELED WITH A CN CONSISTENT WITH THAT OF WOODS IN GOOD CONDITION.
** – FILL AREAS SHALL BE DECOMPACTED AND HAVE BEEN ANALYZED ASSUMING NO CHANGE TO CN FROM PRE– TO POST–DEVELOPMENT CONDITIONS.
WOODS LAND COVER ARE MODELED IN GOOD CONDITION.
MEADOW LAND COVER IS MODELED AS NON–GRAZED.

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN–D_1413_06–1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com

Civil & Environmental Consultants, Inc.

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLVYANIA COUNTY, VIRGINIA

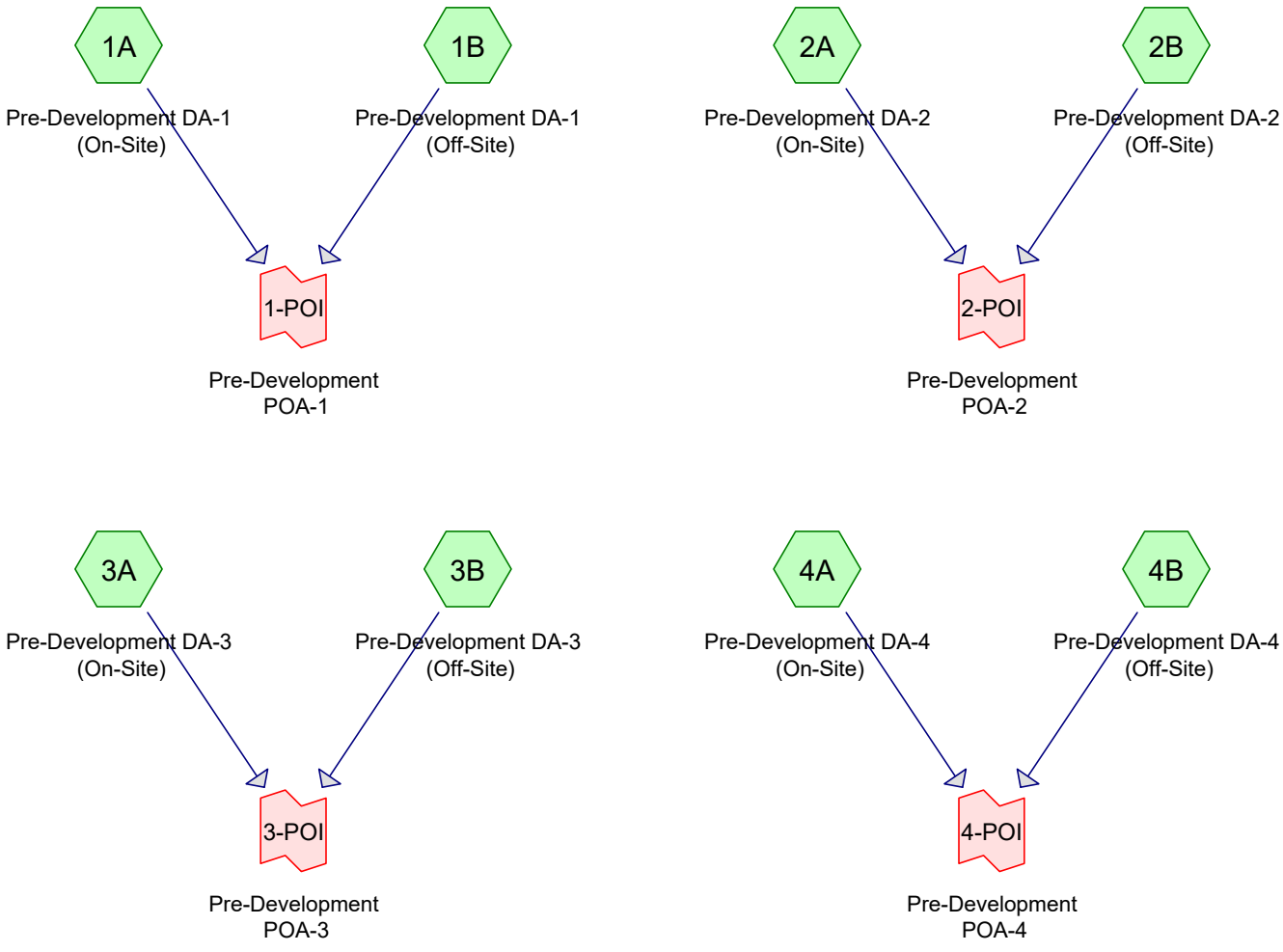
POST-DEVELOPMENT DRAINAGE AERA MAP (HUC12 030101050203)

DRAWN BY:	JMP
CHECKED BY:	MEA
PROJECT NO:	341-132
APPROVED BY:	LCW
DATE:	MAY 2025
DWG SCALE:	1"=120'

DRAWING NO.: C404
SHEET 16 OF 61

P:\340-001\341-132\-04\01\Dwg\C401\341132-C401-C404-Post-04 NORTH Abs.dwg[C404] LS(5/30/2025 – bhamm) – LP: 6/2/2025 8:07 AM

STATION 165
PRE-DEVELOPMENT



Subcat Reach Pond Link

Routing Diagram for 341-132-CV01-PCSM_CN98_JMP WORKING
Prepared by CEC Inc, Printed 5/29/2025

Summary for Subcatchment 1A: Pre-Development DA-1 (On-Site)

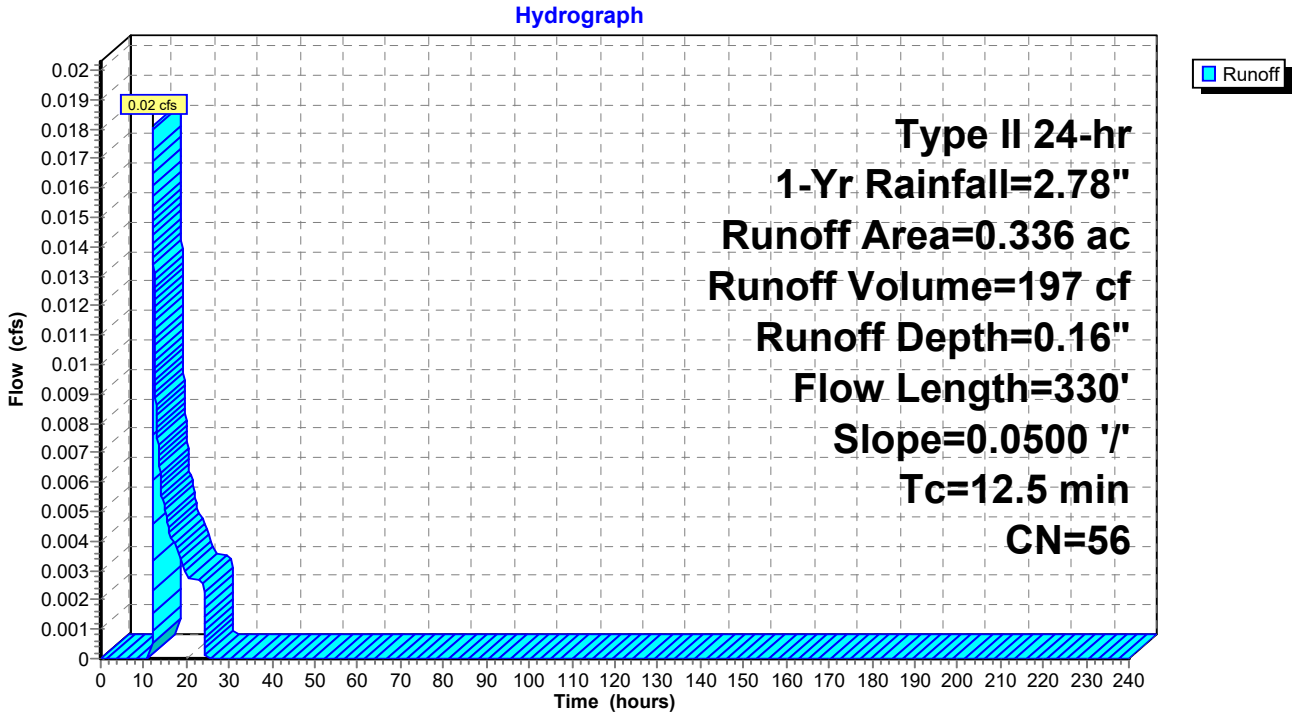
Runoff = 0.02 cfs @ 12.13 hrs, Volume= 197 cf, Depth= 0.16"
Routed to Link 1-POI : Pre-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
0.265	55	Woods, Good, HSG B
0.071	61	Pasture/grassland/range, Good, HSG B
0.336	56	Weighted Average
0.336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	330	Total			

Subcatchment 1A: Pre-Development DA-1 (On-Site)



Summary for Subcatchment 1B: Pre-Development DA-1 (Off-Site)

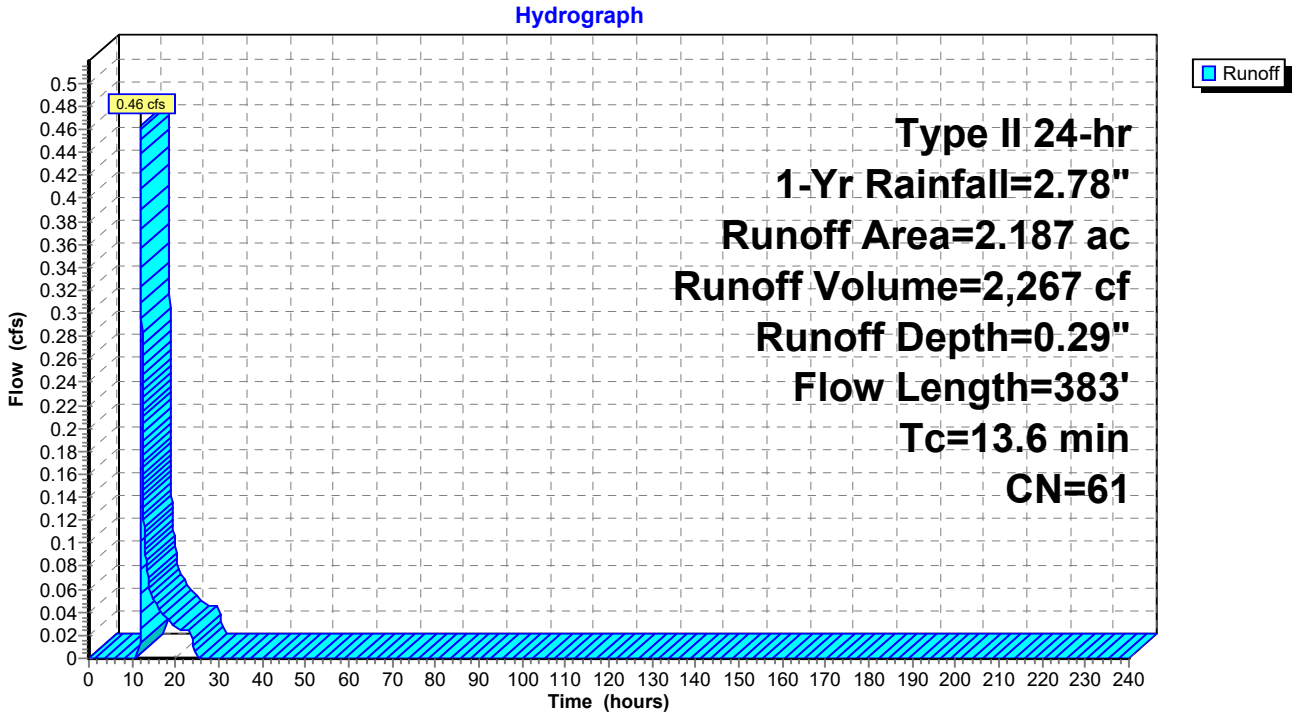
Runoff = 0.46 cfs @ 12.10 hrs, Volume= 2,267 cf, Depth= 0.29"
Routed to Link 1-POI : Pre-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	1.234	55	Woods, Good, HSG B
	0.256	77	Woods, Good, HSG D
	0.515	58	Meadow, non-grazed, HSG B
	0.042	78	Meadow, non-grazed, HSG D
*	0.069	98	Gravel roads, HSG B
	0.071	98	Paved parking, HSG B
	2.187	61	Weighted Average
	2.047		93.60% Pervious Area
	0.140		6.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.5	27	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	71	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	208	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.6	383	Total			

Subcatchment 1B: Pre-Development DA-1 (Off-Site)



Summary for Subcatchment 2A: Pre-Development DA-2 (On-Site)

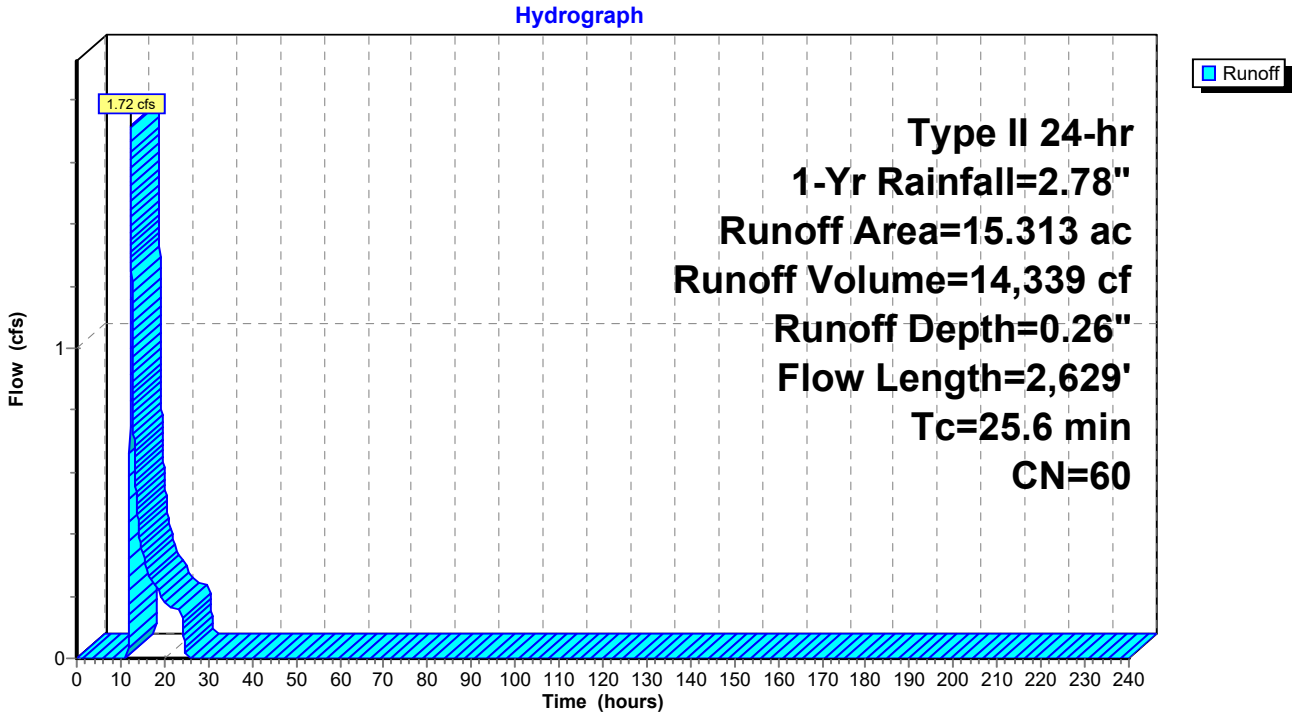
Runoff = 1.72 cfs @ 12.31 hrs, Volume= 14,339 cf, Depth= 0.26"
Routed to Link 2-POI : Pre-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	4.355	55	Woods, Good, HSG B
*	0.070	58	Meadow, non-grazed, HSG B
*	10.742	61	Pasture/grassland/range, Good, HSG B
	0.020	80	Pasture/grassland/range, Good, HSG D
*	0.077	98	Gravel roads, HSG B
	0.049	98	Paved parking, HSG B
	15.313	60	Weighted Average
	15.187		99.18% Pervious Area
	0.126		0.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.2	105	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.8	650	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	11	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	306	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
25.6	2,629	Total			

Subcatchment 2A: Pre-Development DA-2 (On-Site)



Summary for Subcatchment 2B: Pre-Development DA-2 (Off-Site)

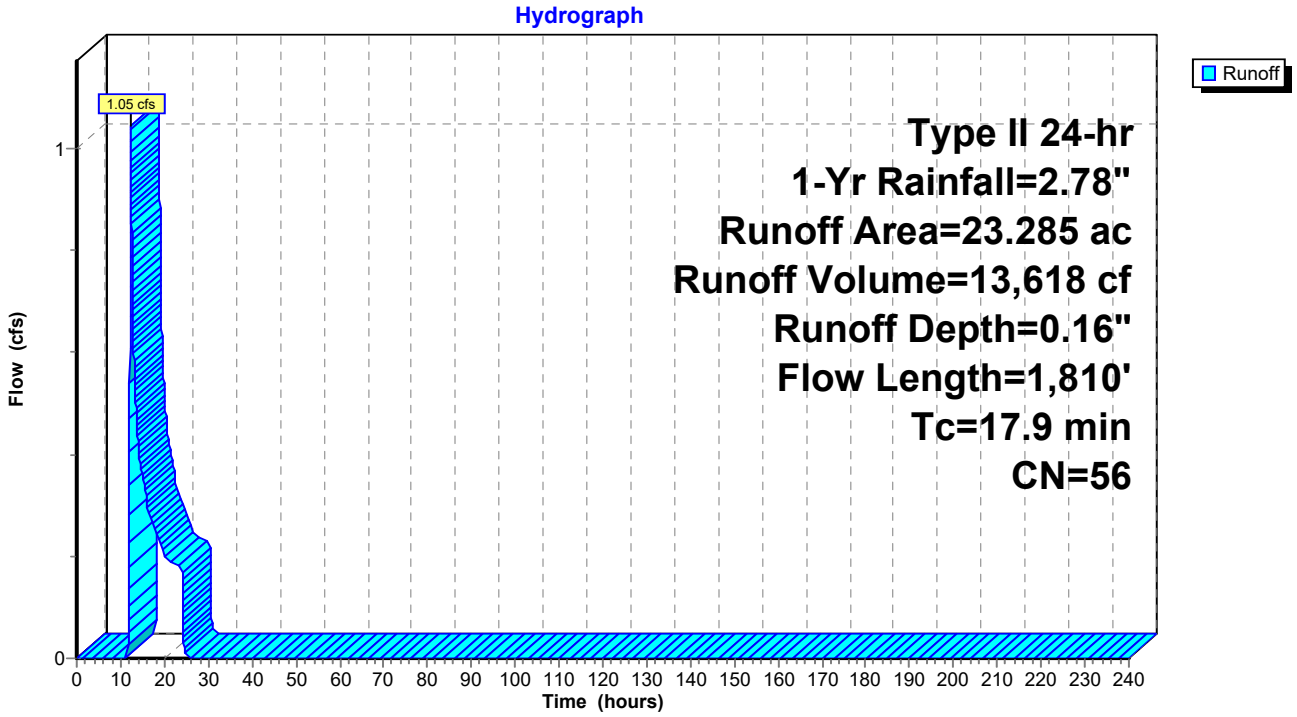
Runoff = 1.05 cfs @ 12.23 hrs, Volume= 13,618 cf, Depth= 0.16"
Routed to Link 2-POI : Pre-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
18.151	55	Woods, Good, HSG B
0.115	77	Woods, Good, HSG D
4.483	58	Meadow, non-grazed, HSG B
0.219	78	Meadow, non-grazed, HSG D
0.317	98	Paved parking, HSG B
23.285	56	Weighted Average
22.968		98.64% Pervious Area
0.317		1.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
6.7	495	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	183	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
17.9	1,810	Total			

Subcatchment 2B: Pre-Development DA-2 (Off-Site)



Summary for Subcatchment 3A: Pre-Development DA-3 (On-Site)

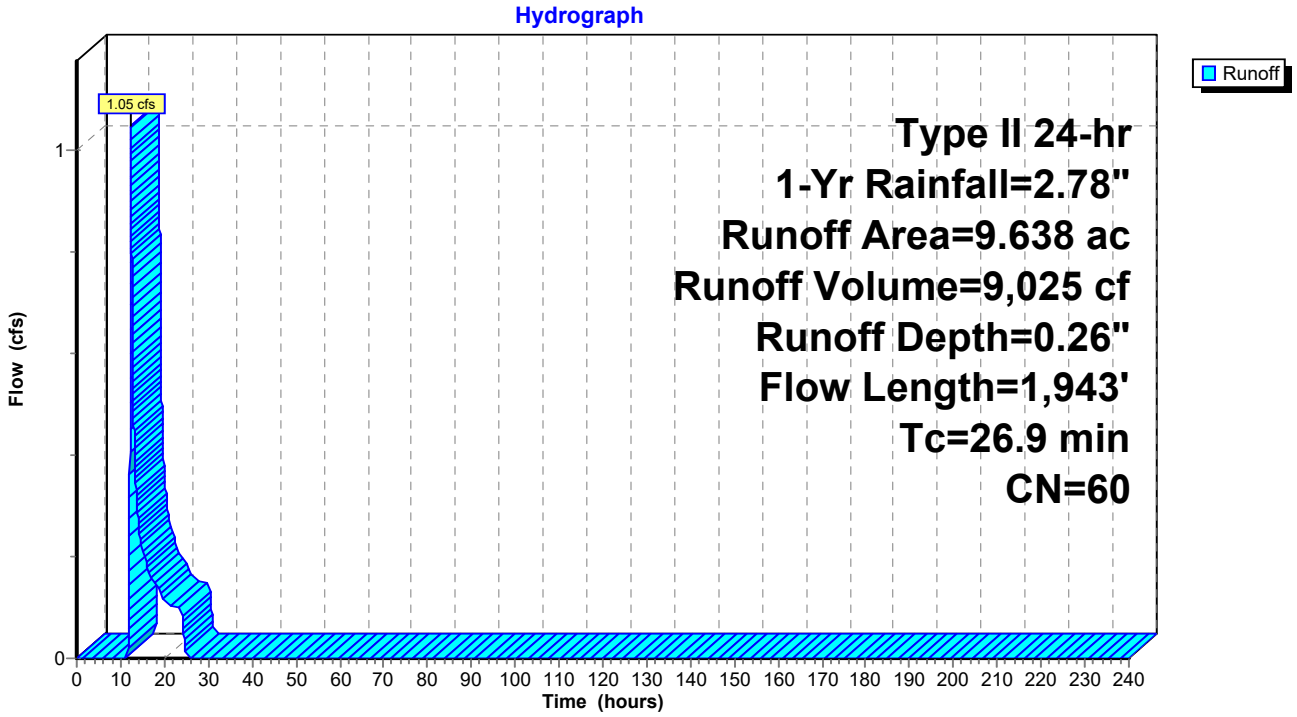
Runoff = 1.05 cfs @ 12.32 hrs, Volume= 9,025 cf, Depth= 0.26"
Routed to Link 3-POI : Pre-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	2.838	55	Woods, Good, HSG B
	4.772	58	Meadow, non-grazed, HSG B
	1.455	61	Pasture/grassland/range, Good, HSG B
*	0.573	98	Gravel roads, HSG B
	9.638	60	Weighted Average
	9.065		94.05% Pervious Area
	0.573		5.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
4.4	318	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.4	802	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	145	0.0700	6.56	9.84	**Trap/Vee/Rect Channel Flow, Stream L160-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030 Stream, clean & straight
0.2	96	0.0200	7.45	89.38	**Trap/Vee/Rect Channel Flow, Stream L159-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Stream, clean & straight
1.7	532	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Stream, clean & straight
26.9	1,943	Total			

Subcatchment 3A: Pre-Development DA-3 (On-Site)



Summary for Subcatchment 3B: Pre-Development DA-3 (Off-Site)

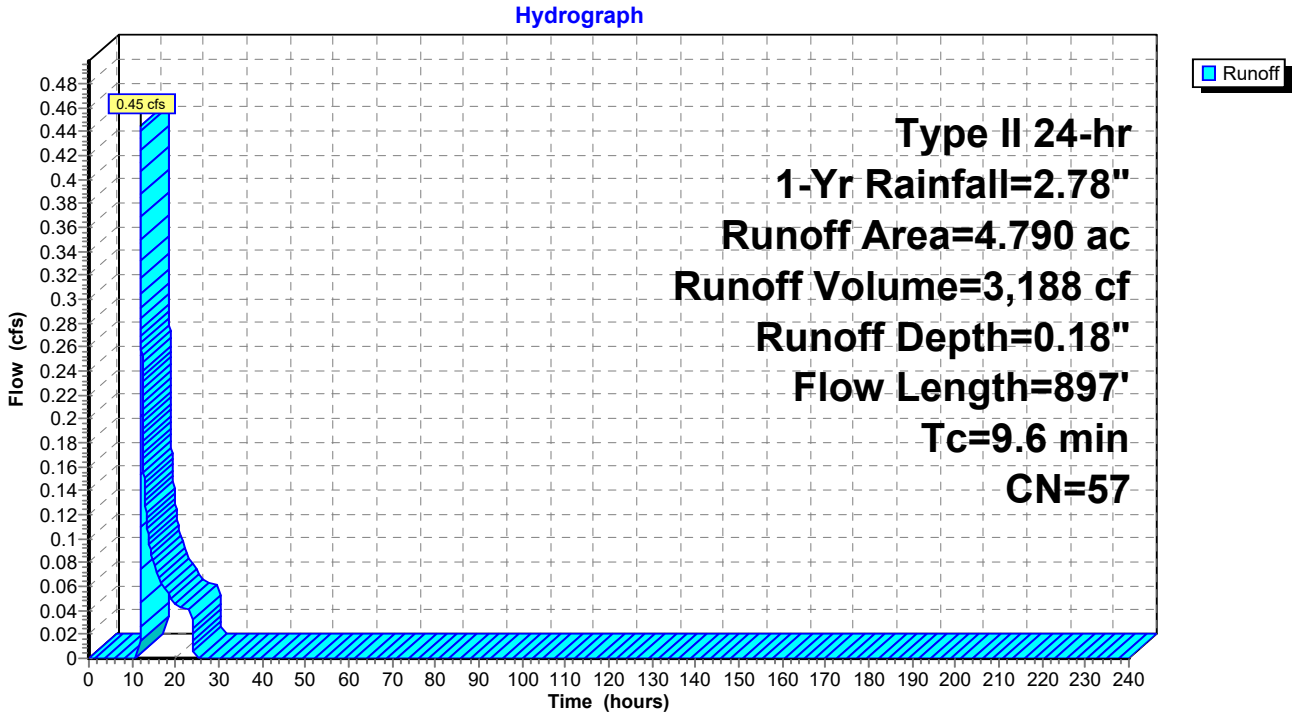
Runoff = 0.45 cfs @ 12.08 hrs, Volume= 3,188 cf, Depth= 0.18"
Routed to Link 3-POI : Pre-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
2.234	55	Woods, Good, HSG B
2.556	58	Meadow, non-grazed, HSG B
4.790	57	Weighted Average
4.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0500	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.4	35	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	339	0.0400	3.00		**Shallow Concentrated Flow, Wetland W266-2** Grassed Waterway Kv= 15.0 fps
0.9	257	0.0400	4.96	7.44	**Trap/Vee/Rect Channel Flow, Stream L157-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030
0.6	112	0.0500	3.35		**Shallow Concentrated Flow, Wetland W258-1** Grassed Waterway Kv= 15.0 fps
0.3	104	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
9.6	897	Total			

Subcatchment 3B: Pre-Development DA-3 (Off-Site)



Summary for Subcatchment 4A: Pre-Development DA-4 (On-Site)

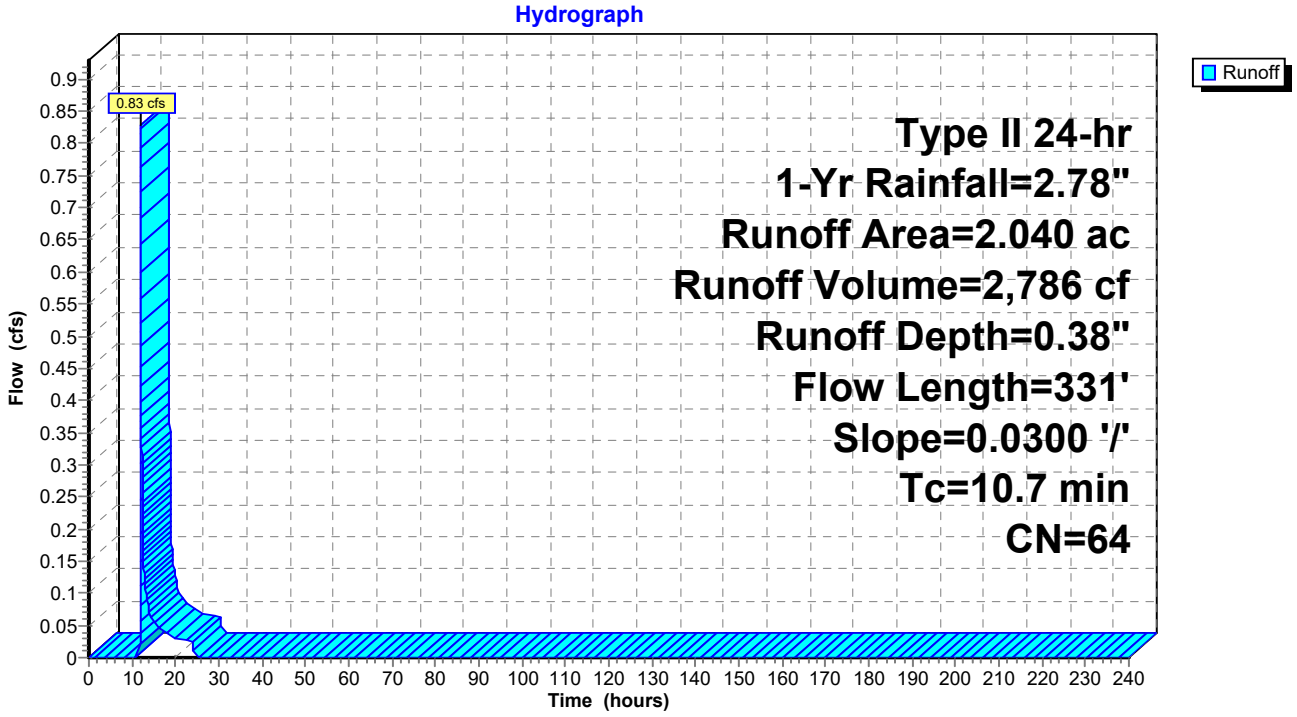
Runoff = 0.83 cfs @ 12.06 hrs, Volume= 2,786 cf, Depth= 0.38"
Routed to Link 4-POI : Pre-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	0.101	55	Woods, Good, HSG B
	1.562	58	Meadow, non-grazed, HSG B
*	0.061	61	Pasture/grassland/range, Good, HSG B
*	0.290	98	Gravel roads, HSG B
	0.026	98	Paved parking, HSG B
	2.040	64	Weighted Average
	1.724		84.51% Pervious Area
	0.316		15.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.9	281	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.7	331	Total			

Subcatchment 4A: Pre-Development DA-4 (On-Site)



Summary for Subcatchment 4B: Pre-Development DA-4 (Off-Site)

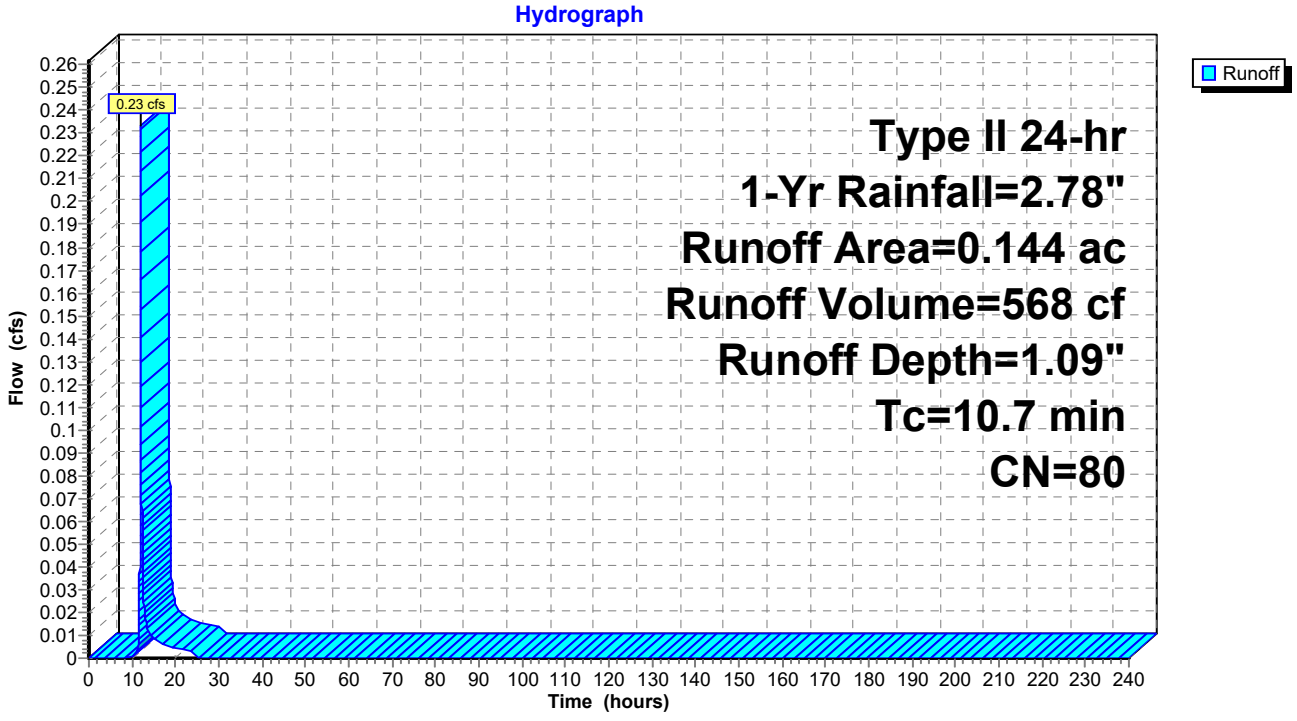
Runoff = 0.23 cfs @ 12.03 hrs, Volume= 568 cf, Depth= 1.09"
Routed to Link 4-POI : Pre-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
0.066	58	Meadow, non-grazed, HSG B
0.078	98	Paved parking, HSG B
0.144	80	Weighted Average
0.066		45.83% Pervious Area
0.078		54.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7					**Direct Entry, Assumed On-Site TC**

Subcatchment 4B: Pre-Development DA-4 (Off-Site)

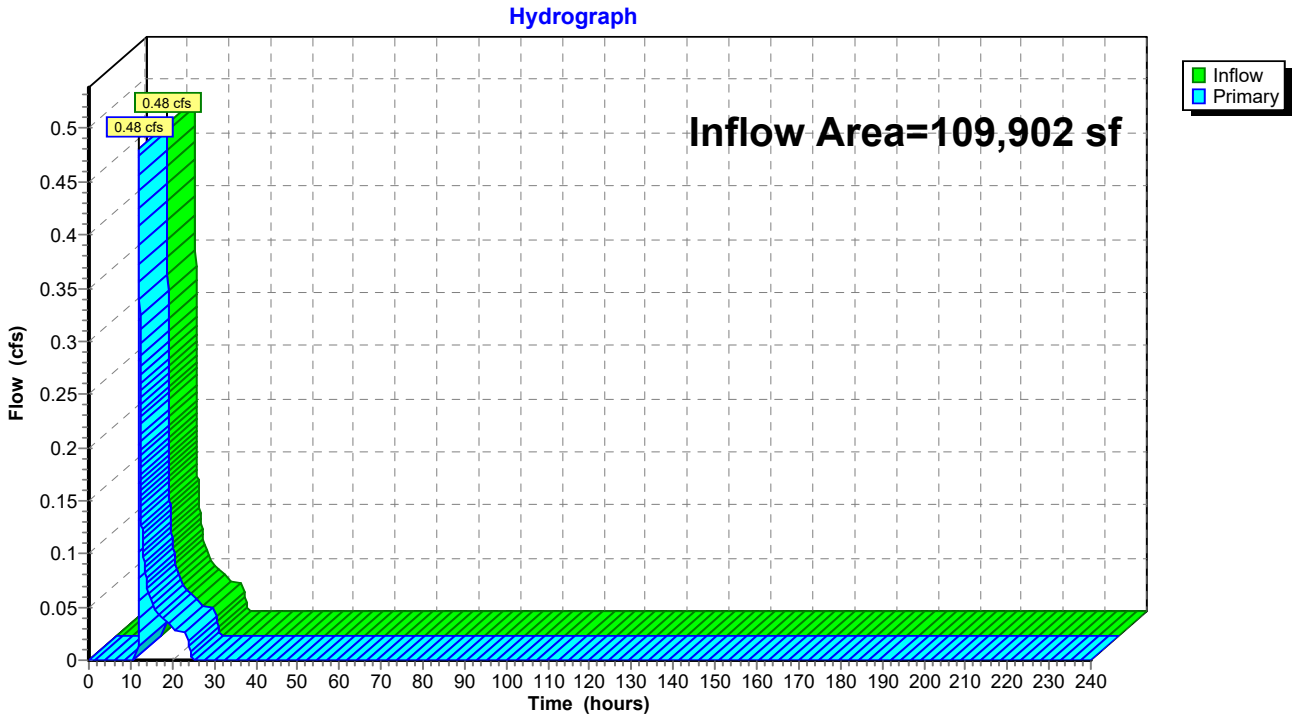


Summary for Link 1-POI: Pre-Development POA-1

Inflow Area = 109,902 sf, 5.55% Impervious, Inflow Depth = 0.27" for 1-Yr event
Inflow = 0.48 cfs @ 12.11 hrs, Volume= 2,463 cf
Primary = 0.48 cfs @ 12.11 hrs, Volume= 2,463 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 1-POI: Pre-Development POA-1

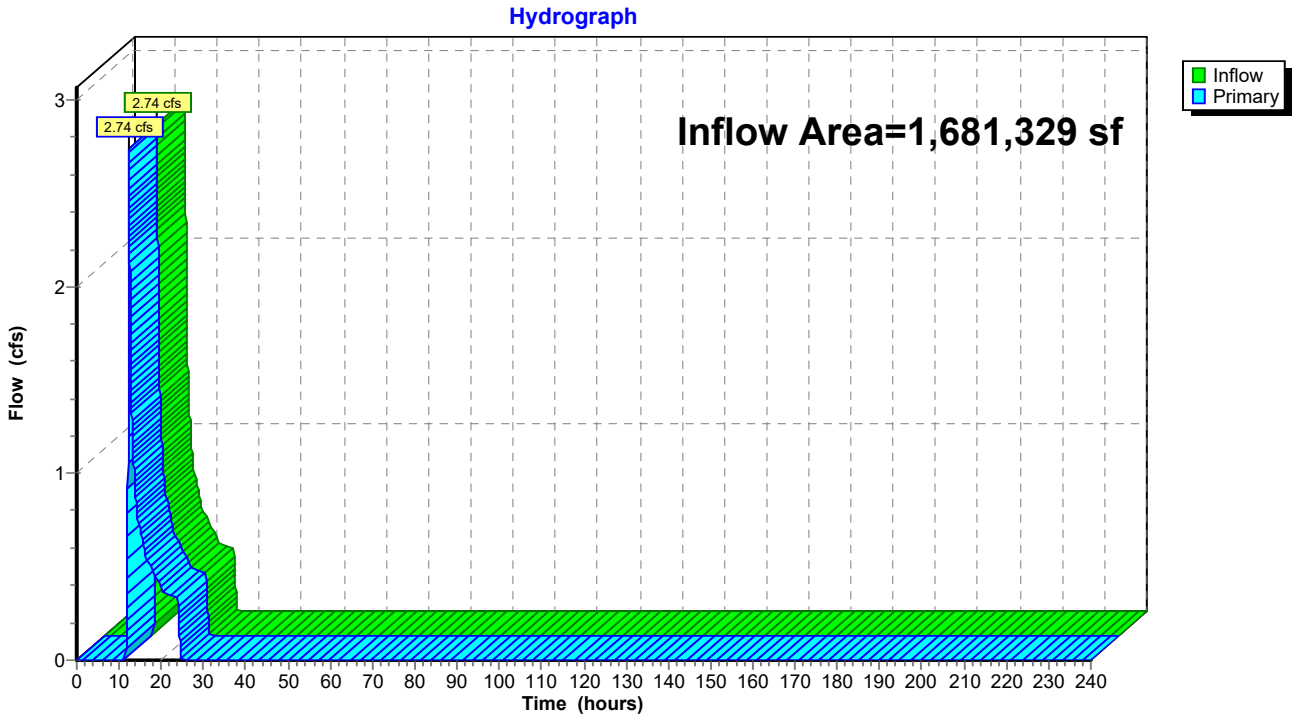


Summary for Link 2-POI: Pre-Development POA-2

Inflow Area = 1,681,329 sf, 1.15% Impervious, Inflow Depth = 0.20" for 1-Yr event
Inflow = 2.74 cfs @ 12.27 hrs, Volume= 27,957 cf
Primary = 2.74 cfs @ 12.27 hrs, Volume= 27,957 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 2-POI: Pre-Development POA-2

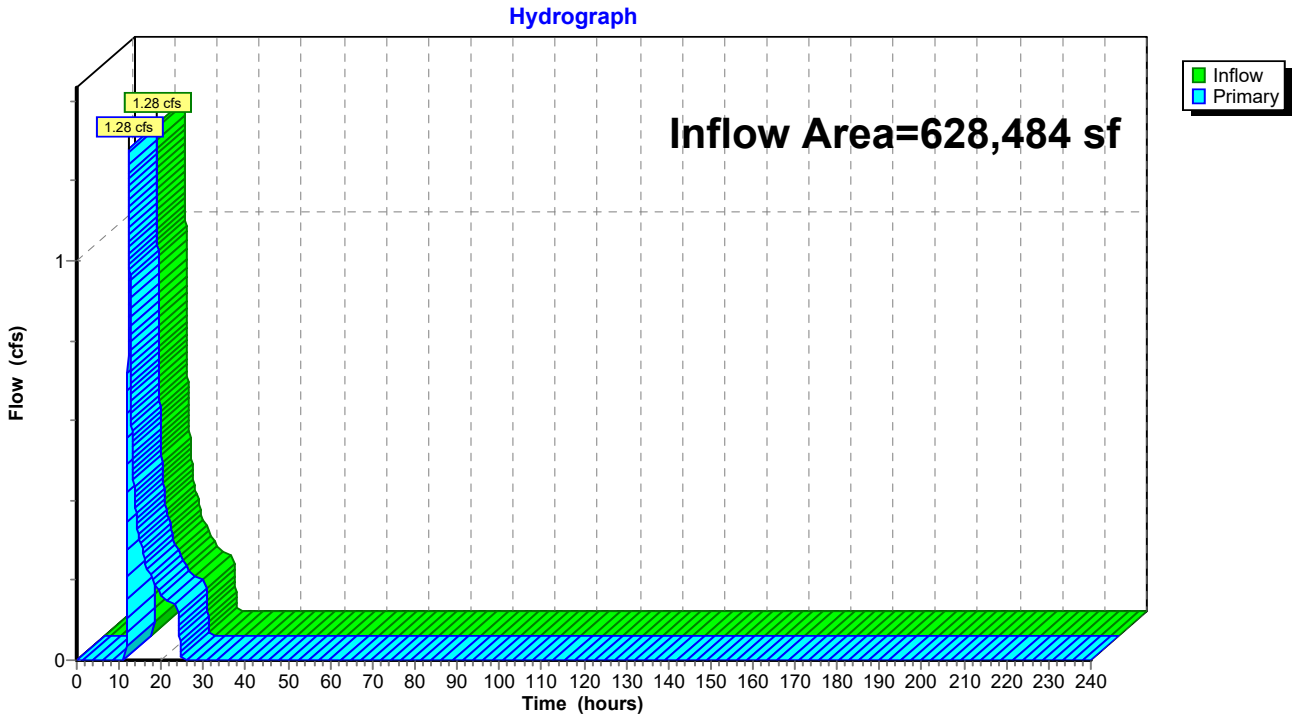


Summary for Link 3-POI: Pre-Development POA-3

Inflow Area = 628,484 sf, 3.97% Impervious, Inflow Depth = 0.23" for 1-Yr event
Inflow = 1.28 cfs @ 12.31 hrs, Volume= 12,212 cf
Primary = 1.28 cfs @ 12.31 hrs, Volume= 12,212 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 3-POI: Pre-Development POA-3

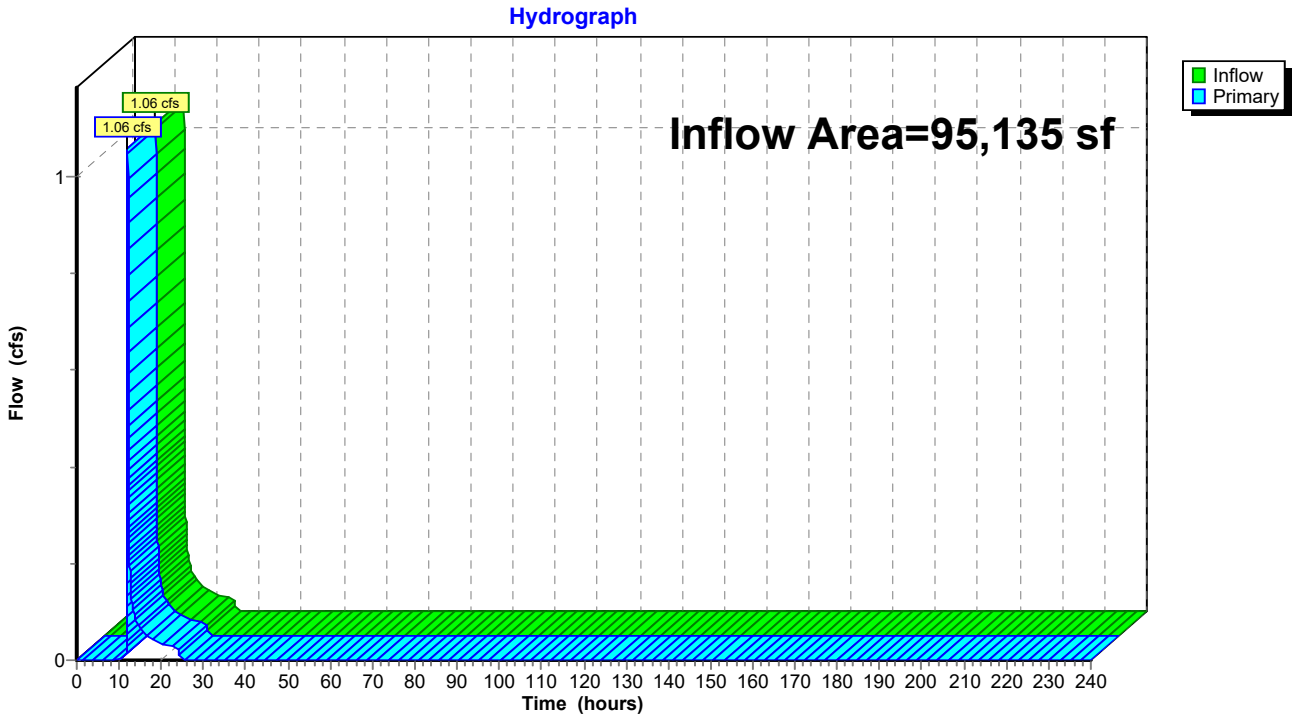


Summary for Link 4-POI: Pre-Development POA-4

Inflow Area = 95,135 sf, 18.04% Impervious, Inflow Depth = 0.42" for 1-Yr event
Inflow = 1.06 cfs @ 12.05 hrs, Volume= 3,355 cf
Primary = 1.06 cfs @ 12.05 hrs, Volume= 3,355 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 4-POI: Pre-Development POA-4



Summary for Subcatchment 1A: Pre-Development DA-1 (On-Site)

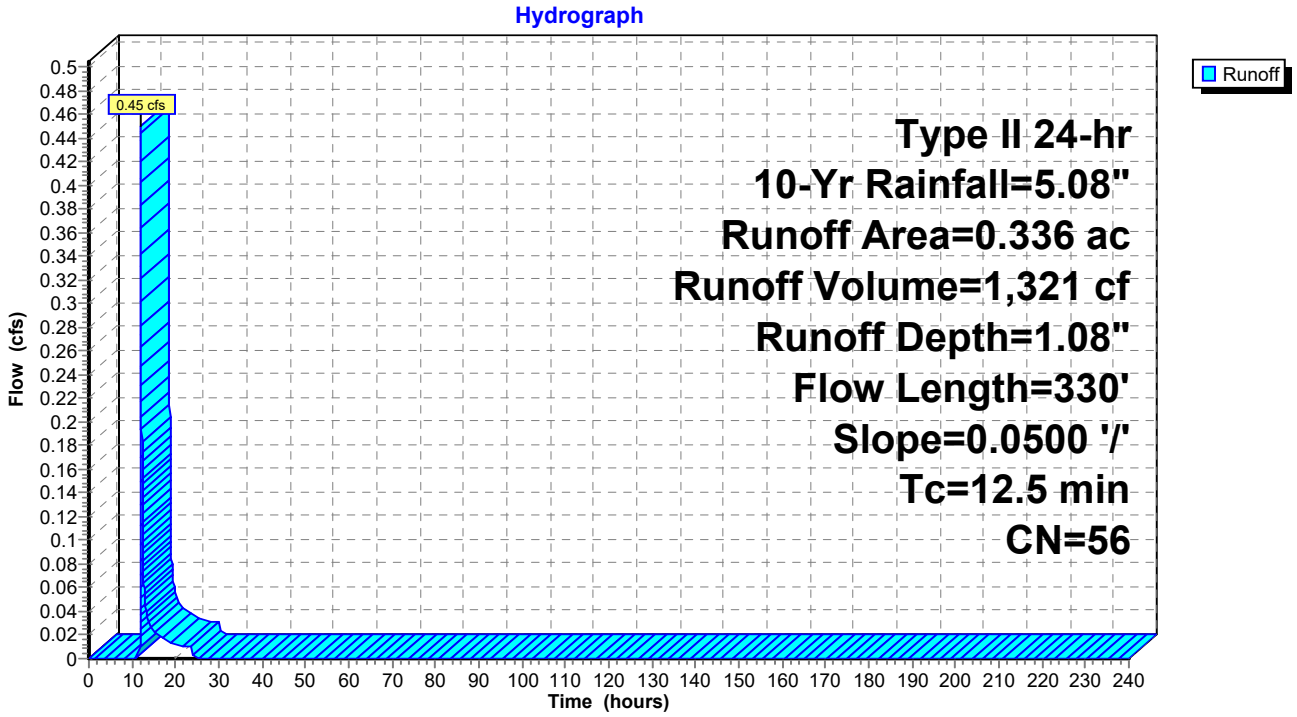
Runoff = 0.45 cfs @ 12.06 hrs, Volume= 1,321 cf, Depth= 1.08"
Routed to Link 1-POI : Pre-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
0.265	55	Woods, Good, HSG B
0.071	61	Pasture/grassland/range, Good, HSG B
0.336	56	Weighted Average
0.336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	330	Total			

Subcatchment 1A: Pre-Development DA-1 (On-Site)



Summary for Subcatchment 1B: Pre-Development DA-1 (Off-Site)

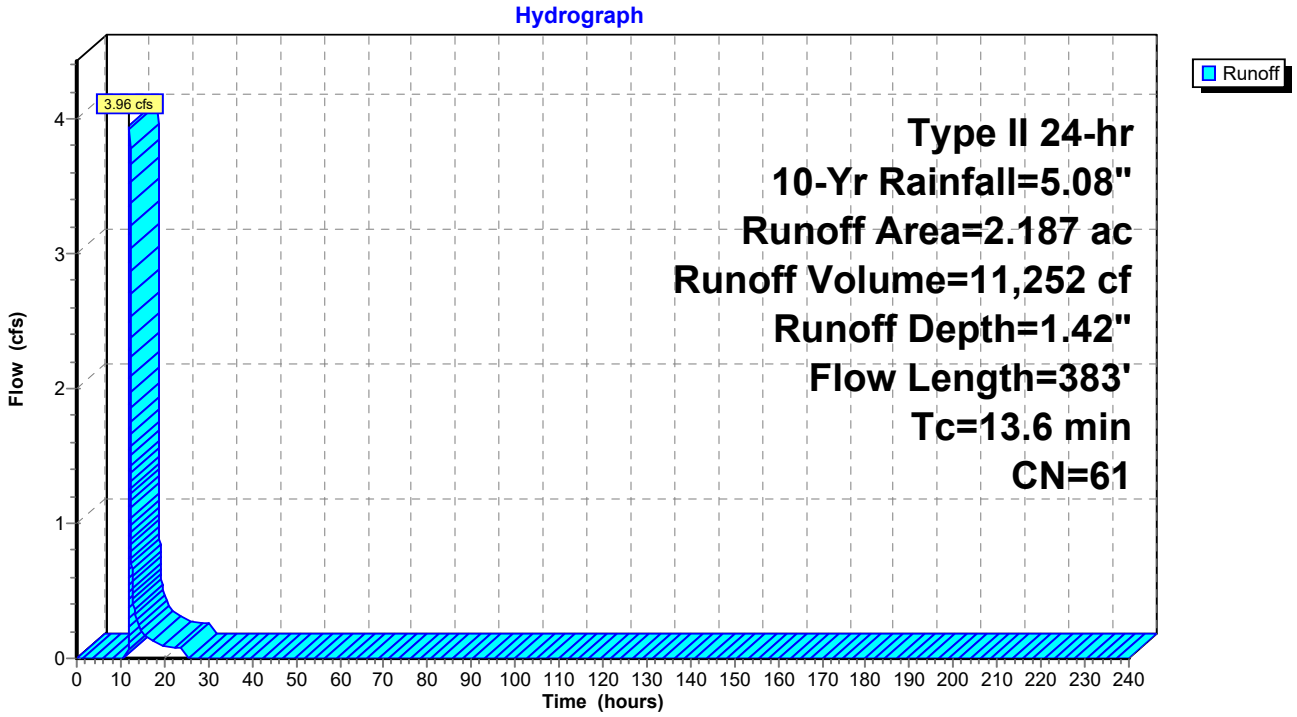
Runoff = 3.96 cfs @ 12.07 hrs, Volume= 11,252 cf, Depth= 1.42"
Routed to Link 1-POI : Pre-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.234	55	Woods, Good, HSG B
	0.256	77	Woods, Good, HSG D
	0.515	58	Meadow, non-grazed, HSG B
	0.042	78	Meadow, non-grazed, HSG D
*	0.069	98	Gravel roads, HSG B
	0.071	98	Paved parking, HSG B
	2.187	61	Weighted Average
	2.047		93.60% Pervious Area
	0.140		6.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.5	27	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.1	27	0.0400	3.22		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
1.0	71	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
4.0	208	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.6	383	Total			

Subcatchment 1B: Pre-Development DA-1 (Off-Site)



Summary for Subcatchment 2A: Pre-Development DA-2 (On-Site)

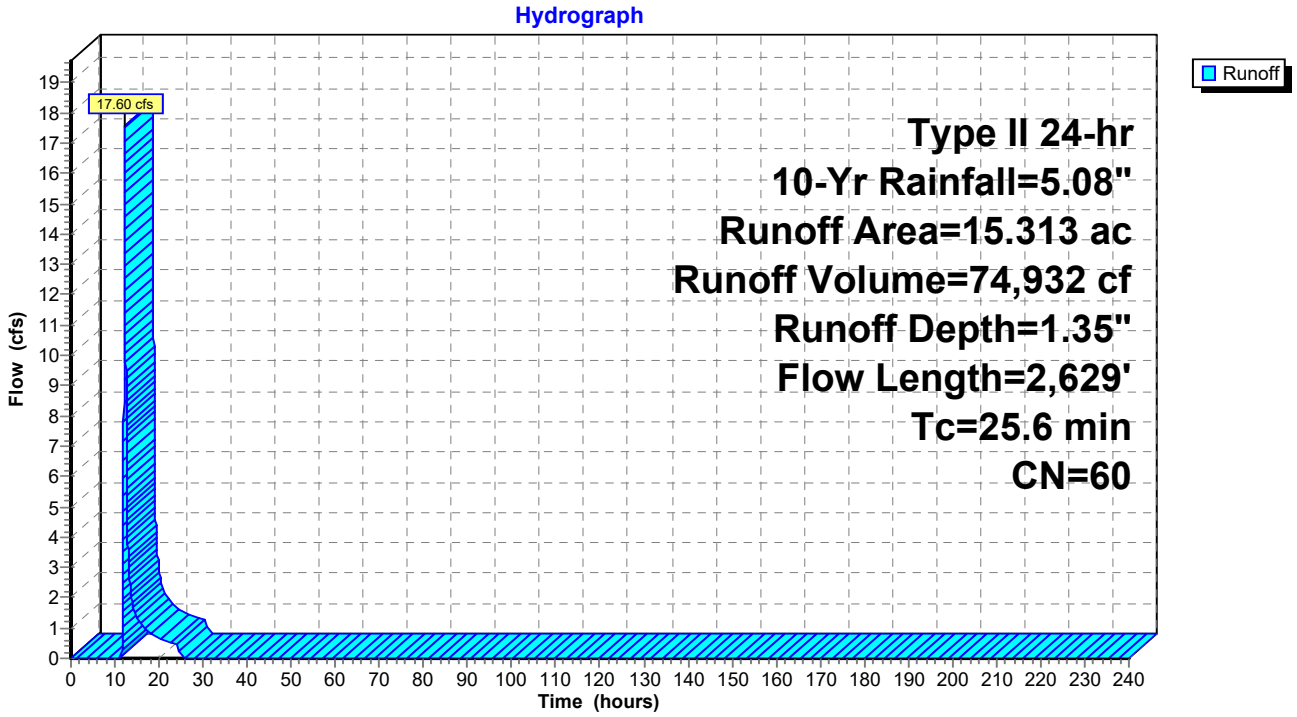
Runoff = 17.60 cfs @ 12.21 hrs, Volume= 74,932 cf, Depth= 1.35"
Routed to Link 2-POI : Pre-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	4.355	55	Woods, Good, HSG B
*	0.070	58	Meadow, non-grazed, HSG B
*	10.742	61	Pasture/grassland/range, Good, HSG B
	0.020	80	Pasture/grassland/range, Good, HSG D
*	0.077	98	Gravel roads, HSG B
	0.049	98	Paved parking, HSG B
	15.313	60	Weighted Average
	15.187		99.18% Pervious Area
	0.126		0.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.2	105	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.8	650	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	11	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	306	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
25.6	2,629	Total			

Subcatchment 2A: Pre-Development DA-2 (On-Site)



Summary for Subcatchment 2B: Pre-Development DA-2 (Off-Site)

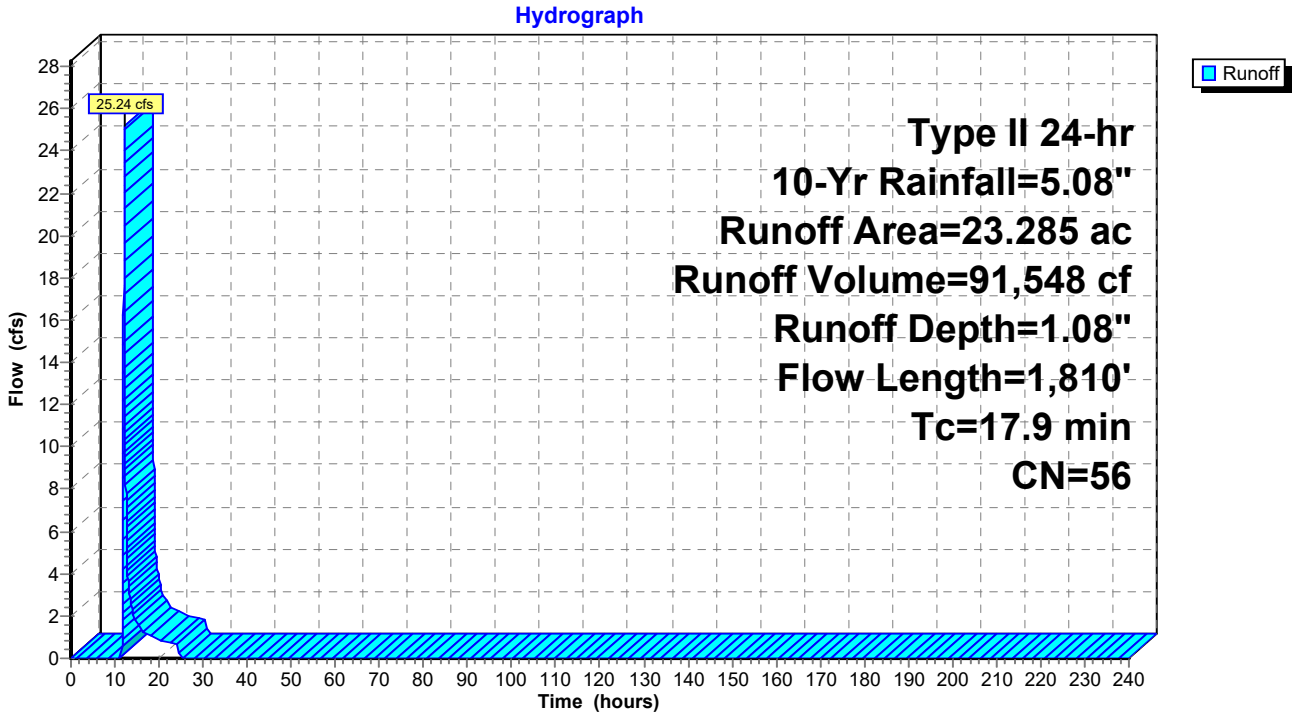
Runoff = 25.24 cfs @ 12.13 hrs, Volume= 91,548 cf, Depth= 1.08"
Routed to Link 2-POI : Pre-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
18.151	55	Woods, Good, HSG B
0.115	77	Woods, Good, HSG D
4.483	58	Meadow, non-grazed, HSG B
0.219	78	Meadow, non-grazed, HSG D
0.317	98	Paved parking, HSG B
23.285	56	Weighted Average
22.968		98.64% Pervious Area
0.317		1.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
6.7	495	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	183	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
17.9	1,810	Total			

Subcatchment 2B: Pre-Development DA-2 (Off-Site)



Summary for Subcatchment 3A: Pre-Development DA-3 (On-Site)

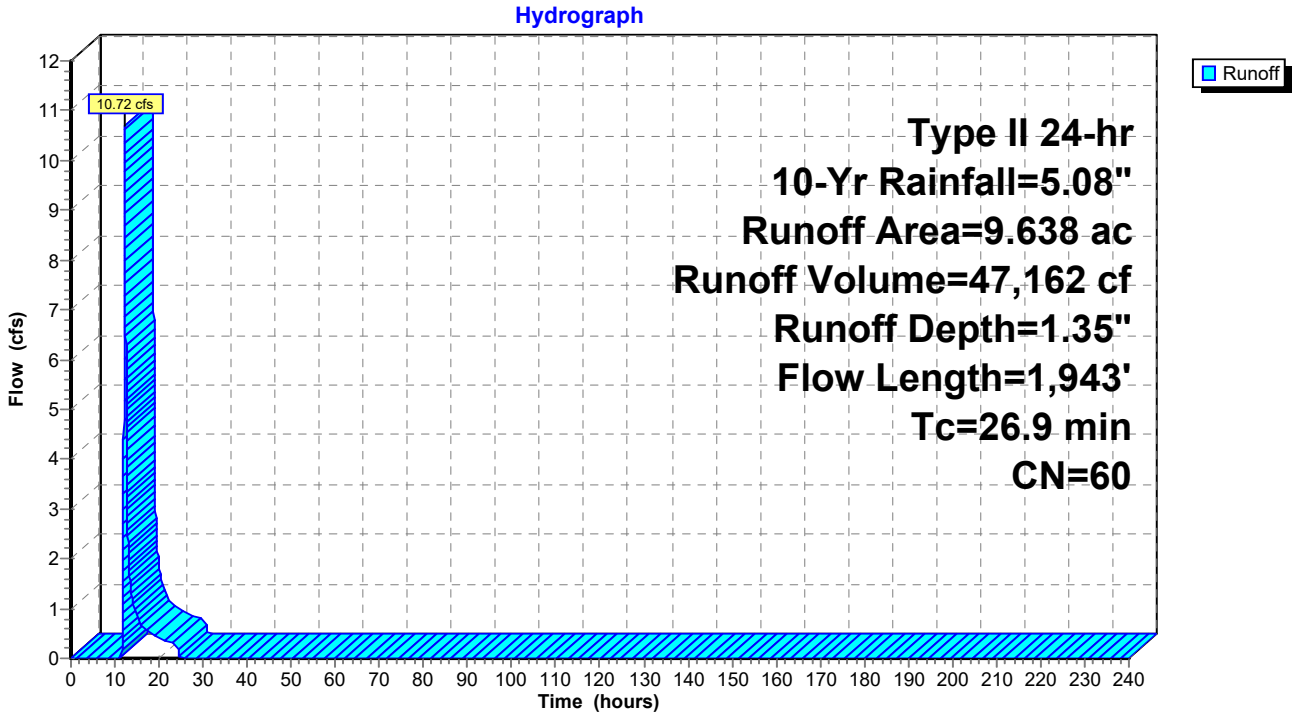
Runoff = 10.72 cfs @ 12.23 hrs, Volume= 47,162 cf, Depth= 1.35"
Routed to Link 3-POI : Pre-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	2.838	55	Woods, Good, HSG B
	4.772	58	Meadow, non-grazed, HSG B
	1.455	61	Pasture/grassland/range, Good, HSG B
*	0.573	98	Gravel roads, HSG B
	9.638	60	Weighted Average
	9.065		94.05% Pervious Area
	0.573		5.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
4.4	318	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.4	802	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	145	0.0700	6.56	9.84	**Trap/Vee/Rect Channel Flow, Stream L160-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030 Stream, clean & straight
0.2	96	0.0200	7.45	89.38	**Trap/Vee/Rect Channel Flow, Stream L159-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Stream, clean & straight
1.7	532	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Stream, clean & straight
26.9	1,943	Total			

Subcatchment 3A: Pre-Development DA-3 (On-Site)



Summary for Subcatchment 3B: Pre-Development DA-3 (Off-Site)

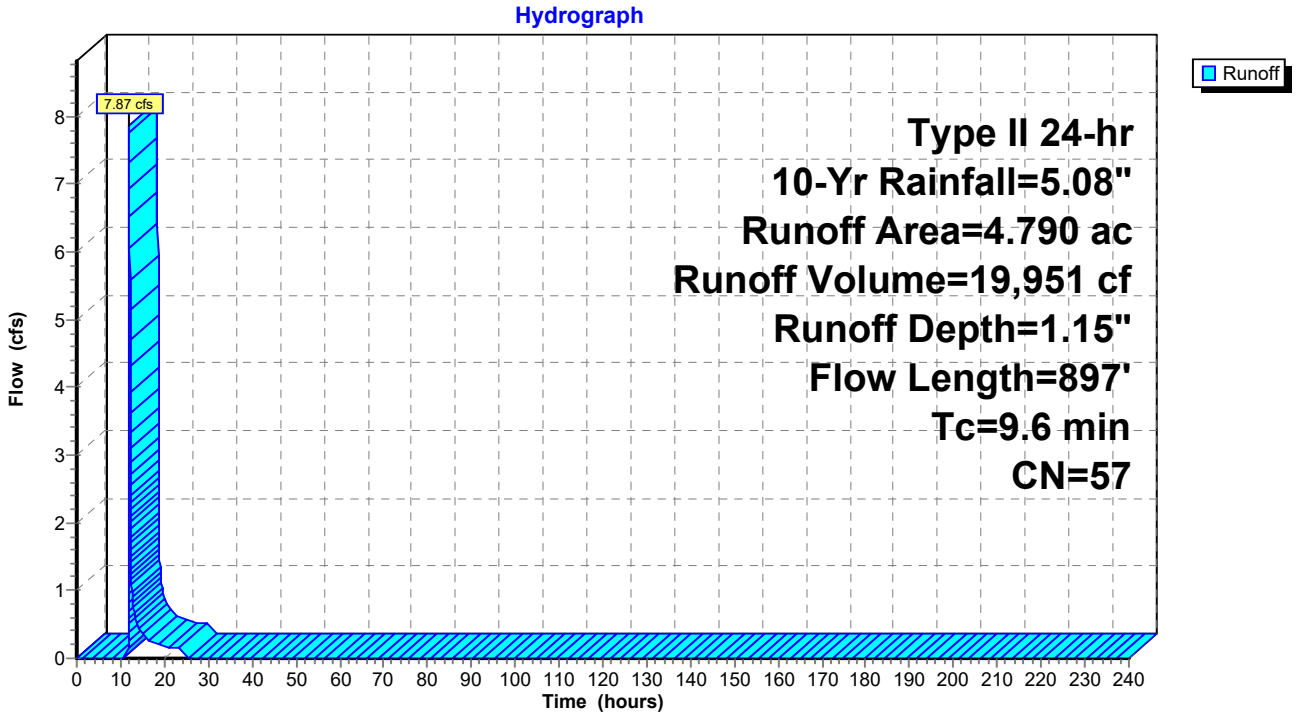
Runoff = 7.87 cfs @ 12.03 hrs, Volume= 19,951 cf, Depth= 1.15"
Routed to Link 3-POI : Pre-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
2.234	55	Woods, Good, HSG B
2.556	58	Meadow, non-grazed, HSG B
4.790	57	Weighted Average
4.790		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0500	0.15		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.4	35	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	339	0.0400	3.00		**Shallow Concentrated Flow, Wetland W266-2** Grassed Waterway Kv= 15.0 fps
0.9	257	0.0400	4.96	7.44	**Trap/Vee/Rect Channel Flow, Stream L157-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030
0.6	112	0.0500	3.35		**Shallow Concentrated Flow, Wetland W258-1** Grassed Waterway Kv= 15.0 fps
0.3	104	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
9.6	897	Total			

Subcatchment 3B: Pre-Development DA-3 (Off-Site)



Summary for Subcatchment 4A: Pre-Development DA-4 (On-Site)

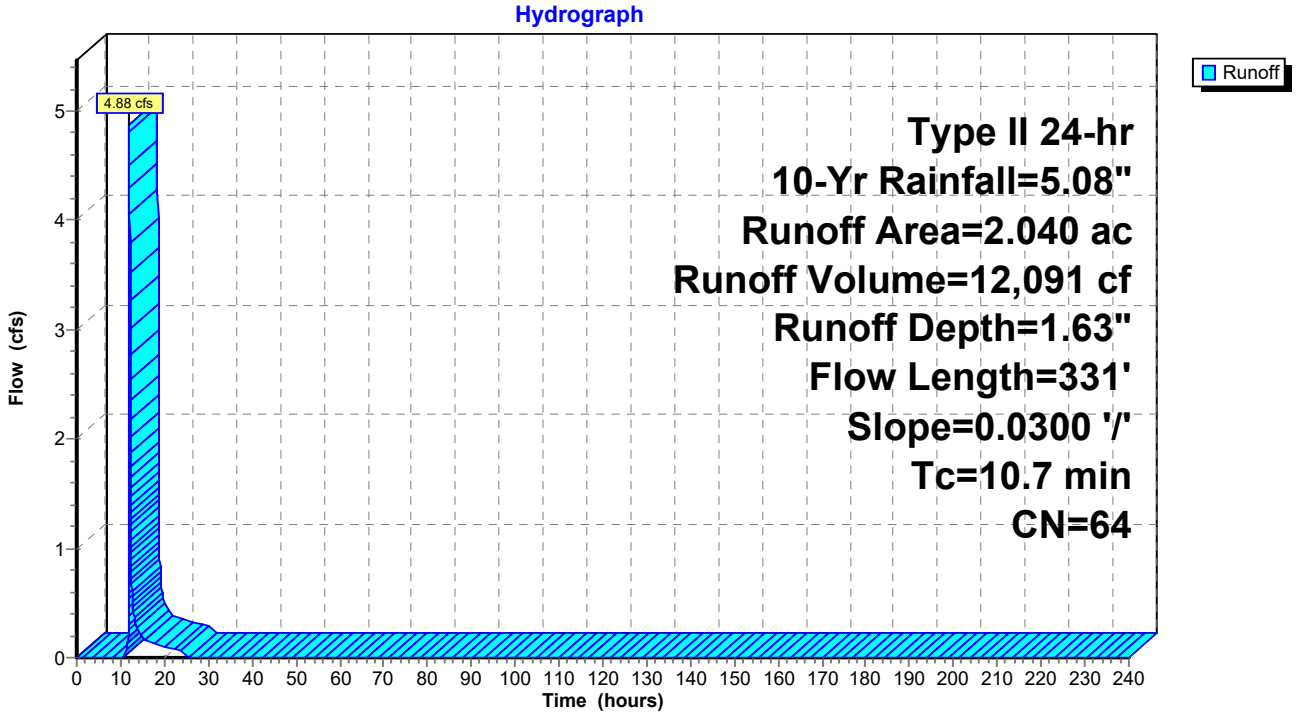
Runoff = 4.88 cfs @ 12.03 hrs, Volume= 12,091 cf, Depth= 1.63"
Routed to Link 4-POI : Pre-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	0.101	55	Woods, Good, HSG B
	1.562	58	Meadow, non-grazed, HSG B
*	0.061	61	Pasture/grassland/range, Good, HSG B
*	0.290	98	Gravel roads, HSG B
	0.026	98	Paved parking, HSG B
	2.040	64	Weighted Average
	1.724		84.51% Pervious Area
	0.316		15.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.9	281	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.7	331	Total			

Subcatchment 4A: Pre-Development DA-4 (On-Site)



Summary for Subcatchment 4B: Pre-Development DA-4 (Off-Site)

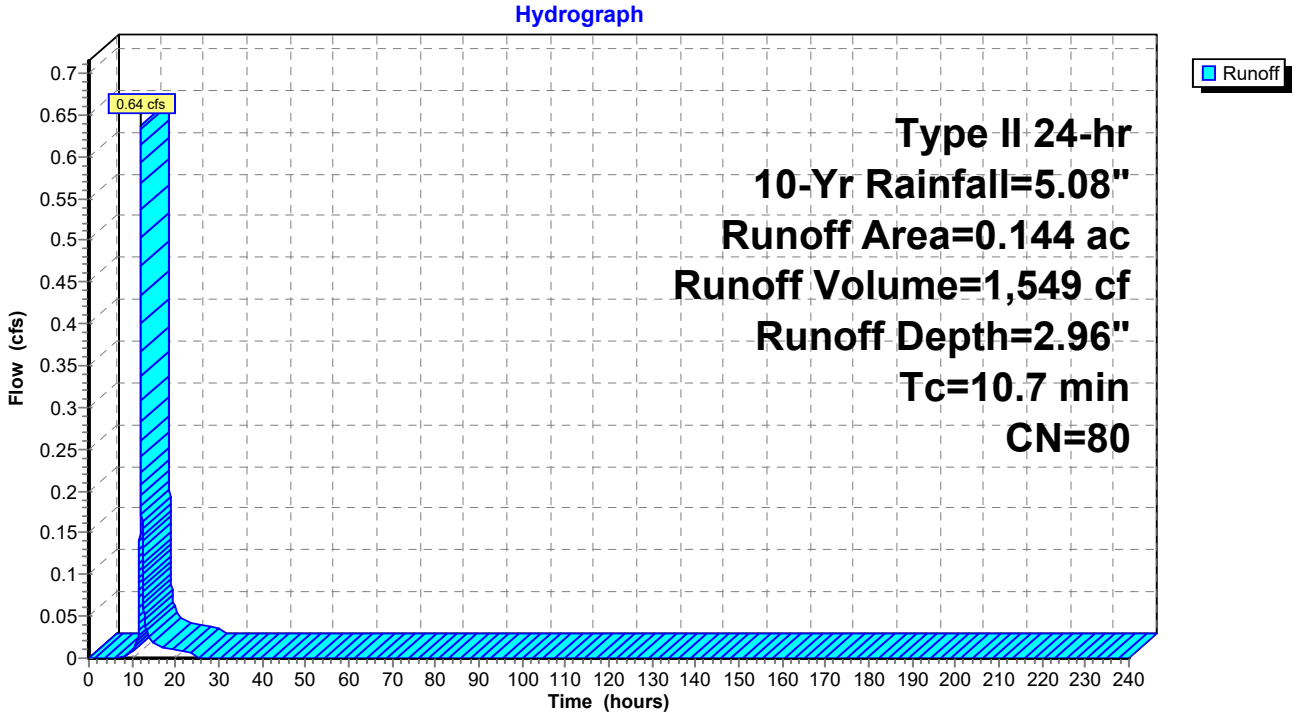
Runoff = 0.64 cfs @ 12.02 hrs, Volume= 1,549 cf, Depth= 2.96"
Routed to Link 4-POI : Pre-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
0.066	58	Meadow, non-grazed, HSG B
0.078	98	Paved parking, HSG B
0.144	80	Weighted Average
0.066		45.83% Pervious Area
0.078		54.17% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7					**Direct Entry, Assumed On-Site TC**

Subcatchment 4B: Pre-Development DA-4 (Off-Site)

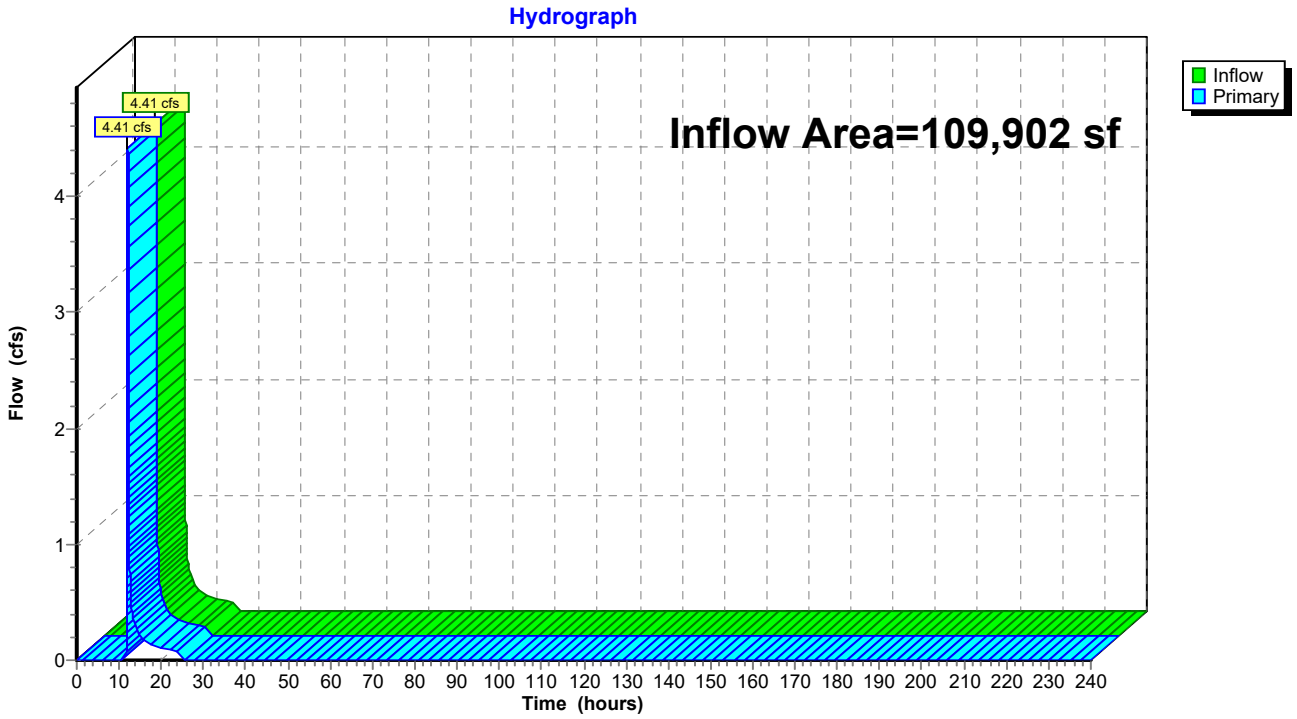


Summary for Link 1-POI: Pre-Development POA-1

Inflow Area = 109,902 sf, 5.55% Impervious, Inflow Depth = 1.37" for 10-Yr event
Inflow = 4.41 cfs @ 12.07 hrs, Volume= 12,573 cf
Primary = 4.41 cfs @ 12.07 hrs, Volume= 12,573 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 1-POI: Pre-Development POA-1

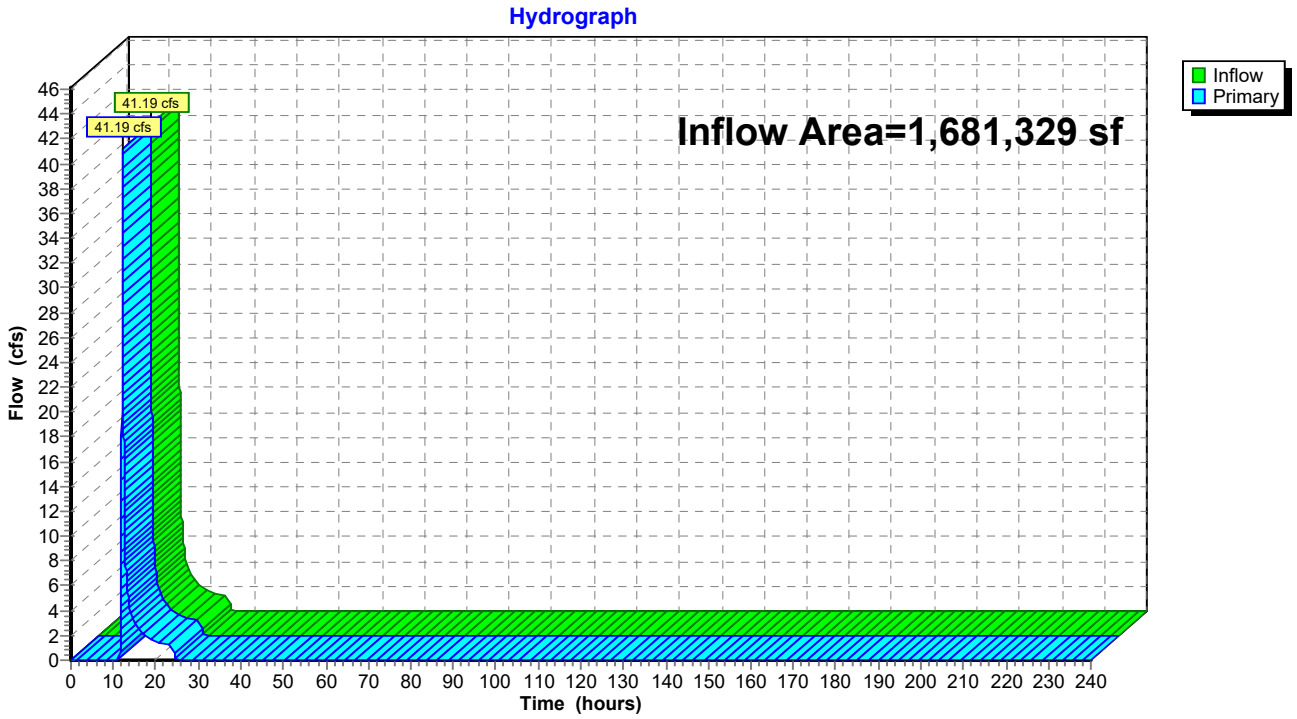


Summary for Link 2-POI: Pre-Development POA-2

Inflow Area = 1,681,329 sf, 1.15% Impervious, Inflow Depth = 1.19" for 10-Yr event
Inflow = 41.19 cfs @ 12.15 hrs, Volume= 166,480 cf
Primary = 41.19 cfs @ 12.15 hrs, Volume= 166,480 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 2-POI: Pre-Development POA-2

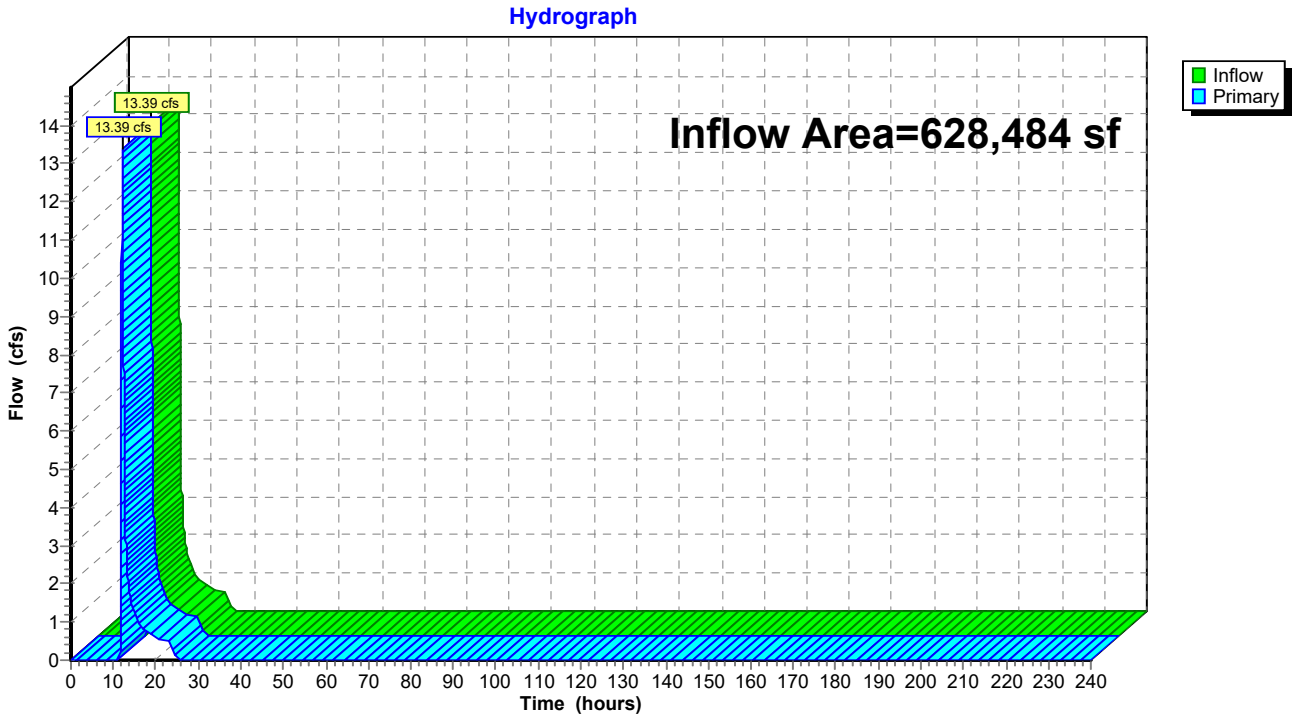


Summary for Link 3-POI: Pre-Development POA-3

Inflow Area = 628,484 sf, 3.97% Impervious, Inflow Depth = 1.28" for 10-Yr event
Inflow = 13.39 cfs @ 12.07 hrs, Volume= 67,113 cf
Primary = 13.39 cfs @ 12.07 hrs, Volume= 67,113 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 3-POI: Pre-Development POA-3

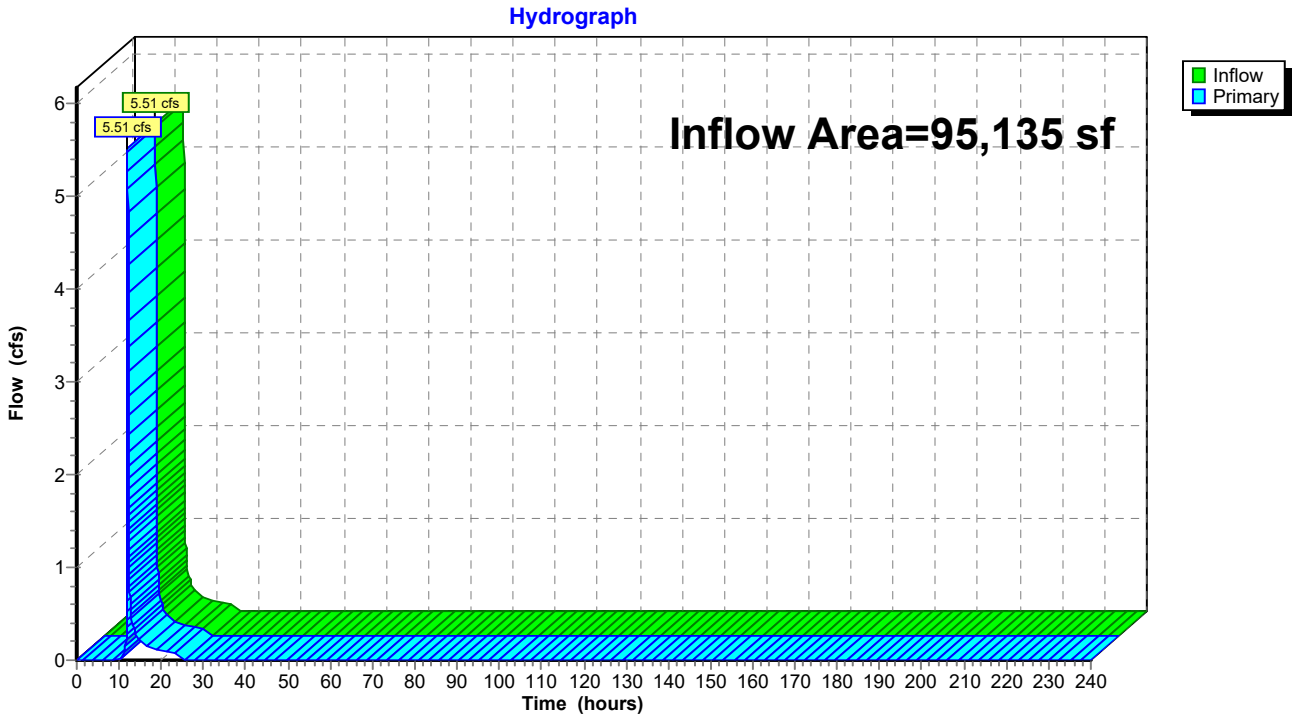


Summary for Link 4-POI: Pre-Development POA-4

Inflow Area = 95,135 sf, 18.04% Impervious, Inflow Depth = 1.72" for 10-Yr event
Inflow = 5.51 cfs @ 12.03 hrs, Volume= 13,640 cf
Primary = 5.51 cfs @ 12.03 hrs, Volume= 13,640 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 4-POI: Pre-Development POA-4



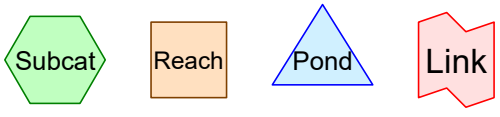
STATION 165
PRE-DEVELOPMENT
(FOREST)

Pre-Development DA-1
(On-Site, Forest)

Pre-Development DA-2
(On-Site, Forest)

Pre-Development DA-3
(On-Site, Forest)

Pre-Development DA-4
(On-Site, Forest)



Routing Diagram for 341-132-CV01-PCSM_CN98
Prepared by CEC Inc, Printed 5/8/2025

Summary for Subcatchment 1F: Pre-Development DA-1 (On-Site, Forest)

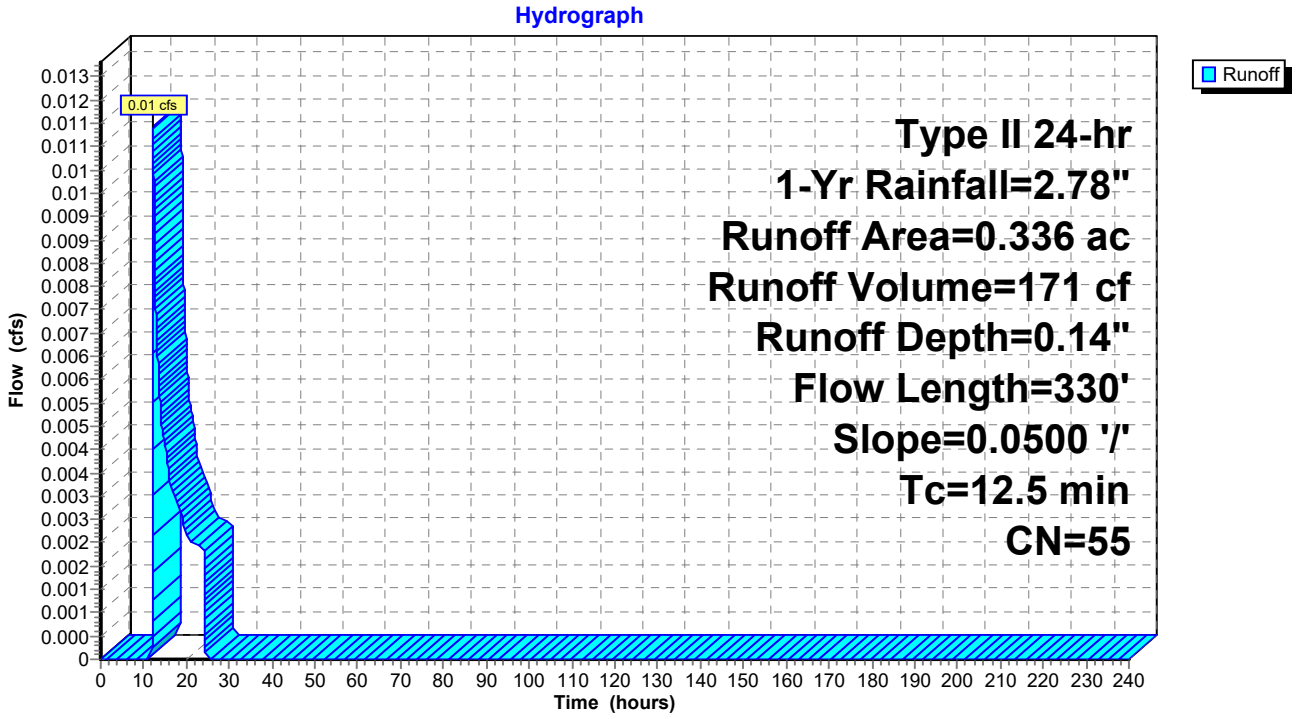
Runoff = 0.01 cfs @ 12.16 hrs, Volume= 171 cf, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
*	0.336	55	Woods, Good, HSG B
	0.336		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0500	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
4.2	280	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
12.5	330	Total			

Subcatchment 1F: Pre-Development DA-1 (On-Site, Forest)



Summary for Subcatchment 2F: Pre-Development DA-2 (On-Site, Forest)

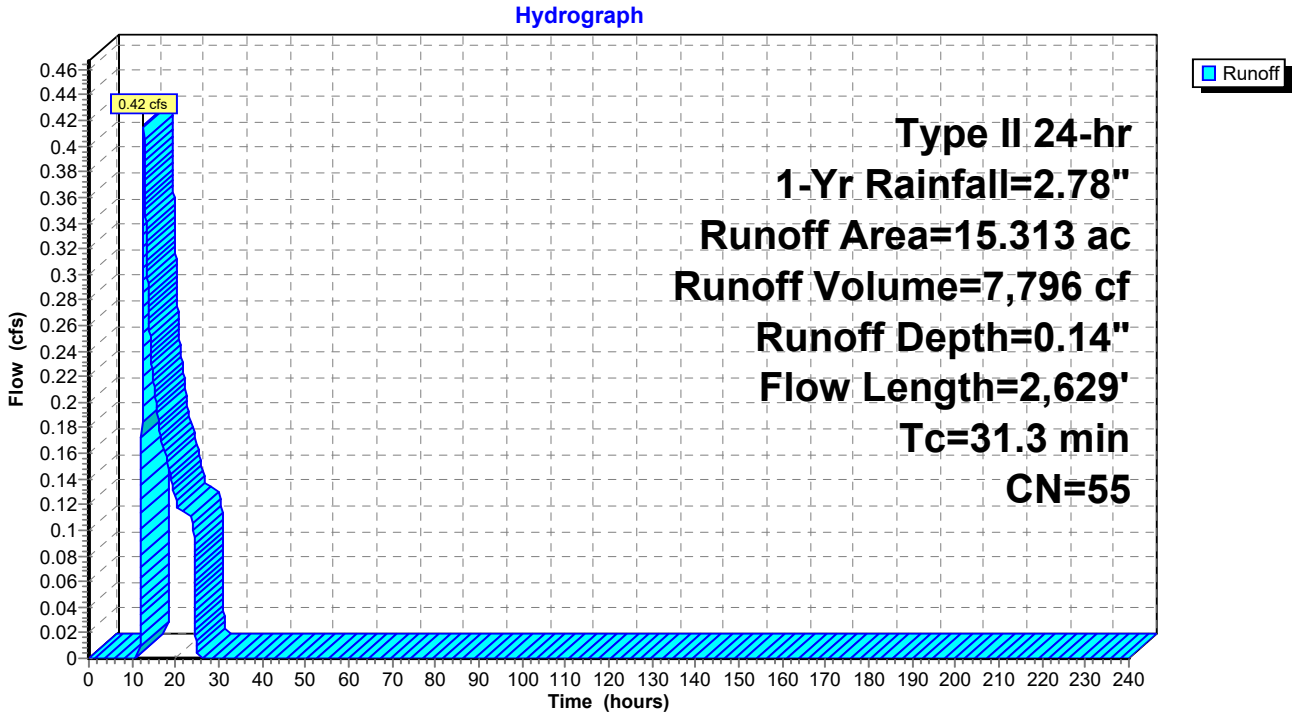
Runoff = 0.42 cfs @ 12.63 hrs, Volume= 7,796 cf, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
15.293	55	Woods, Good, HSG B
0.020	77	Woods, Good, HSG D
15.313	55	Weighted Average
15.313		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.7	105	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.8	650	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	11	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.1	191	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
4.2	285	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
31.3	2,629	Total			

Subcatchment 2F: Pre-Development DA-2 (On-Site, Forest)



Summary for Subcatchment 3F: Pre-Development DA-3 (On-Site, Forest)

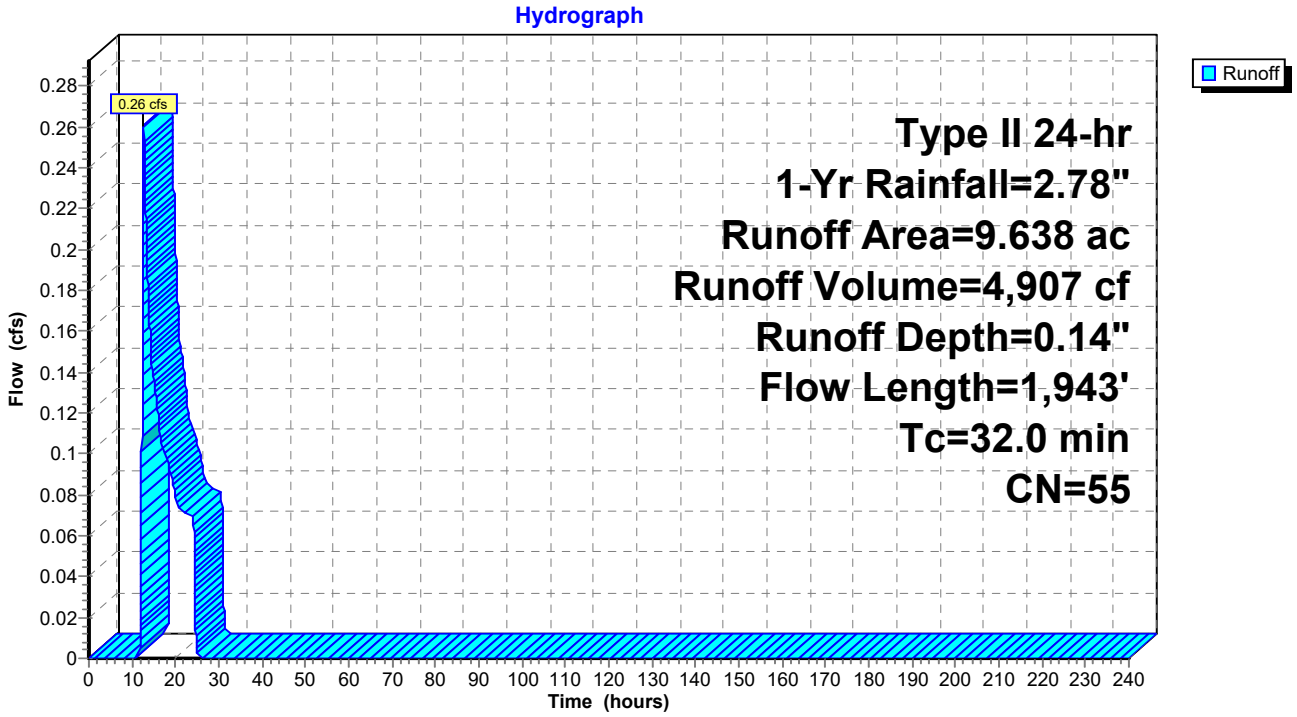
Runoff = 0.26 cfs @ 12.63 hrs, Volume= 4,907 cf, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
9.638	55	Woods, Good, HSG B
9.638		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
6.1	318	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	802	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	145	0.0700	6.56	9.84	**Trap/Vee/Rect Channel Flow, Stream L160-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030 Stream, clean & straight
0.2	96	0.0200	7.45	89.38	**Trap/Vee/Rect Channel Flow, Stream L159-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Stream, clean & straight
1.7	532	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030 Stream, clean & straight
32.0	1,943	Total			

Subcatchment 3F: Pre-Development DA-3 (On-Site, Forest)



Summary for Subcatchment 4F: Pre-Development DA-4 (On-Site, Forest)

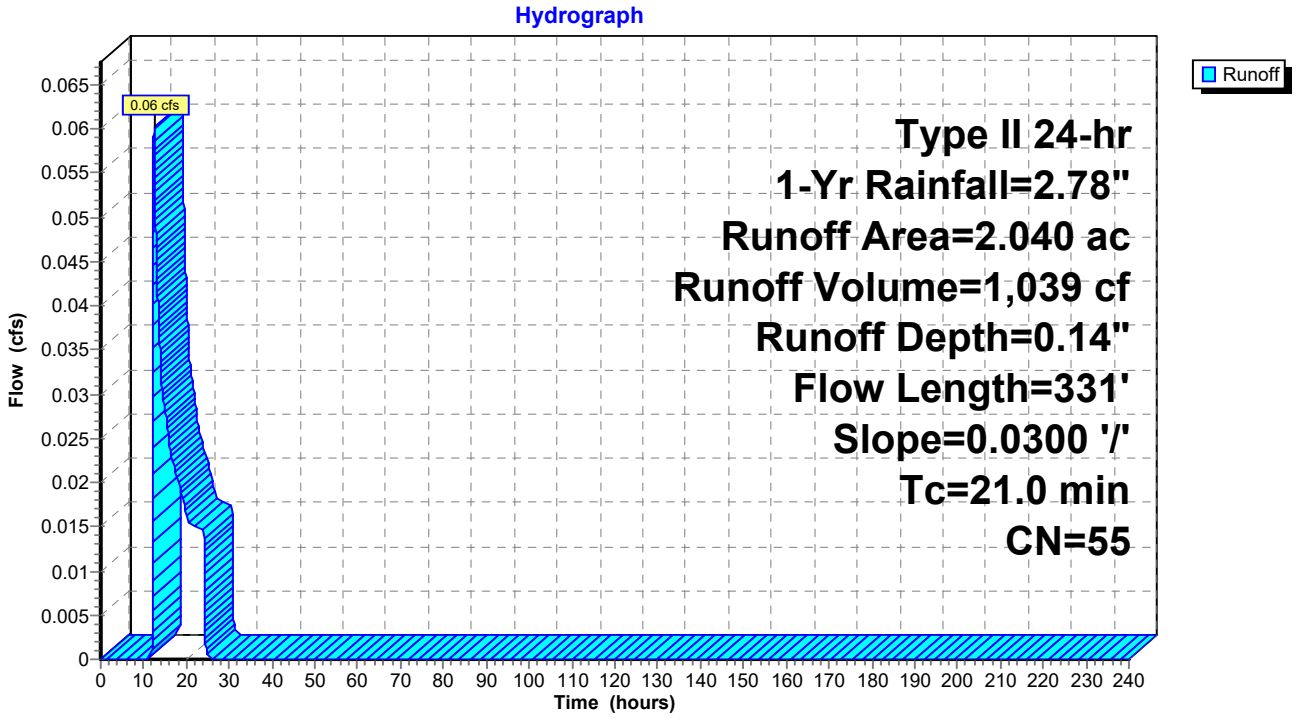
Runoff = 0.06 cfs @ 12.48 hrs, Volume= 1,039 cf, Depth= 0.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

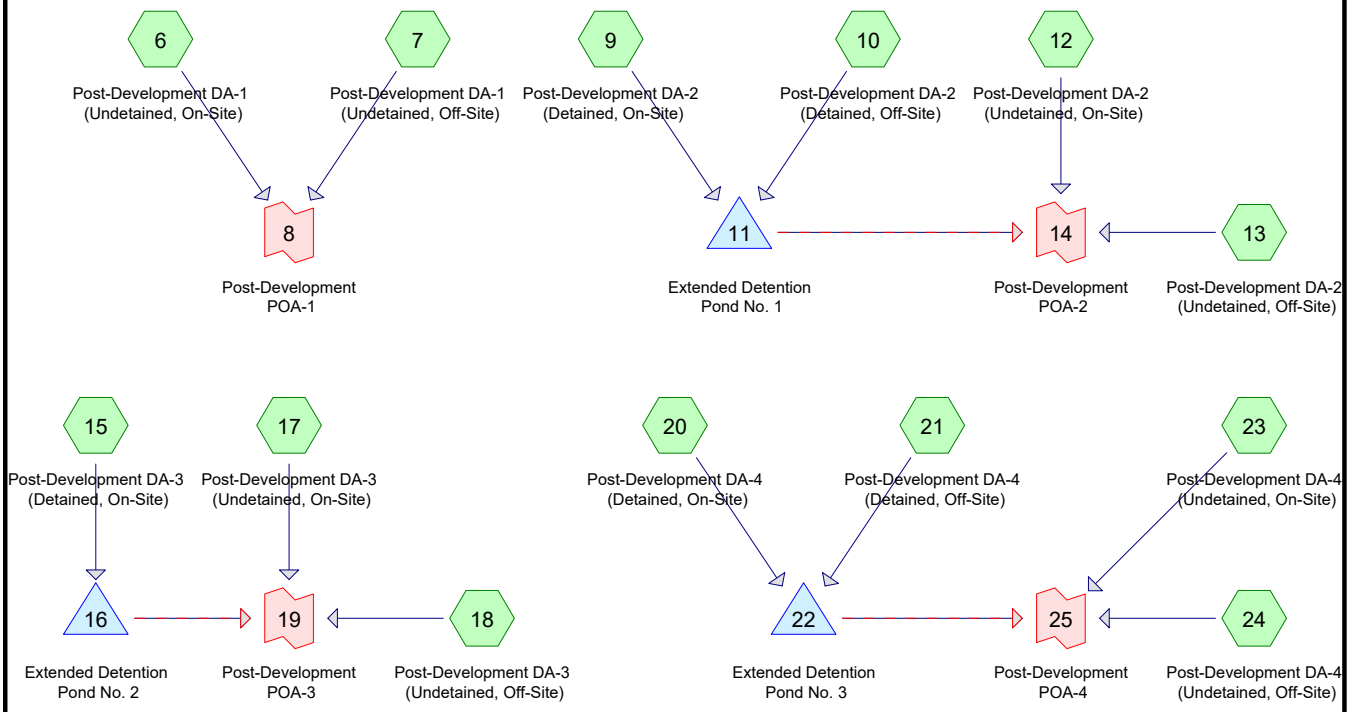
Area (ac)	CN	Description
2.040	55	Woods, Good, HSG B
2.040		100.00% Pervious Area

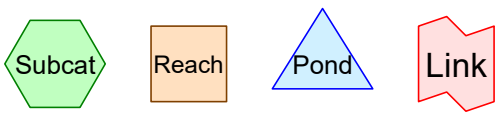
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
10.8	281	0.0300	0.43		**Shallow Concentrated Flow,** Forest w/Heavy Litter Kv= 2.5 fps
21.0	331	Total			

Subcatchment 4F: Pre-Development DA-4 (On-Site, Forest)



STATION 165
POST-DEVELOPMENT





Routing Diagram for 341-132-CV01-PCSM_CN98_JMP WORKING
Prepared by CEC Inc, Printed 5/29/2025

Summary for Subcatchment 6: Post-Development DA-1 (Undetained, On-Site)

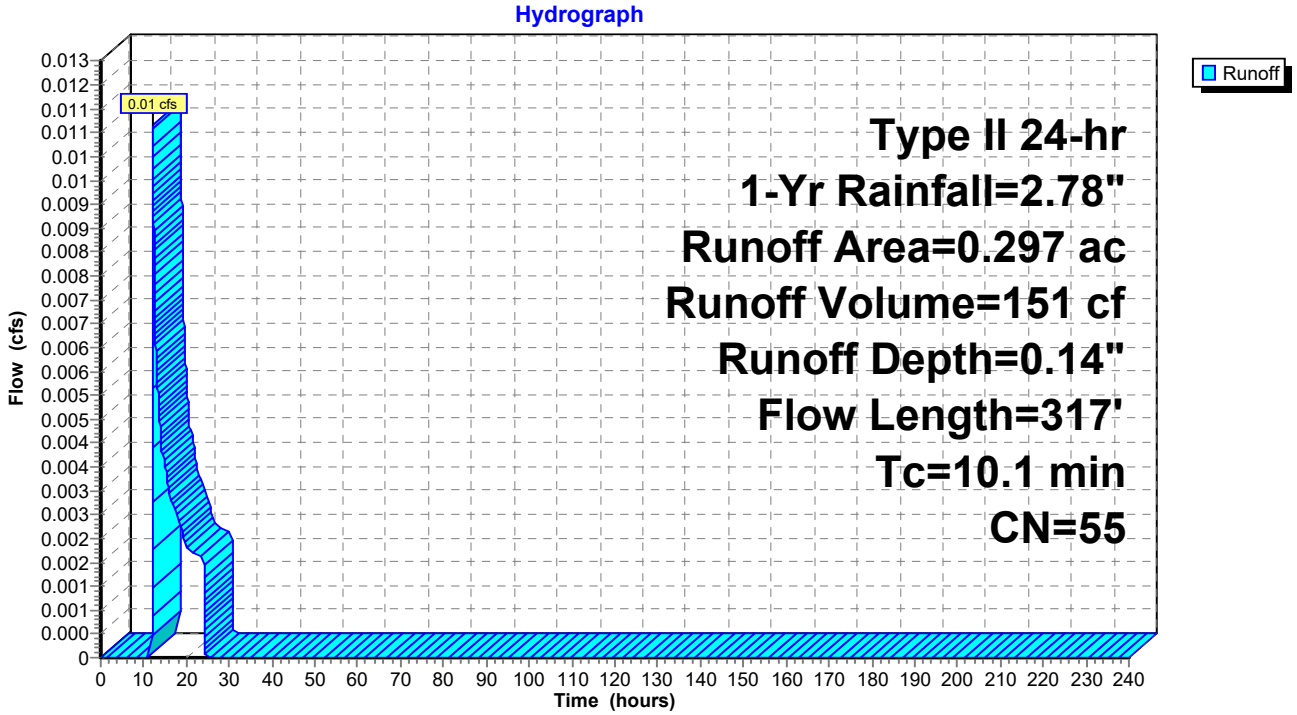
Runoff = 0.01 cfs @ 12.11 hrs, Volume= 151 cf, Depth= 0.14"
Routed to Link 8 : Post-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
0.031	55	Woods, Good, HSG B
0.266	55	Woods, Good, HSG B
0.297	55	Weighted Average
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.6	62	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	205	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	317	Total			

Subcatchment 6: Post-Development DA-1 (Undetained, On-Site)



Summary for Subcatchment 7: Post-Development DA-1 (Undetained, Off-Site)

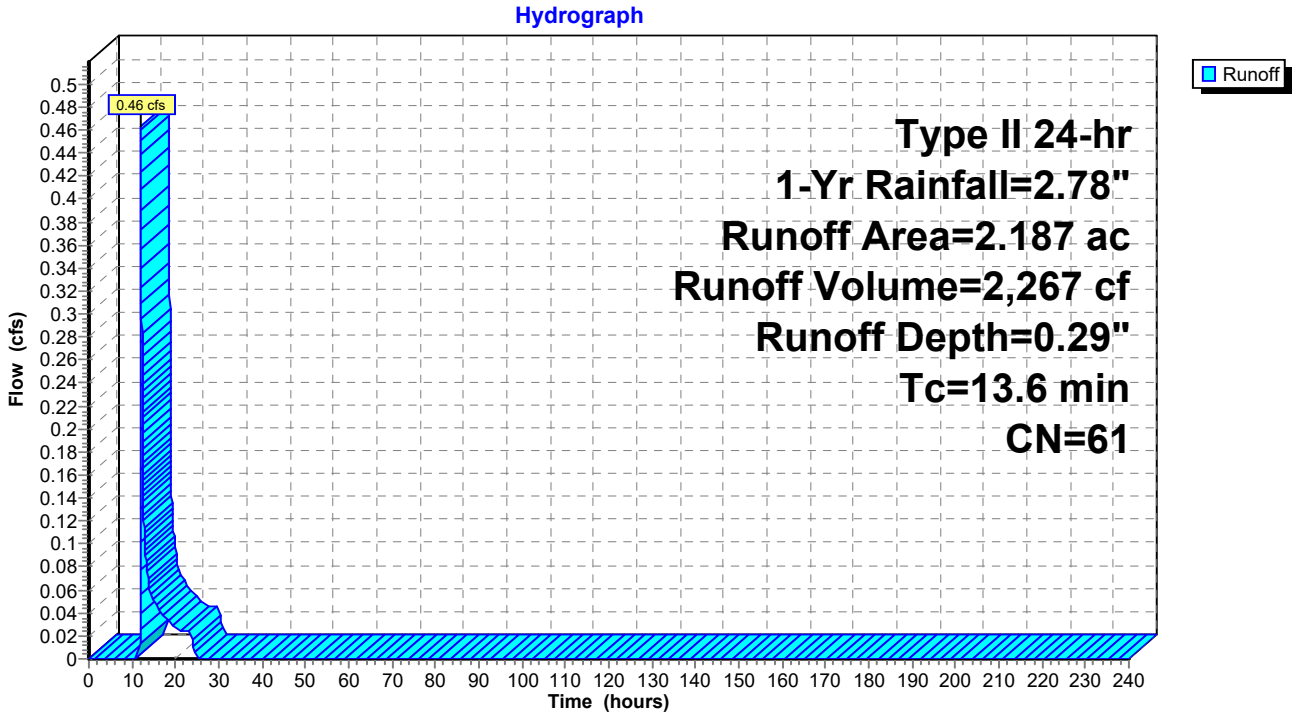
Runoff = 0.46 cfs @ 12.10 hrs, Volume= 2,267 cf, Depth= 0.29"
Routed to Link 8 : Post-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	1.234	55	Woods, Good, HSG B
	0.256	77	Woods, Good, HSG D
	0.515	58	Meadow, non-grazed, HSG B
	0.042	78	Meadow, non-grazed, HSG D
*	0.069	98	Gravel roads, HSG B
	0.071	98	Paved parking, HSG B
	2.187	61	Weighted Average
	2.047		93.60% Pervious Area
	0.140		6.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Assumed Equal to Pre-Development Detained Off-S**

Subcatchment 7: Post-Development DA-1 (Undetained, Off-Site)



Summary for Subcatchment 9: Post-Development DA-2 (Detained, On-Site)

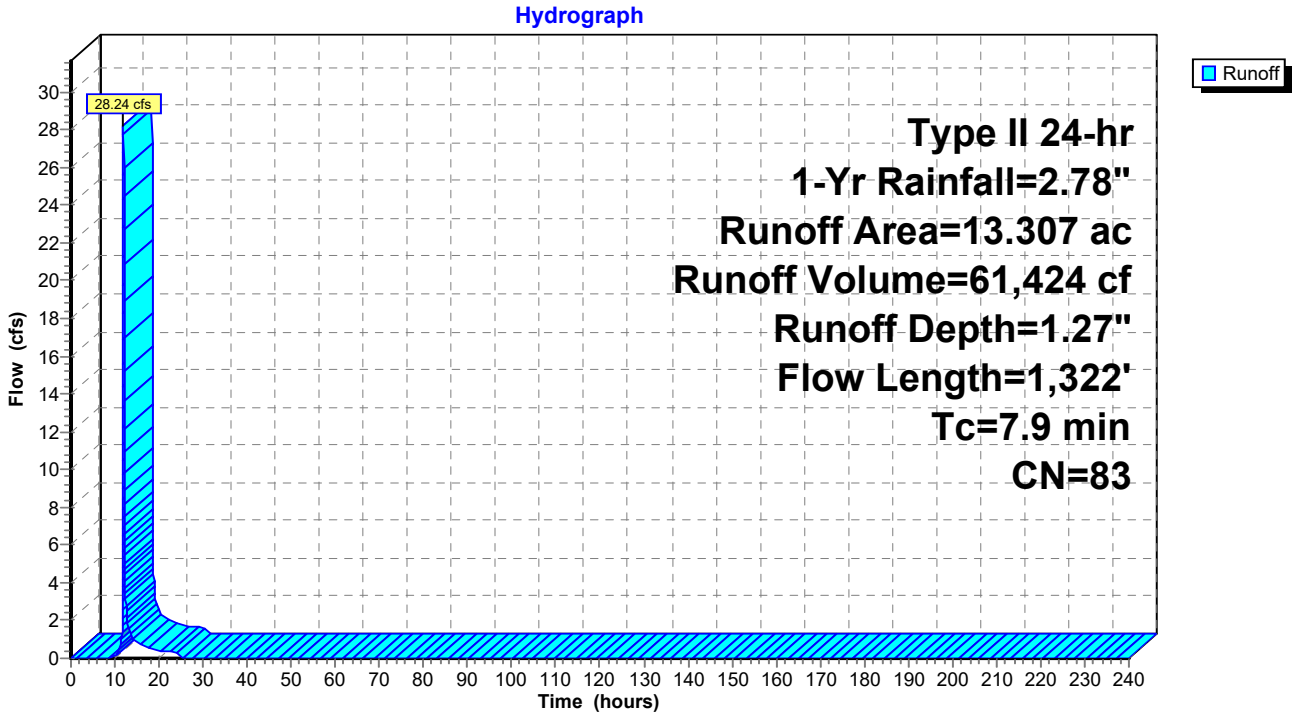
Runoff = 28.24 cfs @ 12.00 hrs, Volume= 61,424 cf, Depth= 1.27"
Routed to Pond 11 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	1.116	55	Woods, Good, HSG B
	1.362	70	Woods, Good, HSG C
	0.020	77	Woods, Good, HSG D
	2.398	58	Meadow, non-grazed, HSG B
	0.775	71	Meadow, non-grazed, HSG C
	0.092	74	>75% Grass cover, Good, HSG C
*	3.439	98	Gravel roads, HSG B
*	4.026	98	Gravel roads, HSG C
	0.079	98	Paved parking, HSG B
	13.307	83	Weighted Average
	5.763		43.31% Pervious Area
	7.544		56.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
3.9	380	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	153	0.0050	4.55	8.05	**Pipe Channel, PD-2** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.5	127	0.0050	4.55	8.05	**Pipe Channel, PD-3** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.7	192	0.0050	4.55	8.05	**Pipe Channel, PD-4** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.6	192	0.0050	5.52	17.33	**Pipe Channel, PD-5** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.4	148	0.0050	5.52	17.33	**Pipe Channel, PD-6** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.2710	47.12	231.32	**Pipe Channel, PD-13** 30.00" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.0250	14.31	70.26	**Pipe Channel, PD-13A** 30.00" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
7.9	1,322	Total			

Subcatchment 9: Post-Development DA-2 (Detained, On-Site)



Summary for Subcatchment 10: Post-Development DA-2 (Detained, Off-Site)

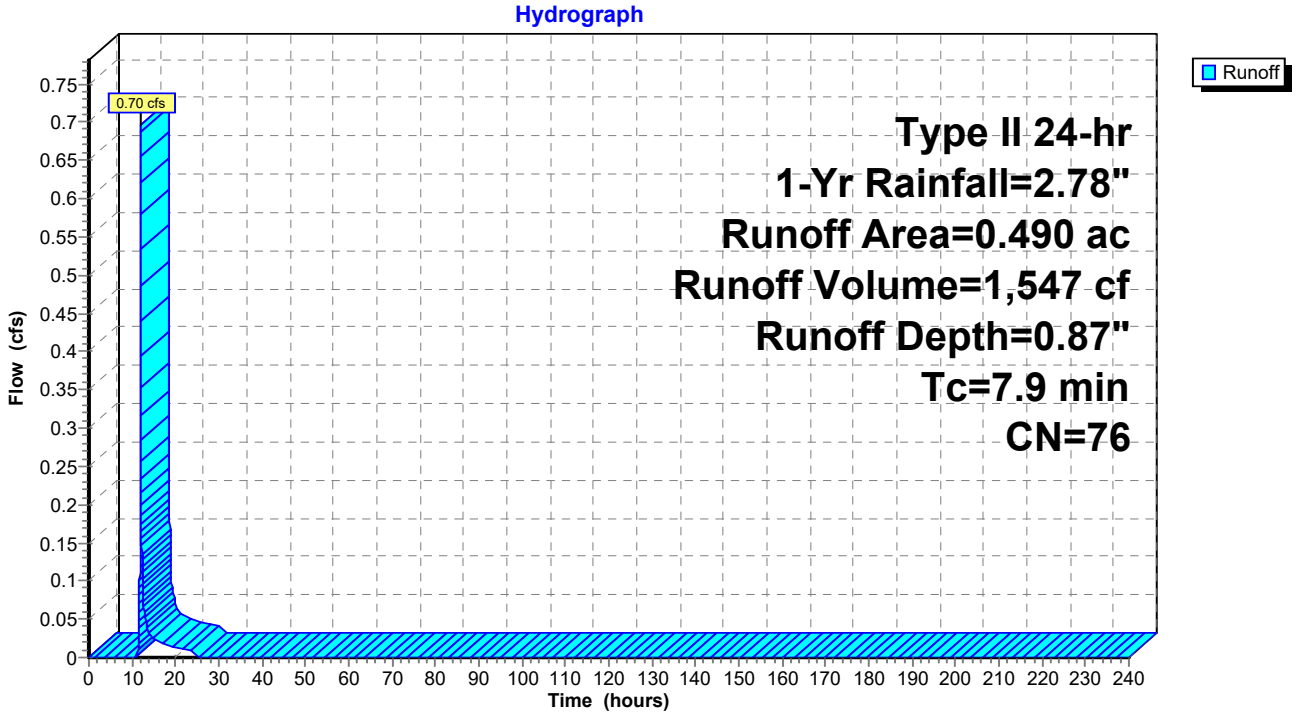
Runoff = 0.70 cfs @ 12.00 hrs, Volume= 1,547 cf, Depth= 0.87"
Routed to Pond 11 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
0.019	55	Woods, Good, HSG B
0.066	77	Woods, Good, HSG D
0.198	58	Meadow, non-grazed, HSG B
0.041	78	Meadow, non-grazed, HSG D
0.166	98	Paved parking, HSG B
0.490	76	Weighted Average
0.324		66.12% Pervious Area
0.166		33.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9					**Direct Entry, Assumed Equal to Detained On-Site TC**

Subcatchment 10: Post-Development DA-2 (Detained, Off-Site)



Summary for Subcatchment 12: Post-Development DA-2 (Undetained, On-Site)

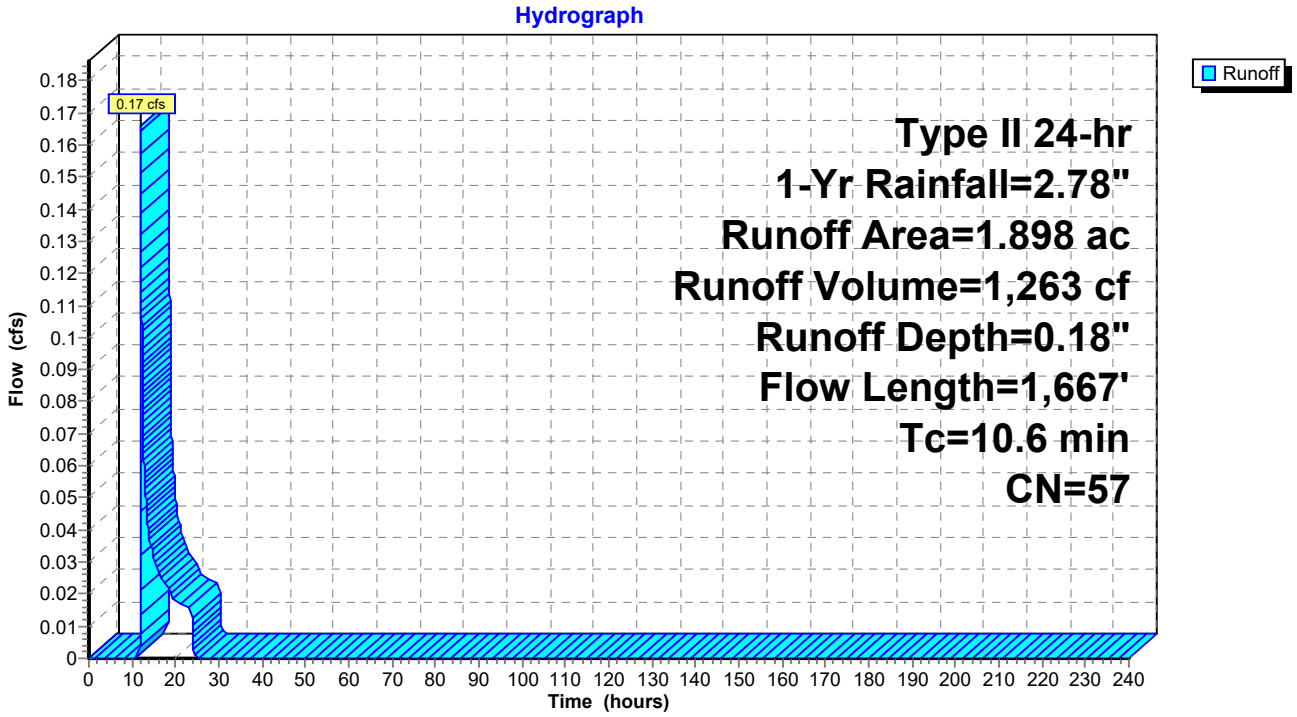
Runoff = 0.17 cfs @ 12.09 hrs, Volume= 1,263 cf, Depth= 0.18"
Routed to Link 14 : Post-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	1.037	55	Woods, Good, HSG B
	0.306	55	Woods, Good, HSG B
	0.476	58	Meadow, non-grazed, HSG B
	0.028	71	Meadow, non-grazed, HSG C
	0.042	74	>75% Grass cover, Good, HSG C
*	0.009	98	Gravel roads, HSG C
	1.898	57	Weighted Average
	1.889		99.53% Pervious Area
	0.009		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.4	110	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
10.6	1,667	Total			

Subcatchment 12: Post-Development DA-2 (Undetained, On-Site)



Summary for Subcatchment 13: Post-Development DA-2 (Undetained, Off-Site)

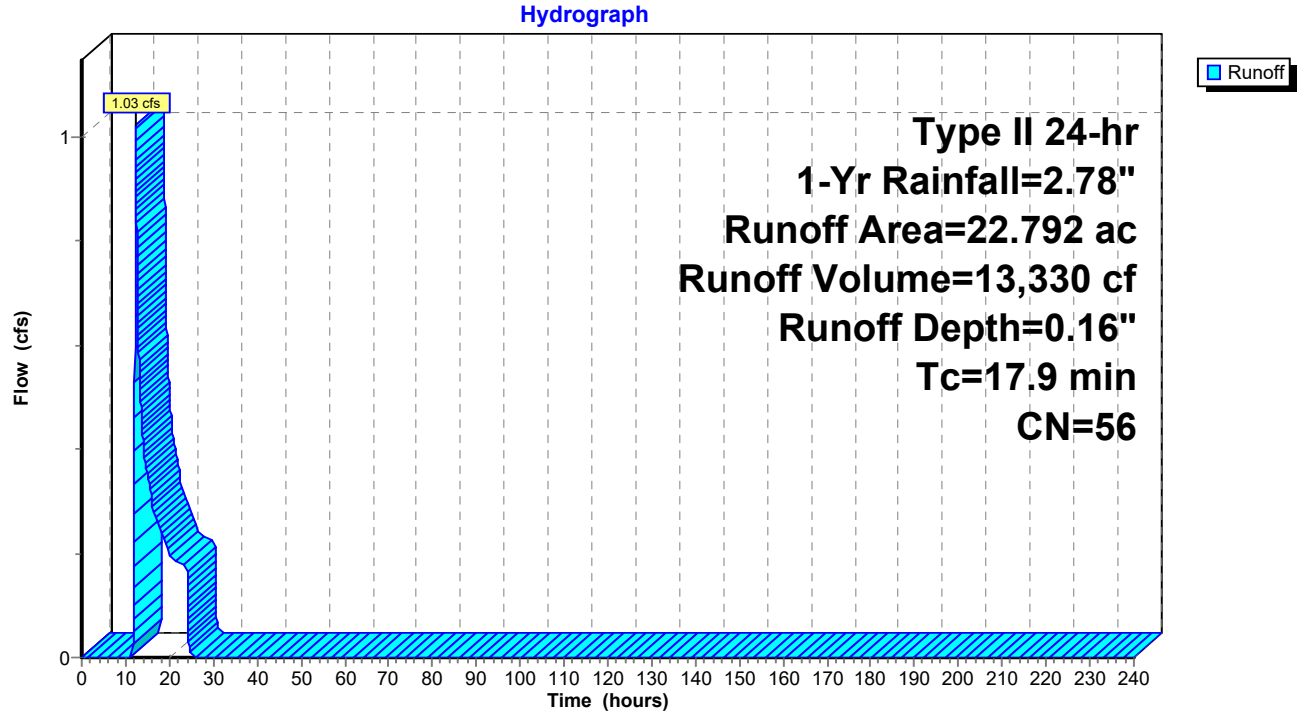
Runoff = 1.03 cfs @ 12.23 hrs, Volume= 13,330 cf, Depth= 0.16"
Routed to Link 14 : Post-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
18.132	55	Woods, Good, HSG B
0.049	77	Woods, Good, HSG D
4.286	58	Meadow, non-grazed, HSG B
0.178	78	Meadow, non-grazed, HSG D
0.147	98	Paved parking, HSG B
22.792	56	Weighted Average
22.645		99.36% Pervious Area
0.147		0.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9					**Direct Entry, Assumed Pre-Development Off-Site TC**

Subcatchment 13: Post-Development DA-2 (Undetained, Off-Site)



Summary for Subcatchment 15: Post-Development DA-3 (Detained, On-Site)

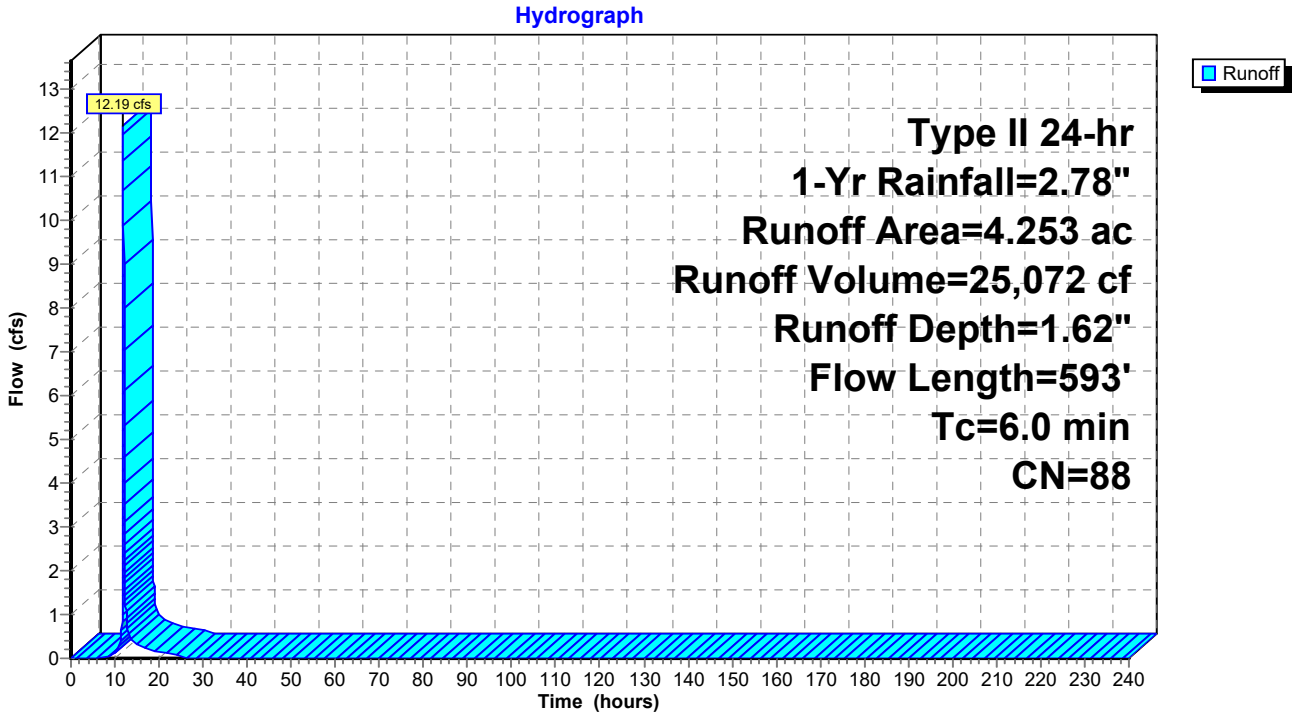
Runoff = 12.19 cfs @ 11.97 hrs, Volume= 25,072 cf, Depth= 1.62"
Routed to Pond 16 : Extended Detention Pond No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	0.118	55	Woods, Good, HSG B
	0.799	58	Meadow, non-grazed, HSG B
	0.231	71	Meadow, non-grazed, HSG C
*	1.777	98	Gravel roads, HSG B
*	1.328	98	Gravel roads, HSG C
	4.253	88	Weighted Average
	1.148		26.99% Pervious Area
	3.105		73.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
2.7	263	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	110	0.0050	4.03	4.95	**Pipe Channel, PD-20** 15.00" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
0.3	100	0.0100	6.44	11.38	**Pipe Channel, PD-22** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	70	0.0500	14.40	25.45	**Pipe Channel, PD-23** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.5	593	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15: Post-Development DA-3 (Detained, On-Site)



Summary for Subcatchment 17: Post-Development DA-3 (Undetained, On-Site)

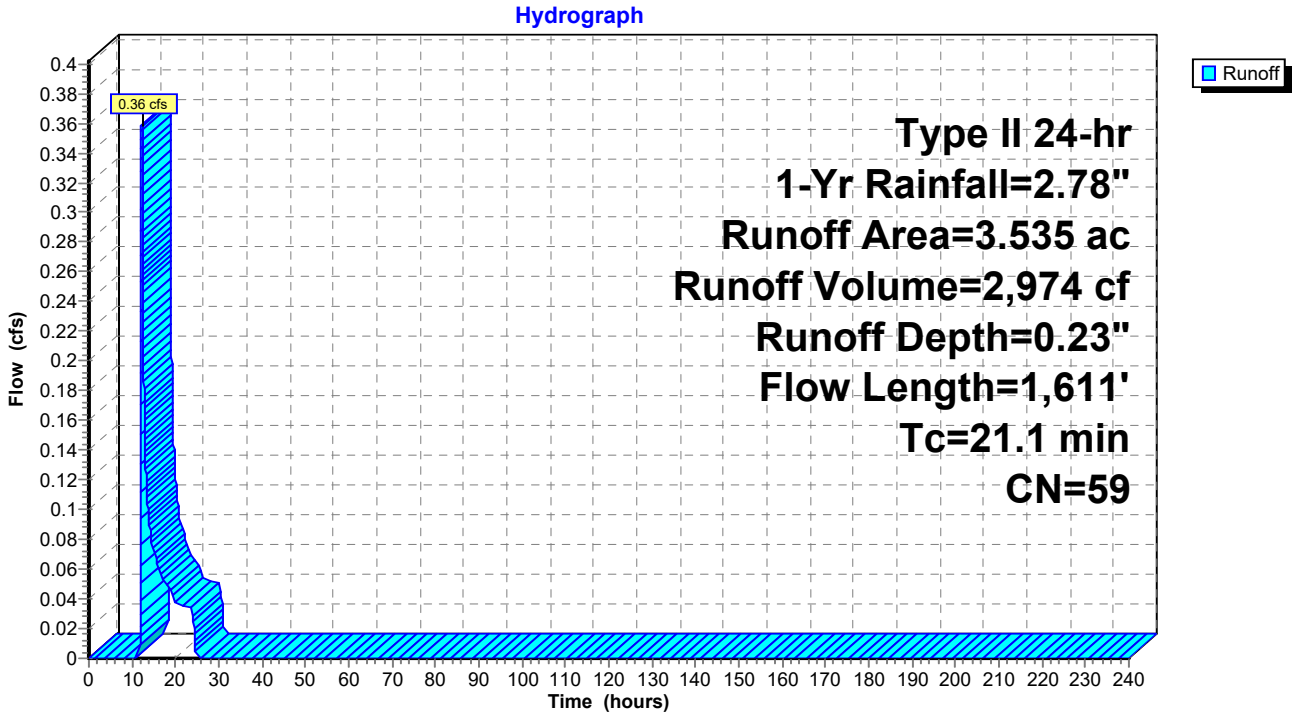
Runoff = 0.36 cfs @ 12.24 hrs, Volume= 2,974 cf, Depth= 0.23"
Routed to Link 19 : Post-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	0.516	55	Woods, Good, HSG B
	0.343	70	Woods, Good, HSG C
	2.556	58	Meadow, non-grazed, HSG B
	0.079	61	>75% Grass cover, Good, HSG B
*	0.041	98	Gravel roads, HSG C
	3.535	59	Weighted Average
	3.494		98.84% Pervious Area
	0.041		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
2.4	205	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	374	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.9	158	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	51	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	145	0.0700	6.56	9.84	**Trap/Vee/Rect Channel Flow, Stream L160-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030
0.2	96	0.0200	7.45	89.38	**Trap/Vee/Rect Channel Flow, Stream L159-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
1.7	532	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
21.1	1,611	Total			

Subcatchment 17: Post-Development DA-3 (Undetained, On-Site)



Summary for Subcatchment 18: Post-Development DA-3 (Undetained, Off-Site)

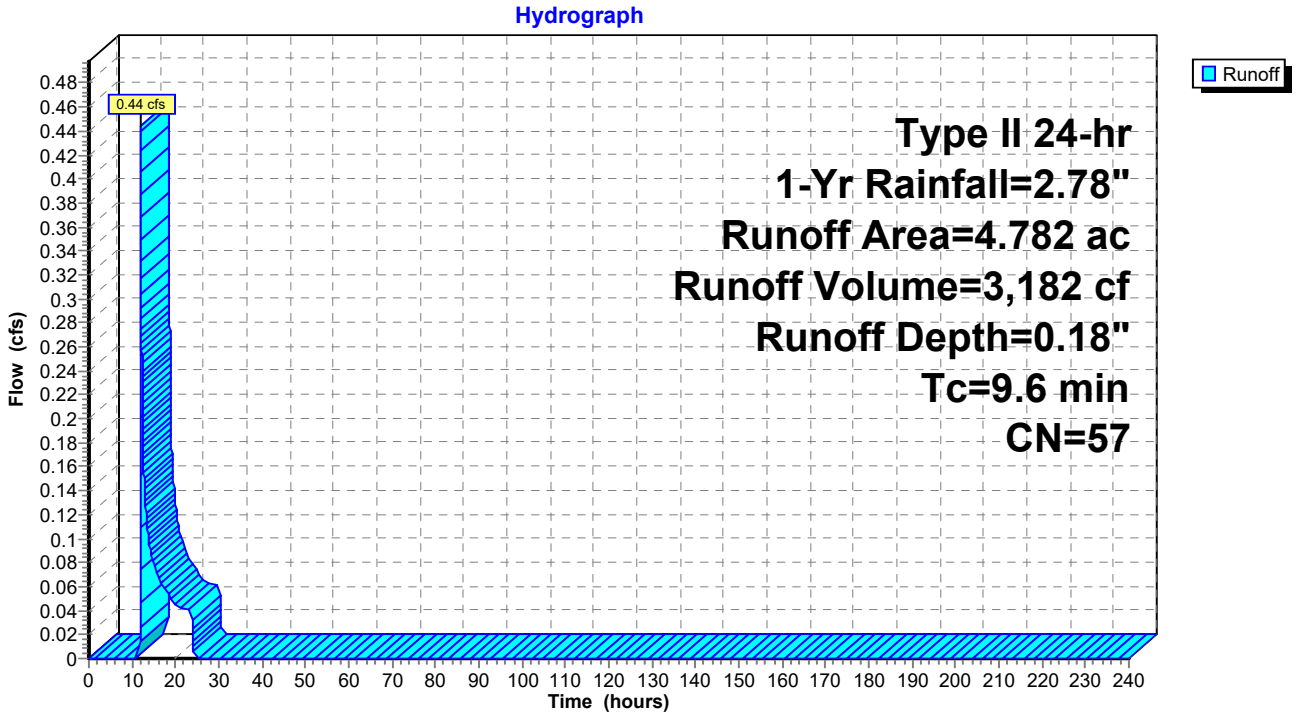
Runoff = 0.44 cfs @ 12.08 hrs, Volume= 3,182 cf, Depth= 0.18"
Routed to Link 19 : Post-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
2.234	55	Woods, Good, HSG B
2.548	58	Meadow, non-grazed, HSG B
4.782	57	Weighted Average
4.782		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6					**Direct Entry, Assumed Pre-Development Off-Site TC**

Subcatchment 18: Post-Development DA-3 (Undetained, Off-Site)



Summary for Subcatchment 20: Post-Development DA-4 (Detained, On-Site)

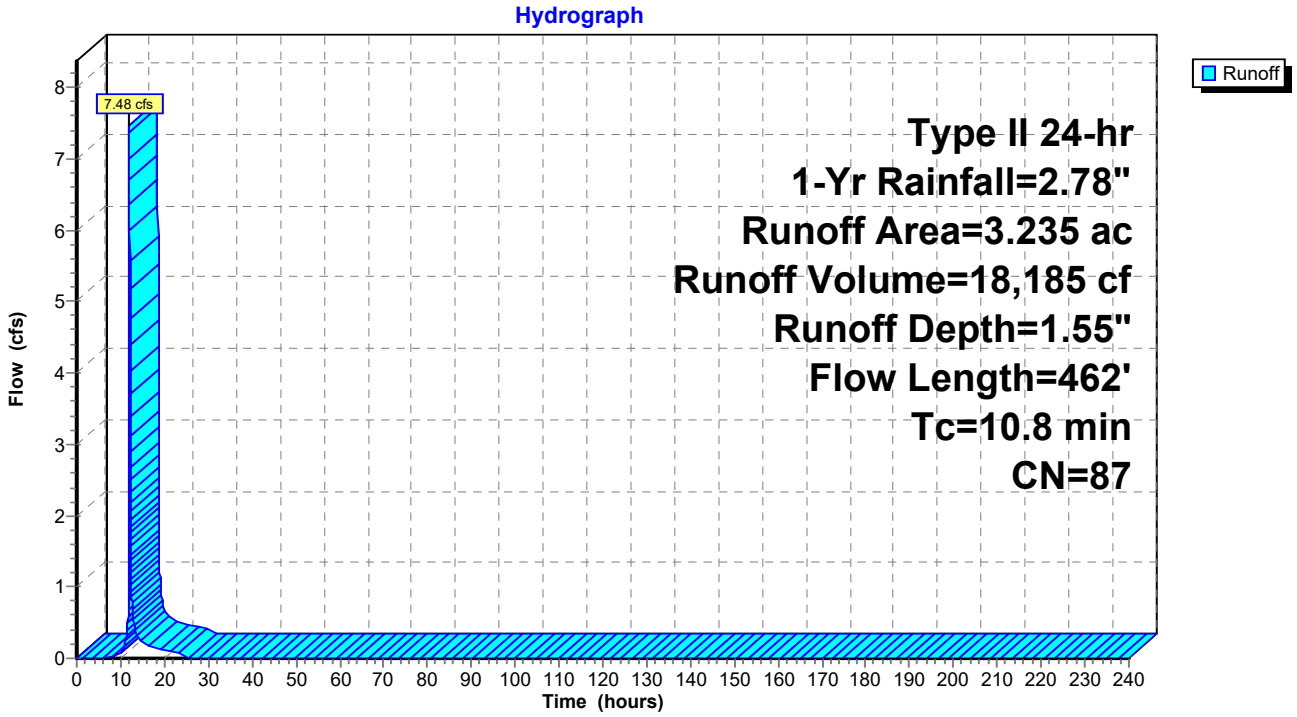
Runoff = 7.48 cfs @ 12.03 hrs, Volume= 18,185 cf, Depth= 1.55"
Routed to Pond 22 : Extended Detention Pond No. 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	0.585	58	Meadow, non-grazed, HSG B
	0.382	71	Meadow, non-grazed, HSG C
	0.017	61	>75% Grass cover, Good, HSG B
*	0.917	98	Gravel roads, HSG B
*	1.308	98	Gravel roads, HSG C
	0.026	98	Paved parking, HSG B
	3.235	87	Weighted Average
	0.984		30.42% Pervious Area
	2.251		69.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.4	30	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.0	272	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	90	0.0050	4.55	8.05	**Pipe Channel, PD-15** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	20	0.0050	5.52	17.33	**Pipe Channel, PD-18** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
10.8	462	Total			

Subcatchment 20: Post-Development DA-4 (Detained, On-Site)



Summary for Subcatchment 21: Post-Development DA-4 (Detained, Off-Site)

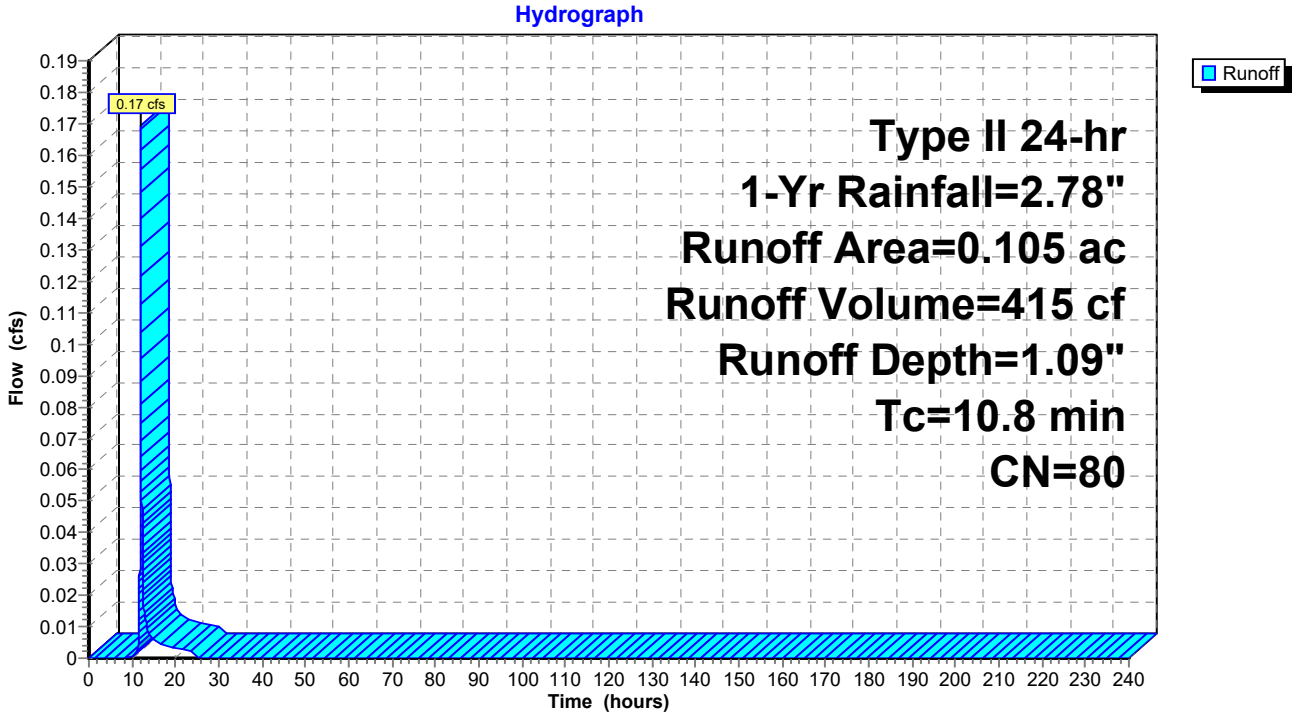
Runoff = 0.17 cfs @ 12.03 hrs, Volume= 415 cf, Depth= 1.09"
Routed to Pond 22 : Extended Detention Pond No. 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
0.047	58	Meadow, non-grazed, HSG B
0.058	98	Paved parking, HSG B
0.105	80	Weighted Average
0.047		44.76% Pervious Area
0.058		55.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8					**Direct Entry, Assumed Post-Development On-Site TC**

Subcatchment 21: Post-Development DA-4 (Detained, Off-Site)



Summary for Subcatchment 23: Post-Development DA-4 (Undetained, On-Site)

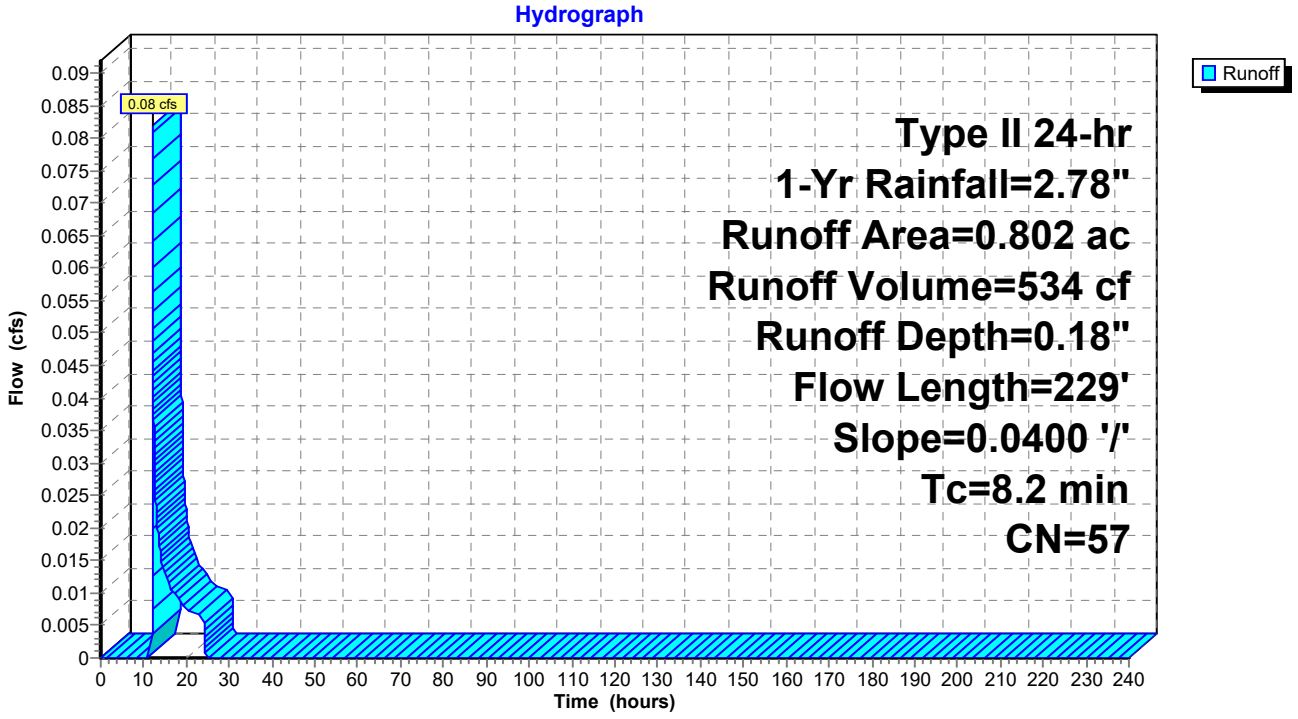
Runoff = 0.08 cfs @ 12.06 hrs, Volume= 534 cf, Depth= 0.18"
Routed to Link 25 : Post-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

	Area (ac)	CN	Description
	0.252	55	Woods, Good, HSG B
	0.140	55	Woods, Good, HSG B
	0.400	58	Meadow, non-grazed, HSG B
*	0.010	98	Gravel roads, HSG C
	0.802	57	Weighted Average
	0.792		98.75% Pervious Area
	0.010		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
2.1	179	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	229	Total			

Subcatchment 23: Post-Development DA-4 (Undetained, On-Site)



Summary for Subcatchment 24: Post-Development DA-4 (Undetained, Off-Site)

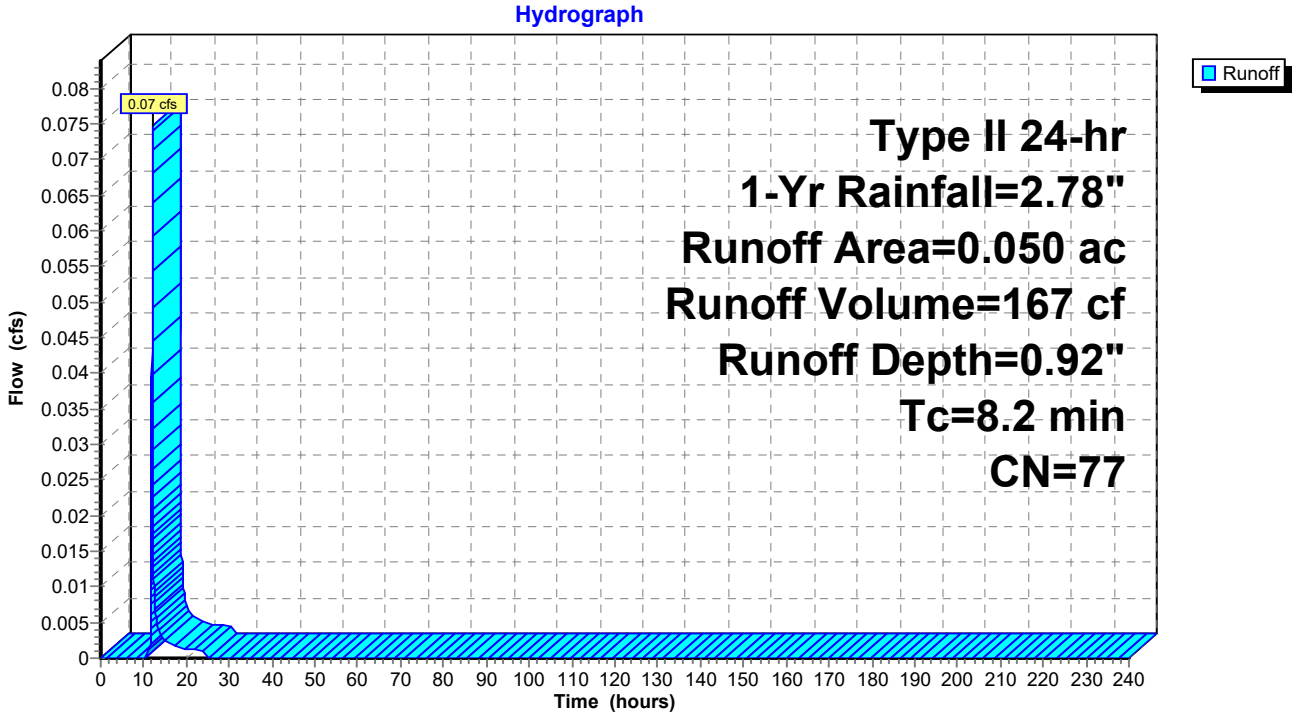
Runoff = 0.07 cfs @ 12.00 hrs, Volume= 167 cf, Depth= 0.92"
Routed to Link 25 : Post-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 1-Yr Rainfall=2.78"

Area (ac)	CN	Description
0.026	58	Meadow, non-grazed, HSG B
0.024	98	Paved parking, HSG B
0.050	77	Weighted Average
0.026		52.00% Pervious Area
0.024		48.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2					**Direct Entry, Assumed Post-Development On-Site TC**

Subcatchment 24: Post-Development DA-4 (Undetained, Off-Site)



Summary for Pond 11: Extended Detention Pond No. 1

Inflow Area = 600,997 sf, 55.88% Impervious, Inflow Depth = 1.26" for 1-Yr event
Inflow = 28.94 cfs @ 12.00 hrs, Volume= 62,971 cf
Outflow = 0.25 cfs @ 24.08 hrs, Volume= 62,971 cf, Atten= 99%, Lag= 725.0 min
Primary = 0.25 cfs @ 24.08 hrs, Volume= 62,971 cf
Routed to Link 14 : Post-Development POA-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 14 : Post-Development POA-2

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 642.87' @ 24.08 hrs Surf.Area= 18,332 sf Storage= 51,804 cf

Plug-Flow detention time= 2,150.9 min calculated for 62,968 cf (100% of inflow)
Center-of-Mass det. time= 2,151.1 min (2,990.0 - 838.9)

Volume	Invert	Avail.Storage	Storage Description
#1	642.00'	7,668 cf	**Western Forebay (Irregular)** Listed below (Recalc)
#2	646.00'	11,699 cf	**Eastern Forebay (Irregular)** Listed below (Recalc)
#3	637.00'	202,527 cf	**Open Pond (Irregular)** Listed below (Recalc)
		221,894 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
642.00	1,475	230.0	0	0	1,475
643.00	2,170	250.0	1,811	1,811	2,276
644.00	2,925	270.0	2,538	4,349	3,143
645.00	3,728	290.0	3,318	7,668	4,077

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
646.00	2,900	205.0	0	0	2,900
647.00	3,540	220.0	3,215	3,215	3,450
648.00	4,230	240.0	3,880	7,095	4,217
649.00	4,990	260.0	4,605	11,699	5,052

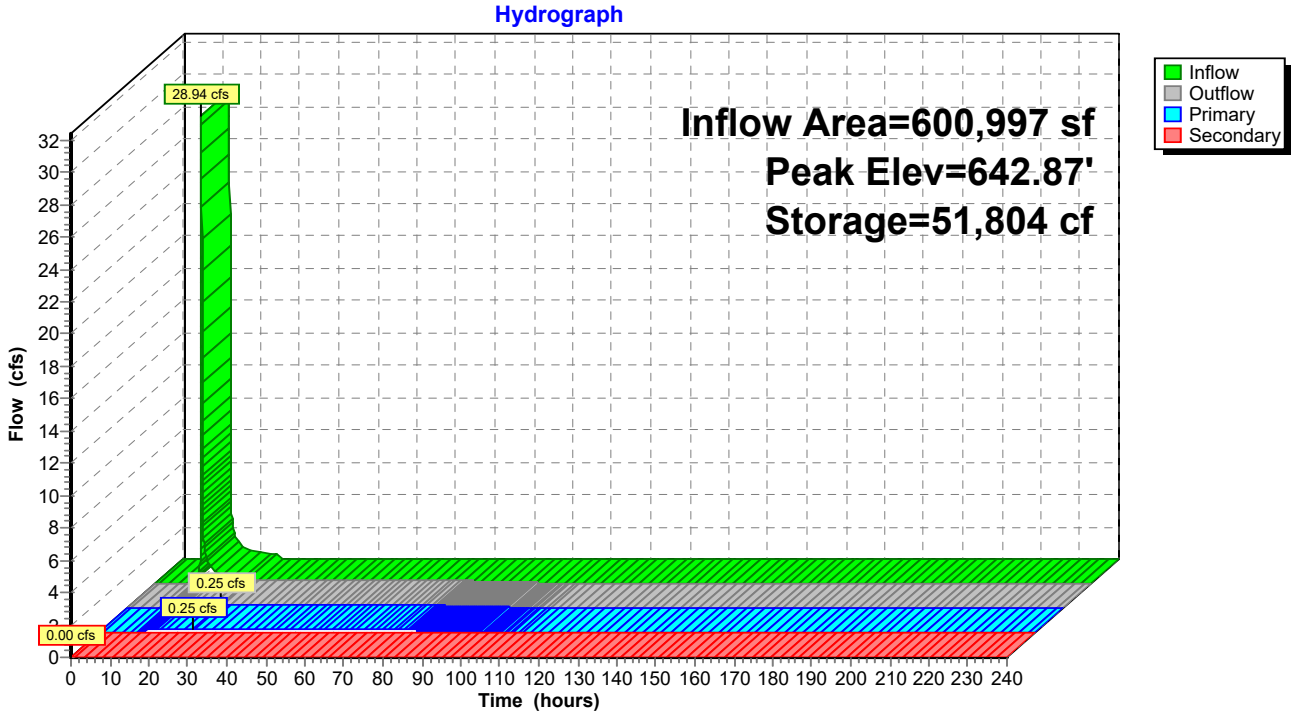
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
637.00	11,670	510.0	0.0	0	0	11,670
639.00	11,670	510.0	30.0	7,002	7,002	12,690
639.20	0	10.0	30.0	233	7,235	33,380
640.00	11,670	510.0	100.0	3,112	10,347	54,071
641.00	13,230	530.0	100.0	12,442	22,789	55,806
642.00	14,830	550.0	100.0	14,022	36,812	57,608
643.00	16,490	570.0	100.0	15,653	52,464	59,476
644.00	18,200	590.0	100.0	17,338	69,802	61,412
645.00	19,960	605.0	100.0	19,073	88,876	62,958
646.00	26,280	850.0	100.0	23,048	111,923	91,335
647.00	28,870	870.0	100.0	27,565	139,488	94,204
648.00	31,515	890.0	100.0	30,183	169,671	97,140
649.00	34,215	910.0	100.0	32,856	202,527	100,143

Device	Routing	Invert	Outlet Devices
#1	Primary	636.70'	**18.00" Round Outlet Pipe** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.70' / 636.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	637.00'	**2.00" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	643.00'	**24.00" W x 6.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	645.00'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	647.40'	**147.0 deg x 90.0' long x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.25 cfs @ 24.08 hrs HW=642.87' (Free Discharge)
└─**1=Outlet Pipe** (Passes 0.25 cfs of 19.80 cfs potential flow)
  ├─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.25 cfs @ 11.58 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=637.00' (Free Discharge)
└─**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 11: Extended Detention Pond No. 1



Summary for Pond 16: Extended Detention Pond No. 2

Inflow Area = 185,261 sf, 73.01% Impervious, Inflow Depth = 1.62" for 1-Yr event
Inflow = 12.19 cfs @ 11.97 hrs, Volume= 25,072 cf
Outflow = 0.08 cfs @ 24.06 hrs, Volume= 25,072 cf, Atten= 99%, Lag= 725.5 min
Primary = 0.08 cfs @ 24.06 hrs, Volume= 25,072 cf
Routed to Link 19 : Post-Development POA-3
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 19 : Post-Development POA-3

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 621.94' @ 24.06 hrs Surf.Area= 11,399 sf Storage= 21,160 cf

Plug-Flow detention time= 2,643.1 min calculated for 25,072 cf (100% of inflow)
Center-of-Mass det. time= 2,643.0 min (3,460.9 - 817.9)

Volume	Invert	Avail.Storage	Storage Description
#1	619.00'	3,500 cf	**Forebay (Prismatic)**Listed below (Recalc)
#2	617.70'	64,766 cf	**Open Pond (Prismatic)**Listed below (Recalc)
		68,266 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
619.00	1,100	0	0
620.00	1,740	1,420	1,420
621.00	2,420	2,080	3,500

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
617.70	3,830	0.0	0	0
618.70	3,830	30.0	1,149	1,149
618.75	0	30.0	29	1,178
619.00	3,830	100.0	479	1,656
620.00	4,600	100.0	4,215	5,871
621.00	5,420	100.0	5,010	10,881
622.00	9,200	100.0	7,310	18,191
623.00	10,375	100.0	9,788	27,979
624.00	11,600	100.0	10,988	38,966
625.00	12,890	100.0	12,245	51,211
626.00	14,220	100.0	13,555	64,766

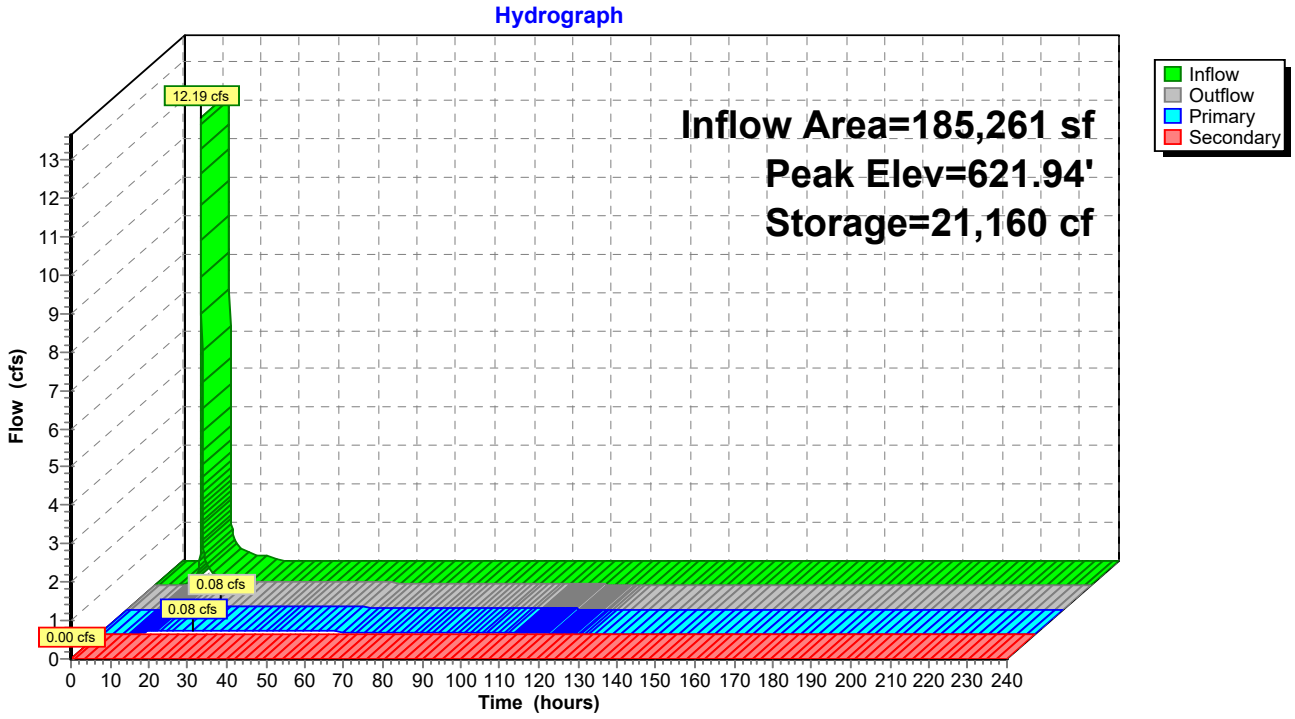
Device	Routing	Invert	Outlet Devices
#1	Primary	617.70'	**18.00" Round Outlet Pipe** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 617.70' / 617.43' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	617.70'	**1.25" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	622.00'	**15.00" W x 6.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	623.25'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600

			Limited to weir flow at low heads
#5	Secondary	624.50'	**147.0 deg x 40.0' long x 1.50' rise Emergency Spillway**
			Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.08 cfs @ 24.06 hrs HW=621.94' (Free Discharge)
└─**1=Outlet Pipe** (Passes 0.08 cfs of 15.90 cfs potential flow)
  └─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.08 cfs @ 9.86 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=617.70' (Free Discharge)
└─**5=Emergency Spillway** (Controls 0.00 cfs)

Pond 16: Extended Detention Pond No. 2



Summary for Pond 22: Extended Detention Pond No. 3

Inflow Area = 145,490 sf, 69.13% Impervious, Inflow Depth = 1.53" for 1-Yr event
Inflow = 7.65 cfs @ 12.03 hrs, Volume= 18,599 cf
Outflow = 0.10 cfs @ 20.15 hrs, Volume= 18,599 cf, Atten= 99%, Lag= 487.5 min
Primary = 0.10 cfs @ 20.15 hrs, Volume= 18,599 cf
Routed to Link 25 : Post-Development POA-4
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 25 : Post-Development POA-4

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 647.13' @ 20.15 hrs Surf.Area= 8,064 sf Storage= 13,949 cf

Plug-Flow detention time= 1,481.4 min calculated for 18,599 cf (100% of inflow)
Center-of-Mass det. time= 1,481.3 min (2,308.2 - 826.9)

Volume	Invert	Avail.Storage	Storage Description
#1	645.50'	3,760 cf	**Forebay (Prismatic)**Listed below (Recalc)
#2	644.00'	50,650 cf	**Open Pond (Prismatic)**Listed below (Recalc)
		54,410 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
645.50	1,030	0	0
646.00	1,205	559	559
647.00	1,590	1,398	1,956
647.50	1,800	848	2,804
648.00	2,025	956	3,760

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
644.00	4,840	0.0	0	0
645.00	4,840	30.0	1,452	1,452
645.05	0	30.0	36	1,488
645.50	4,840	100.0	1,089	2,577
646.00	5,390	100.0	2,558	5,135
647.00	6,300	100.0	5,845	10,980
648.00	7,250	100.0	6,775	17,755
649.00	10,650	100.0	8,950	26,705
650.00	11,960	100.0	11,305	38,010
651.00	13,320	100.0	12,640	50,650

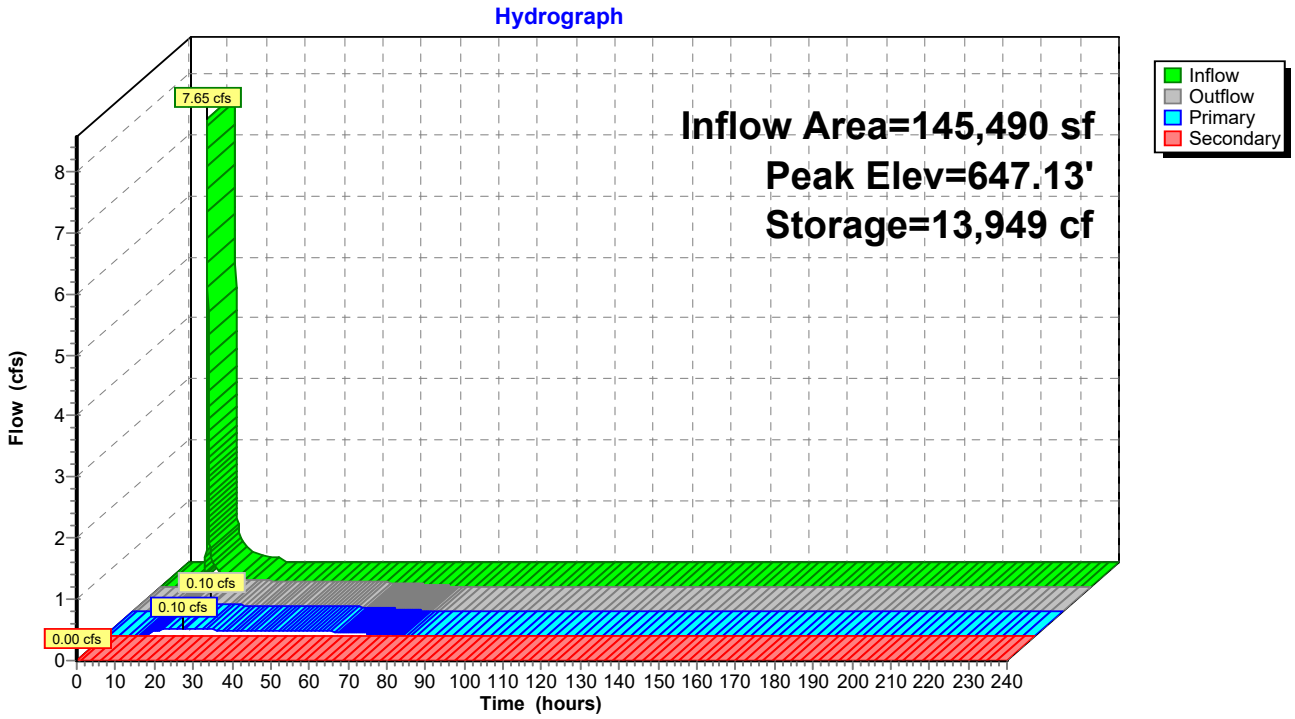
Device	Routing	Invert	Outlet Devices
#1	Primary	643.95'	**15.00" Round Outlet Pipe** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.95' / 643.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	644.00'	**1.50" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	647.50'	**18.00" W x 12.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

#4	Device 1	648.50'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	649.50'	**147.0 deg x 30.0' long x 1.25' rise Emergency Spillway** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.10 cfs @ 20.15 hrs HW=647.13' (Free Discharge)
└─**1=Outlet Pipe** (Passes 0.10 cfs of 9.44 cfs potential flow)
  ├─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.10 cfs @ 8.43 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=644.00' (Free Discharge)
└─**5=Emergency Spillway** (Controls 0.00 cfs)

Pond 22: Extended Detention Pond No. 3

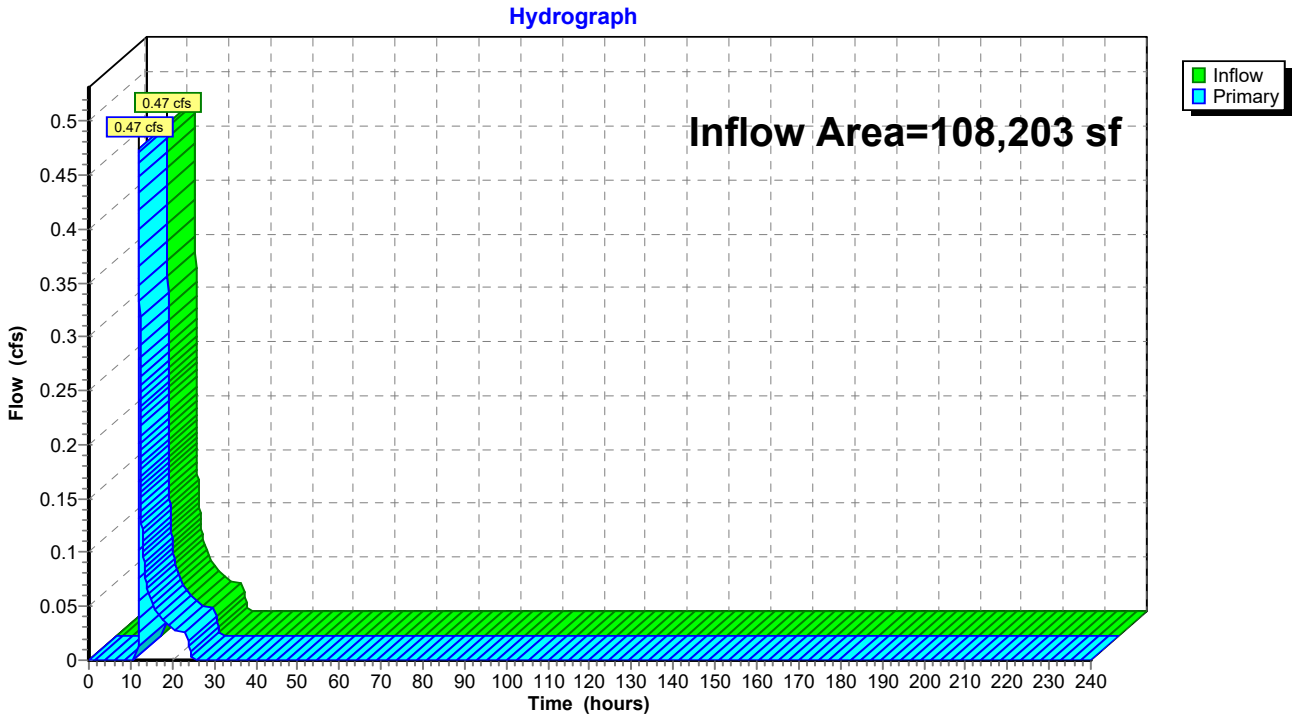


Summary for Link 8: Post-Development POA-1

Inflow Area = 108,203 sf, 5.64% Impervious, Inflow Depth = 0.27" for 1-Yr event
Inflow = 0.47 cfs @ 12.11 hrs, Volume= 2,418 cf
Primary = 0.47 cfs @ 12.11 hrs, Volume= 2,418 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 8: Post-Development POA-1

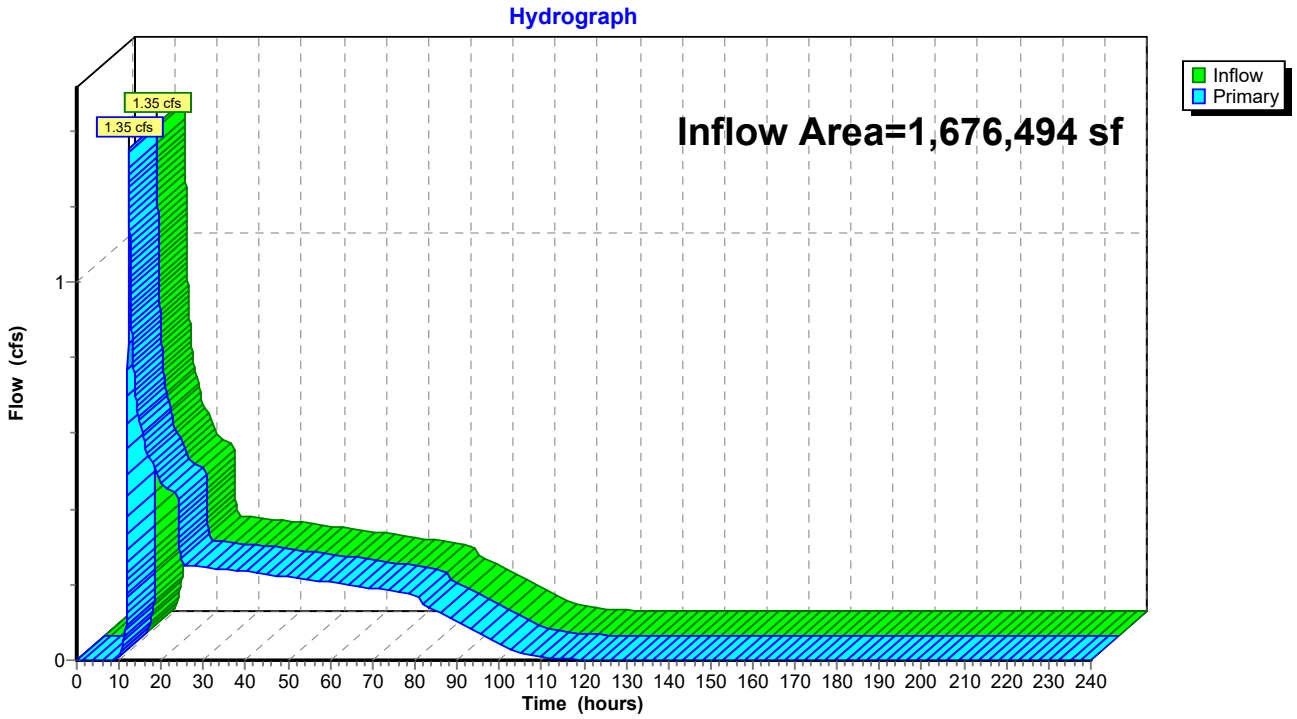


Summary for Link 14: Post-Development POA-2

Inflow Area = 1,676,494 sf, 20.44% Impervious, Inflow Depth = 0.56" for 1-Yr event
Inflow = 1.35 cfs @ 12.23 hrs, Volume= 77,564 cf
Primary = 1.35 cfs @ 12.23 hrs, Volume= 77,564 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 14: Post-Development POA-2

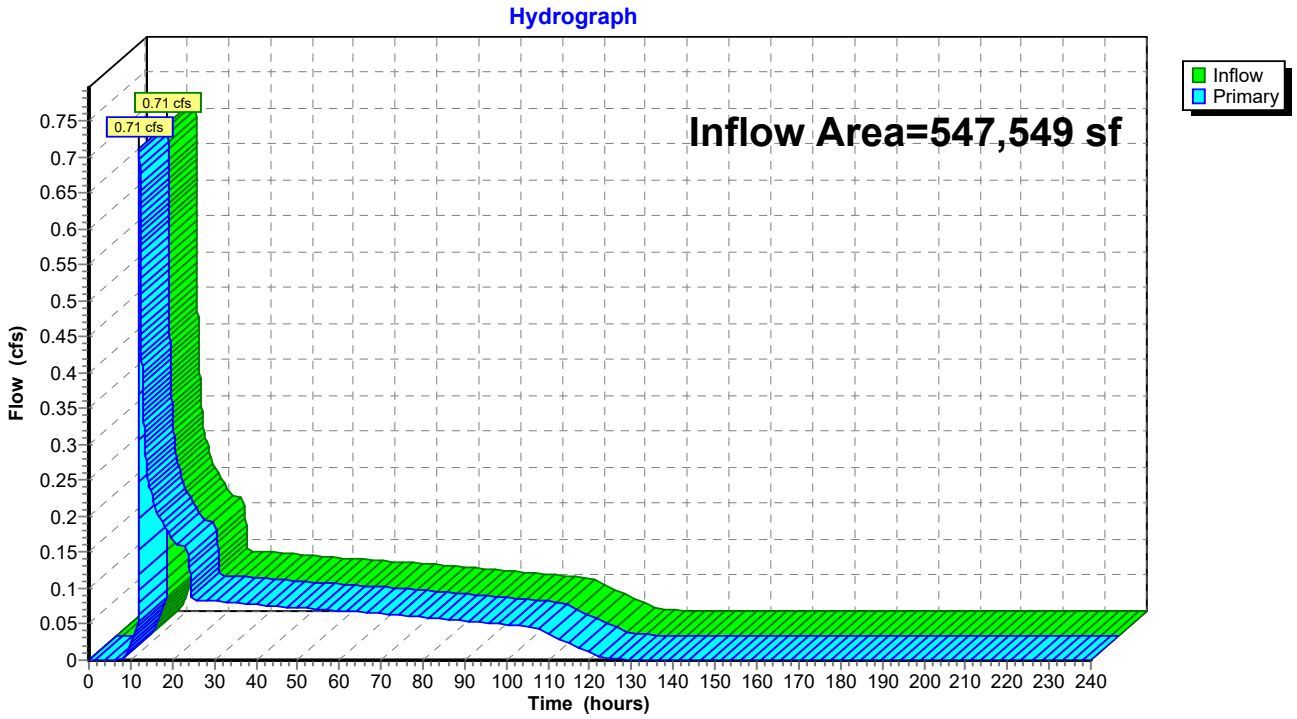


Summary for Link 19: Post-Development POA-3

Inflow Area = 547,549 sf, 25.03% Impervious, Inflow Depth = 0.68" for 1-Yr event
Inflow = 0.71 cfs @ 12.12 hrs, Volume= 31,228 cf
Primary = 0.71 cfs @ 12.12 hrs, Volume= 31,228 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 19: Post-Development POA-3

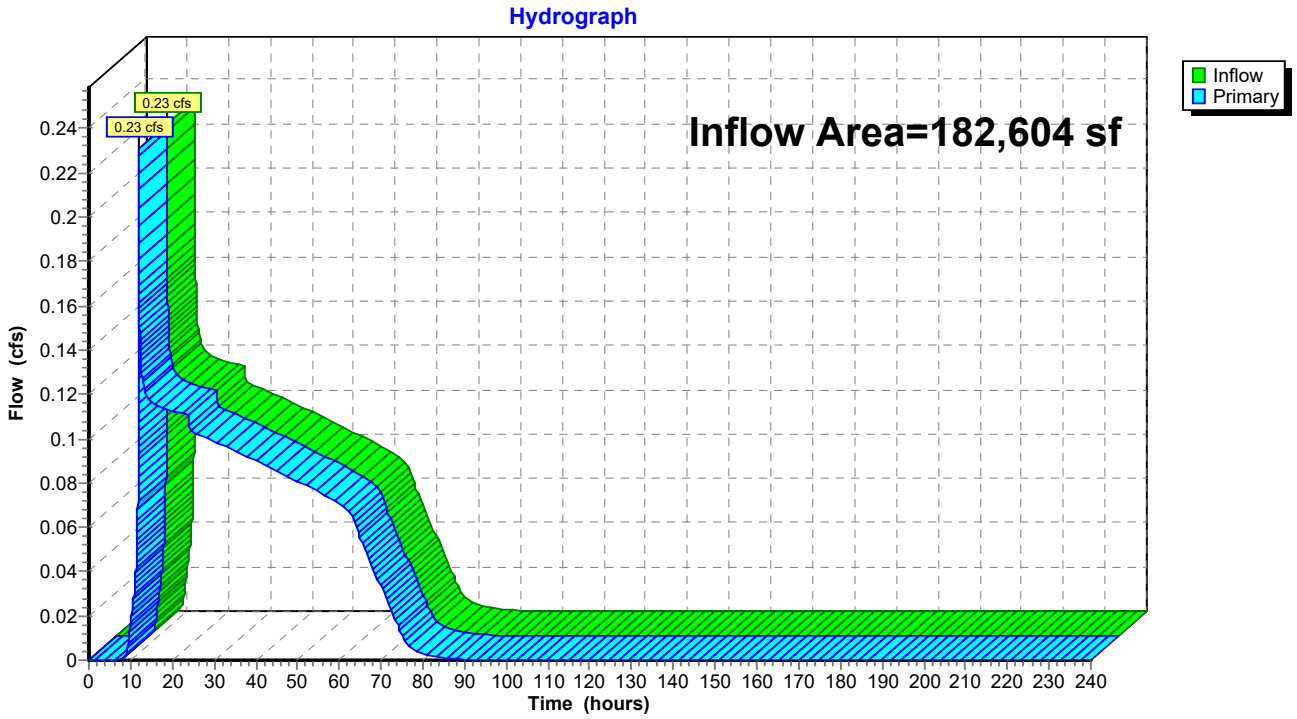


Summary for Link 25: Post-Development POA-4

Inflow Area = 182,604 sf, 55.89% Impervious, Inflow Depth = 1.27" for 1-Yr event
Inflow = 0.23 cfs @ 12.04 hrs, Volume= 19,300 cf
Primary = 0.23 cfs @ 12.04 hrs, Volume= 19,300 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 25: Post-Development POA-4



Summary for Subcatchment 6: Post-Development DA-1 (Undetained, On-Site)

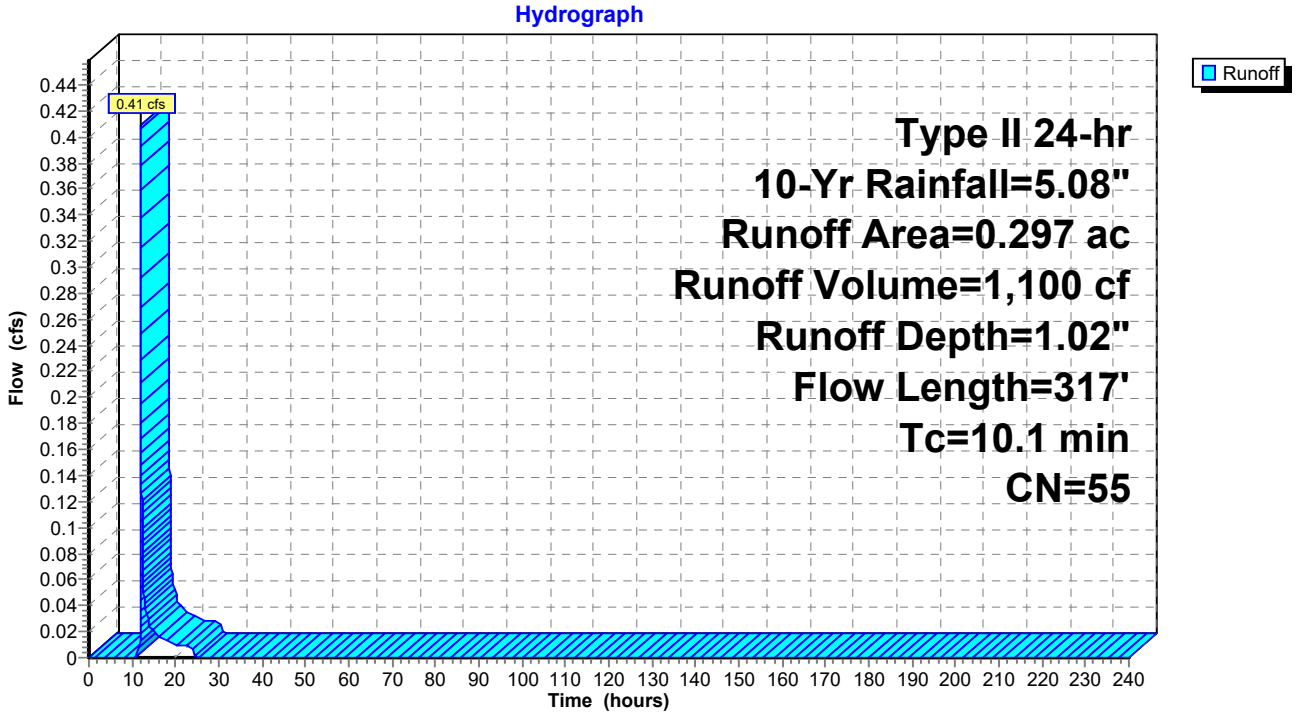
Runoff = 0.41 cfs @ 12.04 hrs, Volume= 1,100 cf, Depth= 1.02"
Routed to Link 8 : Post-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
0.031	55	Woods, Good, HSG B
0.266	55	Woods, Good, HSG B
0.297	55	Weighted Average
0.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.6	62	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.4	205	0.0400	1.00		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.1	317	Total			

Subcatchment 6: Post-Development DA-1 (Undetained, On-Site)



Summary for Subcatchment 7: Post-Development DA-1 (Undetained, Off-Site)

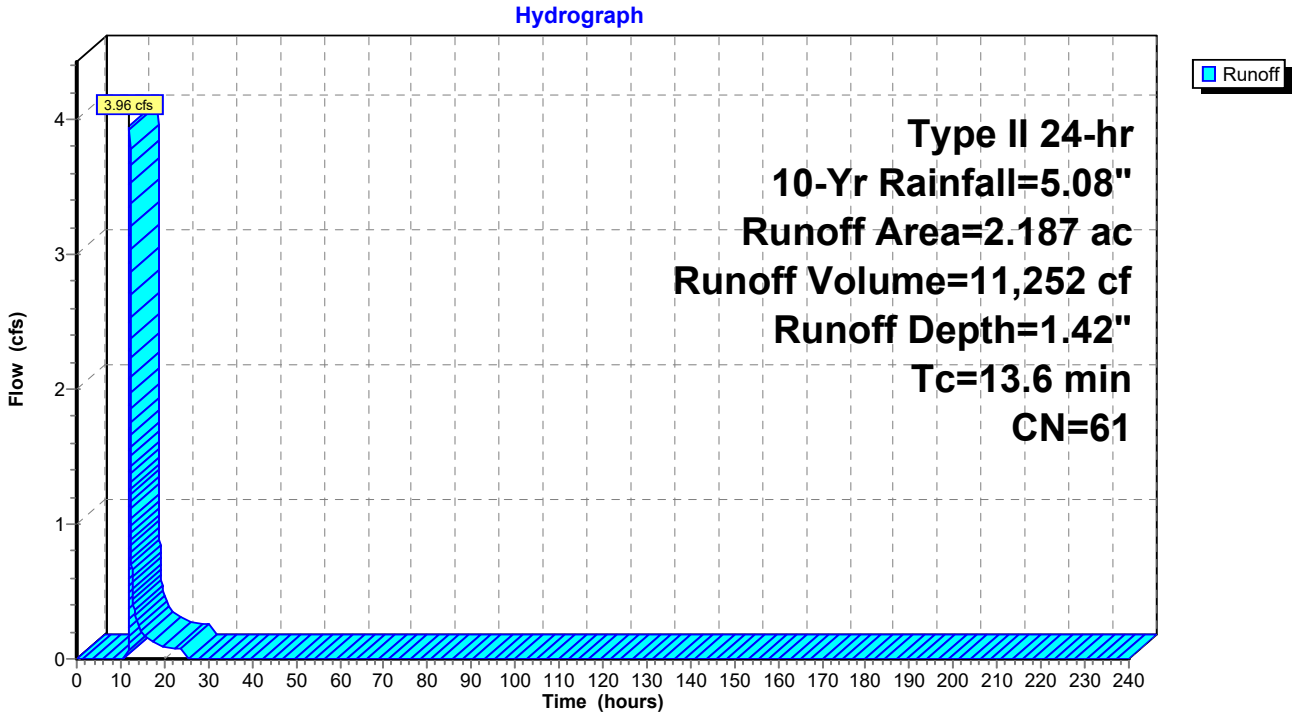
Runoff = 3.96 cfs @ 12.07 hrs, Volume= 11,252 cf, Depth= 1.42"
Routed to Link 8 : Post-Development POA-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.234	55	Woods, Good, HSG B
	0.256	77	Woods, Good, HSG D
	0.515	58	Meadow, non-grazed, HSG B
	0.042	78	Meadow, non-grazed, HSG D
*	0.069	98	Gravel roads, HSG B
	0.071	98	Paved parking, HSG B
	2.187	61	Weighted Average
	2.047		93.60% Pervious Area
	0.140		6.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.6					**Direct Entry, Assumed Equal to Pre-Development Detained Off-S**

Subcatchment 7: Post-Development DA-1 (Undetained, Off-Site)



Summary for Subcatchment 9: Post-Development DA-2 (Detained, On-Site)

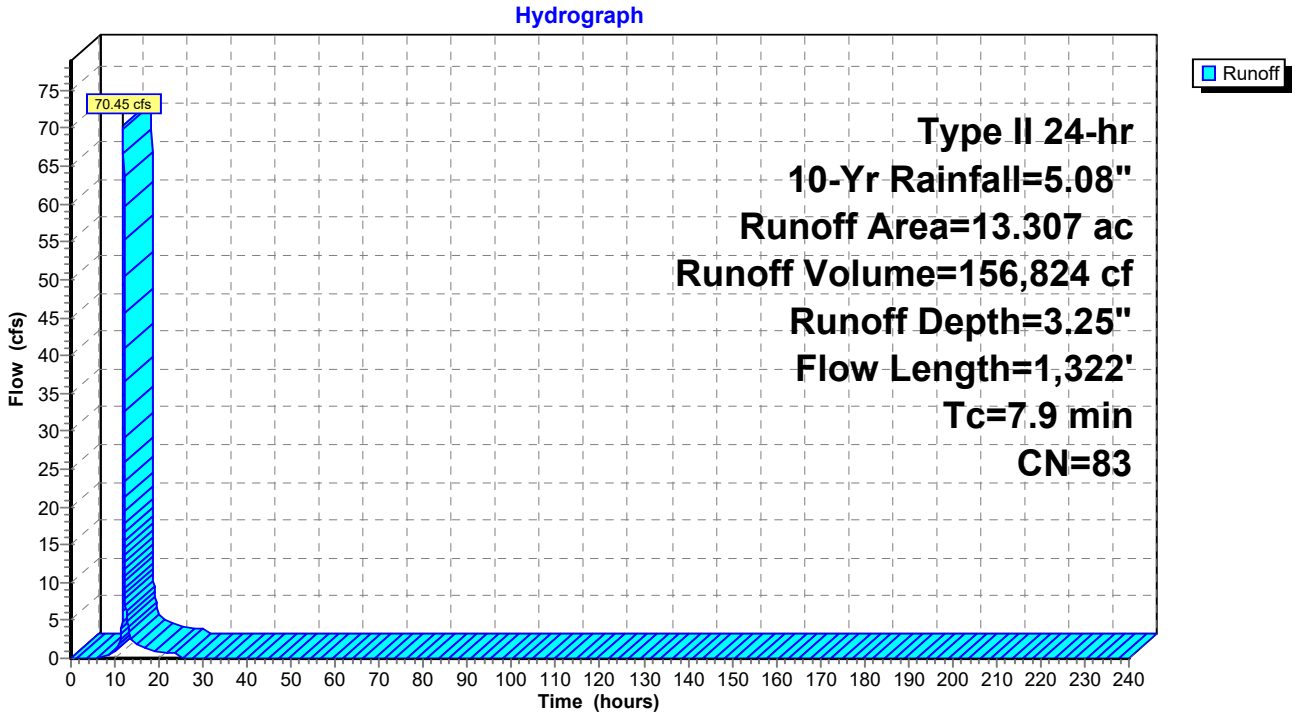
Runoff = 70.45 cfs @ 11.99 hrs, Volume= 156,824 cf, Depth= 3.25"
Routed to Pond 11 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.116	55	Woods, Good, HSG B
	1.362	70	Woods, Good, HSG C
	0.020	77	Woods, Good, HSG D
	2.398	58	Meadow, non-grazed, HSG B
	0.775	71	Meadow, non-grazed, HSG C
	0.092	74	>75% Grass cover, Good, HSG C
*	3.439	98	Gravel roads, HSG B
*	4.026	98	Gravel roads, HSG C
	0.079	98	Paved parking, HSG B
	13.307	83	Weighted Average
	5.763		43.31% Pervious Area
	7.544		56.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
3.9	380	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	153	0.0050	4.55	8.05	**Pipe Channel, PD-2** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.5	127	0.0050	4.55	8.05	**Pipe Channel, PD-3** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.7	192	0.0050	4.55	8.05	**Pipe Channel, PD-4** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.6	192	0.0050	5.52	17.33	**Pipe Channel, PD-5** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.4	148	0.0050	5.52	17.33	**Pipe Channel, PD-6** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.2710	47.12	231.32	**Pipe Channel, PD-13** 30.00" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.0250	14.31	70.26	**Pipe Channel, PD-13A** 30.00" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
7.9	1,322	Total			

Subcatchment 9: Post-Development DA-2 (Detained, On-Site)



Summary for Subcatchment 10: Post-Development DA-2 (Detained, Off-Site)

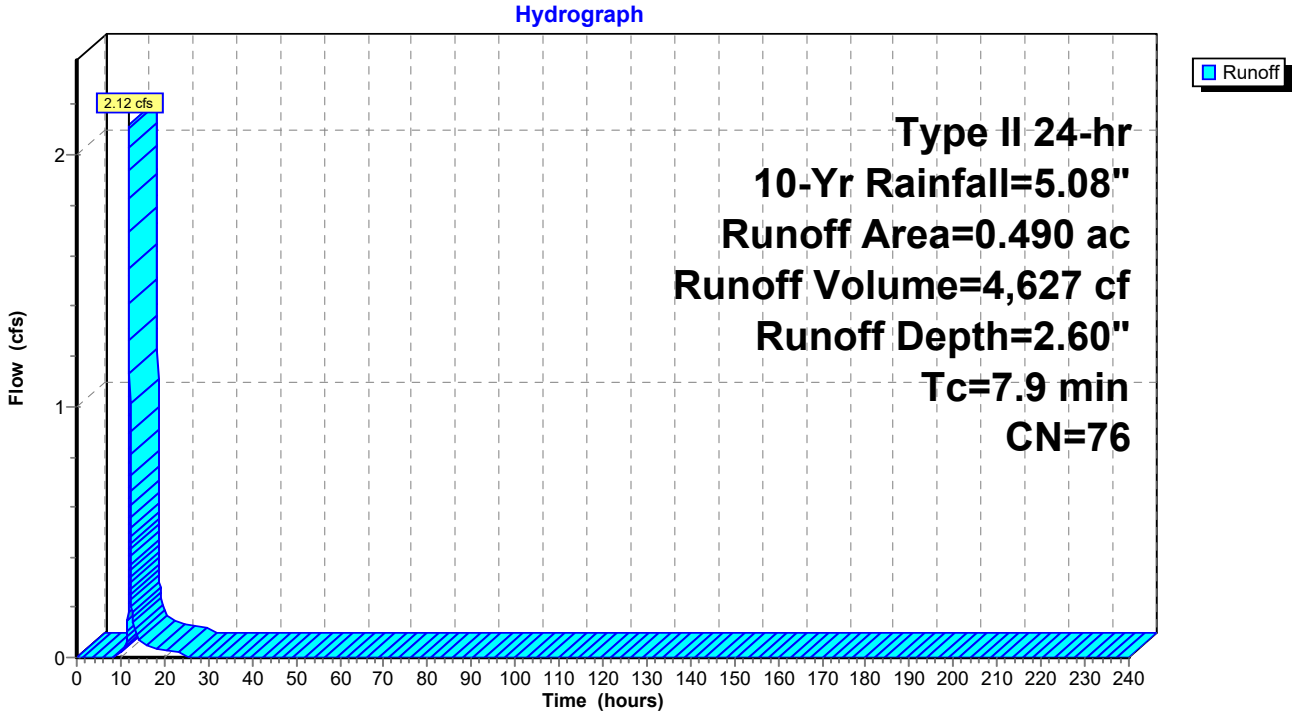
Runoff = 2.12 cfs @ 12.00 hrs, Volume= 4,627 cf, Depth= 2.60"
Routed to Pond 11 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
0.019	55	Woods, Good, HSG B
0.066	77	Woods, Good, HSG D
0.198	58	Meadow, non-grazed, HSG B
0.041	78	Meadow, non-grazed, HSG D
0.166	98	Paved parking, HSG B
0.490	76	Weighted Average
0.324		66.12% Pervious Area
0.166		33.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9					**Direct Entry, Assumed Equal to Detained On-Site TC**

Subcatchment 10: Post-Development DA-2 (Detained, Off-Site)



Summary for Subcatchment 12: Post-Development DA-2 (Undetained, On-Site)

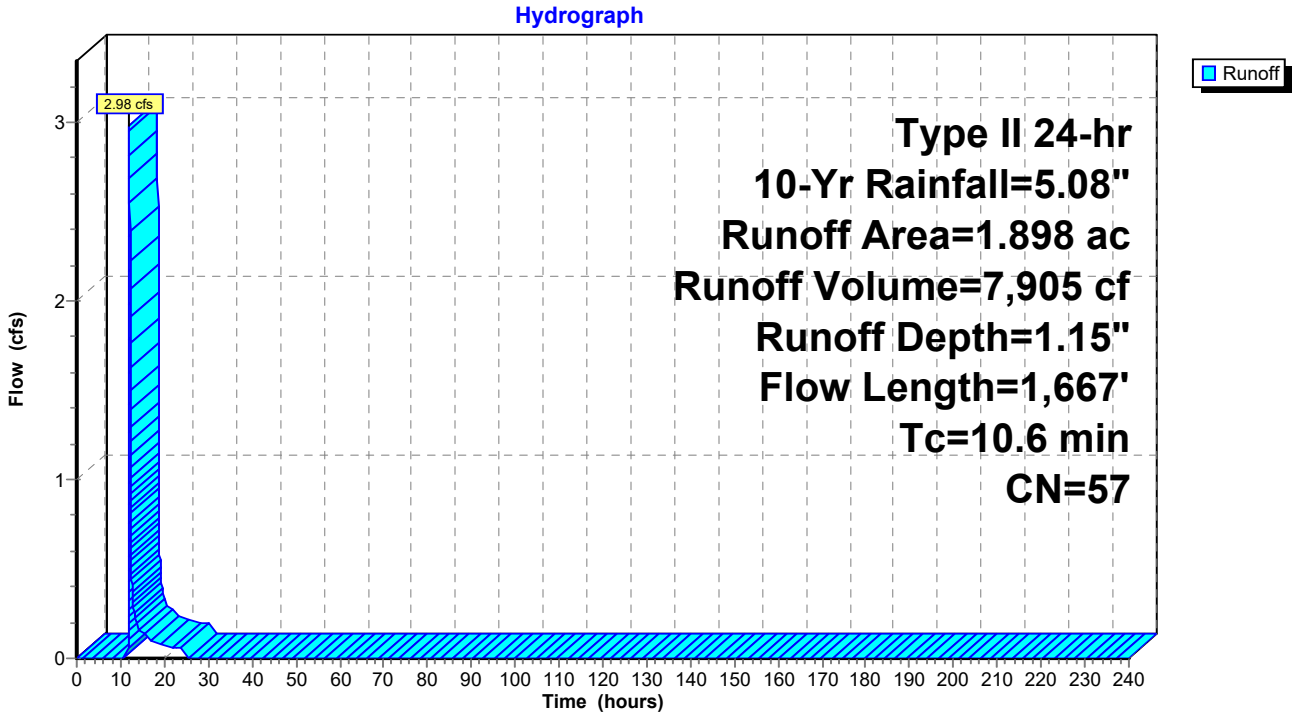
Runoff = 2.98 cfs @ 12.04 hrs, Volume= 7,905 cf, Depth= 1.15"
Routed to Link 14 : Post-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.037	55	Woods, Good, HSG B
	0.306	55	Woods, Good, HSG B
	0.476	58	Meadow, non-grazed, HSG B
	0.028	71	Meadow, non-grazed, HSG C
	0.042	74	>75% Grass cover, Good, HSG C
*	0.009	98	Gravel roads, HSG C
	1.898	57	Weighted Average
	1.889		99.53% Pervious Area
	0.009		0.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.4	110	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
0.4	185	0.0500	8.04	32.15	**Trap/Vee/Rect Channel Flow, Stream L134-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
2.6	811	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
10.6	1,667	Total			

Subcatchment 12: Post-Development DA-2 (Undetained, On-Site)



Summary for Subcatchment 13: Post-Development DA-2 (Undetained, Off-Site)

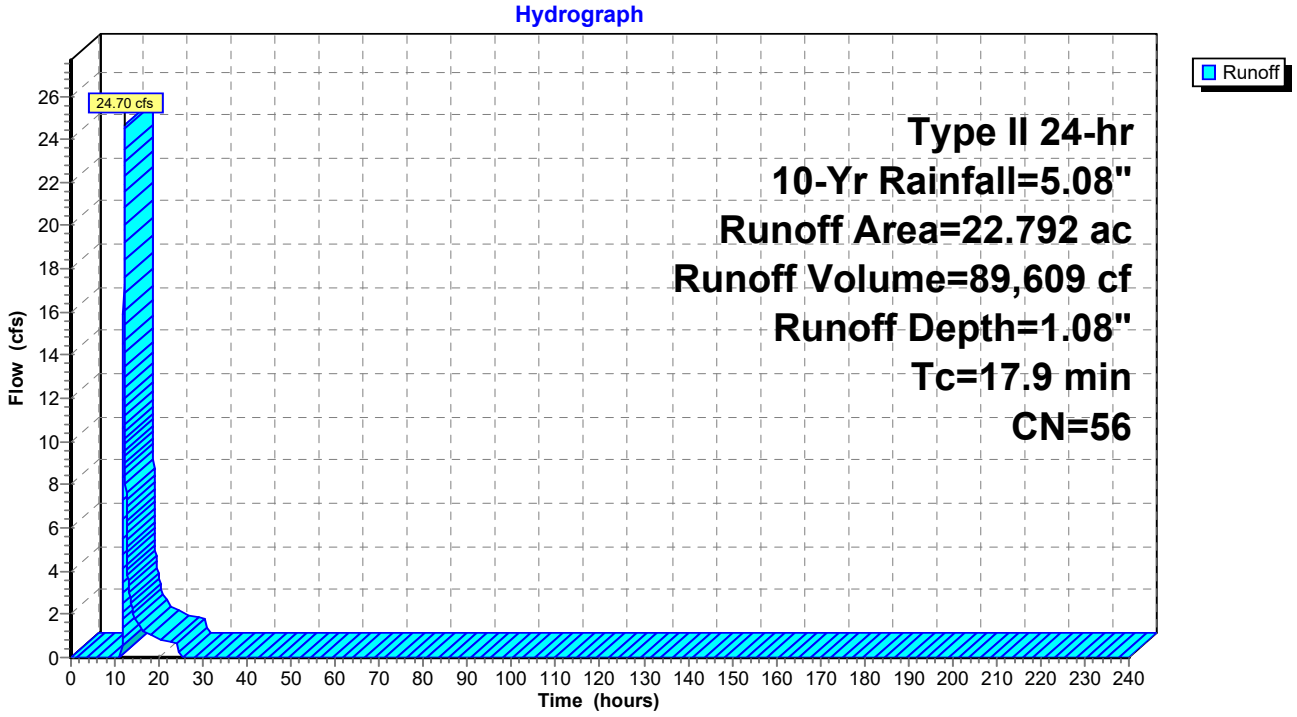
Runoff = 24.70 cfs @ 12.13 hrs, Volume= 89,609 cf, Depth= 1.08"
Routed to Link 14 : Post-Development POA-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
18.132	55	Woods, Good, HSG B
0.049	77	Woods, Good, HSG D
4.286	58	Meadow, non-grazed, HSG B
0.178	78	Meadow, non-grazed, HSG D
0.147	98	Paved parking, HSG B
22.792	56	Weighted Average
22.645		99.36% Pervious Area
0.147		0.64% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9					**Direct Entry, Assumed Pre-Development Off-Site TC**

Subcatchment 13: Post-Development DA-2 (Undetained, Off-Site)



Summary for Subcatchment 15: Post-Development DA-3 (Detained, On-Site)

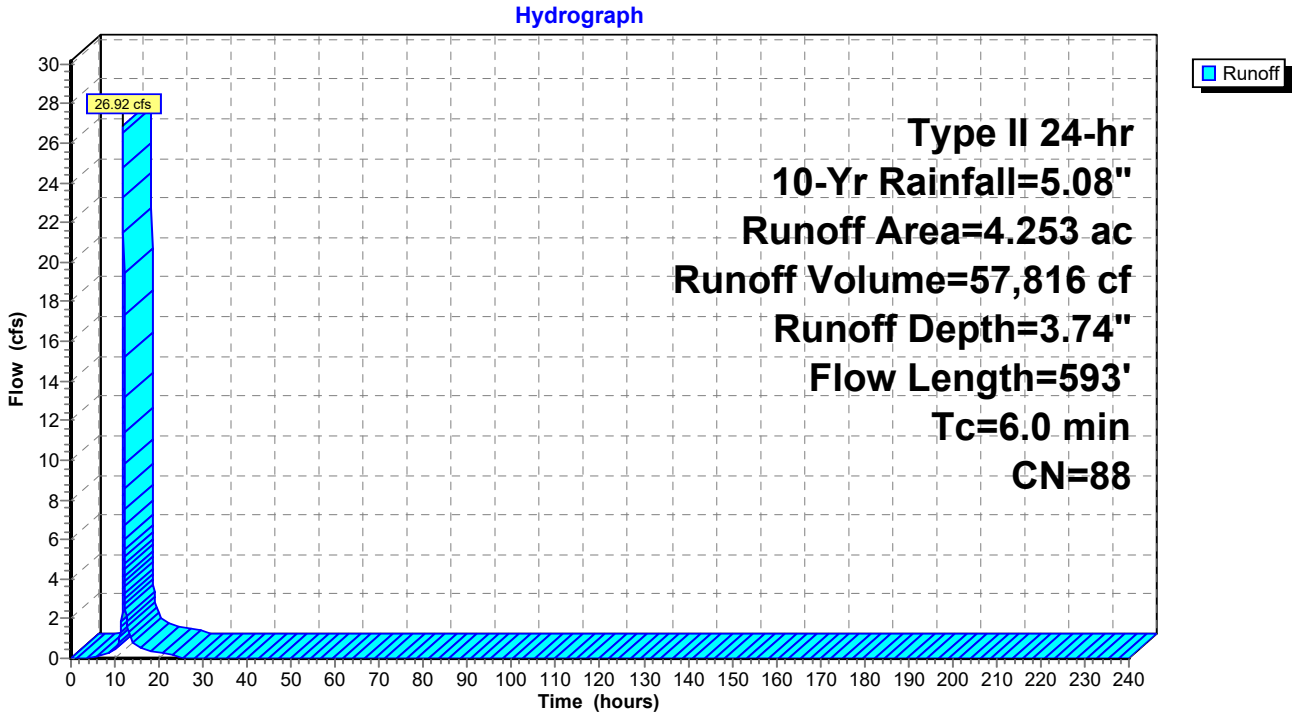
Runoff = 26.92 cfs @ 11.97 hrs, Volume= 57,816 cf, Depth= 3.74"
Routed to Pond 16 : Extended Detention Pond No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	0.118	55	Woods, Good, HSG B
	0.799	58	Meadow, non-grazed, HSG B
	0.231	71	Meadow, non-grazed, HSG C
*	1.777	98	Gravel roads, HSG B
*	1.328	98	Gravel roads, HSG C
	4.253	88	Weighted Average
	1.148		26.99% Pervious Area
	3.105		73.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
2.7	263	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	110	0.0050	4.03	4.95	**Pipe Channel, PD-20** 15.00" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
0.3	100	0.0100	6.44	11.38	**Pipe Channel, PD-22** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	70	0.0500	14.40	25.45	**Pipe Channel, PD-23** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.5	593	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 15: Post-Development DA-3 (Detained, On-Site)



Summary for Subcatchment 17: Post-Development DA-3 (Undetained, On-Site)

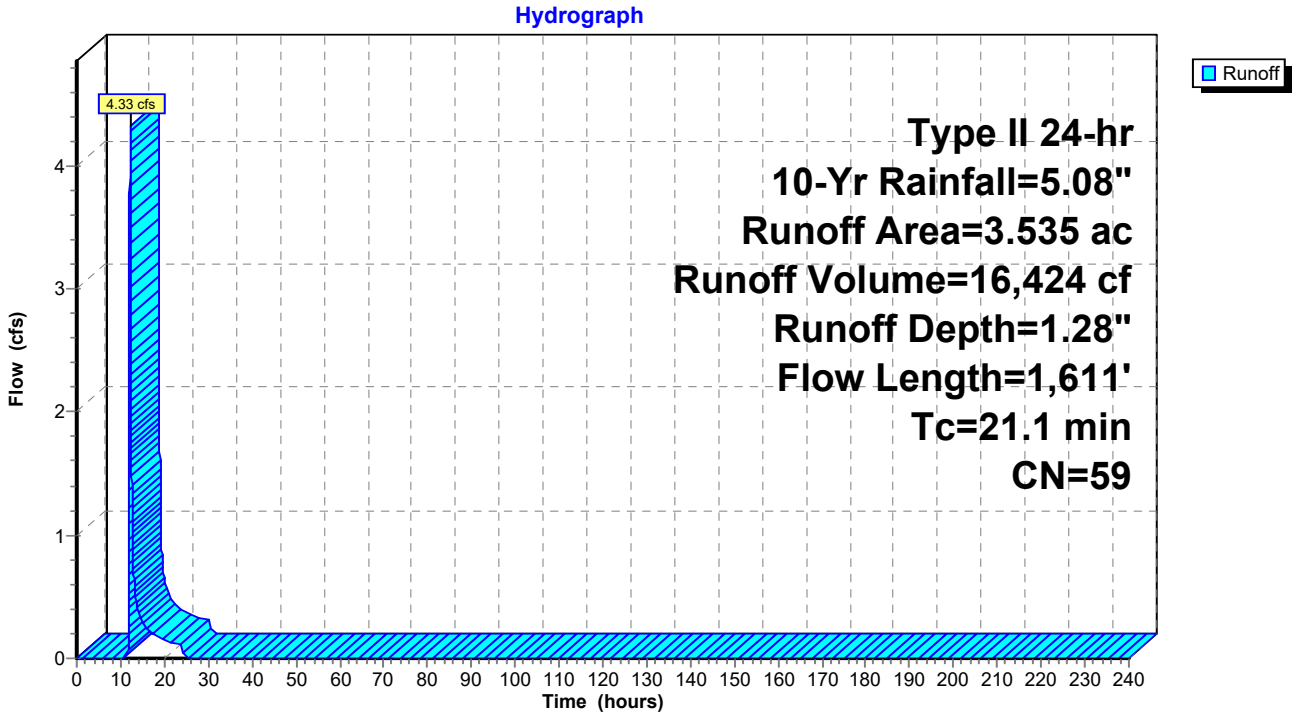
Runoff = 4.33 cfs @ 12.17 hrs, Volume= 16,424 cf, Depth= 1.28"
Routed to Link 19 : Post-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	0.516	55	Woods, Good, HSG B
	0.343	70	Woods, Good, HSG C
	2.556	58	Meadow, non-grazed, HSG B
	0.079	61	>75% Grass cover, Good, HSG B
*	0.041	98	Gravel roads, HSG C
	3.535	59	Weighted Average
	3.494		98.84% Pervious Area
	0.041		1.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
2.4	205	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
7.2	374	0.0300	0.87		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.9	158	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.2	51	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	145	0.0700	6.56	9.84	**Trap/Vee/Rect Channel Flow, Stream L160-1** Bot.W=2.00' D=0.50' Z= 2.0 '/' Top.W=4.00' n= 0.030
0.2	96	0.0200	7.45	89.38	**Trap/Vee/Rect Channel Flow, Stream L159-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
1.7	532	0.0100	5.27	63.20	**Trap/Vee/Rect Channel Flow, Stream L153-1** Bot.W=2.00' D=2.00' Z= 2.0 '/' Top.W=10.00' n= 0.030
21.1	1,611	Total			

Subcatchment 17: Post-Development DA-3 (Undetained, On-Site)



Summary for Subcatchment 18: Post-Development DA-3 (Undetained, Off-Site)

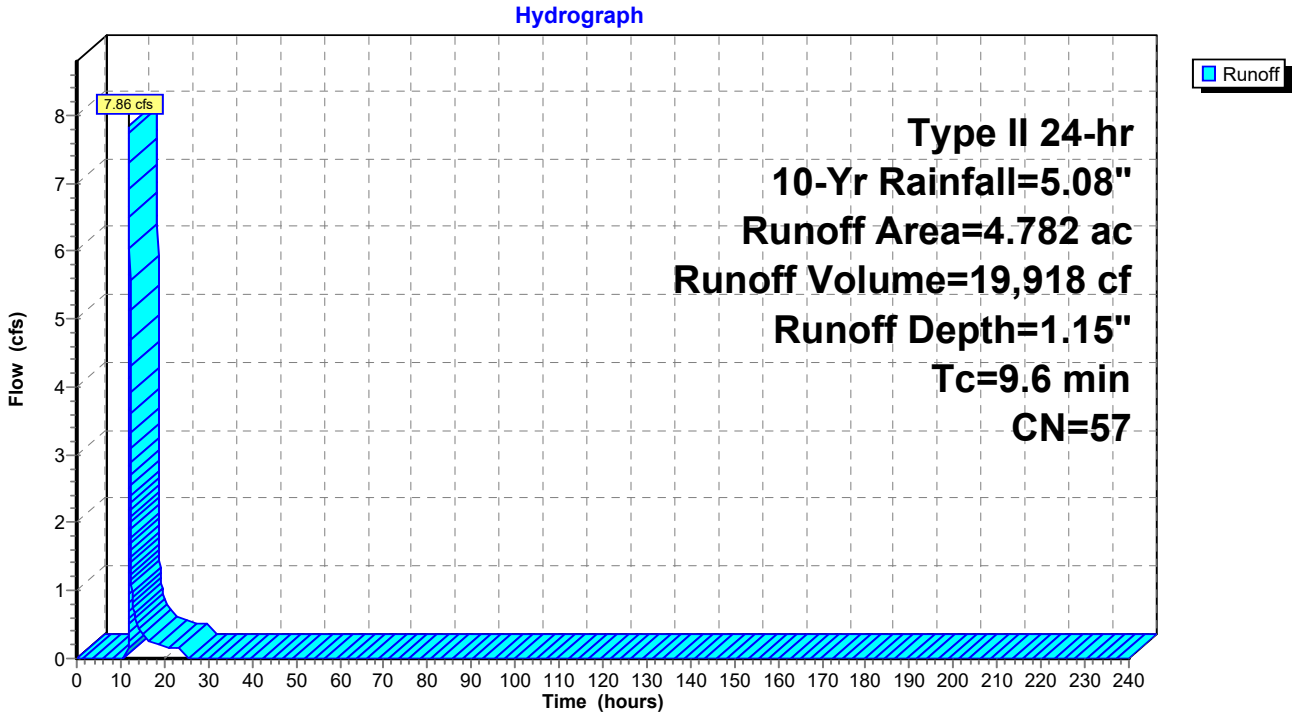
Runoff = 7.86 cfs @ 12.03 hrs, Volume= 19,918 cf, Depth= 1.15"
Routed to Link 19 : Post-Development POA-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
2.234	55	Woods, Good, HSG B
2.548	58	Meadow, non-grazed, HSG B
4.782	57	Weighted Average
4.782		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6					**Direct Entry, Assumed Pre-Development Off-Site TC**

Subcatchment 18: Post-Development DA-3 (Undetained, Off-Site)



Summary for Subcatchment 20: Post-Development DA-4 (Detained, On-Site)

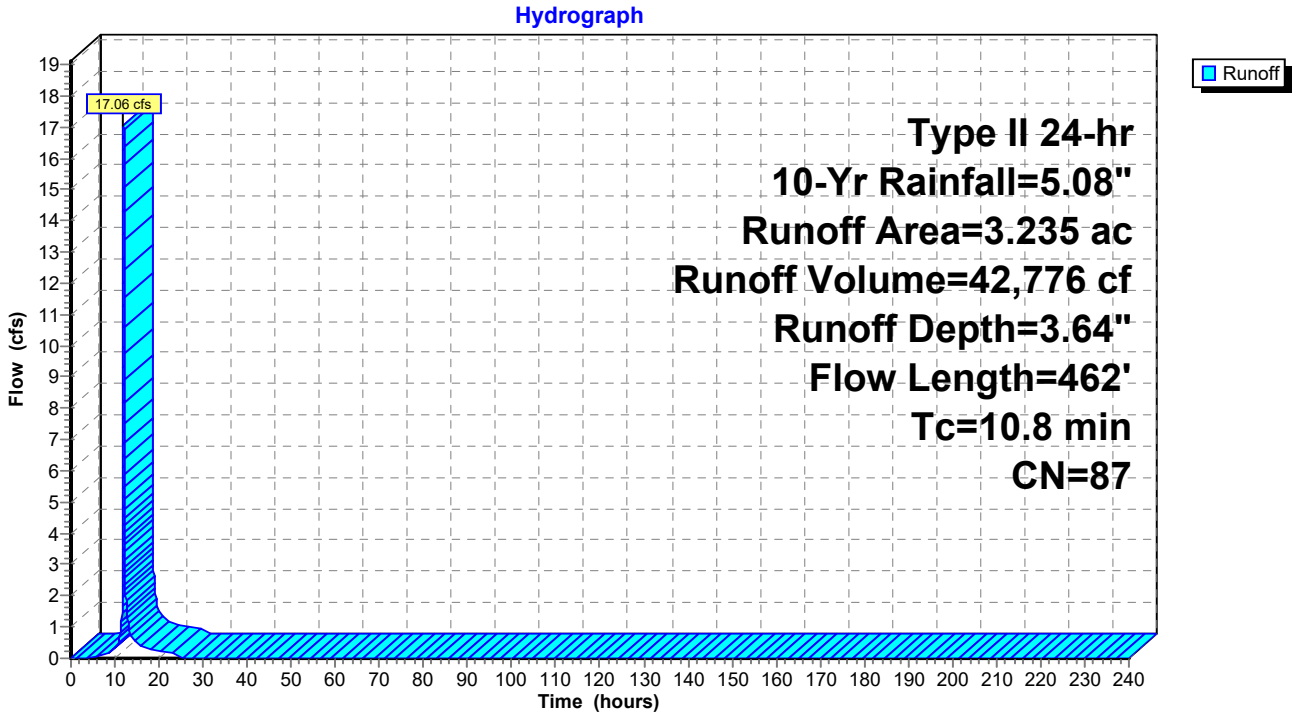
Runoff = 17.06 cfs @ 12.02 hrs, Volume= 42,776 cf, Depth= 3.64"
Routed to Pond 22 : Extended Detention Pond No. 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	0.585	58	Meadow, non-grazed, HSG B
	0.382	71	Meadow, non-grazed, HSG C
	0.017	61	>75% Grass cover, Good, HSG B
*	0.917	98	Gravel roads, HSG B
*	1.308	98	Gravel roads, HSG C
	0.026	98	Paved parking, HSG B
	3.235	87	Weighted Average
	0.984		30.42% Pervious Area
	2.251		69.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.4	30	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.0	272	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	90	0.0050	4.55	8.05	**Pipe Channel, PD-15** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	20	0.0050	5.52	17.33	**Pipe Channel, PD-18** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
10.8	462	Total			

Subcatchment 20: Post-Development DA-4 (Detained, On-Site)



Summary for Subcatchment 21: Post-Development DA-4 (Detained, Off-Site)

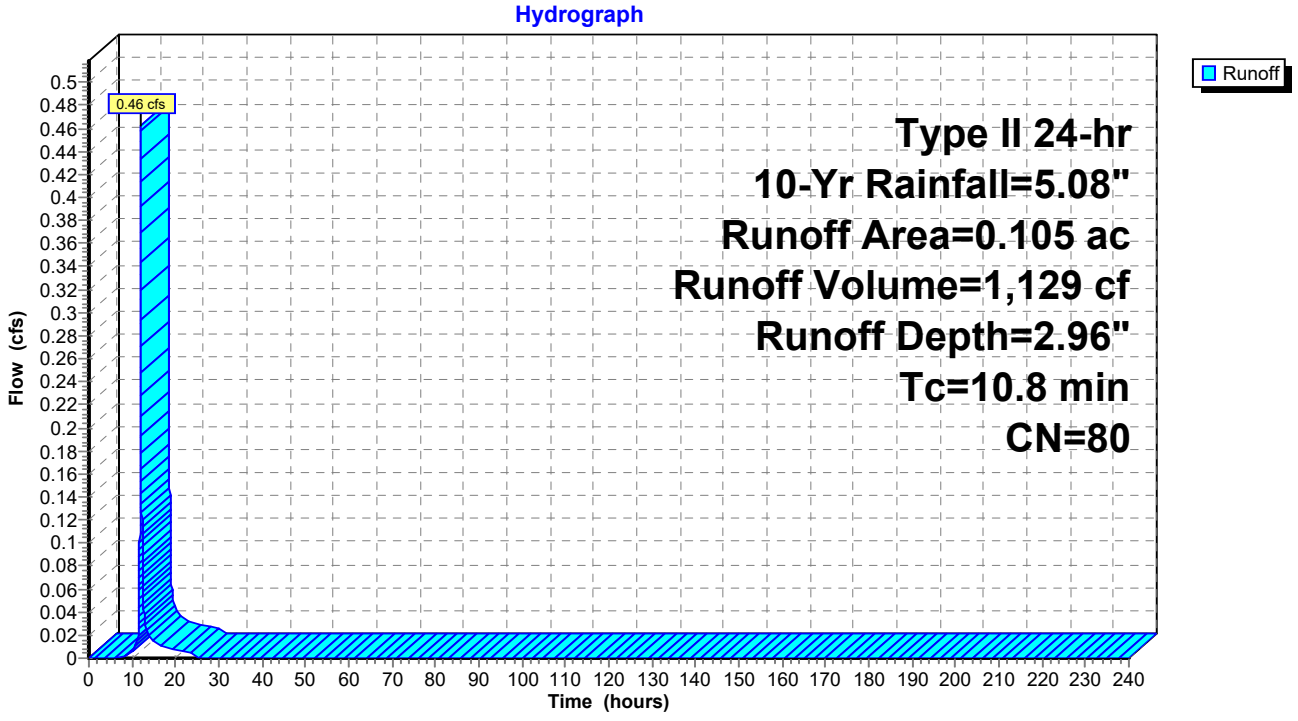
Runoff = 0.46 cfs @ 12.02 hrs, Volume= 1,129 cf, Depth= 2.96"
Routed to Pond 22 : Extended Detention Pond No. 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
0.047	58	Meadow, non-grazed, HSG B
0.058	98	Paved parking, HSG B
0.105	80	Weighted Average
0.047		44.76% Pervious Area
0.058		55.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8					**Direct Entry, Assumed Post-Development On-Site TC**

Subcatchment 21: Post-Development DA-4 (Detained, Off-Site)



Summary for Subcatchment 23: Post-Development DA-4 (Undetained, On-Site)

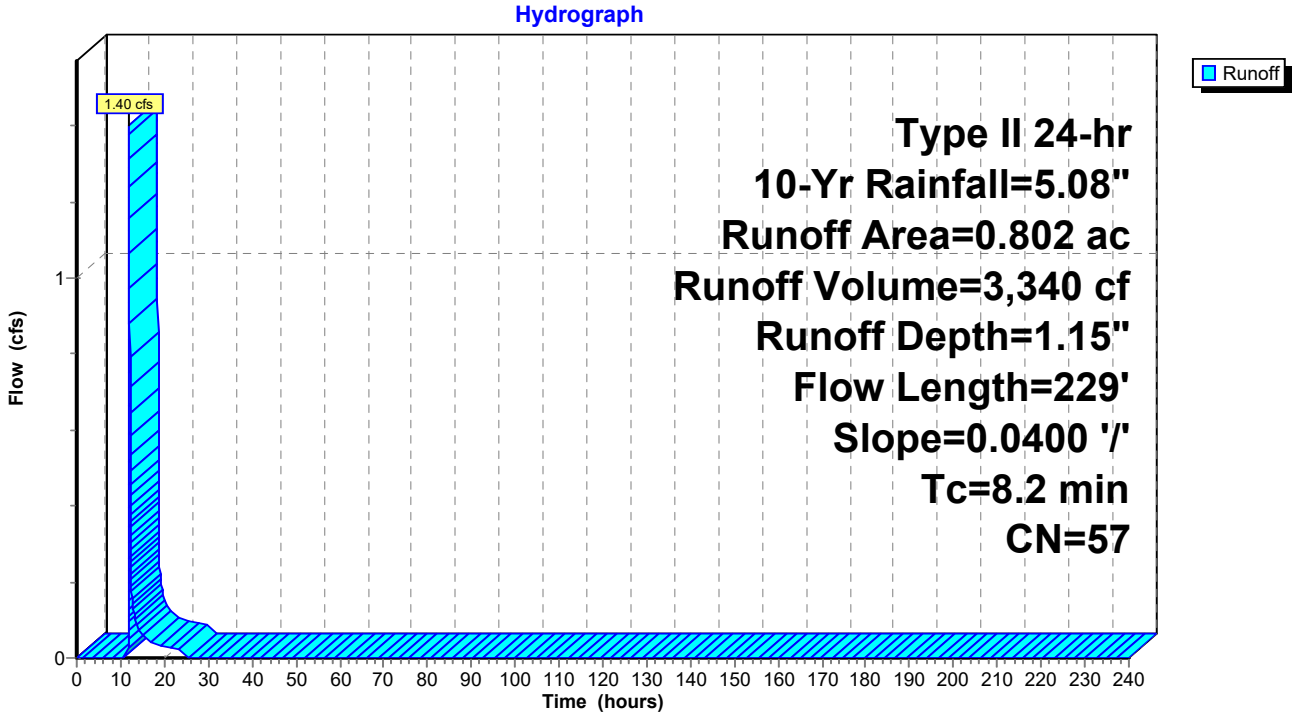
Runoff = 1.40 cfs @ 12.01 hrs, Volume= 3,340 cf, Depth= 1.15"
Routed to Link 25 : Post-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	0.252	55	Woods, Good, HSG B
	0.140	55	Woods, Good, HSG B
	0.400	58	Meadow, non-grazed, HSG B
*	0.010	98	Gravel roads, HSG C
	0.802	57	Weighted Average
	0.792		98.75% Pervious Area
	0.010		1.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.1	50	0.0400	0.14		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
2.1	179	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.2	229	Total			

Subcatchment 23: Post-Development DA-4 (Undetained, On-Site)



Summary for Subcatchment 24: Post-Development DA-4 (Undetained, Off-Site)

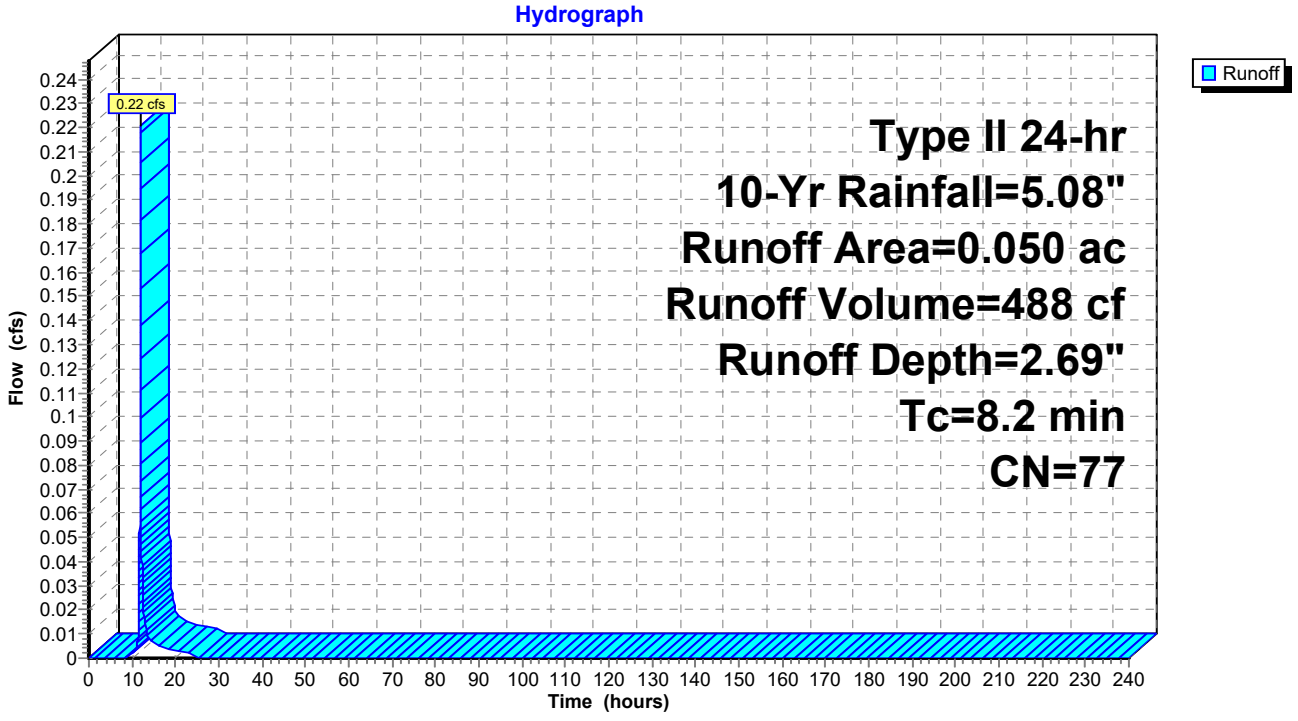
Runoff = 0.22 cfs @ 12.00 hrs, Volume= 488 cf, Depth= 2.69"
Routed to Link 25 : Post-Development POA-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
0.026	58	Meadow, non-grazed, HSG B
0.024	98	Paved parking, HSG B
0.050	77	Weighted Average
0.026		52.00% Pervious Area
0.024		48.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2					**Direct Entry, Assumed Post-Development On-Site TC**

Subcatchment 24: Post-Development DA-4 (Undetained, Off-Site)



Summary for Pond 11: Extended Detention Pond No. 1

Inflow Area = 600,997 sf, 55.88% Impervious, Inflow Depth = 3.22" for 10-Yr event
Inflow = 72.57 cfs @ 11.99 hrs, Volume= 161,451 cf
Outflow = 5.95 cfs @ 12.57 hrs, Volume= 161,451 cf, Atten= 92%, Lag= 34.7 min
Primary = 5.95 cfs @ 12.57 hrs, Volume= 161,451 cf
Routed to Link 14 : Post-Development POA-2
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 14 : Post-Development POA-2

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 644.64' @ 12.57 hrs Surf.Area= 22,738 sf Storage= 88,128 cf

Plug-Flow detention time= 1,028.8 min calculated for 161,444 cf (100% of inflow)
Center-of-Mass det. time= 1,029.1 min (1,841.1 - 812.0)

Volume	Invert	Avail.Storage	Storage Description
#1	642.00'	7,668 cf	**Western Forebay (Irregular)** Listed below (Recalc)
#2	646.00'	11,699 cf	**Eastern Forebay (Irregular)** Listed below (Recalc)
#3	637.00'	202,527 cf	**Open Pond (Irregular)** Listed below (Recalc)
		221,894 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
642.00	1,475	230.0	0	0	1,475
643.00	2,170	250.0	1,811	1,811	2,276
644.00	2,925	270.0	2,538	4,349	3,143
645.00	3,728	290.0	3,318	7,668	4,077

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
646.00	2,900	205.0	0	0	2,900
647.00	3,540	220.0	3,215	3,215	3,450
648.00	4,230	240.0	3,880	7,095	4,217
649.00	4,990	260.0	4,605	11,699	5,052

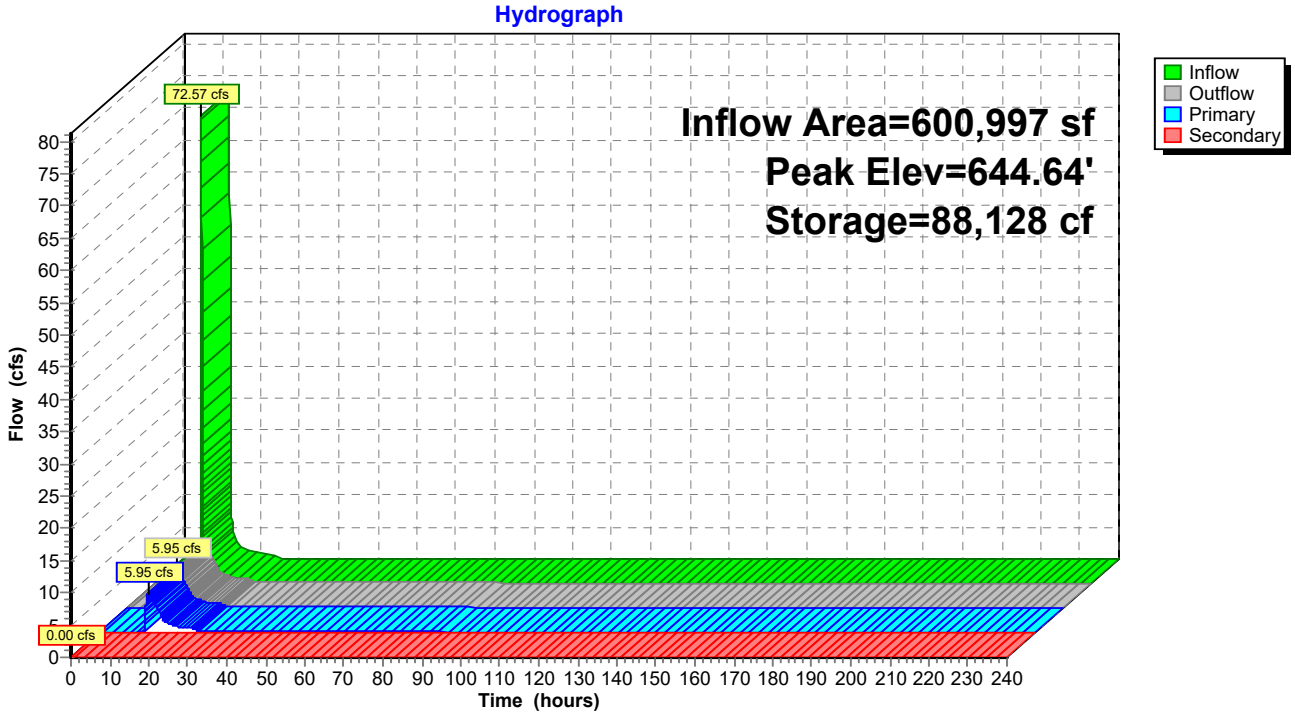
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
637.00	11,670	510.0	0.0	0	0	11,670
639.00	11,670	510.0	30.0	7,002	7,002	12,690
639.20	0	10.0	30.0	233	7,235	33,380
640.00	11,670	510.0	100.0	3,112	10,347	54,071
641.00	13,230	530.0	100.0	12,442	22,789	55,806
642.00	14,830	550.0	100.0	14,022	36,812	57,608
643.00	16,490	570.0	100.0	15,653	52,464	59,476
644.00	18,200	590.0	100.0	17,338	69,802	61,412
645.00	19,960	605.0	100.0	19,073	88,876	62,958
646.00	26,280	850.0	100.0	23,048	111,923	91,335
647.00	28,870	870.0	100.0	27,565	139,488	94,204
648.00	31,515	890.0	100.0	30,183	169,671	97,140
649.00	34,215	910.0	100.0	32,856	202,527	100,143

Device	Routing	Invert	Outlet Devices
#1	Primary	636.70'	**18.00" Round Outlet Pipe** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.70' / 636.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	637.00'	**2.00" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	643.00'	**24.00" W x 6.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	645.00'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	647.40'	**147.0 deg x 90.0' long x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=5.95 cfs @ 12.57 hrs HW=644.64' (Free Discharge)
└─**1=Outlet Pipe** (Passes 5.95 cfs of 22.81 cfs potential flow)
  ├─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.29 cfs @ 13.23 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 5.66 cfs @ 5.66 fps)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=637.00' (Free Discharge)
└─**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 11: Extended Detention Pond No. 1



Summary for Pond 16: Extended Detention Pond No. 2

Inflow Area = 185,261 sf, 73.01% Impervious, Inflow Depth = 3.74" for 10-Yr event
Inflow = 26.92 cfs @ 11.97 hrs, Volume= 57,816 cf
Outflow = 2.78 cfs @ 12.36 hrs, Volume= 57,816 cf, Atten= 90%, Lag= 23.6 min
Primary = 2.78 cfs @ 12.36 hrs, Volume= 57,816 cf
Routed to Link 19 : Post-Development POA-3
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 19 : Post-Development POA-3

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 623.06' @ 12.36 hrs Surf.Area= 12,863 sf Storage= 32,055 cf

Plug-Flow detention time= 1,313.4 min calculated for 57,816 cf (100% of inflow)
Center-of-Mass det. time= 1,313.3 min (2,107.5 - 794.2)

Volume	Invert	Avail.Storage	Storage Description
#1	619.00'	3,500 cf	**Forebay (Prismatic)**Listed below (Recalc)
#2	617.70'	64,766 cf	**Open Pond (Prismatic)**Listed below (Recalc)
		68,266 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
619.00	1,100	0	0
620.00	1,740	1,420	1,420
621.00	2,420	2,080	3,500

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
617.70	3,830	0.0	0	0
618.70	3,830	30.0	1,149	1,149
618.75	0	30.0	29	1,178
619.00	3,830	100.0	479	1,656
620.00	4,600	100.0	4,215	5,871
621.00	5,420	100.0	5,010	10,881
622.00	9,200	100.0	7,310	18,191
623.00	10,375	100.0	9,788	27,979
624.00	11,600	100.0	10,988	38,966
625.00	12,890	100.0	12,245	51,211
626.00	14,220	100.0	13,555	64,766

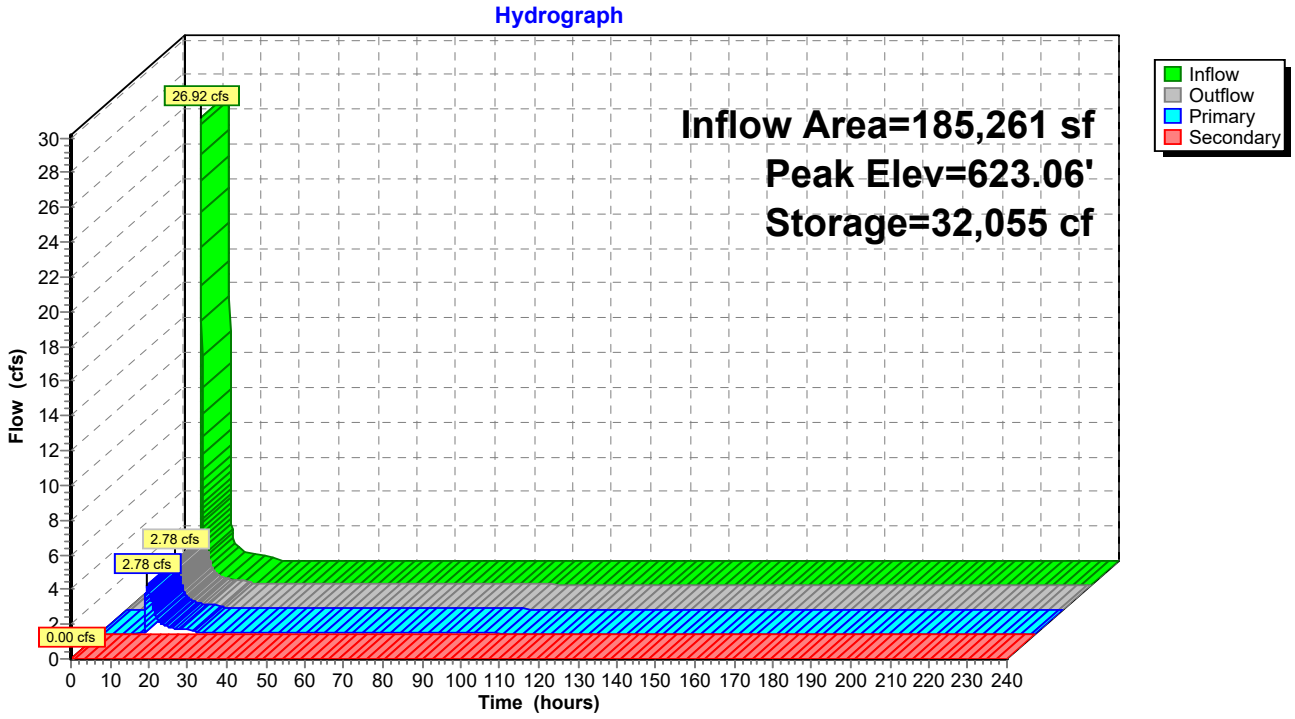
Device	Routing	Invert	Outlet Devices
#1	Primary	617.70'	**18.00" Round Outlet Pipe** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 617.70' / 617.43' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	617.70'	**1.25" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	622.00'	**15.00" W x 6.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	623.25'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600

			Limited to weir flow at low heads
#5	Secondary	624.50'	**147.0 deg x 40.0' long x 1.50' rise Emergency Spillway**
			Cv= 2.47 (C= 3.09)

Primary OutFlow Max=2.78 cfs @ 12.36 hrs HW=623.06' (Free Discharge)
└─**1=Outlet Pipe** (Passes 2.78 cfs of 18.26 cfs potential flow)
  └─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.09 cfs @ 11.09 fps)
  └─**3=Orifice/Grate** (Orifice Controls 2.69 cfs @ 4.30 fps)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=617.70' (Free Discharge)
└─**5=Emergency Spillway** (Controls 0.00 cfs)

Pond 16: Extended Detention Pond No. 2



Summary for Pond 22: Extended Detention Pond No. 3

Inflow Area = 145,490 sf, 69.13% Impervious, Inflow Depth = 3.62" for 10-Yr event
Inflow = 17.53 cfs @ 12.02 hrs, Volume= 43,906 cf
Outflow = 3.02 cfs @ 12.32 hrs, Volume= 43,906 cf, Atten= 83%, Lag= 18.2 min
Primary = 3.02 cfs @ 12.32 hrs, Volume= 43,906 cf
Routed to Link 25 : Post-Development POA-4
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 25 : Post-Development POA-4

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 648.21' @ 12.32 hrs Surf.Area= 9,998 sf Storage= 23,133 cf

Plug-Flow detention time= 930.3 min calculated for 43,906 cf (100% of inflow)
Center-of-Mass det. time= 930.2 min (1,732.7 - 802.5)

Volume	Invert	Avail.Storage	Storage Description
#1	645.50'	3,760 cf	**Forebay (Prismatic)**Listed below (Recalc)
#2	644.00'	50,650 cf	**Open Pond (Prismatic)**Listed below (Recalc)
		54,410 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
645.50	1,030	0	0
646.00	1,205	559	559
647.00	1,590	1,398	1,956
647.50	1,800	848	2,804
648.00	2,025	956	3,760

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
644.00	4,840	0.0	0	0
645.00	4,840	30.0	1,452	1,452
645.05	0	30.0	36	1,488
645.50	4,840	100.0	1,089	2,577
646.00	5,390	100.0	2,558	5,135
647.00	6,300	100.0	5,845	10,980
648.00	7,250	100.0	6,775	17,755
649.00	10,650	100.0	8,950	26,705
650.00	11,960	100.0	11,305	38,010
651.00	13,320	100.0	12,640	50,650

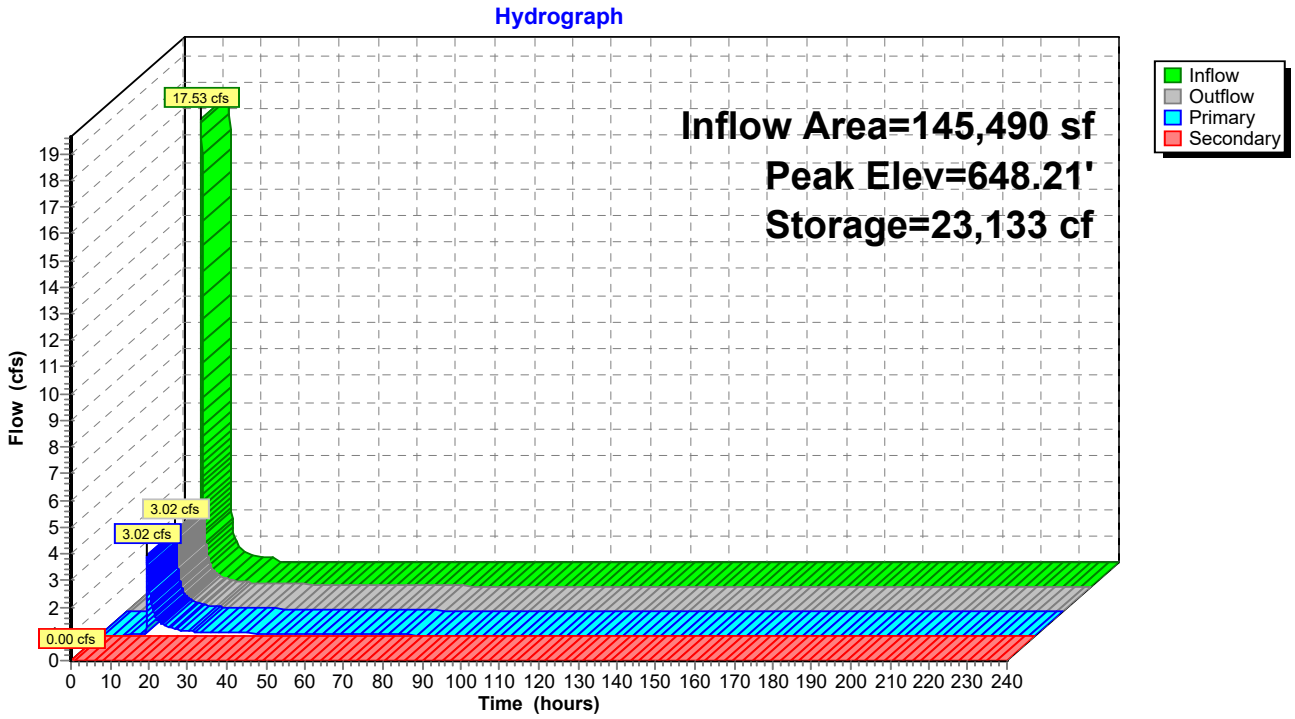
Device	Routing	Invert	Outlet Devices
#1	Primary	643.95'	**15.00" Round Outlet Pipe** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.95' / 643.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	644.00'	**1.50" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	647.50'	**18.00" W x 12.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

#4	Device 1	648.50'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	649.50'	**147.0 deg x 30.0' long x 1.25' rise Emergency Spillway** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=3.02 cfs @ 12.32 hrs HW=648.21' (Free Discharge)
└─**1=Outlet Pipe** (Passes 3.02 cfs of 11.27 cfs potential flow)
  ├─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.12 cfs @ 9.81 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 2.90 cfs @ 2.71 fps)
  └─**4=Outlet Control Structure Inlet**(Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=644.00' (Free Discharge)
└─**5=Emergency Spillway** (Controls 0.00 cfs)

Pond 22: Extended Detention Pond No. 3

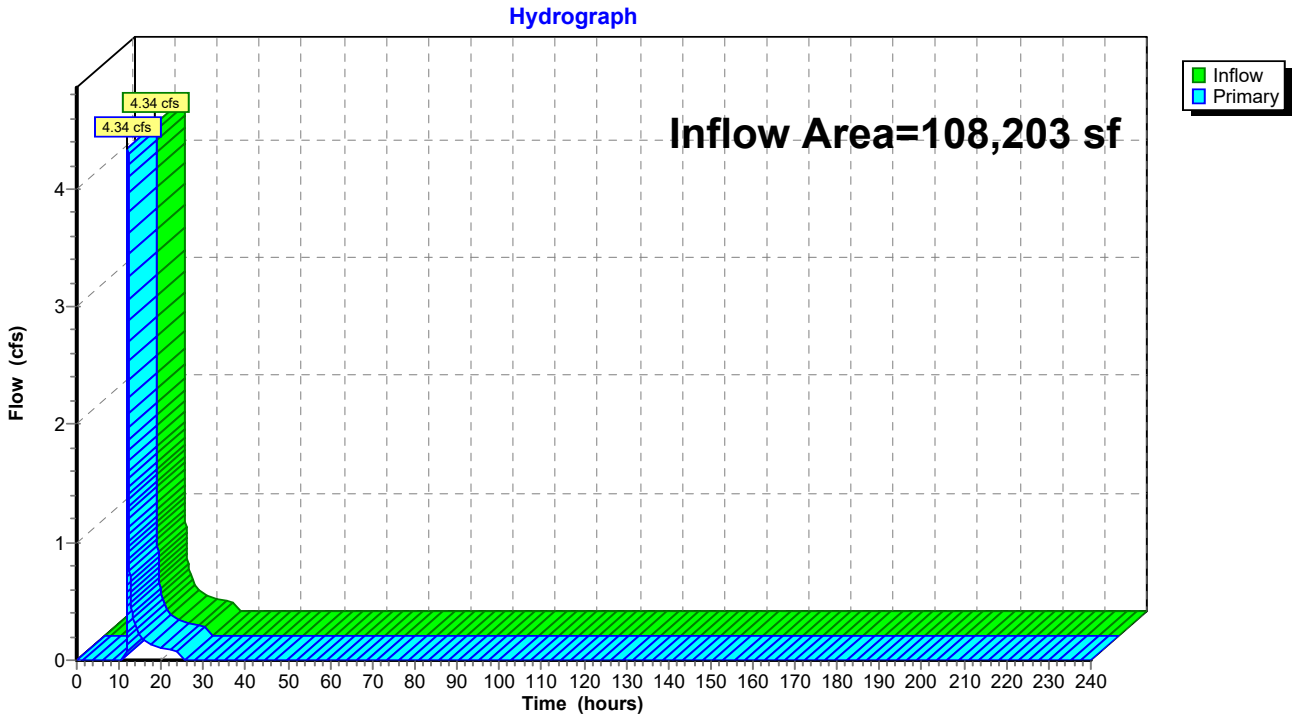


Summary for Link 8: Post-Development POA-1

Inflow Area = 108,203 sf, 5.64% Impervious, Inflow Depth = 1.37" for 10-Yr event
Inflow = 4.34 cfs @ 12.07 hrs, Volume= 12,352 cf
Primary = 4.34 cfs @ 12.07 hrs, Volume= 12,352 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 8: Post-Development POA-1

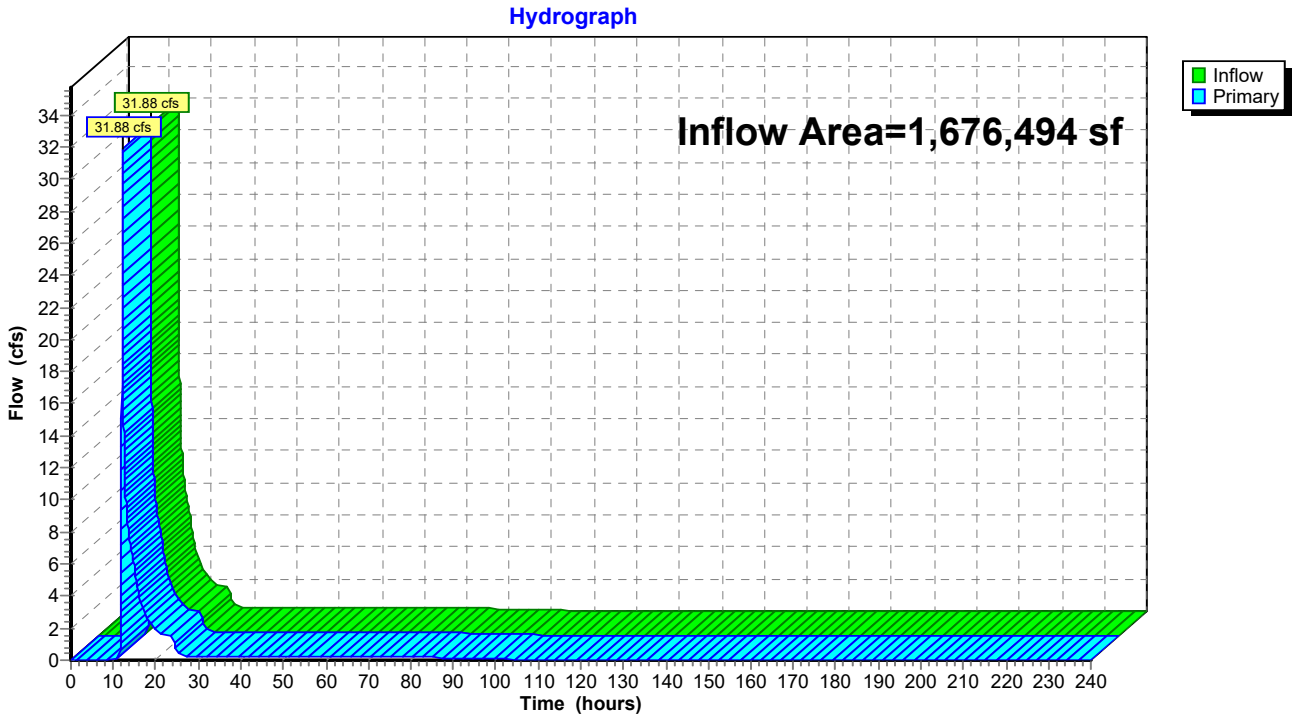


Summary for Link 14: Post-Development POA-2

Inflow Area = 1,676,494 sf, 20.44% Impervious, Inflow Depth = 1.85" for 10-Yr event
Inflow = 31.88 cfs @ 12.12 hrs, Volume= 258,966 cf
Primary = 31.88 cfs @ 12.12 hrs, Volume= 258,966 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 14: Post-Development POA-2

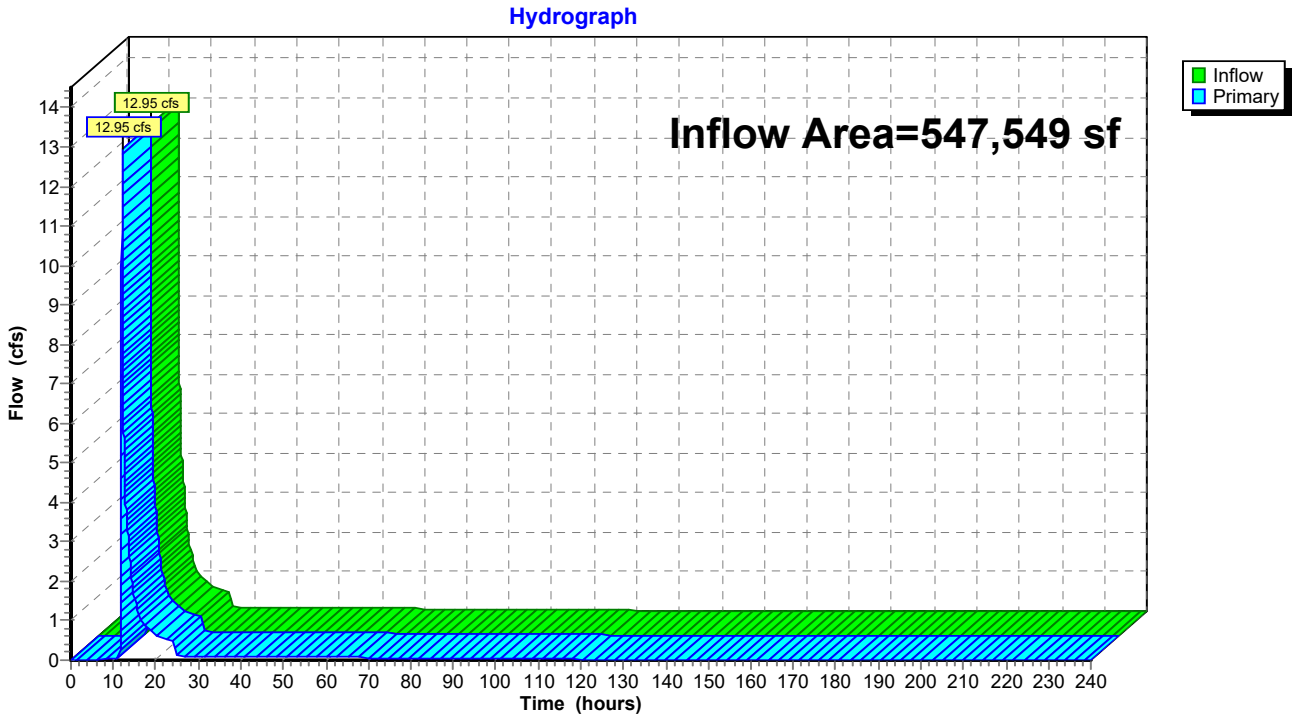


Summary for Link 19: Post-Development POA-3

Inflow Area = 547,549 sf, 25.03% Impervious, Inflow Depth = 2.06" for 10-Yr event
Inflow = 12.95 cfs @ 12.05 hrs, Volume= 94,158 cf
Primary = 12.95 cfs @ 12.05 hrs, Volume= 94,158 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 19: Post-Development POA-3

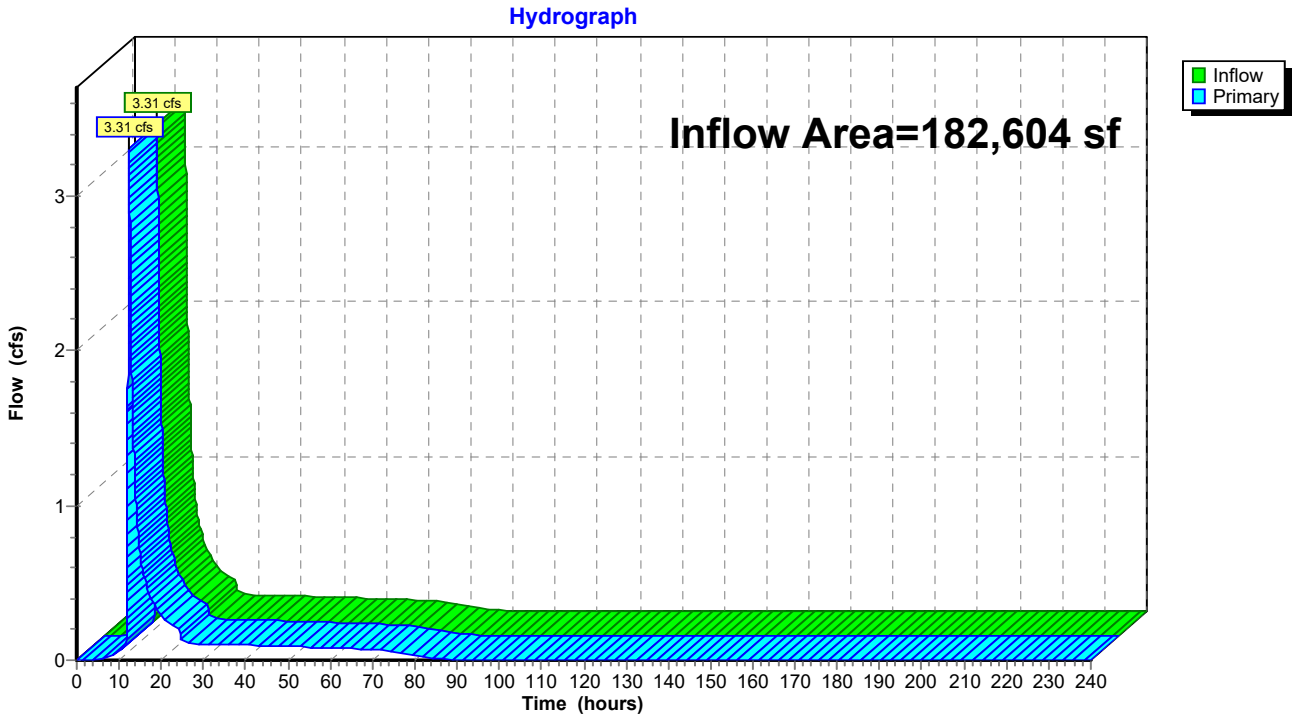


Summary for Link 25: Post-Development POA-4

Inflow Area = 182,604 sf, 55.89% Impervious, Inflow Depth = 3.14" for 10-Yr event
Inflow = 3.31 cfs @ 12.31 hrs, Volume= 47,734 cf
Primary = 3.31 cfs @ 12.31 hrs, Volume= 47,734 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 25: Post-Development POA-4



APPENDIX F
ENERGY BALANCE CALCULATIONS

Civil & Environmental Consultants, Inc.

ENERGY BALANCE METHOD (POI-1)

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, Virginia**
PREPARED BY: **JMP** DATE: **5/7/2025**
CHECKED BY: **LCW** DATE: **5/8/2025**

Energy Balance Equations:

Energy Balance Equation with Run-On:
Figure 5-25

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

q_{1post} = 1-year allowable post-development peak discharge from site (includes offsite run-on)
q_{1pre} = 1-year pre-development peak discharge from site ($q_{1pre,site}$) or offsite area ($q_{1pre,offsite}$)
RV_{1pre} = 1-year pre-development peak runoff volume from site ($RV_{1pre,site}$) or offsite area ($RV_{1pre,offsite}$)
RV_{1post} = 1-year post-development peak runoff volume from site ($RV_{1post,site}$) or offsite area ($RV_{1post,offsite}$)s
IF = Improvement Factor (0.8 for sites > 1 acre)

Under no condition shall:
Figure 5-24

$$Q_{1-yr-Developed} > Q_{1-yr-Pre-Developed}$$

$$Q_{1-yr-Developed} < (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$$

$Q_{1\text{-}yr\text{-}Developed}$ = the allowable peak flow rate of runoff from the developed site
$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ = the peak flow rate of runoff from the site in the pre-developed conditions
$Q_{1\text{-}yr\text{-}Forest}$ = the peak flow rate of runoff from the site in a forested condition
$RV_{1\text{-}yr\text{-}Developed}$ = the volume of runoff from the site in the developed condition
$RV_{1\text{-}yr\text{-}Forest}$ = the volume of runoff from the site in a forested condition

Inputs:

q_{1post} =	**0.47**	cfs
$q_{1pre,site}$ =	**0.02**	cfs
$q_{1pre,offsite}$ =	**0.46**	cfs
$RV_{1pre,site}$ =	**197**	cf
$RV_{1post,site}$ =	**151**	cf
IF =	**0.8**	

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

0.47 ≤ 0.48

Conditions are met.

$Q_{1\text{-}yr\text{-}Developed}$ =	**0.01**	cfs
$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ =	**0.02**	cfs
$Q_{1\text{-}yr\text{-}Forest}$ =	**0.01**	cfs
$RV_{1\text{-}yr\text{-}Developed}$ =	**151**	cf
$RV_{1\text{-}yr\text{-}Forest}$ =	**171**	cf

$Q_{1-yr-Developed}$ ***shall not be*** $> Q_{1-yr-Pre-Developed}$

0.01 ≤ 0.02

Conditions are met.

$Q_{1-yr-Developed}$ ***shall not be*** $< (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$

0.01 ≥ 0.01

Conditions are met.

STORMWATER QUANTITY REQUIREMENTS ARE SATISFIED

Civil & Environmental Consultants, Inc.

ENERGY BALANCE METHOD (POI-2)

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, Virginia**
PREPARED BY: **JMP** DATE: **5/7/2025**
CHECKED BY: **LCW** DATE: **5/8/2025**

Energy Balance Equations:

Energy Balance Equation with Run-On:
Figure 5-25

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

q_{1post} = 1-year allowable post-development peak discharge from site (includes offsite run-on)
q_{1pre} = 1-year pre-development peak discharge from site ($q_{1pre,site}$) or offsite area ($q_{1pre,offsite}$)
RV_{1pre} = 1-year pre-development peak runoff volume from site ($RV_{1pre,site}$) or offsite area ($RV_{1pre,offsite}$)
RV_{1post} = 1-year post-development peak runoff volume from site ($RV_{1post,site}$) or offsite area ($RV_{1post,offsite}$)s
IF = Improvement Factor (0.8 for sites > 1 acre)

Under no condition shall:
Figure 5-24

$$Q_{1-yr-Developed} > Q_{1-yr-Pre-Developed}$$

$$Q_{1-yr-Developed} < (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$$

$Q_{1\text{-}yr\text{-}Developed}$ = the allowable peak flow rate of runoff from the developed site
$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ = the peak flow rate of runoff from the site in the pre-developed conditions
$Q_{1\text{-}yr\text{-}Forest}$ = the peak flow rate of runoff from the site in a forested condition
$RV_{1\text{-}yr\text{-}Developed}$ = the volume of runoff from the site in the developed condition
$RV_{1\text{-}yr\text{-}Forest}$ = the volume of runoff from the site in a forested condition

Inputs:

q_{1post} =	**1.35**	cfs
$q_{1pre,site}$ =	**1.72**	cfs
$q_{1pre,offsite}$ =	**1.05**	cfs
$RV_{1pre,site}$ =	**14,339**	cf
$RV_{1post,site}$ =	**62,687**	cf
IF =	**0.8**	

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

1.35 ≤ 1.36

Conditions are met.

$Q_{1\text{-}yr\text{-}Developed}$ =	**0.38**	cfs
$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ =	**1.72**	cfs
$Q_{1\text{-}yr\text{-}Forest}$ =	**0.42**	cfs
$RV_{1\text{-}yr\text{-}Developed}$ =	**62,687**	cf
$RV_{1\text{-}yr\text{-}Forest}$ =	**7,796**	cf

$$Q_{1-yr-Developed} \textbf{ shall not be } > Q_{1-yr-Pre-Developed}$$

0.38 ≤ 1.72

Conditions are met.

$$Q_{1-yr-Developed} \textbf{ shall not be } < (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$$

0.38 ≥ 0.05

Conditions are met.

STORMWATER QUANTITY REQUIREMENTS ARE SATISFIED

ENERGY BALANCE METHOD (POI-3)

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, Virginia**
PREPARED BY: **JMP** DATE: **5/7/2025**
CHECKED BY: **LCW** DATE: **5/8/2025**

Energy Balance Equations:

Energy Balance Equation with Run-On:
Figure 5-25

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

q_{1post} = 1-year allowable post-development peak discharge from site (includes offsite run-on)
q_{1pre} = 1-year pre-development peak discharge from site ($q_{1pre,site}$) or offsite area ($q_{1pre,offsite}$)
RV_{1pre} = 1-year pre-development peak runoff volume from site ($RV_{1pre,site}$) or offsite area ($RV_{1pre,offsite}$)
RV_{1post} = 1-year post-development peak runoff volume from site ($RV_{1post,site}$) or offsite area ($RV_{1post,offsite}$)s
IF = Improvement Factor (0.8 for sites > 1 acre)

Under no condition shall:
Figure 5-24

$$Q_{1-yr-Developed} > Q_{1-yr-Pre-Developed}$$

$$Q_{1-yr-Developed} < (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$$

$Q_{1-yr-Developed}$ = the allowable peak flow rate of runoff from the developed site
$Q_{1-yr-Pre-Developed}$ = the peak flow rate of runoff from the site in the pre-developed conditions
$Q_{1-yr-Forest}$ = the peak flow rate of runoff from the site in a forested condition
$RV_{1-yr-Developed}$ = the volume of runoff from the site in the developed condition
$RV_{1-yr-Forest}$ = the volume of runoff from the site in a forested condition

Inputs:

q_{1post} =	**0.71**	cfs
$q_{1pre,site}$ =	**1.05**	cfs
$q_{1pre,offsite}$ =	**0.45**	cfs
$RV_{1pre,site}$ =	**9,025**	cf
$RV_{1post,site}$ =	**28,046**	cf
IF =	**0.8**	

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

0.71 ≤ 0.72

Conditions are met.

$Q_{1-yr-Developed}$ =	**0.43**	cfs
$Q_{1-yr-Pre-Developed}$ =	**1.05**	cfs
$Q_{1-yr-Forest}$ =	**0.26**	cfs
$RV_{1-yr-Developed}$ =	**28,046**	cf
$RV_{1-yr-Forest}$ =	**4,907**	cf

$$Q_{1-yr-Developed} \textbf{ shall not be } > Q_{1-yr-Pre-Developed}$$

0.43 ≤ 1.05

Conditions are met.

$$Q_{1-yr-Developed} \textbf{ shall not be } < (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$$

0.43 ≥ 0.05

Conditions are met.

STORMWATER QUANTITY REQUIREMENTS ARE SATISFIED

Civil & Environmental Consultants, Inc.

ENERGY BALANCE METHOD (POI-4)

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, Virginia**
PREPARED BY: **JMP** DATE: **5/7/2025**
CHECKED BY: **LCW** DATE: **5/8/2025**

Energy Balance Equations:

Energy Balance Equation with Run-On:
Figure 5-25

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

q_{1post} = 1-year allowable post-development peak discharge from site (includes offsite run-on)
q_{1pre} = 1-year pre-development peak discharge from site ($q_{1pre,site}$) or offsite area ($q_{1pre,offsite}$)
RV_{1pre} = 1-year pre-development peak runoff volume from site ($RV_{1pre,site}$) or offsite area ($RV_{1pre,offsite}$)
RV_{1post} = 1-year post-development peak runoff volume from site ($RV_{1post,site}$) or offsite area ($RV_{1post,offsite}$)s
IF = Improvement Factor (0.8 for sites > 1 acre)

Under no condition shall:
Figure 5-24

$$Q_{1-yr-Developed} > Q_{1-yr-Pre-Developed}$$

$$Q_{1-yr-Developed} < (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$$

$Q_{1\text{-}yr\text{-}Developed}$ = the allowable peak flow rate of runoff from the developed site
$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ = the peak flow rate of runoff from the site in the pre-developed conditions
$Q_{1\text{-}yr\text{-}Forest}$ = the peak flow rate of runoff from the site in a forested condition
$RV_{1\text{-}yr\text{-}Developed}$ = the volume of runoff from the site in the developed condition
$RV_{1\text{-}yr\text{-}Forest}$ = the volume of runoff from the site in a forested condition

Inputs:

q_{1post} =	**0.23**	cfs
$q_{1pre,site}$ =	**0.83**	cfs
$q_{1pre,offsite}$ =	**0.23**	cfs
$RV_{1pre,site}$ =	**2,786**	cf
$RV_{1post,site}$ =	**18,719**	cf
IF =	**0.8**	

$$q_{1post} \leq q_{1pre,site}\left(\frac{RV_{1pre,site}}{RV_{1post,site}}\right)(IF) + q_{1pre,offsite}$$

0.23 ≤ 0.33

Conditions are met.

$Q_{1\text{-}yr\text{-}Developed}$ =	**0.16**	cfs
$Q_{1\text{-}yr\text{-}Pre\text{-}Developed}$ =	**0.83**	cfs
$Q_{1\text{-}yr\text{-}Forest}$ =	**0.06**	cfs
$RV_{1\text{-}yr\text{-}Developed}$ =	**18,719**	cf
$RV_{1\text{-}yr\text{-}Forest}$ =	**1,039**	cf

$Q_{1-yr-Developed}$ ***shall not be*** $> Q_{1-yr-Pre-Developed}$

0.16 ≤ 0.83

Conditions are met.

$Q_{1-yr-Developed}$ ***shall not be*** $< (Q_{1-yr-Forest} * RV_{1-yr-Forest})/RV_{1-yr-Developed}$

0.16 ≥ 0.00

Conditions are met.

STORMWATER QUANTITY REQUIREMENTS ARE SATISFIED

APPENDIX G
ANTI-SEEP COLLAR CALCULATIONS

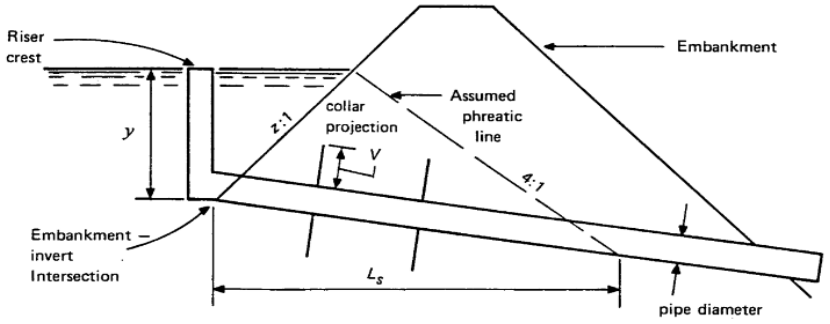
Civil & Environmental Consultants, Inc.

Anti-Seep Collar Design

Sediment Basin A, Outfall

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, VA**
PREPARED BY: JMP DATE: 4/11/2025
CHECKED BY: BJH DATE: 4/11/2025

Length of Pipe (LF):	**100**
Inlet Invert Elevation:	**647.00**
Outlet Invert Elevation:	**646.00**
Riser Crest Elevation:	**653.00**
Z (FT):	**3.00**
Pipe Diameter (IN):	**15**
Initial Number of Collars	**2**
Pipe Slope (FT/FT)	**0.010**
Y (FT)=	**6.0**
Type of Basin	**Permanent**



1. Determine L_s (FT)

$$L_s = y(z+4)\left[1 + \frac{pipe\ slope\ \left(\frac{ft}{ft}\right)}{0.25 - pipe\ slope}\right]$$

L_s= 44

Where:
y = Distance from upstream invert of principal spillway riser to top of dewatering volume
z = Horizontal component of upstream embankment slope
Note: In instances where the Ls equation would yield a distance greater than the total length of pipe, the Ls used is equal to the length of the outfall pipe.

2. Flow Path Increase (FT)

$$L_f = (Increase\ Factor)(\mathrm{Ls})$$

L_f= 51

Notes:
For a permanent basin, the flow path is increased by 15% (i.e. Increase Factor = 1.15)
For a temporary basin, the flow path is increased by 10% (i.e. Increase Factor = 1.1)

3. Minimum collar projection (V_{min}) = flow path increase/twice the number of collars (FT)

$$\mathrm{V_{min}} = \left[\frac{L_f - Ls}{(2)(\#\ of\ Collars)}\right]$$

V_{min}= 2

4. Spacing Check (FT)

$$\text{Minimum Spacing} = [5 * Vmin]$$

Min. Spacing= 10

$$\text{Maximum Spacing} = [14 * Vmin]$$

Max. Spacing= 28

5. Final Anti-Seep Collar Spacing (FT)

$$\text{Spacing} = \left[\frac{L_s}{1+(\#\ of\ Collars)}\right]$$

Spaced every 15 Feet

6. Collar Dimensions (S, FT)

$$\mathrm{S} = [2V + Barrel\ Diameter]$$

S= 5.3

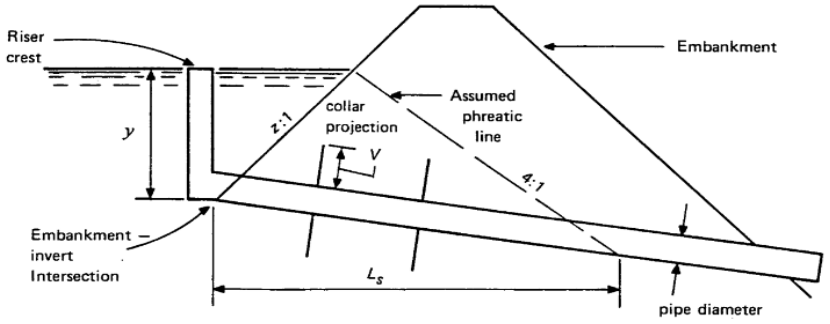
Civil & Environmental Consultants, Inc.

Anti-Seep Collar Design

ED Pond 1, Outfall

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, VA**
PREPARED BY: JBH DATE: 5/7/2025
CHECKED BY: BJH DATE: 5/8/2025

Length of Pipe (LF):	**70**
Inlet Invert Elevation:	**636.70**
Outlet Invert Elevation:	**636.00**
Riser Crest Elevation:	**645.00**
Z (FT):	**3.00**
Pipe Diameter (IN):	**18**
Initial Number of Collars	**3**
Pipe Slope (FT/FT)	**0.010**
Y (FT)=	**8.3**
Type of Basin	**Permanent**



1. Determine L_s (FT)

$$L_s = y(z+4)\left[1 + \frac{pipe\ slope\ \left(\frac{ft}{ft}\right)}{0.25 - pipe\ slope}\right]$$

L_s= 61

Where:
y = Distance from upstream invert of principal spillway riser to top of dewatering volume
z = Horizontal component of upstream embankment slope
Note: In instances where the Ls equation would yield a distance greater than the total length of pipe, the Ls used is equal to the length of the outfall pipe.

2. Flow Path Increase (FT)

$$L_f = (Increase\ Factor)(\mathrm{Ls})$$

L_f= 71

Notes:
For a permanent basin, the flow path is increased by 15% (i.e. Increase Factor = 1.15)
For a temporary basin, the flow path is increased by 10% (i.e. Increase Factor = 1.1)

3. Minimum collar projection (V_{min}) = flow path increase/twice the number of collars (FT)

$$\mathrm{V_{min}} = \left[\frac{L_f - Ls}{(2)(\#\ of\ Collars)}\right]$$

V_{min}= 2

4. Spacing Check (FT)

$$\text{Minimum Spacing} = [5 * Vmin]$$

Min. Spacing= 10

$$\text{Maximum Spacing} = [14 * Vmin]$$

Max. Spacing= 28

5. Final Anti-Seep Collar Spacing (FT)

$$\text{Spacing} = \left[\frac{L_s}{1+(\#\ of\ Collars)}\right]$$

Spaced every 15 Feet

6. Collar Dimensions (S, FT)

$$\mathrm{S} = [2V + Barrel\ Diameter]$$

S= 5.5

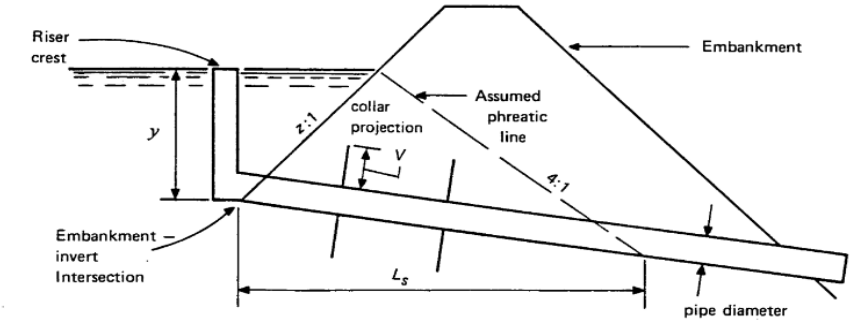
Civil & Environmental Consultants, Inc.

Anti-Seep Collar Design

ED Pond 2, Outfall

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, VA**
PREPARED BY: JBH DATE: 5/7/2025
CHECKED BY: BJH DATE: 5/8/2025

Length of Pipe (LF):	**55**
Inlet Invert Elevation:	**617.70**
Outlet Invert Elevation:	**617.43**
Riser Crest Elevation:	**623.25**
Z (FT):	**3.00**
Pipe Diameter (IN):	**18**
Initial Number of Collars	**2**
Pipe Slope (FT/FT)	**0.005**
Y (FT)=	**5.5**
Type of Basin	**Permanent**



1. Determine L_s (FT)

$$L_s = y(z+4)\left[1 + \frac{pipe\ slope\ \left(\frac{ft}{ft}\right)}{0.25 - pipe\ slope}\right]$$

L_s= 40

Where:
y = Distance from upstream invert of principal spillway riser to top of dewatering volume
z = Horizontal component of upstream embankment slope
Note: In instances where the Ls equation would yield a distance greater than the total length of pipe, the Ls used is equal to the length of the outfall pipe.

2. Flow Path Increase (FT)

$$L_f = (Increase\ Factor)(\mathrm{Ls})$$

L_f= 46

Notes:
For a permanent basin, the flow path is increased by 15% (i.e. Increase Factor = 1.15)
For a temporary basin, the flow path is increased by 10% (i.e. Increase Factor = 1.1)

3. Minimum collar projection (V_{min}) = flow path increase/twice the number of collars (FT)

$$\mathrm{V_{min}} = \left[\frac{L_f - Ls}{(2)(\#\ of\ Collars)}\right]$$

V_{min}= 2

4. Spacing Check (FT)

$$\text{Minimum Spacing} = [5 * Vmin]$$

Min. Spacing= 10

$$\text{Maximum Spacing} = [14 * Vmin]$$

Max. Spacing= 28

5. Final Anti-Seep Collar Spacing (FT)

$$\text{Spacing} = \left[\frac{L_s}{1+(\#\ of\ Collars)}\right]$$

Spaced every 13 Feet

6. Collar Dimensions (S, FT)

$$\mathrm{S} = [2V + Barrel\ Diameter]$$

S= 5.5

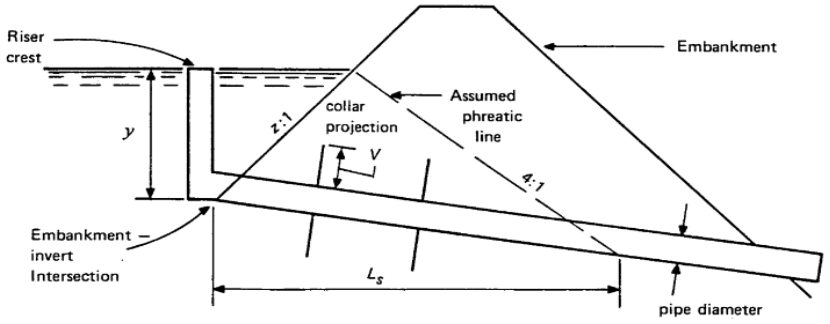
Civil & Environmental Consultants, Inc.

Anti-Seep Collar Design

ED Pond 3, Outfall

PROJECT NAME: **Compressor Station 165**
PROJECT NUMBER: **341-132**
LOCATION: **Pittsylvania County, VA**
PREPARED BY: JBH DATE: 5/7/2025
CHECKED BY: BJH DATE: 5/8/2025

Length of Pipe (LF):	**45**
Inlet Invert Elevation:	**643.95**
Outlet Invert Elevation:	**643.50**
Riser Crest Elevation:	**648.50**
Z (FT):	**3.00**
Pipe Diameter (IN):	**15**
Initial Number of Collars	**2**
Pipe Slope (FT/FT)	**0.010**
Y (FT)=	**4.5**
Type of Basin	**Permanent**



1. Determine L_s (FT)

$$L_s = y(z+4)\left[1 + \frac{pipe\ slope\ \left(\frac{ft}{ft}\right)}{0.25 - pipe\ slope}\right]$$

L_s= 33

Where:
y = Distance from upstream invert of principal spillway riser to top of dewatering volume
z = Horizontal component of upstream embankment slope
Note: In instances where the Ls equation would yield a distance greater than the total length of pipe, the Ls used is equal to the length of the outfall pipe.

2. Flow Path Increase (FT)

$$L_f = (Increase\ Factor)(\mathrm{Ls})$$

L_f= 38

Notes:
For a permanent basin, the flow path is increased by 15% (i.e. Increase Factor = 1.15)
For a temporary basin, the flow path is increased by 10% (i.e. Increase Factor = 1.1)

3. Minimum collar projection (V_{min}) = flow path increase/twice the number of collars (FT)

$$\mathrm{V_{min}} = \left[\frac{L_f - Ls}{(2)(\#\ of\ Collars)}\right]$$

V_{min}= 2

4. Spacing Check (FT)

$$\text{Minimum Spacing} = [5 * Vmin]$$

Min. Spacing= 10

$$\text{Maximum Spacing} = [14 * Vmin]$$

Max. Spacing= 28

5. Final Anti-Seep Collar Spacing (FT)

$$\text{Spacing} = \left[\frac{L_s}{1+(\#\ of\ Collars)}\right]$$

Spaced every 11 Feet

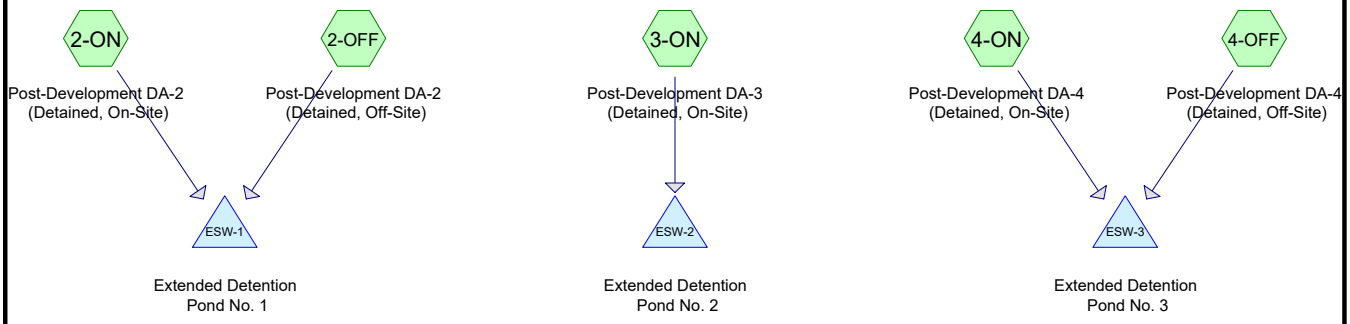
6. Collar Dimensions (S, FT)

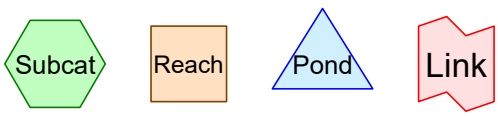
$$\mathrm{S} = [2V + Barrel\ Diameter]$$

S= 5.3

APPENDIX H
EMERGENCY SPILLWAY CALCULATIONS

Emergency Spillway Analyses





Routing Diagram for 341-132-CV01-PCSM_CN98_JMP WORKING
Prepared by CEC Inc, Printed 5/29/2025

Summary for Subcatchment 2-OFF: Post-Development DA-2 (Detained, Off-Site)

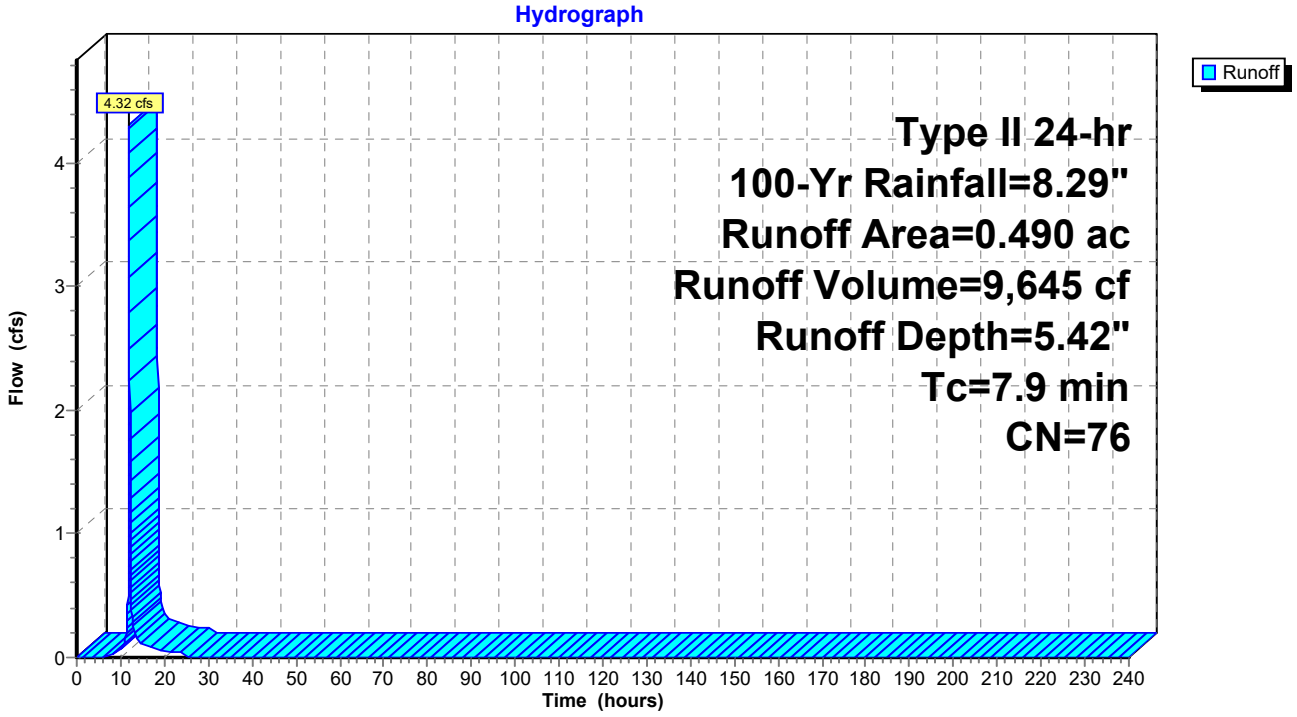
Runoff = 4.32 cfs @ 11.99 hrs, Volume= 9,645 cf, Depth= 5.42"
Routed to Pond ESW-1 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Rainfall=8.29"

Area (ac)	CN	Description
0.019	55	Woods, Good, HSG B
0.066	77	Woods, Good, HSG D
0.198	58	Meadow, non-grazed, HSG B
0.041	78	Meadow, non-grazed, HSG D
0.166	98	Paved parking, HSG B
0.490	76	Weighted Average
0.324		66.12% Pervious Area
0.166		33.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9					**Direct Entry, Assumed Equal to Detained On-Site TC**

Subcatchment 2-OFF: Post-Development DA-2 (Detained, Off-Site)



Summary for Subcatchment 2-ON: Post-Development DA-2 (Detained, On-Site)

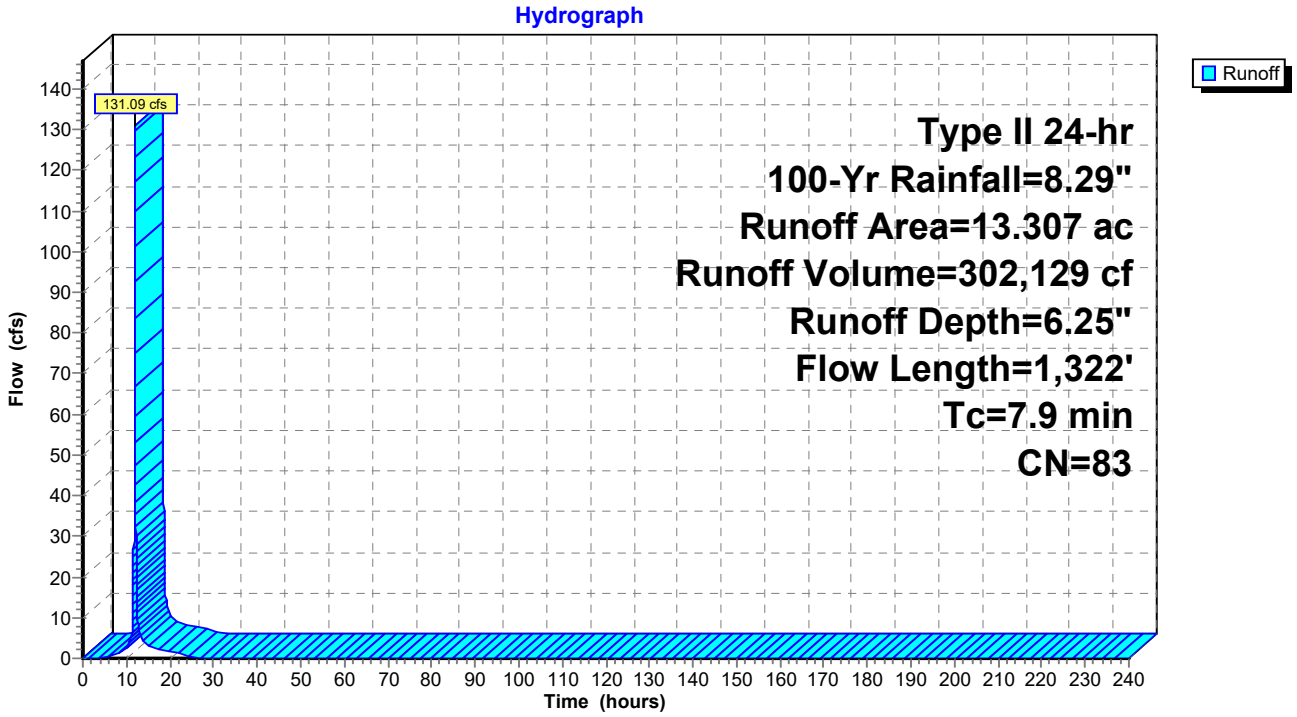
Runoff = 131.09 cfs @ 11.99 hrs, Volume= 302,129 cf, Depth= 6.25"
Routed to Pond ESW-1 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Rainfall=8.29"

	Area (ac)	CN	Description
	1.116	55	Woods, Good, HSG B
	1.362	70	Woods, Good, HSG C
	0.020	77	Woods, Good, HSG D
	2.398	58	Meadow, non-grazed, HSG B
	0.775	71	Meadow, non-grazed, HSG C
	0.092	74	>75% Grass cover, Good, HSG C
*	3.439	98	Gravel roads, HSG B
*	4.026	98	Gravel roads, HSG C
	0.079	98	Paved parking, HSG B
	13.307	83	Weighted Average
	5.763		43.31% Pervious Area
	7.544		56.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
3.9	380	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	153	0.0050	4.55	8.05	**Pipe Channel, PD-2** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.5	127	0.0050	4.55	8.05	**Pipe Channel, PD-3** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.7	192	0.0050	4.55	8.05	**Pipe Channel, PD-4** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.6	192	0.0050	5.52	17.33	**Pipe Channel, PD-5** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.4	148	0.0050	5.52	17.33	**Pipe Channel, PD-6** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.2710	47.12	231.32	**Pipe Channel, PD-13** 30.00" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.0250	14.31	70.26	**Pipe Channel, PD-13A** 30.00" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
7.9	1,322	Total			

Subcatchment 2-ON: Post-Development DA-2 (Detained, On-Site)



Summary for Subcatchment 3-ON: Post-Development DA-3 (Detained, On-Site)

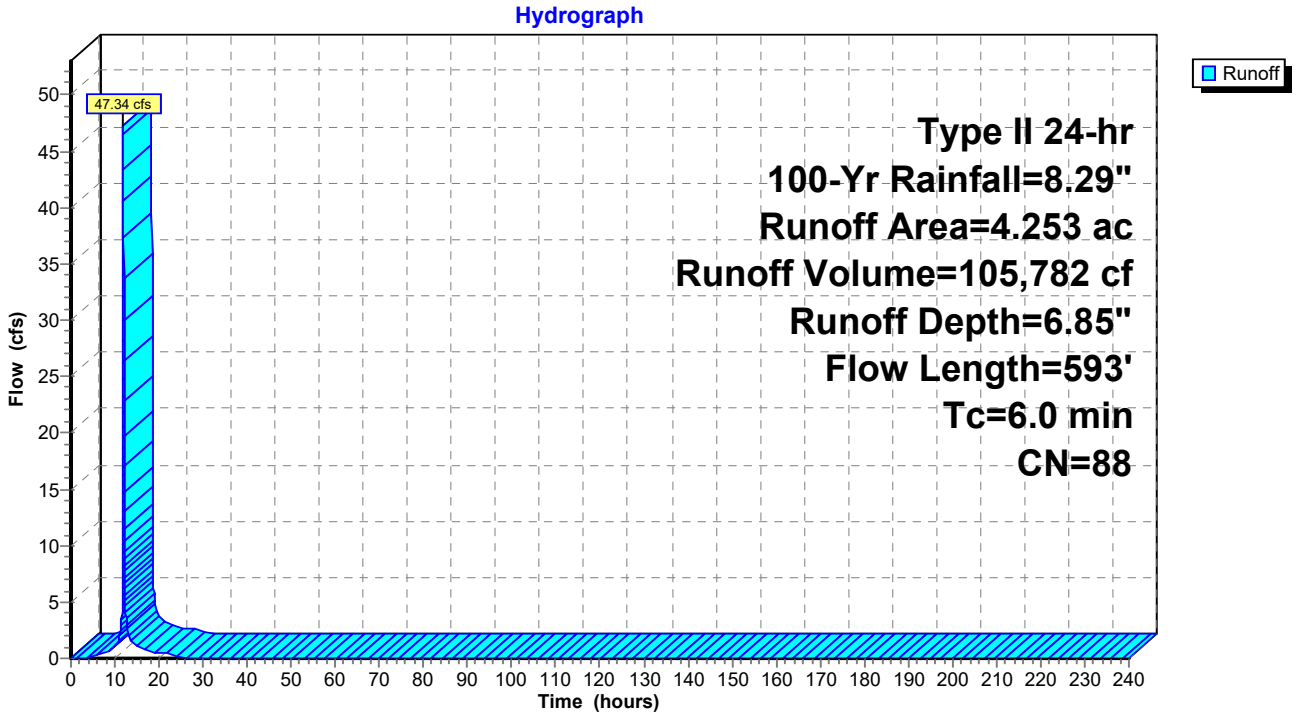
Runoff = 47.34 cfs @ 11.97 hrs, Volume= 105,782 cf, Depth= 6.85"
Routed to Pond ESW-2 : Extended Detention Pond No. 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Rainfall=8.29"

	Area (ac)	CN	Description
	0.118	55	Woods, Good, HSG B
	0.799	58	Meadow, non-grazed, HSG B
	0.231	71	Meadow, non-grazed, HSG C
*	1.777	98	Gravel roads, HSG B
*	1.328	98	Gravel roads, HSG C
	4.253	88	Weighted Average
	1.148		26.99% Pervious Area
	3.105		73.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.93		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
2.7	263	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.5	110	0.0050	4.03	4.95	**Pipe Channel, PD-20** 15.00" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
0.3	100	0.0100	6.44	11.38	**Pipe Channel, PD-22** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	70	0.0500	14.40	25.45	**Pipe Channel, PD-23** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
4.5	593	Total, Increased to minimum Tc = 6.0 min			

Subcatchment 3-ON: Post-Development DA-3 (Detained, On-Site)



Summary for Subcatchment 4-OFF: Post-Development DA-4 (Detained, Off-Site)

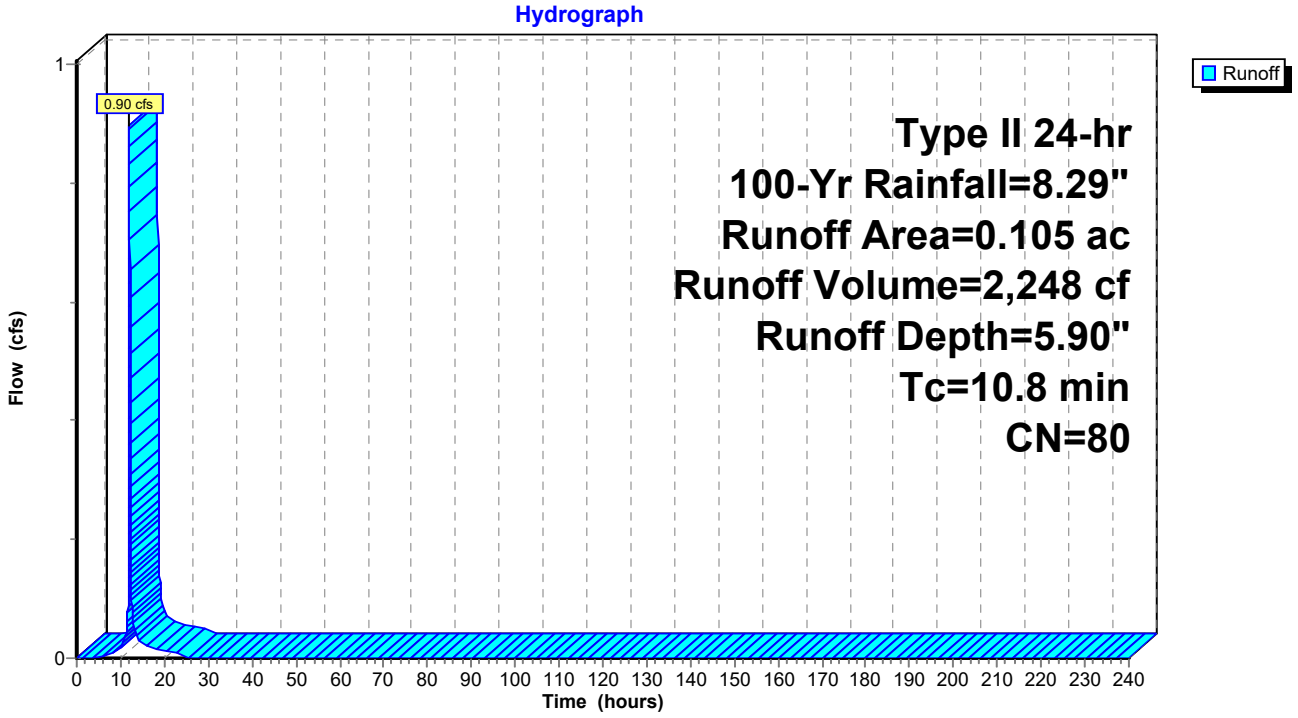
Runoff = 0.90 cfs @ 12.02 hrs, Volume= 2,248 cf, Depth= 5.90"
Routed to Pond ESW-3 : Extended Detention Pond No. 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Rainfall=8.29"

Area (ac)	CN	Description
0.047	58	Meadow, non-grazed, HSG B
0.058	98	Paved parking, HSG B
0.105	80	Weighted Average
0.047		44.76% Pervious Area
0.058		55.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.8					**Direct Entry, Assumed Post-Development On-Site TC**

Subcatchment 4-OFF: Post-Development DA-4 (Detained, Off-Site)



Summary for Subcatchment 4-ON: Post-Development DA-4 (Detained, On-Site)

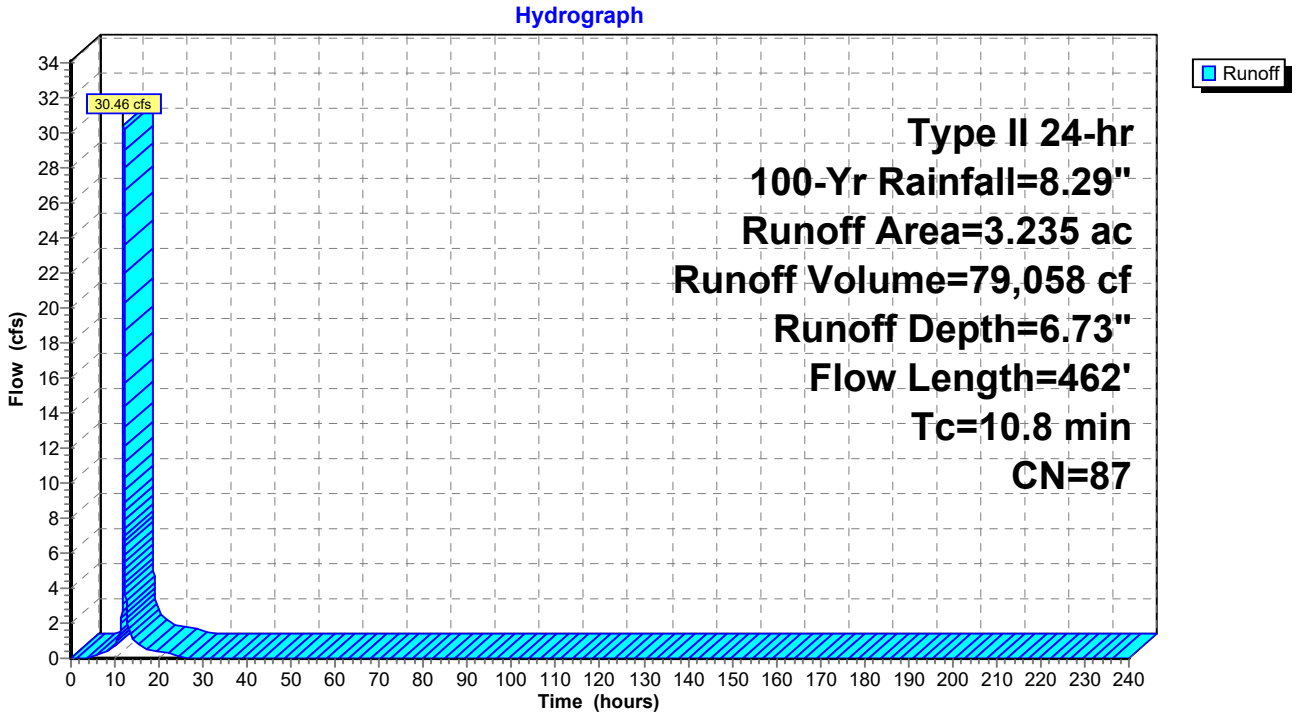
Runoff = 30.46 cfs @ 12.02 hrs, Volume= 79,058 cf, Depth= 6.73"
Routed to Pond ESW-3 : Extended Detention Pond No. 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 100-Yr Rainfall=8.29"

	Area (ac)	CN	Description
	0.585	58	Meadow, non-grazed, HSG B
	0.382	71	Meadow, non-grazed, HSG C
	0.017	61	>75% Grass cover, Good, HSG B
*	0.917	98	Gravel roads, HSG B
*	1.308	98	Gravel roads, HSG C
	0.026	98	Paved parking, HSG B
	3.235	87	Weighted Average
	0.984		30.42% Pervious Area
	2.251		69.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.4	30	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
2.0	272	0.0200	2.28		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.3	90	0.0050	4.55	8.05	**Pipe Channel, PD-15** 18.00" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	20	0.0050	5.52	17.33	**Pipe Channel, PD-18** 24.00" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012
10.8	462	Total			

Subcatchment 4-ON: Post-Development DA-4 (Detained, On-Site)



Summary for Pond ESW-1: Extended Detention Pond No. 1

Inflow Area = 600,997 sf, 55.88% Impervious, Inflow Depth = 6.23" for 100-Yr event
Inflow = 135.41 cfs @ 11.99 hrs, Volume= 311,774 cf
Outflow = 129.06 cfs @ 12.02 hrs, Volume= 311,774 cf, Atten= 5%, Lag= 1.6 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 129.06 cfs @ 12.02 hrs, Volume= 311,774 cf

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Starting Elev= 647.40' Surf.Area= 37,451 sf Storage= 163,596 cf
Peak Elev= 647.99' @ 12.02 hrs Surf.Area= 39,447 sf Storage= 184,165 cf (20,569 cf above start)

Plug-Flow detention time= 245.8 min calculated for 148,178 cf (48% of inflow)
Center-of-Mass det. time= 5.8 min (799.3 - 793.5)

Volume	Invert	Avail.Storage	Storage Description
#1	642.00'	7,668 cf	**Western Forebay (Irregular)** Listed below (Recalc)
#2	646.00'	11,699 cf	**Eastern Forebay (Irregular)** Listed below (Recalc)
#3	637.00'	202,527 cf	**Open Pond (Irregular)** Listed below (Recalc)
		221,894 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
642.00	1,475	230.0	0	0	1,475
643.00	2,170	250.0	1,811	1,811	2,276
644.00	2,925	270.0	2,538	4,349	3,143
645.00	3,728	290.0	3,318	7,668	4,077

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
646.00	2,900	205.0	0	0	2,900
647.00	3,540	220.0	3,215	3,215	3,450
648.00	4,230	240.0	3,880	7,095	4,217
649.00	4,990	260.0	4,605	11,699	5,052

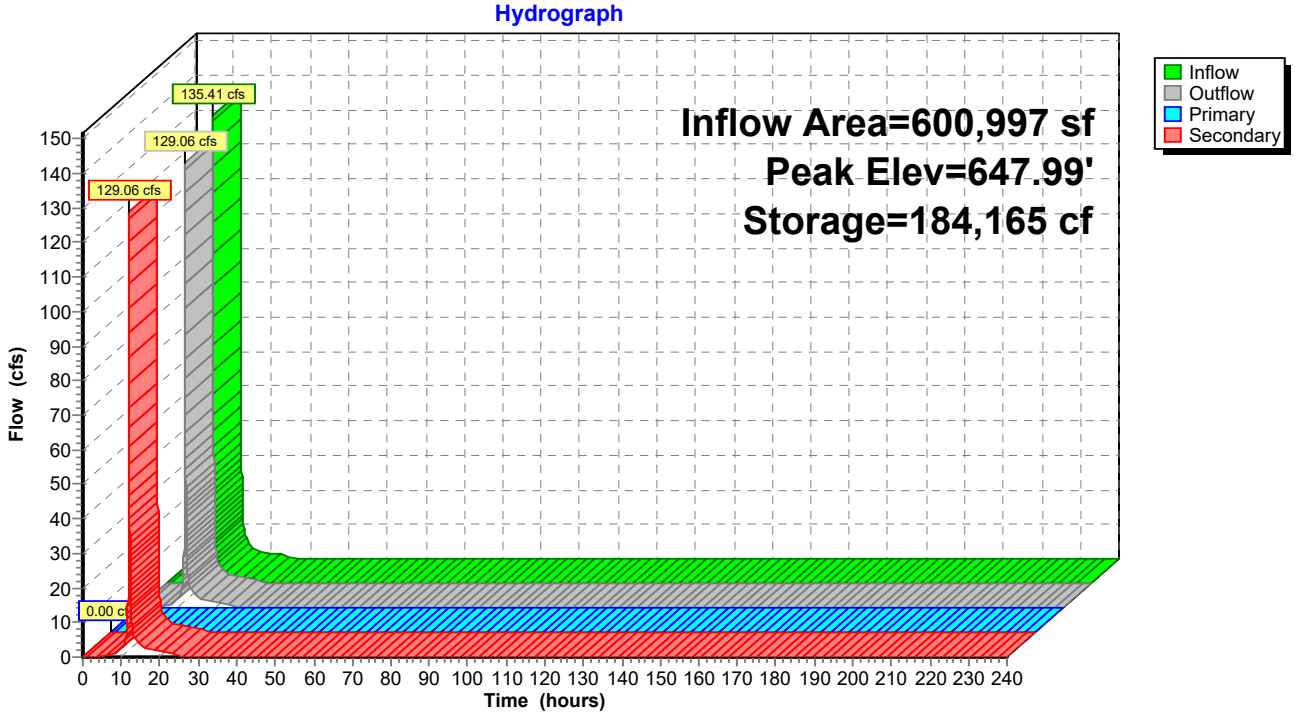
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
637.00	11,670	510.0	0.0	0	0	11,670
639.00	11,670	510.0	30.0	7,002	7,002	12,690
639.20	0	10.0	30.0	233	7,235	33,380
640.00	11,670	510.0	100.0	3,112	10,347	54,071
641.00	13,230	530.0	100.0	12,442	22,789	55,806
642.00	14,830	550.0	100.0	14,022	36,812	57,608
643.00	16,490	570.0	100.0	15,653	52,464	59,476
644.00	18,200	590.0	100.0	17,338	69,802	61,412
645.00	19,960	605.0	100.0	19,073	88,876	62,958
646.00	26,280	850.0	100.0	23,048	111,923	91,335
647.00	28,870	870.0	100.0	27,565	139,488	94,204
648.00	31,515	890.0	100.0	30,183	169,671	97,140
649.00	34,215	910.0	100.0	32,856	202,527	100,143

Device	Routing	Invert	Outlet Devices
#1	Primary	636.70'	**18.00" Round Outlet Pipe X 0.00** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.70' / 636.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	637.00'	**2.00" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	643.00'	**24.00" W x 6.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	645.00'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	647.40'	**147.0 deg x 90.0' long x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=647.40' (Free Discharge)
└─**1=Outlet Pipe** (Controls 0.00 cfs)
  └─**2=Dewatering Orifice (Capped Underdrain)**(Passes < 0.34 cfs potential flow)
  └─**3=Orifice/Grate** (Passes < 9.81 cfs potential flow)
  └─**4=Outlet Control Structure Inlet**(Passes < 59.67 cfs potential flow)

Secondary OutFlow Max=128.79 cfs @ 12.02 hrs HW=647.99' (Free Discharge)
└─**5=Sharp-Crested Vee/Trap Weir**(Weir Controls 128.79 cfs @ 2.37 fps)

Pond ESW-1: Extended Detention Pond No. 1



Summary for Pond ESW-2: Extended Detention Pond No. 2

Inflow Area = 185,261 sf, 73.01% Impervious, Inflow Depth = 6.85" for 100-Yr event
Inflow = 47.34 cfs @ 11.97 hrs, Volume= 105,782 cf
Outflow = 45.34 cfs @ 11.99 hrs, Volume= 105,782 cf, Atten= 4%, Lag= 1.3 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 45.34 cfs @ 11.99 hrs, Volume= 105,782 cf

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Starting Elev= 624.50' Surf.Area= 14,665 sf Storage= 48,495 cf
Peak Elev= 625.00' @ 11.99 hrs Surf.Area= 15,312 sf Storage= 54,798 cf (6,303 cf above start)

Plug-Flow detention time= 217.6 min calculated for 57,285 cf (54% of inflow)
Center-of-Mass det. time= 4.8 min (782.4 - 777.6)

Volume	Invert	Avail.Storage	Storage Description
#1	619.00'	3,500 cf	**Forebay (Prismatic)**Listed below (Recalc)
#2	617.70'	64,833 cf	**Open Pond (Prismatic)**Listed below (Recalc)
		68,333 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
619.00	1,100	0	0
620.00	1,740	1,420	1,420
621.00	2,420	2,080	3,500

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
617.70	3,830	0.0	0	0
618.70	3,830	30.0	1,149	1,149
618.75	0	100.0	96	1,245
619.00	3,830	100.0	479	1,723
620.00	4,600	100.0	4,215	5,938
621.00	5,420	100.0	5,010	10,948
622.00	9,200	100.0	7,310	18,258
623.00	10,375	100.0	9,788	28,046
624.00	11,600	100.0	10,988	39,033
625.00	12,890	100.0	12,245	51,278
626.00	14,220	100.0	13,555	64,833

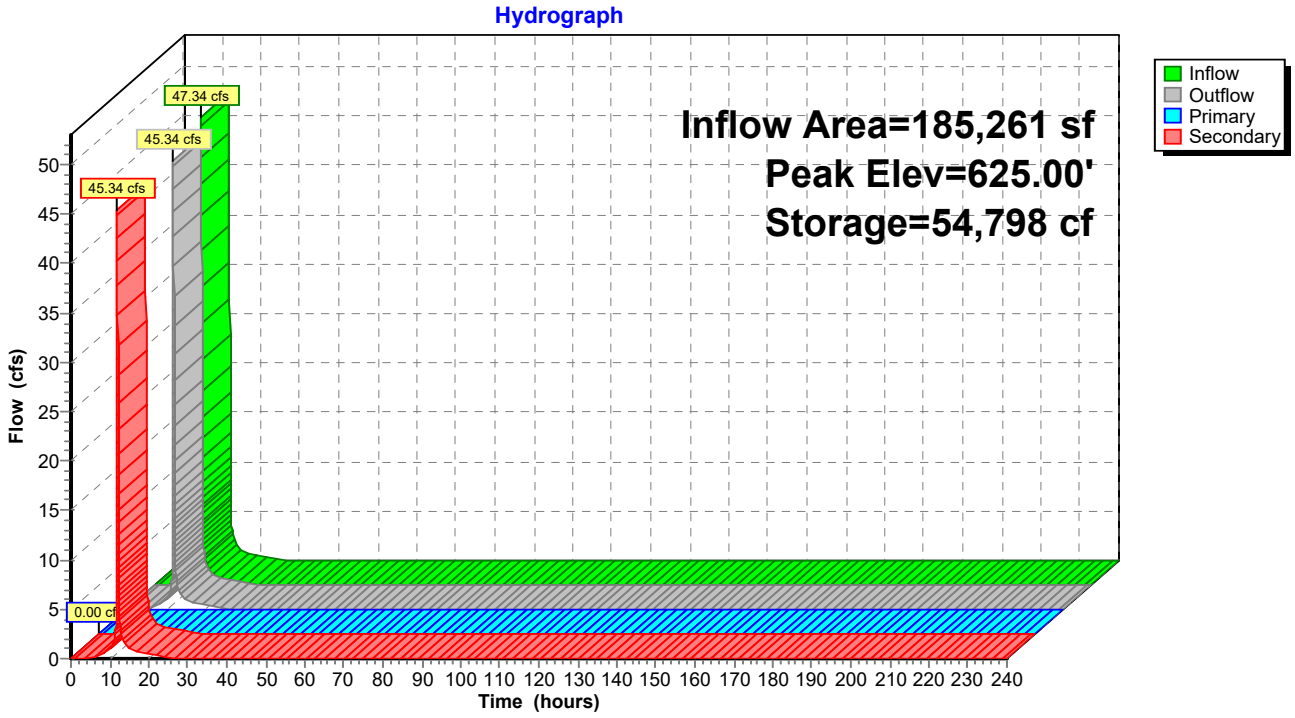
Device	Routing	Invert	Outlet Devices
#1	Primary	617.70'	**18.00" Round Outlet Pipe X 0.00** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 617.70' / 617.43' S= 0.0049 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	617.70'	**1.25" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	622.00'	**15.00" W x 6.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	623.25'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads

#5 Secondary 624.50' **147.0 deg x 40.0' long x 1.50' rise Emergency Spillway**
Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=624.50' (Free Discharge)
└─**1=Outlet Pipe** (Controls 0.00 cfs)
└─**2=Dewatering Orifice (Capped Underdrain)**(Passes < 0.11 cfs potential flow)
└─**3=Orifice/Grate** (Passes < 4.51 cfs potential flow)
└─**4=Outlet Control Structure Inlet** (Passes < 43.07 cfs potential flow)

Secondary OutFlow Max=45.33 cfs @ 11.99 hrs HW=625.00' (Free Discharge)
└─**5=Emergency Spillway** (Weir Controls 45.33 cfs @ 2.17 fps)

Pond ESW-2: Extended Detention Pond No. 2



Summary for Pond ESW-3: Extended Detention Pond No. 3

Inflow Area = 145,490 sf, 69.13% Impervious, Inflow Depth = 6.71" for 100-Yr event
Inflow = 31.35 cfs @ 12.02 hrs, Volume= 81,305 cf
Outflow = 29.97 cfs @ 12.05 hrs, Volume= 81,305 cf, Atten= 4%, Lag= 1.8 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Secondary = 29.97 cfs @ 12.05 hrs, Volume= 81,305 cf

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Starting Elev= 649.50' Surf.Area= 13,330 sf Storage= 35,954 cf
Peak Elev= 649.96' @ 12.05 hrs Surf.Area= 13,931 sf Storage= 41,275 cf (5,322 cf above start)

Plug-Flow detention time= 212.9 min calculated for 45,352 cf (56% of inflow)
Center-of-Mass det. time= 6.6 min (792.1 - 785.5)

Volume	Invert	Avail.Storage	Storage Description
#1	645.50'	3,760 cf	**Forebay (Prismatic)**Listed below (Recalc)
#2	644.00'	50,650 cf	**Open Pond (Prismatic)**Listed below (Recalc)
		54,410 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
645.50	1,030	0	0
646.00	1,205	559	559
647.00	1,590	1,398	1,956
647.50	1,800	848	2,804
648.00	2,025	956	3,760

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
644.00	4,840	0.0	0	0
645.00	4,840	30.0	1,452	1,452
645.05	0	30.0	36	1,488
645.50	4,840	100.0	1,089	2,577
646.00	5,390	100.0	2,558	5,135
647.00	6,300	100.0	5,845	10,980
648.00	7,250	100.0	6,775	17,755
649.00	10,650	100.0	8,950	26,705
650.00	11,960	100.0	11,305	38,010
651.00	13,320	100.0	12,640	50,650

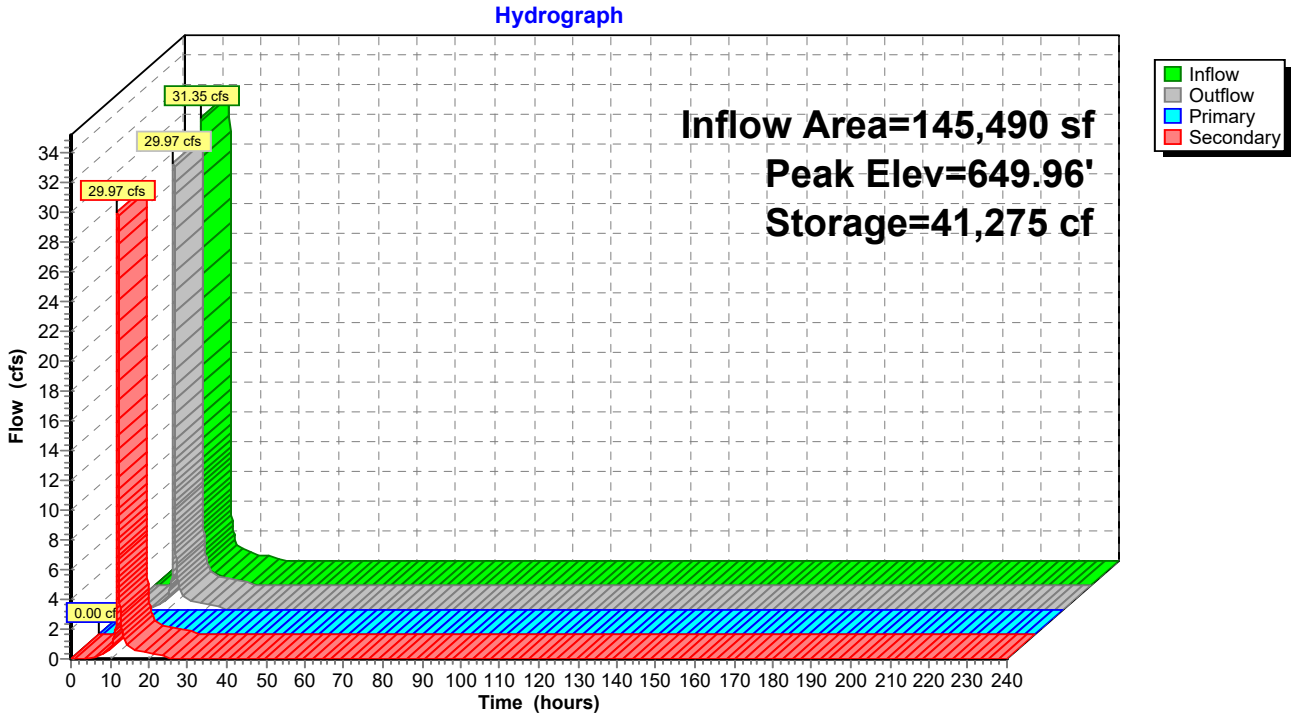
Device	Routing	Invert	Outlet Devices
#1	Primary	643.95'	**15.00" Round Outlet Pipe X 0.00** L= 45.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 643.95' / 643.50' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.23 sf
#2	Device 1	644.00'	**1.50" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	647.50'	**18.00" W x 12.00" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	648.50'	**24.00" x 48.00" Horiz. Outlet Control Structure Inlet** C= 0.600

			Limited to weir flow at low heads
#5	Secondary	649.50'	**147.0 deg x 30.0' long x 1.50' rise Emergency Spillway**
			Cv= 2.47 (C= 3.09)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=649.50' (Free Discharge)
└─**1=Outlet Pipe** (Controls 0.00 cfs)
  └─**2=Dewatering Orifice (Capped Underdrain)**(Passes < 0.14 cfs potential flow)
  └─**3=Orifice/Grate** (Passes < 8.80 cfs potential flow)
  └─**4=Outlet Control Structure Inlet** (Passes < 38.52 cfs potential flow)

Secondary OutFlow Max=29.94 cfs @ 12.05 hrs HW=649.96' (Free Discharge)
└─**5=Emergency Spillway** (Weir Controls 29.94 cfs @ 2.07 fps)

Pond ESW-3: Extended Detention Pond No. 3



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www.nagreen.com
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CHANNEL ANALYSIS

> > > ED Pond No. 1 - Emergency Spillway

Name	ED Pond No. 1 - Emergency Spillway
Discharge	129.06
Channel Slope	0.3333
Channel Bottom Width	90
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Good 65-79%
Soil Type	Silt Loam (SM)

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	129.06 cfs	8.27 ft/s	0.17 ft	0.032	4 lbs/ft2	3.56 lbs/ft2	1.12	STABLE	--

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CHANNEL ANALYSIS

> > > ED Pond No. 2 - Emergency Spillway

Name	ED Pond No. 2 - Emergency Spillway
Discharge	45.34
Channel Slope	0.3333
Channel Bottom Width	40
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Good 65-79%
Soil Type	Silt Loam (SM)

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	45.34 cfs	7.49 ft/s	0.15 ft	0.032	4 lbs/ft2	3.07 lbs/ft2	1.3	STABLE	--

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CHANNEL ANALYSIS

> > > ED Pond No. 3 - Emergency Spillway

Name	ED Pond No. 3 - Emergency Spillway
Discharge	29.97
Channel Slope	0.3333
Channel Bottom Width	30
Left Side Slope	3
Right Side Slope	3
Low Flow Liner	
Retardence Class	C 6-12 in
Vegetation Type	Mix (Sod and Bunch)
Vegetation Density	Good 65-79%
Soil Type	Silt Loam (SM)

Rock Riprap

Phase	Reach	Discharge	Velocity	Normal Depth	Mannings N	Permissible Shear Stress	Calculated Shear Stress	Safety Factor	Remarks	Staple Pattern
Rock Riprap Unvegetated	Straight	29.97 cfs	7.11 ft/s	0.14 ft	0.032	3 lbs/ft2	2.84 lbs/ft2	1.06	STABLE	--

APPENDIX I
STORMWATER CONVEYANCE CALCULATIONS

Channel Flow Rational Calculations

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 3/31/2025
CHECKED BY: JMP **DATE:** 4/16/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION	DRAINAGE AREA (AC)	TEMP (T) OR PERM (P)	TC (MIN)[1]	DESIGN STORM	INTENSITY (IN/HR)	RUNOFF COEFFICIENT	DIRECT FLOW, Q=CiA (CFS)	INDIRECT FLOW (CFS)	TOTAL FLOW (CFS)	MIN. SLOPE (%)	MAX. SLOPE (%)	RIGHT SIDE SLOPES (X_R:1)	LEFT SIDE SLOPES (X_L:1)	BOTTOM WIDTH (FT)	CHANNEL DEPTH (FT)	NORMAL DEPTH (FT)	FREEBOARD (FT)	CHANNEL LINING	NOTES
Temporary Channel No. 1	0.68	T	11.7	10-Year	5.14	0.47	1.65	11.56	13.21	2.0		2.0	2.0	2.0	2.00	1.05	0.95	S150	*Conveys Permanent Channel No. 1C - Phase 1*
Temporary Channel No. 2	0.28	T	8.8	2-Year	4.29	0.37	0.44	6.18	6.62	3.0		15.0	2.0	2.0	1.50	---	---	S150	*Conveys Permanent Channel No. 1A*
		T	8.8	10-Year	5.67		0.59	8.13	8.72							0.56	0.94		
Temporary Channel No. 3	1.76	T	5.0	10-Year	6.79	0.46	5.52	0.00	5.52	7.0	21.0	2.0	2.0	2.0	1.50	0.44	1.06	P550	
Temporary Diversion Dike No. 1	0.57	T	5.0	10-Year	6.79	0.28	1.09	0.00	1.09	3.0	5.0	2.0	13.0	0.0	1.50	0.36	1.14	S150	
Permanent Channel No. 1A - Phase 1	3.18	P	6.9	2-Year	4.65	0.42	6.18	0.00	6.18	1.0		4.0	2.0	2.0	1.75	---	---	S150	
		P	6.9	10-Year	6.12		8.13	0.00	8.13							1.03	0.72		
Permanent Channel No. 1A - Phase 2	0.83	P	5.0	2-Year	5.16	0.42	1.78	0.00	1.78	1.0		3.0	2.0	2.0	1.75	---	---	S150	
		P	5.0	10-Year	6.79		2.34	0.00	2.34							0.63	1.12		
Permanent Channel No. 1B	0.27	P	5.0	2-Year	5.16	0.39	0.54	1.78	2.32	1.0	3.0	3.0	2.0	2.0	2.00	---	---	S150	*Conveys Permanent Channel No. 1A*
		P	5.0	10-Year	6.79		0.71	2.34	3.05							0.71	1.29		
Permanent Channel No. 1C - Phase 1	1.35	P	10.5	2-Year	4.03	0.39	2.14	6.62	8.76	2.0		2.0	2.0	2.0	1.50	---	---	SC150	*Conveys Temporary Channel No. 2*
		P	10.5	10-Year	5.34		2.84	8.72	11.56							1.00	0.50		
Permanent Channel No. 1C - Phase 2	0.20	P	9.8	2-Year	4.13	0.30	0.25	2.32	2.57	2.0		2.0	2.0	2.0	1.50	---	---	SC150	*Conveys Permanent Channel No. 1B*
		P	9.8	10-Year	5.47		0.33	3.05	3.38							0.58	0.92		
Permanent Channel No. 1D	0.45	P	11.0	2-Year	3.96	0.30	0.53	2.57	3.10	1.0	3.0	2.0	2.0	2.0	1.50	---	---	SC150	*Conveys Permanent Channel No. 1C*
		P	11.0	10-Year	5.25		0.71	3.38	4.09							0.83	0.67		
Permanent Channel No. 2	2.57	P	11.4	2-Year	3.91	0.30	3.00	0.00	3.00	1.5	9.0	2.0	2.0	2.0	2.00	---	---	P300	
		P	11.4	10-Year	5.18		3.99	0.00	3.99							0.70	1.30		
Permanent Channel No. 3	0.49	P	5.0	2-Year	5.16	0.63	1.59	0.00	1.59	2.0	9.5	2.0	2.0	2.0	2.00	---	---	P300	
		P	5.0	10-Year	6.79		2.10	0.00	2.10							0.47	1.53		

[1] Time of Concentration calculated via HydroCAD. A minimum TC of 5.0 minutes is assumed per the Rational Method.

Summary for Subcatchment CH-1-P-1: Temporary Channel No. 1 - Phase 1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.9	237	0.0100	2.05	25.96	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=1.75' Z= 2.0 & 4.0 '/' Top.W=12.50' n= 0.071
0.3	68	0.0300	3.56	130.90	**Trap/Vee/Rect Channel Flow, Temporary Channel No. 2** Bot.W=2.00' D=1.50' Z= 2.0 & 28.0 '/' Top.W=47.00' n= 0.061
1.3	115	0.0100	1.45	4.85	**Trap/Vee/Rect Channel Flow, Existing Ditch** Bot.W=10.00' D=0.25' Z= 12.0 & 15.0 '/' Top.W=16.75' n= 0.035
0.1	55	0.0300	9.88	12.12	**Pipe Channel, Culvert No. 2** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
1.2	191	0.0200	2.68	20.10	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1C** Bot.W=2.00' D=1.50' Z= 2.0 '/' Top.W=8.00' n= 0.071
11.7	957	Total			

Summary for Subcatchment CH-1A-P: Permanent Channel No. 1A - Phase 1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
6.9	291	Total			

Summary for Subcatchment CH-1C-P-1: Permanent Channel No. 1C - Phase 1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.9	237	0.0100	2.05	25.96	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=1.75' Z= 2.0 & 4.0 '/' Top.W=12.50' n= 0.071
0.3	68	0.0300	3.56	130.90	**Trap/Vee/Rect Channel Flow, Temporary Channel No. 2** Bot.W=2.00' D=1.50' Z= 2.0 & 28.0 '/' Top.W=47.00' n= 0.061
1.3	115	0.0100	1.45	4.85	**Trap/Vee/Rect Channel Flow, Existing Ditch** Bot.W=10.00' D=0.25' Z= 12.0 & 15.0 '/' Top.W=16.75' n= 0.035
0.1	55	0.0300	9.88	12.12	**Pipe Channel, Culvert No. 2** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
10.5	766	Total			

Summary for Subcatchment CH-1C-P-2: Permanent Channel No. 1C - Phase 2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.9	237	0.0100	2.05	25.96	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=1.75' Z= 2.0 & 4.0 '/' Top.W=12.50' n= 0.071
0.9	179	0.0200	3.14	44.00	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1B** Bot.W=2.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=12.00' n= 0.071
0.0	30	0.0300	11.15	19.71	**Pipe Channel, Culvert No. 2 Extension** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	55	0.0300	11.15	19.71	**Pipe Channel, Culvert No. 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
9.8	792	Total			

Summary for Subcatchment CH-1D-P-2: Permanent Channel No. 1D - Phase 2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.9	237	0.0100	2.05	25.96	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=1.75' Z= 2.0 & 4.0 '/' Top.W=12.50' n= 0.071
0.9	179	0.0200	3.14	44.00	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1B** Bot.W=2.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=12.00' n= 0.071
0.0	30	0.0300	11.15	19.71	**Pipe Channel, Culvert No. 2 Extension** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	55	0.0300	11.15	19.71	**Pipe Channel, Culvert No. 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
1.2	191	0.0200	2.68	20.10	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1C** Bot.W=2.00' D=1.50' Z= 2.0 '/' Top.W=8.00'

n= 0.071

11.0	983	Total

Summary for Subcatchment CH-2-P: Permanent Channel No. 2 - Phase 2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	41	0.0540	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.5	9	0.0400	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.0	267	0.0460	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.4	317	Total			

Summary for Subcatchment CH-2-T: Temporary Channel No. 2 - Phase 1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.9	237	0.0100	2.05	25.96	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=1.75' Z= 2.0 & 4.0 '/' Top.W=12.50' n= 0.071
8.8	528	Total			

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

TEMP CHANNEL NO. 1

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		TEMP CHANNEL NO. 1
TEMPORARY OR PERMANENT	(T OR P)	T
DESIGN STORM	(YR)	10
DRAINAGE AREA	(Acres)	0.68
Qr (REQUIRED CAPACITY)	(CFS)	13.21
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	13.21
PROTECTIVE LINING		S150
VEGETATIVE LINING RETARDANCE		C
RIPRAP GRADATION		N/A
n (MANNING'S COEFFICIENT)		0.051
Va (ALLOWABLE VELOCITY)	(FPS)	6.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.06
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	1.31
CHANNEL BOTTOM WIDTH	(FT)	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0
D (TOTAL DEPTH)	(FT)	2.0
CHANNEL TOP WIDTH @ D	(FT)	10.00
d (CALCULATED FLOW DEPTH)	(FT)	1.05
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	6.21
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	4.32
P (WETTED PERIMETER)	(FT)	6.71
R (HYDRAULIC RADIUS)	(FT)	0.64
S (BED SLOPE)	(FT/FT)	0.020
Sc (CRITICAL SLOPE)	(FT/FT)	0.048
0.7Sc	(FT/FT)	0.034
1.3Sc	(FT/FT)	0.062
STABLE FLOW?	(Y/N)	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.26
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.55
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S

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
Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining method is required for channels with a bed slope of 10% or greater. Shear stress lining design method
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

TEMP CHANNEL NO. 2

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		TEMP CHANNEL NO. 2
TEMPORARY OR PERMANENT	(T OR P)	T
DESIGN STORM	(YR)	10
DRAINAGE AREA	(Acres)	0.28
Qr (REQUIRED CAPACITY)	(CFS)	8.13
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	8.13
PROTECTIVE LINING		S150
VEGETATIVE LINING RETARDANCE		C
RIPRAP GRADATION		N/A
n (MANNING'S COEFFICIENT)		0.057
Va (ALLOWABLE VELOCITY)	(FPS)	6.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.13
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	1.05
CHANNEL BOTTOM WIDTH	(FT)	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	15.0
D (TOTAL DEPTH)	(FT)	1.5
CHANNEL TOP WIDTH @ D	(FT)	27.50
d (CALCULATED FLOW DEPTH)	(FT)	0.56
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	11.57
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	3.82
P (WETTED PERIMETER)	(FT)	11.72
R (HYDRAULIC RADIUS)	(FT)	0.33
S (BED SLOPE)	(FT/FT)	0.030
Sc (CRITICAL SLOPE)	(FT/FT)	0.070
0.7Sc	(FT/FT)	0.049
1.3Sc	(FT/FT)	0.091
STABLE FLOW?	(Y/N)	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.14
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.06
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S

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
Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining method is required for channels with a bed slope of 10% or greater. Shear stress lining design method
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

TEMP CHANNEL NO. 3

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		TEMP CHANNEL NO. 3	TEMP CHANNEL NO. 3
TEMPORARY OR PERMANENT	(T OR P)	T	T
DESIGN STORM	(YR)	10	10
DRAINAGE AREA	(Acres)	1.76	1.76
Qr (REQUIRED CAPACITY)	(CFS)	5.52	5.52
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	5.52	5.52
PROTECTIVE LINING		P550	P550
VEGETATIVE LINING RETARDANCE		C	C
RIPRAP GRADATION		N/A	N/A
n (MANNING'S COEFFICIENT)		0.041	0.031
Va (ALLOWABLE VELOCITY)	(FPS)	12.5	12.5
V (CALCULATED AT FLOW DEPTH d)	(FPS)	4.42	7.92
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	4.00	4.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	1.90	3.59
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0
D (TOTAL DEPTH)	(FT)	1.5	1.50
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	0.44	0.27
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.74	3.09
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.25	0.70
P (WETTED PERIMETER)	(FT)	3.95	3.22
R (HYDRAULIC RADIUS)	(FT)	0.32	0.22
S (BED SLOPE)	(FT/FT)	0.070	0.210
Sc (CRITICAL SLOPE)	(FT/FT)	0.038	0.024
0.7Sc	(FT/FT)	0.027	0.017
1.3Sc	(FT/FT)	0.050	0.032
STABLE FLOW?	(Y/N)	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.11	0.07
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.94	0.77
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S

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
Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

TEMP DIKE NO. 1

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		TEMP DIKE NO. 1	TEMP DIKE NO. 1
TEMPORARY OR PERMANENT	(T OR P)	T	T
DESIGN STORM	(YR)	10	10
DRAINAGE AREA	(Acres)	0.57	0.57
Qr (REQUIRED CAPACITY)	(CFS)	1.09	1.09
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.09	1.09
PROTECTIVE LINING		S150	S150
VEGETATIVE LINING RETARDANCE		C	C
RIPRAP GRADATION		N/A	N/A
n (MANNING'S COEFFICIENT)		0.073	0.063
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	6.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.11	1.50
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.75
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	0.68	0.97
CHANNEL BOTTOM WIDTH	(FT)	0.0	0.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	13.0	13.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0
D (TOTAL DEPTH)	(FT)	1.5	1.5
CHANNEL TOP WIDTH @ D	(FT)	22.50	22.50
d (CALCULATED FLOW DEPTH)	(FT)	0.36	0.31
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	5.42	4.67
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.98	0.73
P (WETTED PERIMETER)	(FT)	5.52	4.75
R (HYDRAULIC RADIUS)	(FT)	0.18	0.15
S (BED SLOPE)	(FT/FT)	0.030	0.050
Sc (CRITICAL SLOPE)	(FT/FT)	0.141	0.111
0.7Sc	(FT/FT)	0.099	0.078
1.3Sc	(FT/FT)	0.183	0.144
STABLE FLOW?	(Y/N)	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.09	0.08
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.86	0.81
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		S	S

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
Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1A - PH. 1

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1A - PH. 1	PERM CHANNEL NO. 1A - PH. 1	PERM CHANNEL NO. 1A - PH. 1	PERM CHANNEL NO. 1A - PH. 1
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	3.18	3.18	3.18	3.18
Qr (REQUIRED CAPACITY)	(CFS)	6.18	6.18	8.13	8.13
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	6.18	6.18	8.13	8.13
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.072	0.072	0.069	0.069
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.41	1.41	1.55	1.55
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.64	0.64
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	4.0	4.0	4.0	4.0
D (TOTAL DEPTH)	(FT)	1.8	1.8	1.8	1.8
CHANNEL TOP WIDTH @ D	(FT)	12.50	12.50	12.50	12.50
d (CALCULATED FLOW DEPTH)	(FT)	0.92	0.92	1.03	1.03
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	7.53	7.53	8.17	8.17
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	4.39	4.39	5.24	5.24
P (WETTED PERIMETER)	(FT)	7.86	7.86	8.54	8.54
R (HYDRAULIC RADIUS)	(FT)	0.56	0.56	0.61	0.61
S (BED SLOPE)	(FT/FT)	0.010	0.010	0.010	0.010
Sc (CRITICAL SLOPE)	(FT/FT)	0.095	0.095	0.085	0.085
0.7Sc	(FT/FT)	0.066	0.066	0.060	0.060
1.3Sc	(FT/FT)	0.123	0.123	0.111	0.111
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.23	0.23	0.26	0.26
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.42	1.42	1.53	1.53
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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.
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1A - PH. 2

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1A - PH. 2	PERM CHANNEL NO. 1A - PH. 2	PERM CHANNEL NO. 1A - PH. 2	PERM CHANNEL NO. 1A - PH. 2
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.83	0.83	0.83	0.83
Qr (REQUIRED CAPACITY)	(CFS)	1.78	1.78	2.34	2.34
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.78	1.78	2.34	2.34
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.084	0.084	0.080	0.080
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	0.93	0.93	1.03	1.03
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.39	0.39
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	3.0	3.0	3.0	3.0
D (TOTAL DEPTH)	(FT)	1.8	1.8	1.8	1.8
CHANNEL TOP WIDTH @ D	(FT)	10.75	10.75	10.75	10.75
d (CALCULATED FLOW DEPTH)	(FT)	0.56	0.56	0.63	0.63
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.81	4.81	5.16	5.16
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.91	1.91	2.26	2.26
P (WETTED PERIMETER)	(FT)	5.03	5.03	5.41	5.41
R (HYDRAULIC RADIUS)	(FT)	0.38	0.38	0.42	0.42
S (BED SLOPE)	(FT/FT)	0.010	0.010	0.010	0.010
Sc (CRITICAL SLOPE)	(FT/FT)	0.147	0.147	0.132	0.132
0.7Sc	(FT/FT)	0.103	0.103	0.092	0.092
1.3Sc	(FT/FT)	0.191	0.191	0.172	0.172
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.14	0.14	0.16	0.16
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.06	1.06	1.13	1.13
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1B-Min. Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1B-Min. Slope	PERM CHANNEL NO. 1B-Min. Slope	PERM CHANNEL NO. 1B-Min. Slope	PERM CHANNEL NO. 1B-Min. Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.27	0.27	0.27	0.27
Qr (REQUIRED CAPACITY)	(CFS)	2.32	2.32	3.05	3.05
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.32	2.32	3.05	3.05
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.081	0.081	0.078	0.078
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.03	1.03	1.14	1.14
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.44	0.44
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	3.0	3.0	3.0	3.0
D (TOTAL DEPTH)	(FT)	2.0	2.0	2.0	2.0
CHANNEL TOP WIDTH @ D	(FT)	12.00	12.00	12.00	12.00
d (CALCULATED FLOW DEPTH)	(FT)	0.63	0.63	0.71	0.71
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	5.15	5.15	5.54	5.54
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.25	2.25	2.67	2.67
P (WETTED PERIMETER)	(FT)	5.40	5.40	5.83	5.83
R (HYDRAULIC RADIUS)	(FT)	0.42	0.42	0.46	0.46
S (BED SLOPE)	(FT/FT)	0.010	0.010	0.010	0.010
Sc (CRITICAL SLOPE)	(FT/FT)	0.133	0.133	0.119	0.119
0.7Sc	(FT/FT)	0.093	0.093	0.083	0.083
1.3Sc	(FT/FT)	0.172	0.172	0.155	0.155
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.16	0.16	0.18	0.18
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.13	1.13	1.21	1.21
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1B-Max Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1B-Max Slope	PERM CHANNEL NO. 1B-Max Slope	PERM CHANNEL NO. 1B-Max Slope	PERM CHANNEL NO. 1B-Max Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.27	0.27	0.27	0.27
Qr (REQUIRED CAPACITY)	(CFS)	2.32	2.32	3.05	3.05
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.19	2.19	3.05	3.05
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.060	0.060	0.057	0.057
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.85	1.85	2.11	2.11
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.86	0.86
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	3.0	3.0	3.0	3.0
D (TOTAL DEPTH)	(FT)	2.0	2.0	2.0	2.0
CHANNEL TOP WIDTH @ D	(FT)	12.00	12.00	12.00	12.00
d (CALCULATED FLOW DEPTH)	(FT)	0.40	0.40	0.46	0.46
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.98	3.98	4.30	4.30
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.18	1.18	1.45	1.45
P (WETTED PERIMETER)	(FT)	4.14	4.14	4.48	4.48
R (HYDRAULIC RADIUS)	(FT)	0.29	0.29	0.32	0.32
S (BED SLOPE)	(FT/FT)	0.030	0.030	0.030	0.030
Sc (CRITICAL SLOPE)	(FT/FT)	0.084	0.084	0.073	0.073
0.7Sc	(FT/FT)	0.059	0.059	0.051	0.051
1.3Sc	(FT/FT)	0.109	0.109	0.095	0.095
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.10	0.10	0.11	0.11
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.90	0.90	0.96	0.96
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1C - PH. 1

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: VMF **DATE:** 5/8/2025
CHECKED BY: BJH **DATE:** 5/8/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1C - PH. 1	PERM CHANNEL NO. 1C - PH. 1	PERM CHANNEL NO. 1C - PH. 1	PERM CHANNEL NO. 1C - PH. 1
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	1.35	1.35	1.35	1.35
Qr (REQUIRED CAPACITY)	(CFS)	8.76	8.76	11.56	11.56
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	8.76	8.76	11.56	11.56
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.054	0.054	0.052	0.052
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.63	2.63	2.91	2.91
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	X	X
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	1.5	1.5	1.5	1.5
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	0.88	0.88	1.00	1.00
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	5.54	5.54	5.98	5.98
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	3.33	3.33	3.97	3.97
P (WETTED PERIMETER)	(FT)	5.95	5.95	6.45	6.45
R (HYDRAULIC RADIUS)	(FT)	0.56	0.56	0.62	0.62
S (BED SLOPE)	(FT/FT)	0.020	0.020	0.020	0.020
Sc (CRITICAL SLOPE)	(FT/FT)	0.056	0.056	0.050	0.050
0.7Sc	(FT/FT)	0.039	0.039	0.035	0.035
1.3Sc	(FT/FT)	0.073	0.073	0.065	0.065
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.22	0.22	0.25	0.25
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.38	1.38	1.50	1.50
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1C - PH. 2

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: VMF **DATE:** 5/8/2025
CHECKED BY: BJH **DATE:** 5/8/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1C - PH. 2	PERM CHANNEL NO. 1C - PH. 2	PERM CHANNEL NO. 1C - PH. 2	PERM CHANNEL NO. 1C - PH. 2
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.20	0.20	0.20	0.20
Qr (REQUIRED CAPACITY)	(CFS)	2.57	2.57	3.38	3.38
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	2.57	2.57	3.38	3.38
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.065	0.065	0.062	0.062
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.65	1.65	1.84	1.84
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.73	0.73
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	1.5	1.5	1.5	1.5
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	0.51	0.51	0.58	0.58
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.05	4.05	4.33	4.33
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.56	1.56	1.84	1.84
P (WETTED PERIMETER)	(FT)	4.30	4.30	4.60	4.60
R (HYDRAULIC RADIUS)	(FT)	0.36	0.36	0.40	0.40
S (BED SLOPE)	(FT/FT)	0.020	0.020	0.020	0.020
Sc (CRITICAL SLOPE)	(FT/FT)	0.090	0.090	0.081	0.081
0.7Sc	(FT/FT)	0.063	0.063	0.057	0.057
1.3Sc	(FT/FT)	0.117	0.117	0.105	0.105
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.13	0.13	0.15	0.15
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.01	1.01	1.08	1.08
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1D-Min. Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: VMF **DATE:** 5/8/2025
CHECKED BY: BJH **DATE:** 5/8/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1D-Min. Slope	PERM CHANNEL NO. 1D-Min. Slope	PERM CHANNEL NO. 1D-Min. Slope	PERM CHANNEL NO. 1D-Min. Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.45	0.45	0.45	0.45
Qr (REQUIRED CAPACITY)	(CFS)	3.10	3.10	4.09	4.09
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.10	3.10	4.09	4.09
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.076	0.076	0.073	0.073
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.21	1.21	1.34	1.34
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.52	0.52
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	1.5	1.5	1.5	1.5
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	0.74	0.74	0.83	0.83
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.95	4.95	5.33	5.33
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.57	2.57	3.05	3.05
P (WETTED PERIMETER)	(FT)	5.30	5.30	5.73	5.73
R (HYDRAULIC RADIUS)	(FT)	0.48	0.48	0.53	0.53
S (BED SLOPE)	(FT/FT)	0.010	0.010	0.010	0.010
Sc (CRITICAL SLOPE)	(FT/FT)	0.114	0.114	0.103	0.103
0.7Sc	(FT/FT)	0.080	0.080	0.072	0.072
1.3Sc	(FT/FT)	0.148	0.148	0.133	0.133
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.18	0.18	0.21	0.21
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.24	1.24	1.33	1.33
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 1D-Max. Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: VMF **DATE:** 5/8/2025
CHECKED BY: BJH **DATE:** 5/8/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 1D-Max. Slope	PERM CHANNEL NO. 1D-Max. Slope	PERM CHANNEL NO. 1D-Max. Slope	PERM CHANNEL NO. 1D-Max. Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.45	0.45	0.45	0.45
Qr (REQUIRED CAPACITY)	(CFS)	3.10	3.10	4.09	4.09
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.10	3.10	4.09	4.09
PROTECTIVE LINING		S150	Grass	S150	Grass
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.056	0.056	0.054	0.054
Va (ALLOWABLE VELOCITY)	(FPS)	6.0	3.0	6.0	3.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	2.22	2.22	2.47	2.47
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	1.75	1.00	1.75	1.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	X	X
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	1.5	1.5	1.5	1.5
CHANNEL TOP WIDTH @ D	(FT)	8.00	8.00	8.00	8.00
d (CALCULATED FLOW DEPTH)	(FT)	0.47	0.47	0.54	0.54
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.90	3.90	4.15	4.15
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.40	1.40	1.65	1.65
P (WETTED PERIMETER)	(FT)	4.12	4.12	4.40	4.40
R (HYDRAULIC RADIUS)	(FT)	0.34	0.34	0.38	0.38
S (BED SLOPE)	(FT/FT)	0.030	0.030	0.030	0.030
Sc (CRITICAL SLOPE)	(FT/FT)	0.070	0.070	0.063	0.063
0.7Sc	(FT/FT)	0.049	0.049	0.044	0.044
1.3Sc	(FT/FT)	0.091	0.091	0.082	0.082
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.12	0.12	0.13	0.13
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.97	0.97	1.04	1.04
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	V	V

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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
Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 2 - Min. Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 2 - Min. Slope	PERM CHANNEL NO. 2 - Min. Slope	PERM CHANNEL NO. 2 - Min. Slope	PERM CHANNEL NO. 2 - Min. Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	2.57	2.57	2.57	2.57
Qr (REQUIRED CAPACITY)	(CFS)	3.00	3.00	3.99	3.99
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.00	3.00	3.99	3.99
PROTECTIVE LINING		P300	P300	Grass/P300	Grass/P300
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.068	0.068	0.066	0.066
Va (ALLOWABLE VELOCITY)	(FPS)	9.0	9.0	16.0	16.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.50	1.50	1.67	1.67
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	3.00	3.00	8.00	8.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.66	0.66
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	2.0	2.0	2.0	2.0
CHANNEL TOP WIDTH @ D	(FT)	10.00	10.00	10.00	10.00
d (CALCULATED FLOW DEPTH)	(FT)	0.62	0.62	0.70	0.70
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	4.48	4.48	4.81	4.81
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	2.00	2.00	2.39	2.39
P (WETTED PERIMETER)	(FT)	4.77	4.77	5.14	5.14
R (HYDRAULIC RADIUS)	(FT)	0.42	0.42	0.47	0.47
S (BED SLOPE)	(FT/FT)	0.015	0.015	0.015	0.015
Sc (CRITICAL SLOPE)	(FT/FT)	0.096	0.096	0.086	0.086
0.7Sc	(FT/FT)	0.068	0.068	0.060	0.060
1.3Sc	(FT/FT)	0.125	0.125	0.112	0.112
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.15	0.15	0.18	0.18
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	1.12	1.12	1.20	1.20
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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.

Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 2 - Max Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 2 - Max Slope	PERM CHANNEL NO. 2 - Max Slope	PERM CHANNEL NO. 2 - Max Slope	PERM CHANNEL NO. 2 - Max Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	2.57	2.57	2.57	2.57
Qr (REQUIRED CAPACITY)	(CFS)	3.00	3.00	3.99	3.99
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	3.00	3.00	3.99	20.96
PROTECTIVE LINING		P300	P300	Grass/P300	Grass/P300
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.042	0.042	0.041	0.032
Va (ALLOWABLE VELOCITY)	(FPS)	9.0	9.0	16.0	16.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.94	3.94	4.43	8.51
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	3.00	3.00	8.00	8.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	1.89	4.03
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	2.0	2.0	2.0	2.0
CHANNEL TOP WIDTH @ D	(FT)	10.00	10.00	10.00	10.00
d (CALCULATED FLOW DEPTH)	(FT)	0.29	0.29	0.34	0.72
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.18	3.18	3.35	4.87
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.76	0.76	0.90	2.46
P (WETTED PERIMETER)	(FT)	3.32	3.32	3.51	5.21
R (HYDRAULIC RADIUS)	(FT)	0.23	0.23	0.26	0.47
S (BED SLOPE)	(FT/FT)	0.090	0.090	0.090	0.090
Sc (CRITICAL SLOPE)	(FT/FT)	0.045	0.045	0.040	0.020
0.7Sc	(FT/FT)	0.031	0.031	0.028	0.014
1.3Sc	(FT/FT)	0.058	0.058	0.051	0.026
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.07	0.07	0.08	0.18
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.79	0.79	0.84	1.22
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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.

Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 3 - Min. Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 3 - Min. Slope	PERM CHANNEL NO. 3 - Min. Slope	PERM CHANNEL NO. 3 - Min. Slope	PERM CHANNEL NO. 3 - Min. Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.49	0.49	0.49	0.49
Qr (REQUIRED CAPACITY)	(CFS)	1.59	1.59	2.10	2.10
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.59	1.59	2.10	2.10
PROTECTIVE LINING		P300	P300	Grass/P300	Grass/P300
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.069	0.069	0.067	0.067
Va (ALLOWABLE VELOCITY)	(FPS)	9.0	9.0	16.0	16.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	1.37	1.37	1.53	1.53
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	3.00	3.00	8.00	8.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	0.58	0.58
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	2.0	2.0	2.0	2.0
CHANNEL TOP WIDTH @ D	(FT)	10.00	10.00	10.00	10.00
d (CALCULATED FLOW DEPTH)	(FT)	0.41	0.41	0.47	0.47
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	3.65	3.65	3.87	3.87
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	1.16	1.16	1.38	1.38
P (WETTED PERIMETER)	(FT)	3.84	3.84	4.10	4.10
R (HYDRAULIC RADIUS)	(FT)	0.30	0.30	0.34	0.34
S (BED SLOPE)	(FT/FT)	0.020	0.020	0.020	0.020
Sc (CRITICAL SLOPE)	(FT/FT)	0.110	0.110	0.098	0.098
0.7Sc	(FT/FT)	0.077	0.077	0.069	0.069
1.3Sc	(FT/FT)	0.143	0.143	0.127	0.127
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.10	0.10	0.12	0.12
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.91	0.91	0.97	0.97
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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.

Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Channel Design Worksheet

Civil & Environmental Consultants, Inc.

Channel Design Data

PERM CHANNEL NO. 3 - Max. Slope

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittslyvania County, VA
PREPARED BY: BJH **DATE:** 4/1/2025
CHECKED BY: JMP **DATE:** 4/17/2025

CHANNEL/SWALE/BERM OR CHANNEL/SWALE/BERM SECTION		PERM CHANNEL NO. 3 - Max. Slope	PERM CHANNEL NO. 3 - Max. Slope	PERM CHANNEL NO. 3 - Max. Slope	PERM CHANNEL NO. 3 - Max. Slope
TEMPORARY OR PERMANENT	(T OR P)	P	P	P	P
DESIGN STORM	(YR)	2	2	10	10
DRAINAGE AREA	(Acres)	0.49	0.49	0.49	0.49
Qr (REQUIRED CAPACITY)	(CFS)	1.59	1.59	2.10	2.10
Q (CALCULATED AT FLOW DEPTH d)	(CFS)	1.59	1.59	2.10	2.10
PROTECTIVE LINING		P300	P300	Grass/P300	Grass/P300
VEGETATIVE LINING RETARDANCE		C	C	C	C
RIPRAP GRADATION		N/A	N/A	N/A	N/A
n (MANNING'S COEFFICIENT)		0.046	0.046	0.044	0.044
Va (ALLOWABLE VELOCITY)	(FPS)	9.0	9.0	16.0	16.0
V (CALCULATED AT FLOW DEPTH d)	(FPS)	3.09	3.09	3.48	3.48
Ta (MAX ALLOWABLE SHEER STRESS)	(LB/FT^2)	3.00	3.00	8.00	8.00
Td (CALCULATED AT FLOW DEPTH d)	(LB/FT^2)	X	X	1.44	1.44
CHANNEL BOTTOM WIDTH	(FT)	2.0	2.0	2.0	2.0
CHANNEL LEFT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
CHANNEL RIGHT SIDE SLOPE	(H:1V)	2.0	2.0	2.0	2.0
D (TOTAL DEPTH)	(FT)	2.0	2.0	2.0	2.0
CHANNEL TOP WIDTH @ D	(FT)	10.00	10.00	10.00	10.00
d (CALCULATED FLOW DEPTH)	(FT)	0.21	0.21	0.24	0.24
CHANNEL TOP WIDTH @ FLOW DEPTH d	(FT)	2.85	2.85	2.97	2.97
A (CROSS-SECTIONAL AREA)	(SQ. FT.)	0.52	0.52	0.60	0.60
P (WETTED PERIMETER)	(FT)	2.95	2.95	3.09	3.09
R (HYDRAULIC RADIUS)	(FT)	0.17	0.17	0.20	0.20
S (BED SLOPE)	(FT/FT)	0.095	0.095	0.095	0.095
Sc (CRITICAL SLOPE)	(FT/FT)	0.058	0.058	0.051	0.051
0.7Sc	(FT/FT)	0.041	0.041	0.036	0.036
1.3Sc	(FT/FT)	0.075	0.075	0.066	0.066
STABLE FLOW?	(Y/N)	YES	YES	YES	YES
FREEBOARD BASED ON UNSTABLE FLOW	(FT)	X	X	X	X
FREEBOARD BASED ON STABLE FLOW	(FT)	0.05	0.05	0.06	0.06
FREEBOARD BASED ON CHANNEL DEPTH	(FT)	0.50	0.50	0.50	0.50
MINIMUM REQUIRED FREEBOARD	(FT)	0.50	0.50	0.50	0.50
MINIMUM DEPTH REQUIRED	(FT)	0.71	0.71	0.74	0.74
DESIGN METHOD FOR PROTECTIVE LINING PERMISSIBLE VELOCITY (V) OR SHEAR STRESS (S)		V	V	S	S

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

Slopes may not be averaged
Minimum freeboard is 0.5 ft. or 1/4 total channel depth, whichever is greater
Permissible velocity lining design method is not acceptable for channels with bed slope of 10% or greater. Shear stress lining 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.

Assume 40% void space for flow in channel bottom, ignore side slopes
if flow depth above stone is less than 0, use maximum velocity to size riprap

Inlet Flow Rational Calculations

PROJECT NAME: Compressor Station 165
PROJECT NUMBER: 341-132
LOCATION: Pittsylvania County, VA
PREPARED BY: JBH **DATE:** 5/7/2025
CHECKED BY: BJH **DATE:** 5/8/2025

INLET/STORM PIPE/CULVERT	DRAINAGE AREA (AC)	TC (MIN)[1]	DESIGN STORM	INTENSITY (IN/HR)	RUNOFF COEFFICIENT	DIRECT FLOW, Q=CiA (CFS)	INDIRECT FLOW (CFS)	TOTAL FLOW (CFS)	NOTES
IN-1 (PD-1)	0.93	5.0	10-Year	6.79	0.89	5.64	0.00	5.64	
IN-2 (PD-2)	1.17	5.0	10-Year	6.79	0.90	7.15	5.64	12.79	*Conveys Flow from PD-1*
IN-3 (PD-3)	0.23	5.0	10-Year	6.79	0.90	1.41	12.79	14.20	*Conveys Flow from PD-2*
IN-4 (PD-4)	0.10	5.0	10-Year	6.79	0.90	0.61	14.20	14.81	*Conveys Flow from PD-3*
IN-4A (PD-4A)	0.21	6.0	10-Year	6.38	0.90	1.21	14.81	16.02	*Conveys Flow from PD-4*
IN-5 (PD-5)	0.40	5.0	10-Year	6.79	0.90	2.44	16.02	18.46	*Conveys Flow from PD-4A*
IN-6 (PD-6)	0.59	5.0	10-Year	6.79	0.90	3.61	18.46	22.07	*Conveys Flow from PD-5*
IN-7 (PD-7)	0.01	5.0	10-Year	6.79	0.90	0.06	0.00	0.06	
IN-8 (PD-8)	0.77	5.0	10-Year	6.79	0.72	3.77	0.06	3.83	*Conveys Flow from PD-7*
IN-9 (PD-9)	0.76	5.0	10-Year	6.79	0.77	3.99	3.83	7.82	*Conveys Flow from PD-8*
IN-10 (PD-10)	0.69	5.0	10-Year	6.79	0.83	3.89	7.82	11.71	*Conveys Flow from PD-9*
IN-11 (PD-11)	0.23	5.0	10-Year	6.79	0.90	1.41	11.71	13.12	*Conveys Flow from PD-10*
IN-12 (PD-12)	0.91	5.0	10-Year	6.79	0.90	5.56	13.12	18.68	*Conveys Flow from PD-11*
IN-13 (PD-13)	0.89	5.0	10-Year	6.79	0.90	5.44	40.75	46.19	*Conveys Flow from PD-6 and PD-12*
MH-1 (PD-13A)	0.00	5.0	10-Year	6.79	0.00	0.00	46.19	46.19	*Conveys Flow from PD-13*
IN-14 (PD-14)	0.24	5.0	10-Year	6.79	0.63	1.02	0.00	1.02	
IN-15 (PD-15)	1.15	5.0	10-Year	6.79	0.80	6.20	1.02	7.22	*Conveys Flow from PD-14*
IN-16 (PD-16)	0.70	5.0	10-Year	6.79	0.59	2.80	0.00	2.80	
IN-17 (PD-17)	0.12	5.0	10-Year	6.79	0.87	0.71	2.80	3.51	*Conveys Flow from PD-16*
IN-18 (PD-18)	0.76	5.0	10-Year	6.79	0.86	4.46	10.73	15.19	*Conveys Flow from PD-15 and PD-17*
IN-19 (PD-19)	0.29	5.0	10-Year	6.79	0.44	0.88	0.00	0.88	
IN-20 (PD-20)	0.69	5.0	10-Year	6.79	0.71	3.32	0.88	4.20	*Conveys Flow from PD-19*
IN-21 (PD-21)	0.48	6.0	10-Year	6.38	0.63	1.92	0.00	1.92	
IN-22 (PD-22)	0.40	5.0	10-Year	6.79	0.90	2.44	6.12	8.56	*Conveys Flow from PD-20 & PD-21*
IN-23 (PD-23)	0.54	5.0	10-Year	6.79	0.90	3.30	8.56	11.86	*Conveys Flow from PD-22*
IN-24 (PD-24)	0.28	5.0	10-Year	6.79	0.81	1.55	0.00	1.55	
IN-25 (PD-25)	0.62	5.0	10-Year	6.79	0.89	3.75	1.55	5.30	*Conveys Flow from PD-24*
IN-26 (PD-26)	0.49	5.0	10-Year	6.79	0.90	2.99	5.30	8.29	*Conveys Flow from PD-25*
Culvert No. 1 - Phase 1	0.43	5.0	10-Year	6.79	0.47	1.36	0.00	1.36	
Culvert No. 1 - Phase 2	0.43	5.0	10-Year	6.79	0.43	1.24	0.00	1.24	
Culvert No. 2 - Phase 1	3.49	10.3	10-Year	5.37	0.40	7.44	1.36	8.80	*Conveys Flow from Culvert No. 1 - Phase 1*
Culvert No. 2 - Phase 2	0.67	5.0	10-Year	6.79	0.40	1.81	1.24	3.05	*Conveys Flow from Culvert No. 1 - Phase 2*
Culvert No. 3 - Phase 2	0.65	13.0	10-Year	4.94	0.30	0.96	3.05	4.01	*Conveys Flow from Culvert 2 - Phase 2*
Existing Culvert No. 1 - Pre*	7.10	5.0	10-Year	6.79	0.32	15.64	0.00	15.64	
Existing Culvert No. 1 - Post*	0.44	5.0	10-Year	6.79	0.31	0.94	0.00	0.94	

1 Time of Concentration calculated via HydroCAD. A minimum TC of 5.0 minutes is assumed per the Rational Method.

*Existing Culvert No. 1 analyzed to prove that the flow in the pre-development conditions is less than the post-development.

Summary for Subcatchment 4S: Culvert No. 2 - Phase 1

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.8	237	0.0100	2.19	43.87	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=2.00' Z= 2.0 & 6.0 '/' Top.W=18.00' n= 0.071
0.3	68	0.0300	4.29	274.32	**Trap/Vee/Rect Channel Flow, Temporary Channel 2** Bot.W=2.00' D=2.00' Z= 2.0 & 28.0 '/' Top.W=62.00' n= 0.061
1.3	115	0.0100	1.45	4.85	**Trap/Vee/Rect Channel Flow, Existing Ditch** Bot.W=10.00' D=0.25' Z= 12.0 & 15.0 '/' Top.W=16.75' n= 0.035
10.3	711	Total			

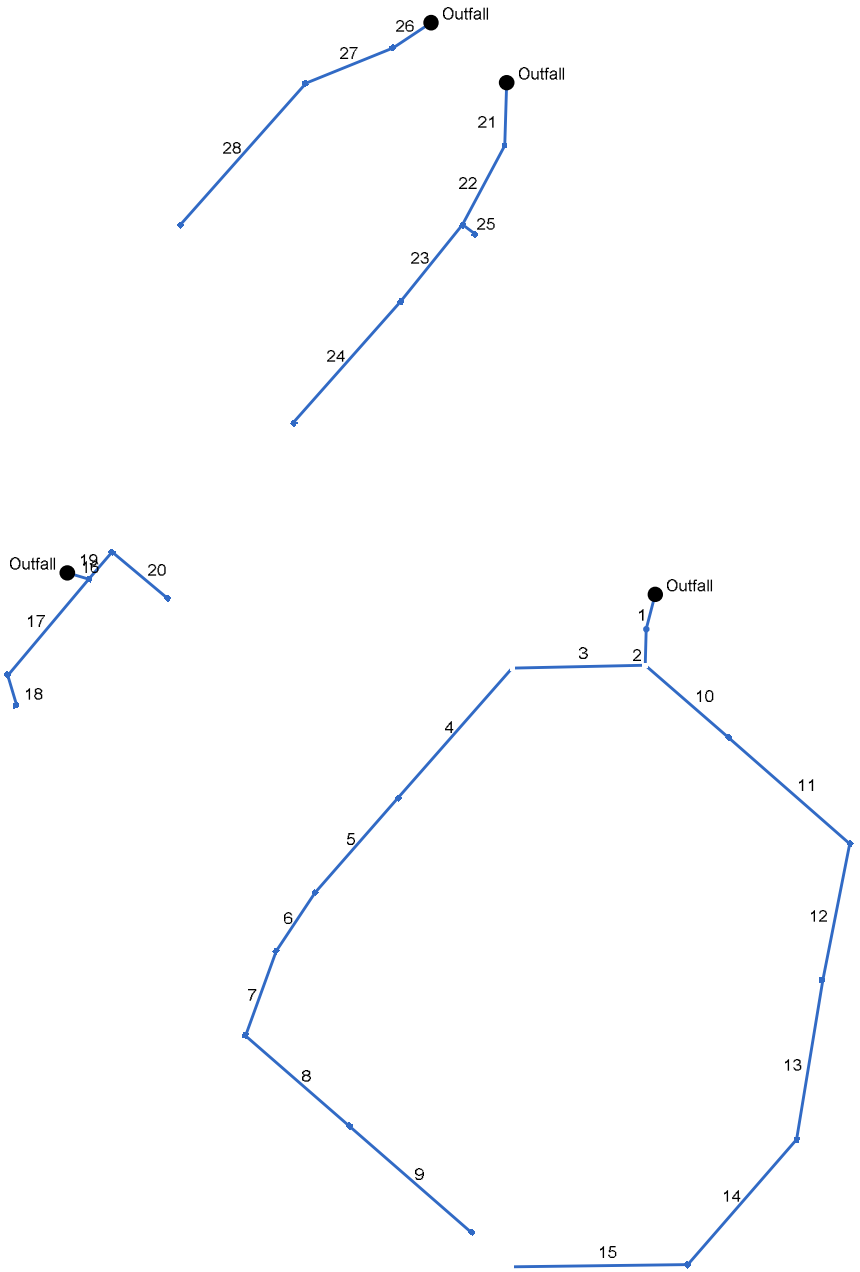
Summary for Subcatchment C-3: Culvert No. 3 - Phase 2

Runoff = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Rainfall file not specified

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.0100	0.28		**Sheet Flow,** Fallow n= 0.050 P2= 3.37"
3.8	227	0.0100	1.00		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
0.1	14	0.1000	3.16		**Shallow Concentrated Flow,** Nearly Bare & Untilled Kv= 10.0 fps
1.9	237	0.0100	2.06	22.95	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1A** Bot.W=2.00' D=1.75' Z= 2.0 & 3.0 '/' Top.W=10.75' n= 0.071
0.9	179	0.0200	3.14	44.00	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1B** Bot.W=2.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=12.00' n= 0.071
0.0	30	0.0300	11.15	19.71	**Pipe Channel, Culvert No. 2 Extension** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
0.1	55	0.0300	11.15	19.71	**Pipe Channel, Culvert No. 2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012
1.2	191	0.0200	2.68	20.10	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1C** Bot.W=2.00' D=1.50' Z= 2.0 '/' Top.W=8.00' n= 0.071
2.0	319	0.0200	2.68	20.10	**Trap/Vee/Rect Channel Flow, Permanent Channel No. 1D** Bot.W=2.00' D=1.50' Z= 2.0 '/' Top.W=8.00' n= 0.071
13.0	1,302	Total			

Hydraflow Storm Sewers Extension for Autodesk® Civil 3D® Plan



Project File: 341132-Storm Sewers.stm	Number of lines: 28	Date: 5/8/2025

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
1	End	40.000	0.00	0.00	0.00	0.00	0.00	0.0	100.4	0.0	46.19	70.25	9.72	30	2.50	642.00	643.00	644.43	645.24	645.21	651.49	PD-13A
2	1	40.000	0.00	0.00	0.00	0.00	0.00	0.0	100.4	0.0	46.19	231.3	23.36	30	27.10	645.70	656.54	646.46	658.78	651.49	663.47	PD-13
3	2	148.214	0.00	0.00	0.00	0.00	0.00	0.0	3.5	0.0	22.07	31.39	5.71	30	0.50	656.54	657.28	658.78	658.88	663.47	664.07	PD-6
4	3	192.315	0.00	0.00	0.00	0.00	0.00	0.0	2.7	0.0	18.46	31.39	5.90	30	0.50	657.28	658.24	658.88	659.69	664.07	664.82	PD-5
5	4	140.000	0.00	0.00	0.00	0.00	0.00	0.0	2.2	0.0	16.02	17.45	6.30	24	0.51	658.74	659.45	660.25	660.96	664.82	665.36	PD-4A
6	5	78.242	0.00	0.00	0.00	0.00	0.00	0.0	1.9	0.0	14.81	17.30	5.19	24	0.50	659.45	659.84	661.27	661.46	665.36	665.66	PD-4
7	6	100.000	0.00	0.00	0.00	0.00	0.00	0.0	1.6	0.0	14.20	17.33	5.03	24	0.50	659.84	660.34	661.69	661.91	665.66	665.66	PD-3
8	7	152.793	0.00	0.00	0.00	0.00	0.00	0.0	0.9	0.0	12.79	17.28	4.18	24	0.50	660.34	661.10	662.54	662.90	665.66	665.59	PD-2
9	8	180.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	5.64	8.04	3.20	18	0.50	661.10	662.00	663.05	663.46	665.59	665.59	PD-1
10	2	121.790	0.00	0.00	0.00	0.00	0.00	0.0	99.8	0.0	18.68	31.44	5.28	30	0.50	656.72	657.33	658.78	658.79	663.47	663.78	PD-12
11	10	180.000	0.00	0.00	0.00	0.00	0.00	0.0	99.1	0.0	13.12	17.33	5.69	24	0.50	657.33	658.23	658.79	659.53	663.78	664.24	PD-11
12	11	155.079	0.00	0.00	0.00	0.00	0.00	0.0	98.4	0.0	11.71	17.38	5.60	24	0.50	658.23	659.01	659.53	660.24	664.24	664.69	PD-10
13	12	180.000	0.00	0.00	0.00	0.00	0.00	0.0	97.7	0.0	7.82	8.04	5.14	18	0.50	659.01	659.91	660.24	661.09	664.69	665.08	PD-9
14	13	185.034	0.00	0.00	0.00	0.00	0.00	0.0	96.3	0.0	3.83	8.07	2.90	18	0.50	659.91	660.84	661.47	661.70	665.08	665.53	PD-8
15	14	196.209	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.06	8.04	0.31	18	0.50	660.84	661.82	661.94	661.98	665.53	666.09	PD-7
16	End	25.000	0.00	0.00	0.00	0.00	0.00	0.0	2.6	0.0	15.19	34.65	4.84	24	2.00	645.50	646.00	648.15	648.25	648.15	650.62	PD-18
17	16	140.000	0.00	0.00	0.00	0.00	0.00	0.0	0.3	0.0	3.51	7.00	3.69	15	1.00	647.45	648.85	649.01	649.61	650.62	652.46	PD-17
18	17	35.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	2.80	4.88	3.82	15	0.49	648.83	649.00	649.61	649.67	652.46	651.57	PD-16
19	16	40.000	0.00	0.00	0.00	0.00	0.00	0.0	2.3	0.0	7.22	24.50	2.30	24	1.00	646.00	646.40	649.01	649.04	650.62	650.09	PD-15
20	19	80.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.02	13.93	0.67	18	1.50	646.90	648.10	649.17	649.17	650.09	651.77	PD-14
21	End	70.000	0.00	0.00	0.00	0.00	0.00	0.0	5.1	0.0	11.86	25.44	6.98	18	5.00	619.00	622.50	622.95	623.81	621.13	631.77	PD-23
22	21	100.000	0.00	0.00	0.00	0.00	0.00	0.0	4.7	0.0	8.56	11.38	6.53	18	1.00	624.41	625.41	625.38	626.54	631.77	632.56	PD-22

Project File: 341132-Storm Sewers.stm

Number of lines: 28

Run Date: 5/8/2025

NOTES:Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period =Yrs. 10 ; c = cir e = ellip b = box

Storm Sewer Tabulation

Station		Len	Drng Area		Rnoff coeff	Area x C		Tc		Rain (I)	Total flow	Cap full	Vel	Pipe		Invert Elev		HGL Elev		Grnd / Rim Elev		Line ID
Line	To Line	(ft)	Incr (ac)	Total (ac)	(C)	Incr	Total	Inlet (min)	Syst (min)	(in/hr)	(cfs)	(cfs)	(ft/s)	Size (in)	Slope (%)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	Dn (ft)	Up (ft)	
23	22	110.000	0.00	0.00	0.00	0.00	0.00	0.0	4.2	0.0	4.20	4.95	4.52	15	0.50	629.18	629.73	630.06	630.61	632.56	633.53	PD-20
24	23	180.000	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.88	4.95	2.18	15	0.50	630.15	631.05	630.77	631.42	633.53	635.17	PD-19
25	22	17.782	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.92	4.98	2.66	15	0.51	625.41	625.50	626.54	626.05	632.56	628.36	PD-21
26	End	50.000	0.00	0.00	0.00	0.00	0.00	0.0	3.2	0.0	8.29	25.22	6.94	15	13.00	619.00	625.50	622.95	626.63	621.13	631.84	PD-26
27	26	105.244	0.00	0.00	0.00	0.00	0.00	0.0	2.8	0.0	5.30	6.99	5.83	15	1.00	628.10	629.15	628.91	630.08	631.84	632.52	PD-25
28	27	210.851	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.0	1.55	4.94	2.51	15	0.50	629.15	630.20	630.08	630.69	632.52	634.44	PD-24

Project File: 341132-Storm Sewers.stm | Number of lines: 28 | Run Date: 5/8/2025

NOTES:Intensity = 88.24 / (Inlet time + 15.50) ^ 0.83; Return period =Yrs. 10 ; c = cir e = ellip b = box

HY-8 Culvert Analysis Report

Culvert No. 1 (Analyzed using Phase 1 flow in an effort to be conservative)

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

Design Flow: 1.36 cfs

Maximum Flow: 1.36 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert No. 1 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
665.50	0.00	0.00	0.00	1
665.69	0.14	0.14	0.00	1
665.77	0.27	0.27	0.00	1
665.83	0.41	0.41	0.00	1
665.89	0.54	0.54	0.00	1
665.94	0.68	0.68	0.00	1
665.98	0.82	0.82	0.00	1
666.02	0.95	0.95	0.00	1
666.06	1.09	1.09	0.00	1
666.10	1.22	1.22	0.00	1
666.13	1.36	1.36	0.00	1
667.90	7.75	7.75	0.00	Overtopping

Culvert Data: Culvert No. 1

Table 1 - Culvert Summary Table: Culvert No. 1

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	665.50	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.14 cfs	0.14 cfs	665.69	0.19	0.0*	1-S2n	0.11	0.14	0.11	0.13	2.61	0.48

0.27 cfs	0.27 cfs	665.77	0.27	0.0*	1-S2 n	0.15	0.20	0.15	0.19	3.19	0.60
0.41 cfs	0.41 cfs	665.83	0.33	0.0*	1-S2 n	0.18	0.25	0.18	0.24	3.60	0.69
0.54 cfs	0.54 cfs	665.89	0.39	0.0*	1-S2 n	0.21	0.29	0.21	0.28	3.92	0.76
0.68 cfs	0.68 cfs	665.94	0.44	0.0*	1-S2 n	0.24	0.32	0.24	0.32	4.19	0.81
0.82 cfs	0.82 cfs	665.98	0.48	0.0*	1-S2 n	0.26	0.35	0.26	0.35	4.41	0.86
0.95 cfs	0.95 cfs	666.02	0.52	0.0*	1-S2 n	0.28	0.38	0.28	0.38	4.62	0.90
1.09 cfs	1.09 cfs	666.06	0.56	0.0*	1-S2 n	0.30	0.41	0.30	0.41	4.80	0.93
1.22 cfs	1.22 cfs	666.10	0.60	0.0*	1-S2 n	0.32	0.44	0.32	0.44	4.96	0.96
1.36 cfs	1.36 cfs	666.13	0.63	0.0*	1-S2 n	0.34	0.46	0.34	0.47	5.12	0.99

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 665.50 ft,

Outlet Elevation (invert): 664.90 ft

Culvert Length: 40.00 ft,

Culvert Slope: 0.0150

Site Data - Culvert No. 1

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 665.50 ft

Outlet Station: 40.00 ft

Outlet Elevation: 664.90 ft

Number of Barrels: 1

Culvert Data Summary - Culvert No. 1

Barrel Shape: Circular

Barrel Diameter: 1.25 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Tailwater Data for Crossing: Culvert 1

Table 2 - Downstream Channel Rating Curve (Crossing: Culvert 1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	664.90	0.00	0.00	0.00	0.00
0.14	665.03	0.13	0.48	0.08	0.25
0.27	665.09	0.19	0.60	0.12	0.26
0.41	665.14	0.24	0.69	0.15	0.27
0.54	665.18	0.28	0.76	0.18	0.28
0.68	665.22	0.32	0.81	0.20	0.28
0.82	665.25	0.35	0.86	0.22	0.28
0.95	665.28	0.38	0.90	0.24	0.29
1.09	665.31	0.41	0.93	0.26	0.29
1.22	665.34	0.44	0.96	0.27	0.29
1.36	665.37	0.47	0.99	0.29	0.29

Tailwater Channel Data - Culvert 1

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0720

Channel Invert Elevation: 664.90 ft

Roadway Data for Crossing: Culvert 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 3.00 ft

Crest Elevation: 667.90 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

HY-8 Culvert Analysis Report

Culvert 2 – Phase 1

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

Design Flow: 8.80 cfs

Maximum Flow: 8.80 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert 2 - Phase 1

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert No. 2 (Phase 1) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
658.05	0.00	0.00	0.00	1
658.52	0.88	0.88	0.00	1
658.72	1.76	1.76	0.00	1
658.91	2.64	2.64	0.00	1
659.08	3.52	3.52	0.00	1
659.23	4.40	4.40	0.00	1
659.37	5.28	5.28	0.00	1
659.52	6.16	6.16	0.00	1
659.67	7.04	7.04	0.00	1
659.84	7.92	7.92	0.00	1
660.02	8.80	8.80	0.00	1
663.00	17.60	17.60	0.00	Overtopping

Culvert Data: Culvert No. 2 (Phase 1)

Table 1 - Culvert Summary Table: Culvert No. 2 (Phase 1)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	658.05	0.00	0.000	0-NF	0.00	0.00	0.00	0.00	0.00	0.00
0.88 cfs	0.88 cfs	658.52	0.47	0.0*	1-S2	0.21	0.35	0.21	0.25	5.65	1.39

					n						
1.76 cfs	1.76 cfs	658.72	0.67	0.0*	1-S2n	0.30	0.50	0.30	0.37	6.91	1.72
2.64 cfs	2.64 cfs	658.91	0.86	0.0*	1-S2n	0.37	0.62	0.38	0.46	7.59	1.94
3.52 cfs	3.52 cfs	659.08	1.03	0.0*	1-S2n	0.43	0.72	0.44	0.54	8.19	2.11
4.40 cfs	4.40 cfs	659.23	1.18	0.0*	1-S2n	0.48	0.80	0.50	0.61	8.63	2.25
5.28 cfs	5.28 cfs	659.37	1.32	0.0*	1-S2n	0.53	0.89	0.55	0.67	9.04	2.36
6.16 cfs	6.16 cfs	659.52	1.47	0.0*	1-S2n	0.58	0.96	0.60	0.72	9.36	2.47
7.04 cfs	7.04 cfs	659.67	1.62	0.0*	5-S2n	0.62	1.03	0.65	0.78	9.64	2.56
7.92 cfs	7.92 cfs	659.84	1.79	0.173	5-S2n	0.66	1.09	0.70	0.82	9.87	2.64
8.80 cfs	8.80 cfs	660.02	1.97	0.579	5-S2n	0.70	1.15	0.74	0.87	10.05	2.72

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 658.05 ft,

Outlet Elevation (invert): 656.40 ft

Culvert Length: 55.02 ft,

Culvert Slope: 0.0300

Site Data - Culvert No. 2 (Phase 1)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 658.05 ft

Outlet Station: 55.00 ft

Outlet Elevation: 656.40 ft

Number of Barrels: 1

Culvert Data Summary - Culvert No. 2 (Phase 1)

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Culvert 2 - Phase 1

Table 2 - Downstream Channel Rating Curve (Crossing: Culvert 2 - Phase 1)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	656.40	0.00	0.00	0.00	0.00
0.88	656.65	0.25	1.39	0.31	0.54
1.76	656.77	0.37	1.72	0.46	0.56
2.64	656.86	0.46	1.94	0.58	0.58
3.52	656.94	0.54	2.11	0.68	0.59
4.40	657.01	0.61	2.25	0.76	0.60
5.28	657.07	0.67	2.36	0.84	0.60
6.16	657.12	0.72	2.47	0.90	0.61
7.04	657.18	0.78	2.56	0.97	0.61
7.92	657.22	0.82	2.64	1.03	0.62
8.80	657.27	0.87	2.72	1.08	0.62

Tailwater Channel Data - Culvert 2 - Phase 1

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0520

Channel Invert Elevation: 656.40 ft

Roadway Data for Crossing: Culvert 2 - Phase 1

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 5.00 ft

Crest Elevation: 663.00 ft

Roadway Surface: Gravel

Roadway Top Width: 30.00 ft

HY-8 Culvert Analysis Report

Culvert No. 2 (Phase 2)

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

Design Flow: 3.05 cfs

Maximum Flow: 3.05 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert 2 - Phase 2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert No. 2 (Phase 2) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
658.95	0.00	0.00	0.00	1
659.22	0.30	0.30	0.00	1
659.34	0.61	0.61	0.00	1
659.43	0.92	0.92	0.00	1
659.50	1.22	1.22	0.00	1
659.57	1.52	1.52	0.00	1
659.64	1.83	1.83	0.00	1
659.70	2.13	2.13	0.00	1
659.76	2.44	2.44	0.00	1
659.83	2.75	2.75	0.00	1
659.89	3.05	3.05	0.00	1
663.40	16.51	16.51	0.00	Overtopping

Culvert Data: Culvert No. 2 (Phase 2)

Table 1 - Culvert Summary Table: Culvert No. 2 (Phase 2)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	658.95	0.00	0.00 0	0-NF	0.00	0.00	0.0 0	0.00	0.00	0.00
0.30 cfs	0.30 cfs	659.22	0.27	0.0*	1-S2	0.13	0.20	0.1 3	0.14	4.13	0.98

					n						
0.61 cfs	0.61 cfs	659.34	0.39	0.0*	1-S2 n	0.18	0.29	0.18	0.20	5.07	1.24
0.92 cfs	0.92 cfs	659.43	0.48	0.0*	1-S2 n	0.22	0.36	0.22	0.26	5.71	1.41
1.22 cfs	1.22 cfs	659.50	0.55	0.0*	1-S2 n	0.25	0.41	0.25	0.30	6.22	1.54
1.52 cfs	1.52 cfs	659.57	0.62	0.0*	1-S2 n	0.28	0.46	0.28	0.34	6.64	1.65
1.83 cfs	1.83 cfs	659.64	0.69	0.0*	1-S2 n	0.31	0.51	0.31	0.38	6.99	1.74
2.13 cfs	2.13 cfs	659.70	0.75	0.0*	1-S2 n	0.33	0.55	0.33	0.41	7.32	1.83
2.44 cfs	2.44 cfs	659.76	0.81	0.0*	1-S2 n	0.36	0.59	0.36	0.44	7.49	1.90
2.75 cfs	2.75 cfs	659.83	0.88	0.0*	1-S2 n	0.38	0.63	0.38	0.47	7.87	1.97
3.05 cfs	3.05 cfs	659.89	0.94	0.0*	1-S2 n	0.40	0.66	0.40	0.50	8.11	2.03

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 658.95 ft,

Outlet Elevation (invert): 656.40 ft

Culvert Length: 85.04 ft,

Culvert Slope: 0.0300

Site Data - Culvert No. 2 (Phase 2)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 658.95 ft

Outlet Station: 85.00 ft

Outlet Elevation: 656.40 ft

Number of Barrels: 1

Culvert Data Summary - Culvert No. 2 (Phase 2)

Barrel Shape: Circular

Barrel Diameter: 1.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Culvert 2 - Phase 2

Table 2 - Downstream Channel Rating Curve (Crossing: Culvert 2 - Phase 2)

Flow (cfs)	Water Surface Elev (ft)	Velocity (ft/s)	Depth (ft)	Shear (psf)	Froude Number
0.00	656.40	0.00	0.00	0.00	0.00
0.30	656.54	0.14	0.98	0.17	0.49
0.61	656.60	0.20	1.24	0.26	0.52
0.92	656.66	0.26	1.41	0.32	0.54
1.22	656.70	0.30	1.54	0.38	0.55
1.52	656.74	0.34	1.65	0.43	0.56
1.83	656.78	0.38	1.74	0.47	0.56
2.13	656.81	0.41	1.83	0.52	0.57
2.44	656.84	0.44	1.90	0.55	0.57
2.75	656.87	0.47	1.97	0.59	0.58
3.05	656.90	0.50	2.03	0.63	0.58

Tailwater Channel Data - Culvert 2 - Phase 2

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0520

Channel Invert Elevation: 656.40 ft

Roadway Data for Crossing: Culvert 2 - Phase 2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 10.00 ft

Crest Elevation: 663.40 ft

Roadway Surface: Gravel

Roadway Top Width: 55.00 ft

HY-8 Culvert Analysis Report

Crossing Discharge Data

Culvert No. 3

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 0.00 cfs

Design Flow: 4.01 cfs

Maximum Flow: 4.01 cfs

Table 1 - Summary of Culvert Flows at Crossing: Culvert No. 3 - Phase 2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert No. 3 (Phase 2) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
646.50	0.00	0.00	0.00	1
646.81	0.40	0.40	0.00	1
646.95	0.80	0.80	0.00	1
647.05	1.20	1.20	0.00	1
647.15	1.60	1.60	0.00	1
647.26	2.00	2.00	0.00	1
647.35	2.41	2.41	0.00	1
647.44	2.81	2.81	0.00	1
647.53	3.21	3.21	0.00	1
647.62	3.61	3.61	0.00	1
647.70	4.01	4.01	0.00	1
649.00	8.11	8.11	0.00	Overtopping

Culvert Data: Culvert No. 3 (Phase 2)

Table 1 - Culvert Summary Table: Culvert No. 3 (Phase 2)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
0.00 cfs	0.00 cfs	646.50	0.00	0.000	0-NF	0.00	0.00	1.25	2.64	0.00	0.00
0.40 cfs	0.40 cfs	646.81	0.31	0.0*	1-JS1	0.12	0.25	1.25	2.64	0.33	0.00

					f						
0.80 cfs	0.80 cfs	646.95	0.45	0.0*	1-JS1f	0.16	0.35	1.25	2.64	0.65	0.00
1.20 cfs	1.20 cfs	647.05	0.55	0.0*	1-JS1f	0.20	0.43	1.25	2.64	0.98	0.00
1.60 cfs	1.60 cfs	647.15	0.65	0.0*	1-JS1f	0.23	0.50	1.25	2.64	1.31	0.00
2.00 cfs	2.00 cfs	647.26	0.76	0.0*	1-JS1f	0.25	0.56	1.25	2.64	1.63	0.00
2.41 cfs	2.41 cfs	647.35	0.85	0.0*	1-JS1f	0.28	0.62	1.25	2.64	1.96	0.00
2.81 cfs	2.81 cfs	647.44	0.94	0.0*	1-JS1f	0.30	0.67	1.25	2.64	2.29	0.00
3.21 cfs	3.21 cfs	647.53	1.03	0.0*	1-JS1f	0.32	0.72	1.25	2.64	2.61	0.00
3.61 cfs	3.61 cfs	647.62	1.12	0.0*	1-JS1f	0.34	0.77	1.25	2.64	2.94	0.00
4.01 cfs	4.01 cfs	647.70	1.20	0.0*	1-JS1f	0.36	0.81	1.25	2.64	3.27	0.00

* Full Flow Headwater elevation is below inlet invert.

Culvert Barrel Data

Culvert Barrel Type Straight Culvert

Inlet Elevation (invert): 646.50 ft,

Outlet Elevation (invert): 642.00 ft

Culvert Length: 45.22 ft,

Culvert Slope: 0.1000

Site Data - Culvert No. 3 (Phase 2)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 646.50 ft

Outlet Station: 45.00 ft

Outlet Elevation: 642.00 ft

Number of Barrels: 1

Culvert Data Summary - Culvert No. 3 (Phase 2)

Barrel Shape: Circular

Barrel Diameter: 1.25 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall (Ke=0.5)

Inlet Depression: None

Tailwater Data for Crossing: Culvert No. 3 - Phase 2

Table 2 - Downstream Channel Rating Curve (Crossing: Culvert No. 3 - Phase 2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)
0.00	644.64	2.64
0.40	644.64	2.64
0.80	644.64	2.64
1.20	644.64	2.64
1.60	644.64	2.64
2.00	644.64	2.64
2.41	644.64	2.64
2.81	644.64	2.64
3.21	644.64	2.64
3.61	644.64	2.64
4.01	644.64	2.64

Tailwater Channel Data - Culvert No. 3 - Phase 2

Tailwater Channel Option: Enter Constant Tailwater Elevation

Constant Tailwater Elevation: 644.64 ft

Roadway Data for Crossing: Culvert No. 3 - Phase 2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 5.00 ft

Crest Elevation: 649.00 ft

Roadway Surface: Gravel

Roadway Top Width: 12.00 ft

APPENDIX J
LANDSCAPING PLANS

NORTH

C702

C701

TAX PARCEL ID: 2436-63-4849

TAX PARCEL ID: 2436-53-9983

TAX PARCEL ID: 2436-75-1295

TAX PARCEL ID: 2436-95-5098

TAX PARCEL ID: 2436-73-3459

TAX PARCEL ID: 2436-72-5208

TAX PARCEL ID: 2436-83-7393

TAX PARCEL ID: 2436-82-8144

TAX PARCEL ID: 2436-80-3032

TAX PARCEL ID: 2446-03-4804

PROPOSED LIMIT OF DISTURBANCE (TYP.)

50' OFFSET FROM STREAM/WETLAND AREA (TYP.)

HUC12: 050102060203 BANISTER RIVER-SHOUSE CREEK

HUC12: 050102060104 CHERRYSTONE CREEK

TRANSCO ROAD

PROPOSED TRAVEL LANE

PROPOSED GAS PIPELINE (TYP.)

EXISTING FIBER OPTIC LINE (TYP.)

EXISTING FENCE (TYP.)

EXISTING UTILITY LINE (TYP.)

EXISTING UTILITY POLE (TYP.)

EXISTING STORM PIPE (TYP.)

EXISTING PROPERTY LINE (TYP.)

EXISTING STREAM (TYP.)

EXISTING GAS LINE (TYP.)

PROPOSED ACCESS ROAD NO. 3

PROPOSED EXTENDED DETENTION POND NO. 3

PROPOSED STOCKPILE

PROPOSED GRAVEL SUBSTATION PAD

PROPOSED EXTENDED DETENTION POND NO. 2

PROPOSED LEVEL SPREADER (TYP.)

PROPOSED RIPRAP APRON (TYP.)

PROPOSED GRAVEL LAUNCHER PAD

PROPOSED RIPRAP APRON (TYP.)

PROPOSED ACCESS ROAD NO. 2

PROPOSED MANAGED TURF POND ACCESS ROAD

PROPOSED GRAVEL COMPRESSOR PAD

PROPOSED EXTENDED DETENTION POND NO. 1

PROPOSED PERMANENT EXCAVATED SPILLWAY (TYP.)

PROPOSED STORM PIPE (TYP.)

PROPOSED CHANNEL (TYP.)

PROPOSED CULVERT (TYP.)

PROPOSED ACCESS ROAD NO. 1

PROPOSED STOCKPILE

PROPOSED BRUSH (TYP.)

EXISTING STORMWATER BASIN

STREAM L085-1
STREAM L166-1
STREAM L086-1
STREAM L087-1
STREAM L164-1
STREAM L165-1
STREAM L163-1
STREAM L161-1
STREAM L159-1
STREAM L160-1
STREAM L153-1
STREAM L114-1
STREAM L158-1
STREAM L157-1
STREAM L134-1
STREAM L139-1
STREAM L156-1
STREAM L155-1
STREAM L154-1
STREAM L154-2
STREAM L152-1

WETLAND W282-1
WETLAND W282-2
WETLAND W284-1
WETLAND W279-1
WETLAND W279-2
WETLAND W285-1
WETLAND W166-1
WETLAND W278-1
WETLAND W148-3
WETLAND W148-4
WETLAND W148-2
WETLAND W277-1
WETLAND W280-1
WETLAND W280-2
WETLAND W276-1
WETLAND W164-2
WETLAND W281-1
WETLAND W275-1
WETLAND W168-1
WETLAND W270-1
WETLAND W273-1
WETLAND W271-2
WETLAND W267-1
WETLAND W147-3
WETLAND W295-1
WETLAND W147-1
WETLAND W147-2
WETLAND W167-1
WETLAND W271-1
WETLAND W283-1
WETLAND W265-1
WETLAND W266-2
WETLAND W226-1
WETLAND W252-2
WETLAND W252-1
WETLAND W243-1
WETLAND W232-1
WETLAND W262-2
WETLAND W264-1
WETLAND W263-2
WETLAND W263-1
WETLAND W260-1
WETLAND W262-1
WETLAND W256-1
WETLAND W257-1
WETLAND W255-1
WETLAND W254-1
WETLAND W253-1
WETLAND W251-1

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN–D_1413_06–1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 150 300

LEGEND

- EXISTING INDEX CONTOUR (660)
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT–OF–WAY
- EXISTING RIGHT–OF–WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE (ST)
- EXISTING WATER LINE (W)
- EXISTING GAS LINE (G)
- EXISTING GAS LINE (BY OTHERS) (G)
- EXISTING OVERHEAD WIRE (OH–E)
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE (UG–E)
- EXISTING UNDERGROUND ELECTRIC LINE (FO)
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED INDEX CONTOUR (660)
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED EDGE OF GRAVEL PAD
- PROPOSED FLAT PAD LIMITS
- PROPOSED BERM
- PROPOSED EDGE OF UNPAVED GRAVEL ROAD
- PROPOSED EDGE OF PAVED ROAD
- PROPOSED GAS PIPELINE (G)
- PROPOSED FENCE
- PROPOSED PERMANENT EXCAVATED SPILLWAY
- PROPOSED CHANNEL
- PROPOSED STORM PIPE
- PROPOSED RIPRAP APRON
- PROPOSED UNDERDRAIN (UD)
- PROPOSED SOIL MEDIA
- PROPOSED S150 CHANNEL LINER
- PROPOSED P300 CHANNEL LINER
- PROPOSED P550 CHANNEL LINER
- BRUSH LAND COVER (ANALYZED AS WOODS, GOOD)
- BRUSH LAND COVER (DECOMPACTED, ANALYZED AS WOODS, GOOD)

REVISION RECORD

NO	DATE	DESCRIPTION

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLVYANIA COUNTY, VIRGINIA

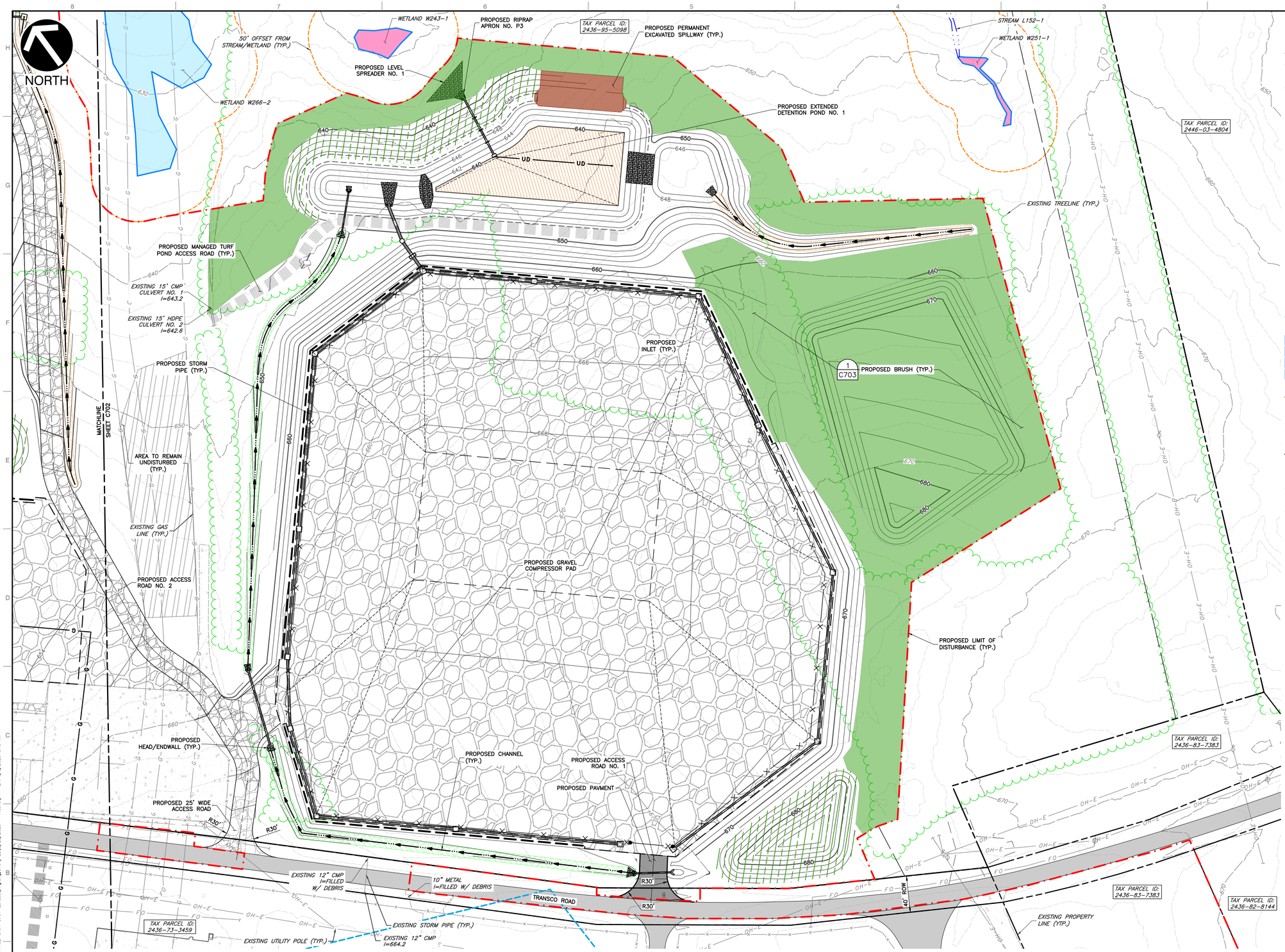
OVERALL LANDSCAPING PLAN

DATE:	MAY 2025
DWG SCALE:	1"=150'
PROJECT NO:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

DRAWING NO.: C700
SHEET 34 OF 61

P:\341-001\341-1321-DA01\dwg\CIVIL\341132-CIV01-C700-Landscaping Overall.dwg[C700] LS(5/28/2025 - Spyder) - LP: 6/3/2025 9:18 AM



LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING GAS LINE (BY OTHERS)
- EXISTING OVERHEAD WIRE
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED EDGE OF GRAVEL PAD
- PROPOSED FLAT PAD LIMITS
- PROPOSED BERM
- PROPOSED EDGE OF UNPAVED GRAVEL ROAD
- PROPOSED EDGE OF PAVED ROAD
- PROPOSED GAS PIPELINE
- PROPOSED FENCE
- PROPOSED CHANNEL
- PROPOSED STORM PIPE
- PROPOSED RIPRAP APRON
- PROPOSED HEAD/ENDWALL (HW/EW)
- PROPOSED INLET (IN)
- PROPOSED MANHOLE (MH)
- PROPOSED OUTLET STRUCTURE
- PROPOSED CONCRETE PIPE ANCHOR
- PROPOSED ANTI-SEEP COLLAR
- PROPOSED PERMANENT EXCAVATED SPILLWAY
- PROPOSED UNDERDRAIN
- PROPOSED SOIL MEDIA
- PROPOSED S150 CHANNEL LINER
- PROPOSED P300 CHANNEL LINER
- PROPOSED P550 CHANNEL LINER
- BRUSH LAND COVER (ANALYZED AS WOODS, GOOD)
- BRUSH LAND COVER (DECOMPACTED, ANALYZED AS WOODS, GOOD)

REFERENCES

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6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET
0 50 100

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com
Civil & Environmental Consultants, Inc.

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLVYANIA COUNTY, VIRGINIA

LANDSCAPING PLAN

DATE:	MAY 2025
DWG SCALE:	1"=50'
PROJECT NO.	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

DRAWING NO.: C701

SHEET 35 OF 61

NORTH

TAX PARCEL ID: 2436-95-5098

STREAM L157-1

WETLAND W266-2

WETLAND W258-1

MATCHLINE SHEET C701

PROPOSED PERMANENT EXCAVATED SPILLWAY (TYP.)

PROPOSED CHANNEL (TYP.)

PROPOSED 25' WIDE ACCESS ROAD

PROPOSED ACCESS ROAD NO. 2

PROPOSED GAS PIPELINE

PROPOSED INLET (TYP.)

PROPOSED STOCKPILE

PROPOSED GRAVEL LAUNCHER PAD

APPROXIMATE PIPELINE TIE-IN LOCATION. CONTRACTOR TO REFER TO GENERAL NOTE 17 ON SHEET C001.

EXISTING FENCE (TYP.)

PROPOSED ACCESS ROAD NO. 3

PROPOSED LEVEL SPREADER (TYP.)

PROPOSED EXTENDED DETENTION POND NO. 2

PROPOSED RIPRAP APRON (TYP.)

PROPOSED GRAVEL SUBSTATION PAD

PROPOSED EXTENDED DETENTION POND NO. 3

EXISTING GAS LINE (TYP.)

PROPOSED HEAD/ENDWALL (TYP.)

PROPOSED BRUSH (TYP.)

1 C703

PROPOSED LIMIT OF DISTURBANCE (TYP.)

STREAM L160-1

STREAM L153-1

EXISTING STREAM (TYP.)

STREAM L159-1

WETLAND W265-1

STREAM L161-1

50' OFFSET FROM STREAM/WETLAND AREA (TYP.)

EXISTING TREELINE (TYP.)

TAX PARCEL ID: 2436-75-1295

EXISTING PROPERTY LINE (TYP.)

40' ROW

TRANSCO ROAD

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT-OF-WAY
- EXISTING RIGHT-OF-WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- ST — EXISTING STORM PIPE
- W — EXISTING WATER LINE
- G — EXISTING GAS LINE
- G — EXISTING GAS LINE (BY OTHERS)
- OH-E — EXISTING OVERHEAD WIRE
- EXISTING UTILITY POLE
- UG-E — EXISTING FIBER OPTIC LINE
- FO — EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- 50' OFFSET FROM STREAM/WETLAND
- PROPOSED LIMIT OF DISTURBANCE
- 660 — PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED EDGE OF GRAVEL PAD
- PROPOSED FLAT PAD LIMITS
- PROPOSED BERM
- PROPOSED EDGE OF UNPAVED GRAVEL ROAD
- PROPOSED EDGE OF PAVED ROAD
- G — PROPOSED GAS PIPELINE
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- PROPOSED CHANNEL
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SCALE IN FEET
0 50 100

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
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PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

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TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

LANDSCAPING PLAN

DATE:	MAY 2025
DWG SCALE:	1" = 50'
PROJECT NO.:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

DRAWING NO.: C702

SHEET 36 OF 61

A:\341-000\341-132\-CAD\Dwg\CIVIL\341132-C001-C701-Landscaping.dwg[C702] 6/5/2025 8:19 AM — LP: 6/3/2025 — vfischer

TABLE 4: BRUSH SEED MIX						
SCIENTIFIC NAME	COMMON NAME	SIZE CATEGORY OF MATURE BRUSH	IDEAL QUANTITY PER ACRE	ESTIMATED SIZE OF BRUSH AFTER 3 YEARS (SF)	APPROXIMATE SEEDS/LB. (USDA)	POTENTIAL SEED SUPPLIER**
GAYLUSSACIA BACCATA	BLACK HUCKLEBERRY	SMALL	201+	7.07	354,000	A
CEANOTHUS AMERICANUS	NEW JERSEY TEA	SMALL	201+	7.07	112,000	A,S
EUONYMUS AMERICANUS	STRAWBERRY BUSH	SMALL	201+	15.91	35,100	S
HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	SMALL	201+	19.62	3,690,680	A
VACCINIUM STAMINEUM	DEERBERRY	SMALL	201+	15.91	372,280	A,S
ROSA CAROLINA	PASTURE ROSE	SMALL	201+	15.91	50,000	S
RHUS AROMATICA	FRAGRANT SUMAC	SMALL	201+	7.07	49,000	A,S
RUBUS ALLEGHENIENSIS	COMMON BLACKBERRY	MEDIUM	51 TO 200	63.62	262,200	E,S
VIBURNUM DENTATUM	ARROWWOOD VIBURNUM*	MEDIUM	51 TO 200	15.91	576,827	A,E,S
RHODODENDRON PERICLYMENOIDES	DWARF AZALEA	MEDIUM	51 TO 200	15.91	4,500	S
VIBURNUM ACERIFOLIUM	MAPLELEAF VIBURNUM	MEDIUM	51 TO 200	7.07	13,100	A,S
SAMBUCUS CANADENSIS	ELDERBERRY	MEDIUM	51 TO 200	28.27	291,590	E,S
ARONIA ARBUTIFOLIA	RED CHOKEBERRY*	LARGE	6 TO 50	15.91	256,500	A,S
LINDERA BENZOIN	SPICEBUSH	LARGE	6 TO 50	7.07	4,500	E,S
CORYLUS AMERICANA	AMERICAN HAZELNUT	LARGE	6 TO 50	15.941	491	A,E,S
HAMAMELIS VIRGINIANA	WITCHHAZEL	LARGE	6 TO 50	7.07	11,000	A,E,S
PARTHENOCISSUS QUINQUEFOLIA	VIRGINIA CREEPER	VERY LARGE	1 TO 5	78.5	18,367	E,S
*PLANTS SHOULD NOT BE SEEDED WHERE BRUSH HOGGING IS ANTICIPATED						

BRUSH SEED MIXTURE INSTRUCTIONAL NARRATIVE:

1. CONTACT SEED SUPPLIERS (SEE SEED SUPPLIER LEGEND AT RIGHT) TO INQUIRE ABOUT SPECIES AND QUANTITIES AVAILABLE.
2. CHOOSE A MINIMUM OF 10 SPECIES FOR BIODIVERSITY. MAXIMIZE BIODIVERSITY BY SELECTING AS MANY SPECIES AS POSSIBLE. USE INFORMATION PROVIDED IN COLUMNS E, F, AND G TO INFORM SELECTIONS. LARGER QUANTITIES SHOULD BE SELECTED FOR THE SMALLER PLANT SPECIES ON THE TOP OF THE LIST AND SMALLER QUANTITIES SHOULD BE SELECTED FOR THE LARGER PLANT SPECIES AND VINE AT THE BOTTOM OF THE LIST. TOTAL SF OF SELECTED PLANTS MUST EXCEED 24,289.06 SF PER ACRE. USE THE SPREADSHEET PROVIDED TO CALCULATE SEEDS REQUIRED PER ACRE TO MEET THE REQUIREMENTS. NOTE: PLANTS WITH AN ASTERISKS SHOULD NOT BE SEEDED WHERE BRUSH HOGGING IS ANTICIPATED.
3. CONTACT SEED SUPPLIER WELL IN ADVANCE TO ENSURE AVAILAILITY AT TIME OF PLANTING. IF NECESSARY, STORE INDOORS IN A COOL AND DRY PLACE. FOLLOW SCARIFICATION, STRATIFICATION, AND SEED BED PREPARATION RECOMMENDATIONS FOR OPTIMUM GERMINATION FROM THE SEED SUPPLIER PRIOR TO SEEDING.
4. PREPARE THE SITE ACCORDING TO GUIDANCE DOCUMENTS LISTED IN THE MEADOW NARRATIVE. FOLLOW GUIDANCE TOOLS-AND-SEEDING-METHODS_PG.PDF FOUND AT WWW.ERNSTSEED.COM FOR SEEDING METHODS.
5. APPLY THE BRUSH SEEDS SEPARATELY FROM THE MEADOW SEED MIX. APPLY SEEDS AT THE RATE OF TOTAL BRUSH SEEDS/ACRE OR TOTAL LBS./AC AS CALCULATED IN THE SPREADSHEET.
6. SELECT A MEADOW SEED MIX AND APPLY ACCORDING TO THE MEADOW SEED MIX INSTRUCTIONAL NARRATIVE.
7. DO NOT BRUSH HOG UNTIL THE FOURTH YEAR TO ALLOW FOR ADEQUATE ESTABLISHMENT. BRUSH HOGGING SHOULD OCCUR IN LATE WINTER (APPROXIMATELY FEBRUARY 25TH) AFTER GROUND-DWELLING BIRD NESTING SEASON AND TO ALLOW SEED AND FRUIT SET AND SEED COLD TREATMENT.

SEED SUPPLIER LEGEND:

S: HTTPS://SHEFFIELDS.COM/

E: HTTPS://WWW.ERNSTSEED.COM/SEED-FINDER-TOOL/?_PRODUCT_TYPE=INDIVIDUAL-SPECIES

A: HTTPS://ARCHEWILD.COM/NATIVE-PLANT-NURSERIES/CUSTOM-GROWING/

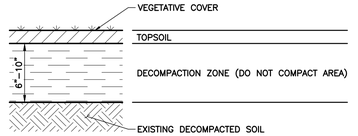
**SUPPLIER OF THIS SEED AS OF 4/25/2025

DETAIL 1
BRUSH PLANTING

N.T.S.

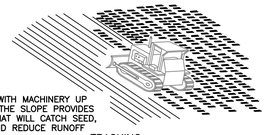
DECOMPACTION DEPTH AND METHOD				
PARAMETER	CONTRIBUTING IMPERVIOUS COVER TO DECOMPACTION AREA RATIO [1]			
	IC/ SA = 0[2]	IC/SA = 0.5	IC/SA = 0.75	IC/SA=1.0[3]
DECOMPACTION DEPTH (INCHES)	6 TO 10[4]	8 TO 12[4]	15 TO 18[4]	18 TO 24[4]
DECOMPACTION METHOD	ROTOTILLER	TILLER	SUBSOILER	SUBSOILER

NOTES:
1. IC = CONTRIBUTING IMPERVIOUS COVER (SQUARE FEET) AND SA = SURFACE AREA OF DECOMPACTION (SQUARE FEET).
2. FOR AMENDMENT OF COMPACTED LAWNS THAT DO NOT RECEIVE OFFSITE RUNOFF.
3. IN GENERAL, IC/SA RATIOS GREATER THAN 1 SHOULD BE AVOIDED.
4. LOWER END FOR HSG B SOILS, HIGHER END FOR HSG C/D.



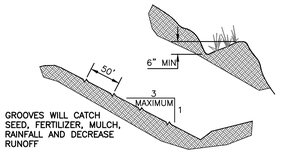
SOIL DECOMPACTION DETAIL

N.T.S.



'TRACKING' WITH MACHINERY UP AND DOWN THE SLOPE PROVIDES GROOVES THAT WILL CATCH SEED, RAINFALL AND REDUCE RUNOFF

TRACKING

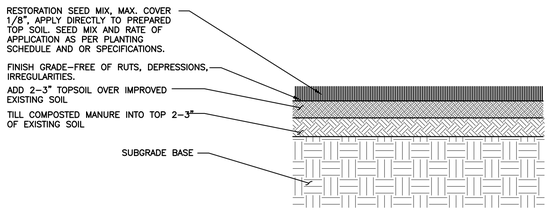


GROOVES WILL CATCH SEED, FERTILIZER, MULCH, RAINFALL AND DECREASE RUNOFF

CONTOUR FURROWS

EQUIPMENT TRACKING DETAIL

N.T.S.



NOTES:
1. MINIMUM TOPSOIL DEPTH IS 4-6 INCHES.
2. TOPSOIL SHOULD HAVE A GOOD HUMUS CONTENT. THIS CAN BE 20 TONS OF COMPOSTED MANURE PER ACRE OR 170 BALES OF PEAT PER ACRE.
3. TOPSOIL WITH A PH OF 6 OR LESS WILL NEED A LIME AMENDMENT. EVENLY APPLY HYDRATED LIME OR GROUND LIMESTONE TO TOP SOIL UNTIL PH IS ADJUSTED TO BETWEEN 6-7. PH BELOW 5.5 OR ABOVE 7.5 IS UNACCEPTABLE FOR LAWNS.
4. 650 LBS OF SLOW RELEASE WELL BALANCED FERTILIZER 10-10-10 PER ACRE SHOULD BE HARROWED INTO THE TOPSOIL PRIOR TO SEEDING.
5. SEEDING IS BEST IN THE LATE SUMMER-EARLY AUTUMN. A HARROW MAY BE USED TO OBTAIN AN EVEN SURFACE THAT IS FIRM, THE SEED MAY BE MECHANICALLY SPREAD INTO THE SURFACE AS PER THE PLANTING SCHEDULE AND OR SPECIFICATIONS.
6. SEE SPECIFICATIONS FOR ADDITIONAL NOTES.

RESTORATION SEED MIX INSTALLATION DETAIL

N.T.S.

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

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NO	DATE	DESCRIPTION

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www.cecinc.com
CEC Civil & Environmental Consultants, Inc.

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COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

LANDSCAPING NOTES AND DETAILS

DATE:	MAY 2025
DWG SCALE:	N.T.S
PROJECT NO.:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

DRAWING NO.: C703

SHEET 37 OF 61

APPENDIX K
SOIL INVESTIGATION INFORMATION

P:\340-000\341-132\-CADD\Dwg\Exhibits\341132-CV01-Soil Investigation Exhibit.dwg[1] LS:(5/8/2025 - byoder) - LP: 5/8/2025 2:35 PM

LEGEND

- PROPOSED LIMIT OF DISTURBANCE
- IT-X — INFILTRATION TEST LOCATION
- B-X — 2025 BORE TEST LOCATION
- B-X — 2024 BORE TEST LOCATION
- RT-X — FIELD RESISTIVITY TEST LOCATION

SCALE IN FEET
0 100 200

DRAWING NO.: 1

SUBSURFACE INVESTIGATION EXHIBIT

DATE:	MAY 2025	DRAWN BY:	JMP
DWG SCALE:	1"=100'	CHECKED BY:	MEA
PROJECT NO:			341-132
APPROVED BY:			LCW

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REVISION RECORD

NO	DATE	DESCRIPTION

Rock Types

Rock Name	Characteristics	Symbol
Claystone	Clay sized particles that are consolidated, lacking fissility.	
Coal	Black and shiny, can break into cubes or conchoidally.	
Conglomerate	Gravel sized grains and larger held together by finer material, called a breccia if clasts are angular.	
Limestone	Effervesses w/ diluted HCl, can be composed of clay up to gravel particles (fossils).	
Sandstone	Primarily sand sized particles modified w/ the descriptor fine, medium, or coarse.	
Shale	Clay sized particles, shale has fissility which is a horizontal sheet-like or laminated feature.	
Siltstone	Composed of silt, normally breaks as irregular chunks.	

Rock Quality Descriptions

Weathering

Completely Weathered: All rock material is decomposed and/or disintegrated. The original rock structure may still be intact.

Highly Weathered: More than half of the rock material is decomposed. Fresh rock is present only as a discontinuous framework or as corestones.

Moderately Weathered: Less than half of the rock material is decomposed. Fresh rock is present at a discontinuous framework or as corestones.

Slightly Weathered: Discoloration or staining indicates weathering of rock material on discontinuity surfaces. Rock may be discolored and softened.

Fresh: No visible signs of rock material weathering.

RQD

Descriptor	%
Very Poor	<25
Poor	25-50
Fair	50-75
Good	75-90
Excellent	>90

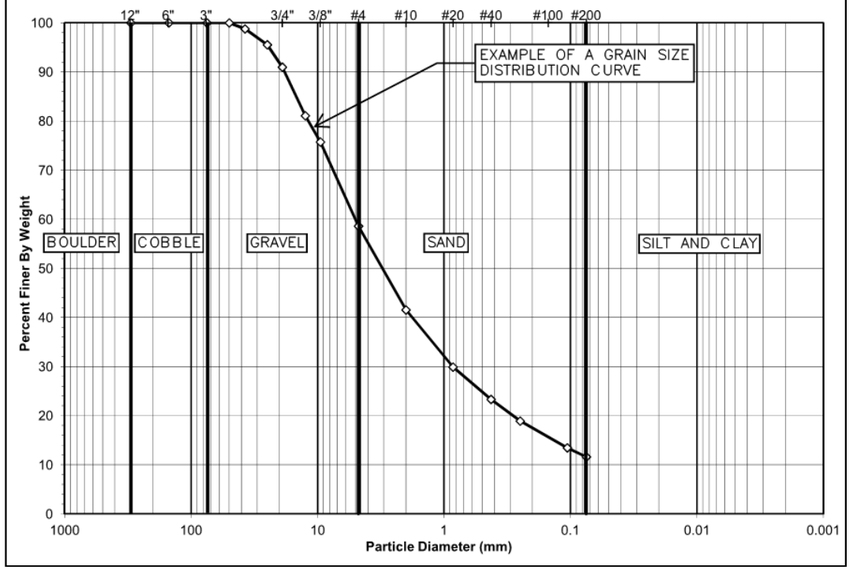
Brokenness

Descriptor	Fracture Spacing (in & ft)
Very Broken	<1 (<0.08)
Broken	1-3 (0.08-0.25)
Moderately Broken	3-6 (0.25-0.5)
Slightly Broken	>6 (>0.5)

Rock Hardness

Descriptor	Field Criterion	Relative Unconfined Compressive Strength
Very Hard	Difficult to break w/ Hammer	> 30,000 psi
Hard	Hand-held sample breaks w/ Hammer	8,000 to 30,000 psi
Medium Hard	Cannot scrape surface w/ knife	2,000 to 8,000 psi
Soft	Cutting or scraping w/ knife difficult	500 to 2,000 psi
Very Soft	Can be cut w/ knife	< 500 psi

Grain Size Distribution Curve



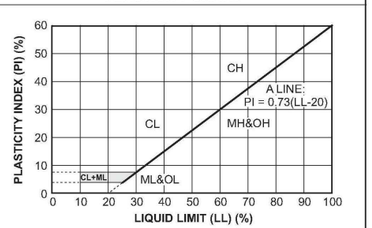
UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART			
COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.)			
GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size	Clean Gravels (Less than 5% fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines
		GP	Poorly-graded gravels, gravel-sand mixtures, little or no fines
	Gravels with fines (More than 12% fines)	GM	Silty gravels, gravel-sand-silt mixtures
		GC	Clayey gravels, gravel-sand-clay mixtures
SANDS 50% or more of coarse fraction smaller than No. 4 sieve size	Clean Sands (Less than 5% fines)	SW	Well-graded sands, gravelly sands, little or no fines
		SP	Poorly graded sands, gravelly sands, little or no fines
	Sands with fines (More than 12% fines)	SM	Silty sands, sand-silt mixtures
		SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.)			
SILTS AND CLAYS Liquid limit less than 50%		ML	Inorganic silts and very fine sands, rock flour, silty of clayey fine sands or clayey silts with slight plasticity
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
		OL	Organic silts and organic silty clays of low plasticity
SILTS AND CLAYS Liquid limit 50% or greater		MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts
		CH	Inorganic clays of high plasticity, fat clays
		OH	Organic clays of medium to high plasticity, organic silts
HIGHLY ORGANIC SOILS		PT	Peat and other highly organic soils

LABORATORY CLASSIFICATION CRITERIA		
GW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
GP	Not meeting all gradation requirements for GW	
GM	Atterberg limits below "A" line or P.I. less than 4	Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols
GC	Atterberg limits above "A" line with P.I. greater than 7	
SW	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3	
SP	Not meeting all gradation requirements for GW	
SM	Atterberg limits below "A" line or P.I. less than 4	Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols.
SC	Atterberg limits above "A" line with P.I. greater than 7	

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent ..... GW, GP, SW, SP
More than 12 percent ..... GM, GC, SM, SC
5 to 12 percent ..... Borderline cases requiring dual symbols

PLASTICITY CHART



Glossary

Alluvial Soil or Alluvium: Soil deposited by water in a river, stream, floodplain, or delta.

Bedrock: Materials underlying soil or other unconsolidated surficial materials in which refusal is consistently encountered on lithified, undisturbed, natural bedrock.

Colluvial Soil or Colluvium: Incoherent soil on or at the base of a slope deposited by gravity or slope movement.

Fill: Soil derived from natural soil, rock, or processed materials that was placed by artificial methods, such as construction, waste disposal, or dumping.

Glacial Outwash: Soil, typically sand and gravel, deposited by glacial streams or meltwater in a preexisting valley or over a plain.

Glacial Till: Soil deposited by and underneath a glacier, generally consisting of a heterogeneous, unstratified mixture of clay, sand, gravel, and boulders.

N-Value: The blow count representation of the penetration resistance of the soil determined by the Standard Penetration Test (SPT). It is the sum of the number of blows required to drive the sampler the second and third 6-inch increments (sample depth interval of 6 to 18 inches) and is recorded in blows per foot (bpf). The N-value is considered to be an indication of the relative density of coarse-grained soils (sand and gravel) or consistency of fine-grained soils (silt and clay).

Pocket Pen (PP): Field penetration test performed using a hand-held penetrometer that estimates unconfined compressive strength of cohesive soil in tons per square foot (tsf).

Recovery %: Total length of rock core or soil sample retrieved divided by the total length of the core run or sample interval, expressed as a percentage.

Refusal: The depth at which greater than 50 SPT hammer blows are required to drive the sampling spoon 6 inches or less.

Residual Soil or Residuum: Soil derived from the physical or chemical weathering of the underlying parent bedrock, generally with N-values less than 30 and 50 bpf in cohesive and cohesionless materials, respectively.

Rock Quality Designation (RQD): The sum of the length of intact rock core pieces longer than 4 inches (excluding mechanical breaks) divided by the total length of the core run, expressed as a percentage.

Shelby Tube: A 2" to 3" diameter, thin walled sampling tube that is pushed into the soil to obtain a relatively undisturbed soil sample for geotechnical laboratory tests.

Split Spoon Sampler: A soil sampling tube which is driven, retrieved, and split-open lengthwise for removal and visual inspection, and testing of the soil obtained.

Standard Penetration Test (SPT) ASTM D1586 : Field penetration test consisting of driving a 2-inch outside diameter split-spoon sampler 18 inches using a 140-pound hammer free falling a distance of 30 inches. The number of blows required to advance the spoon through successive 6-inch increments is recorded to determine the N-value.

Weathered Rock: Materials derived from lithified, undisturbed, natural bedrock which are able to be sampled with a split-spoon. Cohesive and cohesionless materials generally have N-values greater than 30 and 50 bpf, respectively.

N-Value Rating

Fine-Grained Soils (Silt and Clay)

Consistency	Blows/ft	PP (tsf)
Very Soft	0-2	<0.25
Soft	3-4	0.25-0.5
Medium Stiff	5-8	0.5-1
Stiff	9-15	1-2
Very Stiff	16-32	2-4
Hard	>32	>4

Coarse-Grained Soils (Sand and Gravel)

Relative Density	Blows/ft
Very Loose	0-4
Loose	5-10
Medium Dense	11-30
Dense	31-50
Very Dense	>50

Unconsolidated Material

Term	Grain Size in mm (in)	Approximate Example Size
Clay and Silt	<.075	can't see grains to barely visible
Fine Sand	0.075-0.4	table salt to sugar
Med. Sand	0.4-2.0 (~<1/16)	openings in a window screen
Coarse Sand	2.0-4.75 (~1/16-1/8)	sidewalk salt
Gravel	4.75-75 (~1/8-3)	pea to tennis ball
Cobble	75-300 (3-12)	tennis ball to basketball
Boulder	>300 (>12)	larger than a basketball

Other Features – Used to describe other identifiable, pertinent features (e.g., angularity of coarse-grained soils, organics, construction debris, etc.)

Term	%
Trace	< 5
Few	5-15
Some	15-45

Moisture Content
Dry: Sample is dusty or obviously dry.
Moist: Anything that does not fit the definition of dry or wet.
Wet: Sample contains free water.

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Definitions of Standard Terms and Symbols

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-1

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 671 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
670		Topsoil - 0.8 feet		SS 1	100	1-5-5 (10)	4.0
		Reddish Brown, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**					
				SS 2	87	5-5-6 (11)	
			5				
665				SS 3	100	8-5-4 (9)	
		Trace fat clay nodules observed throughout sample SS-3.					
		Reddish Brown, Sandy Silt, ML, Moist, Soft **(RESIDUUM)**	10	SS 4	100	2-2-2 (4)	
		Bottom of boring at 10.5 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-2

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 664 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 38.2 ft / Elev 625.8 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING 35.6 ft / Elev 628.4 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	0	Topsoil - 0.8 feet				
		Brown, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)**	SS 1	100	1-5-3 (8)	4.5
660		Brown, SANDY LEAN CLAY, CL, Moist, Stiff to Medium Stiff **(RESIDUUM)**	SS 2	100	2-5-7 (12)	
	5		SS 3	100	2-3-4 (7)	
655		Brown And Light Gray, Silty Sand, SM, Moist, Loose **(RESIDUUM)** *Some carbonaceous material observed throughout sample.*	SS 4	100	3-3-4 (7)	
	10	Brown, Clayey Sand, SC, Moist, Very Loose to Loose **(RESIDUUM)**	SS 5	100	1-1-3 (4)	
650						
	15		SS 6	100	1-2-4 (6)	
645		Brown, Silty Sand with Gravel, SM, Wet, Very Loose **(RESIDUUM)**	SS 7	100	1-1-1 (2)	
	20	Brown, SILTY SAND, SM, Wet, Loose **(RESIDUUM)**	SS 8	100	1-2-4 (6)	
640		Brown, Silty Sand with Gravel, SM, Wet to Moist, Very Loose to Medium Dense **(RESIDUUM)** *Some fat clay nodules observed throughout stratum.*	SS 9	100	1-2-1 (3)	
	25		SS 10	100	1-2-1 (3)	
635	30					

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

(Continued Next Page)

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-2

CLIENT Transcontinental Gas Pipe Line Company **PROJECT NAME** Compressor Station 165

PROJECT NUMBER 341-132 **PROJECT LOCATION** Pittsylvania County, Virginia

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	30				
		Brown, Silty Sand with Gravel, SM, Wet to Moist, Very Loose to Medium Dense **(RESIDUUM)** *Some fat clay nodules observed throughout stratum.* (continued)		SS 11	100	2-3-7 (10)	
630		*Samples observed to transition from wet to moist at approximately 33 feet bgs.*	35	SS 12	100	5-9-13 (22)	
				SS 13	100	6-12-14 (26)	
625		Orangish Brown, Completely Weathered, Micaceous Sandstone, Very Soft **(WEATHERED BEDROCK)**	40	SS 14	100	6-13-18 (31)	
				SS 15	100	5-16-37 (53)	
620			45				
		Light Grayish Brown, Completely Weathered, Micaceous Sandstone, Very Soft **(WEATHERED BEDROCK)**		SS 16	100	38-50/0.4	
		Bottom of boring at 45.9 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

50/0.4

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-3

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 673 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	0	Topsoil - 0.3 feet				
670		Reddish Brown, Lean Clay with Sand, CL, Moist, Medium Stiff **(RESIDUUM)**	SS 1	100	2-4-4 (8)	4.5
		Reddish Brown, Poorly-Graded Sand with Silt, SP-SM, Moist, Medium Dense to Loose **(RESIDUUM)**	SS 2	100	4-7-6 (13)	
	5		SS 3	100	3-3-5 (8)	
665		Brown, Sandy Silt, ML, Moist, Medium Stiff **(RESIDUUM)** *Trace elastic silt nodules observed throughout sample.*	SS 4	100	2-2-3 (5)	
	10	Brown, Sandy Silt with Gravel, ML, Moist, Medium Stiff **(RESIDUUM)**	SS 5	100	2-2-4 (6)	
660						
	15	Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)**	SS 6	100	2-4-3 (7)	
655		*Trace carbonaceous material observed throughout SS-7*	SS 7	100	2-3-3 (6)	
	20	Reddish Brown, Completely To Highly Weathered, Sandstone, Very Soft to Soft **(WEATHERED BEDROCK)** *Auger refusal encountered at approximately 21.5 feet bgs.*	SS 8	100	47-50/0.1	
		Brown, Completely To Highly Weathered, Sandstone, Very Soft to Soft **(BEDROCK)**	SS 9	100	50/0.1	
		Bottom of boring at 22.6 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

50/0.1
50/0.1

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Moon Township, PA 15108

BORING NUMBER B-4

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 677 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
		Topsoil - 0.8 feet		SS 1	100	3-10-6 (16)	4.5
675		Orangish Brown, Sandy Lean Clay, CL, Dry, Very Stiff **(RESIDUUM)**					
		Reddish Brown, Sandy Lean Clay, CL, Moist, Very Stiff to Medium Stiff **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*		SS 2	100	5-7-10 (17)	
		Bulk sample of auger cuttings obtained from approximately 0 to 10 feet bgs. **Auger cuttings classified as SANDY LEAN CLAY, CL Maximum Dry Density = 110.3 pcf; Optimum Moisture Content = 16.0% Effective Cohesion = 475.2 psf; Angle of Friction = 26.7 degrees CBR = 2.5**	5				
670				SS 3	100	2-2-3 (5)	
		Reddish Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)**	10	SS 4	100	3-3-3 (6)	
665							
		Brownish Gray, Highly Weathered Sandstone, Soft **(WEATHERED BEDROCK)**		SS 5		50/0.1	
		Bottom of boring at 12.1 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

50/0.1

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-5

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 664 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
▽ **AT END OF SOIL SAMPLING** 14.1 ft / Elev 649.9 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
		Topsoil - 0.4 feet Brown, Sandy Lean Clay, CL, Dry to Moist, Soft **(RESIDUUM)**		SS 1	87	2-1-3 (4)
660		Orangish Brown, Lean Clay with Sand, CL, Moist, Stiff **(RESIDUUM)**	5	SS 2	100	4-6-8 (14)
655		Brown, Clayey Sand, SC, Wet, Loose to Very Loose **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*		SS 3	100	2-3-3 (6)
			10	SS 4	100	2-2-2 (4)
650		Orangish Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, Wet, Very Loose to Loose **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.* ▽		SS 5	100	2-1-2 (3)
			15	SS 6	100	2-2-5 (7)
		Bottom of boring at 16.5 feet.				

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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BORING NUMBER B-6

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 665 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 27.5 ft / Elev 637.5 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING 25.5 ft / Elev 639.5 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
665	0	Topsoil - 0.3 feet Brown, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**	SS 1	100	1-5-5 (10)
			SS 2	100	8-6-9 (15)
660	5	Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)** *Shelby tube obtained from offset boring from approximately 6 to 8 feet bgs. Recovery = 1.7 feet; Downward pressure ranged from approximately 0 to 400 psi.* **Shelby tube classified as SILTY SAND, SM**	SS 3	100	2-4-5 (9)
			SS 4	100	2-2-3 (5)
655	10	Dark Red, Silty Sand, SM, Moist to Wet, Loose to Very Loose **(RESIDUUM)** *Some elastic silt nodules observed throughout stratum. Shelby tube obtained from offset boring from approximately 12 to 14 feet bgs. Recovery = 2.0 feet; Downward pressure ranged from approximately 0 to 400 psi.* **Shelby tube classified as SILTY SAND, SM**	SS 5	100	2-3-3 (6)
			SS 6	100	2-2-2 (4)
650	15	*Samples observed to transition from moist to wet at approximately 18 feet bgs.*	SS 7	100	1-2-1 (3)
645	20	Red, Clayey Gravel, GC, Moist, Medium Dense **(RESIDUUM)** *Some carbonaceous material observed throughout sample.*	SS 8	100	5-11-11 (22)
640	25	Orangish Brown, Sandy Silt with Gravel, ML, Wet, Soft to Medium Stiff **(RESIDUUM)**	SS 9	100	1-1-2 (3)
			SS 10	100	1-1-5 (6)
635	30				

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

CEC CUSTOM LOG 341-132 LOGS.GPJ CEC.GDT 6/3/25

(Continued Next Page)

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-6

CLIENT Transcontinental Gas Pipe Line Company **PROJECT NAME** Compressor Station 165

PROJECT NUMBER 341-132 **PROJECT LOCATION** Pittsylvania County, Virginia

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
635		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	30				
		Orangish Brown, Sandy Silt with Gravel, ML, Wet, Soft to Medium Stiff **(RESIDUUM)** *(continued)*		SS 11	100	1-3-4 (7)	▲
		Bottom of boring at 31.5 feet.					

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-7

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 674 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
▽ **AT END OF SOIL SAMPLING** 33.0 ft / Elev 641.0 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Topsoil - 0.4 feet	0			
		Reddish Brown, SANDY LEAN CLAY, CL, Moist, Medium Stiff **(RESIDUUM)**		SS 1	87	2-2-4 (6)
670		Reddish Brown, Silty Sand, SM, Moist, Medium Dense to Loose **(RESIDUUM)**	5	SS 2	100	4-7-7 (14)
				SS 3	100	4-3-5 (8)
665		Reddish Brown, Sandy Silt, ML, Moist, Medium Stiff **(RESIDUUM)**	10	SS 4	100	2-4-4 (8)
		Brown, SILTY SAND, SM, Moist, Loose **(RESIDUUM)**		SS 5	100	2-3-4 (7)
660			15	SS 6	100	4-4-6 (10)
		Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)**		SS 7	100	3-4-5 (9)
655			20	SS 8	100	2-4-5 (9)
650			25	SS 9	100	3-3-5 (8)
		Brown, Sandy Silt, ML, Wet, Medium Stiff **(RESIDUUM)**		SS 10	73	1-4-4 (8)
645			30			

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

(Continued Next Page)

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-7

CLIENT Transcontinental Gas Pipe Line Company **PROJECT NAME** Compressor Station 165

PROJECT NUMBER 341-132 **PROJECT LOCATION** Pittsylvania County, Virginia

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	30			
		Brown, Poorly-Graded Sand with Silt, SP-SM, Wet, Medium Dense **(RESIDUUM)**		SS 11	100	3-7-7 (14)
640		Brown, Silty Sand, SM, Wet to Moist, Medium Dense **(RESIDUUM)**		SS 12	100	1-3-11 (14)
			35			
		Brown, Completely To Highly Weathered, Sandstone, Very Soft to Soft **(WEATHERED BEDROCK)** **Sample classified as SILTY SAND, SM according to USCS**		SS 13	67	18-20-23 (43)
635						
			40	SS 14	100	11-18-24 (42)
				SS 15	100	50/0.4
		Brown, Completely To Highly Weathered, Sandstone, Very Soft to Soft **(BEDROCK)**				
630			45			
				SS 16	100	50/0.2
				SS 17	100	50/0.3
		Bottom of boring at 48.3 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

50/0.4
50/0.2
50/0.3

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-8

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 673 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
	0	Topsoil - 0.4 feet Brown, Sandy Lean Clay, CL, Moist, Very Stiff to Stiff **(RESIDUUM)**	SS 1	100	4-7-12 (19)
670					
		Bulk sample of auger cuttings obtained from 0 to 10 feet bgs. **Auger cuttings classified as SANDY LEAN CLAY, CL** **Maximum Dry Density = 120.5 pcf; Optimum Moisture Content = 11.7%** **Effective Cohesion = 72.0 psf; Angle of Friction = 31.3 degrees** **CBR = 3.4**	SS 2	100	5-5-8 (13)
	5	Brown And Gray, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**	SS 3	100	4-8-9 (17)
665					
		Greenish Gray, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**	SS 4	100	3-5-9 (14)
	10				
660		Orangish Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)**	SS 5	100	4-3-4 (7)
	15	*Trace carbonaceous material and fat clay nodules observed in SS-6.*	SS 6	100	2-2-4 (6)
		Bottom of boring at 16.5 feet.			

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487

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BORING NUMBER B-9

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 656 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
655		Topsoil - 0.4 feet Reddish Brown, Lean Clay, CL, Moist, Medium Stiff to Very Stiff **(RESIDUUM)**		SS 1	100	1-3-5 (8)
				SS 2	100	2-6-10 (16)
			5			
650		Dark Red, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)** *Trace fat clay nodules observed throughout sample.*		SS 3	100	3-4-4 (8)
		Dark Reddish Brown, Sandy Silt, ML, Moist, Soft **(RESIDUUM)**	10	SS 4	100	1-2-2 (4)
645		*Trace fat clay nodules observed in SS-5*		SS 5	100	1-1-3 (4)
			15			
640		Reddish Brown, Sandy Silt with Gravel, ML, Moist, Stiff **(RESIDUUM)**		SS 6	100	4-4-5 (9)
		Bottom of boring at 16.5 feet.				

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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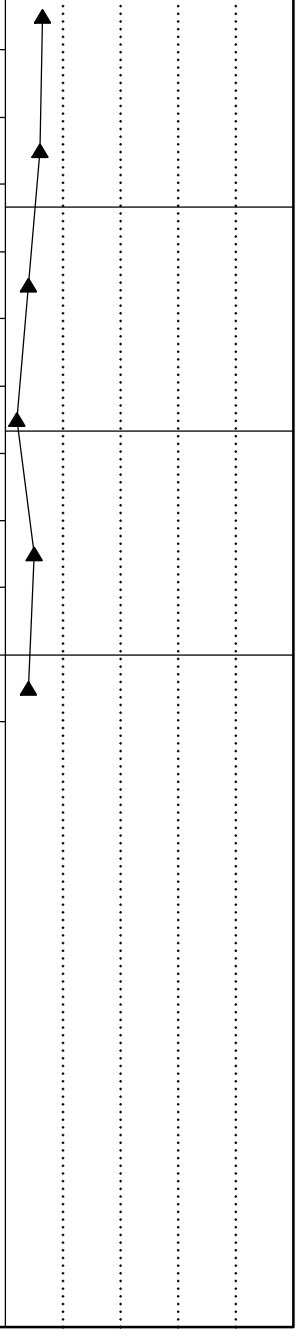
BORING NUMBER B-10

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 663 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487				
		Topsoil - 0.6 feet	0			
		Brown, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**		SS 1	100	2-7-6 (13)
660		Reddish Brown, Sandy Lean Clay with Gravel, CL, Moist, Stiff **(RESIDUUM)**		SS 2	100	2-5-7 (12)
			5			
		Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)**		SS 3	100	2-4-4 (8)
655		Brown, Sandy Silt, ML, Moist, Soft **(RESIDUUM)**	10	SS 4	100	2-2-2 (4)
		White, Silty Sand, SM, Moist, Loose **(RESIDUUM)**		SS 5	100	2-5-5 (10)
650			15			
		Brown, Silty Sand with Gravel, SM, Moist, Loose **(RESIDUUM)** *Trace elastic silt nodules observed throughout sample.*		SS 6	100	2-4-4 (8)
		Bottom of boring at 16.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80



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BORING NUMBER B-11

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 670 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 28.4 ft / Elev 641.6 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING 28.0 ft / Elev 642.0 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
670	0	Topsoil - 0.5 feet Reddish Brown, Sandy Lean Clay with Gravel, CL, Moist, Stiff **(RESIDUUM)**	SS 1	100	4-3-6 (9)
		Reddish Brown, Silty Sand, SM, Moist, Medium Dense to Loose **(RESIDUUM)**	SS 2	100	4-6-7 (13)
665	5		SS 3	100	4-4-4 (8)
660	10		SS 4	100	2-3-3 (6)
		Brown, Clayey Sand, SC, Moist, Loose **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*	SS 5	100	2-4-3 (7)
655	15	Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, Moist, Loose **(RESIDUUM)**	SS 6	100	3-4-5 (9)
		Brown, Well-Graded Sand with Silt, SW-SM, Moist, Loose **(RESIDUUM)**	SS 7	100	2-3-4 (7)
650	20		SS 8	100	3-4-3 (7)
645	25	Brown, Clayey Sand, SC, Moist, Loose **(RESIDUUM)** *Trace fat clay nodules observed throughout sample.*	SS 9	100	3-3-3 (6)
		Brown, Silty Sand, SM, Wet, Loose to Medium Dense **(RESIDUUM)**	SS 10	100	1-2-4 (6)
640	30				

GRAPHIC LOG

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

(Continued Next Page)

Civil & Environmental Consultants, Inc.
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BORING NUMBER B-11

CLIENT Transcontinental Gas Pipe Line Company **PROJECT NAME** Compressor Station 165

PROJECT NUMBER 341-132 **PROJECT LOCATION** Pittsylvania County, Virginia

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80
640		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	30				
		Brown, Silty Sand, SM, Wet, Loose to Medium Dense **(RESIDUUM)** *(continued)*		SS 11	100	6-9-10 (19)	
		Bottom of boring at 31.5 feet.					

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BORING NUMBER B-12

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 665 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA, SPT, and NQ-Core
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING 7.5 ft / Elev 657.5 ft
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
665	0	Brown, Sandy Lean Clay with Gravel, CL, Moist, Medium Stiff **(RESIDUUM)**	SS 1	93	2-2-5 (7)
660	5	Orangish Brown And Gray, SANDY LEAN CLAY, CL, Moist, Very Stiff to Stiff **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*	SS 2	80	4-7-9 (16)
			SS 3	100	3-6-7 (13)
655	10	Orangish Brown And Gray, Clayey Sand, SC, Moist to Wet, Loose to Very Loose **(RESIDUUM)** *Some fat clay nodules observed throughout stratum.*	SS 4	87	3-4-5 (9)
		Trace carbonaceous material observed in SS-5.	SS 5	53	1-1-2 (3)
650	15	Light Brown, Silty Sand, SM, Moist, Very Loose **(RESIDUUM)**	SS 6	80	2-2-1 (3)
645	20	Brown, Silty Sand with Gravel, SM, Moist, Loose **(RESIDUUM)**	SS 7	100	2-2-3 (5)
640	25	Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, Moist, Loose to Dense **(RESIDUUM)**	SS 8	93	3-4-5 (9)
			SS 9	93	5-6-9 (15)
635	30		SS 10	73	3-8-10 (18)

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

CEC CUSTOM LOG 341-132 LOGS.GPJ CEC.GDT 6/3/25

(Continued Next Page)

Civil & Environmental Consultants, Inc.
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BORING NUMBER B-12

CLIENT Transcontinental Gas Pipe Line Company **PROJECT NAME** Compressor Station 165

PROJECT NUMBER 341-132 **PROJECT LOCATION** Pittsylvania County, Virginia

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	SPT N VALUE / PL MC LL / FINES CONTENT (%)
635		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	30				▲ SPT N VALUE ▲ 20 40 60 80; PL MC LL 20 40 60 80; ☐ FINES CONTENT (%) ☐ 20 40 60 80
		Brown, Poorly-Graded Sand with Silt and Gravel, SP-SM, Moist, Loose to Dense **(RESIDUUM)** *(continued)*		SS 11	87	12-12-20 (32)	
		Light Brown, Highly Weathered, Sandstone, Soft **(WEATHERED BEDROCK)**		SS 12	100	50/0.1	50/0.1
630		Light Brown, Sandstone, Moderately Weathered, Moderately Broken, Medium Hard **Unconfined Compressive Strength = 5,625 psi**	35	NQ 1	100 (36)		
		Bottom of boring at 38.1 feet.					

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BORING NUMBER B-13

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 649 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 16.9 ft / Elev 632.1 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING 16.4 ft / Elev 632.6 ft

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
	Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
	Reddish Brown, SANDY FAT CLAY, CH, Moist, Stiff **(RESIDUUM)**		SS 1	100	2-6-7 (13)
645	Reddish Brown, Sandy Silt, ML, Moist, Stiff **(RESIDUUM)**	5	SS 2	100	4-4-5 (9)
	Reddish Brown To Brown, Silty Sand, SM, Moist, Loose to Very Loose **(RESIDUUM)**		SS 3	100	2-3-4 (7)
640	*Bulk sample of auger cuttings obtained from approximately 0 to 15 feet bgs.*	10	SS 4	87	2-2-2 (4)
	Brown, Silty Sand with Gravel, SM, Moist to Wet, Very Loose **(RESIDUUM)**		SS 5	87	1-2-2 (4)
635		15			
	Samples observed to transition from moist to wet at approximately 15 feet bgs.		SS 6	100	2-1-2 (3)
630			SS 7	100	2-1-1 (2)
	Bottom of boring at 19.5 feet.				

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

CEC CUSTOM LOG 341-132 LOGS.GPJ CEC.GDT 6/3/25

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Moon Township, PA 15108

BORING NUMBER B-14

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 638 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487					
		Topsoil - 0.3 feet	0				
		Brown, Sandy Lean Clay, CL, Dry, Medium Stiff **(RESIDUUM)**		SS 1	80	1-3-3 (6)	
635							
		Reddish Brown, SANDY LEAN CLAY, CL, Moist, Very Stiff to Stiff **(RESIDUUM)**		SS 2	100	4-7-9 (16)	
			5				
				SS 3	100	4-6-8 (14)	
630							
		Dark Red, Lean Clay, CL, Moist, Soft **(RESIDUUM)** *Trace fat clay nodules observed throughout sample.*	10	SS 4	100	2-2-2 (4)	1.5
		Brown, Lean Clay with Sand, CL, Moist to Wet, Very Soft **(RESIDUUM)** *Trace fat clay nodules observed throughout sample.*		SS 5	87	1-1-1 (2)	
625			15				
		Brown, Sandy Lean Clay, CL, Wet, Medium Stiff **(RESIDUUM)**		SS 6	100	3-3-4 (7)	
		Bottom of boring at 16.5 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-15

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 649 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Topsoil - 0.3 feet	0				
		Brown To Orangish Brown, Sandy Lean Clay, CL, Moist, Very Stiff to Stiff **(RESIDUUM)**		SS 1	100	5-8-8 (16)	2.5
645				SS 2	100	2-6-7 (13)	3.0
			5				
		Reddish Brown, Lean Clay with Sand, CL, Moist, Stiff to Medium Stiff **(RESIDUUM)**		SS 3	100	5-5-7 (12)	2.5
640				SS 4	100	3-5-4 (9)	2.5
			10				
		Bottom of boring at 10.0 feet.					

Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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Moon Township, PA 15108

BORING NUMBER B-16

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 658 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
		Topsoil - 0.2 feet				
		Orangish Brown, Sandy Lean Clay with Gravel, CL, Moist, Stiff **(RESIDUUM)**		SS 1	87	5-9-6 (15)
655						
		Reddish Brown, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 2	87	4-6-8 (14)
			5			
		Light Brown, Silty Sand, SM, Moist, Medium Dense to Loose **(RESIDUUM)**		SS 3	100	4-5-7 (12)
650						
			10	SS 4	100	3-3-4 (7)
645				SS 5	100	3-4-5 (9)
			15			
				SS 6	100	6-6-4 (10)
		Bottom of boring at 16.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-17

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 658 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
		Topsoil 0.3 feet Brown, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**		SS 1	100	2-5-6 (11)
655		Reddish Brown, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)** *Trace fat clay nodules observed throughout sample.*	5	SS 2	100	2-3-3 (6)
650		Brown, Sandy Silt with Gravel, ML, Moist, Medium Stiff **(RESIDUUM)**		SS 3	100	2-3-4 (7)
			10	SS 4	100	2-3-5 (8)
		Bottom of boring at 10.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-18

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 648 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Topsoil - 0.8 feet	0	SS 1	100	2-5-8 (13)	
645		Brown, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**					
		Orangish Brown And Gray, Lean Clay with Sand, CL, Moist, Stiff **(RESIDUUM)**	5	SS 2	100	2-5-6 (11)	3.5
640		Brown To Light Brown, Clayey Sand, SC, Moist to Wet, Loose to Very Loose **(RESIDUUM)**		SS 3	100	3-4-5 (9)	
		Trace fat clay nodules observed in SS-4.	10	SS 4	100	1-2-2 (4)	
		Bottom of boring at 10.5 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-19

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 652 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487				
		Topsoil - 0.4 feet	0			
650		Brown, CLAYEY SAND, SC, Moist, Medium Dense to Loose **(RESIDUUM)**		SS 1	100	7-6-8 (14)
		Bulk sample of auger cuttings from approximately 0 to 5 feet bgs.				
				SS 2	100	3-4-5 (9)
			5			
645		Orangish Brown, Clayey Sand with Gravel, SC, Moist, Medium Dense **(RESIDUUM)**		SS 3	100	5-10-8 (18)
		Light Orangish Brown, Clayey Sand, SC, Wet, Very Loose **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*	10	SS 4	100	2-1-1 (2)
640				SS 5	87	1-2-2 (4)
			15			
		Brown, Clayey Gravel with Sand, GC, Moist, Medium Dense **(RESIDUUM)**		SS 6	100	5-11-18 (29)
		Bottom of boring at 16.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER B-20

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 653 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
		Topsoil - 0.5 feet				
		Brown, Lean Clay with Sand, CL, Moist, Medium Stiff **(RESIDUUM)** *Trace carbonaceous material observed throughout sample.*		SS 1	80	3-3-5 (8)
650						
		Brown, CLAYEY SAND, SC, Moist, Medium Dense to Loose **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*		SS 2	100	4-7-8 (15)
			5			
				SS 3	100	3-3-4 (7)
645						
		Reddish Brown, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)**	10	SS 4	100	2-2-3 (5)
		Bottom of boring at 10.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER B-21

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 637 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
▽ **AT END OF SOIL SAMPLING** 14.5 ft / Elev 622.5 ft
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
	Topsoil 0.4 feet					
635	Brown, SANDY LEAN CLAY, CL, Moist, Medium Stiff to Stiff **(RESIDUUM)**		SS 1	87	1-3-3 (6)	
			SS 2	100	4-7-8 (15)	
		5				
630	Orangish Brown, Lean Clay with Sand, CL, Moist, Medium Stiff to Soft **(RESIDUUM)**		SS 3	100	2-3-3 (6)	2.0
		10	SS 4	53	1-1-1 (2)	
	Dark Red, Sandy Lean Clay, CL, Moist to Wet, Soft **(RESIDUUM)**					
625	*Samples observed to transition from moist to wet at approximately 12 feet bgs.*		SS 5	47	1-1-1 (2)	
	▽	15				
	Dark Reddish Brown, Clayey Sand, SC, Moist, Loose **(RESIDUUM)**		SS 6	100	1-2-3 (5)	
	Bottom of boring at 16.5 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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BORING NUMBER B-22

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/26/24 **COMPLETED** 6/26/24
GROUND ELEVATION 626 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation obtained from CEC survey.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
625		Topsoil - 0.4 feet Brown, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)**		SS 1	100	2-2-3 (5)	
		Reddish Brown, Lean Clay, CL, Moist, Very Stiff **(RESIDUUM)** *Trace fat clay nodules observed throughout sample.*		SS 2	100	4-6-13 (19)	
			5				
620		Reddish Brown, CLAYEY SAND, SC, Moist, Loose **(RESIDUUM)**		SS 3	100	3-4-5 (9)	
		Reddish Brown, Sandy Lean Clay, CL, Moist to Wet, Very Soft to Medium Stiff **(RESIDUUM)** *Trace fat clay nodules observed throughout stratum.*	10	SS 4	100	1-1-2 (3)	1.0
615		*Samples observed to transition from moist to wet at approximately 12 feet bgs.*		SS 5	73	1-1-1 (2)	0.5
			15				
610				SS 6	100	2-2-4 (6)	1.0
		Dark Reddish Brown, Clayey Sand, SC, Wet, Very Loose **(RESIDUUM)**		SS 7	100	1-2-2 (4)	
		Bottom of boring at 19.5 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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BORING NUMBER B-23

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 673 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation estimated from existing topography.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0			
		Topsoil - 0.8 feet		SS 1	100	2-6-5 (11)
670		Brown, Sandy Lean Clay, CL, Dry to Moist, Stiff **(RESIDUUM)**	5	SS 2	100	5-5-4 (9)
665			10	SS 3	100	3-4-4 (8)
660		Brown, Sandy Silt, ML, Moist, Medium Stiff **(RESIDUUM)**	15	SS 4	100	2-3-5 (8)
		Brown, Silty Sand, SM, Moist, Loose **(RESIDUUM)**				
		Bottom of boring at 16.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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BORING NUMBER B-24

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 6/25/24 **COMPLETED** 6/25/24
GROUND ELEVATION 674 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP QPB **CHECKED BY** HCB
AT END OF CORING --- Not Applicable
NOTES Elevation estimated from existing topography.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487				
		Topsoil 0.4 feet	0			
		Brown, Sandy Lean Clay, CL, Dry, Stiff **(RESIDUUM)**		SS 1	100	2-6-5 (11)
670			5			
		Reddish Brown, Sandy Silt, ML, Moist, Stiff to Very Stiff **(RESIDUUM)**		SS 2	100	4-4-5 (9)
665			10			
				SS 3	100	8-10-7 (17)
660			15			
				SS 4	100	4-6-6 (12)
		Bottom of boring at 16.5 feet.				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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Moon Township, PA 15108

BORING NUMBER B-101

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 674 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 16.9 ft / Elev 657.1 ft
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING 15.2 ft / Elev 658.8 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	0	Topsoil - 0.2 ft. Red, Sandy Lean Clay, CL, Moist, Medium Stiff to Very Stiff **(RESIDUUM)**	SS 1	100	5-4-3 (7)	
670	5		SS 2	100	4-6-9 (15)	3.0
		Red, Sandy Lean Clay with Gravel, CL, Moist, Stiff **(RESIDUUM)** *Trace quartzite fragments observed in SS-3.*	SS 3	100	5-4-6 (10)	2.0
665	10	Light Brown to Tan, Clayey Sand with Gravel, SC, Moist, Loose **(RESIDUUM)** *Black discolorations observed in SS-4.*	SS 4	100	3-3-4 (7)	
		Trace quartzite fragments observed in SS-5.	SS 5	87	1-2-3 (5)	
660	15	Brown, Elastic Silt with Sand, MH, Moist, Soft **(RESIDUUM)** *Trace roots and black discolorations observed in SS-6.*	SS 6	100	1-1-3 (4)	0.5
655	20	Tan, Clayey Sand with Gravel, SC, Wet, Loose **(RESIDUUM)** *Trace quartzite fragments observed in SS-7.*	SS 7	100	1-2-5 (7)	
		Brown and White, Completely Weathered Sandy Quartzite, Very Soft **(WEATHERED ROCK)**	SS 8	100	9-36-37 (73)	
		Bottom of boring at 22.5 feet.				

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

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Moon Township, PA 15108

BORING NUMBER B-102

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 677 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING 14.3 ft / Elev 662.7 ft
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING 18.9 ft / Elev 658.1 ft

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	0	Topsoil - 0.2 ft.				
675		Red, Lean Clay with Sand, CL, Moist, Stiff **(RESIDUUM)** *Trace roots and quartzite fragments observed in SS-1.*	SS 1	80	7-7-8 (15)	4.0
	5	Red, Clayey Sand with Gravel, SC, Moist, Dense to Medium Dense **(RESIDUUM)** *Trace quartzite fragments observed throughout stratum.* *Bulk sample obtained from auger cuttings from approximately 0 to 10 ft.*	SS 2	100	9-15-16 (31)	
670			SS 3	100	9-7-6 (13)	
	10		SS 4	100	7-7-9 (16)	
665		Brown, Silty Sand with Gravel, SM, Moist, Medium Dense **(RESIDUUM)** *Trace quartzite fragments observed in SS-5.*	SS 5	100	8-11-9 (20)	
	15	Dark Gray, Highly Weathered Granite, Soft **(WEATHERED ROCK)**	SS 6	100	50/0.1	
660		Dark Gray, Granite, Completely to Slightly Weathered, Very Broken to Slightly Broken, Very Soft to Medium Hard **(BEDROCK)** *Completely weathered, very broken, very soft from approximately 16.6 to 17.1 ft.*	NQ 1	70 (40)		
		Gray and White, Quartzite, Highly to Moderately Weathered, Very Broken, Soft **(BEDROCK)** *Iron staining observed throughout core run.* *Near vertical fracture from approximately 17.2 to 17.7 ft.*	NQ 2	100 (70)		
	20	Light Gray, Granite, Slightly Weathered, Broken to Slightly Broken, Medium Hard to Hard **(BEDROCK)** *Near vertical fracture from approximately 18.2 to 18.7 ft.* Bottom of boring at 20.1 feet.				

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
FINES CONTENT (%)
20 40 60 80
50/0.1

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BORING NUMBER B-103

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 668 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	0	Topsoil - 0.3 ft.				
		Red, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)** *Trace roots observed in SS-1.*	SS 1	100	4-4-4 (8)	2.0
665						
		Red and Tannish Brown, Clayey Sand, SC, Moist, Medium Dense to Loose **(RESIDUUM)**	SS 2	100	4-5-6 (11)	
	5					
		Trace quartzite fragments observed in SS-3.	SS 3	100	4-3-4 (7)	
660						
	10		SS 4	100	2-3-4 (7)	
		Reddish Brown and White, Clayey Sand with Gravel, SC, Moist, Loose **(RESIDUUM)** *Trace quartzite fragments observed throughout stratum.*	SS 5	100	3-3-4 (7)	
655	15		SS 6	100	3-3-5 (8)	
		Bottom of boring at 16.5 feet.				

SPT N VALUE
20 40 60 80
PL MC LL
20 40 60 80
FINES CONTENT (%)
20 40 60 80

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BORING NUMBER B-104

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 652 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 21.2 ft / Elev 630.8 ft
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING 16.9 ft / Elev 635.1 ft

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
650	Topsoil - 0.1 ft. Red, Sandy Lean Clay with Gravel, CL, Moist, Stiff **(RESIDUUM)** *Trace roots observed in SS-1.*		SS 1	80	5-6-8 (14)	4.0
	Brown, Sandy Silt, ML, Moist, Stiff **(RESIDUUM)**	5	SS 2	100	5-6-6 (12)	2.5
645	Brown, Clayey Sand, SC, Moist, Loose **(RESIDUUM)**		SS 3	100	5-4-6 (10)	
	Tannish Brown, Clayey Sand with Gravel, SC, Moist to Wet, Loose to Very Loose **(RESIDUUM)** *Trace quartzite fragments observed throughout stratum.*	10	SS 4	100	3-3-4 (7)	
640			SS 5	100	2-3-4 (7)	
		15	SS 6	67	2-2-2 (4)	
635	*Spoon was wet at approximately 18.0 ft.*		SS 7	0	1-1-3 (4)	
		20				
630	Brown, Clayey Sand, SC, Wet, Loose **(RESIDUUM)**		SS 8	100	1-2-3 (5)	
	Bottom of boring at 22.5 feet.					

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

Civil & Environmental Consultants, Inc.
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BORING NUMBER B-105

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/30/25 **COMPLETED** 4/30/25
GROUND ELEVATION 649 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
▽ **AT END OF SOIL SAMPLING** 19.2 ft / Elev 629.8 ft
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487					
	Topsoil - 0.4 ft.	0	SS 1	80	4-5-5 (10)	3.5
	Reddish Brown, Lean Clay with Sand, CL, Moist, Stiff **(RESIDUUM)** *Trace roots observed in SS-1.*					
645	Reddish Brown, Clayey Sand, SC, Moist, Loose **(RESIDUUM)**		SS 2	100	3-3-3 (6)	
	Bulk sample obtained from auger cuttings from approximately 0 to 10 ft.	5				
	Reddish Brown, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)** *Trace roots and organics observed in SS-2.*		SS 3	100	2-2-4 (6)	1.0
640	Reddish Brown, Lean Clay with Sand, CL, Moist, Medium Stiff **(RESIDUUM)**	10	SS 4	100	2-3-5 (8)	1.5
	Reddish Brown to Brown, Clayey Sand, SC, Moist, Loose to Medium Dense **(RESIDUUM)** *Trace carbonaceous shale and granite fragments observed throughout stratum.*		SS 5	67	2-2-3 (5)	
635		15	SS 6	100	2-4-4 (8)	
630 ▽			SS 7	100	1-4-4 (8)	
		20	SS 8	80	10-8-13 (21)	
625	Brown and White, Completely to Highly Weathered Clayey Granite, Very Soft to Soft **(WEATHERED ROCK)**	25	SS 9	100	42-50/0.4	
	SS-10 was wet.		SS 10	100	50/0.4	
	Bottom of boring at 27.4 feet.					

SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80

50/0.4
50/0.4

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Moon Township, PA 15108

BORING NUMBER B-106

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 638 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING 14.2 ft / Elev 623.8 ft
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING 9.0 ft / Elev 629.0 ft

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Topsoil - 0.4 ft.	0				
	Brown, Lean Clay with Sand, CL, Moist, Medium Stiff to Stiff **(RESIDUUM)**		SS 1	73	2-3-4 (7)	2.0
635	*Trace roots observed in SS-2.*		SS 2	60	4-4-5 (9)	2.5
	Bulk sample obtained from auger cuttings from approximately 0 to 10 ft.	5				
	Brown, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)**		SS 3	100	2-2-3 (5)	1.0
630						
	Brown, Clayey Sand, SC, Moist to Wet, Loose to Very Loose **(RESIDUUM)**	10	SS 4	100	2-2-3 (5)	
	Trace roots observed in SS-5. *SS-5 was wet.*		SS 5	13	1-1-2 (3)	
625		15				
	Brown, Silty Sand with Gravel, SM, Moist, Dense **(RESIDUUM)** *Trace quartzite fragments observed in SS-6.*		SS 6	100	11-16-18 (34)	
	Bottom of boring at 16.5 feet.					

SPT N VALUE 20 40 60 80
PL MC LL 20 40 60 80
FINES CONTENT (%) 20 40 60 80

Civil & Environmental Consultants, Inc.
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BORING NUMBER B-107

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/30/25 **COMPLETED** 4/30/25
GROUND ELEVATION 622 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
	Topsoil - 0.3 ft.					
620	Brown, Sandy Lean Clay, CL, Moist, Soft to Stiff **(RESIDUUM)** *Trace roots observed throughout stratum.*		SS 1	100	1-2-2 (4)	0.5
			SS 2	20	2-4-5 (9)	2.5
		5				
615	Tannish Light Brown, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 3	100	7-7-13 (20)	
	Tannish Brown, Completely to Highly Weathered Sandy Shaley Claystone, Very Soft to Soft **(WEATHERED ROCK)**	10	SS 4	100	50/0.4	
610	Bottom of boring at 12.2 feet.		SS 5	100	50/0.2	

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

50/0.4
50/0.2

Civil & Environmental Consultants, Inc.
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Moon Township, PA 15108

BORING NUMBER SP-1

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/30/25 **COMPLETED** 4/30/25
GROUND ELEVATION 647 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
		Topsoil - 0.2 ft.		SS 1	100	3-2-4 (6)	1.5
645		Tannish Brown, Sandy Lean Clay, CL, Moist, Medium Stiff to Very Stiff **(RESIDUUM)**		SS 2	100	5-6-7 (13)	2.5
		Some mottling observed throughout stratum.		SS 3	100	5-6-11 (17)	4.0
		Trace roots and organics observed in SS-1.	5	SS 4	100	11-15-11 (26)	4.0
640		Grayish Tan, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 5	100	5-6-6 (12)	
		Bottom of boring at 7.5 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER SP-2

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/30/25 **COMPLETED** 4/30/25
GROUND ELEVATION 648 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING --- Backfilled Immediately

ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
		Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487	0				
		Topsoil - 0.2 ft.		SS 1	100	4-4-6 (10)	4.0
		Tannish Brown, Lean Clay with Sand, CL, Moist, Stiff **(RESIDUUM)** *Trace roots and organics observed in SS-1.*		SS 2	100	5-6-6 (12)	3.5
645				SS 3	100	2-4-6 (10)	3.0
		Orangish Brown and Light Gray, Sandy Lean Clay, CL, Moist, Medium Stiff **(RESIDUUM)** *Trace mottling observed in SS-4.*	5	SS 4	100	3-3-4 (7)	1.5
				SS 5	100	2-2-4 (6)	1.0
640		Tannish Light Brown, Clayey Sand with Gravel, SC, Moist, Loose **(RESIDUUM)**		SS 6	100	2-3-4 (7)	
		Bottom of boring at 9.0 feet.					

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER SP-3

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 623 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING 9.4 ft / Elev 613.6 ft

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Topsoil - 0.2 ft.	0				
	Brown, Sandy Lean Clay, CL, Moist, Soft **(RESIDUUM)** *Trace roots observed in SS-1.*		SS 1	87	2-2-2 (4)	1.0
620			SS 2	100	3-3-5 (8)	2.5
	Reddish Brown, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 3	100	4-7-8 (15)	
	Reddish Brown, Sandy Lean Clay, CL, Moist, Very Stiff to Stiff **(RESIDUUM)**	5	SS 4	100	5-6-10 (16)	2.5
			SS 5	100	4-7-7 (14)	2.0
615	Brown, Clayey Sand, SC, Moist, Loose to Medium Dense **(RESIDUUM)**		SS 6	100	2-5-4 (9)	
		10	SS 7	100	1-4-8 (12)	
	Reddish Brown, Lean Clay, CL, Moist, Very Stiff **(RESIDUUM)**		SS 8	100	5-11-13 (24)	4.0
610	Brown, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 9	100	4-6-6 (12)	
	Bottom of boring at 13.5 feet.					

Soil classifications were derived using the general methodologies presented in ASTM D2488, except where capitalized USCS group names are indicated hereon, if any. Capitalized USCS group names denote the classifications were derived using the general methodologies presented in ASTM D2487

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

Civil & Environmental Consultants, Inc.
700 Cherrington Parkway
Moon Township, PA 15108

BORING NUMBER SP-4

CLIENT Transcontinental Gas Pipe Line Company
PROJECT NAME Compressor Station 165 - Supplimental Investigation
PROJECT NUMBER 341-132
PROJECT LOCATION Pittsylvania County, Virginia
DATE STARTED 4/29/25 **COMPLETED** 4/29/25
GROUND ELEVATION 624 ft **BACKFILL** Auger Cuttings
SOIL SAMPLING CONTRACTOR Test Boring Services, Inc.
WATER LEVELS:
SOIL SAMPLING METHOD HSA & SPT
AT END OF SOIL SAMPLING --- Dry
CEC REP AFP **CHECKED BY** QPB
AT END OF CORING --- Not Applicable
NOTES Surface elevation estimated from existing topography.
24hrs AFTER DRILLING --- Dry

ELEVATION (ft)	MATERIAL DESCRIPTION	DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)
	Topsoil - 0.5 ft.	0				
	Reddish Brown, Lean Clay with Sand, CL, Moist, Medium Stiff to Stiff **(RESIDUUM)** *Trace roots observed throughout stratum.*		SS 1	80	1-2-4 (6)	2.5
			SS 2	100	3-5-9 (14)	3.0
620	Reddish Brown, Sandy Lean Clay, CL, Moist, Very Stiff **(RESIDUUM)**		SS 3	100	6-8-8 (16)	
	Reddish Brown, Sandy Lean Clay with Gravel, CL, Moist, Very Stiff **(RESIDUUM)**	5	SS 4	100	8-8-13 (21)	4.0
	Reddish Brown, Sandy Lean Clay, CL, Moist, Stiff **(RESIDUUM)**		SS 5	100	6-7-5 (12)	
615	Brown, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 6	100	3-8-10 (18)	
	Brown, Clayey Sand with Gravel, SC, Moist, Medium Dense **(RESIDUUM)**	10	SS 7	100	6-7-8 (15)	
	Brown, Clayey Sand, SC, Moist, Medium Dense **(RESIDUUM)**		SS 8	100	4-6-8 (14)	
			SS 9	100	5-8-7 (15)	
610	Tannish Brown, Clayey Sand with Gravel, SC, Wet, Very Loose **(RESIDUUM)**		SS 10	100	2-2-2 (4)	
	Bottom of boring at 15.0 feet.	15				

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

APPENDIX L
INFILTRATION TESTING RESULTS

INFILTRATION TESTING DAILY FIELD REPORT

Project Name:	Compressor Station 165 - Supplemental Investigation	Job No:	341-132
Client:	Transcontinental Gas Pipe Line Company	Site Location:	Pittsylvania County, Virginia
Infiltration Test:	IT-1	Weather Conditions:	Partly Cloudy / Sunny
Latitude:	36°50'3.30"N	Temperature:	80 - 83 F
Longitude:	79°20'15.20"W	Date:	4/30/2025

Soil Depth (feet bgs)			Soil Description (Refer to Test Boring SP-1 log for more information)
0.0	to	0.2	Topsoil
0.2	to	6.0	Tannish Brown, Sandy Lean Clay, CL, Moist
6.0	to	7.5	Grayish Tan, Clayey Sand, SC, Moist

Test ID (Depth, ft bgs): IT-1 (3.5')

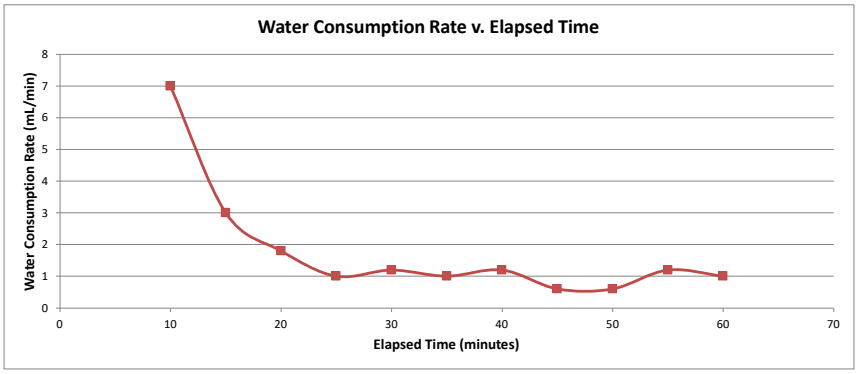
	in	cm
Depth of Borehole	42.0	106.7
Reservoir Height (ags)	37.0	94.0
Parameter 'D'	6.0	15.2
Water head	3.7	9.5
Radius of Borehole	2.0	5.1

Reading Number	Time Interval (min)	Elapsed Time (min)	Interval Water Consumption (mL)	Total Water Consumption (mL)	Water Consumption Rate (mL/min)	Steady Flow Rate* (mL/s)	Water Consumption Stable Rate Criteria (mL)
1	0	--	--	--	--	--	--
2	5	5	1780.0	1780.0	--	--	--
3	5	10	35.0	1815.0	7.0	--	--
4	5	15	15.0	1830.0	3.0	--	-4.0
5	5	20	9.0	1839.0	1.8	--	-1.2
6	5	25	5.0	1844.0	1.0	--	-0.8
7	5	30	6.0	1850.0	1.2	--	0.2
8	5	35	5.0	1855.0	1.0	--	-0.2
9	5	40	6.0	1861.0	1.2	--	0.2
10	5	45	3.0	1864.0	0.6	--	-0.6
11	5	50	3.0	1867.0	0.6	0.016	0.0
12	5	55	6.0	1873.0	1.2		0.6
13	5	60	5.0	1878.0	1.0		-0.2

Assume Condition I to calculate K_{sat}: when L/h is greater than 3

….where L is the vertical distance between constant water head and water table/impervious layer

K_{sat}**	2.15E-05	cm/s
	8.40E-06	in/s
	0.03	**in/hr**



Assumed Safety Factor= 3

Design Infiltration Rate (in/hr)* =** **0.01**

Legend

* The Steady Flow Rate is a stabilized water consumption rate.

**The staurated hydarulic conductivity value (K_{sat}) is determined using Equation 1 in Soil Moisture Corp. April 2012 2840 Operating Instructions for Aardvark Permeameter

***The design infiltration rate is the infiltration rate for the test location reduced by the assumed factor of safety.

Completed By:
X
Austin Perry, E.I.T.
Project Consultant

Reviewed By:
x
Nicholas A. Zyroll
Project Manager

INFILTRATION TESTING DAILY FIELD REPORT

Project Name:	Compressor Station 165 - Supplemental Investigation	Job No:	341-132
Client:	Transcontinental Gas Pipe Line Company	Site Location:	Pittsylvania County, Virginia
Infiltration Test:	IT-2	Weather Conditions:	Partly Cloudy / Sunny
Latitude:	36°50'4.11"N	Temperature:	80 - 83 F
Longitude:	79°20'14.68"W	Date:	4/30/2025

Soil Depth (feet bgs)			Soil Description (Refer to Test Boring SP-2 log for more information)
0.0	to	0.2	Topsoil
0.2	to	4.5	Tannish Brown, Lean Clay with Sand, CL, Moist
4.5	to	7.5	Orangish Brown and Light Gray, Lean Clay, CL, Moist. Redoximorphic Features (Mottling) Observed within Horizon
7.5	to	9.0	Tannish Brown, Clayey Sand with Gravel, SC, Moist

Test ID (Depth, ft bgs): **IT-2 (2.5')**

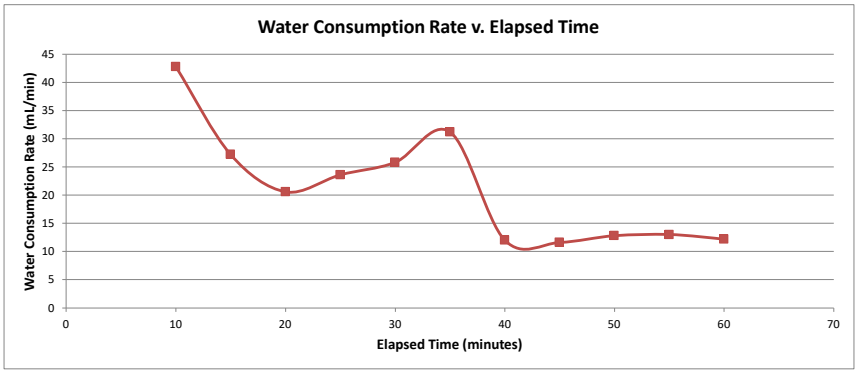
	in	cm
Depth of Borehole	30.0	76.2
Reservoir Height (ags)	37.0	94.0
Parameter 'D'	5.0	12.6
Water head	3.7	9.4
Radius of Borehole	2.0	5.1

Reading Number	Time Interval (min)	Elapsed Time (min)	Interval Water Consumption (mL)	Total Water Consumption (mL)	Water Consumption Rate (mL/min)	Steady Flow Rate* (mL/s)	Water Consumption Stable Rate Criteria (mL)
1	0	--	--	--	--	--	--
2	5	5	1942.0	1942.0	--	--	--
3	5	10	214.0	2156.0	42.8	--	--
4	5	15	136.0	2292.0	27.2	--	-15.6
5	5	20	103.0	2395.0	20.6	--	-6.6
6	5	25	118.0	2513.0	23.6	--	3.0
7	5	30	129.0	2642.0	25.8	--	2.2
8	5	35	156.0	2798.0	31.2	--	5.4
9	5	40	60.0	2858.0	12.0	--	-19.2
10	5	45	58.0	2916.0	11.6	--	-0.4
11	5	50	64.0	2980.0	12.8	**0.211**	1.2
12	5	55	65.0	3045.0	13.0		0.2
13	5	60	61.0	3106.0	12.2		-0.8

Assume Condition I to calculate K_{sat}: when L/h is greater than 3

….where L is the vertical distance between constant water head and water table/impervious layer

K_{sat}**	2.96E-04	cm/s
	1.15E-04	in/s
	0.42	**in/hr**



Assumed Safety Factor= 3

Design Infiltration Rate (in/hr)* =** **0.14**

Legend

* The Steady Flow Rate is a stabilized water consumption rate.

**The staurated hydarulic conductivity value (K_{sat}) is determined using Equation 1 in Soil Moisture Corp. April 2012 2840 Operating Instructions for Aardvark Permeameter

***The design infiltration rate is the infiltration rate for the test location reduced by the assumed factor of safety.

Completed By:
X
Austin Perry, E.I.T.
Project Consultant

Reviewed By:
X
Nicholas A. Zyroll
Project Manager

INFILTRATION TESTING DAILY FIELD REPORT

Project Name:	Compressor Station 165 - Supplemental Investigation	Job No:	341-132
Client:	Transcontinental Gas Pipe Line Company	Site Location:	Pittsylvania County, Virginia
Infiltration Test:	IT-3	Weather Conditions:	Sunny
Latitude:	36°50'9.94"N	Temperature:	79 - 80 F
Longitude:	79°20'8.18"W	Date:	4/29/2025

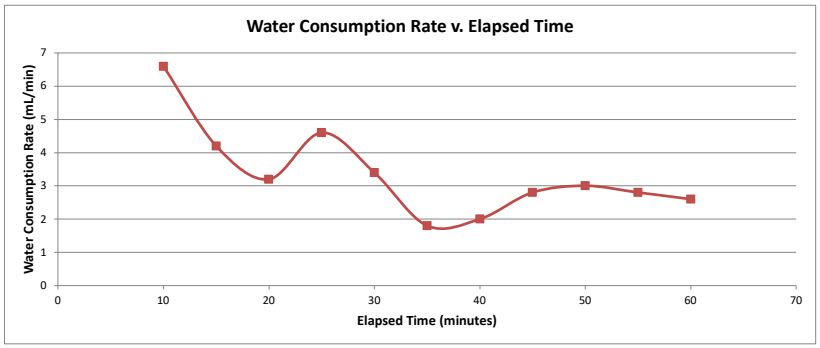
Soil Depth (feet bgs)			Soil Description (Refer to Test Boring SP-3 log for more information)
0.0	to	0.2	Topsoil
0.2	to	3.5	Brown, Sandy Lean Clay, CL, Moist
3.5	to	5.0	Reddish Brown, Clayey Sand, SC, Moist
5.0	to	7.5	Reddish Brown, Sandy Lean Clay, CL, Moist

Test ID (Depth, ft bgs): **IT-3 (5.0')**

	in	cm
Depth of Borehole	60.0	152.4
Reservoir Height (ags)	38.0	96.5
Parameter 'D'	7.6	19.2
Water head	3.8	9.7
Radius of Borehole	2.0	5.1

Reading Number	Time Interval (min)	Elapsed Time (min)	Interval Water Consumption (mL)	Total Water Consumption (mL)	Water Consumption Rate (mL/min)	Steady Flow Rate* (mL/s)	Water Consumption Stable Rate Criteria (mL)
1	0	--	--	--	--	--	--
2	5	5	1259.0	1259.0	--	--	--
3	5	10	33.0	1292.0	6.6	--	--
4	5	15	21.0	1313.0	4.2	--	-2.4
5	5	20	16.0	1329.0	3.2	--	-1.0
6	5	25	23.0	1352.0	4.6	--	1.4
7	5	30	17.0	1369.0	3.4	--	-1.2
8	5	35	9.0	1378.0	1.8	--	-1.6
9	5	40	10.0	1388.0	2.0	--	0.2
10	5	45	14.0	1402.0	2.8	--	0.8
11	5	50	15.0	1417.0	3.0	**0.047**	0.2
12	5	55	14.0	1431.0	2.8		-0.2
13	5	60	13.0	1444.0	2.6		-0.2

Assume Condition I to calculate K_{sat}: when L/h is greater than 3	K_{sat}**	6.33E-05	cm/s
….where L is the vertical distance between constant water head and water table/impervious layer		2.47E-05	in/s
		0.09	**in/hr**



Assumed Safety Factor= 3

Design Infiltration Rate (in/hr)* =** **0.03**

Legend
* The Steady Flow Rate is a stabilized water consumption rate.
**The staurated hydarulic conductivity value (K_{sat}) is determined using Equation 1 in Soil Moisture Corp. April 2012 2840 Operating Instructions for Aardvark Permeameter
***The design infiltration rate is the infiltration rate for the test location reduced by the assumed factor of safety.

Completed By:
X
Austin Perry, E.I.T.
Project Consultant

Reviewed By:
X
Nicholas A. Zyroll
Project Manager

INFILTRATION TESTING DAILY FIELD REPORT

Project Name:	Compressor Station 165 - Supplemental Investigation	Job No:	341-132
Client:	Transcontinental Gas Pipe Line Company	Site Location:	Pittsylvania County, Virginia
Infiltration Test:	IT-4	Weather Conditions:	Sunny
Latitude:	36°50'10.16"N	Temperature:	80 - 81 F
Longitude:	79°20'9.00"W	Date:	4/29/2025

Soil Depth (feet bgs)			Soil Description (Refer to Test Boring SP-4 log for more information)
0.0	to	0.5	Topsoil
0.5	to	3.0	Reddish Brown, Lean Clay with Sand, CL, Moist
3.0	to	4.5	Reddish Brown, Sandy Lean Clay, CL, Moist
4.5	to	6.0	Reddish Brown, Sandy Lean Clay with Gravel, CL, Moist
6.0	to	7.5	Reddish Brown, Sandy Lean Clay, CL, Moist
7.5	to	9.0	Brown, Clayey Sand, SC, Moist

Test ID (Depth, ft bgs): **IT-4 (6.4')**

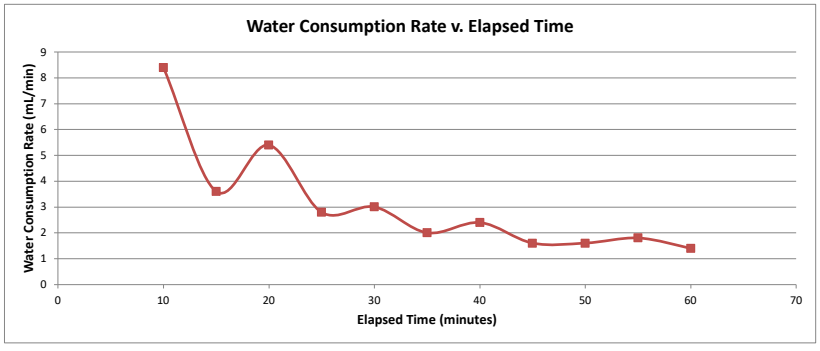
	in	cm
Depth of Borehole	77.0	195.6
Reservoir Height (ags)	37.0	94.0
Parameter 'D'	8.9	22.6
Water head	3.9	9.8
Radius of Borehole	2.0	5.1

Reading Number	Time Interval (min)	Elapsed Time (min)	Interval Water Consumption (mL)	Total Water Consumption (mL)	Water Consumption Rate (mL/min)	Steady Flow Rate* (mL/s)	Water Consumption Stable Rate Criteria (mL)
1	0	--	--	--	--	--	--
2	5	5	1985.0	1985.0	--	--	--
3	5	10	42.0	2027.0	8.4	--	--
4	5	15	18.0	2045.0	3.6	--	-4.8
5	5	20	27.0	2072.0	5.4	--	1.8
6	5	25	14.0	2086.0	2.8	--	-2.6
7	5	30	15.0	2101.0	3.0	--	0.2
8	5	35	10.0	2111.0	2.0	--	-1.0
9	5	40	12.0	2123.0	2.4	--	0.4
10	5	45	8.0	2131.0	1.6	--	-0.8
11	5	50	8.0	2139.0	1.6	**0.027**	0.0
12	5	55	9.0	2148.0	1.8		0.2
13	5	60	7.0	2155.0	1.4		-0.4

Assume Condition I to calculate K_{sat}: when L/h is greater than 3

….where L is the vertical distance between constant water head and water table/impervious layer

K_{sat}**	3.55E-05	cm/s
	1.39E-05	in/s
	0.05	**in/hr**



Assumed Safety Factor= 3

Design Infiltration Rate (in/hr)* =** **0.02**

Legend

* The Steady Flow Rate is a stabilized water consumption rate.

**The staurated hydarulic conductivity value (K_{sat}) is determined using Equation 1 in Soil Moisture Corp. April 2012 2840 Operating Instructions for Aardvark Permeameter

***The design infiltration rate is the infiltration rate for the test location reduced by the assumed factor of safety.

Completed By:

X

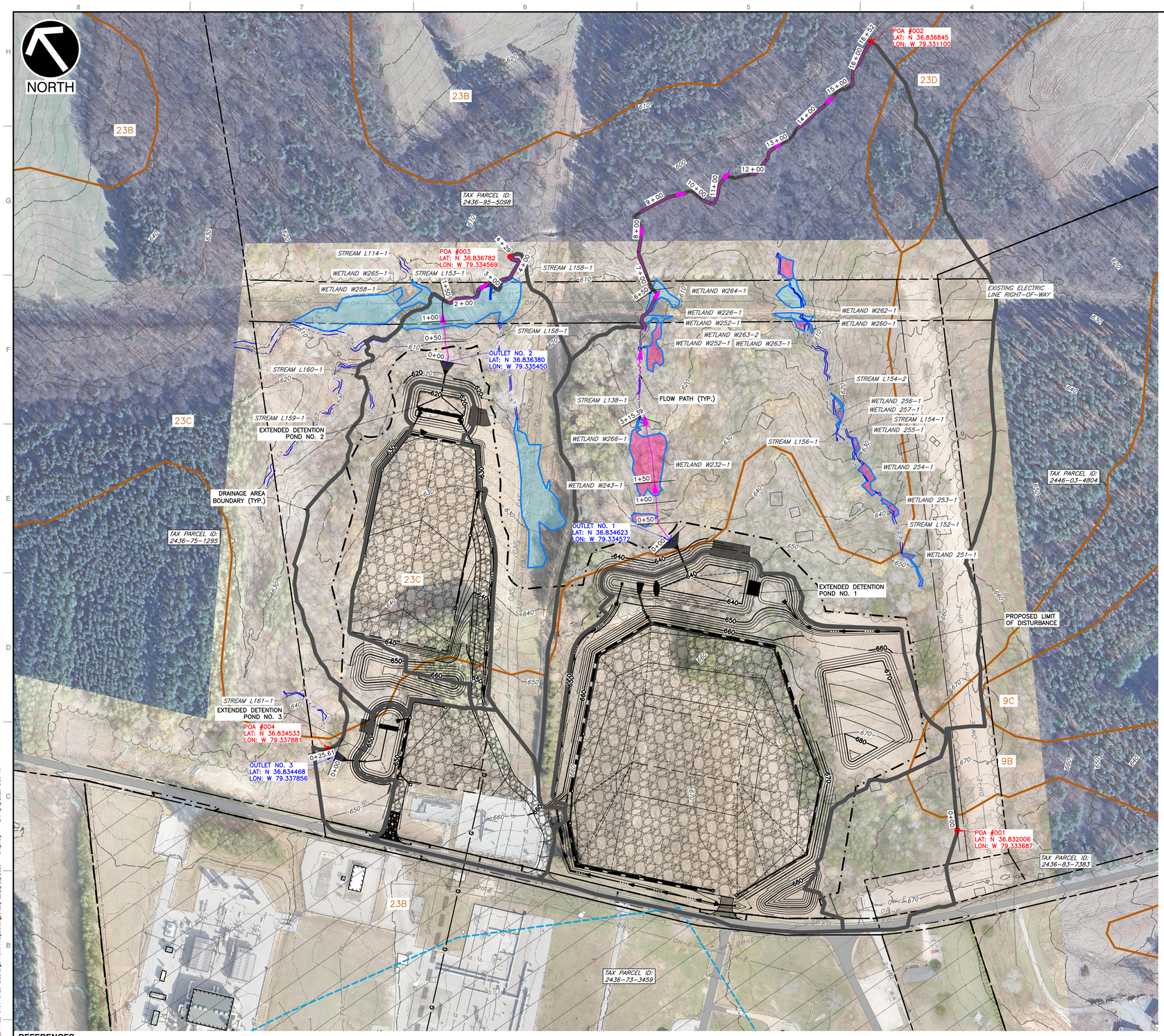
Austin Perry, E.I.T.
Project Consultant

Reviewed By:

X

Nicholas A. Zyroll
Project Manager

APPENDIX M
DISCHARGE ANALYSIS



REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN–D_1413_06–1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

LEGEND

- EXISTING INDEX CONTOUR
- EXISTING INTERMEDIATE CONTOUR
- EXISTING SUBJECT PROPERTY LINE
- EXISTING PROPERTY LINE
- EXISTING TRANSCO ROAD RIGHT–OF–WAY
- EXISTING RIGHT–OF–WAY
- EXISTING FENCE LINE
- EXISTING EDGE OF PAVEMENT
- EXISTING PAVEMENT LIMITS
- EXISTING EDGE OF GRAVEL
- EXISTING GRAVEL LIMITS
- EXISTING GUIDE RAIL
- EXISTING BUILDING
- EXISTING STRUCTURE
- EXISTING STORM PIPE
- EXISTING WATER LINE
- EXISTING GAS LINE
- EXISTING GAS LINE (BY OTHERS)
- EXISTING OVERHEAD WIRE
- EXISTING UTILITY POLE
- EXISTING FIBER OPTIC LINE
- EXISTING UNDERGROUND ELECTRIC LINE
- EXISTING FENCE
- EXISTING TREE LINE
- EXISTING RIPRAP
- EXISTING HUC12 BOUNDARY
- EXISTING STREAM (BY OTHERS)
- EXISTING PEM WETLAND (BY OTHERS)
- EXISTING PFO WETLAND (BY OTHERS)
- EXISTING POW WETLAND (BY OTHERS)
- EXISTING PSS WETLAND (BY OTHERS)
- PROPOSED LIMIT OF DISTURBANCE
- SOIL BOUNDARY
- 23B SOIL ID
- PROPOSED INDEX CONTOUR
- PROPOSED INTERMEDIATE CONTOUR
- PROPOSED EDGE OF GRAVEL PAD
- PROPOSED FLAT PAD LIMITS
- PROPOSED BERM
- PROPOSED EDGE OF UNPAVED DIRT ROAD
- PROPOSED EDGE OF UNPAVED GRAVEL ROAD
- PROPOSED EDGE OF PAVED ROAD
- PROPOSED CHANNEL
- PROPOSED STORM PIPE
- PROPOSED RIPRAP APRON
- DRAINAGE AREA BOUNDARY
- POINT OF ANALYSIS
- FLOW PATH

SCALE IN FEET
0 120 240

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com
Civil & Environmental Consultants, Inc.

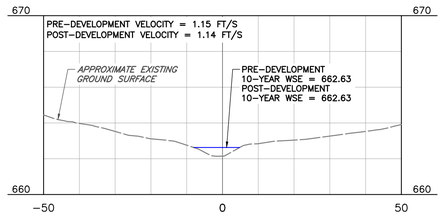
TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

DISCHARGE POINT ANALYSIS

DATE:	MAY 2025
DWG SCALE:	1"=120'
PROJECT NO:	341-132
DRAWN BY:	JMP
CHECKED BY:	MEA
APPROVED BY:	LCW

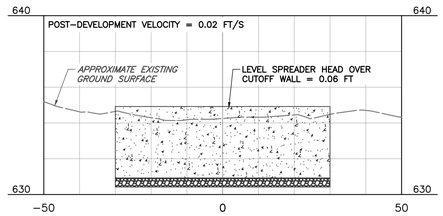
DRAWING NO.: C420
SHEET 32 OF 61

P:\340-005\341-132\-CAD\Dwg\C101\341132-C101-C420-Discharge Point Analysis.dwg(C420) LS:5/28/2025 - kheaver - LP: 6/3/2025 8:39 AM



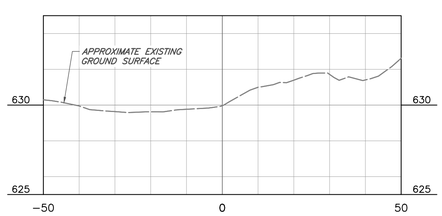
POA 001
STA 0+00

NOTE: THERE IS NO INCREASE IN NORMAL DEPTH BETWEEN THE PRE-DEVELOPMENT AND POST-DEVELOPMENT CONDITIONS. VELOCITY IS REDUCED FROM PRE TO POST DEVELOPMENT.

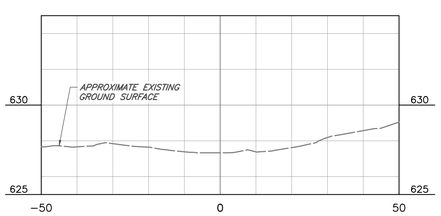


POA 002
STA 0+00

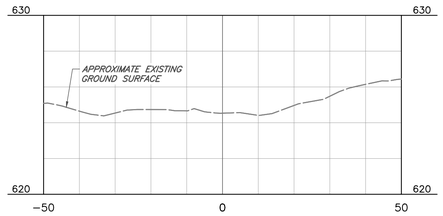
NOTE: LEVEL SPREADER HEAD OVER CUTOFF WALL IS LESS THAN 0.1 FT AS REQUIRED BY THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK. VELOCITY OVER CUTOFF WALL IS MINIMAL AND WILL BE PROTECTED DOWN SLOPE WITH NORTH AMERICAN GREEN SC250.



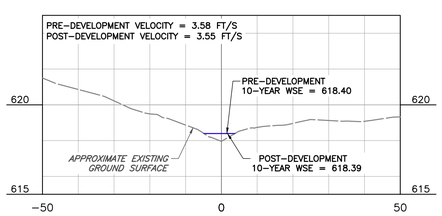
POA 002
STA 0+50



POA 002
STA 1+00

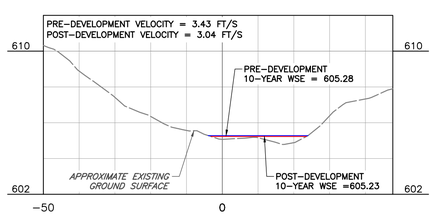


POA 002
STA 1+50



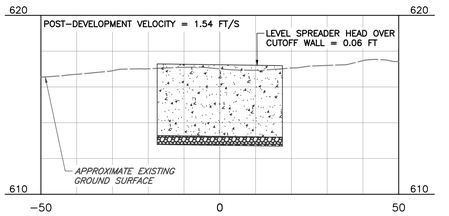
POA 002
STA 3+15.39 (L138-1 HEADWATER)

NOTE: NORMAL DEPTH AND VELOCITY ARE REDUCED FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS. NORMAL DEPTH IS CONTAINED WITHIN EXISTING CHANNEL.



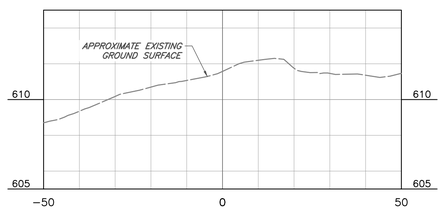
POA 002
STA 6+50 (L134-1 HEADWATER)

NOTE: NORMAL DEPTH AND VELOCITY ARE REDUCED FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS.

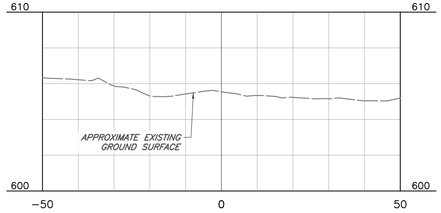


POA 003
STA 0+00

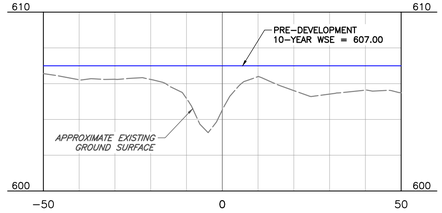
NOTE: LEVEL SPREADER HEAD OVER CUTOFF WALL IS LESS THAN 0.1 FT AS REQUIRED BY THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK., VELOCITY OVER CUTOFF WALL IS MINIMAL AND WILL BE PROTECTED WITH THE AMERICAN GREEN SC250.



POA 003
STA 0+50

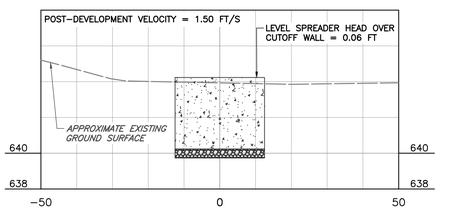


POA 003
STA 1+00



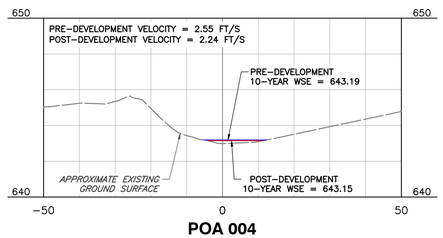
POA 003
STA 1+50

NOTE: EXISTING CHANNEL FLOW EXCEEDS BANK FULL ELEVATION.



POA 004
STA 0+00

NOTE: LEVEL SPREADER HEAD OVER CUTOFF WALL IS LESS THAN 0.1 FT AS REQUIRED BY THE VIRGINIA STORMWATER MANAGEMENT HANDBOOK., VELOCITY OVER CUTOFF WALL IS MINIMAL AND WILL BE PROTECTED WITH THE AMERICAN GREEN SC250.



POA 004
STA 0+25.61

NOTE: NORMAL DEPTH AND VELOCITY ARE REDUCED FROM PRE-DEVELOPMENT TO POST-DEVELOPMENT CONDITIONS.

LEGEND

- APPROXIMATE EXISTING GROUND SURFACE
- PRE-DEVELOPMENT 10-YEAR WATER SURFACE ELEVATION (WSE)
- POST-DEVELOPMENT 10-YEAR WATER SURFACE ELEVATION (WSE)
- PROPOSED LEVEL SPREADER

REFERENCES

1. EXISTING CONTOURS ARE A COMBINATION OF TOPOGRAPHY DERIVED FROM UNMANNED AERIAL LIDAR DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. (CEC) IN JUNE AND DECEMBER 2024 WITH SUPPLEMENTED CONTOURS DERIVED FROM FROM VIRGINIA GIS CLEARINGHOUSE REST SERVICES – VIRGINIA GEOGRAPHIC INFORMATION NETWORK (VGIN), DATED 2018.
2. AERIAL IMAGERY IS A COMBINATION OF IMAGERY DERIVED FROM UNMANNED AERIAL PHOTOGRAMMETRIC DATA AND SUPPLEMENTAL FIELD SURVEY DATA COLLECTED BY CEC ON DECEMBER 4, 2024 AND PHOTOGRAPHY FROM GOOGLE EARTH ACCESSED THROUGH PLEX EARTH, DATE OF PHOTOGRAPHY APRIL 2021.
3. EXISTING INFORMATION WITHIN THE PROJECT AREA IS A COMBINATION OF INFORMATION PROVIDED BY TRANSCO IN MARCH, APRIL, OCTOBER AND NOVEMBER 2024 AND TRADITIONAL SURVEY PERFORMED BY CEC IN JUNE AND DECEMBER 2024.
4. AQUATIC RESOURCES ARE BASED ON STREAM AND WETLAND DELINEATIONS COMPLETED BY WETLAND STUDIES AND SOLUTIONS, INC. (WSSI), DATA WHICH WAS PROVIDED BY WSSI ON MARCH 10, 2025.
5. EXISTING PROPERTY LINES ARE A COMBINATION OF INFORMATION DERIVED FROM ALTA SURVEY FILE TITLED "MAIN-D_1413_06-1413_70_ALTA_EMAILED041024.DWG" PROVIDED BY TRANSCO ON APRIL 11, 2024 AND INFORMATION DERIVED FROM FILE TITLED "EDEN_CY_PROPERTIES_20250219.DWG" PROVIDED BY TRANSCO ON FEBRUARY 19, 2024.
6. EXISTING PARCEL LINES DERIVED FROM PUBLICLY AVAILABLE PITTSYLVANIA COUNTY OPEN DATA, ACCESSED APRIL 2024.

SCALE IN FEET (HORIZONTAL)
0 20 40

SCALE IN FEET (VERTICAL)
0 4 8

COMMONWEALTH OF VIRGINIA
MICHAEL EDWARD ARCHER
Lic. No. 043994
PROFESSIONAL ENGINEER
6-2-2025

REVISION RECORD

NO	DATE	DESCRIPTION

700 Cherrington Parkway
Moon Township, PA 15108
Ph: 412.429.2324 · 800.365.2324
www.cecinc.com

Civil & Environmental Consultants, Inc.

TRANSCONTINENTAL GAS PIPE LINE, LLC
COMPRESSOR STATION 165
PITTSLYVANIA COUNTY, VIRGINIA

DISCHARGE POINT
ANALYSIS CROSS SECTIONS

DATE:	MAY 2025
DRAWN BY:	JMP
CHECKED BY:	MEA
DWG SCALE:	AS SHOWN
PROJECT NO:	341-132
APPROVED BY:	LCW

DRAWING NO.: C421

SHEET 33 OF 61

341-132 Station 165

Prepared By:	BJH	5/28/2025
Checked By:	LCW	5/29/2025

POA 001 - 0+00					
Pre-Development			Post Development		
Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)	Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)
4.41	1.15	662.63	4.34	1.14	662.63

POA 002 - 0+00 (Pond No. 1 Level Spreader)		
Post Development		
Flow (cfs)	Velocity (ft/s)	Head Over Cutoff Wall (ft)
5.95	0.02	0.06

POA 002 - 3+15 (Stream L138-1 Headwater)					
Pre-Development			Post Development		
Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)	Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)
6.49	3.58	618.4	6.22	3.55	618.39

POA 002 - 6+50 (Stream L134-1 Headwater)					
Pre-Development			Post Development		
Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)	Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)
21.09	3.43	605.28	14.99	3.04	605.23

POA 003 - 0+00 (Pond No. 2 Level Spreader)		
Post Development		
Flow (cfs)	Velocity (ft/s)	Head Over Cutoff Wall (ft)
2.78	1.54	0.06

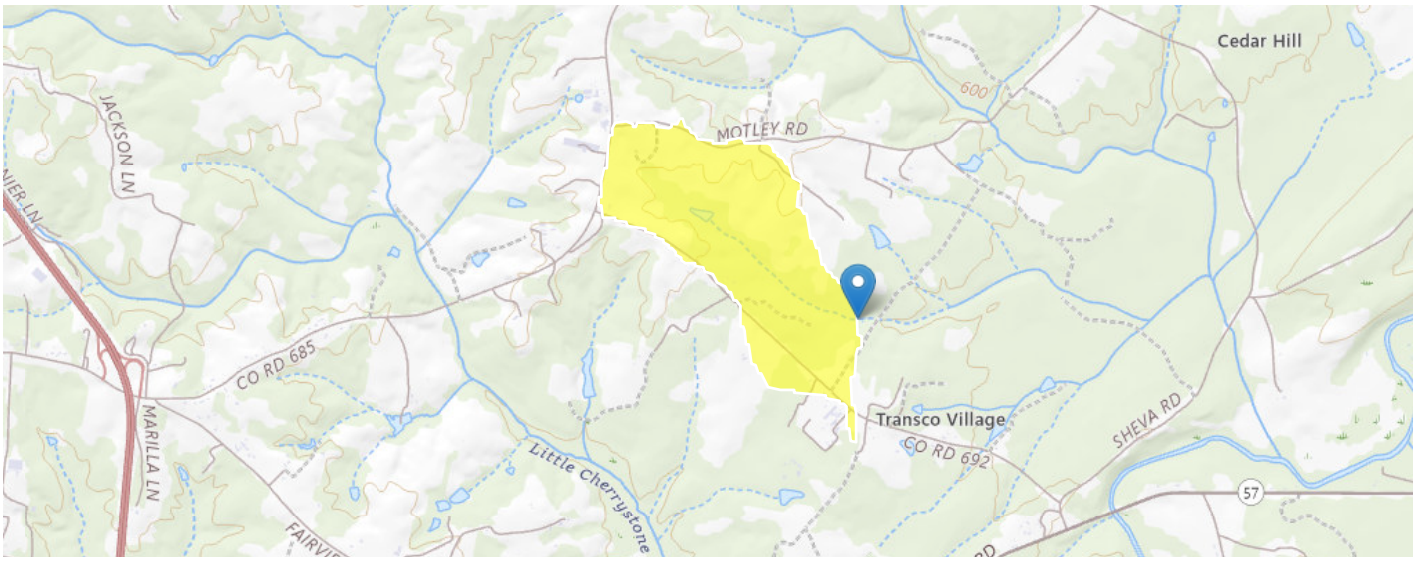
POA 003 - 1+50 (Stream L153)		
Pre-Development		
Flow (cfs)	10-Year WSE	Velocity (ft/s)
342	607	7.17

POA 004 - 0+00 (Pond No. 3 Level Spreader)		
Post Development		
Flow (cfs)	Velocity (ft/s)	Head Over Cutoff Wall (ft)
3.02	1.5	0.06

POA 004 - 0+26 (POA)					
Pre-Development			Post Development		
Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)	Flow (cfs)	Velocity (ft/s)	10-Year WSE (ft)
5.51	2.57	643.19	3.31	2.19	643.15

StreamStats Report POA 003 - STA 1+50

Region ID: VA
Workspace ID: VA20250528013409623000
Clicked Point (Latitude, Longitude): 36.83673, -79.33526
Time: 2025-05-27 21:34:34 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.45	square miles

Peak-Flow Statistics

Peak-Flow Statistics Parameters [76.0 Percent (0.34 square miles) Piedmont nonMesozoic 2011 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.45	square miles	0.06	7866

Peak-Flow Statistics Parameters [24.0 Percent (0.107 square miles) Piedmont Mesozoic 2011 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.45	square miles	0.06	7866

Peak-Flow Statistics Flow Report [76.0 Percent (0.34 square miles) Piedmont nonMesozoic 2011 5144]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	98	ft^3/s	43
42.9-percent AEP flood	122	ft^3/s	42
20-percent AEP flood	223	ft^3/s	32
10-percent AEP flood	342	ft^3/s	31
4-percent AEP flood	547	ft^3/s	32

Statistic	Value	Unit	ASEp
2-percent AEP flood	740	ft^3/s	34
1-percent AEP flood	971	ft^3/s	36
0.5-percent AEP flood	1250	ft^3/s	38

Peak-Flow Statistics Flow Report [24.0 Percent (0.107 square miles) Piedmont Mesozoic 2011 5144]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	56.4	ft^3/s	41
42.9-percent AEP flood	70	ft^3/s	42
20-percent AEP flood	154	ft^3/s	42
10-percent AEP flood	275	ft^3/s	41
4-percent AEP flood	525	ft^3/s	40
2-percent AEP flood	799	ft^3/s	39
1-percent AEP flood	1200	ft^3/s	37
0.5-percent AEP flood	1660	ft^3/s	36

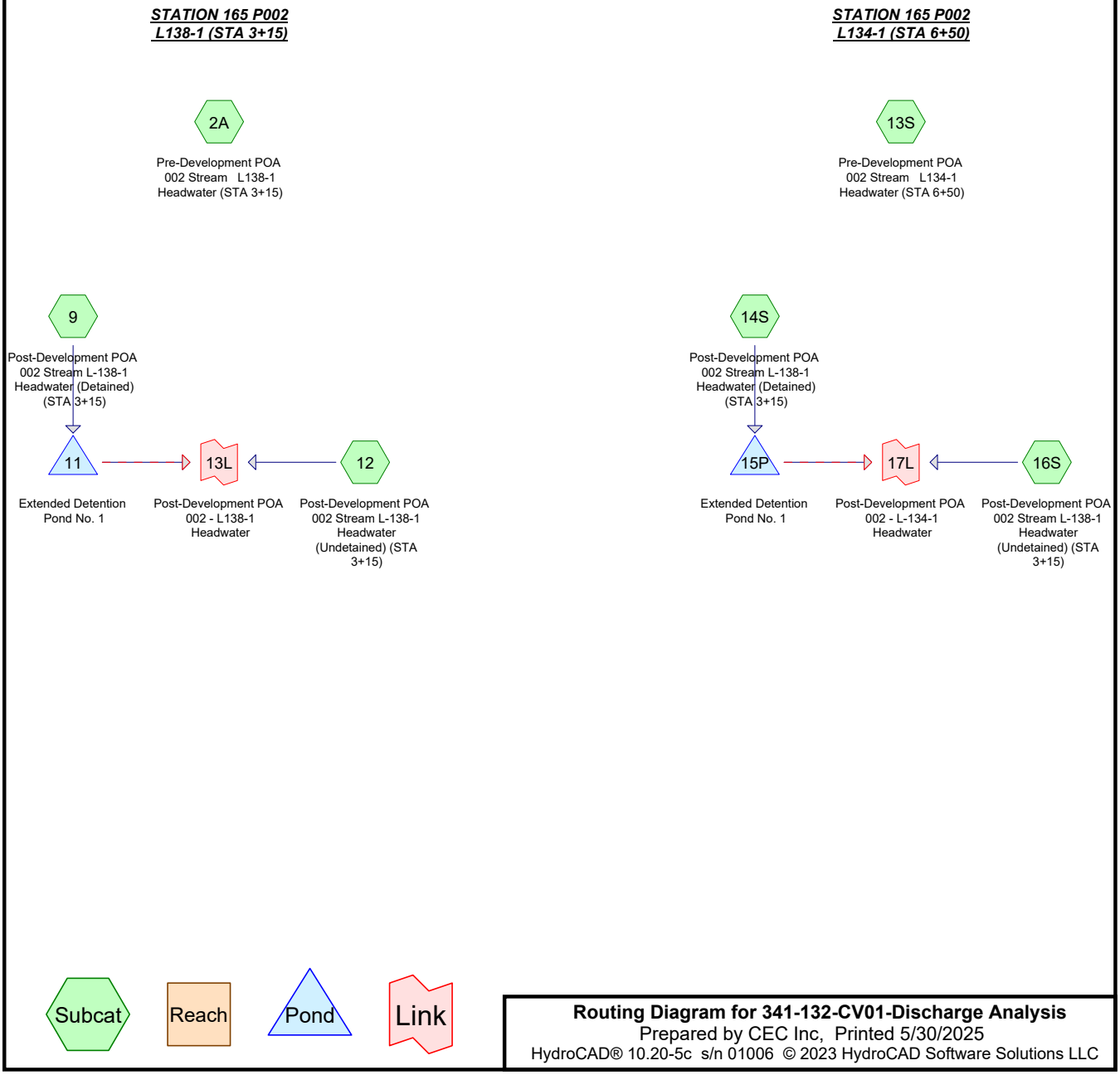
Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
50-percent AEP flood	88	ft^3/s
42.9-percent AEP flood	110	ft^3/s
20-percent AEP flood	206	ft^3/s
10-percent AEP flood	326	ft^3/s
4-percent AEP flood	542	ft^3/s
2-percent AEP flood	754	ft^3/s
1-percent AEP flood	1030	ft^3/s
0.5-percent AEP flood	1350	ft^3/s

Peak-Flow Statistics Citations

Austin, S.H., Krstolic, J.L., and Wiegand, Ute,2011, Peak-flow characteristics of Virginia streams: U.S. Geological Survey Scientific Investigations Report 2011–5144, 106 p. + 3 tables and 2 appendixes on CD. (http://pubs.usgs.gov/sir/2011/5144/)

Application Version: 4.29.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1



Routing Diagram for 341-132-CV01-Discharge Analysis
Prepared by CEC Inc, Printed 5/30/2025

Summary for Subcatchment 2A: Pre-Development POA 002 Stream L138-1 Headwater (STA 3+15)

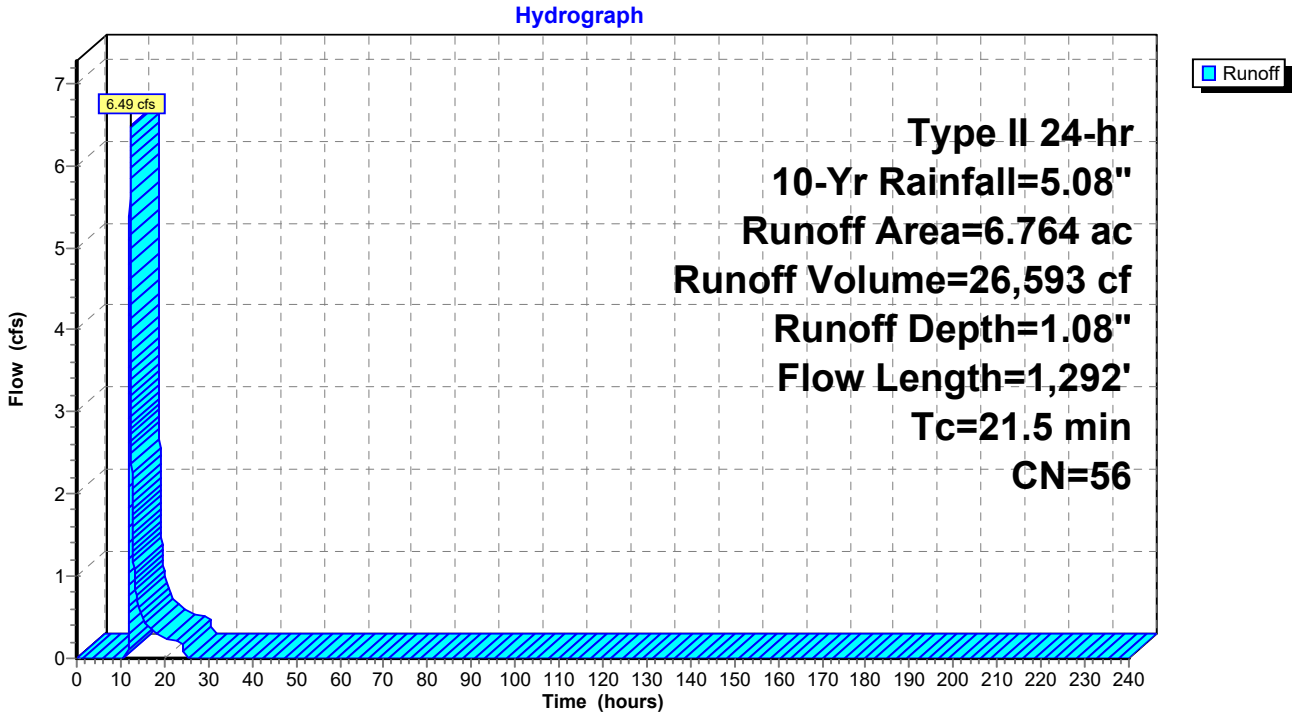
Runoff = 6.49 cfs @ 12.17 hrs, Volume= 26,593 cf, Depth= 1.08"
Routed to nonexistent node 2-POI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	5.087	55	Woods, Good, HSG B
*	0.070	58	Meadow, non-grazed, HSG B
*	1.604	61	Pasture/grassland/range, Good, HSG B
	0.003	98	Paved parking, HSG B
	6.764	56	Weighted Average
	6.761		99.96% Pervious Area
	0.003		0.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.2	105	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.8	650	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	11	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	306	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
21.5	1,292	Total			

Subcatchment 2A: Pre-Development POA 002 Stream L138-1 Headwater (STA 3+15)



Summary for Subcatchment 9: Post-Development POA 002 Stream L-138-1 Headwater (Detained) (STA 3

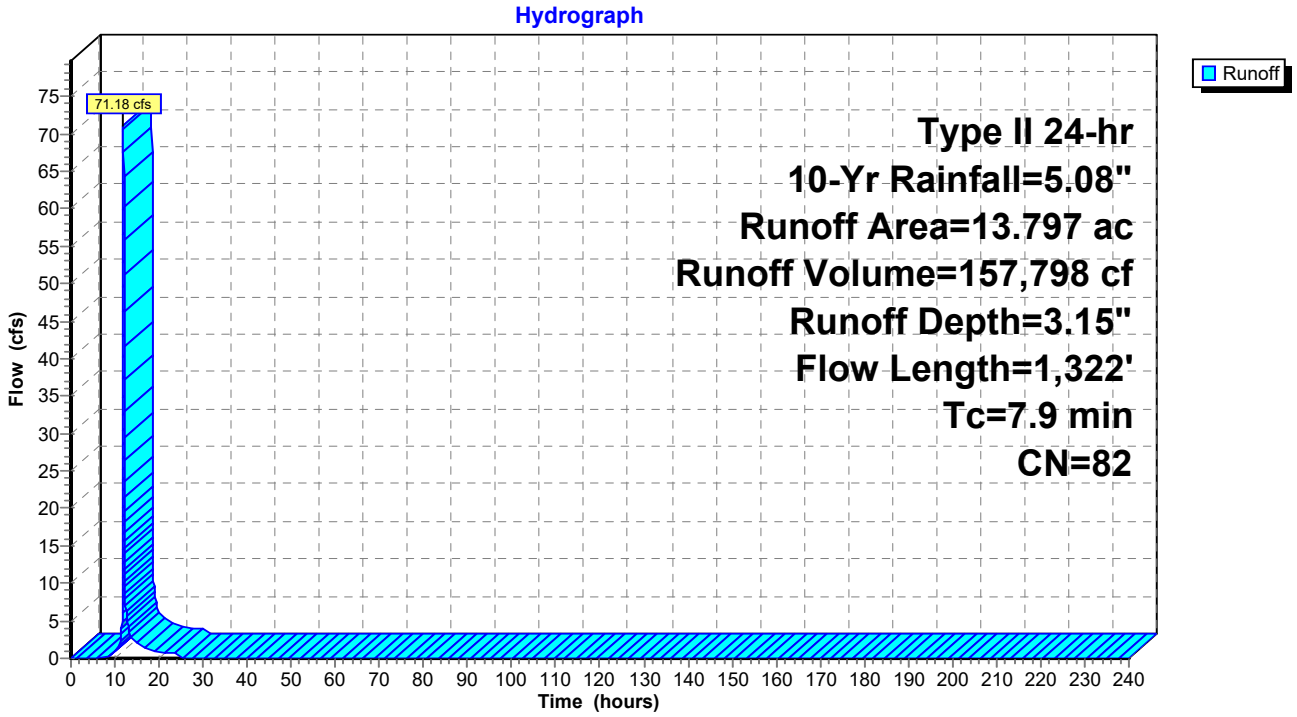
Runoff = 71.18 cfs @ 11.99 hrs, Volume= 157,798 cf, Depth= 3.15"
Routed to Pond 11 : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.135	55	Woods, Good, HSG B
	1.362	70	Woods, Good, HSG C
	0.086	77	Woods, Good, HSG D
	2.596	58	Meadow, non-grazed, HSG B
	0.775	71	Meadow, non-grazed, HSG C
	0.041	78	Meadow, non-grazed, HSG D
	0.092	74	>75% Grass cover, Good, HSG C
*	3.439	98	Gravel roads, HSG B
*	4.026	98	Gravel roads, HSG C
	0.245	98	Paved parking, HSG B
	13.797	82	Weighted Average
	6.087		44.12% Pervious Area
	7.710		55.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
3.9	380	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	153	0.0050	4.55	8.05	**Pipe Channel, PD-2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.5	127	0.0050	4.55	8.05	**Pipe Channel, PD-3** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.7	192	0.0050	4.55	8.05	**Pipe Channel, PD-4** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.6	192	0.0050	5.52	17.33	**Pipe Channel, PD-5** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.4	148	0.0050	5.52	17.33	**Pipe Channel, PD-6** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.2710	47.12	231.32	**Pipe Channel, PD-13** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.0250	14.31	70.26	**Pipe Channel, PD-13A** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
7.9	1,322	Total			

Subcatchment 9: Post-Development POA 002 Stream L-138-1 Headwater (Detained) (STA 3+15)



mmary for Subcatchment 12: Post-Development POA 002 Stream L-138-1 Headwater (Undetained) (STA

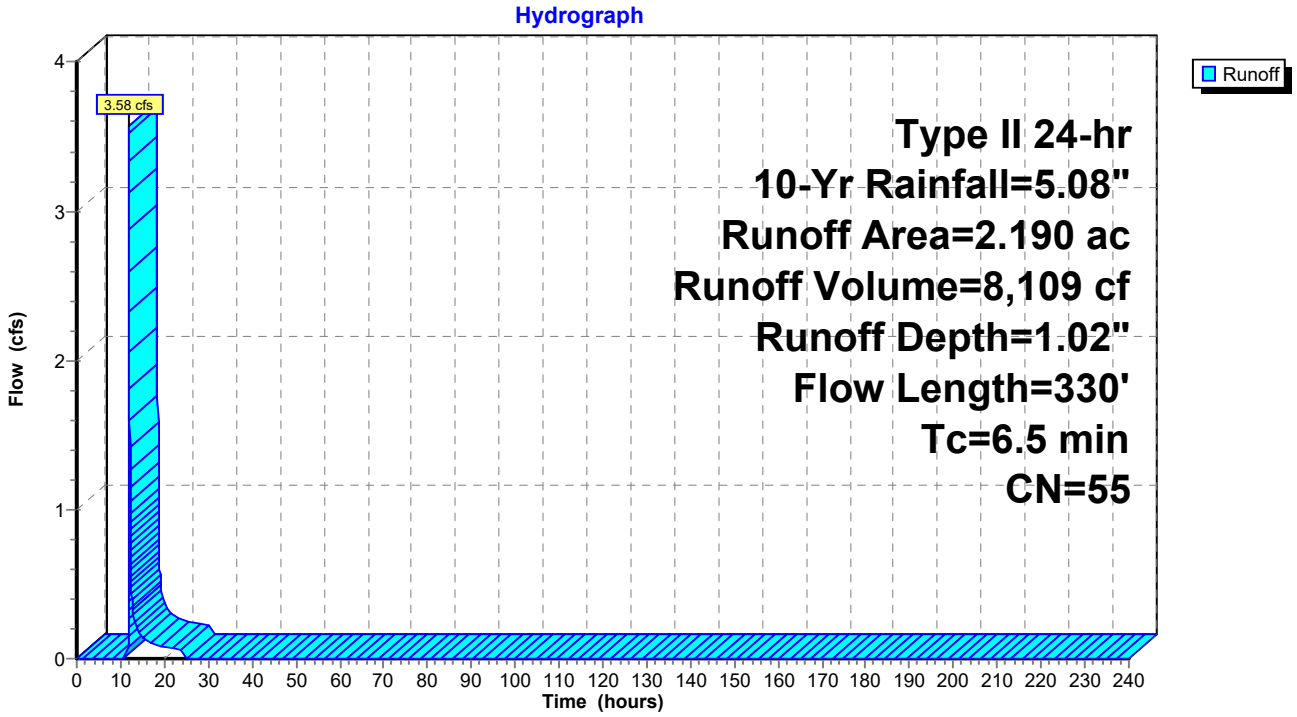
Runoff = 3.58 cfs @ 11.99 hrs, Volume= 8,109 cf, Depth= 1.02"
Routed to Link 13L : Post-Development POA 002 - L138-1 Headwater

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
2.190	55	Woods, Good, HSG B
2.190		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.4	110	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
6.5	330	Total			

Subcatchment 12: Post-Development POA 002 Stream L-138-1 Headwater (Undetained) (STA 3+15)



Summary for Subcatchment 13S: Pre-Development POA 002 Stream L134-1 Headwater (STA 6+50)

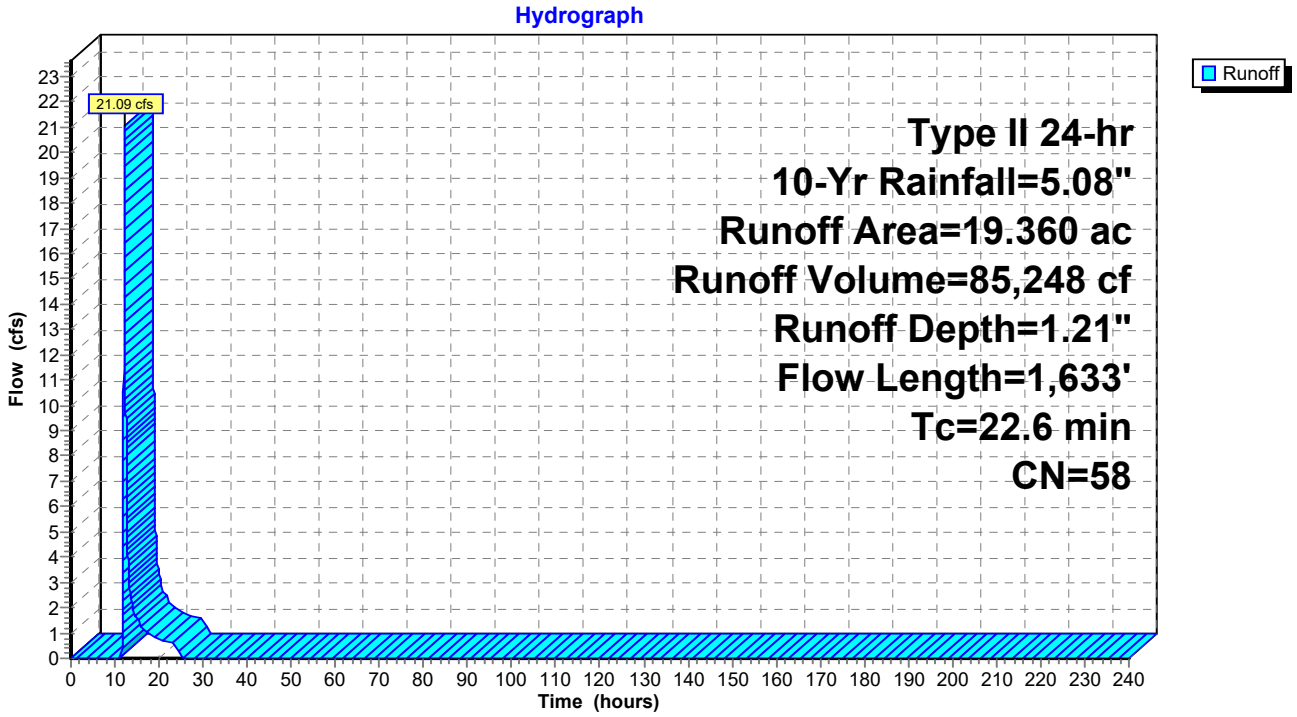
Runoff = 21.09 cfs @ 12.18 hrs, Volume= 85,248 cf, Depth= 1.21"
Routed to nonexistent node 2-POI

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	9.739	55	Woods, Good, HSG B
*	0.675	58	Meadow, non-grazed, HSG B
*	8.688	61	Pasture/grassland/range, Good, HSG B
	0.258	98	Paved parking, HSG B
	19.360	58	Weighted Average
	19.102		98.67% Pervious Area
	0.258		1.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.8	50	0.0300	0.12		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.2	105	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
8.8	650	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	11	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
3.6	306	0.0800	1.41		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
22.6	1,633	Total			

Subcatchment 13S: Pre-Development POA 002 Stream L134-1 Headwater (STA 6+50)



ummary for Subcatchment 14S: Post-Development POA 002 Stream L-138-1 Headwater (Detained) (STA

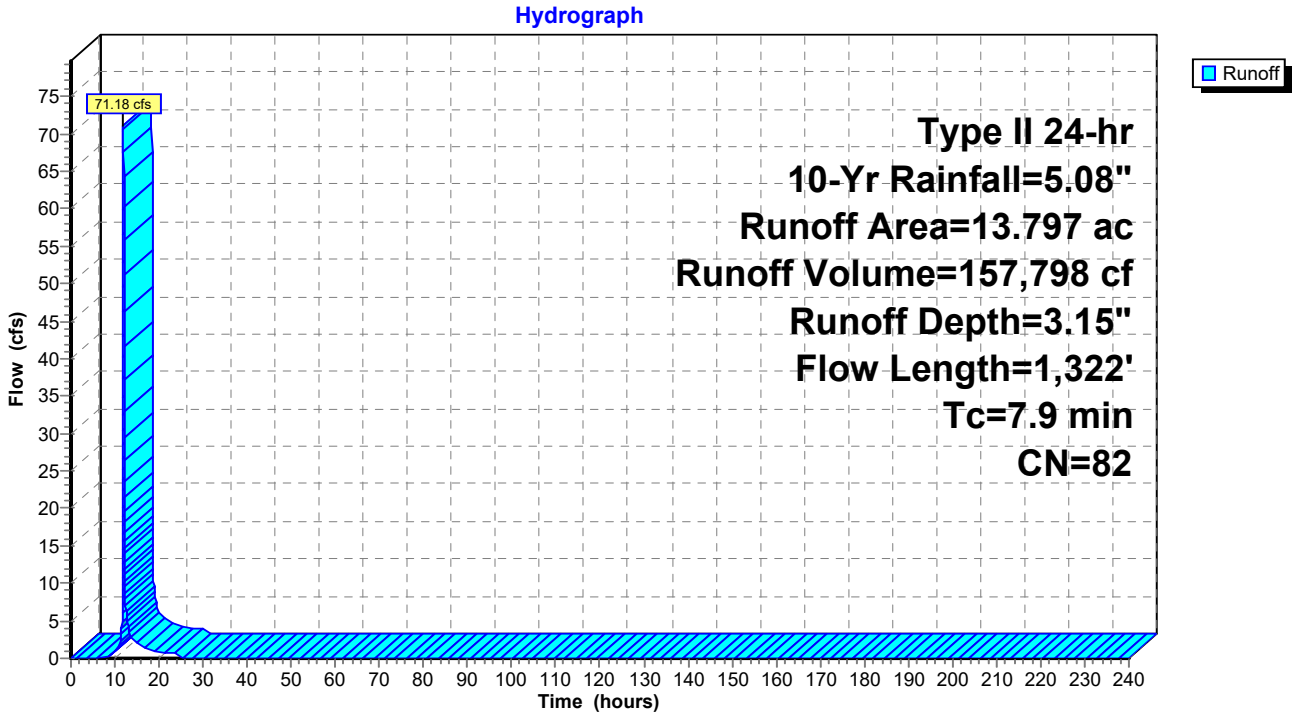
Runoff = 71.18 cfs @ 11.99 hrs, Volume= 157,798 cf, Depth= 3.15"
Routed to Pond 15P : Extended Detention Pond No. 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

	Area (ac)	CN	Description
	1.135	55	Woods, Good, HSG B
	1.362	70	Woods, Good, HSG C
	0.086	77	Woods, Good, HSG D
	2.596	58	Meadow, non-grazed, HSG B
	0.775	71	Meadow, non-grazed, HSG C
	0.041	78	Meadow, non-grazed, HSG D
	0.092	74	>75% Grass cover, Good, HSG C
*	3.439	98	Gravel roads, HSG B
*	4.026	98	Gravel roads, HSG C
	0.245	98	Paved parking, HSG B
	13.797	82	Weighted Average
	6.087		44.12% Pervious Area
	7.710		55.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	50	0.0050	0.71		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
3.9	380	0.0100	1.61		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.6	153	0.0050	4.55	8.05	**Pipe Channel, PD-2** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.5	127	0.0050	4.55	8.05	**Pipe Channel, PD-3** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.7	192	0.0050	4.55	8.05	**Pipe Channel, PD-4** 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.012 Corrugated PP, smooth interior
0.6	192	0.0050	5.52	17.33	**Pipe Channel, PD-5** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.4	148	0.0050	5.52	17.33	**Pipe Channel, PD-6** 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.2710	47.12	231.32	**Pipe Channel, PD-13** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
0.0	40	0.0250	14.31	70.26	**Pipe Channel, PD-13A** 30.0" Round Area= 4.9 sf Perim= 7.9' r= 0.63' n= 0.012 Corrugated PP, smooth interior
7.9	1,322	Total			

Subcatchment 14S: Post-Development POA 002 Stream L-138-1 Headwater (Detained) (STA 3+15)



mmary for Subcatchment 16S: Post-Development POA 002 Stream L-138-1 Headwater (Undetained) (ST

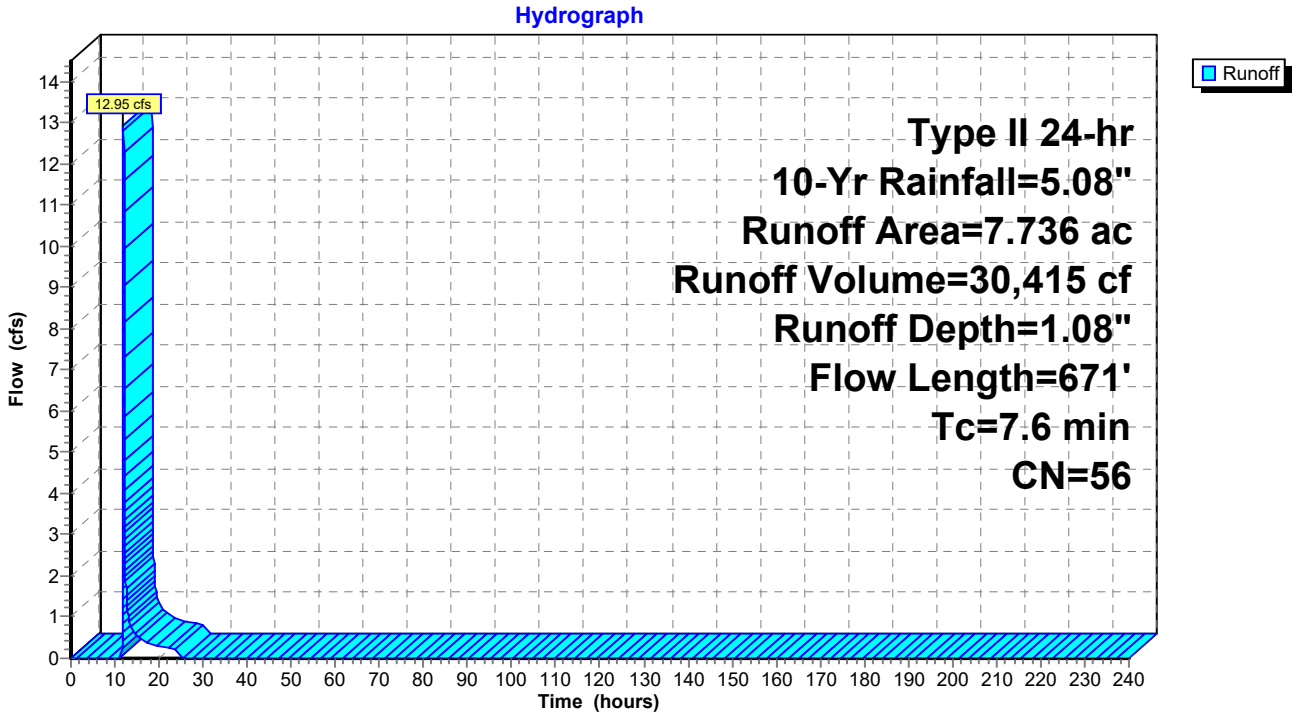
Runoff = 12.95 cfs @ 12.01 hrs, Volume= 30,415 cf, Depth= 1.08"
Routed to Link 17L : Post-Development POA 002 - L-134-1 Headwater

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Type II 24-hr 10-Yr Rainfall=5.08"

Area (ac)	CN	Description
6.757	55	Woods, Good, HSG B
0.857	58	Meadow, non-grazed, HSG B
0.028	71	Meadow, non-grazed, HSG C
0.043	74	>75% Grass cover, Good, HSG C
0.009	89	Gravel roads, HSG C
0.042	98	Paved parking, HSG B
7.736	56	Weighted Average
7.694		99.46% Pervious Area
0.042		0.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.1000	0.20		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.4	110	0.0700	1.32		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.9	170	0.0400	3.00		**Shallow Concentrated Flow, Wetland W232-1** Grassed Waterway Kv= 15.0 fps
0.6	255	0.0400	7.19	28.75	**Trap/Vee/Rect Channel Flow, Stream L138-1** Bot.W=2.00' D=1.00' Z= 2.0 '/' Top.W=6.00' n= 0.030
0.5	86	0.0400	3.00		**Shallow Concentrated Flow, W252-2 & W266-2** Grassed Waterway Kv= 15.0 fps
7.6	671	Total			

Subcatchment 16S: Post-Development POA 002 Stream L-138-1 Headwater (Undetained) (STA 3+15)



Summary for Pond 11: Extended Detention Pond No. 1

Inflow Area = 600,997 sf, 55.88% Impervious, Inflow Depth = 3.15" for 10-Yr event
Inflow = 71.18 cfs @ 11.99 hrs, Volume= 157,798 cf
Outflow = 5.74 cfs @ 12.58 hrs, Volume= 157,798 cf, Atten= 92%, Lag= 35.4 min
Primary = 5.74 cfs @ 12.58 hrs, Volume= 157,798 cf
Routed to Link 13L : Post-Development POA 002 - L138-1 Headwater
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 13L : Post-Development POA 002 - L138-1 Headwater

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 644.54' @ 12.58 hrs Surf.Area= 22,474 sf Storage= 85,814 cf

Plug-Flow detention time= 1,048.8 min calculated for 157,791 cf (100% of inflow)
Center-of-Mass det. time= 1,049.1 min (1,863.4 - 814.3)

Volume	Invert	Avail.Storage	Storage Description
#1	642.00'	7,668 cf	**Western Forebay (Irregular)** Listed below (Recalc)
#2	646.00'	11,699 cf	**Eastern Forebay (Irregular)** Listed below (Recalc)
#3	637.00'	202,527 cf	**Open Pond (Irregular)** Listed below (Recalc)
		221,894 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
642.00	1,475	230.0	0	0	1,475
643.00	2,170	250.0	1,811	1,811	2,276
644.00	2,925	270.0	2,538	4,349	3,143
645.00	3,728	290.0	3,318	7,668	4,077

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
646.00	2,900	205.0	0	0	2,900
647.00	3,540	220.0	3,215	3,215	3,450
648.00	4,230	240.0	3,880	7,095	4,217
649.00	4,990	260.0	4,605	11,699	5,052

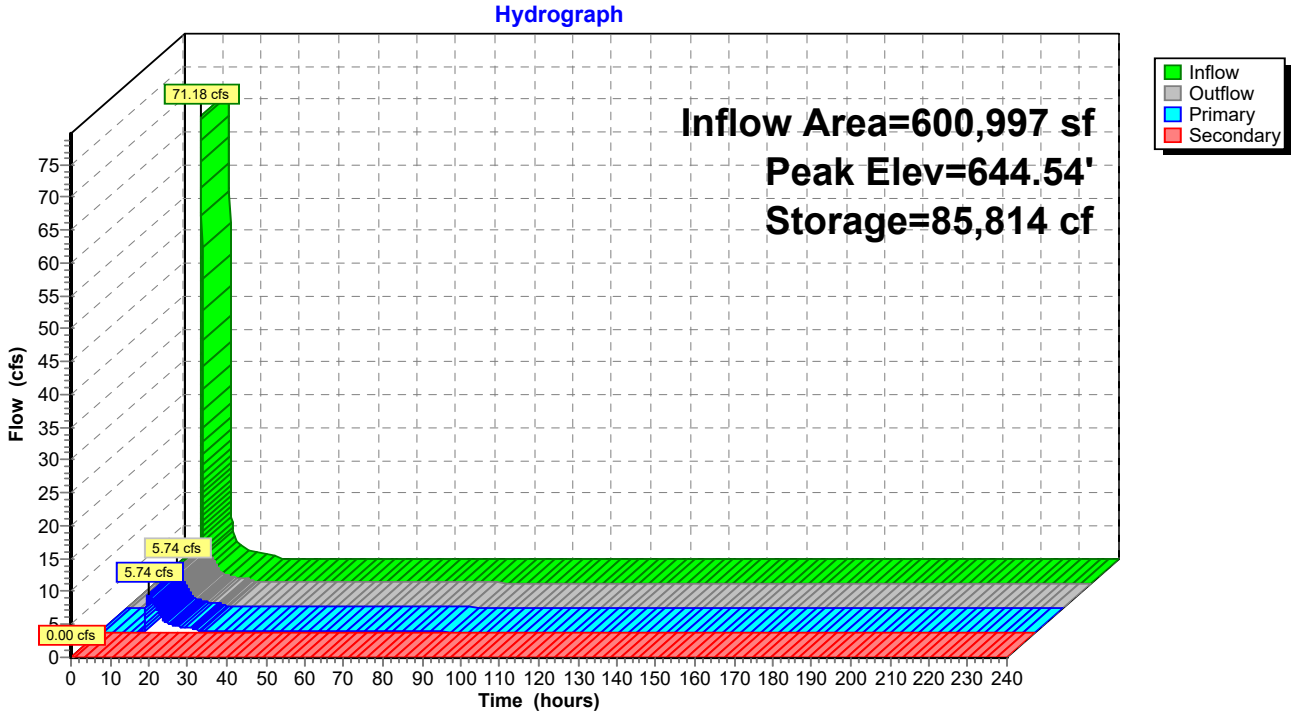
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
637.00	11,670	510.0	0.0	0	0	11,670
639.00	11,670	510.0	30.0	7,002	7,002	12,690
639.20	0	10.0	30.0	233	7,235	33,380
640.00	11,670	510.0	100.0	3,112	10,347	54,071
641.00	13,230	530.0	100.0	12,442	22,789	55,806
642.00	14,830	550.0	100.0	14,022	36,812	57,608
643.00	16,490	570.0	100.0	15,653	52,464	59,476
644.00	18,200	590.0	100.0	17,338	69,802	61,412
645.00	19,960	605.0	100.0	19,073	88,876	62,958
646.00	26,280	850.0	100.0	23,048	111,923	91,335
647.00	28,870	870.0	100.0	27,565	139,488	94,204
648.00	31,515	890.0	100.0	30,183	169,671	97,140
649.00	34,215	910.0	100.0	32,856	202,527	100,143

Device	Routing	Invert	Outlet Devices
#1	Primary	636.70'	**18.0" Round Outlet Pipe** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.70' / 636.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	637.00'	**2.0" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	643.00'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	645.00'	**24.0" x 48.0" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	647.40'	**147.0 deg x 90.0' long x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=5.74 cfs @ 12.58 hrs HW=644.54' (Free Discharge)
└─**1=Outlet Pipe** (Passes 5.74 cfs of 22.65 cfs potential flow)
  ├─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.29 cfs @ 13.14 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 5.45 cfs @ 5.45 fps)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=637.00' (Free Discharge)
└─**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 11: Extended Detention Pond No. 1



Summary for Pond 15P: Extended Detention Pond No. 1

Inflow Area = 600,997 sf, 55.88% Impervious, Inflow Depth = 3.15" for 10-Yr event
Inflow = 71.18 cfs @ 11.99 hrs, Volume= 157,798 cf
Outflow = 5.74 cfs @ 12.58 hrs, Volume= 157,798 cf, Atten= 92%, Lag= 35.4 min
Primary = 5.74 cfs @ 12.58 hrs, Volume= 157,798 cf
Routed to Link 17L : Post-Development POA 002 - L-134-1 Headwater
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link 17L : Post-Development POA 002 - L-134-1 Headwater

Routing by Stor-Ind method, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs
Peak Elev= 644.54' @ 12.58 hrs Surf.Area= 22,474 sf Storage= 85,814 cf

Plug-Flow detention time= 1,048.8 min calculated for 157,791 cf (100% of inflow)
Center-of-Mass det. time= 1,049.1 min (1,863.4 - 814.3)

Volume	Invert	Avail.Storage	Storage Description
#1	642.00'	7,668 cf	**Western Forebay (Irregular)** Listed below (Recalc)
#2	646.00'	11,699 cf	**Eastern Forebay (Irregular)** Listed below (Recalc)
#3	637.00'	202,527 cf	**Open Pond (Irregular)** Listed below (Recalc)
		221,894 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
642.00	1,475	230.0	0	0	1,475
643.00	2,170	250.0	1,811	1,811	2,276
644.00	2,925	270.0	2,538	4,349	3,143
645.00	3,728	290.0	3,318	7,668	4,077

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
646.00	2,900	205.0	0	0	2,900
647.00	3,540	220.0	3,215	3,215	3,450
648.00	4,230	240.0	3,880	7,095	4,217
649.00	4,990	260.0	4,605	11,699	5,052

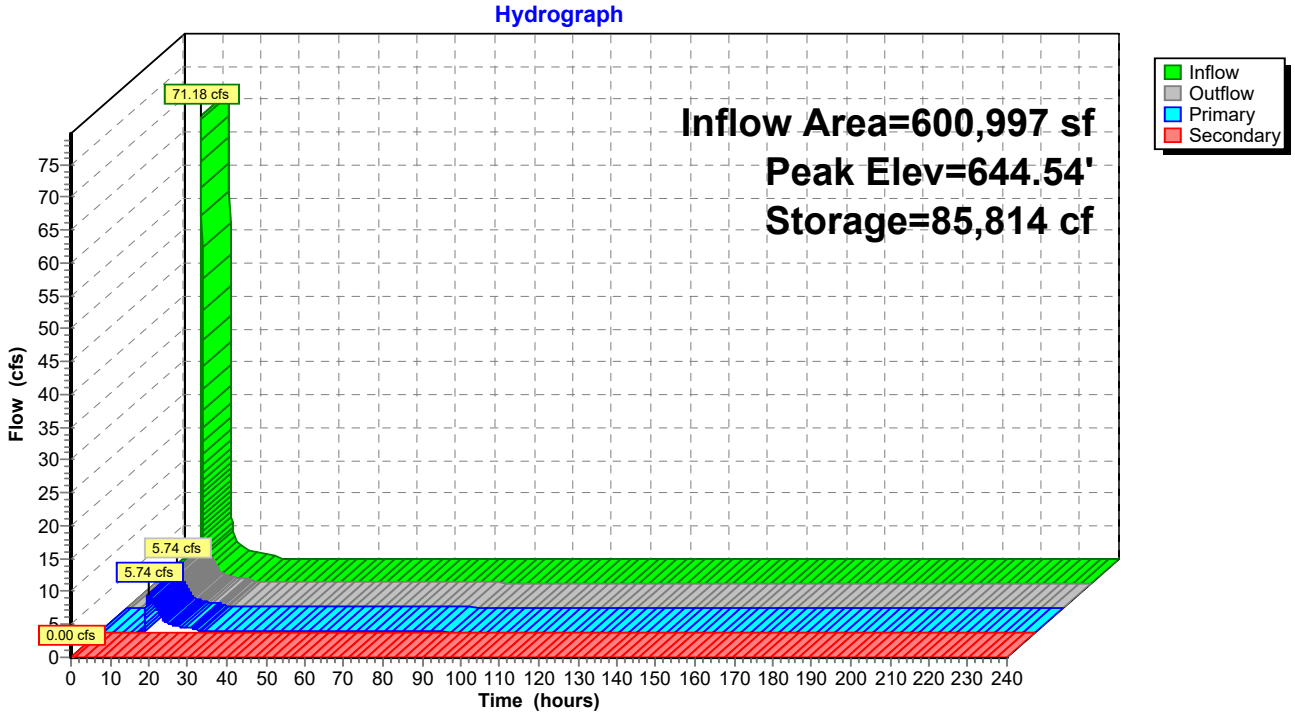
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
637.00	11,670	510.0	0.0	0	0	11,670
639.00	11,670	510.0	30.0	7,002	7,002	12,690
639.20	0	10.0	30.0	233	7,235	33,380
640.00	11,670	510.0	100.0	3,112	10,347	54,071
641.00	13,230	530.0	100.0	12,442	22,789	55,806
642.00	14,830	550.0	100.0	14,022	36,812	57,608
643.00	16,490	570.0	100.0	15,653	52,464	59,476
644.00	18,200	590.0	100.0	17,338	69,802	61,412
645.00	19,960	605.0	100.0	19,073	88,876	62,958
646.00	26,280	850.0	100.0	23,048	111,923	91,335
647.00	28,870	870.0	100.0	27,565	139,488	94,204
648.00	31,515	890.0	100.0	30,183	169,671	97,140
649.00	34,215	910.0	100.0	32,856	202,527	100,143

Device	Routing	Invert	Outlet Devices
#1	Primary	636.70'	**18.0" Round Outlet Pipe** L= 70.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 636.70' / 636.00' S= 0.0100 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 1.77 sf
#2	Device 1	637.00'	**2.0" Vert. Dewatering Orifice (Capped Underdrain)** C= 0.600 Limited to weir flow at low heads
#3	Device 1	643.00'	**24.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 1	645.00'	**24.0" x 48.0" Horiz. Outlet Control Structure Inlet** C= 0.600 Limited to weir flow at low heads
#5	Secondary	647.40'	**147.0 deg x 90.0' long x 1.60' rise Sharp-Crested Vee/Trap Weir** Cv= 2.47 (C= 3.09)

Primary OutFlow Max=5.74 cfs @ 12.58 hrs HW=644.54' (Free Discharge)
└─**1=Outlet Pipe** (Passes 5.74 cfs of 22.65 cfs potential flow)
  └─**2=Dewatering Orifice (Capped Underdrain)**(Orifice Controls 0.29 cfs @ 13.14 fps)
  └─**3=Orifice/Grate** (Orifice Controls 5.45 cfs @ 5.45 fps)
  └─**4=Outlet Control Structure Inlet** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=637.00' (Free Discharge)
└─**5=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond 15P: Extended Detention Pond No. 1

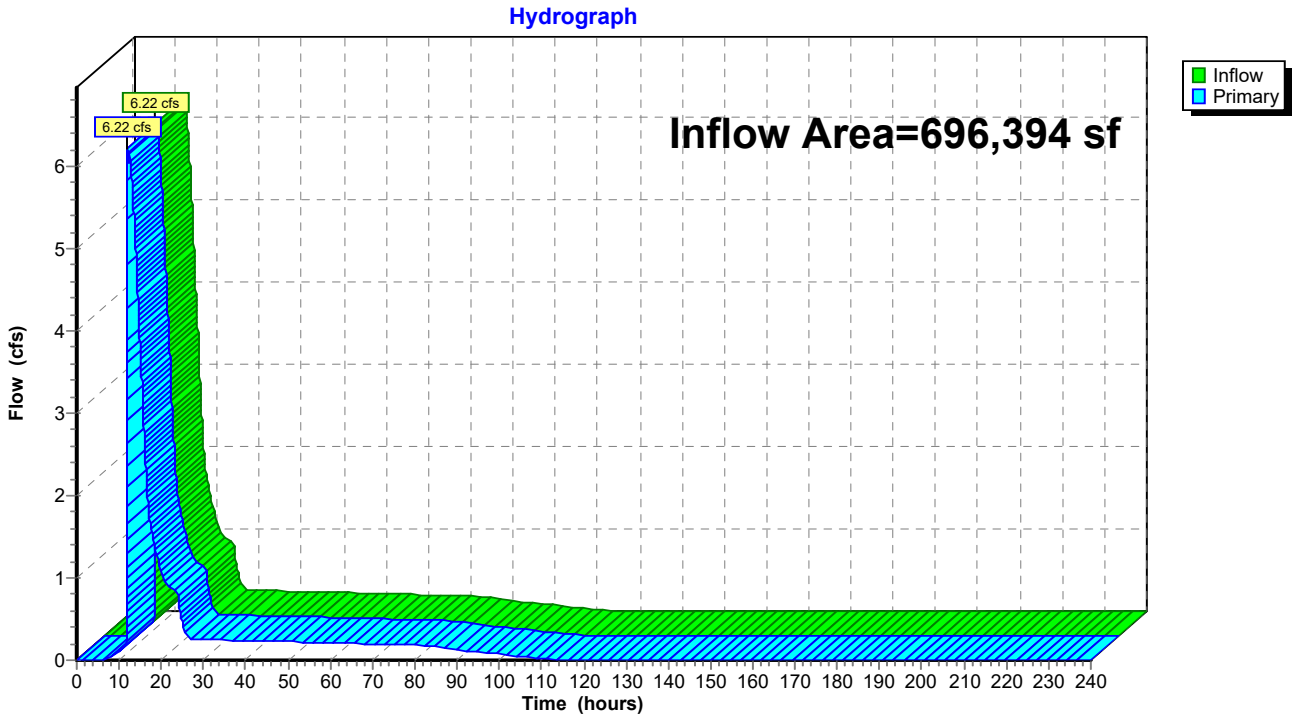


Summary for Link 13L: Post-Development POA 002 - L138-1 Headwater

Inflow Area = 696,394 sf, 48.23% Impervious, Inflow Depth = 2.86" for 10-Yr event
Inflow = 6.22 cfs @ 12.06 hrs, Volume= 165,907 cf
Primary = 6.22 cfs @ 12.06 hrs, Volume= 165,907 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 13L: Post-Development POA 002 - L138-1 Headwater

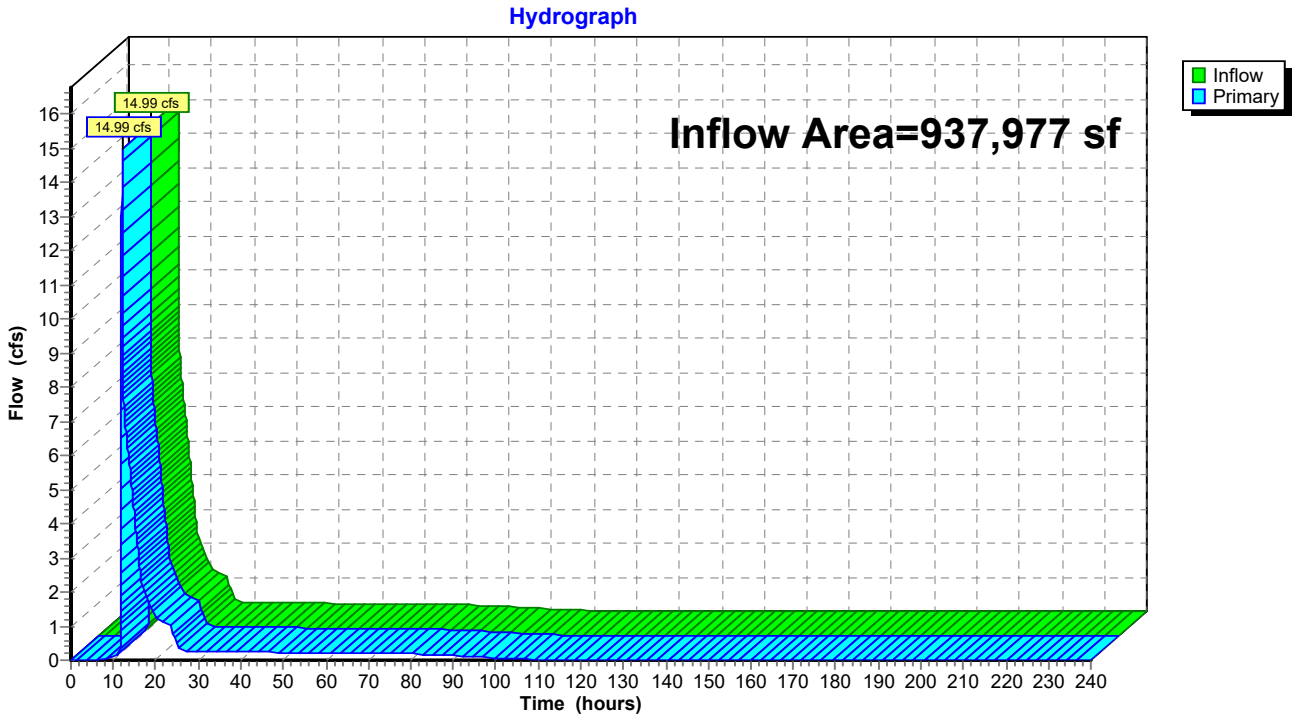


Summary for Link 17L: Post-Development POA 002 - L-134-1 Headwater

Inflow Area = 937,977 sf, 36.00% Impervious, Inflow Depth = 2.41" for 10-Yr event
Inflow = 14.99 cfs @ 12.03 hrs, Volume= 188,213 cf
Primary = 14.99 cfs @ 12.03 hrs, Volume= 188,213 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-240.00 hrs, dt= 0.01 hrs

Link 17L: Post-Development POA 002 - L-134-1 Headwater



Worksheet for POA 001 - Pre (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Discharge	4.41 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+26.24	663.31
-0+13.38	662.98
-0+06.79	662.55
-0+03.14	662.17
-0+01.77	662.14
0+00.41	662.15
0+05.75	662.74
0+10.00	662.84
0+23.29	663.09

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+26.24, 663.31)	(0+23.29, 663.09)	0.100

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.9 in
Roughness Coefficient	0.100
Elevation	662.63 ft
Elevation Range	662.1 to 663.3 ft
Flow Area	3.8 ft²
Wetted Perimeter	12.9 ft
Hydraulic Radius	3.6 in
Top Width	12.87 ft
Normal Depth	5.9 in
Critical Depth	3.5 in
Critical Slope	0.251 ft/ft
Velocity	1.15 ft/s

Worksheet for POA 001 - Pre (STA 0+00)

Results	
Velocity Head	0.02 ft
Specific Energy	0.51 ft
Froude Number	0.370
Flow Type	Subcritical

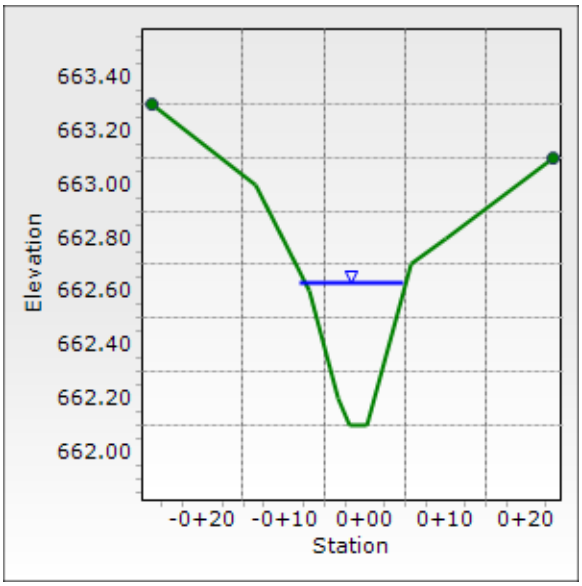
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.9 in
Critical Depth	3.5 in
Channel Slope	0.030 ft/ft
Critical Slope	0.251 ft/ft

Cross Section for POA 001 - Pre (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Normal Depth	5.9 in
Discharge	4.41 cfs



Worksheet for POA 001 - Post (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Discharge	4.34 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+26.24	663.31
-0+13.38	662.98
-0+06.79	662.55
-0+03.14	662.17
-0+01.77	662.14
0+00.41	662.15
0+05.75	662.74
0+10.00	662.84
0+23.29	663.09

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+26.24, 663.31)	(0+23.29, 663.09)	0.100

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.9 in
Roughness Coefficient	0.100
Elevation	662.63 ft
Elevation Range	662.1 to 663.3 ft
Flow Area	3.8 ft²
Wetted Perimeter	12.8 ft
Hydraulic Radius	3.5 in
Top Width	12.78 ft
Normal Depth	5.9 in
Critical Depth	3.5 in
Critical Slope	0.251 ft/ft
Velocity	1.14 ft/s

Worksheet for POA 001 - Post (STA 0+00)

Results	
Velocity Head	0.02 ft
Specific Energy	0.51 ft
Froude Number	0.370
Flow Type	Subcritical

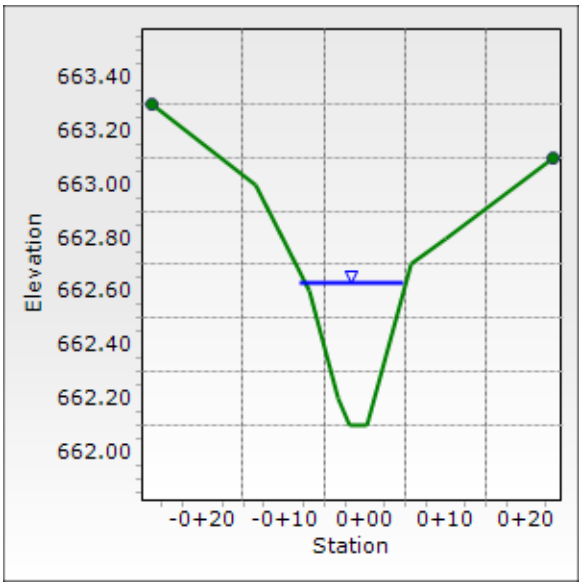
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.9 in
Critical Depth	3.5 in
Channel Slope	0.030 ft/ft
Critical Slope	0.251 ft/ft

Cross Section for POA 001 - Post (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.030 ft/ft
Normal Depth	5.9 in
Discharge	4.34 cfs



Worksheet for POA 002 - Pre - Stream L-138-1 Headwaters (STA 3+15)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Discharge	6.49 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+17.92	619.46
-0+06.35	618.59
0+00.00	617.96
0+04.88	618.52
0+18.21	618.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+17.92, 619.46)	(-0+06.35, 618.59)	0.060
(-0+06.35, 618.59)	(0+04.88, 618.52)	0.030
(0+04.88, 618.52)	(0+18.21, 618.89)	0.060

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.3 in
Roughness Coefficient	0.030
Elevation	618.40 ft
Elevation Range	618.0 to 619.5 ft
Flow Area	1.8 ft²
Wetted Perimeter	8.3 ft
Hydraulic Radius	2.6 in
Top Width	8.26 ft
Normal Depth	5.3 in
Critical Depth	5.9 in
Critical Slope	0.021 ft/ft
Velocity	3.58 ft/s
Velocity Head	0.20 ft
Specific Energy	0.64 ft

Worksheet for POA 002 - Pre - Stream L-138-1 Headwaters (STA 3+15)

Results	
Froude Number	1.349
Flow Type	Supercritical

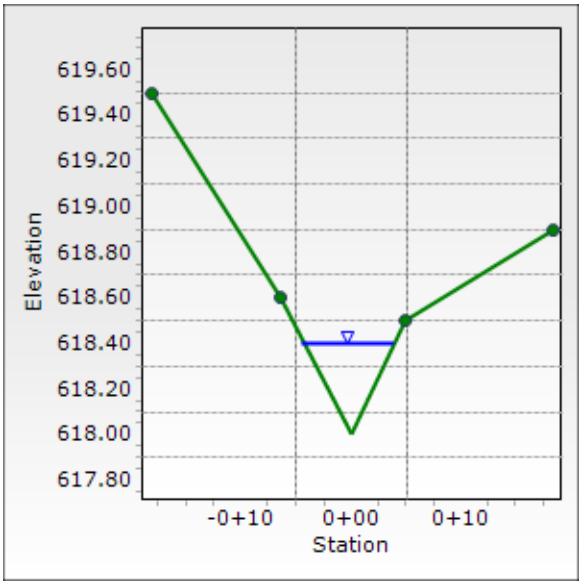
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.3 in
Critical Depth	5.9 in
Channel Slope	0.040 ft/ft
Critical Slope	0.021 ft/ft

Cross Section for POA 002 - Pre - Stream L-138-1 Headwaters (STA 3+15)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	5.3 in
Discharge	6.49 cfs



Worksheet for POA 002 - Post - Stream L-138-1 Headwaters (STA 3+15)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Discharge	6.22 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+17.92	619.46
-0+06.35	618.59
0+00.00	617.96
0+04.88	618.52
0+18.21	618.89

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+17.92, 619.46)	(-0+06.35, 618.59)	0.060
(-0+06.35, 618.59)	(0+04.88, 618.52)	0.030
(0+04.88, 618.52)	(0+18.21, 618.89)	0.060

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.2 in
Roughness Coefficient	0.030
Elevation	618.39 ft
Elevation Range	618.0 to 619.5 ft
Flow Area	1.8 ft²
Wetted Perimeter	8.2 ft
Hydraulic Radius	2.6 in
Top Width	8.13 ft
Normal Depth	5.2 in
Critical Depth	5.8 in
Critical Slope	0.021 ft/ft
Velocity	3.55 ft/s
Velocity Head	0.20 ft
Specific Energy	0.63 ft

Worksheet for POA 002 - Post - Stream L-138-1 Headwaters (STA 3+15)

Results	
Froude Number	1.347
Flow Type	Supercritical

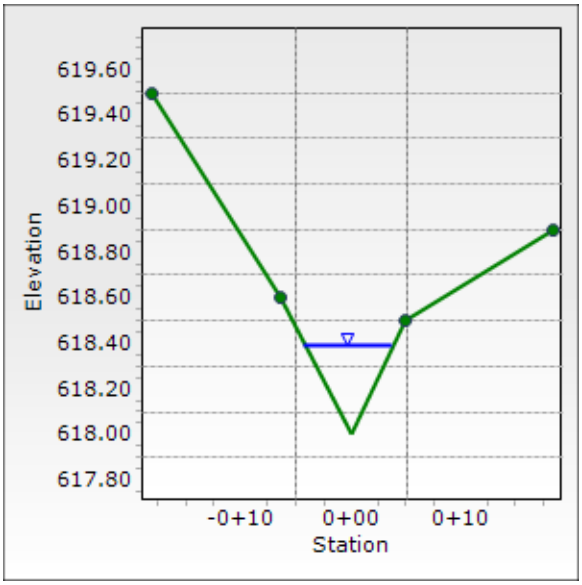
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.2 in
Critical Depth	5.8 in
Channel Slope	0.040 ft/ft
Critical Slope	0.021 ft/ft

Cross Section for POA 002 - Post - Stream L-138-1 Headwaters (STA 3+15)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	5.2 in
Discharge	6.22 cfs



Worksheet for POA 002 - Pre - Stream L-134-1 Headwaters (STA 6+50)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Discharge	21.09 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+20.73	606.43
-0+07.09	605.55
-0+00.98	605.09
0+00.00	605.07
0+08.64	605.18
0+17.29	604.79
0+20.31	604.90
0+34.56	607.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+20.73, 606.43)	(-0+07.09, 605.55)	0.035
(-0+07.09, 605.55)	(0+08.64, 605.18)	0.030
(0+08.64, 605.18)	(0+34.56, 607.12)	0.035

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.9 in
Roughness Coefficient	0.033
Elevation	605.28 ft
Elevation Range	604.8 to 607.1 ft
Flow Area	6.1 ft²
Wetted Perimeter	26.3 ft
Hydraulic Radius	2.8 in
Top Width	26.26 ft
Normal Depth	5.9 in
Critical Depth	6.4 in
Critical Slope	0.024 ft/ft

Worksheet for POA 002 - Pre - Stream L-134-1 Headwaters (STA 6+50)

Results	
Velocity	3.43 ft/s
Velocity Head	0.18 ft
Specific Energy	0.68 ft
Froude Number	1.252
Flow Type	Supercritical

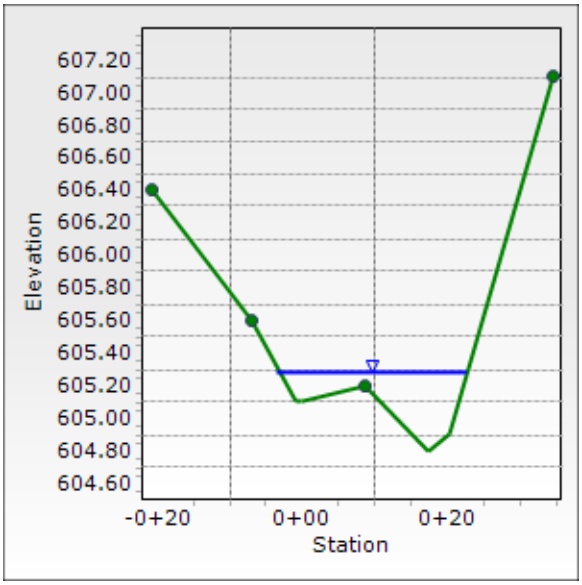
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.9 in
Critical Depth	6.4 in
Channel Slope	0.040 ft/ft
Critical Slope	0.024 ft/ft

Cross Section for POA 002 - Pre - Stream L-134-1 Headwaters (STA 6+50)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	5.9 in
Discharge	21.09 cfs



Worksheet for POA 002 - Post - Stream L-134-1 Headwaters (STA 6+50)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Discharge	14.99 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+20.73	606.43
-0+07.09	605.55
-0+00.98	605.09
0+00.00	605.07
0+08.64	605.18
0+17.29	604.79
0+20.31	604.90
0+34.56	607.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+20.73, 606.43)	(-0+07.09, 605.55)	0.035
(-0+07.09, 605.55)	(0+08.64, 605.18)	0.030
(0+08.64, 605.18)	(0+34.56, 607.12)	0.035

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	5.4 in
Roughness Coefficient	0.033
Elevation	605.23 ft
Elevation Range	604.8 to 607.1 ft
Flow Area	4.9 ft²
Wetted Perimeter	25.4 ft
Hydraulic Radius	2.3 in
Top Width	25.34 ft
Normal Depth	5.4 in
Critical Depth	5.7 in
Critical Slope	0.026 ft/ft

Worksheet for POA 002 - Post - Stream L-134-1 Headwaters (STA 6+50)

Results	
Velocity	3.04 ft/s
Velocity Head	0.14 ft
Specific Energy	0.59 ft
Froude Number	1.214
Flow Type	Supercritical

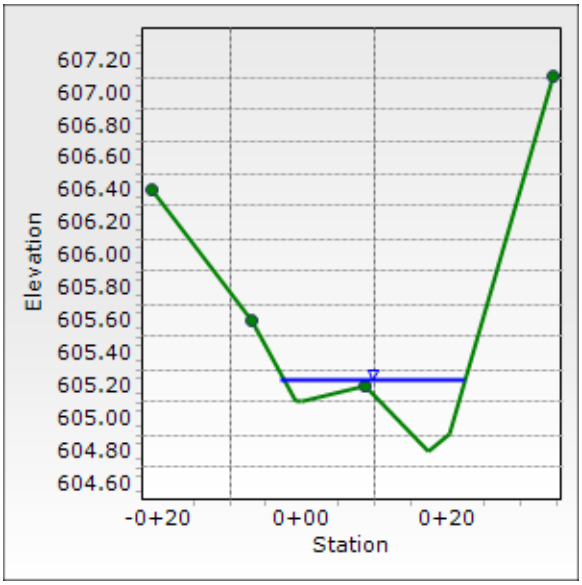
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	5.4 in
Critical Depth	5.7 in
Channel Slope	0.040 ft/ft
Critical Slope	0.026 ft/ft

Cross Section for POA 002 - Post - Stream L-134-1 Headwaters (STA 6+50)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	5.4 in
Discharge	14.99 cfs



Worksheet for POA 003 - Stream Stats - Stream L158-1 (STA 1+50)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.010 ft/ft
Discharge	342.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+15.87	606.01
-0+11.18	605.51
-0+06.27	603.74
-0+03.94	603.26
-0+01.61	603.86
0+02.09	605.29
0+06.00	606.11

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+15.87, 606.01)	(-0+11.18, 605.51)	0.035
(-0+11.18, 605.51)	(0+02.09, 605.29)	0.030
(0+02.09, 605.29)	(0+06.00, 606.11)	0.035

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	44.9 in
Roughness Coefficient	0.032
Elevation	607.00 ft
Elevation Range	603.3 to 606.1 ft
Flow Area	47.7 ft²
Wetted Perimeter	24.6 ft
Hydraulic Radius	23.3 in
Top Width	21.87 ft
Normal Depth	44.9 in
Critical Depth	42.3 in
Critical Slope	0.014 ft/ft
Velocity	7.17 ft/s

Worksheet for POA 003 - Stream Stats - Stream L158-1 (STA 1+50)

Results	
Velocity Head	0.80 ft
Specific Energy	4.54 ft
Froude Number	0.856
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	44.9 in
Critical Depth	42.3 in
Channel Slope	0.010 ft/ft
Critical Slope	0.014 ft/ft

StreamStats Report POA 003 - STA 1+50

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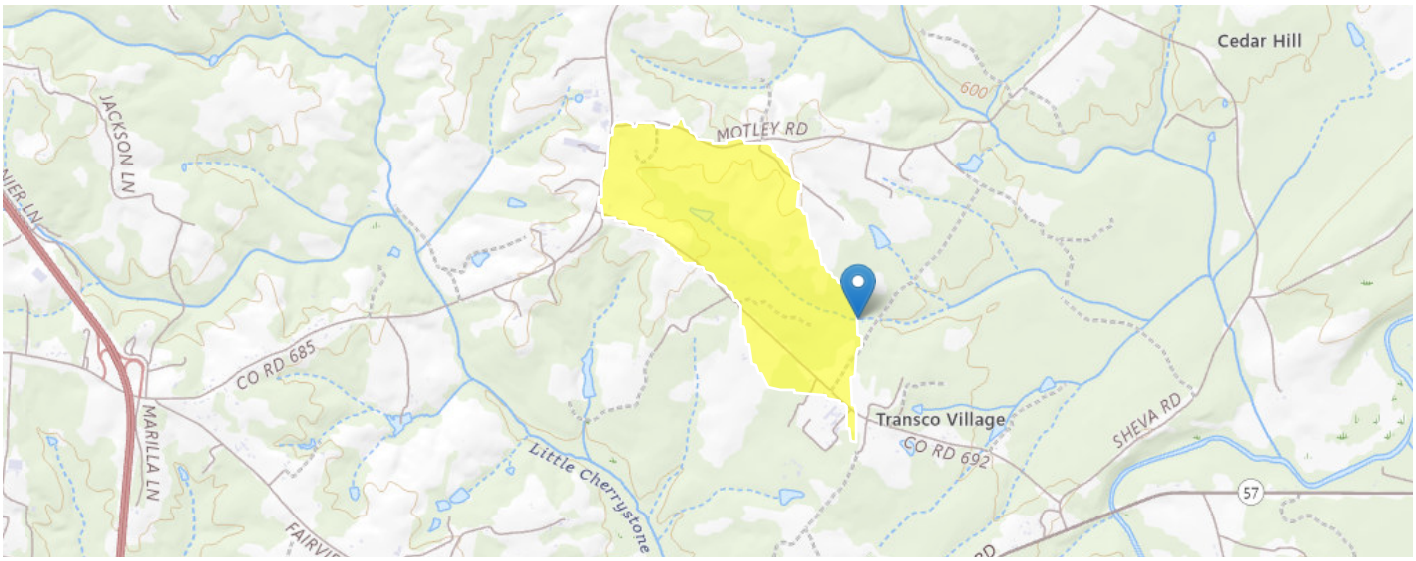
Workspace ID: VA20250528013409623000
Clicked Point (Latitude, Longitude): 36.83673, -79.33526
Time: 2025-05-27 21:34:34 -0400



Collapse All

Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.45	square miles

Peak-Flow Statistics

Peak-Flow Statistics Parameters [76.0 Percent (0.34 square miles) Piedmont nonMesozoic 2011 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.45	square miles	0.06	7866

Peak-Flow Statistics Parameters [24.0 Percent (0.107 square miles) Piedmont Mesozoic 2011 5144]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.45	square miles	0.06	7866

Peak-Flow Statistics Flow Report [76.0 Percent (0.34 square miles) Piedmont nonMesozoic 2011 5144]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	98	ft^3/s	43
42.9-percent AEP flood	122	ft^3/s	42
20-percent AEP flood	223	ft^3/s	32
10-percent AEP flood	342	ft^3/s	31
4-percent AEP flood	547	ft^3/s	32

Statistic	Value	Unit	ASEp
2-percent AEP flood	740	ft^3/s	34
1-percent AEP flood	971	ft^3/s	36
0.5-percent AEP flood	1250	ft^3/s	38

Peak-Flow Statistics Flow Report [24.0 Percent (0.107 square miles) Piedmont Mesozoic 2011 5144]

PIL: Lower 90% Prediction Interval, PIU: Upper 90% Prediction Interval, ASEp: Average Standard Error of Prediction, SE: Standard Error, PC: Percent Correct, RMSE: Root Mean Squared Error, PseudoR^2: Pseudo R Squared (other -- see report)

Statistic	Value	Unit	ASEp
50-percent AEP flood	56.4	ft^3/s	41
42.9-percent AEP flood	70	ft^3/s	42
20-percent AEP flood	154	ft^3/s	42
10-percent AEP flood	275	ft^3/s	41
4-percent AEP flood	525	ft^3/s	40
2-percent AEP flood	799	ft^3/s	39
1-percent AEP flood	1200	ft^3/s	37
0.5-percent AEP flood	1660	ft^3/s	36

Peak-Flow Statistics Flow Report [Area-Averaged]

Statistic	Value	Unit
50-percent AEP flood	88	ft^3/s
42.9-percent AEP flood	110	ft^3/s
20-percent AEP flood	206	ft^3/s
10-percent AEP flood	326	ft^3/s
4-percent AEP flood	542	ft^3/s
2-percent AEP flood	754	ft^3/s
1-percent AEP flood	1030	ft^3/s
0.5-percent AEP flood	1350	ft^3/s

Peak-Flow Statistics Citations

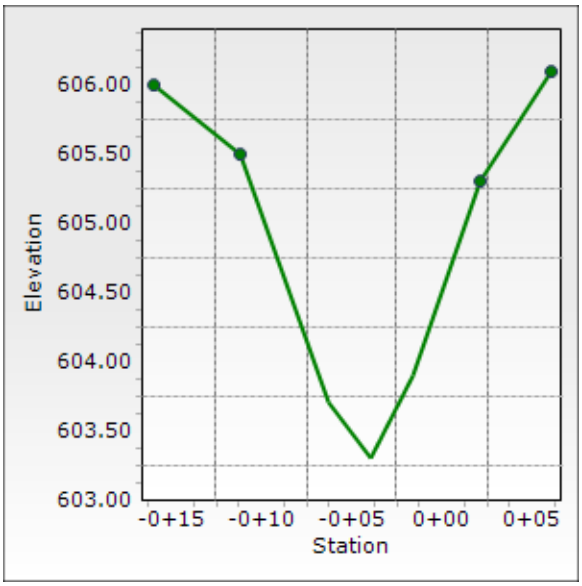
Austin, S.H., Krstolic, J.L., and Wiegand, Ute,2011, Peak-flow characteristics of Virginia streams: U.S. Geological Survey Scientific Investigations Report 2011–5144, 106 p. + 3 tables and 2 appendixes on CD. (http://pubs.usgs.gov/sir/2011/5144/)

Application Version: 4.29.1
StreamStats Services Version: 1.2.22
NSS Services Version: 2.2.1

Cross Section for POA 003 - Stream Stats - Stream L158-1 (STA 1+50)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.010 ft/ft
Normal Depth	44.9 in
Discharge	342.00 cfs



Worksheet for POA 004 - Post-POA 004 (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Discharge	5.51 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+22.39	645.40
-0+12.48	643.61
0+00.00	642.99
0+08.96	643.06
0+22.26	643.60
0+50.00	644.84

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+22.39, 645.40)	(-0+12.48, 643.61)	0.060
(-0+12.48, 643.61)	(0+22.26, 643.60)	0.030
(0+22.26, 643.60)	(0+50.00, 644.84)	0.060

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	2.4 in
Roughness Coefficient	0.030
Elevation	643.19 ft
Elevation Range	643.0 to 645.4 ft
Flow Area	2.1 ft²
Wetted Perimeter	16.4 ft
Hydraulic Radius	1.6 in
Top Width	16.35 ft
Normal Depth	2.4 in
Critical Depth	2.7 in
Critical Slope	0.025 ft/ft
Velocity	2.57 ft/s
Velocity Head	0.10 ft

Worksheet for POA 004 - Post-POA 004 (STA 0+00)

Results	
Specific Energy	0.31 ft
Froude Number	1.248
Flow Type	Supercritical

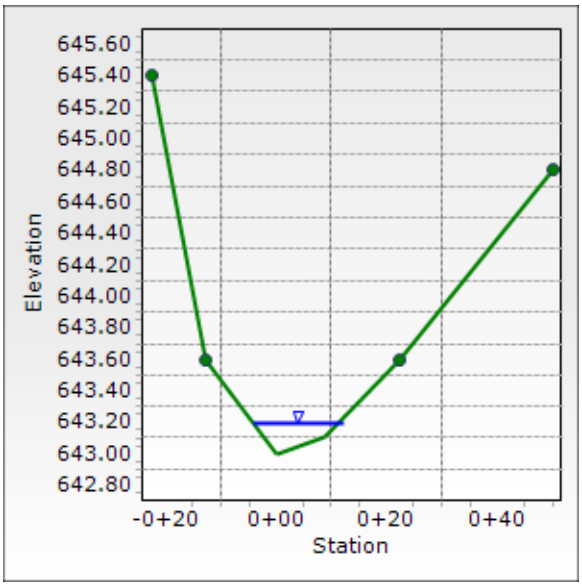
GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	2.4 in
Critical Depth	2.7 in
Channel Slope	0.040 ft/ft
Critical Slope	0.025 ft/ft

Cross Section for POA 004 - Post-POA 004 (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	2.4 in
Discharge	5.51 cfs



Worksheet for POA 004 - Pre-POA 004 (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Discharge	3.31 cfs

Section Definitions

Station (ft)	Elevation (ft)
-0+22.39	645.40
-0+12.48	643.61
0+00.00	642.99
0+08.96	643.06
0+22.26	643.60
0+50.00	644.84

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+22.39, 645.40)	(-0+12.48, 643.61)	0.060
(-0+12.48, 643.61)	(0+22.26, 643.60)	0.030
(0+22.26, 643.60)	(0+50.00, 644.84)	0.060

Options	
Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results	
Normal Depth	1.9 in
Roughness Coefficient	0.030
Elevation	643.15 ft
Elevation Range	643.0 to 645.4 ft
Flow Area	1.5 ft²
Wetted Perimeter	14.5 ft
Hydraulic Radius	1.2 in
Top Width	14.49 ft
Normal Depth	1.9 in
Critical Depth	2.1 in
Critical Slope	0.027 ft/ft
Velocity	2.19 ft/s
Velocity Head	0.07 ft

Worksheet for POA 004 - Pre-POA 004 (STA 0+00)

Results	
Specific Energy	0.24 ft
Froude Number	1.199
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.0 in
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.0 in
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	1.9 in
Critical Depth	2.1 in
Channel Slope	0.040 ft/ft
Critical Slope	0.027 ft/ft

Cross Section for POA 004 - Pre-POA 004 (STA 0+00)

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.040 ft/ft
Normal Depth	1.9 in
Discharge	3.31 cfs