Granville
Fearrington Village
Chatham County, NC

STORMWATER MANAGEMENT CALCULATIONS

DEVELOPER:

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11/14/12

PREPARED BY

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Granville Stormwater Management

General

Granville is a single-family subdivision proposed for development under the Chatham County R-1-SUP (Planned Residential Development) zoning. The 51.76-acre site is adjacent to the south property line of the Fearrington Planned Unit Development. The site consists of a large fallow field and woodlands. There are ephemeral, intermittent, and perineal streams and the site along with some small wetland areas.

Single family lots with an average area of approximately 0.66 acre are proposed. Approximately 19 acres of the site will be left as open space. Streets will be constructed per North Carolina Department of Transportation (NCDOT) standards with ribbon pavement and ditch section. Water for the subdivision will be provided by the Chatham County Public Utilities. Sewer for the subdivision will be provided by Fearrington Utilities, LLC. Drainage for streets and lots will consist of inlets, pipes, and channels.

The majority of the stormwater from the site currently drains to a tributary to Bush Creek that exits the site in the northeast corner. A small portion along the northern border of the site drains to a drainage feature that flows to Fearrington Village. Soils on the site are Georgeville, Cid-Lignum, and Norfolk-Badin in Hydrologic Group B. Slopes are moderate. A large portion of the site will remain in open space containing perimeter buffers, stream buffers, wetland buffers, and a large amount of voluntary open space.

An area of approximately 6 acres offsite drainage enters the site at the northwest corner of the property. The area is currently undeveloped. An area of approximately 4 acres of currently undeveloped offsite land enters the site on the southern border. The proposed project will maintain the existing overall drainage pattern, with all stormwater exiting at the northwest corner and along the northern border at existing discharge points.

Chatham County Stormwater Ordinance requires capture and treatment of the runoff volume for the 1-year, 1-hour storm event in a device that removes 85% of total suspended solids (TSS). Post development peak discharge for the site must not exceed predevelopment peak discharge rates for the 1,2,5, 10, and 25 year 24-hour storm events.

Stormwater management for Granville will be accomplished by utilizing a collection system consisting of the subdivision road ditches, diversion channels and pipes to direct runoff form most of the developed areas (streets and lots) to wet ponds. Wet ponds were chosen for treatment to meet the 85% TSS requirement and will be designed according to the North Carolina Department of Environment Quality (NCDEQ) Stormwater Design Manual. A total of seven (7) wet ponds are proposed due to the site topography and presence of a large amount of stream buffers.

Design Parameters

The stormwater management design for Granville uses the Rational Method and US Natural Resources Conservation Services (NRCS) methods as applicable. The Rational Method is used for peak discharge calculations and NRCS methods are used for runoff calculations.

Peak discharges were determined using composite Rational runoff coefficients (C), and rainfall intensities for the 24-hour storm for 1,2,5,10, and 25-year storms. Runoff calculations for design volume determination for the wet ponds used NRCS weighted curve numbers and a 1-year 1-hour rainfall of 1.43 inches.

All channels and pipes were designed according to NCDOT standards and /or Chatham County standards outside of rights of way. All stormwater conveyances were designed to carry the 25-year storm as applicable.

The wet pond design follows the Minimum Design Criteria (MDC) in Chapter C-3 of the NCDEQ Stormwater Design Manual. The pond surface area required is per Table 1 for Piedmont areas. Other MDC regarding pond volume, depth, drawdown, etc. are per the MDC.

The wet ponds provide treatment and also provide storage volume to reduce peak discharge. Flood routing of the various storms was performed to determine a peak discharge for the device. Dr. H.R. Mlacolm's "Chainsaw Routing" method was used for flood routing.

The runoff from most of the developed areas of the site is collected and directed to the wet ponds. A small amount of developed area (lots and street) is not tributary to the wet ponds. Likewise, the vast majority of the project open space will remain undeveloped and is allowed to bypass the wet ponds. The peak runoff from areas not tributary to the wet ponds was computed and added to the discharge from the wet ponds to determine the post development peak discharge. The total post development discharge was compared to, and found less than, the predevelopment peak discharge for the site.

Proposed Development Assumptions

The proposed lots in Granville are assumed to be similar to the recently developed lots in Fearrington Village. The assumed lot coverage is as follows:

House (Roof)	3,000 square feet
Driveway	1,800 square feet
Walkway & Parking Pad	800 square feet
Patio / Courtyard	400 square feet
Lawn / Landscaping	7,000 square feet
Wooded	15,950 square feet

Proposed Granville Post Development Land Use

Impervious Surfaces	7.72 acres
Lawn / Grass / Landscaped	15.07 acres
Open Field	1.34 acres
Wooded	27.01 acres
Stormwater Devices	0.06 acre

Stormwater Treatment

The wet ponds (SCM) proposed for Granville treats the runoff from nearly all developed areas. The wet pond design provides surface area and detention time in compliance with MDC requirements for 85% TSS removal. Storage of the design volume for each wet pond is provided and a riser outlet allows drawdown of the design volume in approximately 2 days. The outlet riser acts as an emergency spillway sized to pass the 100-year storm with 1 foot of freeboard at 100-year flow. Planted shelves and sediment storage are proposed in accordance with MDC.

Predevelopment Discharge

The following is an estimate of the total Granville discharge prior to development for 51.76 acre site:

Composite C Land Use	Area (acres)	C	%	Extension
Open Field	9.00	0.22	17.3879	0.04
Woodland	42.76	0.20	82.6121	0.17
Total	51.76			0.21

Composite C Value = 0.21 for predevelopment conditions

Predevelopment Discharge by Rational Method

Rainfall Intensity (I) per Chatham County Stormwater 24-hour storm:

Storm	Rainfall Intensity (inches / hour)
I-1	2.96
I-2	3.57
I-5	4.47
I-10	5.18
I-25	6.13
I-50	6.89
I-100	7.67

Peak Predevelopment Discharge 51.76 acres, C=0.21

Storm	Peak Runoff (cfs)
1-year	**32.4**
2-year	**39.1**
5-year	**49.0**
10-year	**56.8**
25-year	**67.2**
50-year	**75.5**
100-year	**84.0**

Post Development Discharge

The total site discharge for Granville post development is the sum of the discharge from the wet ponds and the areas not tributary to the wet ponds. The offsite areas that drain to Granville bypass the wet ponds via an existing drainage feature (west offsite drainage) or by piping and channels constructed with Granville (south offsite drainage).

Post Development -Areas not Tributary to Wet Ponds
Composite C

Land Use	Area (acres)	C	%	Extension
Open Field	1.34	0.22	5.12	0.01
Woodland	22.81	0.20	87.16	0.17
Lawn / Grass	1.10	0.22	4.20	0.01
Impervious	0.92	0.95	3.52	0.03
Total	26.17			0.23

Composite C Value = 0.23 for predevelopment conditions
Predevelopment Discharge by Rational Method
Rainfall Intensity (I) per Chatham County Stormwater 24-hour storm:

Storm	Rainfall Intensity (inches / hour)
I-1	2.96
I-2	3.57
I-5	4.47
I-10	5.18
I-25	6.13
I-50	6.89
I-100	7.67

Peak Predevelopment Discharge 26.17 acres, C=0.23

Storm	Peak Runoff (cfs)
1-year	18.0
2-year	21.7
5-year	27.1
10-year	31.4
25-year	37.2
50-year	41.8
100-year	46.5

Wet Ponds – Inflow to Wet Pond 1 – 7 post development

Wet Pond 1 Inflow

Total Drainage Area		4.32	acres				
Post Development Land Use				C	Fraction	CN	Extension
Impervious		1.18	acre	0.95	0.273148		0.26
Lawn Landscaping		1.8	acre	0.22	0.416667		0.09
Forest		1.23	acre	0.20	0.284722		0.06
SCM		0.11	acre	1.00	0.025463		0.03
		4.32					
					Composite C		0.43
					Use C		0.43
Tc = 5 minutes			24-hour storm Appendix A				
I-1	2.96	Q-1=	5.59	cfs			
I-2	3.57	Q-2=	6.74	cfs			
I-5	4.47	Q-5=	8.44	cfs			
I-10	5.18	Q-10=	9.78	cfs			
I-25	6.13	Q-25=	11.57	cfs			
I-50	6.89	Q-50=	13.01	cfs			
I-100	7.67	Q-100=	14.48	cfs			

Wet Pond 2 Inflow

Total Drainage Area		3.33	acres				
Post Development Land Use				C	Fraction	CN	Extension
Impervious		1.02	acre	0.95	0.306306		0.29
Lawn Landscaping		1.79	acre	0.22	0.537538		0.12
Forest		0.45	acre	0.20	0.135135		0.03
SCM		0.07	acre	1.00	0.021021		0.02
		3.33					
					Composite C		0.46
					Use C		0.46
Tc = 5 minutes			24-hour storm Appendix A				
I-1	2.96	Q-1=	4.54	cfs			
I-2	3.57	Q-2=	5.48	cfs			
I-5	4.47	Q-5=	6.86	cfs			
I-10	5.18	Q-10=	7.95	cfs			
I-25	6.13	Q-25=	9.41	cfs			
I-50	6.89	Q-50=	10.58	cfs			
I-100	7.67	Q-100=	11.77	cfs			

Wet Pond 3 Inflow

Total Drainage Area	3.01	acres

Post Development Land Use			C	Fraction	CN	Extension
Impervious	0.88	acre	0.95	0.292359		0.28
Lawn Landscaping	2.05	acre	0.22	0.681063		0.15
Forest	0	acre	0.20	0		0.00
SCM	0.08	acre	1.00	0.026578		0.03
	3.01					
				Composite C		0.45
				Use C		0.45

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	4.08	cfs
I-2	3.57	Q-2=	4.92	cfs
I-5	4.47	Q-5=	6.16	cfs
I-10	5.18	Q-10=	7.14	cfs
I-25	6.13	Q-25=	8.45	cfs
I-50	6.89	Q-50=	9.49	cfs
I-100	7.67	Q-100=	10.57	cfs

Wet Pond 4 Inflow

Total Drainage Area	3.91	acres

Post Development Land Use			C	Fraction	CN	Extension
Impervious	1.01	acre	0.95	0.258312		0.25
Lawn Landscaping	1.84	acre	0.22	0.470588		0.10
Forest	0.98	acre	0.20	0.250639		0.05
SCM	0.08	acre	1.00	0.02046		0.02
	3.91					
				Composite C		0.42
				Use C		0.42

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	4.89	cfs
I-2	3.57	Q-2=	5.90	cfs
I-5	4.47	Q-5=	7.39	cfs
I-10	5.18	Q-10=	8.56	cfs
I-25	6.13	Q-25=	10.14	cfs
I-50	6.89	Q-50=	11.39	cfs
I-100	7.67	Q-100=	12.68	cfs

Wet Pond 5 Inflow

Total Drainage Area	4.48	acres				
Post Development Land Use			C	Fraction	CN	Extension
Impervious	0.89	acre	0.95	0.198661		0.19
Lawn Landscaping	3.48	acre	0.22	0.776786		0.17
Forest	0	acre	0.20	0		0.00
SCM	0.11	acre	1.00	0.024554		0.02
	4.48					
				Composite C		0.38
				Use C		0.38

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	5.14	cfs
I-2	3.57	Q-2=	6.19	cfs
I-5	4.47	Q-5=	7.75	cfs
I-10	5.18	Q-10=	8.99	cfs
I-25	6.13	Q-25=	10.63	cfs
I-50	6.89	Q-50=	11.95	cfs
I-100	7.67	Q-100=	13.31	cfs

Wet Pond 6 Inflow

Total Drainage Area	2.60	acres				
Post Development Land Use			C	Fraction	CN	Extension
Impervious	0.84	acre	0.95	0.323077		0.31
Lawn Landscaping	1.32	acre	0.22	0.507692		0.11
Forest	0.36	acre	0.20	0.138462		0.03
SCM	0.08	acre	1.00	0.030769		0.03
	2.60					
				Composite C		0.48
				Use C		0.48

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	3.70	cfs
I-2	3.57	Q-2=	4.46	cfs
I-5	4.47	Q-5=	5.59	cfs
I-10	5.18	Q-10=	6.48	cfs
I-25	6.13	Q-25=	7.66	cfs
I-50	6.89	Q-50=	8.61	cfs
I-100	7.67	Q-100=	9.59	cfs

Wet Pond 7 Inflow

Total Drainage Area	3.94	acres				
Post Development Land Use			C	Fraction	CN	Extension
Impervious	0.98	acre	0.95	0.248731		0.24
Lawn Landscaping	1.69	acre	0.22	0.428934		0.09
Forest	1.18	acre	0.20	0.299492		0.06
SCM	0.09	acre	1.00	0.022843		0.02
	3.94					
				Composite C		0.41
				Use C		0.41

Tc = 5 minutes		24-hour storm Appendix A		
I-1	2.96	Q-1=	4.86	cfs
I-2	3.57	Q-2=	5.86	cfs
I-5	4.47	Q-5=	7.34	cfs
I-10	5.18	Q-10=	8.50	cfs
I-25	6.13	Q-25=	10.06	cfs
I-50	6.89	Q-50=	11.31	cfs
I-100	7.67	Q-100=	12.59	cfs

Wet Pond Discharge – WP = Wet Pond
A flood routing using Chainsaw Routing was performed for each wet pond using the inflow values above. The post development discharge is summarized below:

	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7
	cfs	cfs	cfs	cfs	cfs	cfs	cfs
Q-1	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Q-2	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Q-5	0.02	0.03	0.02	0.03	0.02	0.02	0.03
Q-10	0.03	0.03	0.03	0.03	0.02	0.03	0.03
Q-25	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Q-50	0.03	0.03	0.03	0.03	0.03	0.03	0.03
Q-100	0.03	0.03	0.03	0.03	0.03	0.03	0.03

See CCM calculations and routing results.

Total Post Development Discharge is the sum of wet pond discharge and the areas that are bypassed or not tributary to the wet ponds. A summary of the total Granville site post development discharge is summarized below (WP = Wet Pond):

	WP 1	WP 2	WP 3	WP 4	WP 5	WP 6	WP 7	Not Treated	Total Discharge
	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
Q-1	0.02	0.02	0.02	0.02	0.02	0.02	0.02	17.96	18.10
Q-2	0.02	0.02	0.02	0.02	0.02	0.02	0.02	21.66	21.80
Q-5	0.02	0.03	0.02	0.03	0.02	0.02	0.03	27.12	27.29
Q-10	0.03	0.03	0.03	0.03	0.02	0.03	0.03	31.43	31.63
Q-25	0.03	0.03	0.03	0.03	0.03	0.03	0.03	37.19	37.40
Q-50	0.03	0.03	0.03	0.03	0.03	0.03	0.03	41.80	42.01
Q-100	0.03	0.03	0.03	0.03	0.03	0.03	0.03	46.54	46.75

Total Granville Peak Discharge Predevelopment vs. Post Development

	Predevelopment Total Granville Discharge	**Post Development Total Granville Discharge**
	cfs	**cfs**
Q-1	**32.43**	**18.10**
Q-2	**39.11**	**21.80**
Q-5	**48.98**	**27.29**
Q-10	**56.75**	**31.63**
Q-25	**67.16**	**37.40**
Q-50	**75.49**	**42.01**
Q-100	**84.04**	**46.75**

The stormwater management proposed for Granville using wet ponds reduces the post development discharge for the site. The post development total Granville site discharge is less than the predevelopment total site discharge for all storms.

Granville

Land Use Summary

Land Use (Acres)	Wet Pond 1	Wet Pond 2	Wet Pond 3	Wet Pond 4	Wet Pond 5	Wet Pond 6	Wet Pond 7	Not Tributary to SCM	Total Area (Acres)
Impervious	1.18	1.02	0.88	1.01	0.89	0.84	0.98	0.92	7.72
Lawn / Grassed	1.80	1.79	2.05	1.84	3.48	1.32	1.69	1.10	15.07
Open Field	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.34	1.34
Wooded	1.23	0.45	0.00	0.98	0.00	0.36	1.18	22.81	27.01
SCM	0.11	0.07	0.08	0.08	0.11	0.08	0.09	0.00	0.62
									51.76

Overall Project is 14.91% impervious
Total Area Tributary to Wet Ponds (SCM) = 25.59 acres
Total Area Not Tributary to Wet Ponds (SCM) = 26.17 acres

Total Lot Impervious Estimated (6,000 sq. ft. / lot) = 5.92 acres
Total Street Impervious = 1.80 acre

Granville

Typical Lot Coverage

Assume Granville Lots will be similar to homes constructed in recent Fearrington Village

Average Lot Size in Granville = 28,950 sq. ft.

Impervious	
House	3,000 sq. ft.
Driveway	1,800 sq. ft.
Walk & Parking	800 sq. ft.
Patio / Courtyard	400 sq. ft.
Total Impervious	6,000 sq. ft.
Lawn / Landscaping	7,000 sq. ft.

Balance of Lot to remain wooded or grass in current open field
28,950 - 6,000 - 7,000 = 15,950 sq. ft. or 55% not developed

Wet Pond 1

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 1

Total Drainage Area	4.32 acres	Trib Area			
Post Development Land Use		CN	% of Total	CN	Extension
Impervious	1.18 acre	98	0.273148		26.77
Lawn / Grassed	1.80 acre	61	0.416667		25.42
Wooded	1.23 acre	55	0.284722		15.66
SCM	0.11 acre	100	0.025463		2.55
	3.17				
			Composite CN		70.39
			Use CN		71

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 4.084507

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.080017 inches

Total Runoff Volume = 1,255 cu. ft.

Wet Pond Surface Area
Impervious 27.31 %

SA / DA 1.08125 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 27.31 %

Wet Pond Surface Area Use % Impervious 27.31%

SA / DA 0.010812 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	2,034.59 sq. ft.	Main Pool
Add 25% for Forebay=	2,543.24 sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**2,543.24 sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 1 Inflow

Total Drainage Area 4.32 acres

Post Development Land Use		C	Fraction	CN	Extension
Impervious	1.18 acre	0.95	0.273148		0.26
Lawn Landscaping	1.8 acre	0.22	0.416667		0.09
Forest	1.23 acre	0.20	0.284722		0.06
SCM	0.11 acre	1.00	0.025463		0.03
	4.32				
			Composite C		0.43
			Use C		0.43

Tc = 5 minutes 24-hour storm Apeendix A

I-1	2.96	Q-1=	5.59 cfs
I-2	3.57	Q-2=	6.74 cfs
I-5	4.47	Q-5=	8.44 cfs
I-10	5.18	Q-10=	9.78 cfs
I-25	6.13	Q-25=	11.57 cfs
I-50	6.89	Q-50=	13.01 cfs
I-100	7.67	Q-100=	14.48 cfs

STAGE-STORAGE

WET POND 1

Project: Fearrington Granville SCM 1 Storage

Invert Elevation: 436.5

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
436.5	0	4,793		0
			2,786	
437	0.5	6,350		2,786
			3,335	
437.5	1	6,991		6,121
			3,672	
438	1.5	7,698		9,793
			8,441	
439	2.5	9184		18,234

$$b = \frac{\ln\left(\frac{18,234}{2786}\right)}{\ln\left(\frac{2.5}{0.5}\right)} = \frac{1.8787}{1.6094} = 1.1673$$

$$K_s = \frac{18,234}{2.5^{1.1673}} = 6,257$$

$$\text{STORAGE} = 6257Z^{1.1673}$$

STAGE-STORAGE

WET POND 1

Project: Fearrington Granville SCM 1 Forebay

Invert Elevation: 432

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
432	0	18		0
			71	
433	1	124		71
			220	
434	2	316		291
			454	
435	3	592		745
			756	
436	4	920		1501
			504	
436.5	4.5	1096		2005

STAGE-STORAGE

WET POND 1

Project: Fearrington Granville SCM 1 Main Pool

Invert Elevation: 432

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
432	0	1174		0
			1406.5	
433	1	1639		1406.5
			1905	
434	2	2171		3311.5
			2470	
435	3	2769		5781.5
			3102.5	
436	4	3436		8884
			1783	
436.5	4.5	3697		10667

Fearrington Granville
Wet Pond 1

Area Tributary to Basin = 4.32 ac

Onsite Area Not Tributary to Basin = 4.32 acre
Total DA Used for Treatment Calculation = 4.32 acres

Composite C = 0.43 (27% impervious)
Composite Curve Number = 71
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 4.084507

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.0800 inches

Total Runoff Volume = 1,255 cu. ft.

Design Volume = 1,255 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 27% impervious and 3-foot depth
SA /DA = 1.08
Surfcace Area Required = 1.08 x 4.32 x 43,560 / 100

Surface Area Required = 2,032 sq . Ft.

Wet Pond Main Pool Area at El. 436.5 = 3,697 sq. ft.

MDC 2 Main Pool Depth

Equation 1: Vmp = 0.87 x HRT / T x DV
Design Volume = 1,255 cu. ft.

Vmp = 3,057 cu. ft.

Vmp = Main Pool Volume (cu. ft.)
HRT = Residence Time (14 days)
T = Ave. Time Between Storms (5 days)
DV = Design Volume (cu. ft.)

Main Pool Volume= 10,667 cu. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 431
Main Pool Bottom = El. 432
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume= 10,667 cu. ft.
Forebay Volume = 2,005 cu. ft.

11482 / 2,005 = 18.80%
Forebay Volume % 18.80%

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 6257 z^1.1673

Design Volume = 1,255 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.25 feet
Stage required for Treatment Volume = 1.43 feet (Stage = 236.5 + 0.25 = 236.75)
Set Weir at or above 236.75

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.25 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 236.75 = 5,571 sq. ft.
Orifice Area = 5,571 x Sqrt(2 x 0.25) / 48 x 0.6 x 20,428
Orifice Area = 0.0067 sq. ft.
Orifice Diameter = 1.0 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 59 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 1

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 14.48 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.45 feet

Top of Dike = 439.5

Freeboard = 1 foot

Height on Weir = 0.45 foot

Set Top of Weir @ 438.05 Maximum Height

Maximum Water Surface Elevation at Q-100 = 438.50

Riser Outlet Barrel

Q-100 = 14.48 cfs

18-inch Headwater= 3.67 feet

Riser Invert = 433.30

Rsier Weir = 438.05

Headwater Available = 4.75 feet OK

Slope Required 18 inch 1.89%

Q-full= 14.48 fps

V-full= 8.2 fps

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.89%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 438.55

Riser Invert = 433.30

Uplift Height = 5.25 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 149.16 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 9307 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 4.75 feet

Wall Weight = 6648 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3324 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 0.94 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 1

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	6257
b =	1.1673

OUTLET ORIFICE #1:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0.09	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:	ELEVATION =	1.55	(ft)
	LENGTH =	16	(ft)
	WEIR COEFFICIENT =	3	3.0

WETPOND 1

Granville SCM 1 | Postdevelopment | Q-1

PEAK FLOW (cfs)	5.59
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.53	0	0.00	0.00
		32.03		
2	1.93	32.03	0.01	0.00
		115.82		
3	3.66	147.85	0.04	0.01
		219.15		
4	5.06	367.00	0.09	0.01
		302.83		
5	5.59	669.83	0.15	0.01
		334.69		
6	5.06	1,004.52	0.21	0.01
		302.53		
7	3.93	1,307.05	0.26	0.02
		234.91		
8	3.03	1,541.97	0.30	0.02
		180.84		
9	2.34	1,722.81	0.33	0.02
		139.16		
10	1.80	1,861.97	0.35	0.02
		107.02		
11	1.39	1,968.99	0.37	0.02
		82.24		
12	1.07	2,051.23	0.38	0.02
		63.14		
13	0.83	2,114.37	0.39	0.02
		48.41		
14	0.64	2,162.78	0.40	0.02
		37.05		
15	0.49	2,199.83	0.41	0.02
		28.29		
16	0.38	2,228.12	0.41	0.02
		21.54		
17	0.29	2,249.65	0.42	0.02
		16.33		
18	0.23	2,265.99	0.42	0.02

		12.32		
19	0.17	2,278.30	0.42	0.02
		9.22		
20	0.13	2,287.53	0.42	0.02
		6.84		
21	0.10	2,294.36	0.42	0.02
		5.00		
22	0.08	2,299.36	0.42	0.02
		3.58		
23	0.06	2,302.93	0.42	0.02
		2.48		
24	0.05	2,305.42	0.43	0.02
		1.64		
25	0.04	2,307.06	0.43	0.02
		0.99		
26	0.03	2,308.05	0.43	0.02
		0.49		
27	0.02	2,308.54	0.43	0.02
		0.10		
28	0.02	2,308.64	0.43	0.02
		(0.20)		
29	0.01	2,308.44	0.43	0.00
		0.77		
30	0.01	2,309.22	0.43	0.00
		0.60		

WET POND 1

Granville SCM 1	Postdevelopment	Q-2
PEAK FLOW (cfs)	6.74	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.64	0	0.00	0.00
		38.62		
2	2.33	38.62	0.01	0.00
		139.64		
3	4.41	178.26	0.05	0.01
		264.28		
4	6.10	442.54	0.10	0.01
		365.19		
5	6.74	807.74	0.17	0.01
		403.64		
6	6.10	1,211.37	0.24	0.02
		364.87		
7	4.74	1,576.24	0.31	0.02
		283.35		
8	3.65	1,859.60	0.35	0.02
		218.17		
9	2.82	2,077.77	0.39	0.02
		167.92		
10	2.17	2,245.69	0.42	0.02
		129.17		
11	1.68	2,374.86	0.44	0.02
		99.30		
12	1.29	2,474.16	0.45	0.02
		76.27		
13	1.00	2,550.42	0.46	0.02
		58.51		
14	0.77	2,608.93	0.47	0.02
		44.81		
15	0.59	2,653.74	0.48	0.02
		34.25		
16	0.46	2,687.99	0.48	0.02
		26.11		
17	0.35	2,714.11	0.49	0.02
		19.84		
18	0.27	2,733.94	0.49	0.02

		15.00		
19	0.21	2,748.94	0.49	0.02
		11.26		
20	0.16	2,760.21	0.50	0.02
		8.39		
21	0.12	2,768.59	0.50	0.02
		6.17		
22	0.10	2,774.76	0.50	0.02
		4.46		
23	0.07	2,779.22	0.50	0.02
		3.14		
24	0.06	2,782.36	0.50	0.02
		2.12		
25	0.04	2,784.49	0.50	0.02
		1.34		
26	0.03	2,785.82	0.50	0.02
		0.74		
27	0.03	2,786.56	0.50	0.02
		0.27		
28	0.02	2,786.83	0.50	0.02
		(0.09)		

WETPOND 1

Granville SCM 1 Postdevelopment Q-5

PEAK FLOW (cfs)	8.44
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.81	0	0.00	0.00
		48.36		
2	2.92	48.36	0.02	0.00
		174.86		
3	5.52	223.22	0.06	0.01
		331.00		
4	7.63	554.22	0.13	0.01
		457.39		
5	8.44	1,011.61	0.21	0.01
		505.56		
6	7.63	1,517.17	0.30	0.02
		457.04		
7	5.93	1,974.21	0.37	0.02
		354.98		
8	4.58	2,329.18	0.43	0.02
		273.37		
9	3.53	2,602.55	0.47	0.02
		210.44		
10	2.72	2,812.99	0.50	0.02
		161.93		
11	2.10	2,974.93	0.53	0.02
		124.53		
12	1.62	3,099.45	0.55	0.02
		95.69		
13	1.25	3,195.14	0.56	0.02
		73.45		
14	0.96	3,268.59	0.57	0.02
		56.31		
15	0.74	3,324.90	0.58	0.02
		43.09		
16	0.57	3,367.98	0.59	0.02
		32.89		
17	0.44	3,400.88	0.59	0.02
		25.03		
18	0.34	3,425.91	0.60	0.02

		18.97		
19	0.26	3,444.88	0.60	0.02
		14.30		
20	0.20	3,459.18	0.60	0.02
		10.70		
21	0.16	3,469.88	0.60	0.02
		7.92		
22	0.12	3,477.80	0.60	0.02
		5.78		
23	0.09	3,483.58	0.61	0.02
		4.13		
24	0.07	3,487.71	0.61	0.02
		2.85		
25	0.06	3,490.56	0.61	0.02
		1.87		

WETPOND 1

Granville SCM 1	Postdevelopment	Q-10
PEAK FLOW (cfs)	9.78	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.93	0	0.00	0.00
		56.03		
2	3.38	56.03	0.02	0.00
		202.62		
3	6.40	258.65	0.07	0.01
		383.60		
4	8.85	642.25	0.14	0.01
		530.07		
5	9.78	1,172.32	0.24	0.01
		585.90		
6	8.85	1,758.22	0.34	0.02
		529.70		
7	6.88	2,287.92	0.42	0.02
		411.44		
8	5.30	2,699.36	0.49	0.02
		316.88		
9	4.09	3,016.24	0.54	0.02
		243.97		
10	3.15	3,260.21	0.57	0.02
		187.76		
11	2.43	3,447.98	0.60	0.02
		144.42		
12	1.87	3,592.40	0.62	0.02
		111.01		
13	1.45	3,703.41	0.64	0.02
		85.24		
14	1.11	3,788.65	0.65	0.02
		65.37		
15	0.86	3,854.02	0.66	0.02
		50.06		
16	0.66	3,904.08	0.67	0.03
		38.25		
17	0.51	3,942.33	0.67	0.03
		29.14		
18	0.39	3,971.47	0.68	0.03

		22.12		
19	0.30	3,993.58	0.68	0.03
		16.70		
20	0.23	4,010.29	0.68	0.03
		12.53		
21	0.18	4,022.82	0.68	0.03
		9.31		
22	0.14	4,032.13	0.69	0.03
		6.83		
23	0.11	4,038.96	0.69	0.03
		4.92		
24	0.08	4,043.88	0.69	0.03
		3.44		
25	0.06	4,047.32	0.69	0.03
		2.30		
26	0.05	4,049.62	0.69	0.03
		1.43		
27	0.04	4,051.05	0.69	0.03
		0.75		
28	0.03	4,051.80	0.69	0.03
		0.23		
29	0.02	4,052.03	0.69	0.00
		1.35		
30	0.02	4,053.38	0.69	0.00
		1.04		

WET POND 1

Granville SCM 1	Postdevelopment	Q-25
PEAK FLOW (cfs)	11.57	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	1.10	0	0.00	0.00
		66.29		
2	4.00	66.29	0.02	0.00
		239.69		
3	7.57	305.98	0.08	0.01
		453.86		
4	10.47	759.84	0.16	0.01
		627.16		
5	11.57	1,387.00	0.28	0.02
		693.24		
6	10.47	2,080.24	0.39	0.02
		626.76		
7	8.14	2,707.00	0.49	0.02
		486.87		
8	6.27	3,193.87	0.56	0.02
		375.02		
9	4.84	3,568.89	0.62	0.02
		288.77		
10	3.73	3,857.66	0.66	0.02
		222.28		
11	2.88	4,079.94	0.69	0.03
		171.01		
12	2.22	4,250.95	0.72	0.03
		131.48		
13	1.71	4,382.44	0.74	0.03
		101.00		
14	1.32	4,483.44	0.75	0.03
		77.50		
15	1.02	4,560.94	0.76	0.03
		59.38		
16	0.78	4,620.32	0.77	0.03
		45.41		
17	0.60	4,665.73	0.78	0.03
		34.64		
18	0.47	4,700.36	0.78	0.03

		26.33		
19	0.36	4,726.69	0.79	0.03
		19.93		
20	0.28	4,746.62	0.79	0.03
		14.99		
21	0.21	4,761.61	0.79	0.03
		11.18		
22	0.16	4,772.79	0.79	0.03
		8.24		
23	0.13	4,781.03	0.79	0.03
		5.98		
24	0.10	4,787.01	0.79	0.03
		4.24		
25	0.08	4,791.25	0.80	0.03
		2.89		
26	0.06	4,794.14	0.80	0.03
		1.85		
27	0.04	4,795.99	0.80	0.03
		1.05		
28	0.03	4,797.05	0.80	0.03
		0.44		
29	0.03	4,797.48	0.80	0.00
		1.60		
30	0.02	4,799.08	0.80	0.00
		1.23		

Wet Pond 2

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 2

Total Drainage Area	3.33 acres	Trib Area			
Post Development Land Use		CN	% of Total	CN	Extension
Impervious	1.02 acre	98	0.306306		30.02
Lawn / Grassed	1.79 acre	61	0.537538		32.79
Wooded	0.45 acre	55	0.135135		7.43
SCM	0.07 acre	100	0.021021		2.10
	3.33				
			Composite CN		72.34
			Use CN		73

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 3.69863

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.108564 inches

Total Runoff Volume = 1,312 cu. ft.

Wet Pond Surface Area
Impervious 30.63 %

SA / DA 1.1914 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 30.63 %

Wet Pond Surface Area Use % Impervious 30.63%

SA / DA 0.011914 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	1,728.18 sq. ft.	Main Pool
Add 25% for Forebay=	2,160.23 sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**2,160.23 sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 2 Inflow

Total Drainage Area 3.33 acres

Post Development Land Use		C	Fraction	CN	Extension
Impervious	1.02 acre	0.95	0.306306		0.29
Lawn Landscaping	1.79 acre	0.22	0.537538		0.12
Forest	0.45 acre	0.20	0.135135		0.03
SCM	0.07 acre	1.00	0.021021		0.02
	3.33				
			Composite C		0.46
			Use C		0.45

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	4.54 cfs
I-2	3.57	Q-2=	5.48 cfs
I-5	4.47	Q-5=	6.86 cfs
I-10	5.18	Q-10=	7.95 cfs
I-25	6.13	Q-25=	9.41 cfs
I-50	6.89	Q-50=	10.58 cfs
I-100	7.67	Q-100=	11.77 cfs

STAGE-STORAGE

WET POND 1

Project: Fearrington Granville SCM 2 Storage

Invert Elevation: 409

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
409	0	3,022		0
			3,918	
410	1	4,814		3,918
			5,391	
411	2	5,968		9,309
			6,627	
412	3	7,286		15,936

$$b = \frac{\ln\left(\frac{15,936}{3918}\right)}{\ln\left(\frac{3}{1}\right)} = \frac{1.4030}{1.0986} = 1.2771$$

$$K_s = \frac{15,936}{3^{1.2771}} = 3918$$

$$\text{STORAGE} = 3918\ Z^{1.2771}$$

STAGE-STORAGE

WET POND 1

Project: Fearrington Granville SCM 2 Forebay

Invert Elevation: 407

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
407	0	37		0
			167.5	
408	1	298		167.5
			559	
409	2	820		726.5

STAGE-STORAGE

WET POND 2

Project: Fearrington Granville SCM 2 Main Pool

Invert Elevation: 405

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
405	0	423		0
			577	
406	1	731		577
			922.5	
407	2	1114		1499.5
			1383	
408	3	1652		2882.5
			1947	
409	4	2242		4829.5

Fearrington Granville
Wet Pond 2

Area Tributary to Basin = 3.33 ac

Total DA Used for Treatment Calculation = 3.33 acres

Composite C = 0.46 (27% impervious)
Composite Curve Number = 73
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 3.69863

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.1086 inches

Total Runoff Volume = 1,312 cu. ft.

Design Volume = 1,312 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 30.63% impervious and 3-foot depth
SA /DA = 1.1914
Surfcace Area Required = 1.19 x 4.32 x 43,560 / 100

Surface Area Required = 1,728 sq . Ft.

Wet Pond Main Pool Area at El. 409 = 2,242 sq. ft.

Fearrington Granville
SCM 2

Area Tributary to Basin = 3.33 ac

Total DA Used for Treatment Calculation = 3.33 acres

Composite C = 0.46 (27% impervious)
Composite Curve Number = 73
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 3.69863

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.1086 inches

Total Runoff Volume = 1,312 cu. ft.

Design Volume = 1,312 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 30.63% impervious and 3-foot depth
SA /DA = 1.1914
Surfcace Area Required = 1.19 x 4.32 x 43,560 / 100

Surface Area Required = 1,728 sq . Ft.

Wet Pond Main Pool Area at El. 409 = 2,242 sq. ft.

MDC 2 Main Pool Depth
Equation 1: Vmp = 0.87 x HRT / T x DV
Design Volume = 1,312 cu. ft.

Vmp = 3,197 cu. ft.

Vmp = Main Pool Volume (cu. ft.)
HRT = Residence Time (14 days)
T = Ave. Time Between Storms (5 days)
DV = Design Volume (cu. ft.)

Main Pool Volume= 4,573 cu. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 404
Main Pool Bottom = El. 405
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume=	4,830 cu. ft.
Forebay Volume =	726 cu. ft.
11482 / 2,005 =	15.03%
Forebay Volume %	15.03%

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 3918 z^1.2771

Design Volume = 1,312 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.42 feet
Stage required for Treatment Volume = 042 feet (Stage = 409 + 0.42 = 409.42)
Set Weir at or above 409.42

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.42 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 409.42 = 3,375 sq. ft.
Orifice Area = 3,375 x Sqrt(2 x 0.42) / 48 x 0.6 x 20,428
Orifice Area = 0.0059 sq. ft.
Orifice Diameter = 1.0 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 52 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 2

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 11.77 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.39 feet

Top of Dike =	412	
Freeboard =	1	foot
Height on Weir =	0.39	foot
Set Top of Weir @	**410.61**	Maximum Height

Maximum Water Surface Elevation at Q-100 = 411.00

Riser Outlet Barrel

Q-100 =	11.77	cfs	
18-inch Headwater=	2.75	feet	
Riser Invert =	405.50		
Rsier Weir =	410.61		
Headwater Available =	5.11	feet	OK
Slope Required	18	inch	1.25%
Q-full=	11.77	fps	
V-full=	6.6	fps	

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.25%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 411.11

Riser Invert = 405.50

Uplift Height = 5.61 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 159.33 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 9942 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 5.11 feet

Wall Weight = 7149 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3492 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 0.99 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 2

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	3918
b =	1.2771

OUTLET ORIFICE #1:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0.09	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:	ELEVATION =	1.61	(ft)
	LENGTH =	16	(ft)
	WEIR COEFFICIENT =	3	3.0

WET POND 2

Granville SCM 2 | Postdevelopment | Q-1

PEAK FLOW (cfs)	4.54
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1
POND INVERT =	

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.43	0	0.00	0.00
		26.01		
2	1.57	26.01	0.02	0.00
		93.97		
3	2.97	119.98	0.07	0.01
		177.82		
4	4.11	297.80	0.13	0.01
		245.72		
5	4.54	543.52	0.21	0.01
		271.55		
6	4.11	815.07	0.29	0.02
		245.39		
7	3.19	1,060.47	0.36	0.02
		190.45		
8	2.46	1,250.91	0.41	0.02
		146.52		
9	1.90	1,397.43	0.45	0.02
		112.65		
10	1.46	1,510.09	0.47	0.02
		86.54		
11	1.13	1,596.63	0.50	0.02
		66.41		
12	0.87	1,663.04	0.51	0.02
		50.89		
13	0.67	1,713.93	0.52	0.02
		38.92		
14	0.52	1,752.85	0.53	0.02
		29.69		
15	0.40	1,782.54	0.54	0.02
		22.58		
16	0.31	1,805.13	0.55	0.02
		17.09		
17	0.24	1,822.22	0.55	0.02
		12.87		
18	0.18	1,835.09	0.55	0.02

		9.60		
19	0.14	1,844.69	0.55	0.02
		7.09		
20	0.11	1,851.78	0.56	0.02
		5.15		
21	0.08	1,856.93	0.56	0.02
		3.66		
22	0.06	1,860.59	0.56	0.02
		2.50		
23	0.05	1,863.09	0.56	0.02
		1.62		
24	0.04	1,864.71	0.56	0.02
		0.93		
25	0.03	1,865.64	0.56	0.02
		0.40		
26	0.02	1,866.04	0.56	0.02
		(0.00)		

WET POND 2

Granville SCM 2 Postdevelopment Q-2

PEAK FLOW (cfs)	5.48
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.52	0	0.00	0.00
		31.40		
2	1.89	31.40	0.02	0.00
		113.42		
3	3.59	144.82	0.08	0.01
		214.70		
4	4.96	359.52	0.15	0.01
		296.68		
5	5.48	656.20	0.25	0.02
		327.89		
6	4.96	984.08	0.34	0.02
		296.33		
7	3.85	1,280.42	0.42	0.02
		230.02		
8	2.97	1,510.44	0.47	0.02
		177.01		
9	2.29	1,687.45	0.52	0.02
		136.14		
10	1.77	1,823.59	0.55	0.02
		104.63		
11	1.36	1,928.21	0.57	0.02
		80.33		
12	1.05	2,008.54	0.59	0.02
		61.60		
13	0.81	2,070.14	0.61	0.02
		47.15		
14	0.62	2,117.29	0.62	0.02
		36.02		
15	0.48	2,153.31	0.63	0.02
		27.43		
16	0.37	2,180.74	0.63	0.02
		20.81		
17	0.29	2,201.55	0.64	0.02
		15.71		
18	0.22	2,217.26	0.64	0.02

		11.77		
19	0.17	2,229.03	0.64	0.02
		8.74		
20	0.13	2,237.77	0.64	0.02
		6.40		
21	0.10	2,244.16	0.65	0.02
		4.59		
22	0.08	2,248.76	0.65	0.02
		3.20		
23	0.06	2,251.96	0.65	0.02
		2.13		
24	0.05	2,254.09	0.65	0.02
		1.30		
25	0.04	2,255.39	0.65	0.02
		0.67		
26	0.03	2,256.05	0.65	0.02
		0.17		
27	0.02	2,256.23	0.65	0.02
		(0.21)		

WET POND 2

Granville SCM 2 Postdevelopment Q-5

PEAK FLOW (cfs)	6.86
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.66	0	0.00	0.00
		39.30		
2	2.37	39.30	0.03	0.00
		141.98		
3	4.49	181.28	0.09	0.01
		268.84		
4	6.20	450.12	0.18	0.01
		371.51		
5	6.86	821.63	0.29	0.02
		410.60		
6	6.20	1,232.23	0.40	0.02
		371.13		
7	4.82	1,603.36	0.50	0.02
		288.14		
8	3.72	1,891.50	0.57	0.02
		221.79		
9	2.87	2,113.29	0.62	0.02
		170.63		
10	2.21	2,283.92	0.66	0.02
		131.19		
11	1.71	2,415.11	0.68	0.03
		100.78		
12	1.31	2,515.89	0.71	0.03
		77.33		
13	1.01	2,593.22	0.72	0.03
		59.26		
14	0.78	2,652.48	0.74	0.03
		45.32		
15	0.60	2,697.80	0.75	0.03
		34.57		
16	0.46	2,732.37	0.75	0.03
		26.28		
17	0.36	2,758.66	0.76	0.03
		19.90		
18	0.28	2,778.55	0.76	0.03

		14.97		
19	0.21	2,793.52	0.77	0.03
		11.17		
20	0.16	2,804.69	0.77	0.03
		8.24		
21	0.13	2,812.93	0.77	0.03
		5.98		
22	0.10	2,818.92	0.77	0.03
		4.24		
23	0.08	2,823.16	0.77	0.03
		2.90		
24	0.06	2,826.06	0.77	0.03
		1.87		
25	0.04	2,827.93	0.77	0.03
		1.07		
26	0.03	2,829.00	0.77	0.03
		0.45		
27	0.03	2,829.45	0.78	0.03
		(0.02)		

WET POND 2

Granville SCM 2	Postdevelopment	Q-10
PEAK FLOW (cfs)	7.95	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.76	0	0.00	0.00
		45.55		
2	2.75	45.55	0.03	0.00
		164.53		
3	5.20	210.08	0.10	0.01
		311.62		
4	7.19	521.69	0.21	0.01
		430.62		
5	7.95	952.31	0.33	0.02
		475.94		
6	7.19	1,428.25	0.45	0.02
		430.21		
7	5.59	1,858.47	0.56	0.02
		334.05		
8	4.31	2,192.52	0.63	0.02
		257.16		
9	3.32	2,449.68	0.69	0.03
		197.89		
10	2.56	2,647.57	0.74	0.03
		152.18		
11	1.98	2,799.75	0.77	0.03
		116.95		
12	1.52	2,916.70	0.79	0.03
		89.78		
13	1.17	3,006.47	0.81	0.03
		68.83		
14	0.91	3,075.30	0.83	0.03
		52.68		
15	0.70	3,127.97	0.84	0.03
		40.22		
16	0.54	3,168.20	0.85	0.03
		30.62		
17	0.42	3,198.82	0.85	0.03
		23.22		
18	0.32	3,222.03	0.86	0.03

		17.51		
19	0.25	3,239.54	0.86	0.03
		13.11		
20	0.19	3,252.64	0.86	0.03
		9.71		
21	0.15	3,262.36	0.87	0.03
		7.10		
22	0.11	3,269.45	0.87	0.03
		5.08		
23	0.09	3,274.53	0.87	0.03
		3.52		
24	0.07	3,278.05	0.87	0.03
		2.32		
25	0.05	3,280.37	0.87	0.03
		1.40		
26	0.04	3,281.77	0.87	0.03
		0.69		
27	0.03	3,282.46	0.87	0.03
		0.14		
28	0.02	3,282.59	0.87	0.03
		(0.29)		

WET POND

Granville SCM 2 Postdevelopment Q-25

PEAK FLOW (cfs)	9.41
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.90	0	0.00	0.00
		53.91		
2	3.25	53.91	0.03	0.01
		194.73		
3	6.16	248.65	0.12	0.01
		368.91		
4	8.51	617.56	0.24	0.01
		509.79		
5	9.41	1,127.35	0.38	0.02
		563.47		
6	8.51	1,690.82	0.52	0.02
		509.36		
7	6.62	2,200.19	0.64	0.02
		395.56		
8	5.10	2,595.74	0.72	0.03
		304.56		
9	3.93	2,900.30	0.79	0.03
		234.40		
10	3.03	3,134.71	0.84	0.03
		180.31		
11	2.34	3,315.02	0.88	0.03
		138.61		
12	1.80	3,453.63	0.91	0.03
		106.45		
13	1.39	3,560.08	0.93	0.03
		81.66		
14	1.07	3,641.74	0.94	0.03
		62.54		
15	0.83	3,704.28	0.96	0.03
		47.80		
16	0.64	3,752.08	0.97	0.03
		36.44		
17	0.49	3,788.52	0.97	0.03
		27.67		
18	0.38	3,816.20	0.98	0.03

		20.92		
19	0.29	3,837.11	0.98	0.03
		15.71		
20	0.23	3,852.82	0.99	0.03
		11.69		
21	0.17	3,864.51	0.99	0.03
		8.59		
22	0.13	3,873.11	0.99	0.03
		6.21		
23	0.10	3,879.32	0.99	0.03
		4.37		
24	0.08	3,883.68	0.99	0.03
		2.95		
25	0.06	3,886.63	0.99	0.03
		1.85		
26	0.05	3,888.48	0.99	0.03
		1.01		
27	0.04	3,889.49	0.99	0.03
		0.36		
28	0.03	3,889.85	0.99	0.03
		(0.14)		

WET POND 2

Granville SCM 2 | Postdevelopment | Q-25

PEAK FLOW (cfs)	9.41
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.90	0	0.00	0.00
		53.91		
2	3.25	53.91	0.03	0.01
		194.73		
3	6.16	248.65	0.12	0.01
		368.91		
4	8.51	617.56	0.24	0.01
		509.79		
5	9.41	1,127.35	0.38	0.02
		563.47		
6	8.51	1,690.82	0.52	0.02
		509.36		
7	6.62	2,200.19	0.64	0.02
		395.56		
8	5.10	2,595.74	0.72	0.03
		304.56		
9	3.93	2,900.30	0.79	0.03
		234.40		
10	3.03	3,134.71	0.84	0.03
		180.31		
11	2.34	3,315.02	0.88	0.03
		138.61		
12	1.80	3,453.63	0.91	0.03
		106.45		
13	1.39	3,560.08	0.93	0.03
		81.66		
14	1.07	3,641.74	0.94	0.03
		62.54		
15	0.83	3,704.28	0.96	0.03
		47.80		
16	0.64	3,752.08	0.97	0.03
		36.44		
17	0.49	3,788.52	0.97	0.03
		27.67		
18	0.38	3,816.20	0.98	0.03

		20.92		
19	0.29	3,837.11	0.98	0.03
		15.71		
20	0.23	3,852.82	0.99	0.03
		11.69		
21	0.17	3,864.51	0.99	0.03
		8.59		
22	0.13	3,873.11	0.99	0.03
		6.21		
23	0.10	3,879.32	0.99	0.03
		4.37		
24	0.08	3,883.68	0.99	0.03
		2.95		
25	0.06	3,886.63	0.99	0.03
		1.85		
26	0.05	3,888.48	0.99	0.03
		1.01		
27	0.04	3,889.49	0.99	0.03
		0.36		
28	0.03	3,889.85	0.99	0.03
		(0.14)		

Wet Pond 3

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 3

Total Drainage Area	3.01 acres	Trib Area			
Post Development Land Use		CN	% of Total	CN	Extension
Impervious	0.88 acre	98	0.292359		28.65
Lawn / Grassed	2.05 acre	61	0.681063		41.54
Wooded	0.00 acre	55	0		0.00
SCM	0.08 acre	100	0.026578		2.66
	3.01				
			Composite CN		72.85
			Use CN		73

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 3.69863

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.108564 inches

Total Runoff Volume = 1,186 cu. ft.

Wet Pond Surface Area
Impervious 29.24 %

SA / DA 1.1449 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 29.24 %

Wet Pond Surface Area Use % Impervious 29.24%

SA / DA 0.011449 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	1,501.14 sq. ft.	Main Pool
Add 25% for Forebay=	1,876.43 sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**1,876.43 sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 3 Inflow

Total Drainage Area 3.01 acres

Post Development Land Use			C	Fraction	CN	Extension
Impervious	0.88	acre	0.95	0.292359		0.28
Lawn Landscaping	2.05	acre	0.22	0.681063		0.15
Forest	0	acre	0.20	0		0.00
SCM	0.08	acre	1.00	0.026578		0.03
	3.01					
				Composite C		0.45
				Use C		0.45

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	4.08 cfs
I-2	3.57	Q-2=	4.92 cfs
I-5	4.47	Q-5=	6.16 cfs
I-10	5.18	Q-10=	7.14 cfs
I-25	6.13	Q-25=	8.45 cfs
I-50	6.89	Q-50=	9.49 cfs
I-100	7.67	Q-100=	10.57 cfs

STAGE-STORAGE

WET POND 3

Project: Fearrington Granville SCM 3 Storage

Invert Elevation: 446

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
446	0	3,552		0
			4,284	
447	1	5,015		4,284
			5,650	
448	2	6,284		9,933
			6,837	
449	3	7,389		16,770

$$b = \frac{\ln\left(\frac{16,770}{4,284}\right)}{\ln\left(\frac{3}{1}\right)} = \frac{1.3647}{1.0986} = 1.2422$$

$$\frac{16,770}{3^{1.2422}} = 4284$$

$$\text{STORAGE} = 4284 Z^{1.2422}$$

STAGE-STORAGE

WET POND 3

Project: Fearrington Granville SCM 3 Forebay

Invert Elevation: 443

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
443	0	0		0
			102	
444	1	204		102
			353	
445	2	502		455
			621	
446	3	740		1076

STAGE-STORAGE

WET POND 3

Project: Fearrington Granville SCM 3 Main Pool

Invert Elevation: 442

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
442	0	472		0
			685.5	
443	1	899		685.5
			1158	
444	2	1417		1843.5
			1712.5	
445	3	2008		3556
			2410	
446	4	2812		5966

Fearrington Granville
Wet Pond 3

Area Tributary to Basin = 3.01 ac

Total DA Used for Treatment Calculation = 3.01 acres

Composite C = 0.45 (29% impervious)
Composite Curve Number = 73
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 3.69863

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.1086 inches

Total Runoff Volume = 1,186 cu. ft.

Design Volume = 1,186 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 29.24% impervious and 3-foot depth
SA /DA = 1.1449
Surfcace Area Required = 1.14 x 3.01 x 43,560 / 100

Surface Area Required = 1,501 sq . Ft.

Wet Pond Main Pool Area at El. 446 = 2,812 sq. ft.

MDC 2 Main Pool Depth
Equation 1: Vmp = 0.87 x HRT / T x DV
Design Volume = 1,186 cu. ft.

Vmp = 3,197 cu. ft.

Vmp = Main Pool Volume (cu. ft.)
HRT = Residence Time (14 days)
T = Ave. Time Between Storms (5 days)
DV = Design Volume (cu. ft.)

Main Pool Volume= 5,966 cu. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 441
Main Pool Bottom = El. 442
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume=	5,966 cu. ft.
Forebay Volume =	1,076 cu. ft.

11482 / 2,005 =	18.04%
Forebay Volume %	18.04%

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 4284 z^1.2422

Treatment Volume = 1,186 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.35 feet
Stage required for Treatment Volume = 0.35 feet (Stage = 446 + 0.35 = 446.35)
Set Weir at or above 446.35

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.35 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 446.35 = 4,064 sq. ft.
Orifice Area = 4,064 x Sqrt(2 x 0.35) / 48 x 0.6 x 20,428
Orifice Area = 0.0058 sq. ft.
Orifice Diameter = 1.03 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 51 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 3

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 10.57 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.36 feet

Top of Dike = 449

Freeboard = 1 foot

Height on Weir = 0.36 foot

Set Top of Weir @ 447.64 Maximum Height

Maximum Water Surface Elevation at Q-100 = 448.00

Riser Outlet Barrel

Q-100 = 10.57 cfs

18-inch Headwater= 2.42 feet

Riser Invert = 442.00

Rsier Weir = 447.64

Headwater Available = 5.64 feet OK

Slope Required 18 inch 1.01%

Q-full= 10.57 fps

V-full= 6 fps

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.01%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 448.14

Riser Invert = 442.00

Uplift Height = 6.14 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 174.30 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 10877 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 5.64 feet

Wall Weight = 7887 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3737 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 1.06 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 3

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	4284
b =	1.2422

OUTLET ORIFICE #1:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0.09	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:	ELEVATION =	1.64	(ft)
	LENGTH =	16	(ft)
	WEIR COEFFICIENT =	3	3.0

WET POND 3

Granville SCM 3 Postdevelopment Q-1

PEAK FLOW (cfs)	4.08
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.39	0	0.00	0.00
		23.38		
2	1.41	23.38	0.02	0.00
		84.48		
3	2.67	107.86	0.05	0.01
		159.81		
4	3.69	267.66	0.11	0.01
		220.82		
5	4.08	488.49	0.17	0.01
		244.03		
6	3.69	732.52	0.24	0.02
		220.52		
7	2.87	953.04	0.30	0.02
		171.14		
8	2.21	1,124.18	0.34	0.02
		131.66		
9	1.71	1,255.84	0.37	0.02
		101.22		
10	1.32	1,357.06	0.40	0.02
		77.75		
11	1.01	1,434.81	0.41	0.02
		59.66		
12	0.78	1,494.47	0.43	0.02
		45.71		
13	0.60	1,540.18	0.44	0.02
		34.96		
14	0.46	1,575.14	0.45	0.02
		26.66		
15	0.36	1,601.80	0.45	0.02
		20.27		
16	0.28	1,622.07	0.46	0.02
		15.34		
17	0.21	1,637.41	0.46	0.02
		11.54		
18	0.16	1,648.95	0.46	0.02

		8.61		
19	0.13	1,657.55	0.47	0.02
		6.35		
20	0.10	1,663.90	0.47	0.02
		4.61		
21	0.08	1,668.51	0.47	0.02
		3.26		
22	0.06	1,671.77	0.47	0.02
		2.23		
23	0.04	1,673.99	0.47	0.02
		1.43		
24	0.03	1,675.42	0.47	0.02
		0.81		
25	0.03	1,676.23	0.47	0.02
		0.34		
26	0.02	1,676.57	0.47	0.02
		(0.03)		

WET POND 3

Granville SCM 3 | Postdevelopment | Q-2

PEAK FLOW (cfs)	4.92
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.47	0	0.00	0.00
		28.19		
2	1.70	28.19	0.02	0.00
		101.87		
3	3.22	130.06	0.06	0.01
		192.76		
4	4.45	322.82	0.12	0.01
		266.36		
5	4.92	589.18	0.20	0.01
		294.37		
6	4.45	883.56	0.28	0.02
		266.04		
7	3.46	1,149.59	0.35	0.02
		206.50		
8	2.67	1,356.09	0.40	0.02
		158.90		
9	2.06	1,514.99	0.43	0.02
		122.20		
10	1.59	1,637.20	0.46	0.02
		93.91		
11	1.22	1,731.10	0.48	0.02
		72.09		
12	0.94	1,803.20	0.50	0.02
		55.28		
13	0.73	1,858.48	0.51	0.02
		42.31		
14	0.56	1,900.78	0.52	0.02
		32.31		
15	0.43	1,933.09	0.53	0.02
		24.60		
16	0.33	1,957.69	0.53	0.02
		18.66		
17	0.26	1,976.35	0.54	0.02
		14.07		
18	0.20	1,990.42	0.54	0.02

		10.54		
19	0.15	2,000.96	0.54	0.02
		7.81		
20	0.12	2,008.77	0.54	0.02
		5.71		
21	0.09	2,014.48	0.54	0.02
		4.09		
22	0.07	2,018.58	0.55	0.02
		2.84		
23	0.05	2,021.42	0.55	0.02
		1.88		
24	0.04	2,023.30	0.55	0.02
		1.14		
25	0.03	2,024.44	0.55	0.02
		0.57		
26	0.02	2,025.01	0.55	0.02
		0.13		
27	0.02	2,025.13	0.55	0.02
		(0.21)		

WET POND 3

Granville SCM 3	Postdevelopment	Q-5
PEAK FLOW (cfs)	6.16	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.59	0	0.00	0.00
		35.29		
2	2.13	35.29	0.02	0.00
		127.54		
3	4.03	162.83	0.07	0.01
		241.41		
4	5.57	404.25	0.15	0.01
		333.60		
5	6.16	737.84	0.24	0.02
		368.69		
6	5.57	1,106.54	0.34	0.02
		333.24		
7	4.33	1,439.78	0.42	0.02
		258.71		
8	3.34	1,698.49	0.47	0.02
		199.13		
9	2.58	1,897.62	0.52	0.02
		153.19		
10	1.99	2,050.81	0.55	0.02
		117.77		
11	1.53	2,168.59	0.58	0.02
		90.47		
12	1.18	2,259.05	0.60	0.02
		69.41		
13	0.91	2,328.46	0.61	0.02
		53.18		
14	0.70	2,381.64	0.62	0.02
		40.66		
15	0.54	2,422.30	0.63	0.02
		31.01		
16	0.42	2,453.31	0.64	0.02
		23.57		
17	0.32	2,476.87	0.64	0.02
		17.83		
18	0.25	2,494.70	0.65	0.02

		13.41		
19	0.19	2,508.11	0.65	0.02
		9.99		
20	0.15	2,518.11	0.65	0.02
		7.37		
21	0.11	2,525.47	0.65	0.02
		5.34		
22	0.09	2,530.81	0.65	0.02
		3.77		
23	0.07	2,534.58	0.66	0.02
		2.57		
24	0.05	2,537.15	0.66	0.02
		1.64		
25	0.04	2,538.79	0.66	0.02
		0.92		
26	0.03	2,539.71	0.66	0.02
		0.37		
27	0.02	2,540.08	0.66	0.02
		(0.06)		

WET POND 3

Granville SCM 3	Postdevelopment	Q-10
PEAK FLOW (cfs)	7.14	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.68	0	0.00	0.00
		40.91		
2	2.47	40.91	0.02	0.00
		147.82		
3	4.67	188.73	0.08	0.01
		279.87		
4	6.46	468.60	0.17	0.01
		386.74		
5	7.14	855.34	0.27	0.02
		427.44		
6	6.46	1,282.78	0.38	0.02
		386.36		
7	5.02	1,669.14	0.47	0.02
		299.99		
8	3.87	1,969.13	0.53	0.02
		230.93		
9	2.98	2,200.06	0.58	0.02
		177.69		
10	2.30	2,377.75	0.62	0.02
		136.64		
11	1.77	2,514.40	0.65	0.02
		104.99		
12	1.37	2,619.39	0.67	0.03
		80.59		
13	1.06	2,699.98	0.69	0.03
		61.78		
14	0.81	2,761.76	0.70	0.03
		47.27		
15	0.63	2,809.03	0.71	0.03
		36.08		
16	0.48	2,845.11	0.72	0.03
		27.46		
17	0.37	2,872.57	0.72	0.03
		20.81		
18	0.29	2,893.38	0.73	0.03

		15.68		
19	0.22	2,909.07	0.73	0.03
		11.73		
20	0.17	2,920.80	0.73	0.03
		8.68		
21	0.13	2,929.48	0.74	0.03
		6.33		
22	0.10	2,935.81	0.74	0.03
		4.52		
23	0.08	2,940.33	0.74	0.03
		3.12		
24	0.06	2,943.45	0.74	0.03
		2.05		
25	0.05	2,945.50	0.74	0.03
		1.21		
26	0.04	2,946.71	0.74	0.03
		0.57		
27	0.03	2,947.29	0.74	0.03
		0.08		
28	0.02	2,947.37	0.74	0.03
		(0.30)		

WET POND 3

Granville SCM 3	Postdevelopment	Q-25
PEAK FLOW (cfs)	8.45	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.81	0	0.00	0.00
		48.41		
2	2.92	48.41	0.03	0.00
		174.94		
3	5.53	223.35	0.09	0.01
		331.28		
4	7.64	554.63	0.19	0.01
		457.78		
5	8.45	1,012.41	0.31	0.02
		505.97		
6	7.64	1,518.38	0.43	0.02
		457.38		
7	5.94	1,975.75	0.54	0.02
		355.17		
8	4.58	2,330.93	0.61	0.02
		273.46		
9	3.53	2,604.38	0.67	0.03
		210.45		
10	2.72	2,814.83	0.71	0.03
		161.88		
11	2.10	2,976.71	0.75	0.03
		124.43		
12	1.62	3,101.14	0.77	0.03
		95.55		
13	1.25	3,196.69	0.79	0.03
		73.28		
14	0.96	3,269.97	0.80	0.03
		56.12		
15	0.74	3,326.09	0.82	0.03
		42.88		
16	0.57	3,368.97	0.82	0.03
		32.67		
17	0.44	3,401.64	0.83	0.03
		24.81		
18	0.34	3,426.45	0.84	0.03

		18.74		
19	0.26	3,445.19	0.84	0.03
		14.06		
20	0.20	3,459.25	0.84	0.03
		10.45		
21	0.16	3,469.70	0.84	0.03
		7.67		
22	0.12	3,477.37	0.85	0.03
		5.53		
23	0.09	3,482.90	0.85	0.03
		3.87		
24	0.07	3,486.77	0.85	0.03
		2.60		
25	0.06	3,489.37	0.85	0.03
		1.62		
26	0.04	3,490.98	0.85	0.03
		0.86		
27	0.03	3,491.84	0.85	0.03
		0.27		
28	0.03	3,492.12	0.85	0.03
		(0.18)		

Wet Pond 4

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 4

Total Drainage Area	3.91 acres	Trib Area			
Post Development Land Use		CN	% of Total	CN	Extension
Impervious	1.01 acre	98	0.258312		25.31
Lawn / Grassed	1.84 acre	61	0.470588		28.71
Wooded	0.98 acre	55	0.250639		13.79
SCM	0.08 acre	100	0.02046		2.05
	3.91				
			Composite CN		69.85
			Use CN		70

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 4.285714

Runoff = (P - 0.2S)^2 / (P + 0.8S) 0.067544 inches

Total Runoff Volume = 959 cu. ft.

Wet Pond Surface Area
Impervious 25.83 %

SA / DA 1.0324 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 25.83 %

Wet Pond Surface Area Use % Impervious 25.83%

SA / DA 0.010324 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	1,758.38 sq. ft.	Main Pool
Add 25% for Forebay=	2,197.97 sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**2,197.97 sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 4 Inflow

Total Drainage Area 3.91 acres

Post Development Land Use		C	Fraction	CN	Extension
Impervious	1.01 acre	0.95	0.258312		0.25
Lawn Landscaping	1.84 acre	0.22	0.470588		0.10
Forest	0.98 acre	0.20	0.250639		0.05
SCM	0.08 acre	1.00	0.02046		0.02
	3.91				
			Composite C		0.42
			Use C		0.42

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	4.89 cfs
I-2	3.57	Q-2=	5.90 cfs
I-5	4.47	Q-5=	7.39 cfs
I-10	5.18	Q-10=	8.56 cfs
I-25	6.13	Q-25=	10.14 cfs
I-50	6.89	Q-50=	11.39 cfs
I-100	7.67	Q-100=	12.68 cfs

STAGE-STORAGE

WET POND 4

Project: Fearrington Granville SCM 4 Storage

Invert Elevation: 435

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
435	0	4407		0
			5538	
436	1	6669		5538
			7591	
437	2	8513		13129
			9719	
438	3	10925		22848

$$b = \frac{\ln\left(\frac{22,848}{5538}\right)}{\ln\left(\frac{3}{1}\right)} = \frac{1.4172}{1.0986} = 1.2900$$

$$K_s = \quad 22848 = K_s\, 3^{1.2900}$$

$$\text{STORAGE} = 5538\, z^{1.2900}$$

STAGE-STORAGE

WET POND 4

Project: Fearrington Granville SCM 4 Forebay

Invert Elevation: 433

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
433	0	200		0
			420	
434	1	640		420
			688.5	
435	2	737		1108.5

STAGE-STORAGE

WET POND 4

Project: Fearrington Granville SCM 4 Main Pool

Invert Elevation: 431

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
431	0	637		0
			827.5	
432	1	1018		827.5
			1294.5	
433	2	1571		2122
			1946	
434	3	2321		4068
			2995.5	
435	4	3670		7063.5

Fearrington Granville
Wet Pond 4

Area Tributary to Basin = 3.91 ac

Total DA Used for Treatment Calculation = 3.91 acres

Composite C = 0.42 (25.8% impervious)
Composite Curve Number = 70
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 4.285714

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.0675 inches

Total Runoff Volume = 959 cu. ft.

Design Volume = 959 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 25.83% impervious and 3-foot depth
SA /DA = 1.0324
Surfcace Area Required = 1.03 x 3.91 x 43,560 / 100

Surface Area Required = 1,758 sq . Ft.

Wet Pond Main Pool Area at El. 446 = 3,670 sq. ft.

MDC 2 Main Pool Depth
Equation 1: Vmp = 0.87 x HRT / T x DV
Design Volume = 959 cu. ft.

Vmp = 3,197 cu. ft.

Vmp = Main Pool Volume (cu. ft.)
HRT = Residence Time (14 days)
T = Ave. Time Between Storms (5 days)
DV = Design Volume (cu. ft.)

Main Pool Volume= 7,063 cu. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 430
Main Pool Bottom = El. 431
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume=	7,063	cu. ft.
Forebay Volume =	1,108	cu. ft.

7,063/1,108	15.69%
Forebay Volume %	15.69%

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 5538 z^1.2900

Design Volume = 959 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.26 feet
Stage required for Treatment Volume = 0.26 feet (Stage = 435 + 0.26 = 435.26)
Set Weir at or above 435.26

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.26 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 435.26 = 5,063 sq. ft.
Orifice Area = 5,063 x Sqrt(2 x 0.26) / 48 x 0.6 x 20,428
Orifice Area = 0.0062 sq. ft.
Orifice Diameter = 1.07 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 55 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 4

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 12.68 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.41 feet

Top of Dike = 438

Freeboard = 1 foot

Height on Weir = 0.41 foot

Set Top of Weir @ 436.59 Maximum Height

Maximum Water Surface Elevation at Q-100 = 437.00

Riser Outlet Barrel

Q-100 = 12.68 cfs

18-inch Headwater= 3.04 feet

Riser Invert = 431.00

Rsier Weir = 436.59

Headwater Available = 5.59 feet OK

Slope Required 18 inch 1.45%

Q-full= 12.68 fps

V-full= 7.2 fps

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.45%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 437.09

Riser Invert = 431.00

Uplift Height = 6.09 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 172.97 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 10793 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 5.59 feet

Wall Weight = 7821 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3716 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 1.05 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 4

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	5538
b =	1.29

OUTLET ORIFICE #1:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0.09	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:	ELEVATION =	1.59	(ft)
	LENGTH =	16	(ft)
	WEIR COEFFICIENT =	3	3.0

WET POND 4

Granville SCM 4	Postdevelopment	Q-1
PEAK FLOW (cfs)	4.89	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.47	0	0.00	0.00
		28.02		
2	1.69	28.02	0.02	0.00
		101.26		
3	3.20	129.28	0.05	0.01
		191.60		
4	4.42	320.88	0.11	0.01
		264.77		
5	4.89	585.65	0.18	0.01
		292.63		
6	4.42	878.28	0.24	0.02
		264.48		
7	3.44	1,142.77	0.29	0.02
		205.32		
8	2.65	1,348.09	0.33	0.02
		158.02		
9	2.04	1,506.10	0.36	0.02
		121.55		
10	1.58	1,627.65	0.39	0.02
		93.43		
11	1.22	1,721.09	0.40	0.02
		71.76		
12	0.94	1,792.84	0.42	0.02
		55.04		
13	0.72	1,847.88	0.43	0.02
		42.15		
14	0.56	1,890.04	0.43	0.02
		32.22		
15	0.43	1,922.25	0.44	0.02
		24.56		
16	0.33	1,946.81	0.44	0.02
		18.65		
17	0.26	1,965.46	0.45	0.02
		14.09		
18	0.20	1,979.55	0.45	0.02

		10.58		
19	0.15	1,990.14	0.45	0.02
		7.87		
20	0.12	1,998.01	0.45	0.02
		5.79		
21	0.09	2,003.80	0.45	0.02
		4.18		
22	0.07	2,007.97	0.46	0.02
		2.94		
23	0.05	2,010.91	0.46	0.02
		1.98		
24	0.04	2,012.89	0.46	0.02
		1.24		
25	0.03	2,014.13	0.46	0.02
		0.67		
26	0.02	2,014.80	0.46	0.02
		0.23		
27	0.02	2,015.04	0.46	0.02
		(0.10)		

WET POND 4

Granville SCM 4	Postdevelopment	Q-2
PEAK FLOW (cfs)	5.9	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.56	0	0.00	0.00
		33.80		
2	2.04	33.80	0.02	0.00
		122.17		
3	3.86	155.97	0.06	0.01
		231.24		
4	5.34	387.21	0.13	0.01
		319.54		
5	5.90	706.75	0.20	0.01
		353.17		
6	5.34	1,059.92	0.28	0.02
		319.23		
7	4.15	1,379.15	0.34	0.02
		247.86		
8	3.20	1,627.01	0.39	0.02
		190.79		
9	2.47	1,817.80	0.42	0.02
		146.80		
10	1.90	1,964.60	0.45	0.02
		112.88		
11	1.47	2,077.48	0.47	0.02
		86.73		
12	1.13	2,164.21	0.48	0.02
		66.56		
13	0.87	2,230.78	0.49	0.02
		51.02		
14	0.67	2,281.79	0.50	0.02
		39.03		
15	0.52	2,320.82	0.51	0.02
		29.79		
16	0.40	2,350.61	0.51	0.02
		22.66		
17	0.31	2,373.27	0.52	0.02
		17.17		
18	0.24	2,390.44	0.52	0.02

		12.93		
19	0.18	2,403.37	0.52	0.02
		9.66		
20	0.14	2,413.03	0.53	0.02
		7.14		
21	0.11	2,420.17	0.53	0.02
		5.20		
22	0.08	2,425.37	0.53	0.02
		3.70		
23	0.06	2,429.08	0.53	0.02
		2.55		
24	0.05	2,431.63	0.53	0.02
		1.66		
25	0.04	2,433.29	0.53	0.02
		0.97		
26	0.03	2,434.26	0.53	0.02
		0.44		
27	0.02	2,434.71	0.53	0.02
		0.04		
28	0.02	2,434.74	0.53	0.02
		(0.28)		

WET POND 4

Granville SCM 4 Postdevelopment Q-5

PEAK FLOW (cfs)	7.39
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.71	0	0.00	0.00
		42.34		
2	2.55	42.34	0.02	0.00
		153.01		
3	4.84	195.36	0.07	0.01
		289.71		
4	6.68	485.06	0.15	0.01
		400.34		
5	7.39	885.41	0.24	0.02
		442.50		
6	6.68	1,327.90	0.33	0.02
		400.00		
7	5.20	1,727.91	0.41	0.02
		310.63		
8	4.01	2,038.53	0.46	0.02
		239.16		
9	3.09	2,277.69	0.50	0.02
		184.07		
10	2.38	2,461.76	0.53	0.02
		141.59		
11	1.84	2,603.35	0.56	0.02
		108.83		
12	1.42	2,712.18	0.57	0.02
		83.58		
13	1.09	2,795.76	0.59	0.02
		64.11		
14	0.84	2,859.87	0.60	0.02
		49.10		
15	0.65	2,908.97	0.61	0.02
		37.52		
16	0.50	2,946.49	0.61	0.02
		28.60		
17	0.39	2,975.08	0.62	0.02
		21.71		
18	0.30	2,996.80	0.62	0.02

		16.41		
19	0.23	3,013.21	0.62	0.02
		12.32		
20	0.18	3,025.52	0.63	0.02
		9.16		
21	0.14	3,034.68	0.63	0.02
		6.73		
22	0.11	3,041.41	0.63	0.02
		4.85		
23	0.08	3,046.27	0.63	0.02
		3.41		
24	0.06	3,049.68	0.63	0.02
		2.29		
25	0.05	3,051.97	0.63	0.02
		1.43		
26	0.04	3,053.41	0.63	0.02
		0.77		
27	0.03	3,054.18	0.63	0.02
		0.26		
28	0.02	3,054.44	0.63	0.02
		(0.13)		

WET POND 4

Granville SCM 4	Postdevelopment	Q-10
PEAK FLOW (cfs)	8.56	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.82	0	0.00	0.00
		49.04		
2	2.96	49.04	0.03	0.00
		177.24		
3	5.60	226.28	0.08	0.01
		335.62		
4	7.74	561.90	0.17	0.01
		463.80		
5	8.56	1,025.70	0.27	0.02
		512.64		
6	7.74	1,538.35	0.37	0.02
		463.44		
7	6.02	2,001.78	0.45	0.02
		359.92		
8	4.64	2,361.70	0.52	0.02
		277.15		
9	3.58	2,638.86	0.56	0.02
		213.34		
10	2.76	2,852.19	0.60	0.02
		164.14		
11	2.13	3,016.33	0.62	0.02
		126.20		
12	1.64	3,142.53	0.64	0.02
		96.95		
13	1.26	3,239.48	0.66	0.02
		74.40		
14	0.98	3,313.88	0.67	0.03
		57.01		
15	0.75	3,370.89	0.68	0.03
		43.60		
16	0.58	3,414.50	0.69	0.03
		33.27		
17	0.45	3,447.76	0.69	0.03
		25.30		
18	0.34	3,473.06	0.70	0.03

		19.15		
19	0.27	3,492.21	0.70	0.03
		14.41		
20	0.20	3,506.62	0.70	0.03
		10.76		
21	0.16	3,517.38	0.70	0.03
		7.94		
22	0.12	3,525.32	0.70	0.03
		5.77		
23	0.09	3,531.08	0.71	0.03
		4.09		
24	0.07	3,535.18	0.71	0.03
		2.80		
25	0.06	3,537.98	0.71	0.03
		1.81		
26	0.04	3,539.79	0.71	0.03
		1.04		
27	0.03	3,540.83	0.71	0.03
		0.45		
28	0.03	3,541.27	0.71	0.03
		(0.01)		

WET POND 4

Granville SCM 4	Postdevelopment	Q-25
PEAK FLOW (cfs)	10.14	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.97	0	0.00	0.00
		58.10		
2	3.50	58.10	0.03	0.00
		209.94		
3	6.64	268.04	0.10	0.01
		397.63		
4	9.17	665.67	0.19	0.01
		549.49		
5	10.14	1,215.17	0.31	0.02
		607.38		
6	9.17	1,822.55	0.42	0.02
		549.11		
7	7.13	2,371.66	0.52	0.02
		426.50		
8	5.50	2,798.16	0.59	0.02
		328.46		
9	4.24	3,126.62	0.64	0.02
		252.88		
10	3.27	3,379.49	0.68	0.03
		194.60		
11	2.52	3,574.09	0.71	0.03
		149.66		
12	1.94	3,723.76	0.74	0.03
		115.02		
13	1.50	3,838.78	0.75	0.03
		88.31		
14	1.16	3,927.08	0.77	0.03
		67.71		
15	0.89	3,994.79	0.78	0.03
		51.83		
16	0.69	4,046.62	0.78	0.03
		39.58		
17	0.53	4,086.21	0.79	0.03
		30.14		
18	0.41	4,116.35	0.79	0.03

		22.86		
19	0.31	4,139.21	0.80	0.03
		17.25		
20	0.24	4,156.46	0.80	0.03
		12.92		
21	0.19	4,169.38	0.80	0.03
		9.59		
22	0.14	4,178.97	0.80	0.03
		7.01		
23	0.11	4,185.98	0.80	0.03
		5.03		
24	0.09	4,191.01	0.81	0.03
		3.50		
25	0.07	4,194.51	0.81	0.03
		2.32		
26	0.05	4,196.83	0.81	0.03
		1.41		
27	0.04	4,198.24	0.81	0.03
		0.71		

Wet Pond 5

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 5

Total Drainage Area	4.48 acres	Trib Area			
Post Development Land Use		CN	% of Total	CN	Extension
Impervious	0.89 acre	98	0.198661		19.47
Lawn / Grassed	3.48 acre	61	0.776786		47.38
Wooded	0.00 acre	55	0		0.00
SCM	0.11 acre	100	0.024554		2.46
	4.48				
			Composite CN		69.31
			Use CN		70

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 4.285714

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.067544 inches

Total Runoff Volume = 1,098 cu. ft.

Wet Pond Surface Area
Impervious 19.87 %

SA / DA 0.008357 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 19.87 %

Wet Pond Surface Area Use % Impervious 19.87%

SA / DA 0.008357 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	1,630.86	sq. ft.	Main Pool
Add 25% for Forebay=	2,038.57	sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**2,038.57**	**sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 5 Inflow

Total Drainage Area 4.48 acres

Post Development Land Use		C	Fraction	CN	Extension
Impervious	0.89 acre	0.95	0.198661		0.19
Lawn Landscaping	3.48 acre	0.22	0.776786		0.17
Forest	0 acre	0.20	0		0.00
SCM	0.11 acre	1.00	0.024554		0.02
	4.48				
			Composite C		0.38
			Use C		0.38

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	5.14 cfs
I-2	3.57	Q-2=	6.19 cfs
I-5	4.47	Q-5=	7.75 cfs
I-10	5.18	Q-10=	8.99 cfs
I-25	6.13	Q-25=	10.63 cfs
I-50	6.89	Q-50=	11.95 cfs
I-100	7.67	Q-100=	13.31 cfs

STAGE-STORAGE

WET PONDS

Project: Fearrington Granville SCM 5 Storage

Invert Elevation: 449

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
449	0	4838		0
			6213.5	
450	1	7589		6213.5
			8322.5	
451	2	9056		14536
			10003.5	
452	3	10951		24539.5

$$\frac{\ln\left(\frac{24,539.5}{6213.5}\right)}{\ln\left(\frac{3}{1}\right)} = \frac{1.3736}{1.0986} = 1.2503$$

$$24539.5 = (3)^{1.2503} K = 6213$$

$$\text{STORAGE} = 6213 Z^{1.2503}$$

STAGE-STORAGE

WET POND 5

Project: Fearrington Granville SCM 5 Forebay

Invert Elevation: 445

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
445	0	22		0
			74.5	
446	1	127		74.5
			217	
447	2	307		291.5
			435	
448	3	563		726.5
			721.5	
449	4	880		1448

STAGE-STORAGE

WET POND 5.

Project: Fearrington Granville SCM 5 Main Pool

Invert Elevation: 445

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
445	0	619		0
			975.5	
446	1	1332		975.5
			1731	
447	2	2130		2706.5
			3024.5	
448	3	3919		5731
			3938.5	
449	4	3958		9669.5

Fearrington Granville
Wet Pond 5

Area Tributary to Basin = 4.48 ac

Total DA Used for Treatment Calculation = 4.48 acres

Composite C = 0.38 (20% impervious)
Composite Curve Number = 70
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 4.285714

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.0675 inches

Total Runoff Volume = 1,098 cu. ft.

Design Volume = 1,098 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 19.87% impervious and 3-foot depth
SA /DA = 0.8357
Surfcace Area Required = 0.84 x 4.48 x 43,560 / 100

Surface Area Required = 1,631 sq . Ft.

Wet Pond Main Pool Area at El. 449 = 3,958 sq. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 444
Main Pool Bottom = El. 445
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume=	9,670 cu. ft.
Forebay Volume =	1,452 cu. ft.
11482 / 2,005 =	15.02%
Forebay Volume %	15.02%

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 6213 z^1.2503

Design Volume = 1,098 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.25 feet
Stage required for Treatment Volume = 0.25 feet (Stage = 449 + 0.25 = 449.25)
Set Weir at or above 449.25

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.25 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 449.25 = 5526 sq. ft.
Orifice Area = 5,526 x Sqrt(2 x 0.25) / 48 x 0.6 x 20,428
Orifice Area = 0.0067 sq. ft.
Orifice Diameter = 1.11 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 58 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 5

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 13.31 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.43 feet

Top of Dike = 452

Freeboard = 1 foot

Height on Weir = 0.43 foot

Set Top of Weir @ 450.57 Maximum Height

Maximum Water Surface Elevation at Q-100 = 451.00

Riser Outlet Barrel

Q-100 = 13.31 cfs

18-inch Headwater= 3.25 feet

Riser Invert = 445.00

Rsier Weir = 450.57

Headwater Available = 5.57 feet OK

Slope Required 18 inch 1.60%

Q-full= 13.31 fps

V-full= 7.5 fps

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.60%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 451.07

Riser Invert = 445.00

Uplift Height = 6.07 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 172.58 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 10769 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 5.57 feet

Wall Weight = 7802 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3709 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 1.05 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 5

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	6213
b =	1.2503

OUTLET ORIFICE #1:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0.09	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:	ELEVATION =	1.57	(ft)
	LENGTH =	16	(ft)
	WEIR COEFFICIENT =	3	3.0

WET PONDS

Granville SCM 5 Postdevelopment Q-1

PEAK FLOW (cfs)	5.14
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.49	0	0.00	0.00
		29.45		
2	1.78	29.45	0.01	0.00
		106.47		
3	3.36	135.92	0.05	0.01
		201.45		
4	4.65	337.37	0.10	0.01
		278.38		
5	5.14	615.75	0.16	0.01
		307.67		
6	4.65	923.42	0.22	0.01
		278.09		
7	3.61	1,201.51	0.27	0.02
		215.91		
8	2.79	1,417.42	0.31	0.02
		166.20		
9	2.15	1,583.62	0.34	0.02
		127.87		
10	1.66	1,711.48	0.36	0.02
		98.31		
11	1.28	1,809.80	0.37	0.02
		75.53		
12	0.99	1,885.33	0.39	0.02
		57.96		
13	0.76	1,943.29	0.39	0.02
		44.42		
14	0.59	1,987.71	0.40	0.02
		33.97		
15	0.45	2,021.68	0.41	0.02
		25.92		
16	0.35	2,047.60	0.41	0.02
		19.71		
17	0.27	2,067.31	0.41	0.02
		14.92		
18	0.21	2,082.23	0.42	0.02

		11.23		
19	0.16	2,093.47	0.42	0.02
		8.39		
20	0.12	2,101.85	0.42	0.02
		6.19		
21	0.09	2,108.05	0.42	0.02
		4.50		
22	0.07	2,112.55	0.42	0.02
		3.20		
23	0.06	2,115.74	0.42	0.02
		2.19		
24	0.04	2,117.93	0.42	0.02
		1.41		
25	0.03	2,119.35	0.42	0.02
		0.82		
26	0.03	2,120.16	0.42	0.02
		0.36		
27	0.02	2,120.52	0.42	0.02
		0.00		

WET POND 5

Granville SCM 5	Postdevelopment	Q-2
PEAK FLOW (cfs)	6.19	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.59	0	0.00	0.00
		35.47		
2	2.14	35.47	0.02	0.00
		128.21		
3	4.05	163.68	0.05	0.01
		242.66		
4	5.60	406.33	0.11	0.01
		335.32		
5	6.19	741.65	0.18	0.01
		370.61		
6	5.60	1,112.26	0.25	0.02
		335.01		
7	4.35	1,447.28	0.31	0.02
		260.14		
8	3.36	1,707.41	0.36	0.02
		200.28		
9	2.59	1,907.69	0.39	0.02
		154.12		
10	2.00	2,061.81	0.41	0.02
		118.54		
11	1.54	2,180.35	0.43	0.02
		91.10		
12	1.19	2,271.45	0.45	0.02
		69.95		
13	0.91	2,341.40	0.46	0.02
		53.64		
14	0.71	2,395.03	0.47	0.02
		41.06		
15	0.54	2,436.09	0.47	0.02
		31.36		
16	0.42	2,467.46	0.48	0.02
		23.89		
17	0.32	2,491.35	0.48	0.02
		18.12		
18	0.25	2,509.47	0.48	0.02

		13.68		
19	0.19	2,523.15	0.49	0.02
		10.25		
20	0.15	2,533.40	0.49	0.02
		7.61		
21	0.11	2,541.00	0.49	0.02
		5.57		
22	0.09	2,546.58	0.49	0.02
		4.00		
23	0.07	2,550.58	0.49	0.02
		2.79		
24	0.05	2,553.36	0.49	0.02
		1.86		
25	0.04	2,555.22	0.49	0.02
		1.14		
26	0.03	2,556.36	0.49	0.02
		0.58		
27	0.02	2,556.94	0.49	0.02
		0.15		
28	0.02	2,557.09	0.49	0.02
		(0.18)		

WET POND 5

Granville SCM 5	Postdevelopment	Q-5
PEAK FLOW (cfs)	7.75	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.74	0	0.00	0.00
		44.40		
2	2.68	44.40	0.02	0.00
		160.52		
3	5.07	204.92	0.07	0.01
		303.88		
4	7.01	508.80	0.14	0.01
		419.92		
5	7.75	928.72	0.22	0.01
		464.14		
6	7.01	1,392.86	0.30	0.02
		419.59		
7	5.45	1,812.45	0.37	0.02
		325.86		
8	4.20	2,138.31	0.43	0.02
		250.92		
9	3.24	2,389.23	0.47	0.02
		193.14		
10	2.50	2,582.37	0.50	0.02
		148.60		
11	1.93	2,730.97	0.52	0.02
		114.25		
12	1.49	2,845.22	0.54	0.02
		87.77		
13	1.15	2,932.99	0.55	0.02
		67.35		
14	0.88	3,000.34	0.56	0.02
		51.61		
15	0.68	3,051.95	0.57	0.02
		39.47		
16	0.52	3,091.42	0.57	0.02
		30.11		
17	0.40	3,121.52	0.58	0.02
		22.89		
18	0.31	3,144.41	0.58	0.02

		17.33		
19	0.24	3,161.74	0.58	0.02
		13.04		
20	0.19	3,174.78	0.58	0.02
		9.73		
21	0.14	3,184.50	0.59	0.02
		7.18		
22	0.11	3,191.68	0.59	0.02
		5.21		
23	0.09	3,196.89	0.59	0.02
		3.69		
24	0.07	3,200.59	0.59	0.02
		2.53		
25	0.05	3,203.11	0.59	0.02
		1.62		
26	0.04	3,204.74	0.59	0.02
		0.93		
27	0.03	3,205.67	0.59	0.02
		0.39		
28	0.02	3,206.06	0.59	0.02
		(0.02)		

WIRT POND 5

Granville SCM 5 | Postdevelopment | Q-10

PEAK FLOW (cfs)	8.99
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.86	0	0.00	0.00
		51.51		
2	3.11	51.51	0.02	0.00
		186.20		
3	5.88	237.70	0.07	0.01
		352.54		
4	8.13	590.25	0.15	0.01
		487.17		
5	8.99	1,077.42	0.25	0.02
		538.49		
6	8.13	1,615.91	0.34	0.02
		486.82		
7	6.32	2,102.73	0.42	0.02
		378.11		
8	4.87	2,480.84	0.48	0.02
		291.19		
9	3.76	2,772.03	0.52	0.02
		224.17		
10	2.90	2,996.20	0.56	0.02
		172.50		
11	2.23	3,168.70	0.58	0.02
		132.66		
12	1.72	3,301.36	0.60	0.02
		101.94		
13	1.33	3,403.31	0.62	0.02
		78.26		
14	1.02	3,481.57	0.63	0.02
		60.00		
15	0.79	3,541.57	0.64	0.02
		45.92		
16	0.61	3,587.49	0.64	0.02
		35.06		
17	0.47	3,622.55	0.65	0.02
		26.69		
18	0.36	3,649.24	0.65	0.02

		20.24		
19	0.28	3,669.48	0.66	0.02
		15.26		
20	0.22	3,684.74	0.66	0.02
		11.42		
21	0.17	3,696.16	0.66	0.02
		8.46		
22	0.13	3,704.62	0.66	0.02
		6.18		
23	0.10	3,710.81	0.66	0.02
		4.42		
24	0.08	3,715.23	0.66	0.02
		3.07		
25	0.06	3,718.30	0.66	0.02
		2.02		
26	0.05	3,720.32	0.66	0.02
		1.22		
27	0.03	3,721.54	0.66	0.02
		0.60		
28	0.03	3,722.14	0.66	0.02
		0.12		

WET PONDS

Granville SCM 5 Postdevelopment Q-25

PEAK FLOW (cfs)	10.63
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	1.02	0	0.00	0.00
		60.90		
2	3.67	60.90	0.02	0.00
		220.16		
3	6.96	281.06	0.08	0.01
		416.91		
4	9.61	697.97	0.17	0.01
		576.13		
5	10.63	1,274.10	0.28	0.02
		636.82		
6	9.61	1,910.93	0.39	0.02
		575.75		
7	7.47	2,486.68	0.48	0.02
		447.22		
8	5.76	2,933.90	0.55	0.02
		344.45		
9	4.44	3,278.35	0.60	0.02
		265.22		
10	3.43	3,543.57	0.64	0.02
		204.13		
11	2.64	3,747.69	0.67	0.03
		157.02		
12	2.04	3,904.71	0.69	0.03
		120.70		
13	1.57	4,025.42	0.71	0.03
		92.70		
14	1.21	4,118.12	0.72	0.03
		71.11		
15	0.93	4,189.23	0.73	0.03
		54.46		
16	0.72	4,243.69	0.74	0.03
		41.62		
17	0.56	4,285.31	0.74	0.03
		31.73		
18	0.43	4,317.04	0.75	0.03

		24.10		
19	0.33	4,341.13	0.75	0.03
		18.21		
20	0.25	4,359.35	0.75	0.03
		13.68		
21	0.20	4,373.02	0.76	0.03
		10.18		
22	0.15	4,383.20	0.76	0.03
		7.48		
23	0.12	4,390.68	0.76	0.03
		5.40		
24	0.09	4,396.08	0.76	0.03
		3.80		
25	0.07	4,399.88	0.76	0.03
		2.56		
26	0.05	4,402.44	0.76	0.03
		1.61		
27	0.04	4,404.04	0.76	0.03
		0.87		
28	0.03	4,404.92	0.76	0.03
		0.31		

Wet Pond 6

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 6

Total Drainage Area	2.60	acres	Trib Area		
Post Development Land Use			CN	% of Total	CN Extension
Impervious	0.84	acre	98	0.323077	31.66
Lawn / Grassed	1.32	acre	61	0.507692	30.97
Wooded	0.36	acre	55	0.138462	7.62
SCM	0.08	acre	100	0.030769	3.08
	2.60				
				Composite CN	73.32
				Use CN	74

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 3.513514

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.124731 inches

Total Runoff Volume = 1,177 cu. ft.

Wet Pond Surface Area
Impervious 32.31 %

SA / DA 0.012485 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 32.31 %

Wet Pond Surface Area Use % Impervious 32.31%

SA / DA 0.012485 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	1,414.00 sq. ft.	Main Pool
Add 25% for Forebay=	1,767.50 sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**1,767.50 sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 6 Inflow

Total Drainage Area 2.60 acres

Post Development Land Use		C	Fraction	CN	Extension
Impervious	0.84 acre	0.95	0.323077		0.31
Lawn Landscaping	1.32 acre	0.22	0.507692		0.11
Forest	0.36 acre	0.20	0.138462		0.03
SCM	0.08 acre	1.00	0.030769		0.03
	2.60				
			Composite C		0.48
			Use C		0.48

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	3.70 cfs
I-2	3.57	Q-2=	4.46 cfs
I-5	4.47	Q-5=	5.59 cfs
I-10	5.18	Q-10=	6.48 cfs
I-25	6.13	Q-25=	7.66 cfs
I-50	6.89	Q-50=	8.61 cfs
I-100	7.67	Q-100=	9.59 cfs

STAGE-STORAGE

Project: Fearrington Granville SCM 6 WET POND 6 Storage

Invert Elevation: 434

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
434	0	3380		0
			4336	
435	1	5292		4336
			5837.5	
436	2	6383		10173.5
			6957	
437	3	7531		17130.5

$$b = \frac{\ln\left(\frac{17{,}130.5}{4336}\right)}{\ln\left(\frac{3}{1}\right)} = \frac{1.3739}{1.0986} = 1.2506$$

$$17{,}130.5 = K_s(3)^{1.2506}$$

$$K_s = 4336$$

$$\text{STORAGE} = 4336\,Z^{1.2506}$$

STAGE-STORAGE

WET POND 6

Project: Fearrington Granville SCM 6 Main Pool

Invert Elevation: 431

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
431	0	765		0
			1057	
432	1	1349		1057
			1696	
433	2	2043		2753
			2419	
434	3	2795		5172

STAGE-STORAGE

WET POND 6

Project: Fearrington Granville SCM 6 Forebay

Invert Elevation: 431

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
431	0	22		0
			81.5	
432	1	141		81.5
			234.5	
433	2	328		316
			456.5	
434	3	585		776

Fearrington Granville
Wet Pond 6

Area Tributary to Basin = 2.60 ac

Total DA Used for Treatment Calculation = 2.60 acres

Composite C = 0.48 (32% impervious)
Composite Curve Number = 74
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 3.513514

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.1247 inches

Total Runoff Volume = 1,177 cu. ft.

Design Volume = 1,177 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 32.31% impervious and 3-foot depth
SA /DA = 1.2482
Surfcace Area Required = 1.25x 2.60 x 43,560 / 100

Surface Area Required = 1,414 sq . Ft.

Wet Pond Main Pool Area at El. 434 = 2,795 sq. ft.

MDC 2 Main Pool Depth
Equation 1: Vmp = 0.87 x HRT / T x DV
Design Volume = 1,177 cu. ft.

Vmp = 2,868 cu. ft.

Vmp = Main Pool Volume (cu. ft.)
HRT = Residence Time (14 days)
T = Ave. Time Between Storms (5 days)
DV = Design Volume (cu. ft.)

Main Pool Volume= 5,172 cu. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 430
Main Pool Bottom = El. 431
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume=	5,172	cu. ft.
Forebay Volume =	776	cu. ft.
11482 / 2,005 =	15.00%	
Forebay Volume %	15.00%	

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 4336 z^1.2506

Design Volume = 1,177 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.33 feet
Stage required for Treatment Volume = 0.35feet (Stage = 434 + 0.33 = 434.33)
Set Weir at or above 434.33

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.33 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 434.33 = 4,011 sq. ft.
Orifice Area = 4,011 x Sqrt(2 x 0.33) / 48 x 0.6 x 20,428
Orifice Area = 0.0056 sq. ft.
Orifice Diameter = 1.0 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 49 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 6

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 9.59 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.34 feet

Top of Dike = 437

Freeboard = 1 foot

Height on Weir = 0.34 foot

Set Top of Weir @ 435.66 Maximum Height

Maximum Water Surface Elevation at Q-100 = 436.00

Riser Outlet Barrel

Q-100 = 9.59 cfs

18-inch Headwater= 2.17 feet

Riser Invert = 430.00

Rsier Weir = 435.66

Headwater Available = 5.66 feet OK

Slope Required 18 inch 1.60%

Q-full= 10.5 fps

V-full= 5.9 fps

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.00%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 436.16

Riser Invert = 430.00

Uplift Height = 6.16 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 174.96 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 10917 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 5.66 feet

Wall Weight = 7919 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3748 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 1.06 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 6

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	4336
b =	1.2506

OUTLET ORIFICE #1:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0.09	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2:	(HORIZONTAL- RISER)		
	ELEVATION =	0	(ft)
	DIAMETER =	0	(ft)
	WEIR COEFFICIENT =	3	3.0
	ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:	ELEVATION =	1.66	(ft)
	LENGTH =	16	(ft)
	WEIR COEFFICIENT =	3	3.0

WET POND 6

Granville SCM 6	Postdevelopment	Q-1
PEAK FLOW (cfs)	3.74	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.36	0	0.00	0.00
		21.43		
2	1.29	21.43	0.01	0.00
		77.44		
3	2.45	98.87	0.05	0.01
		146.47		
4	3.38	245.34	0.10	0.01
		202.39		
5	3.74	447.72	0.16	0.01
		223.66		
6	3.38	671.38	0.23	0.01
		202.10		
7	2.63	873.48	0.28	0.02
		156.83		
8	2.03	1,030.31	0.32	0.02
		120.63		
9	1.56	1,150.95	0.35	0.02
		92.73		
10	1.21	1,243.68	0.37	0.02
		71.22		
11	0.93	1,314.90	0.39	0.02
		54.63		
12	0.72	1,369.53	0.40	0.02
		41.85		
13	0.55	1,411.38	0.41	0.02
		31.99		
14	0.43	1,443.36	0.41	0.02
		24.38		
15	0.33	1,467.74	0.42	0.02
		18.52		
16	0.25	1,486.27	0.42	0.02
		14.00		
17	0.20	1,500.27	0.43	0.02
		10.52		
18	0.15	1,510.79	0.43	0.02

		7.83		
19	0.12	1,518.62	0.43	0.02
		5.76		
20	0.09	1,524.38	0.43	0.02
		4.16		
21	0.07	1,528.54	0.43	0.02
		2.93		
22	0.05	1,531.47	0.44	0.02
		1.98		
23	0.04	1,533.45	0.44	0.02
		1.25		
24	0.03	1,534.70	0.44	0.02
		0.69		
25	0.02	1,535.39	0.44	0.02
		0.25		
26	0.02	1,535.64	0.44	0.02
		(0.08)		

WET POND 6

Granville SCM 6	Postdevelopment	Q-2
PEAK FLOW (cfs)	4.46	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.43	0	0.00	0.00
		25.55		
2	1.54	25.55	0.02	0.00
		92.35		
3	2.92	117.90	0.06	0.01
		174.71		
4	4.03	292.61	0.12	0.01
		241.42		
5	4.46	534.03	0.19	0.01
		266.80		
6	4.03	800.84	0.26	0.02
		241.11		
7	3.14	1,041.95	0.32	0.02
		187.13		
8	2.42	1,229.08	0.36	0.02
		143.98		
9	1.86	1,373.06	0.40	0.02
		110.71		
10	1.44	1,483.78	0.42	0.02
		85.06		
11	1.11	1,568.84	0.44	0.02
		65.29		
12	0.85	1,634.13	0.46	0.02
		50.04		
13	0.66	1,684.17	0.47	0.02
		38.28		
14	0.51	1,722.45	0.48	0.02
		29.22		
15	0.39	1,751.67	0.48	0.02
		22.23		
16	0.30	1,773.90	0.49	0.02
		16.84		
17	0.23	1,790.74	0.49	0.02
		12.69		
18	0.18	1,803.43	0.50	0.02

		9.48		
19	0.14	1,812.91	0.50	0.02
		7.01		
20	0.11	1,819.92	0.50	0.02
		5.11		
21	0.08	1,825.03	0.50	0.02
		3.64		
22	0.06	1,828.67	0.50	0.02
		2.51		
23	0.05	1,831.18	0.50	0.02
		1.63		
24	0.04	1,832.81	0.50	0.02
		0.96		
25	0.03	1,833.77	0.50	0.02
		0.44		
26	0.02	1,834.22	0.50	0.02
		0.04		
27	0.02	1,834.26	0.50	0.02
		(0.26)		

WET POND 6

Granville SCM 6	Postdevelopment	Q-5
PEAK FLOW (cfs)	5.59	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.53	0	0.00	0.00
		32.03		
2	1.93	32.03	0.02	0.00
		115.74		
3	3.66	147.76	0.07	0.01
		219.05		
4	5.06	366.81	0.14	0.01
		302.69		
5	5.59	669.50	0.22	0.01
		334.53		
6	5.06	1,004.03	0.31	0.02
		302.35		
7	3.93	1,306.38	0.38	0.02
		234.71		
8	3.03	1,541.09	0.44	0.02
		180.64		
9	2.34	1,721.73	0.48	0.02
		138.95		
10	1.80	1,860.67	0.51	0.02
		106.80		
11	1.39	1,967.48	0.53	0.02
		82.02		
12	1.07	2,049.50	0.55	0.02
		62.91		
13	0.83	2,112.42	0.56	0.02
		48.18		
14	0.64	2,160.60	0.57	0.02
		36.82		
15	0.49	2,197.42	0.58	0.02
		28.06		
16	0.38	2,225.49	0.59	0.02
		21.31		
17	0.29	2,246.80	0.59	0.02
		16.10		
18	0.23	2,262.90	0.59	0.02

		12.09		
19	0.17	2,274.99	0.60	0.02
		8.99		
20	0.13	2,283.99	0.60	0.02
		6.61		
21	0.10	2,290.59	0.60	0.02
		4.77		
22	0.08	2,295.36	0.60	0.02
		3.35		
23	0.06	2,298.71	0.60	0.02
		2.26		
24	0.05	2,300.97	0.60	0.02
		1.41		
25	0.04	2,302.38	0.60	0.02
		0.76		
26	0.03	2,303.14	0.60	0.02
		0.26		
27	0.02	2,303.40	0.60	0.02
		(0.13)		

WET POND 6

Granville SCM 6 | Postdevelopment | Q-10

PEAK FLOW (cfs)	6.48
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1
POND INVERT =	

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.62	0	0.00	0.00
		37.13		
2	2.24	37.13	0.02	0.00
		134.16		
3	4.24	171.29	0.08	0.01
		253.97		
4	5.86	425.25	0.16	0.01
		350.95		
5	6.48	776.20	0.25	0.02
		387.88		
6	5.86	1,164.08	0.35	0.02
		350.59		
7	4.56	1,514.66	0.43	0.02
		272.19		
8	3.51	1,786.86	0.49	0.02
		209.52		
9	2.71	1,996.37	0.54	0.02
		161.19		
10	2.09	2,157.57	0.57	0.02
		123.94		
11	1.61	2,281.51	0.60	0.02
		95.21		
12	1.24	2,376.72	0.62	0.02
		73.07		
13	0.96	2,449.79	0.63	0.02
		55.99		
14	0.74	2,505.77	0.65	0.02
		42.82		
15	0.57	2,548.60	0.65	0.02
		32.67		
16	0.44	2,581.27	0.66	0.02
		24.84		
17	0.34	2,606.11	0.67	0.02
		18.81		
18	0.26	2,624.92	0.67	0.03

		14.15		
19	0.20	2,639.07	0.67	0.03
		10.57		
20	0.16	2,649.64	0.67	0.03
		7.80		
21	0.12	2,657.44	0.68	0.03
		5.67		
22	0.09	2,663.10	0.68	0.03
		4.02		
23	0.07	2,667.12	0.68	0.03
		2.75		
24	0.05	2,669.88	0.68	0.03
		1.78		
25	0.04	2,671.65	0.68	0.03
		1.02		
26	0.03	2,672.68	0.68	0.03
		0.44		
27	0.03	2,673.12	0.68	0.03
		(0.01)		

WET POND 6

Granville SCM 6	Postdevelopment	Q-25
PEAK FLOW (cfs)	7.66	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.73	0	0.00	0.00
		43.89		
2	2.65	43.89	0.03	0.00
		158.58		
3	5.01	202.47	0.09	0.01
		300.27		
4	6.93	502.74	0.18	0.01
		414.94		
5	7.66	917.68	0.29	0.02
		458.61		
6	6.93	1,376.29	0.40	0.02
		414.55		
7	5.39	1,790.84	0.49	0.02
		321.90		
8	4.15	2,112.74	0.56	0.02
		247.82		
9	3.20	2,360.55	0.61	0.02
		190.70		
10	2.47	2,551.25	0.65	0.02
		146.66		
11	1.90	2,697.92	0.68	0.03
		112.71		
12	1.47	2,810.63	0.71	0.03
		86.53		
13	1.13	2,897.16	0.72	0.03
		66.35		
14	0.87	2,963.51	0.74	0.03
		50.79		
15	0.67	3,014.30	0.75	0.03
		38.79		
16	0.52	3,053.08	0.76	0.03
		29.53		
17	0.40	3,082.62	0.76	0.03
		22.40		
18	0.31	3,105.02	0.77	0.03

		16.90		
19	0.24	3,121.92	0.77	0.03
		12.66		
20	0.18	3,134.58	0.77	0.03
		9.39		
21	0.14	3,143.97	0.77	0.03
		6.87		
22	0.11	3,150.84	0.77	0.03
		4.92		
23	0.08	3,155.76	0.78	0.03
		3.43		
24	0.06	3,159.19	0.78	0.03
		2.27		
25	0.05	3,161.46	0.78	0.03
		1.38		
26	0.04	3,162.84	0.78	0.03
		0.69		
27	0.03	3,163.53	0.78	0.03
		0.16		
28	0.02	3,163.69	0.78	0.03
		(0.25)		

Wet Pond 7

Wet Pond 7

Total Drainage Area	3.94 acres	Trib Area			
Post Development Land Use		CN	% of Total	CN	Extension
Impervious	0.98 acre	98	0.248731		24.38
Lawn / Grassed	1.69 acre	61	0.428934		26.16
Wooded	1.18 acre	55	0.299492		16.47
SCM	0.09 acre	100	0.022843		2.28
	3.94				
				Composite CN	69.30
				Use CN	70

1 Year 24 -hour rainfall (P) 1.43 inches

S = 1,000 / CN - 10 S = 4.285714

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.067544 inches

Total Runoff Volume = 966 cu. ft.

Wet Pond Surface Area
Impervious 24.87 %

SA / DA 0.010007 Per Table 1 Chapter C-3 State Manual

Percent Impervious = 24.87 %

Wet Pond Surface Area Use % Impervious 24.87%

SA / DA 0.010007 From NCDEQ Stormwater Design Manual Chapter C-3 Table 1
3 foot depth 24% Impervious

Wet Pond Surface Area =	1,717.47 sq. ft.	Main Pool
Add 25% for Forebay=	2,146.83 sq. ft.	Main Pool + Forebay
Total Wet Pond Surface Area =	**2,146.83 sq. ft.**	

Granville Stormwater

All soils are Hydrologic Group B

Wet Pond 7 Inflow

Total Drainage Area 3.94 acres

Post Development Land Use		C	Fraction	CN	Extension
Impervious	0.98 acre	0.95	0.248731		0.24
Lawn Landscaping	1.69 acre	0.22	0.428934		0.09
Forest	1.18 acre	0.20	0.299492		0.06
SCM	0.09 acre	1.00	0.022843		0.02
	3.94				
			Composite C		0.41
			Use C		0.41

Tc = 5 minutes 24-hour storm Appendix A

I-1	2.96	Q-1=	4.86	cfs
I-2	3.57	Q-2=	5.86	cfs
I-5	4.47	Q-5=	7.34	cfs
I-10	5.18	Q-10=	8.50	cfs
I-25	6.13	Q-25=	10.06	cfs
I-50	6.89	Q-50=	11.31	cfs
I-100	7.67	Q-100=	12.59	cfs

STAGE-STORAGE

WET POND 7

Project: Fearrington Granville SCM 7 Storage

Invert Elevation: 419

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
419	0	3951		0
			4835	
420	1	5719		4835
			6287.5	
421	2	6856		11122.5
			7452.5	
421	2	8049		18575

$$b = \frac{\ln\left(\frac{18,575}{4835}\right)}{\ln\left(\frac{3}{1}\right)} = \frac{1.3459}{1.0986} = 1.2251$$

K_5 $18,575 = K_5(3)^{1.2251}$

$K_5 = 4835$

STORAGE $= 4835\,Z^{1.2251}$

STAGE-STORAGE

WET POND 7

Project: Fearrington Granville SCM 7 Forebay

Invert Elevation: 416

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
416	0	117		0
			198	
417	1	279		198
			392.5	
418	2	506		590.5
			717.5	
419	3	929		1308

STAGE-STORAGE

WET POND 7

Project: Fearrington Granville SCM 7 Main Pool

Invert Elevation: 415

Contour	Z (Feet)	Area (Sq. Ft.)	Volume (Cu. Ft.)	Cummulative Volume (Cu. Ft.)
415	0	343		0
			634	
416	1	925		634
			1230.5	
417	2	1536		1864.5
			2177	
418	3	2818		4041.5
			2920	
419	4	3022		6961.5

Fearrington Granville
Wet Pond 7

Area Tributary to Basin = 3.94 ac

Total DA Used for Treatment Calculation = 3.94 acres

Composite C = 0.41 (25% impervious)
Composite Curve Number = 70
Treatment Volume
Capture and Treat Runoff from 1-year 24-hour rainfall
Rainfall = 1.43 inches
Compute by NRCS Method

S = 1,000 / CN - 10 S = 4.285714

Runoff = (P - 0.2S) / (P + 0.8S)^2 0.0675 inches

Total Runoff Volume = 966 cu. ft.

Design Volume = 966 cu. ft.

Per C-3 Wet Pond chapter NCDEQ Stormwater Design Manual

MDC 1 Main Pool Surface Area
SA/DA Table 1 for 24.87% impervious and 3-foot depth
SA /DA = 1.0007
Surfcace Area Required = 1.25x 3.94 x 43,560 / 100

Surface Area Required = 1,717 sq . Ft.

Wet Pond Main Pool Area at El. 419 = 3,951 sq. ft.

MDC 2 Main Pool Depth
Equation 1: Vmp = 0.87 x HRT / T x DV
Design Volume = 966 cu. ft.

Vmp = 2,353 cu. ft.

Vmp = Main Pool Volume (cu. ft.)
HRT = Residence Time (14 days)
T = Ave. Time Between Storms (5 days)
DV = Design Volume (cu. ft.)

Main Pool Volume= 6,962 cu. ft.

MDC 3 Sediment Storage

Main Pool Excavation Bottom = El. 414.5
Main Pool Bottom = El. 415
Sediment Storage Provided

MDC 4 Avoid Short Circuiting

Channels Enters Forebay - grading to direct flow away from outlet

MDC 5 Forebay Volume 15 - 20 % Main Pool Volume

Main Pool Volume=	6,962 cu. ft.
Forebay Volume =	1,308 cu. ft.

11482 / 2,005 =	18.79%
Forebay Volume %	18.79%

MDC 6 Vegetated Shelf

Vegetated shelf 6 feet wide at 6:1 slope provided

MDC 7 Drawdown time 2- 5 days

See drawdown calculations
Drawdown time = 2 days

MDC 8 1-year 24-hour storm controlled

See routing calculations for 1-year through 100-year storm

MDC 9 Fountain - N/A

MDC 10 Trash Rack - Provided

MDC 11 Vegetation

See planting plan.

Stage Storage for Wet Pond Storage Pool

Storage = 4835 z^1.2251

Design Volume = 966 cu ft.
Depth Above Normal Pool for Treatment Volume = 0.27 feet
Stage required for Treatment Volume = 0.27 feet (Stage = 419 + 0.27 = 419.27)
Set Weir at or above 419.27

Drawdown
Draw Down Treatment Volume in 2- 5 days
Try 2 days - 48 hours Cd= 0.6 H=0.27 ft.
Orifice Area = Surface Area(sq. ft.) x Sqrt(2 X H) / Time (hr) x Cd x 20,428
Surface Area at 419.27 = 4,428 sq. ft.
Orifice Area = 4,428 x Sqrt(2 x 0.27) / 48 x 0.6 x 20,428
Orifice Area = 0.0080 sq. ft.
Orifice Diameter = 1.0 inches

Use 1-inch diameter orifice for drawdown for 2 day drawdown
Actual Drain Time Approxiamtely 49 hours

Granville Stormwater
Wet Pond Outlet

Wet Pond 7

Riser Weir

Assume Full 100-year inflow passed over top of riser weir

Q-100 = 12.59 cfs (Q)

Riser Structure 4' x 4' - Riser Weir Length = 16 feet (L)

Assume Weir Coefficient = 3.0 C

Height on Weir by Weir Equation - Q = C x L x H^3/2

100-year Height on Weir = 0.41 feet

Top of Dike = 422

Freeboard = 1 foot

Height on Weir = 0.41 foot

Set Top of Weir @ 420.59 Maximum Height

Maximum Water Surface Elevation at Q-100 = 421.00

Riser Outlet Barrel

Q-100 = 12.59 cfs

18-inch Headwater= 3.01 feet

Riser Invert = 414.50

Rsier Weir = 420.59

Headwater Available = 6.09 feet OK

Slope Required 18 inch 1.60%

Q-full= 10.5 fps

V-full= 5.9 fps

Material Required in Zone 2 Use 9' x 5' x 22" D Class B

Use 18-inch RCP @1.00%

Buoyancy

Floatation - Assume water surface 0.5 feet over top of riser

Water Surface Height = 421.09

Riser Invert = 414.50

Uplift Height = 6.59 feet

Riser Outside Dimensions = 5.33' x 5.33'

Volume Displaced = 187.23 cu. ft. Outside Dimensions x Uplift Height

Uplift = Volume Displaced x 62.4 lb/cu. ft.

Uplift = 11683 lbs.

Downforce

Wall Weight = 5.33 x 0.5 x wall height x 2 x 150 lbs./ cu. ft.

4.00 x 0.5 x wall height x 2 x 150 lbs. / cu. ft.

Wall Height = 6.09 feet

Wall Weight = 8523 lbs.

Required Slab Weight = Uplift - Downforce x 1.25

Required Slab Weight = 3950 lbs.

Slab Diminsion = 6.33' x 6.33'

Submerged Concrete Weight = 88 lbs. / cu. ft.

Slab Thickness Required = Slab Weight / 6.33 x 6.33 x 88

Slab Thickness Required = 1.12 feet

Use 1.5 feet bottom slab for safety

Routing Results

WET POND 7

STAGE-STORAGE RELATIONSHIP: (S = K*Y^b)	
K =	4835
b =	1.2251

OUTLET ORIFICE #1: (HORIZONTAL- RISER)		
ELEVATION =	0	(ft)
DIAMETER =	0.09	(ft)
WEIR COEFFICIENT =	3	3.0
ORIFICE COEFFICIENT =	0.6	0.6

OUTLET ORIFICE #2: (HORIZONTAL- RISER)		
ELEVATION =	0	(ft)
DIAMETER =	0	(ft)
WEIR COEFFICIENT =	3	3.0
ORIFICE COEFFICIENT =	0.6	0.6

OUTLET WEIR #3:		
ELEVATION =	1.59	(ft)
LENGTH =	16	(ft)
WEIR COEFFICIENT =	3	3.0

WET POND 7

Granville SCM 7	Postdevelopment	Q-1
PEAK FLOW (cfs)	4.86	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.46	0	0.00	0.00
		27.85		
2	1.68	27.85	0.01	0.00
		100.65		
3	3.18	128.50	0.05	0.01
		190.44		
4	4.40	318.94	0.11	0.01
		263.15		
5	4.86	582.08	0.18	0.01
		290.83		
6	4.40	872.91	0.25	0.02
		262.84		
7	3.42	1,135.75	0.31	0.02
		204.03		
8	2.64	1,339.78	0.35	0.02
		157.02		
9	2.03	1,496.80	0.38	0.02
		120.77		
10	1.57	1,617.57	0.41	0.02
		92.82		
11	1.21	1,710.39	0.43	0.02
		71.27		
12	0.93	1,781.66	0.44	0.02
		54.66		
13	0.72	1,836.32	0.45	0.02
		41.85		
14	0.55	1,878.17	0.46	0.02
		31.97		
15	0.43	1,910.15	0.47	0.02
		24.36		
16	0.33	1,934.51	0.47	0.02
		18.49		
17	0.25	1,952.99	0.48	0.02
		13.96		
18	0.20	1,966.95	0.48	0.02

		10.47		
19	0.15	1,977.42	0.48	0.02
		7.78		
20	0.12	1,985.20	0.48	0.02
		5.70		
21	0.09	1,990.91	0.48	0.02
		4.10		
22	0.07	1,995.01	0.49	0.02
		2.87		
23	0.05	1,997.88	0.49	0.02
		1.92		
24	0.04	1,999.80	0.49	0.02
		1.19		
25	0.03	2,000.99	0.49	0.02
		0.62		
26	0.02	2,001.61	0.49	0.02
		0.18		
27	0.02	2,001.79	0.49	0.02
		(0.15)		

WET POND 7

Granville SCM 7 Postdevelopment Q-2

PEAK FLOW (cfs)	5.86
TIME-TO-PEAK (min)	5
TIME INCREMENT (min)	1

POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.56	0	0.00	0.00
		33.57		
2	2.02	33.57	0.02	0.00
		121.36		
3	3.84	154.93	0.06	0.01
		229.67		
4	5.30	384.61	0.13	0.01
		317.37		
5	5.86	701.98	0.21	0.01
		350.76		
6	5.30	1,052.74	0.29	0.02
		317.04		
7	4.12	1,369.78	0.36	0.02
		246.14		
8	3.18	1,615.93	0.41	0.02
		189.46		
9	2.45	1,805.39	0.45	0.02
		145.76		
10	1.89	1,951.15	0.48	0.02
		112.07		
11	1.46	2,063.22	0.50	0.02
		86.09		
12	1.12	2,149.31	0.52	0.02
		66.06		
13	0.87	2,215.37	0.53	0.02
		50.62		
14	0.67	2,265.99	0.54	0.02
		38.71		
15	0.51	2,304.70	0.55	0.02
		29.53		
16	0.40	2,334.23	0.55	0.02
		22.45		
17	0.31	2,356.68	0.56	0.02
		16.99		
18	0.24	2,373.67	0.56	0.02

		12.78		
19	0.18	2,386.46	0.56	0.02
		9.54		
20	0.14	2,396.00	0.56	0.02
		7.04		
21	0.11	2,403.03	0.57	0.02
		5.11		
22	0.08	2,408.14	0.57	0.02
		3.62		
23	0.06	2,411.77	0.57	0.02
		2.48		
24	0.05	2,414.24	0.57	0.02
		1.59		
25	0.04	2,415.83	0.57	0.02
		0.91		
26	0.03	2,416.74	0.57	0.02
		0.38		
27	0.02	2,417.13	0.57	0.02
		(0.02)		

WET POND 7

Granville SCM 7	Postdevelopment	Q-5
PEAK FLOW (cfs)	7.34	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.70	0	0.00	0.00
		42.05		
2	2.54	42.05	0.02	0.00
		152.00		
3	4.80	194.06	0.07	0.01
		287.75		
4	6.64	481.81	0.15	0.01
		397.63		
5	7.34	879.44	0.25	0.02
		439.48		
6	6.64	1,318.92	0.35	0.02
		397.26		
7	5.16	1,716.18	0.43	0.02
		308.48		
8	3.98	2,024.66	0.49	0.02
		237.50		
9	3.07	2,262.16	0.54	0.02
		182.77		
10	2.37	2,444.93	0.57	0.02
		140.57		
11	1.82	2,585.50	0.60	0.02
		108.04		
12	1.41	2,693.53	0.62	0.02
		82.95		
13	1.08	2,776.49	0.64	0.02
		63.61		
14	0.84	2,840.10	0.65	0.02
		48.70		
15	0.64	2,888.79	0.66	0.02
		37.20		
16	0.50	2,925.99	0.66	0.02
		28.33		
17	0.38	2,954.33	0.67	0.03
		21.50		
18	0.30	2,975.83	0.67	0.03

		16.23		
19	0.23	2,992.05	0.68	0.03
		12.16		
20	0.18	3,004.22	0.68	0.03
		9.03		
21	0.14	3,013.25	0.68	0.03
		6.61		
22	0.10	3,019.86	0.68	0.03
		4.75		
23	0.08	3,024.62	0.68	0.03
		3.32		
24	0.06	3,027.93	0.68	0.03
		2.21		
25	0.05	3,030.14	0.68	0.03
		1.35		
26	0.04	3,031.50	0.68	0.03
		0.70		
27	0.03	3,032.19	0.68	0.03
		0.19		
28	0.02	3,032.38	0.68	0.03
		(0.20)		

WET POND 7

Granville SCM 7	Postdevelopment	Q-10
PEAK FLOW (cfs)	8.5	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	
POND INVERT =		

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.81	0	0.00	0.00
		48.70		
2	2.94	48.70	0.02	0.00
		176.02		
3	5.56	224.72	0.08	0.01
		333.27		
4	7.69	557.99	0.17	0.01
		460.54		
5	8.50	1,018.53	0.28	0.02
		509.03		
6	7.69	1,527.56	0.39	0.02
		460.15		
7	5.98	1,987.71	0.48	0.02
		357.35		
8	4.61	2,345.06	0.55	0.02
		275.15		
9	3.55	2,620.21	0.61	0.02
		211.78		
10	2.74	2,831.99	0.65	0.02
		162.92		
11	2.11	2,994.91	0.68	0.03
		125.25		
12	1.63	3,120.16	0.70	0.03
		96.20		
13	1.26	3,216.36	0.72	0.03
		73.80		
14	0.97	3,290.16	0.73	0.03
		56.54		
15	0.75	3,346.70	0.74	0.03
		43.22		
16	0.58	3,389.92	0.75	0.03
		32.96		
17	0.44	3,422.88	0.75	0.03
		25.04		
18	0.34	3,447.92	0.76	0.03

		18.94		
19	0.26	3,466.86	0.76	0.03
		14.23		
20	0.20	3,481.09	0.76	0.03
		10.60		
21	0.16	3,491.69	0.77	0.03
		7.81		
22	0.12	3,499.50	0.77	0.03
		5.65		
23	0.09	3,505.15	0.77	0.03
		3.99		
24	0.07	3,509.13	0.77	0.03
		2.70		
25	0.06	3,511.83	0.77	0.03
		1.71		
26	0.04	3,513.55	0.77	0.03
		0.95		
27	0.03	3,514.50	0.77	0.03
		0.37		
28	0.03	3,514.87	0.77	0.03
		(0.09)		

WET POND 7

Granville SCM 7	Postdevelopment	Q-25
PEAK FLOW (cfs)	10.06	
TIME-TO-PEAK (min)	5	
TIME INCREMENT (min)	1	

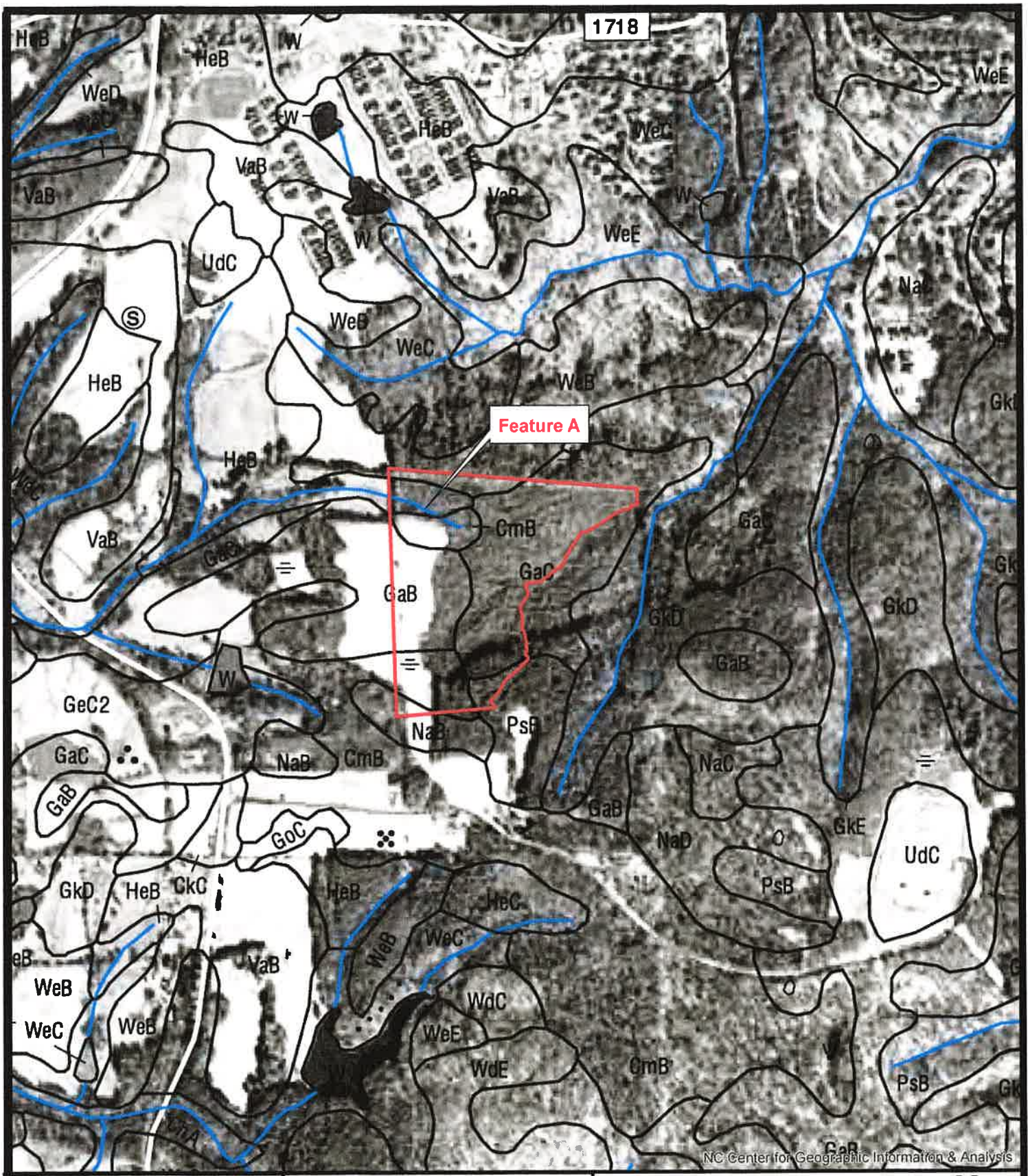
POND INVERT =

WET STAGE	(ft)
WET STORAGE	(cf)

TIME STEP (min)	INFLOW (cfs)	STORAGE (cf)	STAGE (ft)	OUTFLOW (cfs)
0	0	0	0	0
		0		
1	0.96	0	0.00	0.00
		57.64		
2	3.48	57.64	0.03	0.00
		208.31		
3	6.58	265.95	0.09	0.01
		394.50		
4	9.10	660.45	0.20	0.01
		545.15		
5	10.06	1,205.60	0.32	0.02
		602.56		
6	9.10	1,808.15	0.45	0.02
		544.73		
7	7.07	2,352.89	0.56	0.02
		423.08		
8	5.45	2,775.96	0.64	0.02
		325.80		
9	4.21	3,101.77	0.70	0.03
		250.81		
10	3.24	3,352.58	0.74	0.03
		192.99		
11	2.50	3,545.56	0.78	0.03
		148.40		
12	1.93	3,693.97	0.80	0.03
		114.03		
13	1.49	3,808.00	0.82	0.03
		87.52		
14	1.15	3,895.52	0.84	0.03
		67.09		
15	0.88	3,962.61	0.85	0.03
		51.33		
16	0.68	4,013.94	0.86	0.03
		39.18		
17	0.53	4,053.12	0.87	0.03
		29.82		
18	0.41	4,082.94	0.87	0.03

		22.59		
19	0.31	4,105.53	0.88	0.03
		17.02		
20	0.24	4,122.55	0.88	0.03
		12.73		
21	0.19	4,135.28	0.88	0.03
		9.42		
22	0.14	4,144.70	0.88	0.03
		6.87		
23	0.11	4,151.57	0.88	0.03
		4.90		
24	0.09	4,156.47	0.88	0.03
		3.38		
25	0.07	4,159.85	0.88	0.03
		2.21		
26	0.05	4,162.06	0.88	0.03
		1.31		
27	0.04	4,163.36	0.89	0.03
		0.61		
28	0.03	4,163.98	0.89	0.03
		0.08		

Appendix



Project Number: 15120.W1	**Map Title:** Figure 2 - Soil Survey Fearrington Village South
Project Manager: SB	0 1,000 2,000 Feet N
Scale: 1" = 1000'	S&EC Soil & Environmental Consultants, PA
Date: 01/14/2022	**Source:** Chatham County Soil Survey Sheet 05

APPENDIX A: CHATHAM COUNTY RAINFALL DISTRIBUTIONS

It has been determined that the rainfall totals and intensities for Pittsboro, NC are suitable for the entire County and as shall be used as the rainfall data for Chatham County. This information is from the current NOAA National Weather Service Precipitation Frequency Data Server (PFDS) for Pittsboro, NC (latitude 35.71, longitude -79.18)

This table can also be found at: http://hdsc.nws.noaa.gov/hdsc/pfds/orb/nc_pfds.html.

Chatham County Precipitation (inches)

Duration / Recurrence Interval (yrs)	5 min	10 min	15 min	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
1	0.42	0.67	0.84	1.15	1.43	1.69	1.80	2.15	2.55	2.96
2	0.50	0.79	1.00	1.38	1.73	2.05	2.18	2.60	3.08	3.57
5	0.57	0.92	1.16	1.65	2.12	2.54	2.71	3.24	3.85	4.47
10	0.63	1.01	1.27	1.85	2.40	2.90	3.12	3.74	4.48	5.18
25	0.69	1.10	1.40	2.07	2.76	3.37	3.65	4.41	5.33	6.13
50	0.73	1.17	1.48	2.23	3.02	3.73	4.07	4.94	6.01	6.89
100	0.77	1.23	1.55	2.37	3.27	4.08	4.49	5.48	6.72	7.67
200	0.80	1.27	1.61	2.50	3.51	4.42	4.92	6.04	7.47	8.46
500	0.84	1.33	1.67	2.66	3.81	4.87	5.49	6.79	8.50	9.56
1000	0.86	1.36	1.71	2.77	4.04	5.21	5.93	7.39	9.34	10.43

Chatham County Rainfall Intensities (inches/hour)

Duration / Recurrence Interval (yrs)	5 min	10 min	15 min	30 min	1 hr	2 hr	3 hr	6 hr	12 hr	24 hr
1	5.04	4.02	3.36	2.30	1.43	0.85	0.60	0.36	0.21	0.12
2	6.00	4.74	4.00	2.76	1.73	1.03	0.73	0.43	0.26	0.15
5	6.84	5.52	4.64	3.30	2.12	1.27	0.90	0.54	0.32	0.19
10	7.56	6.06	5.08	3.70	2.40	1.45	1.04	0.62	0.37	0.22
25	8.28	6.60	5.60	4.14	2.76	1.69	1.22	0.74	0.44	0.26
50	8.76	7.02	5.92	4.46	3.02	1.87	1.36	0.82	0.50	0.29
100	9.24	7.38	6.20	4.74	3.27	2.04	1.50	0.91	0.56	0.32
200	9.60	7.62	6.44	5.00	3.51	2.21	1.64	1.01	0.62	0.35
500	10.08	7.98	6.68	5.32	3.81	2.44	1.83	1.13	0.71	0.40
1000	10.32	8.16	6.84	5.54	4.04	2.61	1.98	1.23	0.78	0.43

APPENDIX B: CURVE NUMBERS

The tables below are the accepted values for Curve Numbers (CN) in Chatham County for Hydrological Analysis. Other CN Tables may be used as deemed appropriate by the Stormwater Administrator:

CURVE NUMBERS FOR VARIOUS HYDROLOGICAL CONDITIONS

	Average % Impervious area	Hydrologic Soil Group A	B	C	D
Pervious Areas:					
Parks, Golf Courses, Lawns, Cemeteries, etc					
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% to 95%)		39	61	74	80
Very Good condition (grass cover > 95%)		30	55	70	77
Woods and Grass combination (parks, orchards and tree farms)					
Poor condition (ground cover sparse)		57	73	82	86
Fair condition (ground cover moderate)		43	65	76	82
Good condition (ground cover good)		32	58	72	79
Very Good condition (ground cover excelent)		28	53	69	76
National/State Forrest					
Poor condition (ground cover sparse; < 50%)		45	66	77	83
Fair condition (ground cover moderate; 50% to 75%)		36	60	73	79
Good condition (ground cover good; 75% to 95%)		30	55	70	77
Very Good condition (ground cover excelent; > 95%)		25	50	68	75
Impervious Areas:					
Paved parking lots, roofs, driveways, etc.		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding ROW)		98	98	98	98
Paved; curbs, storm sewers, sidewalks & grass plot (including ROW)		86	91	93	95
Paved; curbs, storm sewers, sidewalks & tree plot (including ROW)		82	88	91	92
Paved; open ditches (including ROW)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
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 house)	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)					
Poor condition (No vegetation, Bare Soil)		77	86	91	94
Fair condition (Sparse vegetation, Some ground cover)		76	85	90	93
Good condition (Established vegetation, ground cover good)		74	83	88	91
Very Good condition (ground cover excelent, Hydroseed, Flexterra)		68	79	85	88

note: some curve numbers are interpolated based on similar hydrological conditions and engineering judgment; JWH

Table 1: Piedmont and Mountain SA/DA Table (Adapted from Driscoll, 1986)

Percent Impervious Cover	Permanent Pool Average Depth (ft)					
	3.0	4.0	5.0	6.0	7.0	8.0
10%	0.51	0.43	0.37	0.30	0.27	0.25
20%	0.84	0.69	0.61	0.51	0.44	0.40
30%	1.17	0.94	0.84	0.72	0.61	0.56
40%	1.51	1.24	1.09	0.91	0.78	0.71
50%	1.79	1.51	1.31	1.13	0.95	0.87
60%	2.09	1.77	1.49	1.31	1.12	1.03
70%	2.51	2.09	1.80	1.56	1.34	1.17
80%	2.92	2.41	2.07	1.82	1.62	1.40
90%	3.25	2.64	2.31	2.04	1.84	1.59
100%	3.55	2.79	2.52	2.34	2.04	1.75

Table 2: Coastal SA/DA Table (Adapted from Driscoll, 1986)

Percent Impervious Cover	Permanent Pool Average Depth (ft)					
	3.0	4.0	5.0	6.0	7.0	8.0
10%	0.78	0.61	0.44	0	0	0
20%	1.48	1.04	0.87	0.70	0.52	0.35
30%	2.18	1.65	1.39	1.13	0.87	0.70
40%	2.96	2.26	1.83	1.39	0.96	0.78
50%	3.65	2.87	2.35	1.83	1.31	1.96
60%	4.35	3.31	2.78	2.26	1.74	1.13
70%	5.22	3.92	3.22	2.52	1.83	1.31
80%	5.92	4.52	3.65	2.78	1.91	1.57
90%	6.53	5.05	4.18	2.96	2.44	1.74
100%	7.13	5.92	4.87	3.83	2.78	1.83

NOAA Atlas 14, Volume 2, Version 3
Location name: Pittsboro, North Carolina, USA*
Latitude: 35.7898°, Longitude: -79.0871°
Elevation: 456.45 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/h

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	
5-min	**4.98** (4.56-5.45)	**5.87** (5.38-6.43)	**6.77** (6.19-7.40)	**7.46** (6.82-8.15)	**8.20** (7.45-8.94)	**8.71** (7.90-9.50)	**9.18** (8.27-10.0)	**9.58** (8.58-10.5)	**10.0** (8.88-10.9)	(9
10-min	**3.98** (3.64-4.35)	**4.69** (4.30-5.14)	**5.42** (4.96-5.93)	**5.96** (5.45-6.52)	**6.53** (5.94-7.13)	**6.94** (6.29-7.57)	**7.29** (6.57-7.96)	**7.58** (6.80-8.29)	**7.91** (7.03-8.65)	(7
15-min	**3.32** (3.04-3.63)	**3.93** (3.60-4.31)	**4.57** (4.18-5.00)	**5.03** (4.60-5.50)	**5.52** (5.02-6.02)	**5.86** (5.30-6.39)	**6.14** (5.54-6.70)	**6.38** (5.72-6.97)	**6.64** (5.89-7.26)	(6
30-min	**2.27** (2.08-2.49)	**2.72** (2.49-2.97)	**3.24** (2.97-3.55)	**3.64** (3.33-3.98)	**4.09** (3.72-4.46)	**4.41** (4.00-4.81)	**4.71** (4.24-5.13)	**4.97** (4.45-5.43)	**5.28** (4.69-5.77)	(4
60-min	**1.42** (1.30-1.55)	**1.70** (1.56-1.87)	**2.08** (1.90-2.28)	**2.37** (2.17-2.59)	**2.72** (2.47-2.97)	**2.99** (2.71-3.26)	**3.24** (2.92-3.54)	**3.48** (3.12-3.81)	**3.79** (3.36-4.14)	(3
2-hr	**0.838** (0.764-0.922)	**1.01** (0.923-1.11)	**1.25** (1.14-1.37)	**1.43** (1.30-1.58)	**1.67** (1.50-1.83)	**1.85** (1.66-2.03)	**2.03** (1.81-2.23)	**2.21** (1.96-2.42)	**2.44** (2.14-2.68)	(2
3-hr	**0.593** (0.542-0.652)	**0.716** (0.656-0.788)	**0.886** (0.809-0.975)	**1.03** (0.934-1.13)	**1.20** (1.09-1.32)	**1.35** (1.21-1.48)	**1.49** (1.33-1.63)	**1.64** (1.45-1.79)	**1.83** (1.60-2.01)	(1
6-hr	**0.357** (0.328-0.391)	**0.430** (0.395-0.471)	**0.533** (0.488-0.584)	**0.618** (0.564-0.676)	**0.729** (0.661-0.795)	**0.820** (0.739-0.894)	**0.912** (0.815-0.994)	**1.01** (0.890-1.10)	**1.14** (0.990-1.24)	(1
12-hr	**0.209** (0.193-0.229)	**0.252** (0.232-0.276)	**0.314** (0.288-0.343)	**0.367** (0.335-0.400)	**0.436** (0.395-0.474)	**0.495** (0.445-0.536)	**0.554** (0.494-0.600)	**0.618** (0.543-0.668)	**0.705** (0.610-0.762)	(0.(
24-hr	**0.122** (0.115-0.131)	**0.148** (0.139-0.158)	**0.185** (0.173-0.198)	**0.214** (0.200-0.229)	**0.254** (0.236-0.271)	**0.285** (0.265-0.304)	**0.317** (0.293-0.339)	**0.349** (0.323-0.375)	**0.394** (0.363-0.424)	(0.:
2-day	**0.071** (0.067-0.076)	**0.086** (0.081-0.092)	**0.107** (0.100-0.114)	**0.123** (0.115-0.132)	**0.145** (0.135-0.155)	**0.162** (0.150-0.173)	**0.179** (0.166-0.192)	**0.197** (0.182-0.212)	**0.221** (0.203-0.238)	(0.:
3-day	**0.050** (0.047-0.054)	**0.061** (0.057-0.065)	**0.075** (0.070-0.080)	**0.086** (0.080-0.092)	**0.101** (0.094-0.108)	**0.113** (0.105-0.121)	**0.125** (0.116-0.134)	**0.138** (0.127-0.148)	**0.155** (0.142-0.167)	(0.1
4-day	**0.040** (0.037-0.043)	**0.048** (0.045-0.051)	**0.059** (0.055-0.063)	**0.068** (0.063-0.072)	**0.079** (0.074-0.085)	**0.089** (0.082-0.095)	**0.098** (0.091-0.105)	**0.108** (0.100-0.116)	**0.122** (0.111-0.131)	(0.1
7-day	**0.026** (0.025-0.028)	**0.031** (0.029-0.033)	**0.038** (0.036-0.041)	**0.043** (0.041-0.046)	**0.051** (0.047-0.054)	**0.057** (0.053-0.060)	**0.062** (0.058-0.067)	**0.069** (0.063-0.073)	**0.077** (0.071-0.082)	(0.(
10-day	**0.021** (0.020-0.022)	**0.025** (0.023-0.026)	**0.030** (0.028-0.032)	**0.034** (0.032-0.036)	**0.039** (0.037-0.042)	**0.043** (0.040-0.046)	**0.047** (0.044-0.050)	**0.052** (0.048-0.055)	**0.057** (0.053-0.061)	(0.(
20-day	**0.014** (0.013-0.015)	**0.017** (0.016-0.017)	**0.019** (0.018-0.021)	**0.022** (0.021-0.023)	**0.025** (0.024-0.027)	**0.028** (0.026-0.029)	**0.030** (0.028-0.032)	**0.033** (0.030-0.035)	**0.036** (0.034-0.039)	(0.(
30-day	**0.012** (0.011-0.012)	**0.014** (0.013-0.014)	**0.016** (0.015-0.017)	**0.018** (0.017-0.018)	**0.020** (0.019-0.021)	**0.022** (0.020-0.023)	**0.023** (0.022-0.025)	**0.025** (0.023-0.026)	**0.027** (0.025-0.029)	(0.(
45-day	**0.010** (0.009-0.010)	**0.012** (0.011-0.012)	**0.013** (0.013-0.014)	**0.014** (0.014-0.015)	**0.016** (0.015-0.017)	**0.017** (0.016-0.018)	**0.019** (0.018-0.020)	**0.020** (0.019-0.021)	**0.021** (0.020-0.023)	(0.(
60-day	**0.009** (0.008-0.009)	**0.010** (0.010-0.011)	**0.012** (0.011-0.012)	**0.013** (0.012-0.013)	**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)	(0.(