SWM/BMP Narrative

PRE DEVELOPED CONDITIONS

This site is 1.56 acres of very flat to moderately sloping terrain which ultimately drains towards 2nd swamp to the east of this site. This site has a natural drainage divide running approximately north - south that divides the site into two distinct subsheds. The tank site drains to the west while the access roadway drains to the east. Both of these areas drain to the existing double 15" culvert crossing under Johnson Road. The culvert crossing in question is located immediately south of the tank site entrance and drains a total of 25.88 acres. The pre-developed conditions summary of the water flowing to this culvert crossing is located on this drawing.

POST DEVELOPED CONDITIONS AND PEAK SHAVING

The post developement analysis for the water flowing to the culvert crossing has been included on this drawing. The pre-developed 10 year water surface elevation for this culvert is 149.36 and the post developed is 149.52. The pre-developed discharge is 12.79 cfs and the post developed is 13.73 cfs. The existing culvert under Johnson Road is adequate to handle these flows and associated headwater increases, therefore we have an adequate outfall. Please see the routing calculations for the pre-developed and post developed headwater computations in the attached computations booklet.

BEST MANAGEMENT PRACTICES (BMP's)

The proposed impervious area of the site is less than 16% as demonstrated by the computations shown on this drawing. Therefore it our stance that BMP's are not required for this development.

BMP Facility Design Calculations

1 - Watershed Information

List all the SubAreas and 'C' Factors used in the BMP Computations

SubArea Designation/Description	'C'	Acres
(1) Impervious Developed Area to West	0.90	0.09
(2) Pervious Developed Area to West	0.45	0.87
(3) Undisturbed Site Area to West	0.15	0.00
(4) Impervious Developed Area to East	0.90	0.15
(5) Pervious Developed Area to East	0.45	0.45
(6) Undisturbed Developed Area to East	0.15	0.00
(7) Pervious Developed Bypass Area	0.45	0.00
(8) Undisturbed Bypass Area	0.15	0.00

2 - Phospohorous Removal - Chesapeake Bay Method

Calculate Existing Site Imperviousness

Existing Impervious Area	0	Ac.
Total Area	1.56	Ac.
Existing Conditions Imperviousness	**0**	%

Determine Average Watershed Imperviousness

Average Watershed Imperviousness	**16**	%

Note: Use 16% if the local jurisdiction does have watershed imperviousness provided.

Calculate Post Developed Site Imperviousness

Post Developed Impervious Area	0.24	Ac.
Total Area	1.56	Ac.
Post Developed Imperviousness	**15.38**	%

Calculate Phosphorous Loadings

Pre-Developed Phosphorous Loading	0.69	Lbs./Year
Post Developed Phosphorous Loading	0.67	Lbs./Year

Calculate Phosphorous Removal Required

Removal Required	-0.02	Lbs./Year
BMP Removal Required	**-2.94**	%

Pre-developed Analysis

DRAINAGE AREA		
Time Of Concentration - Overland Flow Segment		
Length	(ft.)	300
Slope	(ft./ft.)	0.0060
Manning's Sheet Flow Coefficient		0.400
2 Year / 24 hour Precipitation	(in.)	3.5
Segment Time	(min.)	80
Time Of Concentration - Concentrated Flow Segment		
Paved/Unpaved		Unpaved
Concentrated Flow Coefficient		16.1345
Slope	(ft./ft.)	0.0080
Velocity	(fps.)	1.44
Length	(ft.)	274
Segment Time	(min.)	3.2
Time Of Concentration - Channel Flow Segment		
Depth	(ft.)	2
Bottom Width	(ft.)	0
Left Side Slope	XH:1V	13
Right Side Slope	XH:1V	10
Hydraulic Radius	(ft.)	0.98
Mannings Coefficient		0.050
Slope	(ft./ft.)	0.0196
Velocity	(fps.)	4.13
Length	(ft.)	562
Segment Time	(min.)	2.3
Time Of Concentration		
Computed	**(min.)**	**85**
Rational Coefficient		
Wooded Area	(ac.)	17.62
Wooded Rational Coefficient		0.15
Impervious Area	(ac.)	3.28
Impervious Rational Coefficient		0.90
Open Area	(ac.)	4.98
Open Rational Coefficient		0.30
Total Area	**(ac.)**	**25.88**
Weighted Rational Coefficient		**0.27**
2 Year Rational Peak		
Area	(ac.)	25.88
Rational Coefficient		0.27
Intensity	(in./hr.)	1.22
2 Year Flow	**(cfs)**	**8.65**
10 Year Rational Peak		
Area	(ac.)	25.88
Rational Coefficient		0.27
Intensity	(in./hr.)	1.78
10 Year Flow	**(cfs)**	**12.62**

Post Developed Analysis

DRAINAGE AREA		
Time Of Concentration - Overland Flow Segment		
Length	(ft.)	300
Slope	(ft./ft.)	0.0060
Manning's Sheet Flow Coefficient		0.400
2 Year / 24 hour Precipitation	(in.)	3.5
Segment Time	(min.)	80
Time Of Concentration - Concentrated Flow Segment		
Paved/Unpaved		Unpaved
Concentrated Flow Coefficient		16.1345
Slope	(ft./ft.)	0.0080
Velocity	(fps.)	1.44
Length	(ft.)	274
Segment Time	(min.)	3.2
Time Of Concentration - Channel Flow Segment		
Depth	(ft.)	2
Bottom Width	(ft.)	0
Left Side Slope	XH:1V	13
Right Side Slope	XH:1V	10
Hydraulic Radius	(ft.)	0.98
Mannings Coefficient		0.050
Slope	(ft./ft.)	0.0196
Velocity	(fps.)	4.13
Length	(ft.)	562
Segment Time	(min.)	2.3
Time Of Concentration		
Computed	**(min.)**	**85**
Rational Coefficient		
Wooded Area	(ac.)	16.06
Wooded Rational Coefficient		0.15
Impervious Area	(ac.)	3.52
Impervious Rational Coefficient		0.90
Open Area	(ac.)	6.30
Open Rational Coefficient		0.30
Total Area	**(ac.)**	**25.88**
Weighted Rational Coefficient		**0.29**
2 Year Rational Peak		
Area	(ac.)	25.88
Rational Coefficient		0.29
Intensity	(in./hr.)	1.22
2 Year Flow	**(cfs)**	**9.11**
10 Year Rational Peak		
Area	(ac.)	25.88
Rational Coefficient		0.29
Intensity	(in./hr.)	1.78
10 Year Flow	**(cfs)**	**13.29**

Existing Culvert Stage-Storage-Discharge Analysis

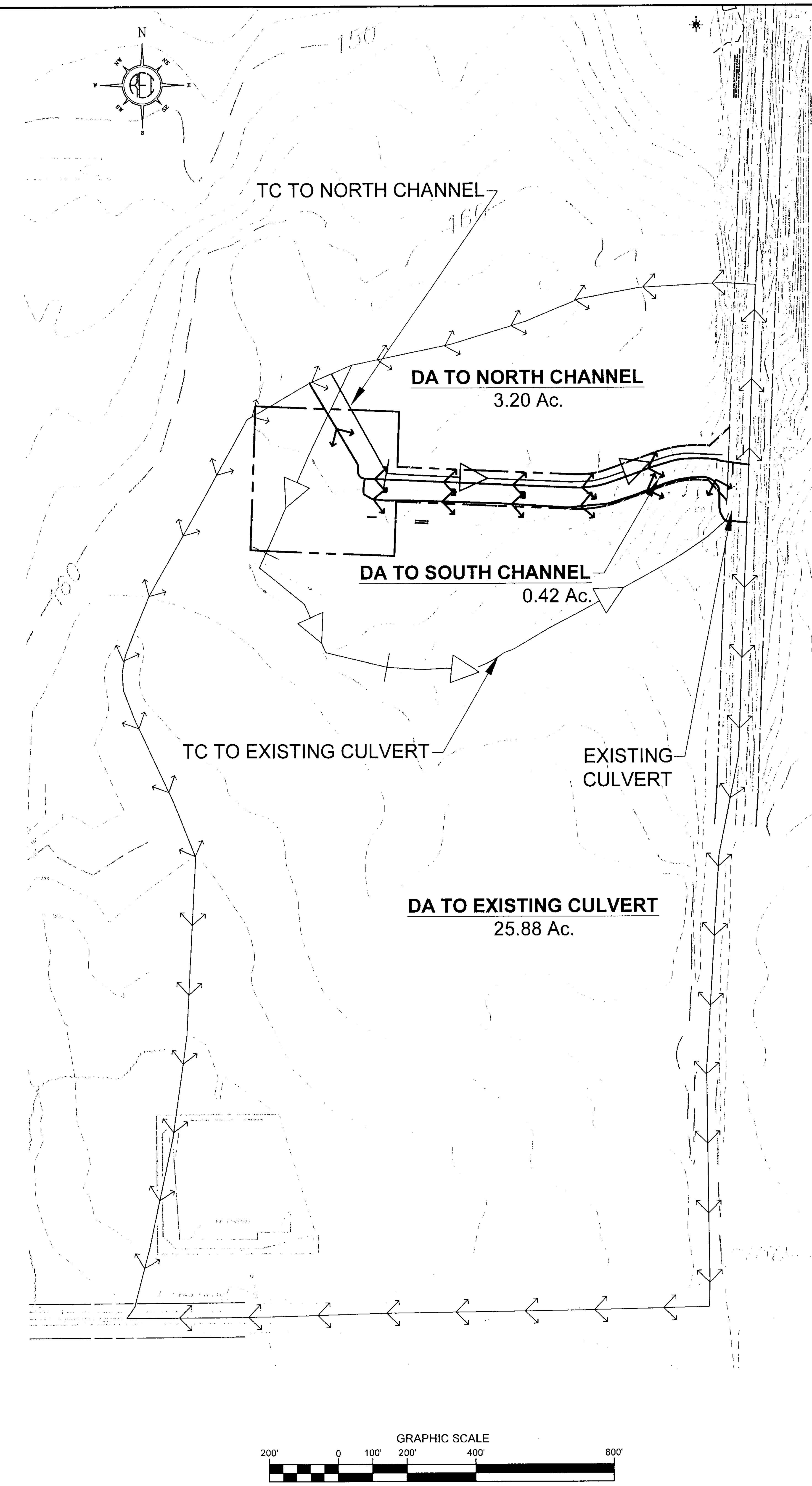
Storage vs. Elevation for Ex. Culvert					**Storage vs. Discharge for Ex. Culvert**			
Elevation (ft.)	Elevation Change (ft.)	Surface Area (sq. ft.)	Inc. Volume (cu. ft.)	Total Accumulated Volume (cu. ft.)	Outfall Barrel Head (ft)	Outfall Barrel Flow (cfs)	**Total Flow (cfs)**	Remarks
148.30	0.00	0	0	0	0.00	0.00	0.00	
149.00	0.70	1,007	352	352	0.70	10.66	10.66	
150.00	1.00	2,271	1,639	1,991	1.70	16.61	16.61	
151.00	1.00	8,310	5,291	7,282	2.70	20.93	20.93	
151.69	0.69	16,807	8,666	15,947	3.39	23.45	23.45	

Outfall barrel:

# of Barrels =	2	
Diameter =	1.25	ft.
Length =	97	ft.
Invert In =	148.30	
Invert Out =	147.35	
Culvert Inlet Control Constant c =	0.0398	
Culvert Inlet Control Constant Y =	0.6700	
Culvert Inlet Control Constant W =	-0.0049	
Entrance Loss Coefficient =	0.50	
Acceleration of Gravity =	32.16	ft./sec.^{2}
Manning's Coeffiecient =	0.013	

North Channel - Time Of Concentration

DRAINAGE AREA		North
Time Of Concentration - Overland Flow Segment		
Length	(ft.)	165
Slope	(ft./ft.)	0.0050
Manning's Sheet Flow Coefficient		0.150
2 Year / 24 hour Precipitation	(in.)	3.4
Segment Time	(min.)	24.7
Time Of Concentration - Channel Flow Segment		
Depth	(ft.)	2
Bottom Width	(ft.)	0
Left Side Slope	XH:1V	3
Right Side Slope	XH:1V	3
Hydraulic Radius	(ft.)	0.83
Mannings Coefficient		0.070
Slope	(ft./ft.)	0.0600
Velocity	(fps.)	4.61
Length	(ft.)	493
Segment Time	(min.)	1.8
Time Of Concentration		
Computed	(min.)	26.5
Used	**(min.)**	**27**



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DATE	NO.	REVISION	APPROVAL
02/13/07	1	RESPOND TO VDOT/BCOM COMMENTS	KMB

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COMMONWEALTH OF VIRGINIA
KENNETH M. BAYBUTT
No. 028257
2/16/07
PROFESSIONAL ENGINEER

SWM/BMP ANALYSIS

RICHARD BLAND COLLEGE
CONSTRUCTION
OF
ELEVATED WATER STORAGE TANK

PRINCE GEORGE & DINWIDDIE COUNTY VIRGINIA

PLOTTING SCALE: 1" = 200'
DATE PLOTTED: 12/22/2006
FILE: C11.dwg
DRAWN BY: GTS
DESIGNED BY: DJM
REVIEWED BY: KMB
PROJECT NO.: 210640004

SHEET
C11
OF

I:\21064 - Richard Bland College\RBC Tanks\Sheets\Water\Storage Tank Drawings\C11.dwg