Glade Spring Crossing Subdivision
Preliminary Plat
Stormwater Management Plan
Blacksburg, VA
February 1, 2024

Volume 1 of 3
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Project Description

The purpose of this project is to construct a residential subdivision along Glade Road in Blacksburg, VA. The existing site is mostly undeveloped, except for one dwelling unit and an existing stormwater detention facility. Approximately 176 new dwelling units, 5,300 LF of roadway, 4,000 LF of trail, and four stormwater management facilities are proposed in the Glade Spring Crossing (herein called GSC) development. The exact makeup of the development and the landcover will be determined during the preliminary plat and site plan stages. This stormwater management concept plan provides the general approach to meeting the stormwater management regulations given the features proposed within the greater rezoning document. As such, the calculations and flow rates presented within are preliminary in nature and subject to change.

Conceptual Stormwater Management Approach

Two points of analysis, A and B, are considered for meeting the flood and channel protection regulatory requirements described in 9VAC25-870-66. The channel protection requirement of 9VAC25-870-66.B.3.a. is applied to Points of Analysis A and B to demonstrate regulatory compliance. The "energy balance" equation in this subsection is applied to the onsite runoff areas to determine the allowable peak flow rate during the 1-year, 24-hour design storm. The difference between the predevelopment peak and the allowable is the reduction required at the respective point of analysis. This "required reduction" is subtracted from the total predevelopment peak flow rate (which includes both onsite and offsite runoff) to determine the actual allowable total peak flow rate at the point of analysis post-development during the design storm.

Flood protection compliance is demonstrated by applying 9VAC25-870-66.C.2.b. to each point of analysis. This subsection requires that the post-development peak flow rate of the 10-year, 24-hour design storm is less than the predevelopment peak flow rate at the point of analysis. Both the channel and flood protection requirements are met through the construction of three stormwater management facilities for Point of Analysis A. The requirements are met at Point of Analysis B by reducing the size of the contributing drainage area from the site.

All three are proposed in support of the goal of providing regional stormwater improvements in the Toms Creek watershed. An unnamed tributary to the Shadow Lakes Tributary, which is identified on FEMA FIRM Panel 0127C, conveys urban runoff through the center of the site. The contributing drainage area exceeds 100 acres and thus is subject to the Town of Blacksburg Flood Hazard Overlay and Creek Valley Overlay. An analysis of the 100-year floodplain, Flood Hazard Overlay, and Creek Valley Overlay is provided in the document "Glade Spring Crossing Subdivision Preliminary Plat Submission: Floodplain Calculations" dated November 1, 2023.

These three regional stormwater management facilities also serve the proposed development and assist in meeting flood and channel protection regulatory requirements described in 9VAC25-870-66. at Point of Analysis A. The three ponds, identified as Ponds A, B, and C, discharge to the existing natural channel running through the site and exiting at the Point of Analysis. While Pond A is identified as a proposed facility, it shares the location of the existing detention facility located on the site. Upgrades to this facility are proposed as part of the GSC development. The proposed upgrades include excavation to increase storage volume, modification of the embankment, a new outlet structure, and new discharge culvert. Pond A is proposed to remain a dry detention facility.

Pond B and Pond C act in series to reduce the peak discharge into the receiving channel. The contributing drainage area of Pond B is mostly made up of offsite upstream urban runoff. Pond B is proposed to perform as a dry detention facility, throttling offsite flow before discharging to Pond C. Pond C is proposed to perform as a wet pond, constructed to the Virginia Stormwater BMP Clearinghouse specification for Practice 14: Wet Ponds. Wet ponds built to this specification remove Total Phosphorus and Nitrogen mass load from the contributing drainage area runoff. As such, Pond C is utilized to meet the GSC water quality obligations described in 9VAC25-870-63.

No stormwater management facilities are proposed in the small drainage area discharging to the Shadow Lake Road roadside ditch, Point of Analysis B. The stormwater concept plan provided during the rezoning process documented a fourth possible stormwater management facility, SWM Area D. The concept plan narrative stated the following about this point of analysis:

> *Point of Analysis B currently meets the channel and flood protection requirements without the construction of a BMP; however, during preliminary plat and site design, additional analysis may show the need for a BMP, such as a dry swale, check dams, level spreader, or underground detention.*

As the site design has been refined closer to the final proposed configuration since the rezoning process, it has been determined that SWM Area D is still not needed to meet the requirements. The regulatory requirements described in 9VAC25-870-66 are met by reducing the contributing drainage area and thus the peak flow rate at the point of discharge.

Drainage Pattern Summary

A natural drainage way is present on the site in the existing condition discharging to Point of Analysis A. The drainage way receives offsite runoff from the University Boulevard, Glade Road, Village Way South, and Broce Drive areas. These areas are heavily developed, with land uses including commercial, 1/4-to-1/3-acre lot single family residential, and high density residential (apartments, townhomes). Most of the offsite runoff enters the site from one of two existing culverts under the US 460 Bypass: a “northern” culvert (48” CMP) and “southern”

culvert (36" CMP). An existing detention pond maintained by the Town of Blacksburg is present on the parcel. This pond primarily receives runoff from the "northern" culvert and the adjacent Village at Toms Creek "common area" (tax map number 225-16-A). The runoff from the "southern" culvert is currently undetained and flows freely through the drainage way to the downstream property line. Additional runoff from "The Farm" (tax map number 225-A-5) and the Village at Toms Creek Phase 1, detention pond 1 contribute to the total flow rate at the property line. The combined flow at this point results in downstream flooding in the existing condition. This combined flow accounts for the predevelopment upstream stormwater improvements and ongoing land development projects. These include "The Union" and "The Farm" apartments and their associated underground detention facilities.

To address this flooding, stormwater management improvements are proposed on the 225-A-3 (Glade Spring Crossing) parcel. These include upgrades to the existing Town of Blacksburg detention pond (Pond A), construction of a new dry detention pond to detain flow from the "southern" culvert (Pond B), and construction of a new wet pond to the VA DEQ design specification 14 standard (Pond C). These measures combine to reduce the peak flow rate leaving in the natural drainage way during the 1-year and 10-year, 24-hour storm events. Furthermore, it is shown in a separate document that the water surface elevation of the 100-year floodplain is not increased in the post-development condition.

Point of Analysis B receives minimal runoff from the site in the existing condition. The runoff is primarily from the 30' Town of Blacksburg right of way connecting to Shadow Lake Road and the ~20' width of T.M. 224-(A)-57, which is part of the site. The land cover consists of turf and gravel, which makes up the two driveways in the ~50' wide connection to Shadow Lake Road. In the predevelopment condition, a small portion of the southwest side of T.M. 225-(A)-3 drains towards Point of Analysis B. As part of the proposed grading, the ridge representing the drainage divide is shifted by the cut slope in the rear of the adjacent proposed lots, thus reducing the size of the contributing drainage area to Point of Analysis B.

Methodology

Four designed existing detention facilities are present in the upstream offsite contributing drainage area. Two are located at "The Union" apartment development on University City Boulevard. The third is located at "The Farm" apartment development on Glade Road. The fourth located at the Village at Toms Creek. Engineering calculations for those developments were utilized in determining the peak flow rate during the existing condition. While not designed to serve as detention, both the "northern" and "southern" culverts under US 460 detain flows upstream of the site. Both culverts have been modeled as detention basins to determine accurate flow rates entering the site. The runoff discharged from the "northern" culvert is combined with other contributing areas to be routed through the existing Town of Blacksburg detention pond. Channel routing is performed on the Town of Blacksburg pond, the "southern" culvert discharge, "The Farm" development, and other contributing areas to the discharge point of the site, where

it is combined with the Village pond discharge to determine the total peak flow rate in the existing condition.

The same offsite runoff from across the 460 culverts, the Village, and "The Farm" is utilized to determine the peak flow rate after the proposed stormwater management improvements. Contributing onsite future development is calculated and added to the new stormwater improvements. Runoff resulting from onsite development is determined by measuring the proposed impervious area of the proposed roads, sidewalks, trails, and assumed house and driveway footprints.

"Northern" runoff is routed through the upgraded Town of Blacksburg pond (Pond A). The proposed dry pond (Pond B) and wet pond (Pond C) are intended to operate in series in the southern drainage way through the site. Runoff from the "southern" culvert discharge, "The Farm," and other onsite areas is routed through Pond B. The Pond B discharge is combined with other contributing drainage areas to Pond C. This combined flow is routed through the wet pond. The wet pond (Pond C) discharge, Town of Blacksburg upgraded pond (Pond A) discharge, and other contributing undetained areas are channel routed to the point of discharge from the site where it is combined with the Village pond discharge to determine the peak flow rate after construction of the stormwater management improvements.

Given the location of the Creek Valley Overlay, the proposed improvements must be placed on the upstream side of the site and away from the point of discharge. As such, portions of the 225-A-3 (Glade Spring Crossing) parcel/site are not being detained by the stormwater management facilities. Developed undetained areas are shown to have minimal impact on the peak flow rate at the point of discharge from the property line.

Water Quality

The water quality requirements for the development are achieved through the construction of Pond C, which is a wet pond built to the Virginia Stormwater BMP Clearinghouse specification for Practice 14. Two VRRM spreadsheets are contained in this document. The first is a "site only" analysis to determine the required total phosphorus (TP) reduction for the development. The applicable area for this calculation is 45.65 acres, which includes the entire property area and the right of way connecting to Village Way South. The resulting required TP load reduction is 24.19 lb/year.

The second VRRM spreadsheet contains the drainage area information for the entire contributing area to Pond C. This includes both onsite and offsite runoff. A total of 58.03 acres is contributing to Pond C, which achieves a TP load reduction of 38.43 lb/year. This exceeds the required reduction by 14.24 lb/year. The second spreadsheet also provides the BMP treatment volume that must be accounted for in the design of Pond C. The entire 122,454 cubic foot treatment volume must be provided as wet storage below the permanent pool water surface elevation. As described in the Practice 14 specification, the volume of the required pretreatment

sediment forebay and main pool may both be counted towards this treatment volume. One sediment forebay is proposed to serve Pond C. Both outfalls into the pond discharge to the forebay.

Conveyance Sizing

Preliminary conveyance sizing calculations have been performed for the preliminary plat using the 10-year design storm. Curb inlets have been evaluated using and assumed runoff coefficient (C) of 0.65. A sampling of multiple areas around the proposed development by the engineer indicated that 0.65 was representative of the typical land cover for all curb inlets. A typical rainfall intensity of 4 in./hour was used for all curb inlet evaluations per the criteria described for local roads in Table 9-1 of the VDOT Drainage Manual. The maximum allowable spread for local roads is the gutter width plus ½ of the driving lane. The roll top curb gutter pan is considered to be 1.67' in width. The minimum lane width is 12', resulting in a maximum spread of 7.67' throughout the subdivision. Included in this document is VDOT form LD-204, which contains the curb inlet throat length, bypass, and spread calculations.

Storm drain pipes are also evaluated in this document. Tabular results are provided documenting the 10-year hydraulic grade lines, per the procedure outlined in HEC-22, Chapter 7.

Summary of Stormwater Compliance Results

The table below summarizes the allowable peak flow rates at each point of analysis and after the proposed GSC stormwater improvements. Both the allowable and postdevelopment flow rates are inclusive of the offsite runoff entering the site. The table also describes the water quality benefits from the stormwater improvements in the form of total phosphorus (TP) reduction. Note that the flow rates and TP reductions below are preliminary in nature and subject to change pending complete engineering design.

Preliminary Stormwater Regulatory Summary*				
Water Quantity				
Point of Analysis		Allowable peak flow rate (Q_{allow})	Postdev. Actual peak flow rate (Q_{post})	Regulations met?
A	1-year peak flow rate	75.45 cfs	23.13 cfs	$Q_{post}<Q_{allow}$ ∴ Yes
	10-year peak flow rate	175.77 cfs	96.89 cfs	$Q_{post}<Q_{allow}$ ∴ Yes
B	1-year peak flow rate	1.43 cfs	1.11 cfs	$Q_{post}<Q_{allow}$ ∴ Yes
	10-year peak flow rate	5.66 cfs	4.34 cfs	$Q_{post}<Q_{allow}$ ∴ Yes

Water Quality		
Target TP load reduction	TP load reduction achieved (after SWM improvements)	Excess TP load reduction relative to target
24.19 lb/yr	38.43 lb/yr	+14.24 lb/yr

***Note: All numbers are preliminary and subject to change during site plan engineering design.**

Beyond the regulatory requirements above, the Regional Stormwater Agreement associated with this project placed additional requirements regarding the peak flow rates at Point of Analysis A. The table below summarizes the reduction requirements and the reductions achieved.

Regional Stormwater Improvement Summary at Point of Analysis A*			
Water Quantity			
	Percent reduction required	Percent reduction achieved	Conclusion
1-year peak flow rate	60% (+/-10%)	48.46/75.45 = 64%	Reduction within agreed upon range
10-year peak flow rate	48% (+/-10%)	78.88/175.77 = 45%	Reduction within agreed upon range

***Note: All numbers are preliminary and subject to change during site plan engineering design.**

Town of Blacksburg Flood Hazard Overlay and Creek Valley Overlay

No flood study is on record establishing the 100-year base flood water surface elevation within the existing drainage way. As such, in pursuance of Section 3243(b) of the zoning

ordinance, the engineer prepared a preliminary floodplain study to delineate the existing floodplain and the subsequent Flood Hazard Overlay (FHO) and Creek Valley Overlay (CVO). This flood study is provided in a separate document. The engineer proposes that the FHO be defined as the floodplain shown within the flood study. A final delineation study of the floodplain and CVO will be prepared during the preliminary plat process for Town approval.

The CVO limits are proposed to be modified as part of this project, pursuant to Section 3231. The calculated 100-year floodplain is utilized as the basis for the redefined CVO. The new CVO includes areas within the floodplain, areas within 50 feet of the channel centerline, and adjacent slopes 25% or steeper. Slopes were confirmed by the topographic survey dated 4/28/2022 sealed by a licensed land surveyor. The resulting CVO is depicted in this stormwater management analysis and in the rezoning documents.

The study further documents that the proposed Glade Spring Crossing development and stormwater management improvements do not result in an increase in the water surface elevation at any point along the analyzed floodplain. The preliminary redrawn Creek Valley Overlay is compared to the existing CVO in Appendix A.

Wetlands and Jurisdictional Waters

A preliminary wetland delineation and jurisdictional water evaluation performed has been performed prior to the proposed project. Five areas have been identified as possible wetlands on the site. Pond C on this plan will impact one of the identified wetlands. A map depicting the preliminary wetlands and jurisdictional waters is included in Appendix B. Note that these areas are preliminary and have not yet been confirmed by the US Army Corps of Engineers.

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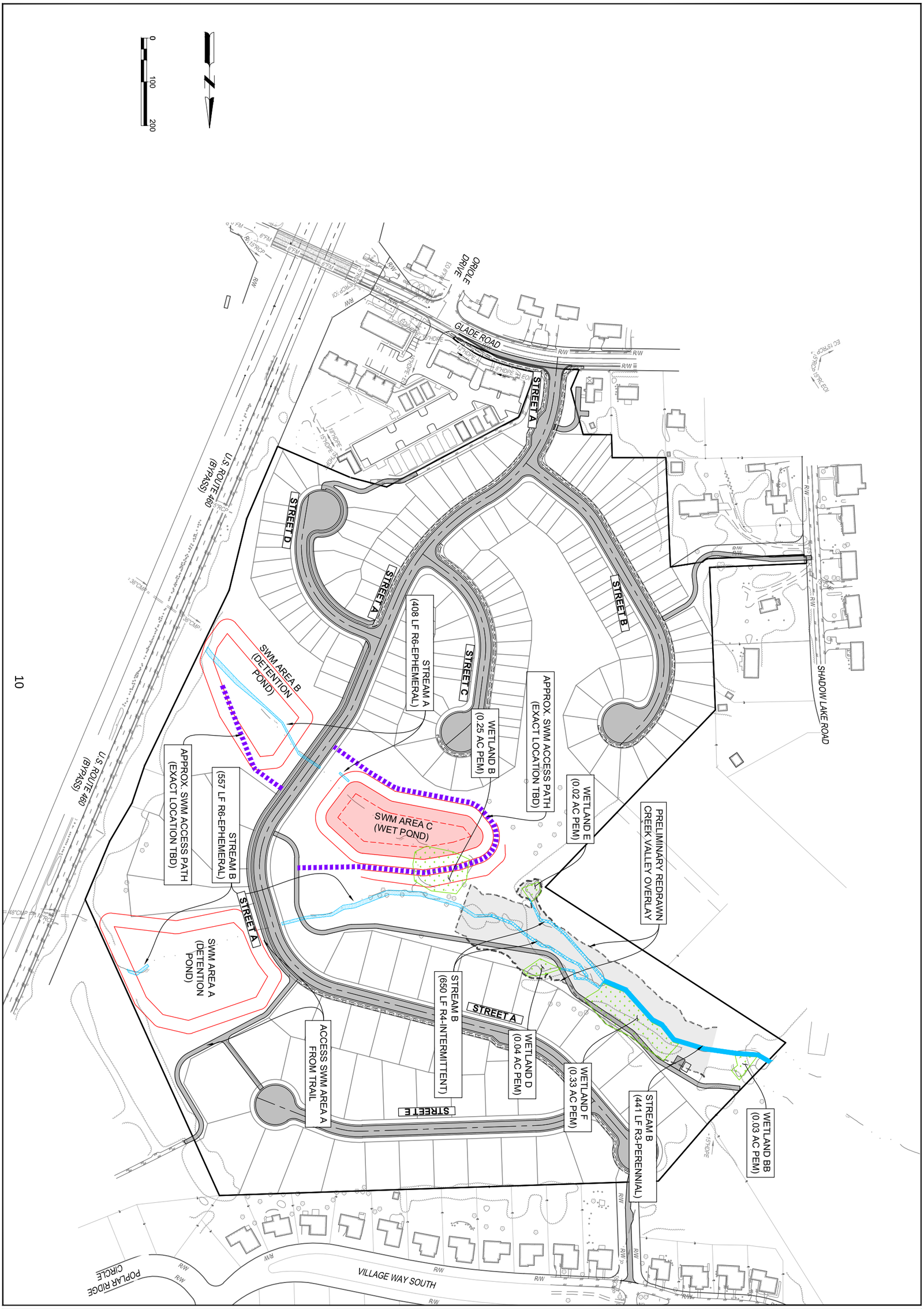

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PROPOSED DEVELOPMENT OF
GLADE SPRING CROSSING
ZONED PLANNED RESIDENTIAL - ORDINANCE 2007

PROPERTY OF GLADE SPRING CROSSING, LLC
TM# 225-(A)-3, 225-(A)-4, & 224-(A)-57; 45.0976 AC.

TOWN OF BLACKSBURG - PRICES FORK DISTRICT
MONTGOMERY COUNTY, VIRGINIA

NOT FOR CONSTRUCTION

STORMWATER MANAGEMENT AREAS EXHIBIT

PRELIMINARY

No.	Revision Issue	Date

Drawn By: MSF
Checked By: WGB
Date: 02/01/2024
Scale: AS SHOWN
Sheet No. 1 of 1
SWM

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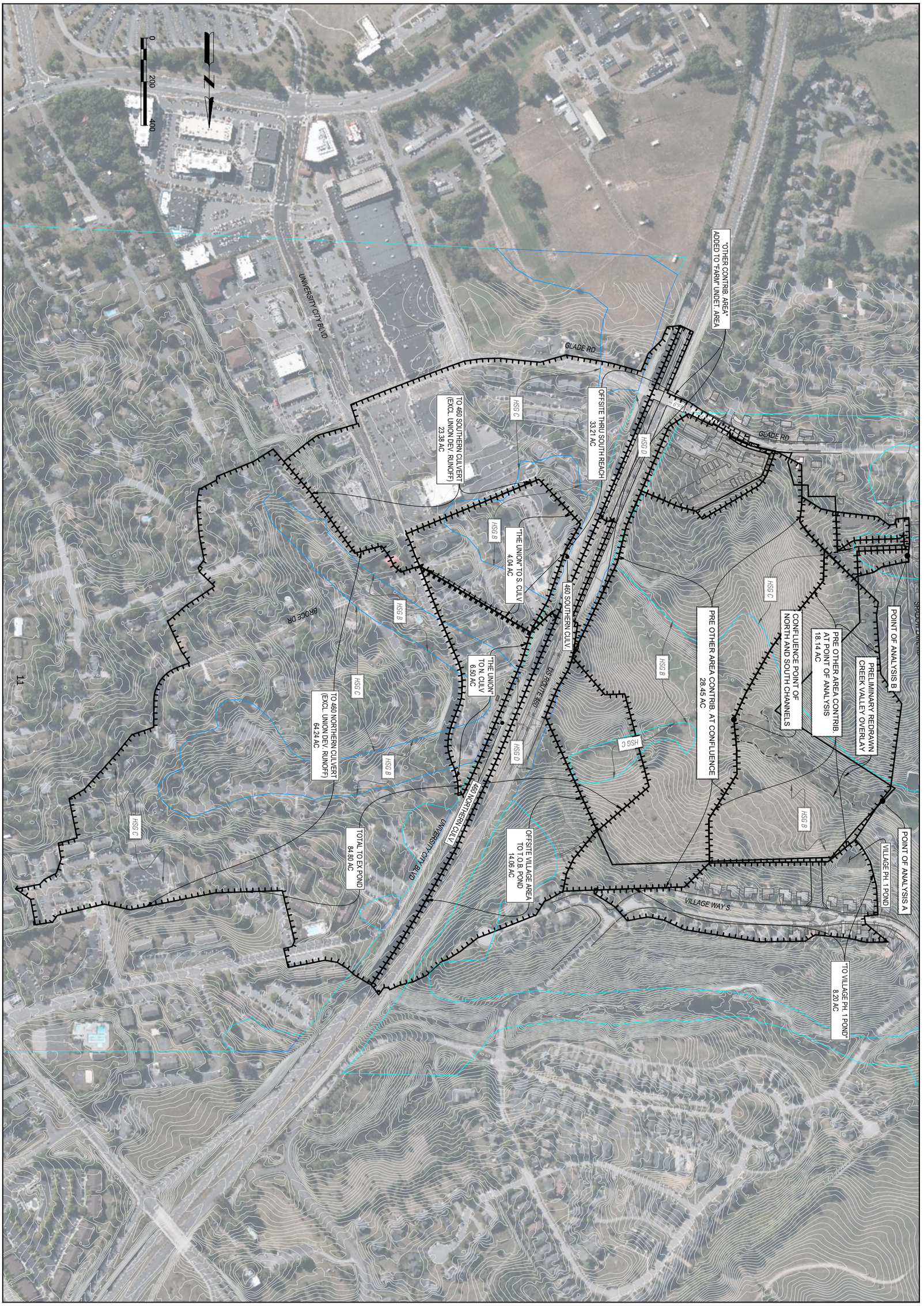

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Sheet No. 1 of 1	Drawn By: MSF	PROPOSED DEVELOPMENT OF GLADE SPRING CROSSING ZONED PLANNED RESIDENTIAL - ORDINANCE 2007 PROPERTY OF GLADE SPRING CROSSING, LLC TM# 225-(A)-3, 225-(A)-4, & 224-(A)-57; 45.0976 AC. TOWN OF BLACKSBURG - PRICES FORK DISTRICT MONTGOMERY COUNTY, VIRGINIA	NOT FOR CONSTRUCTION PREDEVELOPMENT OFFSITE CONTRIBUTING DRAINAGE AREAS PRELIMINARY
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	Date: 11/01/2023		
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No.	Revision Issue	Date

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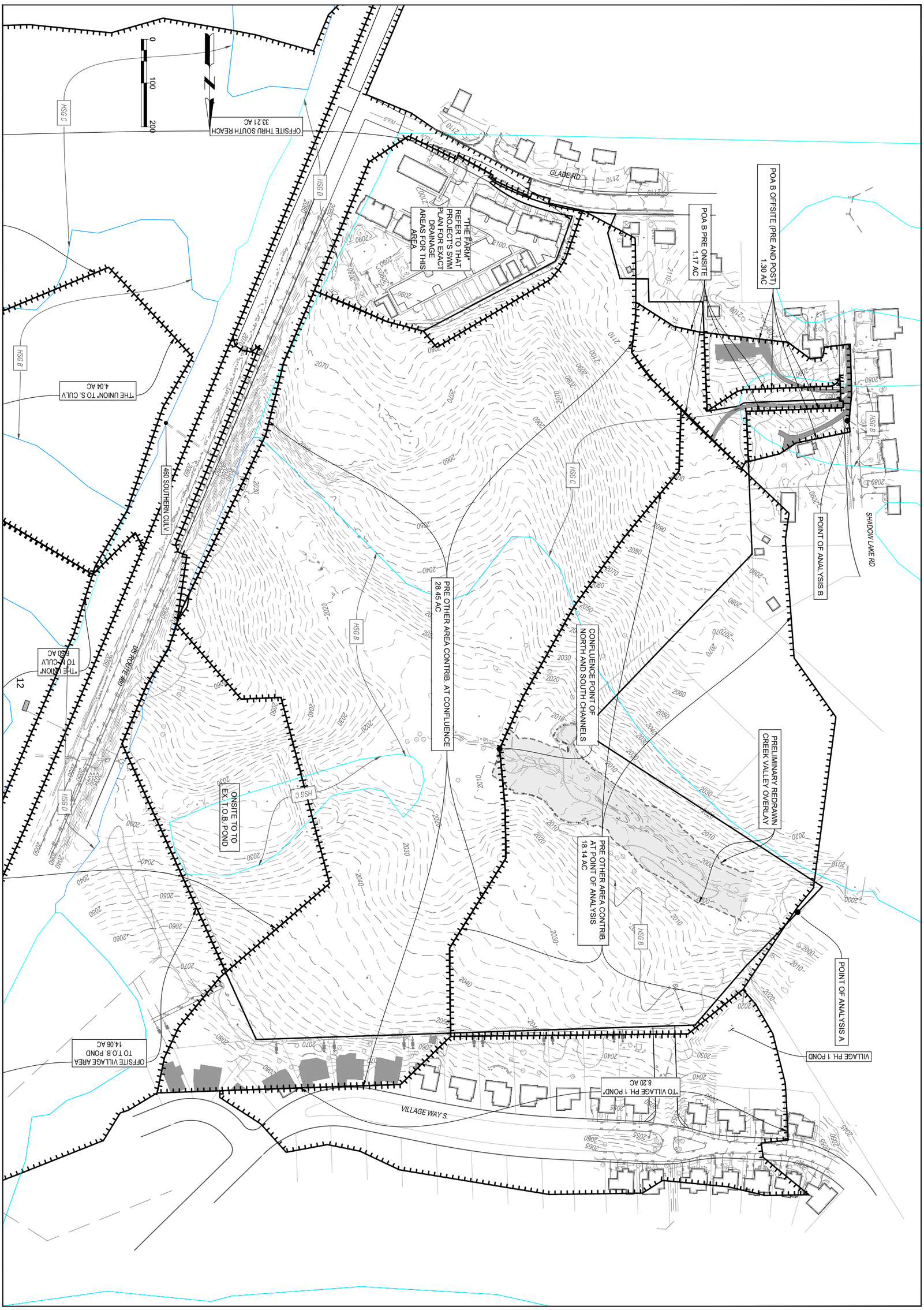

Sheet No. 1 of 1	Checked By: ---	Drawn By: MSF	PROPOSED DEVELOPMENT OF GLADE SPRING CROSSING ZONED PLANNED RESIDENTIAL - ORDINANCE 2007 PROPERTY OF GLADE SPRING CROSSING, LLC TM# 225-(A)-3, 225-(A)-4, & 224-(A)-57; 45.0976 AC. TOWN OF BLACKSBURG - PRICES FORK DISTRICT MONTGOMERY COUNTY, VIRGINIA	NOT FOR CONSTRUCTION PREDEVELOPMENT ONSITE DRAINAGE AREAS	PRELIMINARY No. Revision Issue Date
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PROPOSED DEVELOPMENT OF
GLADE SPRING CROSSING
ZONED PLANNED RESIDENTIAL - ORDINANCE 2007

PROPERTY OF GLADE SPRING CROSSING, LLC
TM# 225-(A)-3, 225-(A)-4, & 224-(A)-57; 45.0976 AC.

TOWN OF BLACKSBURG - PRICES FORK DISTRICT
MONTGOMERY COUNTY, VIRGINIA

POSTDEVELOPMENT ONSITE DRAINAGE AREAS

PRELIMINARY

No.	Revision Issue	Date

Drawn By: MSF
Checked By: MTJ
Date: 10/24/2023
Scale: AS SHOWN
Sheet No. 1 of 1
D3

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NOAA Atlas 14, Volume 2, Version 3
Location name: Blacksburg, Virginia, USA*
Latitude: 37.2393°, Longitude: -80.4395°
Elevation: 2009.87 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

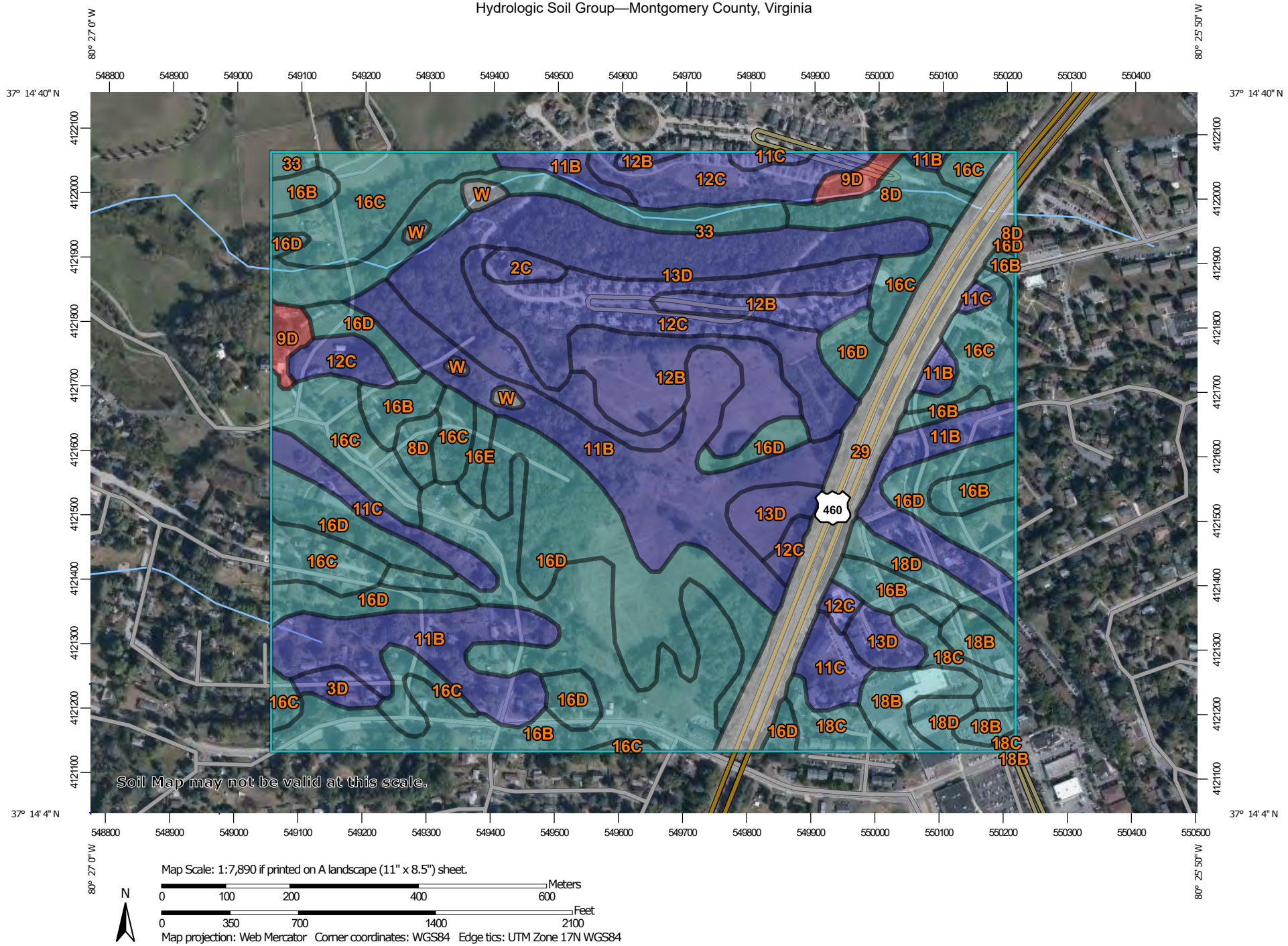
PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.294** (0.267-0.326)	**0.351** (0.318-0.389)	**0.421** (0.380-0.466)	**0.471** (0.424-0.521)	**0.533** (0.476-0.589)	**0.575** (0.510-0.636)	**0.616** (0.542-0.684)	**0.653** (0.569-0.729)	**0.697** (0.599-0.785)	**0.729** (0.618-0.827)
10-min	**0.470** (0.426-0.520)	**0.561** (0.508-0.622)	**0.674** (0.609-0.746)	**0.754** (0.679-0.833)	**0.849** (0.759-0.938)	**0.915** (0.812-1.01)	**0.979** (0.861-1.09)	**1.03** (0.902-1.16)	**1.10** (0.947-1.24)	**1.15** (0.973-1.30)
15-min	**0.588** (0.533-0.651)	**0.706** (0.639-0.782)	**0.853** (0.771-0.944)	**0.953** (0.859-1.05)	**1.08** (0.962-1.19)	**1.16** (1.03-1.28)	**1.24** (1.09-1.37)	**1.31** (1.14-1.46)	**1.39** (1.19-1.56)	**1.44** (1.22-1.63)
30-min	**0.806** (0.731-0.892)	**0.975** (0.882-1.08)	**1.21** (1.10-1.34)	**1.38** (1.24-1.53)	**1.59** (1.43-1.76)	**1.75** (1.55-1.93)	**1.90** (1.67-2.11)	**2.03** (1.77-2.27)	**2.21** (1.90-2.49)	**2.33** (1.98-2.65)
60-min	**1.00** (0.911-1.11)	**1.22** (1.11-1.36)	**1.55** (1.40-1.72)	**1.80** (1.62-1.99)	**2.12** (1.90-2.35)	**2.37** (2.10-2.62)	**2.61** (2.30-2.90)	**2.85** (2.48-3.18)	**3.17** (2.72-3.57)	**3.41** (2.89-3.86)
2-hr	**1.17** (1.06-1.29)	**1.42** (1.29-1.57)	**1.81** (1.64-1.99)	**2.10** (1.90-2.32)	**2.49** (2.23-2.75)	**2.79** (2.49-3.09)	**3.10** (2.73-3.44)	**3.40** (2.97-3.80)	**3.81** (3.27-4.29)	**4.11** (3.48-4.67)
3-hr	**1.25** (1.14-1.38)	**1.52** (1.38-1.67)	**1.92** (1.75-2.11)	**2.23** (2.02-2.46)	**2.65** (2.38-2.91)	**2.97** (2.65-3.28)	**3.30** (2.92-3.65)	**3.64** (3.18-4.05)	**4.08** (3.50-4.59)	**4.42** (3.74-5.02)
6-hr	**1.53** (1.42-1.68)	**1.85** (1.71-2.02)	**2.31** (2.13-2.53)	**2.69** (2.46-2.94)	**3.20** (2.91-3.51)	**3.62** (3.26-3.97)	**4.06** (3.60-4.47)	**4.52** (3.95-5.00)	**5.16** (4.41-5.76)	**5.66** (4.75-6.39)
12-hr	**1.86** (1.72-2.03)	**2.23** (2.06-2.44)	**2.78** (2.57-3.04)	**3.25** (2.98-3.54)	**3.91** (3.54-4.26)	**4.46** (3.99-4.87)	**5.05** (4.46-5.54)	**5.69** (4.94-6.28)	**6.62** (5.59-7.40)	**7.39** (6.11-8.34)
24-hr	**2.26** (2.10-2.44)	**2.73** (2.54-2.94)	**3.47** (3.22-3.73)	**4.06** (3.77-4.37)	**4.93** (4.54-5.29)	**5.65** (5.18-6.07)	**6.44** (5.85-6.90)	**7.28** (6.56-7.82)	**8.51** (7.56-9.16)	**9.54** (8.39-10.3)
2-day	**2.68** (2.51-2.89)	**3.25** (3.03-3.50)	**4.09** (3.80-4.40)	**4.78** (4.43-5.13)	**5.75** (5.30-6.17)	**6.55** (6.01-7.03)	**7.41** (6.75-7.95)	**8.32** (7.52-8.94)	**9.63** (8.60-10.4)	**10.7** (9.46-11.6)
3-day	**2.85** (2.67-3.07)	**3.45** (3.22-3.71)	**4.33** (4.04-4.65)	**5.05** (4.69-5.41)	**6.06** (5.60-6.49)	**6.89** (6.34-7.38)	**7.77** (7.11-8.33)	**8.71** (7.90-9.35)	**10.0** (9.00-10.8)	**11.1** (9.87-12.0)
4-day	**3.02** (2.83-3.24)	**3.65** (3.41-3.91)	**4.58** (4.28-4.90)	**5.32** (4.96-5.70)	**6.37** (5.90-6.81)	**7.23** (6.67-7.73)	**8.14** (7.46-8.71)	**9.10** (8.27-9.75)	**10.5** (9.40-11.3)	**11.6** (10.3-12.5)
7-day	**3.52** (3.29-3.78)	**4.24** (3.96-4.55)	**5.25** (4.90-5.63)	**6.05** (5.64-6.50)	**7.17** (6.65-7.69)	**8.07** (7.45-8.64)	**8.99** (8.27-9.66)	**9.96** (9.10-10.7)	**11.3** (10.2-12.2)	**12.4** (11.1-13.4)
10-day	**4.05** (3.79-4.33)	**4.86** (4.56-5.19)	**5.94** (5.56-6.34)	**6.76** (6.32-7.21)	**7.88** (7.33-8.40)	**8.75** (8.11-9.32)	**9.63** (8.89-10.3)	**10.5** (9.66-11.2)	**11.7** (10.7-12.6)	**12.7** (11.5-13.6)
20-day	**5.51** (5.21-5.84)	**6.56** (6.19-6.94)	**7.85** (7.40-8.30)	**8.85** (8.33-9.36)	**10.2** (9.57-10.8)	**11.2** (10.5-11.9)	**12.3** (11.4-13.0)	**13.3** (12.4-14.2)	**14.7** (13.6-15.7)	**15.8** (14.5-16.9)
30-day	**6.85** (6.48-7.24)	**8.10** (7.66-8.56)	**9.51** (8.99-10.0)	**10.6** (9.98-11.2)	**12.0** (11.2-12.6)	**13.0** (12.2-13.7)	**14.0** (13.1-14.8)	**15.0** (14.0-15.9)	**16.3** (15.1-17.3)	**17.2** (15.9-18.4)
45-day	**8.67** (8.23-9.13)	**10.2** (9.68-10.7)	**11.8** (11.2-12.4)	**13.0** (12.3-13.7)	**14.5** (13.7-15.2)	**15.6** (14.7-16.4)	**16.7** (15.7-17.5)	**17.7** (16.6-18.6)	**18.9** (17.7-20.0)	**19.8** (18.5-21.0)
60-day	**10.4** (9.93-11.0)	**12.2** (11.6-12.8)	**13.9** (13.3-14.6)	**15.2** (14.5-16.0)	**16.8** (15.9-17.6)	**17.9** (17.0-18.8)	**18.9** (17.9-19.9)	**19.9** (18.8-21.0)	**21.1** (19.8-22.3)	**21.9** (20.6-23.2)

[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.

Please refer to NOAA Atlas 14 document for more information.



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Meters: 0 100 200 400 600

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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 Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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 1:15,800.

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: Montgomery County, Virginia
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Sep 29, 2019—Oct 4, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2C	Berks-Groseclose complex, 7 to 15 percent slopes	B	1.3	0.5%
3D	Berks-Lowell-Rayne complex, 15 to 25 percent slopes	B	1.4	0.5%
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	C	5.6	2.1%
9D	Carbo and Chilhowie soils, 15 to 25 percent slopes	D	2.6	1.0%
11B	Duffield-Ernest complex, 2 to 7 percent slopes	B	39.6	14.8%
11C	Duffield-Ernest complex, 7 to 15 percent slopes	B	7.4	2.8%
12B	Frederick and Vertrees silt loams, 2 to 7 percent slopes	B	13.1	4.9%
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	B	25.3	9.4%
13D	Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes	B	25.0	9.3%
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	C	35.5	13.2%
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	C	30.3	11.3%
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	C	37.2	13.9%
16E	Groseclose and Poplimento soils, 25 to 60 percent slopes	C	1.2	0.4%
18B	Groseclose-Urban land complex, 2 to 7 percent slopes	C	6.3	2.4%
18C	Groseclose-Urban land complex, 7 to 15 percent slopes	C	4.8	1.8%
18D	Groseclose-Urban land complex, 15 to 25 percent slopes	C	4.3	1.6%

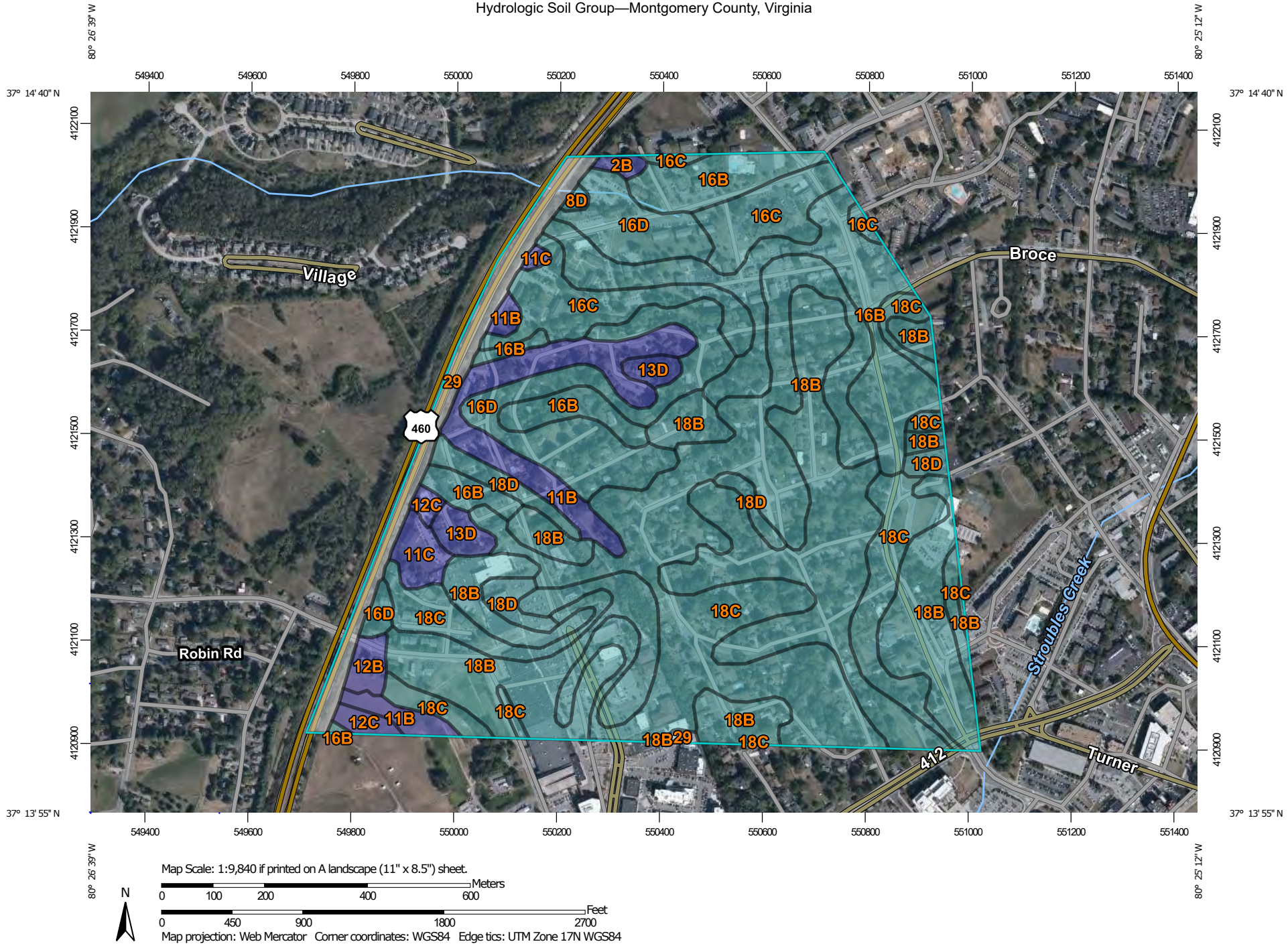
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
29	Udorthents and Urban land		16.2	6.1%
33	Weaver soils	C	9.6	3.6%
W	Water		1.3	0.5%
Totals for Area of Interest			**268.1**	**100.0%**

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher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Turner
Stroubles Creek
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Meters
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Feet
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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 Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

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 1:15,800.

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)

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

Soil Survey Area: Montgomery County, Virginia
Survey Area Data: Version 13, Jun 5, 2020

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

Date(s) aerial images were photographed: Sep 29, 2019—Oct 4, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
2B	Berks-Groseclose complex, 2 to 7 percent slopes	B	0.8	0.3%
8D	Caneyville-Opequon-Rock outcrop complex, 7 to 25 percent slopes	C	0.4	0.1%
11B	Duffield-Ernest complex, 2 to 7 percent slopes	B	15.1	5.4%
11C	Duffield-Ernest complex, 7 to 15 percent slopes	B	3.2	1.1%
12B	Frederick and Vertrees silt loams, 2 to 7 percent slopes	B	1.9	0.7%
12C	Frederick and Vertrees silt loams, 7 to 15 percent slopes	B	2.0	0.7%
13D	Frederick and Vertrees gravelly silt loams, 15 to 25 percent slopes	B	3.4	1.2%
16B	Groseclose and Poplimento soils, 2 to 7 percent slopes	C	36.4	13.0%
16C	Groseclose and Poplimento soils, 7 to 15 percent slopes	C	18.1	6.4%
16D	Groseclose and Poplimento soils, 15 to 25 percent slopes	C	25.9	9.2%
18B	Groseclose-Urban land complex, 2 to 7 percent slopes	C	79.7	28.4%
18C	Groseclose-Urban land complex, 7 to 15 percent slopes	C	75.6	26.9%
18D	Groseclose-Urban land complex, 15 to 25 percent slopes	C	7.1	2.5%
29	Udorthents and Urban land		11.1	3.9%
Totals for Area of Interest			**280.8**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

WATER QUALITY

SITE ONLY ANALYSIS TO DETERMINE REQUIRED TP LOAD REDUCTION

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: Glade Heights Preliminary Analysis for Site

Date: 45231

Total Rainfall (in):	**43**
Total Disturbed Acreage:	**45.65**

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	28.28	17.33	0.00	45.61	100
Managed Turf (acres)	0.00	0.00	0.00	0.00	0.00	0
Impervious Cover (acres)	0.00	0.00	0.04	0.00	0.04	0
					45.65	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.00	0.00	0.00	0.00	0
Managed Turf (acres)	0.00	21.77	11.27	0.00	33.04	72
Impervious Cover (acres)	0.00	6.51	6.10	0.00	12.61	28
					45.65	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	0.41	0.21	0.95	0.03
Treatment Volume (ft^3)	68,284	24,932	43,352	4,133
TP Load (lb/yr)	42.90	15.66	27.24	2.60

Baseline TP Load (lb/yr): 13.562226* **Reduction below new development load limitation not required*

Total TP Load Reduction Required (lb/yr)	**24.19**	2.10	22.08

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)
0.08	**0.94**	**0.47**

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	306.92	25.72

SITE ONLY ANALYSIS TO DETERMINE REQUIRED TP LOAD REDUCTION

Site Compliance Summary

Maximum % Reduction Required Below Pre-ReDevelopment Load	20%

** Note: % Reduction will reduce post-development TP load to less than or equal to baseline load of 13.56 lb/yr (0.41 lb/ac/yr)*
[Required reduction for Post-ReDev. = Post-ReDev TP load - baseline load of 13.562226 lb/yr], baseline load = site area x 0.41 lb/ac/yr

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)	42.90
Remaining TP Load Reduction (lb/yr) Required	**24.19**

**Reduction below new development load limitation not required*

TOTAL AREA TO WET POND
TO DETERMINE TP REMOVED BY BMP

DEQ Virginia Runoff Reduction Method Re-Development Compliance Spreadsheet - Version 3.0

BMP Design Specifications List: **2013 Draft Stds & Specs**

Site Summary

Project Title: Glade Heights Preliminary Analysis to Wet Pond
Date: 45231

Total Rainfall (in):	**43**
Total Disturbed Acreage:	**58.03**

Site Land Cover Summary

Pre-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total
Forest/Open (acres)	0.00	0.72	1.66	1.53	3.91	7
Managed Turf (acres)	0.00	9.18	21.88	0.72	31.78	55
Impervious Cover (acres)	0.00	2.55	18.54	1.25	22.34	38
					58.03	100

Post-ReDevelopment Land Cover (acres)

	A soils	B Soils	C Soils	D Soils	Totals	% of Total	
Forest/Open (acres)	0.00	0.72	1.66	1.53	3.91	7	*
Managed Turf (acres)	0.00	7.26	16.07	0.72	24.05	41	
Impervious Cover (acres)	0.00	4.47	24.35	1.25	30.07	52	
*** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method**					58.03	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	0.58	0.53	0.95	0.53
Treatment Volume (ft^3)	123,051	96,394	26,657	96,394
TP Load (lb/yr)	77.31	60.56	16.75	60.56

Total TP Load Reduction Required (lb/yr)	**25.69**	12.11	13.58

	Final Post-Development Load (Post-ReDevelopment & New Impervious)	Pre-ReDevelopment
TN Load (lb/yr)	553.08	460.39

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)
1.20	**1.33**	**1.20**

Wet pond contributing drainage area
5.83 ac (Union runoff to south culvert)
23.38 ac ("To 460 South Culvert (excl. Union")
4.00 ac (Runoff from "The Farm")
9.95 ac ("Post onsite to Pond B")
11.56 ac ("Postdev to Pond C")
58.03 ac total

TOTAL AREA TO WET POND
TO DETERMINE TP REMOVED BY BMP

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)	38.43
Total TN Load Reduction Achieved (lb/yr)	164.93
Remaining Post Development TP Load (lb/yr)	38.89
Remaining TP Load Reduction (lb/yr) Required	**0.00**

**** TARGET TP REDUCTION EXCEEDED BY [redacted]LB/YEAR ****

SEE SITE ONLY VRRM ANALYSIS FOR TARGET TP REDUCTION (24.19 LB/YR)
TP LOAD REDUCTION ACHIEVED: 38.43 LB/YR
TARGET TP REDUCTION EXCEED BY:
38.43 - 24.19 = 14.24 LB/YR

TOTAL AREA TO WET POND
TO DETERMINE TP REMOVED BY BMP

Drainage Area Summary

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	Total
Forest/Open (acres)	3.91	0.00	0.00	0.00	0.00	3.91
Managed Turf (acres)	24.05	0.00	0.00	0.00	0.00	24.05
Impervious Cover (acres)	30.07	0.00	0.00	0.00	0.00	30.07
Total Area (acres)	**58.03**	**0.00**	**0.00**	**0.00**	**0.00**	**58.03**

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)	38.43	0.00	0.00	0.00	0.00	38.43
TN Load Reduced (lb/yr)	164.93	0.00	0.00	0.00	0.00	164.93

TOTAL AREA TO WET POND
TO DETERMINE TP REMOVED BY BMP

Drainage Area A Summary

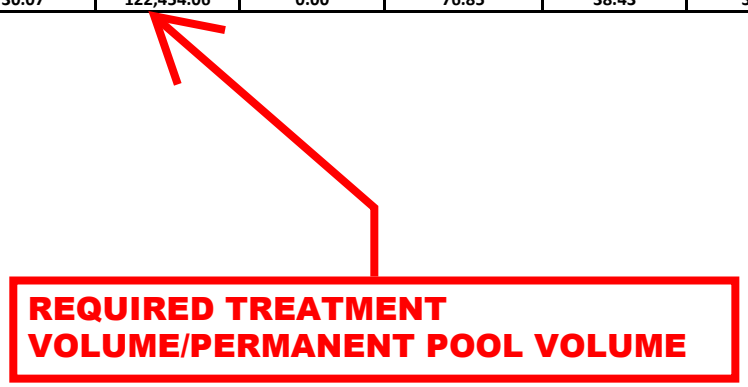
Land Cover Summary

	A Soils	B Soils	C Soils	D Soils	Total	% of Total
Forest/Open (acres)	0.00	0.72	1.66	1.53	3.91	7
Managed Turf (acres)	0.00	7.26	16.07	0.72	24.05	41
Impervious Cover (acres)	0.00	4.47	24.35	1.25	30.07	52
					58.03	

BMP Selections

Practice	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
13.a. Wet Pond #1 (Spec #14)	**24.05**	**30.07**	**122,454.06**	**0.00**	**76.85**	**38.43**	**38.43**	

Total Impervious Cover Treated (acres)	30.07
Total Turf Area Treated (acres)	24.05
Total TP Load Reduction Achieved in D.A. (lb/yr)	38.43
Total TN Load Reduction Achieved in D.A. (lb/yr)	164.93



Pond C Storage Volumes

Permanent Pool Storage Volume													
Elevation (msl)	Forebay (sf)	Forebay (ac)	Incr. FB Volume (cu-ft)	FB Volume (cu-ft)	FB Volume (ac-ft)	Perm. Pool (sf)	Perm. Pool (ac)	Pool Incr. Volume (cu-ft)	Pool Volume (cu-ft)	Pool Volume (ac-ft)	Total Avail. Treatment Volume (FB Vol. + Pool Vol.)		
2009	2231	0.0000	0.0	0	0.0000	1888	0.1474	0.0	0	0.0000	0	0.0000	
2010	2881	0.0661	2556.0	2556	0.0587	13558	0.3112	7723.0	7723	0.1773	10279	0.2360	
2011	3597	0.0826	3239.0	5795	0.1330	15267	0.3505	14412.5	22136	0.5082	27931	0.6412	
2012	4379	0.1005	3988.0	9783	0.2246	17038	0.3911	16152.5	38288	0.8790	48071	1.1036	
2013	5227	0.1200	4803.0	14586	0.3348	18873	0.4333	17955.5	56244	1.2912	70830	1.6260	
2014	6142	0.1410	5684.5	20271	0.4653	20772	0.4769	19822.5	76066	1.7462	96337	2.2116	
2015	7897	0.1813	7019.5	27290	0.6265	24617	0.5651	22694.5	98761	2.2672	126051	2.8937	
2015.3	9852	0.2262	2662.3	**29952**	**0.6876**	29004	0.6658	8043.1	106804	2.4519	**136756**	**3.1395**	<-Perm. Pool WSE

Required forebay volume range	Contrib. imperv. Area =	30.07 ac	
	Min. = 0.1 in. per imperv. Acre =	10915 cu-ft	0.2506 ac-ft
	Max. = 0.25 in. per imperv. Acre =	27289 cu-ft	0.6265 ac-ft
	Designed forebay vol. @ 2015.3 =	**29952** cu-ft	**0.6876** ac-ft
	Conclusion: Adequate volume has been provided		

Required permanent pool volume	VRRM BMP Tv (min. permanent pool vol.) =	122454 cu-ft	2.8112 ac-ft
	Designed permanent pool vol. @ 2015.3 =	**136756** cu-ft	**3.1395** ac-ft
	Conclusion: Adequate volume has been provided		

Dry Detention Storage Volume							
Elevation (msl)	Dry Det. Contour (sf)	Dry Det. Contour (ac)	Incr. Dry Det. Volume (cu-ft)	Dry Det. Volume (cu-ft)	Dry Det. Volume (ac-ft)	Total Pond Volume (Wet Treatment volume total + Det. Volume) (cu-ft)	Total Pond Volume (Wet Treatment volume total + Det. Volume) (ac-ft)
2015.3	38856	0.8920	0.0	0	0.0000	136756	3.1395
2016	49082	1.1268	30778.3	30778	0.7066	167534	3.8461
2017	51889	1.1912	50485.5	81264	1.8656	218020	5.0050
2018	54751	1.2569	53320.0	134584	3.0896	271340	6.2291
2019	57640	1.3232	56195.5	190779	4.3797	327535	7.5192
2020	60651	1.3924	59145.5	249925	5.7375	386681	8.8770

WATER QUANTITY

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1] Average runoff condition, and $I_a = 0.2S$.

[2] The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

[3] CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

[4] Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

[5] Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Table 2-2c Runoff curve numbers for other agricultural lands [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2/]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3/]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4/]	48	65	73
Woods—grass combination (orchard or tree farm). [5/]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6/]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4/]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.

2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.

3 *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

4 Actual curve number is less than 30; use CN = 30 for runoff computations.

5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.