

Project Name:

True North Data Site Plan

Date:

8/23/2017

BMP Design Specifications List:

2011 Stds & Specs

CLEAR ALL

(Ctrl+Shift+R)

data input cells

constant values

calculation cells

final results

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals
Forest/Open Space (acres) – undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	9.00	9.00
Managed Turf (acres) – disturbed, graded for yards or other turf to be mowed/managed	0.00	4.95	1.85	9.16	15.96
Impervious Cover (acres)	0.00	6.09	2.43	12.19	20.71
* Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method					45.67

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	35.58
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Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.53	3.05	4.61

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

Drainage Area Curve Numbers and Runoff Depths*

Curve numbers (CN, CNadj) and runoff depths (RV_{Developed}) are computed with and without reduction practices.

Drainage Area A

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	0.00	3.34	0.40	4.22
Impervious Cover	0.00	3.64	1.21	7.29

Total Area (acres):

20.11

Runoff Reduction Volume (ft³):

4,146

RV_{Developed} (watershed-inch) with no Runoff Reduction*

RV_{Developed} (watershed-inch) with Runoff Reduction*

Adjusted CN*

1-year storm	2-year storm	10-year storm
1.41	1.86	3.30
1.35	1.81	3.24
87	87	87

Drainage Area B

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	0.00	0.00	0.00	0.00
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	0.00	1.77	0.21	2.23
Impervious Cover	0.00	2.45	0.82	4.90

Total Area (acres):

12.37

Runoff Reduction Volume (ft³):

0

RV_{Developed} (watershed-inch) with no Runoff Reduction*

RV_{Developed} (watershed-inch) with Runoff Reduction*

Adjusted CN*

1-year storm	2-year storm	10-year storm
1.48	1.95	3.40
1.48	1.95	3.40
89	89	89

CN_(D.A. A)

88

CN_(D.A. B)

89

*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.

LAND COVER SUMMARY – POST DEVELOPMENT

Land Cover Summary

Forest/Open Space Cover (acres)	9.00
Weighted Rv (forest)	0.05
% Forest	20%
Managed Turf Cover (acres)	15.96
Weighted Rv (turf)	0.23
% Managed Turf	35%
Impervious Cover (acres)	20.71
Rv (Impervious)	0.95
% Impervious	45%
Site Area (acres)	45.67
Site Rv	0.52

Treatment Volume and Nutrient Loads

Treatment Volume (acre-ft)	1.9843
Treatment Volume (cubic feet)	86,435
TP Load (lb/yr)	54.31
TN Load (lb/yr) (Informational Purposes Only)	388.50

ALL CONSTRUCTION SHALL CONFORM TO THE CURRENT LOUDOUN COUNTY, LOUDOUN WATER AND VIRGINIA DEPT. OF TRANSPORTATION STANDARDS AND SPECIFICATIONS.

SWM/BMP FACILITY NAME

TYPE OF FACILITY

TOTAL ACRES TREATED

IMPERVIOUS ACRES TREATED

LATITUDE

LONGITUDE

DESCRIPTION OF DICHARGE

SWM A	Stormtech Isolator Row	20.11	12.15	39.041	-77.539	24" HDPE to Bayfilter A
SWM B	Stormtech Isolator Row	12.37	8.16	39.041	-77.538	24" HDPE to Bayfilter B
Bayfilter A	Stormtech Bayfilter	20.11	12.15	39.041	-77.539	24" RCP to Natural Stream
Bayfilter B	Underground Facility	12.37	8.16	39.041	-77.538	24" RCP to Natural Stream
Bioretention A	Bioretention Basin	4.77	2.45	39.042	-77.541	24" RCP to SWM A

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	3.34	0.40	4.22	7.96	0.23
Impervious Cover (acres)	0.00	3.64	1.21	7.29	12.15	0.95
Total	0.00	3.64	1.21	7.29	20.11	

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

30.46

Post Development Treatment Volume in D.A. A (ft³)

48,473

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	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
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	2.32	2.45	0	4,146	6,219	10,365	25	0.00	6.50	3.58	2.93	14.a. MTD - Hydrodynamic
6.b. Bioretention #2 or Micro-Bioretention #2 (Spec #9)	80			0	0	0	0	50	0.00	0.00	0.00	0.00	
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0	5.64	9.70	6,219	0	44,327	44,327	40	2.93	23.92	10.74	16.11	14.b. MTD - Filtering
14.b. Manufactured Treatment Device-Filtering	0			44,327	0	44,327	44,327	50	16.11	0.00	8.05	8.05	

Drainage Area B

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)	0.00	0.00	0.00	0.00	0.00	0.00
Managed Turf (acres)	0.00	1.77	0.21	2.23	4.21	0.23
Impervious Cover (acres)	0.00	2.45	0.82	4.90	8.16	0.95
Total	0.00	2.45	0.82	4.90	12.37	

total Phosphorus Available for Removal in D.A. B (lb/yr)

19.86

Post Development Treatment Volume in D.A. B (ft³)

31,616

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	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
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0	4.21	8.16	0	0	31,616	31,616	40	0.00	19.84	7.94	11.91	14.b. MTD - Filtering
14.b. Manufactured Treatment Device-Filtering	0			31,616	0	31,616	31,616	50	11.91	0.00	5.95	5.95	

Site Results (Water Quality Compliance)

Area Checks

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	12.15	8.16	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	12.15	8.16	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	7.96	4.21	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	7.96	4.21	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft³)

2

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)	4,146	0	0	0	0	4,146
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	30.46	19.86	0.00	0.00	0.00	50.32
TP LOAD REDUCTION ACHIEVED (lb/yr)	22.37	13.89	0.00	0.00	0.00	36.26
TP LOAD REMAINING (lb/yr)	8.09	5.97	0.00	0.00	0.00	14.06
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	29.78	0.00	0.00	0.00	0.00	29.78

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	54.31
TP LOAD REDUCTION REQUIRED (lb/yr)	35.58
TP LOAD REDUCTION ACHIEVED (lb/yr)	36.26
TP LOAD REMAINING (lb/yr):	18.05
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	0.00
** TARGET TP REDUCTION EXCEEDED BY 0.68 LB/YEAR **	

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	388.50
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	29.78
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	358.72

* ISOLATOR ROWS ARE LISTED AS HYDRODYNAMIC DEVICES SO THAT THEY COULD BE CONNECTED IN SERIES TO BAYFILTERS WHICH ARE LISTED AS THE FILTERS IN THE ABOVE VRRM SPREASHEETS.

PROJECT NO:17034.001.02

SCALE: AS SHOWN

DATE: 8/25/17

DESIGN: LEP

DRAWN: LEP

CHECKED: CHL

SHEET No.

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107723

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COMMONWEALTH OF VIRGINIA
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10/30/17
PROFESSIONAL ENGINEER

BMP COMPUTATIONS

TRUE NORTH DATA
PHASE I - SITE PLAN
CATOCTIN ELECTION DISTRICT
LOUDOUN COUNTY, VIRGINIA

PROJECT NO:17034.001.02

SCALE: AS SHOWN

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