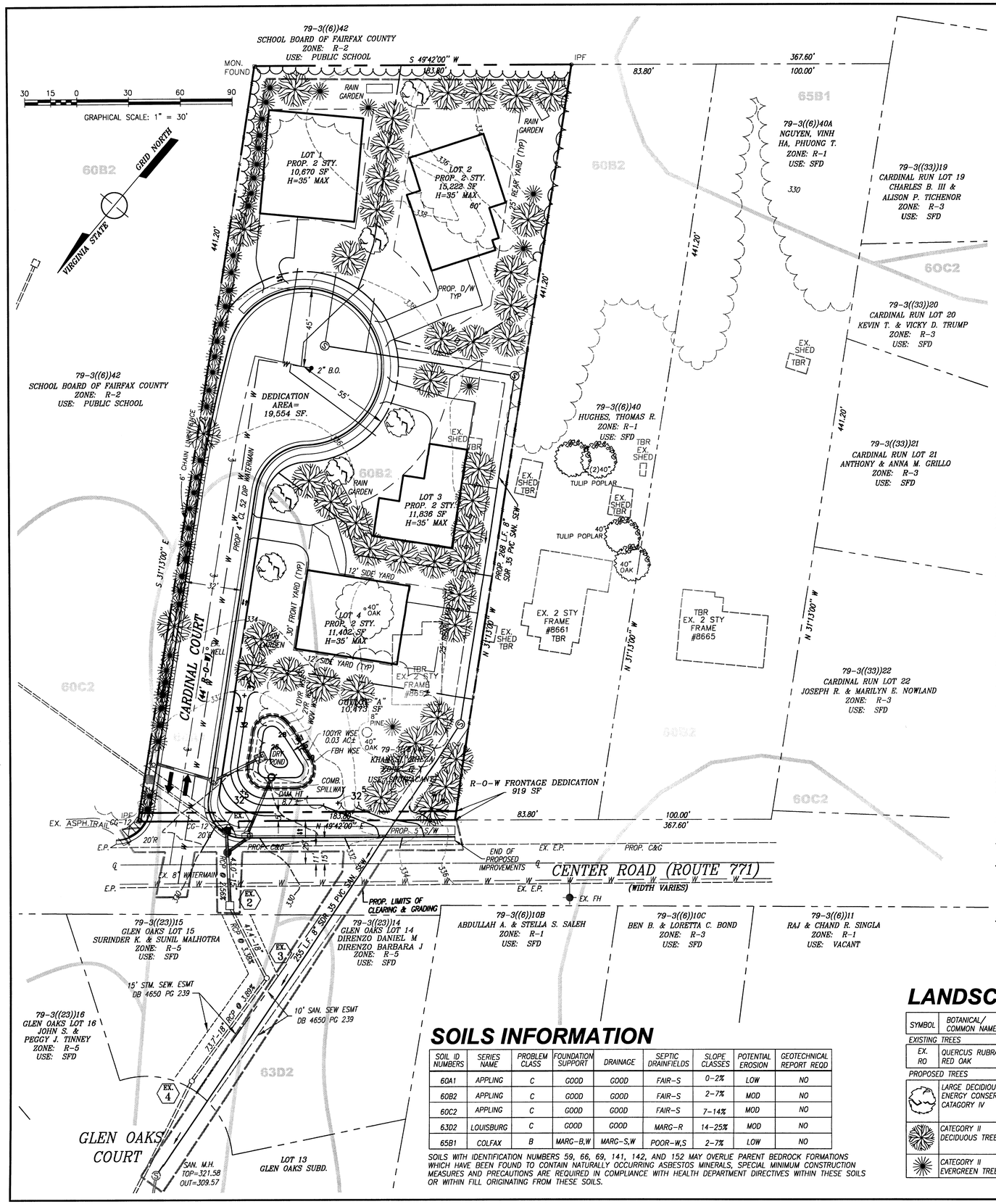


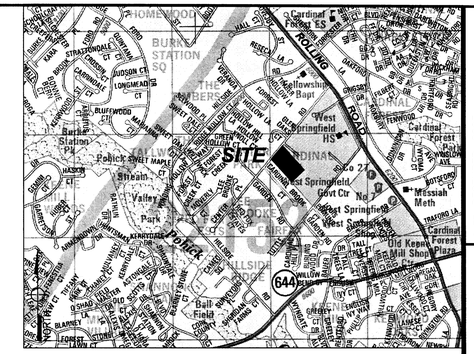
ZONING NOTES

1. THIS PLAN PROPOSES FOR APPROVAL THE REZONING OF PARCEL 41 FROM THE R-1 ZONE TO THE R-3 ZONE. THE PROPERTY IS CURRENTLY ZONED R-1.
2. THE PROPERTY DELINEATED HEREON IS LOCATED ON TAX MAP 79-3((6))41.
3. AREA TABULATION
   AVERAGE LOT AREA (CONVENTIONAL) REQUIRED= 11,500 S.F. (PER R-3 ZONE)
   MINIMUM LOT AREA (CONVENTIONAL) REQUIRED= 10,500 S.F. (PER R-3 ZONE)
   AVERAGE LOT AREA (CONVENTIONAL) PROVIDED= 11,500 S.F. MIN.
4. LOT WIDTH
   MINIMUM REQUIRED LOT (CONVENTIONAL) WIDTH (INTERIOR)= 80 FT. (PER R-3 ZONE)
   MINIMUM REQUIRED LOT (CONVENTIONAL) WIDTH (CORNER)= 105 FT. (PER R-3 ZONE)
5. PROPOSED USE: SINGLE FAMILY DWELLING
6. BUILDING HEIGHT
   MAXIMUM BUILDING HEIGHT (SINGLE FAMILY) = 35 FT. (PER R-3 ZONE)
7. REAL ESTATE ASSESSMENT RECORDS INDICATE A 1940 CONSTRUCTION DATE FOR THE HOUSE ON LOT 41. SAID STRUCTURE WILL BE REMOVED WITH THE PROPOSED DEVELOPMENT.
8. MINIMUM YARD REQUIREMENTS SINGLE FAMILY DWELLINGS (CONVENTIONAL SUBDIVISION LOT)
   FRONT YARD: 30' (PER R-3 ZONE)
   SIDE YARD: 12' (PER R-3 ZONE)
   REAR YARD: 25' (PER R-3 ZONE)
9. MAXIMUM DENSITY 3 DWELLING UNITS PER ACRE.
   PROP. DENSITY=(4 UNITS/1.8383 AC.)= 2.2 UNITS/AC.
10. THIS PROPERTY WILL BE SERVED BY PUBLIC WATER AND SEWER.
11. BEST MANAGEMENT PRACTICES (BMP) AND STORMWATER MANAGEMENT WILL POSSIBLY BE PROVIDED ON SITE WITH AN EXTENDED DRY POND FACILITY IN OUTLOT "A" IN COMBINATION WITH INDIVIDUAL RAIN GARDENS FOR THE IMPERVIOUS AREAS AS SHOWN ON EACH LOT, OR BY OTHER APPROPRIATE MEANS, UNLESS THE BMP AND/OR SWM REQUIREMENTS ARE WAIVED.
12. OPEN SPACE REQUIRED FOR R-3 ZONE (CONVENTIONAL) = N/A
13. CONTOURS ARE AT A 2 FOOT INTERVAL. TOPOGRAPHY AND BOUNDARY DELINEATED HEREON IS BASED ON A FIELD SURVEY BY WILLIAM RAMSEY DATED, FEBRUARY, 2003.
14. THIS SITE IS LOCATED IN FLOOD ZONE 'X' (AREAS DETERMINED TO BE OUTSIDE THE 500-YEAR FLOOD PLAIN) AS SHOWN ON F.I.R.M. MAP NO. 515525 0075 D PANEL 75 OF 150, DATED MARCH 5, 1990.
15. NO TITLE REPORT FURNISHED. PROPERTY IS SUBJECT TO ENCUMBRANCES OF RECORD.
16. THIS SITE IS NOT LOCATED WITHIN A HISTORIC OVERLAY DISTRICT.
17. THIS SITE IS NOT LOCATED WITHIN A NATURAL RESOURCE OVERLAY DISTRICT.
18. THIS SITE IS NOT LOCATED WITHIN A AIRPORT NOISE IMPACT OVERLAY DISTRICT.
19. THIS SITE IS NOT LOCATED WITHIN A SIGN CONTROL OVERLAY DISTRICT.
20. THIS SITE IS NOT LOCATED WITHIN A HIGHWAY CORRIDOR OVERLAY DISTRICT.
21. THIS SITE IS NOT LOCATED WITHIN A WATER SUPPLY PROTECTION OVERLAY DISTRICT.
22. THERE ARE NO VISIBLE GRAVE SITES OR BURIAL GROUNDS LOCATED ON THIS PROPERTY.
23. TO THE BEST OF OUR KNOWLEDGE AND BELIEF, THERE ARE NO HAZARDOUS/TOXIC SUBSTANCES OR WASTE AND/OR PETROLEUM PRODUCTS TO BE GENERATED, UTILIZED, STORED, TREATED AND/OR DISPOSED OF ON-SITE.
24. THERE ARE NO ON-SITE SCENIC ASSETS NOR NATURAL FEATURES TO BE PROTECTED OR PRESERVED.
25. THE ADJACENT PROPERTIES TO THE SOUTH ARE CURRENTLY SINGLE FAMILY DWELLINGS ZONED R-3. TO THE NORTH AND EAST IS WEST SPRINGFIELD HIGH SCHOOL. THE PROPOSED SINGLE FAMILY DETACHED UNITS WILL NOT POSE ANY ADVERSE EFFECT ON THESE PROPERTIES.
26. THERE ARE NO SPECIAL AMENITIES PROPOSED WITH THIS DEVELOPMENT.
27. THERE ARE NO MAPPED RPA'S, RMA'S OR ENVIRONMENTAL QUALITY CORRIDORS ON-SITE PER APPLICABLE FAIRFAX COUNTY REFERENCE MAPS AND THE ADOPTED COMPREHENSIVE PLAN.
28. IT IS ANTICIPATED THAT THE CONSTRUCTION OF THE DEVELOPMENT WILL BEGIN AS SOON AS ALL NECESSARY COUNTY APPROVALS AND PERMITS ARE OBTAINED, SUBJECT TO MARKET CONDITIONS AT THAT TIME.
29. THE PROPOSED DEVELOPMENT CONFORMS TO THE PROVISIONS OF ALL APPLICABLE ORDINANCES, REGULATIONS AND ADOPTED STANDARDS FOR THE R-3 ZONE.
30. THERE ARE NO MAJOR UNDERGROUND UTILITY EASEMENTS OR UTILITY EASEMENTS 25' WIDE OR GREATER ON-SITE.
31. THE DEVELOPER WILL PROVIDE THE PROPOSED CARDINAL COURT CUL-DE-SAC WITH CURB, GUTTER AND SIDEWALK, AS WELL AS CURB, GUTTER AND SIDEWALK ALONG THE FRONTAGE OF CENTER ROAD. THE SANITARY SEWER WILL BE EXTENDED ALONG THE EASTERN BOUNDARY OF THE SITE, AS SHOWN, TO PROVIDE SEWER FOR THE PROPOSED LOTS. A WATERMAIN WILL BE EXTENDED FROM CENTER ROAD TO PROVIDE PUBLIC WATER SERVICE. IT IS ANTICIPATED THAT CONSTRUCTION OF THESE IMPROVEMENTS WILL BEGIN AS SOON AS ALL NECESSARY COUNTY APPROVALS AND PERMITS ARE OBTAINED.
32. TRANSITIONAL SCREENING AND BARRIERS ARE NOT REQUIRED FOR THIS DEVELOPMENT.
33. ALL EXISTING ON-SITE IMPROVEMENTS WILL BE REMOVED.
34. PARKING REQUIREMENTS:
    REQUIRED PARKING= 2 SPACES PER S.F.D. [PER 11-103 Z.O.]
    PROPOSED PARKING= 2 SPACES PER UNIT
35. THIS PROPOSED GENERALIZED DEVELOPMENT PLAN IS IN CONFORMANCE WITH THE CURRENT COMPREHENSIVE PLAN RECOMMENDATIONS.
36. THIS SITE IS LOCATED WITHIN THE MAIN BRANCH COMMUNITY PLANNING SECTOR OF THE POHICK PLANNING DISTRICT OF THE COMPREHENSIVE PLAN FOR FAIRFAX COUNTY, VIRGINIA.
37. OWNER/APPLICANT:
    LOT 41
    GHOLAMREZA KHAMESI
    450 SPRINGVALE RD.
    GREAT FALLS, VA. 22066
38. EXISTING AREA IN THE R1 ZONE=1.8383 ACRES
    PROPOSED AREA IN THE R3 ZONE=1.8383 ACRES

RZ 2004-SP-001 Staff KC
Application No.
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (PDP) 2-3-05
SEE PROFFERS DATED
Date of BOS (FDP) approval 3-7-05
Sheet 1 of 12

VICINITY MAP

SCALE: 1"=1000'



LEGEND

EXISTING		PROPOSED
	PROPERTY LINE	
	EASEMENT LINE	
	EDGE PAVEMENT	
	CENTERLINE	
	FENCE LINE	
G G	GAS LINE	G G
EX. 8" W/M W	WATER MAIN	PROP. 8" W/M W
	BUILDINGS	
	RETAINING WALL	
EX. CONC. S/W	SIDEWALK	PROP. CONC. S/W
EX. C&G	CURB & GUTTER	CG-6 TRANS CG-6R
A 8" SAN.	SANITARY SEWER	A 8" SAN
3 4	STORM SEWER	3 15" RCP 4
OE	OVERHEAD ELECTRIC	OE
UE	UNDERGROUND ELECTRIC LINE	UE
OT	OVERHEAD TELEPHONE LINE	OT
UT	UNDERGROUND TELEPHONE LINE	UT
	FLOODPLAIN	
	TREE LINE	
T.B.R. SAVE 30" OAK	TREES	
392	CONTOUR LINE	92
	SPOT ELEVATION	+98.5
	LIMITS OF CLEARING & GRADING	LCG
	BENCHMARK	
	VEHICULAR TRAFFIC CIRCULATION	
	PEDESTRIAN TRAFFIC CIRCULATION	

LOT TABULATION

EXISTING	AREA		WIDTH	PROPOSED	AREA		WIDTH
NAME	S.F.*	ACRES	FT.	NAME	S.F.*	ACRES	FT.
LOT 41	80,076	1.8383	183.8	FRONTAGE	919	0.0211	
				CUL-DE-SAC	19,554	0.4489	
				LOT 1	10,670	0.2449	85
				LOT 2	15,222	0.3495	80
				LOT 3	11,836	0.2717	110
				LOT 4	11,402	0.2618	99
				OUTLOT A	10,473	0.2404	
TOTAL	80,076*	1.8383		TOTAL	80,076	1.8383	

*NUMBER ROUNDED TO NEAREST INTEGER

LANDSCAPE SCHEDULE

SYMBOL	BOTANICAL/ COMMON NAME	QUANT.	SIZE	CREDIT	CANOPY	REMARKS
EXISTING TREES						
EX. RO	QUERCUS RUBRA/ RED OAK	1	40" DIA	1.25	6,250 SF	AVG. 40' RAD. CANOPY AREA
PROPOSED TREES						
	LARGE DECIDIOUS TREES WITH ENERGY CONSERVATION CREDIT CATAGORY IV	6	1" CAL	1.50	2,025 SF	PLANT NORTHWEST OF PROPOSED HOUSES. LOCATED 20'-35' FROM EDGE OF BUILDING.
	CATEGORY II DECIDUOUS TREES	44	1" CAL	N/A	3,300 SF	
	CATEGORY II EVERGREEN TREES	44	1" CAL	N/A	3,300 SF	
				TOTAL=	14,875 SF	

SOILS INFORMATION

SOIL ID NUMBERS	SERIES NAME	PROBLEM CLASS	FOUNDATION SUPPORT	DRAINAGE	SEPTIC DRAINFIELDS	SLOPE CLASSES	POTENTIAL EROSION	GEOTECHNICAL REPORT REQD
60A1	APPLING	C	GOOD	GOOD	FAIR-S	0-2%	LOW	NO
60B2	APPLING	C	GOOD	GOOD	FAIR-S	2-7%	MOD	NO
60C2	APPLING	C	GOOD	GOOD	FAIR-S	7-14%	MOD	NO
63D2	LOUISBURG	C	GOOD	GOOD	MARG-R	14-25%	MOD	NO
65B1	COLFAX	B	MARG-B,W	MARG-S,W	POOR-W,S	2-7%	LOW	NO

SOILS WITH IDENTIFICATION NUMBERS 59, 66, 69, 141, 142, AND 152 MAY OVERLIE PARENT BEDROCK FORMATIONS WHICH HAVE BEEN FOUND TO CONTAIN NATURALLY OCCURRING ASBESTOS MINERALS, SPECIAL MINIMUM CONSTRUCTION MEASURES AND PRECAUTIONS ARE REQUIRED IN COMPLIANCE WITH HEALTH DEPARTMENT DIRECTIVES WITHIN THESE SOILS OR WITHIN FILL ORIGINATING FROM THESE SOILS.

TREE COVER TAB.

GROSS SITE AREA (R-3)=	80,076 SF
TOTAL BUILDING AREA =	0 SF
STREET FRONTAGE AREA =	919 SF
ADJUSTED GROSS SITE AREA= 80,076 - (919) SF=	79,157 SF
LANDSCAPING REQUIRED= (0.20)(79,157 SF)=	15,831 SF
EXISTING TREE COVER=	13,633 SF
EXISTING TREE COVER TO BE REMOVED=	-12,783 SF
	850 SF
CREDIT FOR TREE PRESERVED= (1.25)(850 SF)=	1,062 SF
PROPOSED NEW PLANTINGS	14,875 SF
TOTAL PROVIDED	15,937 SF > 15,831 SF

DATE: DECEMBER, 2003
SCALE: 1"=30'
FILE NAME: GEN-DEV-PLAN.DWG
PROJECT NO: VAFX-21.09-01-RZ

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WE Inc.
Williams Enterprises Incorporated
18 Mosby Lane Stafford, Virginia 22554
540-286-3710 and 540-286-0345 Fax
weincorporated@msn.com

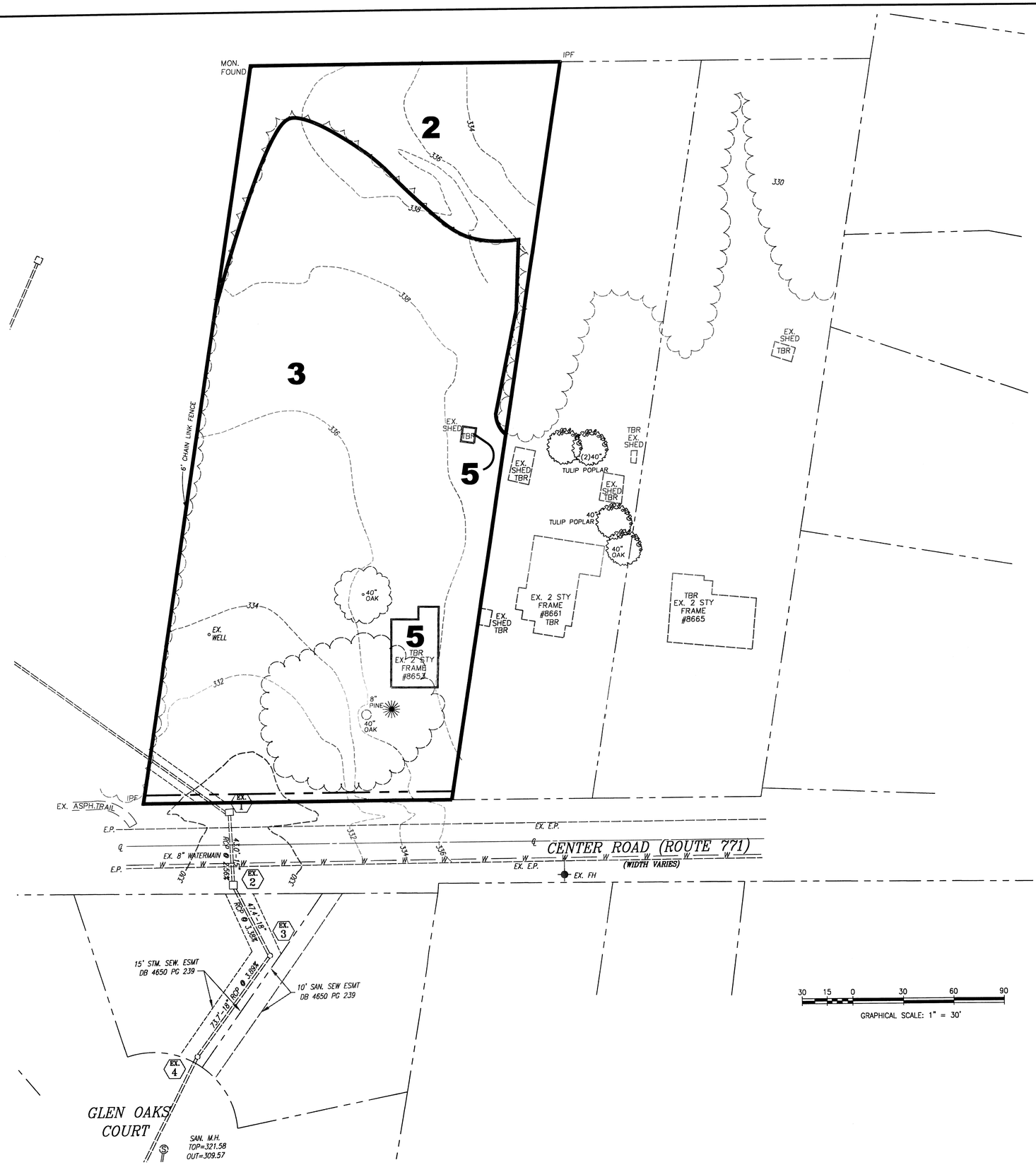
COMMONWEALTH OF VIRGINIA
ROBERT E. WILLIAMS, JR.
No. 025886
12/15/2004
PROFESSIONAL ENGINEER

GENERALIZED DEVELOPMENT PLAN

RECEIVED
Department of Planning & Zoning
DEC 1 7 2004
Zoning Evaluation Division

CARDINAL ESTATES

SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA



EXISTING COVER TYPE SUMMARY TABLE

LABEL	COVER TYPE	PRIMARY SPECIES	SUCCESSIONAL STAGE	CONDITION*	ACREAGE	COMMENTS
2	UPLAND FOREST	MAPLE, OAK SASSAFRAS	EARLY STAGE	POOR	0.32 AC.	SEE CONDITION
3	OLD FIELD	OAK, YELLOW POP.	OVERGROWN YARD	POOR	1.49 AC.	SEE CONDITION
5	DEVELOPED	N/A	N/A	N/A	0.03 AC.	ABANDONED HOUSE, SHED
CONDITION DESCRIPTIONS:				TOTAL ACREAGE:	1.84 AC.	
COVER TYPE 2:	THIS AREA COVERS 17% OF THE SITE. THE AREA IS AN EARLY SUCCESSION OF UPLAND FOREST OR A LATE STAGE OF OLD FIELD.					
COVER TYPE 3:	THIS AREA COVERS 81% OF THE SITE. ON LOT 41, THE AREA WAS ONCE A MAINTAINED LAWN BUT HAS MOVED FROM A LAWN TO AN OLD FIELD WITH LACK OF MAINTENANCE.					
COVER TYPE 5:	THIS AREA CONTAINS 2% OF THE SITE. ABANDONED HOUSE AND SHED.					

EXISTING TREE SCHEDULE

BOTANICAL/ COMMON NAME	QUANT.	SIZE	ROOT
QUERCUS RUBRA/ RED OAK	2	40"CAL.	EX.
PINUS TAEDA/ LOBLOLLY PINE	1	8"CAL.	EX.

LEGEND

2 UPLAND FOREST

3 OLD FIELD

5 DEVELOPED

EXISTING DECIDUOUS

EXISTING EVERGREEN

EXISTING VEGETATION INFORMATION INCLUDED ON THIS PLAN WAS PREPARED BY: WILLIAMS ENTERPRISES, INC.

W. ROSS DICKERSON
CERTIFIED ARBORIST MA4305A

RZ 2004-SP-001 Application No. Staff KC
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(DP) (CDP) (CDP) (FDP)
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Date of (BOS) (PC) approval 3-7-05
Sheet 2 of 6

DATE: DECEMBER, 2003
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WE Inc.
Williams Enterprises Incorporated
18 Mosby Lane Stafford, Virginia 22554
540-286-3710 and 540-286-0345 Fax
weincorporated@msn.com

COMMONWEALTH OF VIRGINIA
ROBERT E. WILLIAMS JR.
No. 105866
12/15/2004
LICENSED PROFESSIONAL ENGINEER

EXISTING VEGETATION MAP

CARDINAL ESTATES

SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA

STORM SEWER DESIGN COMPUTATIONS

FROM STR	TO STR	TYPE OF STR	DRAIN AREA A (Ac)	RUNOFF COEFF C	C X A INC (Ac)	C X A CUM (Ac)	TIME OF CONCENTRATION Tc TO (min)	TIME IN (min)	ACCUM TIME (min)	RAINFALL INTENSITY I (in/hr)	DISCHARGE INC (cfs)	DISCHARGE CUM (cfs)	DESIGN PIPE DIA (in)	SLOPE (%)	"n"	MAX Q (cfs)	VELOCITY (fps)	LENGTH (ft)	FALL (ft)	UPPER INVERT (ft)	LOWER INVERT (ft)	LOSSES (ft)	STATION (ft)	TOP ELEV (ft)
OFF-SITE AREA-1: 1.92 AC @ C=0.40; CxA=0.77																								
OFF-SITE AREA TO PROP. 4: 1.14 AC @ C=0.40; CxA=0.46																								
SWM AREA-6: 0.0554 AC @ C=0.73; CxA=0.04																								
3		MH																		323.87				
			–	–	–	1.27	5	–	5	7.27	–	9.23	18	1.69	0.013	13.7	7.7	13	0.22					
	2A	MH																			323.65			
2C		RISER																		324.15				
			–	–	–	–	5	–	5	7.27	3.19	3.19	15	0.94	0.013	6.4	5	37	0.35					
	2B	DI																			323.80			
2B		DI																		323.70				
			0.28	0.57	0.16	–	5	–	5	7.27	1.16	4.35	15	1.33	0.013	8.0	6.5	15	0.20					
	2A	MH																			323.50			
2A		MH																		323.40				
			–	–	–	–	5	–	5	7.27	–	13.58	18	2.00	0.013	15	8.5	31	0.63					
	EX 2	DI																			322.77			
EX 2		DI																		321.91				
			0.26	0.57	0.15	–	5	–	5	7.27	1.09	14.67	18	3.38	0.013	19.4	11.0	47	1.60					
	EX 3	MH																			320.31			
EX 3		MH																		319.56				
			–	–	–	–	5	–	5	7.27	–	14.67	18	3.89	0.013	20.8	11.8	74	2.87					
	EX 4	MH																			316.69			

EXISTING STORM SEWER TABLE

INLET #1		*MANHOLE #3*	
TOP	*328.45*	*TOP*	*324.56*
INV IN 15"	*324.41*	*INV IN 18" (FROM #2)*	*320.31*
INV OUT 15"	*323.87*	*INV OUT 18"*	*319.56*
INLET #2		*MANHOLE #4*	
TOP	*328.49*	*TOP*	*322.73*
INV IN 15" (FROM #1)	*322.77*	*INV IN 18" (FROM #3)*	*316.69*
INV OUT 18"	*321.91*	*INV OUT 24"*	*316.16*

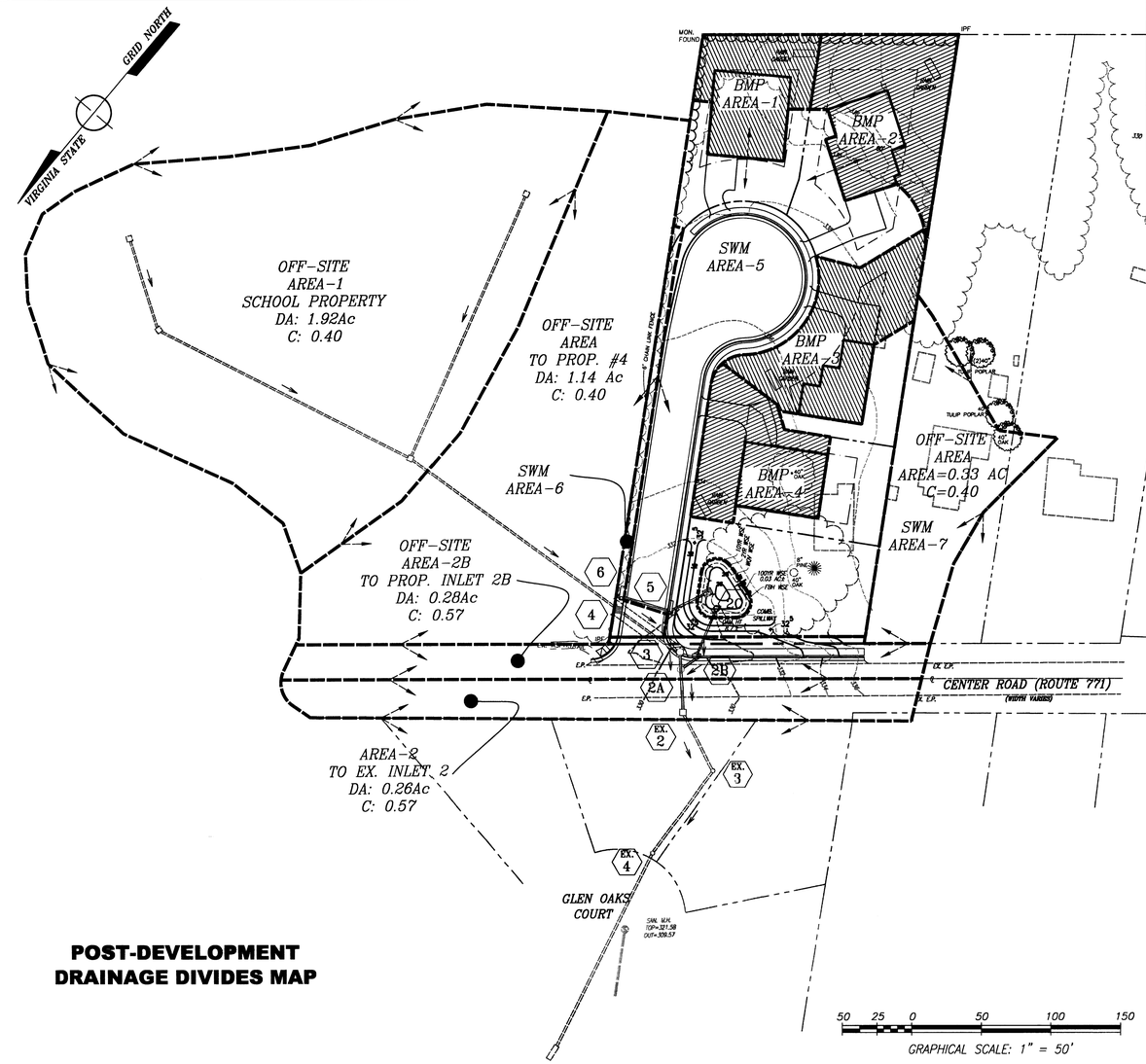
PROPOSED STORM SEWER TABLE

MH #2A		*RISER #2C*	
TOP	*329.75*	*TOP*	*330.00*
INV IN 15"	*323.50*	*ORIFICE IN*	*326.00*
INV IN 18"	*323.65*	*INV OUT 15"*	*324.15*
INV OUT 18"	*323.40*		
		MH #3	
INLET #2B		*TOP*	*330.45*
TOP	*330.40*	*INV IN 15"*	*324.41*
INV IN 15"	*323.80*	*INV OUT 18"*	*323.87*
INV OUT 15"	*323.70*		

ADEQUATE OUTFALL NARRATIVE

THIS GENERAL DEVELOPMENT PLAN PROPOSES THE UPGRADE OF THE EXISTING 15" RCP PIPE CROSSING CENTER ROAD FROM EXISTING INLET #1 TO EXISTING INLET #2 TO AN 18" RCP. IT WAS FOUND THAT THE 15" RCP WAS INADEQUATE TO PASS THE PRE-DEVELOPMENT FLOWS FROM THE SITE AND UPSTREAM AREAS. BY INCREASING THE SIZE OF THE PIPE TO AN 18" RCP, IT IMPROVES THE OVERALL PERFORMANCE OF THE SYSTEM AND BETTER ACCOMMODATES THE PROPOSED DEVELOPMENT.

AS SHOWN ON THE STORM SEWER DESIGN COMPUTATION TABLE AND DRAINAGE DIVIDES MAP ON THIS SHEET, THE UPSTREAM AREAS TO THE NORTH, 3.06 ACRES FROM THE SCHOOL PROPERTY WITH A C FACTOR OF 0.40 AND 0.0554 ACRES OF ONSITE UNCONTROLLED RUNOFF WITH A C FACTOR OF 0.73, ACCOUNT FOR A 10 YEAR PEAK DISCHARGE OF 9.23 CFS ENTERING THE STORM DRAIN SYSTEM PRIOR TO THE SITE OUTFALL. BMP AREAS 1 AND 2 SHEET FLOW TO ON LOT RAIN GARDENS, THEN SHEET FLOW TO THE SCHOOL PROPERTY TO THE SOUTH. THE REMAINDER OF THE SITE FLOWS TO THE PROPOSED EXTENDED DRY POND. THE OUTFALL STRUCTURE FOR THE POND IS LABELED #2C. THE 15" RCP AT 0.94% LEAVING THE STRUCTURE AND FLOWING TO STRUCTURE #2B HAS A CAPACITY OF 6.4 CFS, WHICH IS GREATER THAN THE 10 YEAR PEAK DISCHARGE FROM THE POND (3.19 CFS). SURFACE FLOW FROM THE STREET, 1.16 CFS, ENTERS THE STORM DRAIN SYSTEM AT #2B. THE 15" RCP AT 1.33% LEAVING THE STRUCTURE AND FLOWING TO STRUCTURE #2A HAS A CAPACITY OF 8.0 CFS, WHICH IS GREATER THAN THE 10 YEAR COMBINED PEAK DISCHARGE (4.35 CFS) FROM THE POND (3.19 CFS) AND THE SURFACE FLOW (1.16 CFS). AT STRUCTURE #2A THE FLOW FROM THE UPSTREAM AREAS (9.23 CFS) AND FROM THE ONSITE AREAS (4.35 CFS) COMBINES TO FLOW TO EXISTING STRUCTURE #2 (13.58 CFS). A NEW 18" RCP PIPE AT 2.00% WILL BE INSTALLED FROM #2A TO EXISTING #2. THE NEW PIPE WILL HAVE A CAPACITY OF 15 CFS WHICH IS GREATER THAN THE COMBINED FLOW. SURFACE FLOW FROM THE STREET, 1.09 CFS, ENTERS THE SYSTEM AT EXISTING #2. FROM EXISTING STRUCTURE 2, NO CHANGES ARE PROPOSED TO EXISTING STRUCTURE 3 AND EXISTING STRUCTURE 4. SINCE BOTH ARE MANHOLES, NO ADDITIONAL FLOWS ARE INTRODUCED INTO THE SYSTEM. THEIR EXISTING CAPACITIES OF 19.4 CFS AND 20.8 CFS STILL EXCEED THE PROPOSED FLOWS LEADING TO THEM (13.58+1.09=14.67 CFS). SINCE THE PROPOSED AND EXISTING STORM DRAIN SYSTEM HAS A GREATER CAPACITY THAN THE COMBINED PEAK DISCHARGE FROM THE PROPOSED DEVELOPMENT AND THE UPSTREAM AREAS, AS SHOWN HERE, IT IS THE OPINION OF THE DESIGN ENGINEER THAT AN ADEQUATE OUTFALL EXISTS FOR THE SITE.



POST-DEVELOPMENT DRAINAGE DIVIDES MAP

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APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 2-3-05
Date of (BOS) (PC) approval 3-7-05
Sheet 3 of 6

DATE: DECEMBER, 2003
SCALE: 1"=30'
FILE NAME: GEN-DEV-PLAN.DWG
PROJECT NO: VAFX-21.09-01

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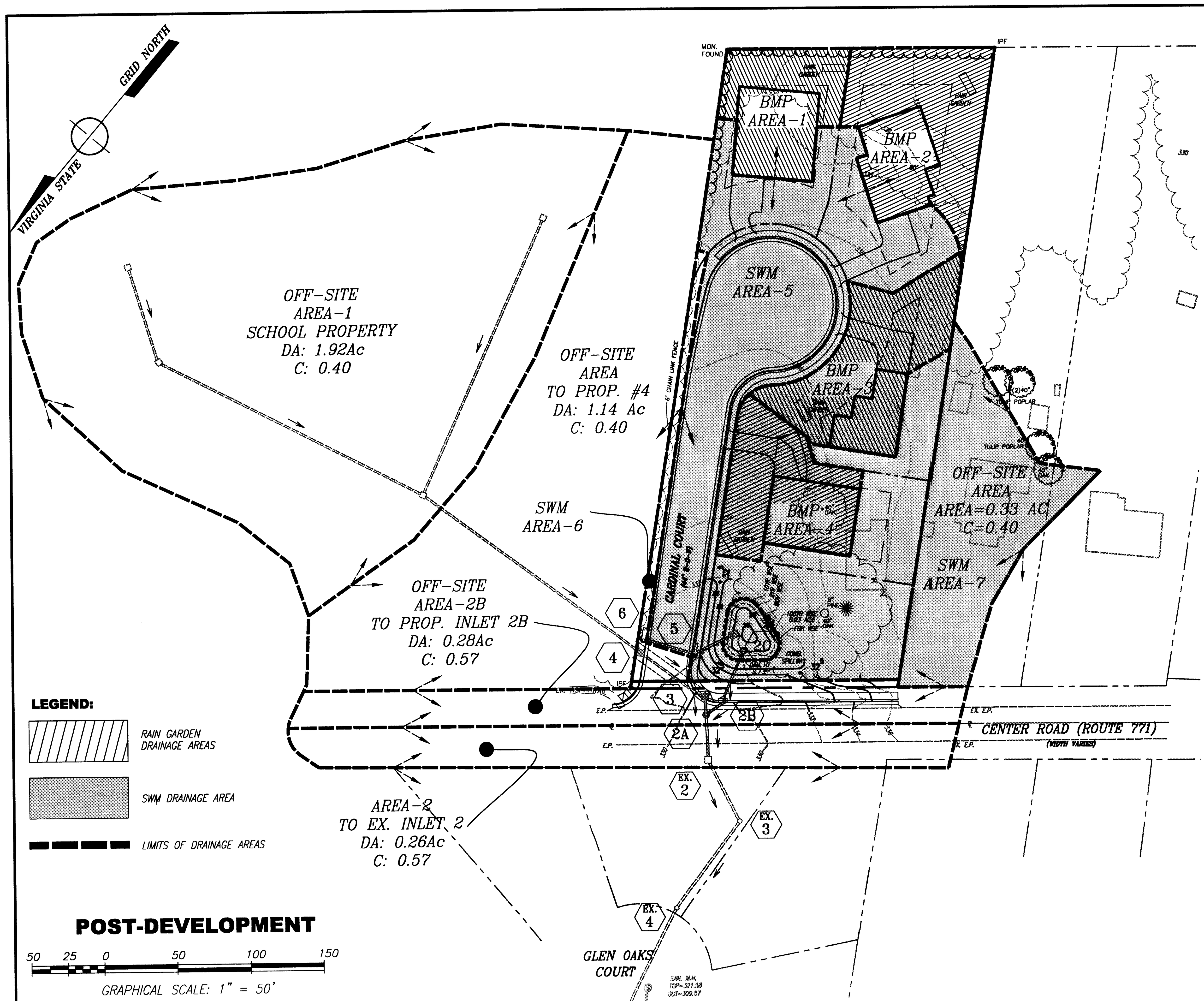
WE Inc.
Williams Enterprises Incorporated
18 Mosby Lane Stafford,Virginia 22554
540-286-3710 and 540-286-0345 Fax
weincorporated@msn.com

COMMONWEALTH OF VIRGINIA
ROBERT E. WILLIAMS, JR.
12/15/2004
PROFESSIONAL ENGINEER

DRAINAGE AREA ANALYSIS & ADEQUATE OUTFALL

CARDINAL ESTATES

SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA

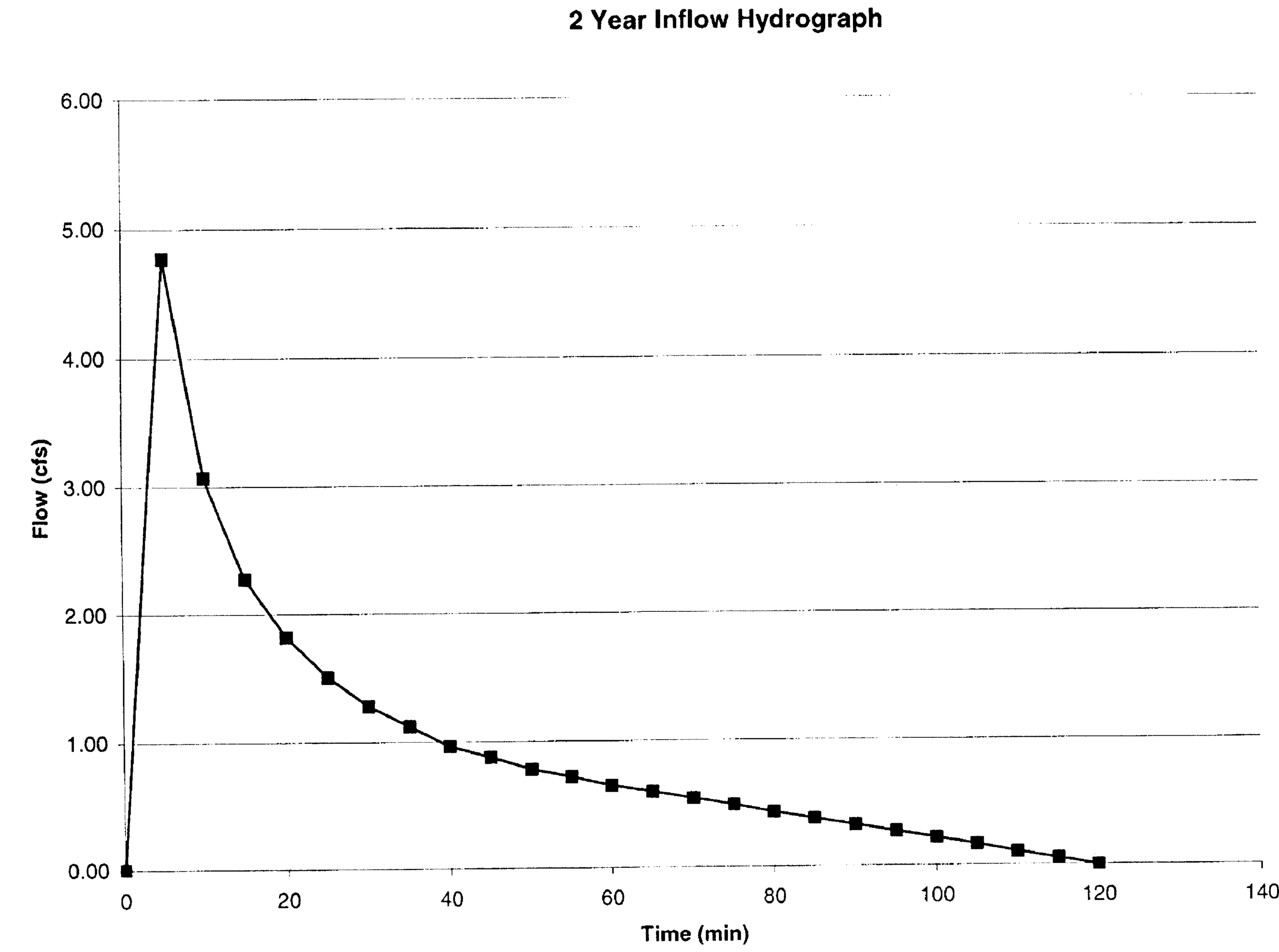


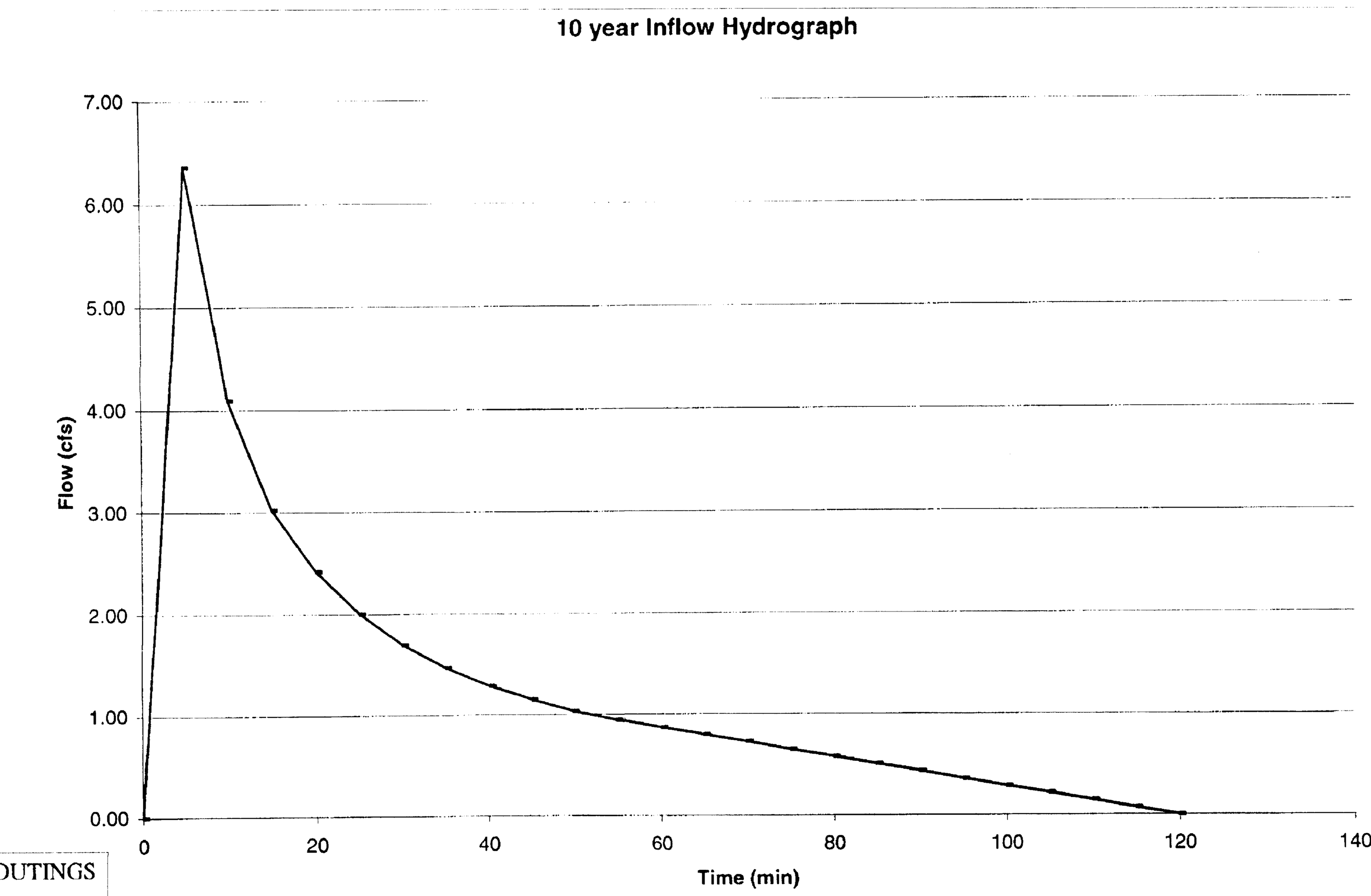
2 YEAR STORM ROUTING

TIME	Qin	Qriser	Qweir	Qorf	Qtot	WSE	VOLUME
0.0	0.00	0.0	0.0	0.0	0.00	226.00	0.00
5.0	4.77	0.0	0.0	0.0	0.01	228.01	711.75
10.0	3.07	0.0	0.6	0.0	0.60	229.33	1,794.68
15.0	2.27	0.0	2.0	0.0	1.97	229.72	2,207.49
20.0	1.82	0.0	2.0	0.0	**2.04**	**229.74**	**2,226.34 PEAK**
25.0	1.50	0.0	1.7	0.0	1.77	229.67	2,151.75
30.0	1.28	0.0	1.5	0.0	1.50	229.60	2,077.33
35.0	1.12	0.0	1.3	0.0	1.30	229.55	2,017.09
40.0	0.96	0.0	1.1	0.0	1.12	229.50	1,965.73
45.0	0.87	0.0	1.0	0.0	0.99	229.46	1,923.16
50.0	0.78	0.0	0.9	0.0	0.88	229.43	1,889.83
55.0	0.72	0.0	0.8	0.0	0.80	229.40	1,862.23
60.0	0.65	0.0	0.7	0.0	0.73	229.38	1,838.33
65.0	0.59	0.0	0.6	0.0	0.66	229.35	1,815.44
70.0	0.54	0.0	0.6	0.0	0.58	229.32	1,784.75
75.0	0.49	0.0	0.5	0.0	0.52	229.30	1,764.95
80.0	0.43	0.0	0.5	0.0	0.47	229.28	1,744.49
85.0	0.38	0.0	0.4	0.0	0.42	229.26	1,723.41
90.0	0.32	0.0	0.3	0.0	0.36	229.24	1,701.63
95.0	0.27	0.0	0.3	0.0	0.31	229.22	1,679.04
100.0	0.22	0.0	0.2	0.0	0.26	229.20	1,657.15
105.0	0.17	0.0	0.2	0.0	0.21	229.17	1,634.58
110.0	0.10	0.0	0.1	0.0	0.16	229.14	1,607.50
115.0	0.05	0.0	0.1	0.0	0.11	229.11	1,577.55

10 YEAR STORM ROUTING

TIME	Qin	Qriser	Qweir	Qorf	Qtot	WSE	VOLUME
0.0	0.00	0.0	0.0	0.0	0.00	226.00	0.00
5.0	6.36	0.0	0.0	0.0	0.01	228.37	954.20
10.0	4.09	0.0	2.0	0.0	2.01	229.73	2,216.87
15.0	3.03	0.0	3.2	0.0	**3.19**	**229.99**	**2,517.63 PEAK**
20.0	2.42	0.0	2.8	0.0	2.84	229.91	2,430.48
25.0	2.00	0.0	2.3	0.0	2.37	229.81	2,311.49
30.0	1.70	0.0	2.0	0.0	1.99	229.72	2,211.76
35.0	1.47	0.0	1.7	0.0	1.70	229.65	2,132.98
40.0	1.29	0.0	1.5	0.0	1.48	229.60	2,069.84
45.0	1.15	0.0	1.3	0.0	1.30	229.55	2,018.80
50.0	1.03	0.0	1.1	0.0	1.16	229.51	1,976.43
55.0	0.94	0.0	1.0	0.0	1.04	229.48	1,941.11
60.0	0.87	0.0	0.9	0.0	0.95	229.45	1,912.64
65.0	0.80	0.0	0.9	0.0	0.88	229.43	1,888.15
70.0	0.73	0.0	0.8	0.0	0.81	229.40	1,864.74
75.0	0.65	0.0	0.7	0.0	0.73	229.38	1,840.33
80.0	0.58	0.0	0.6	0.0	0.66	229.35	1,815.16
85.0	0.51	0.0	0.6	0.0	0.59	229.33	1,790.32
90.0	0.44	0.0	0.5	0.0	0.52	229.30	1,765.15
95.0	0.36	0.0	0.4	0.0	0.45	229.28	1,738.23
100.0	0.29	0.0	0.4	0.0	0.38	229.25	1,709.91
105.0	0.22	0.0	0.3	0.0	0.32	229.22	1,681.29
110.0	0.15	0.0	0.2	0.0	0.25	229.19	1,651.61
115.0	0.07	0.0	0.2	0.0	0.18	229.16	1,619.09





EXISTING SITE COVERAGE

EX. SITE AREA=	80,076 S.F. OR 1.8383 AC.
FRONTAGE DEDICATION=	919 S.F. OR 0.0211 AC.
PROP. SITE AREA=	79,157 S.F. OR 1.8172 AC.
EX. IMPERVIOUS AREA=	1,233 S.F. OR 0.0283 AC. (1.6%)
EX. PERVIOUS AREA=	77,924 S.F. OR 1.7889 AC. (98.4%)
EX. 'C' FACTOR=	0.31
EX. Tc=	5 MIN.
EX. Q(2)=	0.31(1.8172)(5.45)= 3.07 CFS
EX. Q(10)=	0.31(1.8172)(7.27)= 4.10 CFS

ALLOWABLE SWM DISCHARGE

EX. Q(2)=	0.31(1.8172)(5.45)= 3.07 CFS
EX. Q(10)=	0.31(1.8172)(7.27)= 4.10 CFS

UNCONTROLLED AREAS

BMP AREA-1	Q(2)= 0.48 CFS Q(10)= 0.65 CFS
BMP AREA-2	Q(2)= 0.60 CFS Q(10)= 0.81 CFS
SWM AREA-6	Q(2)= 0.22 CFS Q(10)= 0.29 CFS
SWM AREA-7 (OFF-SITE)	Q(2)= 0.72 CFS Q(10)= 0.96 CFS

ALLOWED POND DISCHARGE

ALLOWED Q(2)=	3.07-0.48-0.60-0.22+0.72= 2.49 CFS
ALLOWED Q(10)=	4.10-0.65-0.81-0.29+0.96= 3.31 CFS

RAIN GARDEN SIZING

WIDTH= 5 FEET
LENGTH= 15 FEET
DEPTH= 4 FEET
SURFACE DEPTH= 0.5 FEET
VOID RATIO= 40%
VOLUME= (5)(15)(4)(0.40)+(5)(15)(0.5)= 158 CF

PROPOSED BMP AREA SUMMARY

BMP AREA-1		BMP AREA-3	
AREA	0.1458 AC	AREA	0.2118 AC
IMPERV. AREA (52%)	0.0758 AC	IMPERV. AREA (31.4%)	0.0666 AC
'C'	0.61	'C'	0.49
Q(2)	0.48 CFS	Q(2)	0.56 CFS
Q(10)	0.65 CFS	Q(10)	0.75 CFS
BMP VOL. REQ'D (1ST 1/2")		BMP VOL. REQ'D (1ST 1/2")	
0.5(36.3)(52)(0.1458)=	138 CF	0.5(36.3)(31.4)(0.2118)=	121 CF
BMP AREA-2		BMP AREA-4	
AREA	0.2313 AC	AREA	0.1670 AC
IMPERV. AREA (30.5%)	0.0705 AC	IMPERV. AREA (52.1%)	0.0870 AC
'C'	0.48	'C'	0.52
Q(2)	0.60 CFS	Q(2)	0.47 CFS
Q(10)	0.81 CFS	Q(10)	0.63 CFS
BMP VOL. REQ'D (1ST 1/2")		BMP VOL. REQ'D (1ST 1/2")	
0.5(36.3)(30.5)(0.2313)=	128 CF	0.5(36.3)(52.1)(0.1670)=	158 CF

PROPOSED SWM AREA SUMMARY

SWM AREA-5		
AREA	1.0059 AC	
IMPERV. AREA	0.4288 AC	
'C'	0.55	
Q(2)	3.02 CFS	
Q(10)	4.02 CFS	
BMP VOLUME REQ'D		
4375(0.55)-875= (1531 CF/AC)(1.0059 AC)=1540 CF		
SWM AREA-6		
AREA	0.0554 AC	
IMPERV. AREA	0.0394 AC	
'C'	0.73	
Q(2)	0.22 CFS	
Q(10)	0.29 CFS	
BMP VOLUME REQ'D	N/A (UNCONTROLLED)	
SWM AREA-7 (OFF-SITE)		
AREA	0.33 AC	
IMPERV. AREA	-	
'C'	0.40	
Q(2)	0.72 CFS	
Q(10)	0.96 CFS	

SWM / BMP NARRATIVE

SWM AND BMP WILL BE PROVIDED ON-SITE BY A DRY POND STORMWATER MANAGEMENT FACILITY IN COMBINATION WITH INDIVIDUAL RAIN GARDENS SERVING EACH OF THE PROPOSED LOTS. AS DEMONSTRATED BY THE BMP COMPUTATIONS, THE INDIVIDUAL RAIN GARDENS LOCATED ON EACH PROPOSED LOT IN CONJUNCTION WITH THE PROPOSED POND, WHICH WILL COLLECT THE DISCHARGE FROM THE CUL-DE-SAC, WILL PROVIDE 42.7% PHOSPHOROUS REMOVAL. AS SHOWN IN THE PROPOSED BMP AREA SUMMARY TABLE THE LARGEST REQUIRED BMP RAIN GARDEN VOLUME WAS 158 C.F. FOR BMP AREA #4. THEREFORE, PER THE RAIN GARDEN SIZING COMPUTATIONS, A 5'X15'X4' RAIN GARDEN WITH 0.5' OF SURFACE STORAGE CAN ACCOMMODATE THE REQUIRED STORAGE FOR EACH LOT. THE EXTENDED DRY POND WILL ACCOMMODATE THE REMAINING UNTREATED AREAS PROVIDING THE REMAINING 1,540 CF OF WATER QUALITY VOLUME REQUIRED.

WHILE THE INDIVIDUAL RAIN GARDENS PROVIDE WATER QUALITY STORAGE FOR A PORTION OF THEIR RESPECTIVE LOTS, THEY DO NOT PROVIDE WATER QUANTITY STORAGE. WHILE BMP AREAS 1 AND 2 SHEET FLOW TO THE SOUTH, THE REMAINING SITE AREA, INCLUDING BMP AREAS 3 AND 4, IS DIRECTED TO THE POND. A 48" RISER STRUCTURE IS PROPOSED WITH A 0.5" ORIFICE AT THE BOTTOM ELEVATION OF 326.00. THE 0.5" ORIFICE PROVIDES A 49 HOUR DRAWDOWN TIME WHICH EXCEEDS THE MINIMUM 48 HOURS REQUIRED. BASED ON THE WATER QUALITY VOLUME AND POND CONFIGURATION, THE WEIR ELEVATION WAS DETERMINED TO BE 329.02. THE ALLOWABLE DISCHARGES WERE DETERMINED BY USING THE EXISTING ON-SITE DISCHARGES OF 3.07 AND 4.10 CFS FOR THE TWO AND TEN YEAR RAINFALL EVENTS, AND SUBTRACTING THE PROPOSED UNCONTROLLED DISCHARGES FOR BMP AREAS 1 AND 2 AND SWM AREA 6 THEN ADDING THE SWM AREA 7, WHICH IS AN OFF-SITE AREA THAT POTENTIALLY DRAIN TO THE POND(SEE COMPUTATIONS THIS SHEET). THE ALLOWABLE RELEASE RATE FROM THE POND WAS DETERMINED TO BE 2.49 AND 3.31 CFS FOR THE 2 YEAR AND 10 YEAR EVENTS, RESPECTIVELY. A 1' WIDE WEIR AT ELEVATION 329.02 WAS USED, WHICH PROVIDES A PEAK OUTFLOW OF 2.04 AND 3.19 CFS FOR THE 2 AND 10-YEAR EVENTS RESPECTIVELY. EACH IS LESS THAN THE ALLOWABLE RELEASE RATES OF 2.49 CFS AND 3.31 CFS.

FINALLY, THE SDF AND FBH HYDROGRAPHS WERE ROUTED TO CHECK THE TOP OF EMBANKMENT ELEVATION. THE SDF WATER SURFACE ELEVATION WAS DETERMINED TO BE 330.21. BY ADDING TWO FEET OF FREEBOARD (COMBINED SPILLWAY) AND COMPARING IT TO THE TOP OF THE EMBANKMENT ALONG THE PERIMETER OF THE PRIMARILY EXCAVATED POND (332.5.0±), IT WAS DETERMINED THAT ADEQUATE FREEBOARD EXISTS (330.21+2=332.21<332.5). THIS ELEVATION IS ALSO GREATER THAN THE FBH WATER SURFACE ELEVATION OF 330.42. WHILE THE FINAL POND DESIGN WILL BE DETERMINED DURING THE FINAL SUBDIVISION PREPARATION, WITH A COMPUTED 42.7% PHOSPHOROUS REMOVAL (WHICH EXCEEDS THE REQUIRED 40%) AND WITH 2 AND 10 YEAR PEAK OUTFLOW RATES LESS THAN THE PRE-DEVELOPMENT VALUES AND WITH A POND THAT PROVIDES THE NECESSARY SWM STORAGE WITH THE REQUIRED FREEBOARD, IT IS THE OPINION OF THE DESIGN ENGINEER THAT SWM AND BMP CAN BE PROVIDED FOR THE DEVELOPMENT.

OUTLET STRUCTURE FOR 2 AND 10 YEAR HYDROGRAPH ROUTINGS

(Types: 1:Weir; 2:Pipe; 3:Riser)	Structure 1	Structure 2	Structure 3
1: Type	3: Riser	1: Weir	1: Weir
Weir: 2: Elevation (ft)	0.00	229.02	0.00
3: Length (ft)	0.00	1.00	0.00
4: Coefficient	0.00	3.33	0.00
Riser: 5: Elevation (ft)	230.00	0.00	0.00
6: Diameter (in)	48.00	0.00	0.00
7: Orifice Elevation (ft)	226.00	0.00	0.00
8: Orifice Diameter (in)	0.50	0.00	0.00
9: Orifice Elevation (ft)	0.00	0.00	0.00
10: Orifice Diameter (in)	0.00	0.00	0.00
11: Orifice Elevation (ft)	0.00	0.00	0.00
12: Orifice Diameter (in)	0.00	0.00	0.00
Pipe: 13: Invert Elevation (ft)	225.90	0.00	0.00
14: Diameter (in)	15.00	0.00	0.00
15: Orifice Diameter (in)	15.00	0.00	0.00
16: Length (ft)	18.00	0.00	0.00
17: Manning's n	0.013	0.000	0.000
18: Slope (ft/ft)	0.019	0.000	0.000
19: Entrance Loss Coefficient	0.6	0.0	0.0

Surface: 20: Initial Elevation (ft) 226.00

OUTLET STRUCTURE FOR SDF AND FBH HYDROGRAPH ROUTINGS

(Types: 1:Weir; 2:Pipe; 3:Riser)	Structure 1	Structure 2	Structure 3
1: Type	3: Riser	1: Weir	1: Weir
Weir: 2: Elevation (ft)	0.00	0.00	0.00
3: Length (ft)	0.00	0.00	0.00
4: Coefficient	0.00	0.00	0.00
Riser: 5: Elevation (ft)	230.00	0.00	0.00
6: Diameter (in)	48.00	0.00	0.00
7: Orifice Elevation (ft)	0.00	0.00	0.00
8: Orifice Diameter (in)	0.00	0.00	0.00
9: Orifice Elevation (ft)	0.00	0.00	0.00
10: Orifice Diameter (in)	0.00	0.00	0.00
11: Orifice Elevation (ft)	0.00	0.00	0.00
12: Orifice Diameter (in)	0.00	0.00	0.00
Pipe: 13: Invert Elevation (ft)	225.90	0.00	0.00
14: Diameter (in)	15.00	0.00	0.00
15: Orifice Diameter (in)	15.00	0.00	0.00
16: Length (ft)	18.00	0.00	0.00
17: Manning's n	0.013	0.000	0.000
18: Slope (ft/ft)	0.019	0.000	0.000
19: Entrance Loss Coefficient	0.6	0.0	0.0

Surface: 20: Initial Elevation (ft) 230.00

RZ 2004-SP-001
Application No. Staff KC
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 2-3-05
Date of (BOS) (PC) approval 3-7-05
Sheet 4 of 6

Detention pond

Stormwater Quantity Flow to Pond
Tc= 5 min
c = 0.51
A = 1.7147 acres
cxA = 0.874497

December 15, 2004
RZ 2004-SP-0001
Cardinal Estates

Inflow Hydrograph

Time	2 yr		10 yr		100 yr (SDF)		FBH	
	intensity	flow	intensity	flow	intensity	flow	intensity	flow
	in/hr	cfs	in/hr	cfs	in/hr	cfs	in/hr	cfs
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	5.45	4.77	7.27	6.36	9.84	8.61	x 1.5	12.91
10	3.51	3.07	4.68	4.09	6.37	5.57	x 1.5	8.36
15	2.60	2.27	3.46	3.03	4.73	4.14	x 1.5	6.20
20	2.08	1.82	2.77	2.42	3.74	3.27	x 1.5	4.91
25	1.72	1.50	2.29	2.00	3.13	2.74	x 1.5	4.11
30	1.46	1.28	1.94	1.70	2.65	2.32	x 1.5	3.48
35	1.28	1.12	1.68	1.47	2.33	2.04	x 1.5	3.06
40	1.10	0.96	1.47	1.29	2.07	1.81	x 1.5	2.72
45	1.00	0.87	1.31	1.15	1.88	1.64	x 1.5	2.47
50	0.89	0.78	1.18	1.03	1.69	1.48	x 1.5	2.22
55	0.82	0.72	1.08	0.94	1.55	1.36	x 1.5	2.03
60	0.74	0.65	0.99	0.87	1.42	1.24	x 1.5	1.86
65	0.68	0.59	0.91	0.80	1.30	1.14	x 1.5	1.71
70	0.62	0.54	0.83	0.73	1.18	1.03	x 1.5	1.55
75	0.56	0.49	0.74	0.65	1.07	0.94	x 1.5	1.40
80	0.49	0.43	0.66	0.58	0.95	0.83	x 1.5	1.25
85	0.43	0.38	0.58	0.51	0.83	0.73	x 1.5	1.09
90	0.37	0.32	0.50	0.44	0.71	0.62	x 1.5	0.93
95	0.31	0.27	0.41	0.36	0.59	0.52	x 1.5	0.77
100	0.25	0.22	0.33	0.29	0.47	0.41	x 1.5	0.62
105	0.19	0.17	0.25	0.22	0.36	0.31	x 1.5	0.47
110	0.12	0.10	0.17	0.15	0.24	0.21	x 1.5	0.31
115	0.06	0.05	0.08	0.07	0.12	0.10	x 1.5	0.16
120	0.00	0.00	0.00	0.00	0.00	0.00	x 1.5	0.00

DATE: DECEMBER, 2003
SCALE: 1"=30'
FILE NAME: GEN-DEV-PLAN.DWG
PROJECT NO: VAFX-21J09-01

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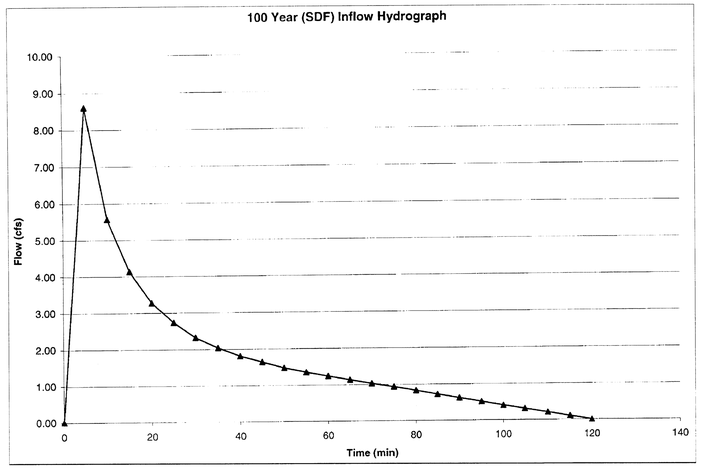
WE Inc.
Williams Enterprises Incorporated
18 Mosby Lane Stafford, Virginia 22554
540-286-3710 and 540-286-0345 Fax
weincorporated@msn.com

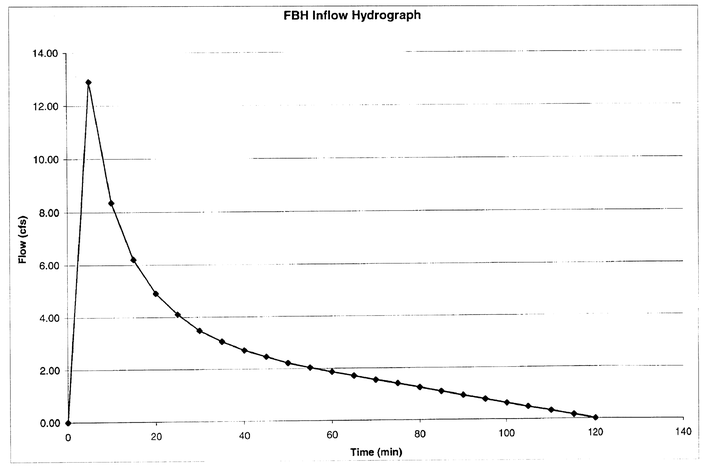
COMMONWEALTH OF VIRGINIA
ROBERT E. WILLIAMS, JR.
No. 025886
12/15/2004
PROFESSIONAL ENGINEER

STORMWATER MANAGEMENT CONCEPT PLAN

CARDINAL ESTATES

SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA





100 YEAR STORM ROUTING

TIME	Qin	Qriser	Qweir	Qorf	Qtot	WSE	VOLUME
0.0	0.00	0.0	0.0	0.0	0.00	230.00	2,532.60
5.0	8.61	6.2 RW	0.0	0.0	6.17	230.28	2,880.87
10.0	5.57	7.6 RW	0.0	0.0	7.55	230.32	2,932.88
15.0	4.14	3.3 RW	0.0	0.0	3.27	230.18	2,757.88
20.0	3.27	3.9 RW	0.0	0.0	**5.92**	**230.21**	**2,787.79 PEAK**
25.0	2.74	2.3 RW	0.0	0.0	2.32	230.15	2,711.08
30.0	2.32	2.6 RW	0.0	0.0	2.62	230.16	2,726.50
35.0	2.04	1.9 RW	0.0	0.0	1.91	230.13	2,688.85
40.0	1.81	2.0 RW	0.0	0.0	2.00	230.13	2,693.79
45.0	1.64	1.6 RW	0.0	0.0	1.58	230.11	2,669.93
50.0	1.48	1.5 RW	0.0	0.0	1.50	230.11	2,665.60
55.0	1.36	1.4 RW	0.0	0.0	1.38	230.10	2,658.32
60.0	1.24	1.3 RW	0.0	0.0	1.26	230.10	2,650.90
65.0	1.14	1.2 RW	0.0	0.0	1.16	230.09	2,644.18
70.0	1.03	1.1 RW	0.0	0.0	1.05	230.09	2,637.31
75.0	0.94	1.0 RW	0.0	0.0	0.96	230.08	2,630.70
80.0	0.83	0.9 RW	0.0	0.0	0.86	230.07	2,623.65
85.0	0.73	0.8 RW	0.0	0.0	0.75	230.07	2,615.91
90.0	0.62	0.6 RW	0.0	0.0	0.65	230.06	2,608.02
95.0	0.52	0.5 RW	0.0	0.0	0.54	230.06	2,599.63
100.0	0.41	0.4 RW	0.0	0.0	0.44	230.05	2,590.76
105.0	0.31	0.3 RW	0.0	0.0	0.34	230.04	2,581.20
110.0	0.21	0.2 RW	0.0	0.0	0.24	230.03	2,571.41
115.0	0.10	0.1 RW	0.0	0.0	0.14	230.02	2,559.20

FBH STORM ROUTING

TIME	Qin	Qriser	Qweir	Qorf	Qtot	WSE	VOLUME
0.0	0.00	0.0	0.0	0.0	0.00	230.00	2,532.60
5.0	12.91	9.5 RW	0.0	0.0	9.52	230.37	3,002.43
10.0	8.36	11.3 RW	0.0	0.0	**11.35**	**230.42**	**3,063.74 PEAK**
15.0	6.20	4.8 RW	0.0	0.0	4.77	230.24	2,824.49
20.0	4.91	6.0 RW	0.0	0.0	5.96	230.27	2,872.38
25.0	4.11	3.7 RW	0.0	0.0	3.67	230.20	2,776.52
30.0	3.48	3.9 RW	0.0	0.0	3.86	230.20	2,784.88
35.0	3.06	2.9 RW	0.0	0.0	2.88	230.17	2,739.51
40.0	2.72	2.9 RW	0.0	0.0	2.91	230.17	2,740.89
45.0	2.47	2.4 RW	0.0	0.0	2.41	230.15	2,715.71
50.0	2.22	2.1 RW	0.0	0.0	2.10	230.14	2,699.22
55.0	2.03	2.2 RW	0.0	0.0	2.24	230.14	2,706.78
60.0	1.86	1.8 RW	0.0	0.0	1.78	230.12	2,681.72
65.0	1.71	1.8 RW	0.0	0.0	1.81	230.12	2,683.22
70.0	1.55	1.5 RW	0.0	0.0	1.54	230.11	2,667.85
75.0	1.40	1.4 RW	0.0	0.0	1.45	230.11	2,662.16
80.0	1.25	1.3 RW	0.0	0.0	1.27	230.10	2,651.26
85.0	1.09	1.1 RW	0.0	0.0	1.13	230.09	2,642.09
90.0	0.93	1.0 RW	0.0	0.0	0.96	230.08	2,630.86
95.0	0.77	0.8 RW	0.0	0.0	0.80	230.07	2,619.90
100.0	0.62	0.7 RW	0.0	0.0	0.65	230.06	2,608.36
105.0	0.47	0.5 RW	0.0	0.0	0.51	230.05	2,596.50
110.0	0.31	0.4 RW	0.0	0.0	0.35	230.04	2,582.55
115.0	0.16	0.2 RW	0.0	0.0	0.20	230.03	2,567.02

Cardinal Estates
BMP COMPUTATIONS

"C" Factor Ratio Calculation

Subarea Designation (1)	"C" (2)		Weighted "C" (3)		"C" Factor Ratio (4)
BMP1	0.61	/	0.54	=	1.1
BMP2	0.48	/	0.54	=	0.9
BMP3	0.49	/	0.54	=	0.9
BMP4	0.52	/	0.54	=	1.0
SWM5	0.55	/	0.54	=	1.0
SWM6	0.73	/	0.54	=	1.3

Part 4: Determine Compliance with Phosphorus Removal Requirement

(A) Select Requirement — (a) 40.0%

Water Supply Overlay District (Occoquan Watershed) = — 50%

Chesapeake Bay Preservation Area (New Development) = — 40% (Fairfax County) 50% (Prince William County)

Chesapeake Bay Preservation Area (Redevelopment) = [1-0.9x("C"pre/"C"post)] x 100 = [1-0.9x("I"pre/"I"post)] x 100 = — N/A (Fairfax County)

(B) If Line 3(a) 42.7% Greater Than Line 4(a) — 40.0% then Phosphorus

REMOVAL REQUIREMENT IS SATISFIED

Cardinal Estates
BMP COMPUTATIONS

Part 3: Compute the Total Phosphorus Removal for the Site

Subarea Designation (1)	BMP Type (2)	Removal Eff.(%) (3)		Area Ratio (4) [See Below]		"C" Factor Ratio (5) [See Below]		Product (6)
BMP1	RAIN GARDEN	50%	X	0.08	X	1.1	=	4.5%
BMP2	RAIN GARDEN	50%	X	0.13	X	0.9	=	5.6%
BMP3	RAIN GARDEN	50%	X	0.12	X	1.0	=	5.8%
BMP4	RAIN GARDEN	50%	X	0.09	X	1.0	=	4.6%
SWM5	POND	40%	X	0.55	X	1.0	=	22.1%
SWM6	UNCONTROLLED	0%	X	0.03	X	1.0	=	0.0%
						(a) Total =		42.7%

Area Ratio Calculation

Subarea Designation (1)	Acres (2)		Site Area Acres (3)		Percent Usable		Area Ratio (5)
BMP1	0.1458	/	1.8172	X	100.0%	=	0.08
BMP2	0.2313	/	1.8172	X	100.0%	=	0.13
BMP3	0.2118	/	1.8172	X	100.0%	=	0.12
BMP4	0.1670	/	1.8172	X	100.0%	=	0.09
SWM5	1.0059	/	1.8172	X	100.0%	=	0.55
SWM6	0.0554	/	1.8172	X	100.0%	=	0.03

Cardinal Estates
BMP COMPUTATIONS

Part 1: List of the Subareas and C Factors Used in the BMP Computations

	Subarea Designation and Description (1)	"C" (2)	Acres (3)	Percent Credit
BMP1	ON-SITE CONTROLLED BY RAIN GARDEN LOT 1	0.61	0.1458	100.0%
BMP2	ON-SITE CONTROLLED BY RAIN GARDEN LOT 2	0.48	0.2313	100.0%
BMP3	ON-SITE CONTROLLED BY RAIN GARDEN LOT 3	0.49	0.2118	100.0%
BMP4	ON-SITE CONTROLLED BY RAIN GARDEN LOT 4	0.52	0.1670	100.0%
SWM5	ON-SITE CONTROLLED BY POND	0.55	1.0059	100.0%
SWM6	ON-SITE UNCONTROLLED	0.73	0.0554	0.0%
			1.8172	

Part 2: Compute the Weighted Average "C" Factor for the Site

(A) Area of the Site
2 + 3 + 5A + 5B + 5C + 5D — (a) 1.82 Acres

(B)	Subarea Designation (1)	"C" (2)		Acres (3)		Product (4)
BMP1	ON-SITE CONTROLLED BY RAIN GARDEN LOT 1	0.61	X	0.1458	=	0.09
BMP2	ON-SITE CONTROLLED BY RAIN GARDEN LOT 2	0.48	X	0.2313	=	0.11
BMP3	ON-SITE CONTROLLED BY RAIN GARDEN LOT 3	0.49	X	0.2118	=	0.10
BMP4	ON-SITE CONTROLLED BY RAIN GARDEN LOT 4	0.52	X	0.1670	=	0.09
SWM5	ON-SITE CONTROLLED BY POND	0.55	X	1.0059	=	0.55
SWM6	ON-SITE UNCONTROLLED	0.73	X	0.0554	=	0.04
			(b) Total	1.8172	=	0.98

(C) Weighted Average "C" Factor — (b) / (a) = (c) = 0.54

WATER QUALITY IMPROVEMENT (WQI) COMPUTATIONS
EXTENDED DETENTION AT POND

DRAINAGE AREA TO POND = 1.7147 ACRES

REQUIRED WQV EXTENDED DETENTION VOLUME: 1,540 CU. FT.

ELEVATION VERSUS STORAGE RELATIONSHIP (TABULAR FORM):

ELEV. (FEET) [A]	DEPTH (FEET) [B]	WATER SURFACE AREA (SQ.FT.) [C]	AVG. AREA (SQ.FT.) [D]	INC. VOLUME (CU.FT.) [B]X[D]	TOTAL VOLUME (CU.FT.)	TOTAL VOLUME (AC-FT.)
326.00		88			-	0.00000
	2.00		320	639		
328.00		551			639	0.01467
	2.00		884	1,767		
330.00		1,216			2,406	0.05523
	2.00		1,874	3,748		
332.00		2,532			6,154	0.14128

BY LINEAR INTERPOLATION,
EXTENDED DETENTION VOLUME OF 1,540 CU. FT.
AVAILABLE AT APPROX. ELEVATION: 329.0198 FEET
USE WQI ELEVATION = 329.02 ACTUAL VOLUME PROVIDED = 1,540 CU. FT. OKAY

DEWATERING ORIFICE SIZE AND DRAWDOWN TIME:

EXTENDED DETENTION VOLUME PROVIDED = 1,540 CU. FT.
FOR A MINIMUM 48 HOUR DRAWDOWN, AVERAGE OUTFLOW = 32.09 CU.FT./HOUR
= 0.53 CU.FT./MIN.
= 0.01 CFS

ASSUMING THE AVERAGE OUTFLOW OCCURS AT THE AVERAGE DEPTH AND AN ORIFICE OF 0.75 INCHES:
AVERAGE DEPTH (h) = h/2 = (329.0 - 326.00) / 2
= 3.02 / 2
= 1.51 FEET
TRUE AVERAGE DEPTH = 1.51 MINUS 0.5 X ORIFICE OR
= 1.51 MINUS 0.5 X 0.0625 FEET
= 1.47875 FEET

FOR VERTICAL ORIFICE, Q = C x A x SQRT(2gh)
SOLVING FOR AREA (A):
A = Q / C x SQRT(2gh)
WHERE,
Q = 0.01 CFS -- AVERAGE OUTFLOW
C = 0.65 ORIFICE COEFFICIENT
g = 32.2 GRAVITATIONAL CONSTANT
h = 1.47875 TRUE AVERAGE DEPTH
A = 0.00141 SQ FT = 0.20234093 SQ IN = MAXIMUM ORIFICE AREA

ALTERNATIVE ORIFICE SELECTIONS:

ORIFICE DIAMETER IN INCHES =	0.500	NO. =	1	A =	0.1963 SQ IN
ORIFICE DIAMETER IN INCHES =	0.375	NO. =	2	A =	0.2209 SQ IN
ORIFICE DIAMETER IN INCHES =	0.250	NO. =	3	A =	0.1473 SQ IN
ORIFICE DIAMETER IN INCHES =	0.250	NO. =	4	A =	0.1963 SQ IN
ORIFICE DIAMETER IN INCHES =	0.250	NO. =	5	A =	0.2454 SQ IN

USE 1 HOLE @ 0.500 " DIAMETER FOR DEWATERING ORIFICE
A = 0.19635 SQ IN OR 0.00136 SQ FT

ACTUAL AVERAGE OUTFLOW :
Q = 0.65 x 0.00136 x SQRT (64.4 x 1.47875)
Q = 0.65 x 0.00136 x SQRT (95.2315)
Q = 0.65 x 0.00136 x 9.75866

Q = 0.01 CFS
ACTUAL DRAWDOWN TIME (T) =
T = STORAGE VOLUME / AVERAGE OUTFLOW
T = 1,540 CU FT / 0.01 CFS
T = 178,073 SECONDS OR 2,968 MINUTES OR 49.46 HOURS
SINCE T (49.46) IS GREATER THAN 48.00 HOURS,
ORIFICE SELECTION IS OKAY

SUMMARY: **WQI EXTENDED DETENTION AT POND**
DEWATERING DEVICE:
USE 1 HOLE @ 0.5 " DIAMETER FOR DEWATERING ORIFICE
OR 1 HOLE @ 4 / 8" DIAMETER ORIFICE
DEWATERING ELEVATION = 329.02 FEET
DRAWDOWN TIME (T) =
49 HOURS & 27 MINS & 53 SECONDS

RZ 2004-SP-001
Application No. Staff KC
APPROVED DEVELOPMENT PLAN
(DP) (GDP) (CDP) (FDP)
SEE PROFFERS DATED 2-3-05
Date of (BOS) (PC) approval 3-7-05
Sheet 5 of 6

DATE: DECEMBER, 2003
SCALE: 1"=30'
FILE NAME: GEN-DEV-PLAN.DWG
PROJECT NO: VAFX-21.09-01

WE Inc.
Williams Enterprises Incorporated
18 Mosby Lane Stafford, Virginia 22554
540-286-3710 and 540-286-0345 Fax
weinc orporated@msn.com

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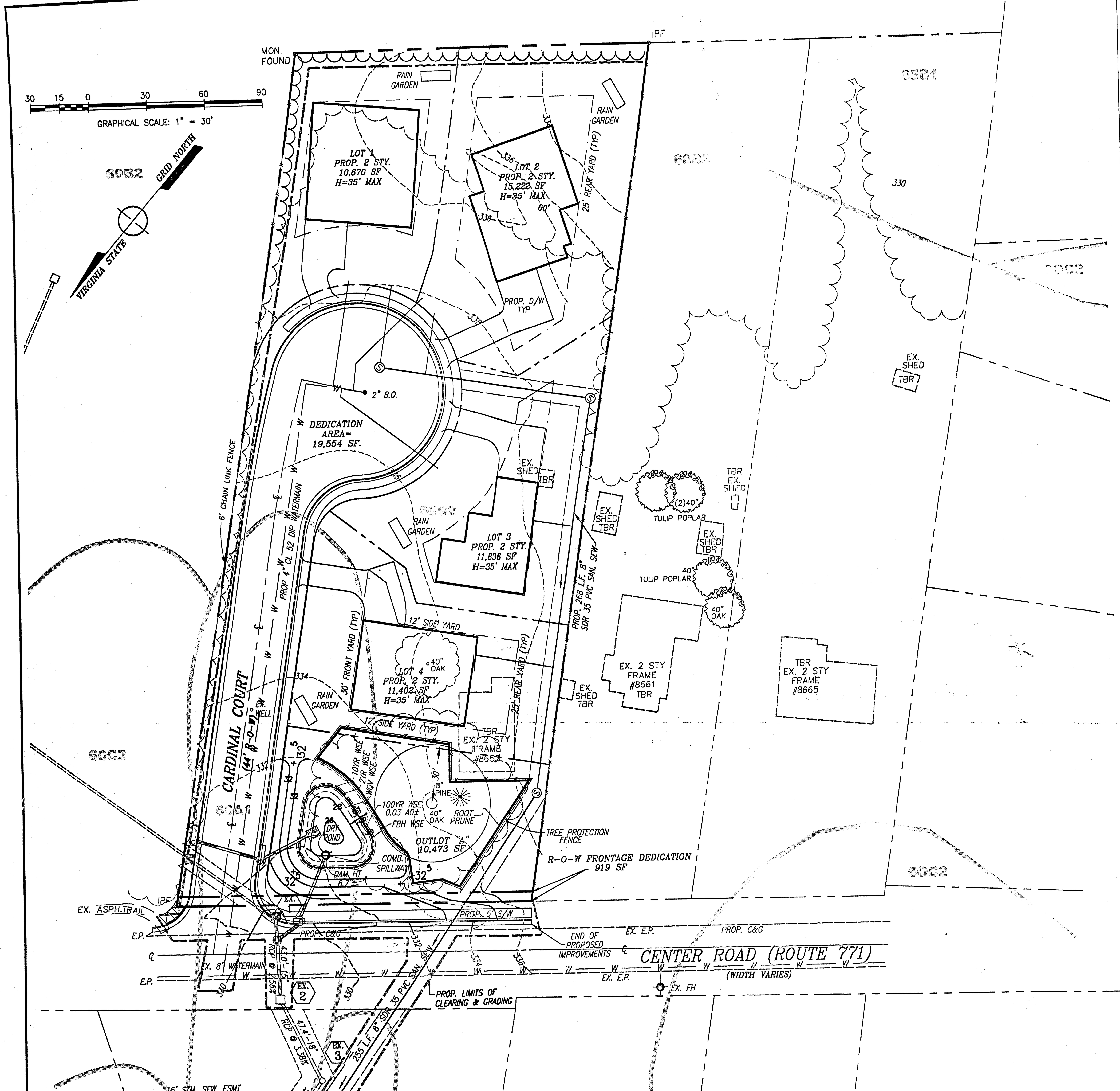
COMMONWEALTH OF VIRGINIA ROBERT E. WILLIAMS, JR. No. 02386 12/15/2004 PROFESSIONAL ENGINEER

STORMWATER MANAGEMENT CONCEPT PLAN

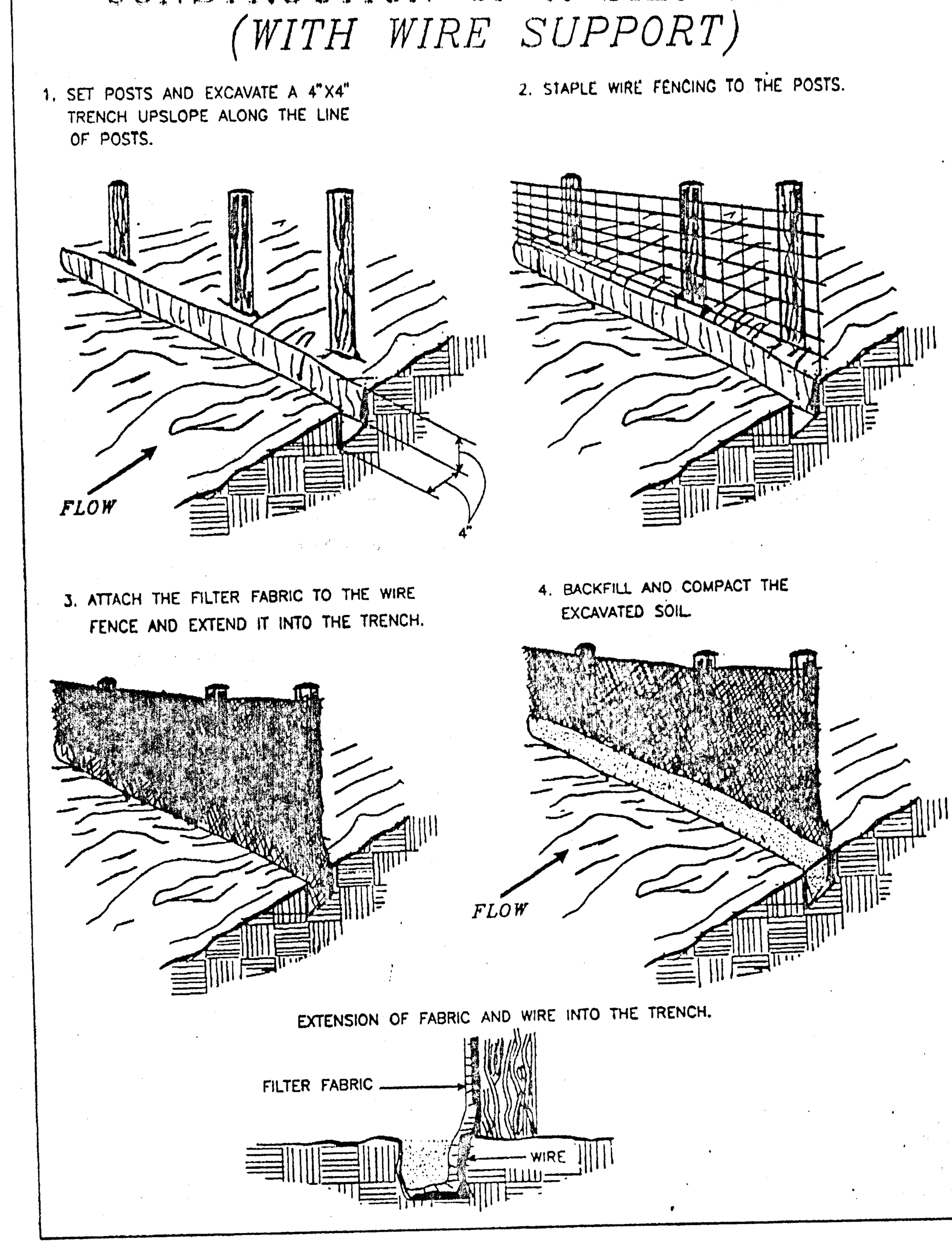
CARDINAL ESTATES

SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA

SHEET 5 OF 5

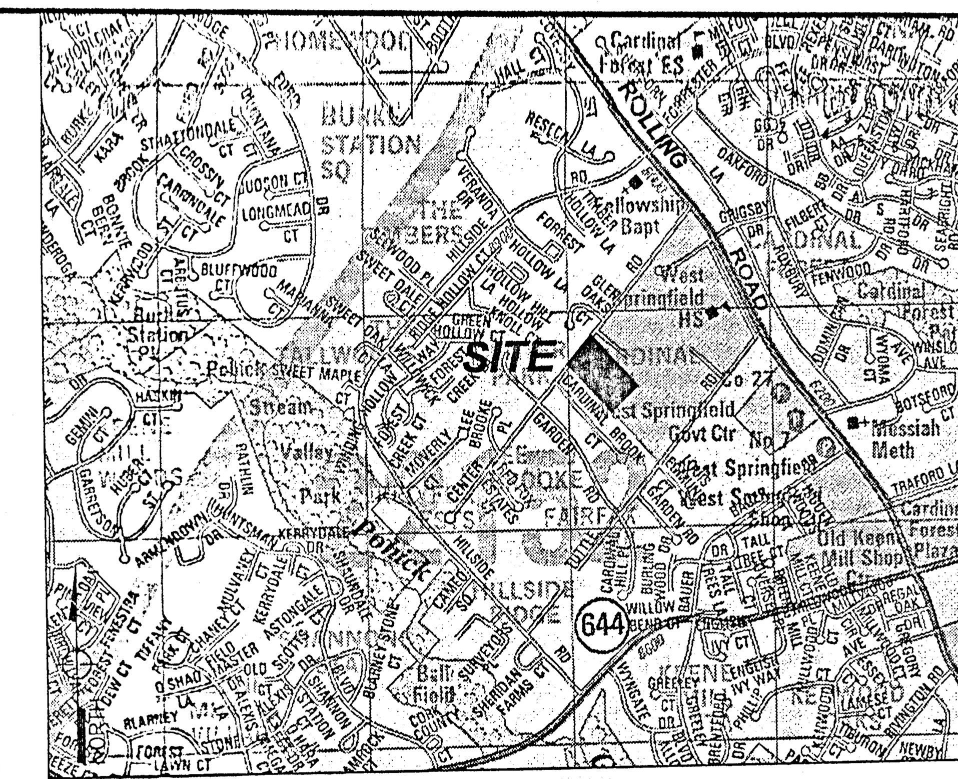


CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)



TREE PROTECTION DETAIL

W. ROSS DICKERSON 12/17/04
CERTIFIED ARBORIST MA430 5A
DATE



VICINITY MAP

SCALE: 1"=1000'

LEGEND

EXISTING		PROPOSED
	PROPERTY LINE	
	EASEMENT LINE	
	EDGE PAVEMENT	
	CENTERLINE	
	FENCE LINE	
G	GAS LINE	G
EX. 8" W/M W	WATER MAIN	PROP. 8" W/M W
	BUILDINGS	
	RETAINING WALL	
EX. CONC. S/W	SIDEWALK	PROP. CONC. S/W
EX. C&G	CURB & GUTTER	CG-6 TRANS CG-6R
(A) 8" SAN.	SANITARY SEWER	(A) 8" SAN
(3) (4)	STORM SEWER	(3) 15" RCP (4)
OE	OVERHEAD ELECTRIC	OE
UE	UNDERGROUND ELECTRIC LINE	UE
OT	OVERHEAD TELEPHONE LINE	OT
UT	UNDERGROUND TELEPHONE LINE	UT
	FLOODPLAIN	
	TREE LINE	
T.B.R. SAVE 30" OAK	TREES	
392	CONTOUR LINE	92
	SPOT ELEVATION	+98.6
	LIMITS OF CLEARING & GRADING	LCG
	BENCHMARK	
	VEHICULAR TRAFFIC CIRCULATION	
	PEDESTRIAN TRAFFIC CIRCULATION	

TREE SAVE NOTES

1. CURRENTLY THEIR EXISTS A 40" SOUTHERN RED OAK (QUERCUS FALCATA) ON NORTHERN END OF THE PROPERTY (APPROXIMATELY 20' FROM THE FRONT RIGHT CORNER OF THE EXISTING HOUSE). THE FOLLOWING NOTES APPLY TO THIS TREE.
2. PRIOR TO ANY CONSTRUCTION ACTIVITY ALL DEADWOOD, BROKEN OR SPLIT BRANCHES, AND RUBBING OR DISEASED BRANCHES ARE TO PRUNED UNDER THE SUPERVISION OF A CERTIFIED ARBORIST. LOWER LIMBS WILL ALSO BE PRUNED AT THIS TIME IF IT IS DESIRABLE TO RAISE THE CLEARANCE FOR PROPOSED CONSTRUCTION.
3. PRIOR TO ANY CONSTRUCTION ACTIVITY, ROOT PRUNING IS TO BE COMPLETED UNDER THE SUPERVISION OF A CERTIFIED ARBORIST AS SHOWN, AS STAKED OUT BY A LAND SURVEYOR.
4. IMMEDIATELY SUBSEQUENT TO ROOT PRUNING, VERTICAL MULCHING (2"-4" DIAMETER, 3' ON CENTER, FOR A DEPTH OF 12- 18") SHALL BE INSTALLED THROUGHOUT THE AREA OF ROOT PRUNING.
5. ORGANIC MULCHING IS TO BE APPLIED TO A DEPTH OF 2-4" OVER THE ENTIRE AREA EMCOMPASSED BY THE ROOT PRUNING AREA.
6. IMMEDIATELY SUBSEQUENT TO THE COMPLETION OF VERTICAL MULCHING A TREE PROTECTION FENCE (AS SHOWN IN DETAIL BELOW) IS TO BE CONSTRUCTED.
7. NO VEHICLES OF ANY TYPE, STOCKPILING OF MATERIALS, OR EXCESSIVE FOOT TRAFFIC IS TO BE ALLOWED WITHIN THE AREA ENCOMPASSED BY THE TREE PROTECTION FENCE DURING CONSTRUCTION.
8. DURING CONSTRUCTION PERIODIC INSPECTIOSN SHALL BE PERFORMED BY A CERTIFIED ARBORIST TO EVALUATE THE TREE AND RECOMMEND ANY REMEDIAL ACTIONS.

SOILS INFORMATION

SOIL ID NUMBERS	SERIES NAME	PROBLEM CLASS	FOUNDATION SUPPORT	DRAINAGE	SEPTIC DRAINFIELDS	SLOPE CLASSES	POTENTIAL EROSION	GEOTECHNICAL REPORT REQD
60A1	APPLING	C	GOOD	GOOD	FAIR-S	0-2%	LOW	NO
60B2	APPLING	C	GOOD	GOOD	FAIR-S	2-7%	MOD	NO
60C2	APPLING	C	GOOD	GOOD	FAIR-S	7-14%	MOD	NO
63D2	LOUISBURG	C	GOOD	GOOD	MARG-R	14-25%	MOD	NO
65B1	COLFAX	B	MARG-B,W	MARG-S,W	POOR-W,S	2-7%	LOW	NO

SOILS WITH IDENTIFICATION NUMBERS 59, 66, 69, 141, 142, AND 152 MAY OVERLIE PARENT BEDROCK FORMATIONS WHICH HAVE BEEN FOUND TO CONTAIN NATURALLY OCCURRING ASBESTOS MINERALS, SPECIAL MINIMUM CONSTRUCTION MEASURES AND PRECAUTIONS ARE REQUIRED IN COMPLIANCE WITH HEALTH DEPARTMENT DIRECTIVES WITHIN THESE SOILS OR WITHIN FILL ORIGINATING FROM THESE SOILS.

DATE: DECEMBER, 2003
SCALE: 1"=30'
FILE NAME: GEN-DEV-PLAN.DWG
PROJECT NO: VAFX-21J09-01-RZ

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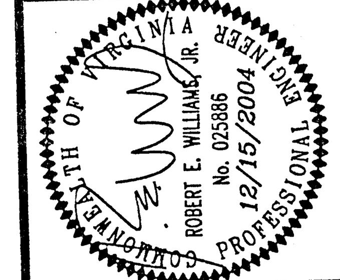
Williams Enterprises Incorporated
18 Mosby Lane Stafford, Virginia 22554
540-286-3710 and 540-286-0345 Fax
weincorporated@msn.com



TREE PROTECTION PLAN

RECEIVED
Department of Planning & Zoning
DEC 1 7 2004
Zoning Evaluation Division

CARDINAL ESTATES

SPRINGFIELD DISTRICT
FAIRFAX COUNTY, VIRGINIA

Application No RZ 2004-SP-001 Staff KC
APPROVED DEVELOPMENT PLAN
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SEE PROFFERS DATED 2-3-05
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