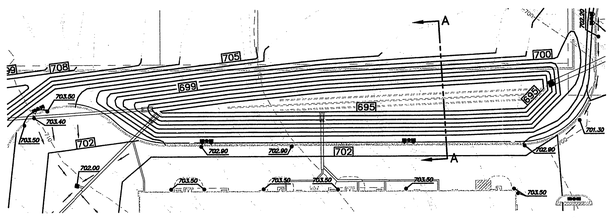
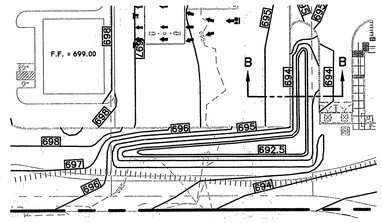


SAM'S CLUB BIORETENTION

NORTH
SCALE: l"=60



SAM'S GAS BIORETENTION

NORTH
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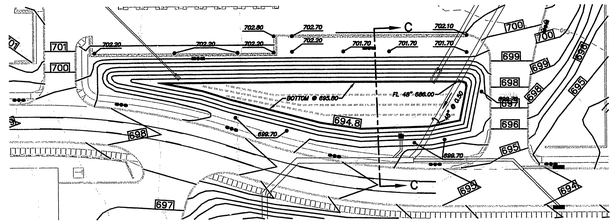

WAL-MART EAST BIORETENTION

NORTH
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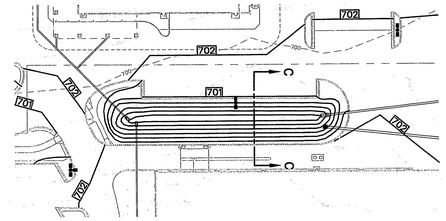
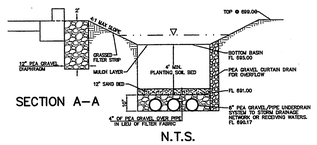


WAL-MART WEST BIORETENTION

NORTH
SCALE: l"=60



SECTION A–A

N.T.S.

Sam's Store Bioretention Volume Calculations

Volume calculation formula: ISWM Section 1.2.3.2

$WQ_v=[1.5xR_vxA] / 12$ $R_v= 0.05+0.009i$ i, is % impervious cover

Drainage area tabulation:

Acres	Drainage Area Designation
1.67	B6d1-A
0.26	B6d2-A
0.25	B6d2-B
0.77	B6d2-C
0.64	B6d3-A
0.81	B6d4-A
0.37	B6d4-B
0.29	B6d4-C
0.97	B6d4-D
1.28	B6d4-E
7.31	Total drainage area acres
-2.11	less acres in grass areas
5.20	impervious acres for treatment

WQ Volume calculations:

5.20 retail-comm. Ac.at 90% impervious V = [1.5x0.86x5.20] / 12 = 0.56 acre-feet
Total storage volume required = 0.56 acre-feet

SAMS CLUB BIORETENTION BASIN VOLUME CALCULATIONS

Planimeter scale: 60.00 ft/in

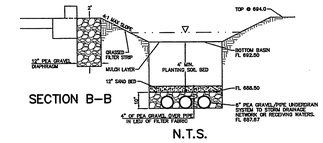
Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
695.00	1.900	.1579	.0000	.000	.000
696.00	2.800	.2326	.5781	.193	.193
697.00	3.750	.3099	.8091	.270	.463
698.00	4.730	.3909	1.5489	.350	.813
699.00	5.800	.4793	1.3031	.434	1.247
700.00	7.150	.5909	1.6025	.534	1.781
701.00	10.380	.8579	2.1407	.720	2.501

SAMS BIORETENTION OUTLET STRUCTURE INPUT DATA

Structure ID	=	7
Structure Type	=	Inlet Box
# of Openings	=	1
Invert Elev.	=	698.50 ft
Orifice Area	=	16.0000 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	16.90 ft
Weir Coeff.	=	3.000

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
695.00	.00	Free Outfall		None contributing
695.25	.00	Free Outfall		None contributing
695.50	.00	Free Outfall		None contributing
695.75	.00	Free Outfall		None contributing
696.00	.00	Free Outfall		None contributing
696.25	.00	Free Outfall		None contributing
696.50	.00	Free Outfall		None contributing
696.75	.00	Free Outfall		None contributing
697.00	.00	Free Outfall		None contributing
697.25	.00	Free Outfall		None contributing
697.50	.00	Free Outfall		None contributing
697.75	.00	Free Outfall		None contributing
698.00	.00	Free Outfall	7	
698.25	6.00	Free Outfall	7	
698.50	16.97	Free Outfall	7	
698.75	31.18	Free Outfall	7	
699.00	47.00	Free Outfall	7	
699.25	65.09	Free Outfall	7	
699.50	84.18	Free Outfall	7	
699.75	101.87	Free Outfall	7	
700.00	108.91	Free Outfall	7	
700.25	115.51	Free Outfall	7	
700.50	121.76	Free Outfall	7	
700.75	127.70	Free Outfall	7	
701.00	133.38	Free Outfall	7	



SECTION B–B

N.T.S.

Sam's Gas Bioretention Volume Calculations

Volume calculation formula: ISWM Section 1.2.3.2

$WQ_v=[1.5xR_vxA] / 12$ $R_v= 0.05+0.009i$ i, is % impervious cover

Drainage area tabulation:

Acres	Drainage Area Designation
1.28	B6f1-E
1.28	total drainage area acres
-0.31	less acres in grass areas
0.97	impervious acres for treatment

WQ Volume calculations:

0.97 retail-comm. Ac.at 90% impervious V = [1.5x0.86x0.97] / 12 = 0.10 acre-feet
Total storage volume required = 0.10 acre-feet

SAMS GAS BIORETENTION BASIN VOLUME CALCULATIONS

Planimeter scale: 60.00 ft/in

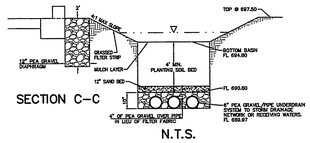
Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
692.50	.680	.0562	.0000	.000	.000
693.00	.960	.0793	.2023	.034	.034
694.00	1.650	.1364	.3197	.107	.140
695.00	3.000	.2479	.5682	.189	.330
695.50	5.000	.4132	.9812	.164	.493

SAMS GAS BIORETENTION OUTLET STRUCTURE INPUT DATA

Structure ID	=	6
Structure Type	=	Inlet Box
# of Openings	=	1
Invert Elev.	=	694.00 ft
Orifice Area	=	9.0000 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	12.00 ft
Weir Coeff.	=	3.000

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
692.50	.00	Free Outfall		None contributing
692.75	.00	Free Outfall		None contributing
693.00	.00	Free Outfall		None contributing
693.25	.00	Free Outfall		None contributing
693.50	.00	Free Outfall		None contributing
693.75	.00	Free Outfall		None contributing
694.00	.00	Free Outfall	6	
694.25	4.50	Free Outfall	6	
694.50	12.73	Free Outfall	6	
694.75	23.38	Free Outfall	6	
695.00	36.00	Free Outfall	6	
695.25	48.43	Free Outfall	6	
695.50	59.05	Free Outfall	6	



SECTION C–C

N.T.S.

W-M Store (East) Bioretention Volume Calculations

Volume calculation formula: ISWM Section 1.2.3.2

$WQ_v=[1.5xR_vxA] / 12$ $R_v= 0.05+0.009i$ i, is % impervious cover

Drainage area tabulation:

Acres	Drainage Area Designation
1.09	B6d7-A
0.08	B6d7-B
1.30	B6d7-C
0.11	B6d7-D
0.73	B6d7-E
0.00	B6d7-Fa
0.25	B6d7-Fb
0.16	B6d7-Fc
1.79	B6d8
0.04	B6d9-A
0.25	B6d9-B
6.32	total drainage area acres
-0.61	less acres in grass areas
5.71	impervious acres for treatment

WQ Volume calculations:

5.71 retail-comm. Ac.at 90% impervious V = [1.5x0.86x5.71] / 12 = 0.61 acre-feet
Total storage volume required = 0.61acre-feet

W-M EAST BIORETENTION BASIN VOLUME CALCULATIONS

Planimeter scale: 60.00 ft/in

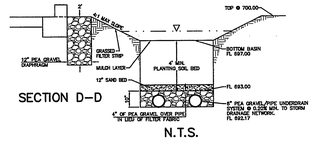
Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
694.80	2.620	.2165	.0000	.000	.000
695.00	2.710	.2273	.4656	.044	.044
696.00	3.460	.2810	.7610	.254	.298
697.00	4.320	.3570	.9548	.318	.616
698.00	5.370	.4438	1.1989	.400	1.016
698.50	5.750	.4752	1.3782	.230	1.246
698.75	6.000	.4959	1.4565	.121	1.367

W-M EAST BIORETENTION OUTLET STRUCTURE INPUT DATA

Structure ID	=	5
Structure Type	=	Inlet Box
# of Openings	=	1
Invert Elev.	=	697.50 ft
Orifice Area	=	16.0000 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	16.00 ft
Weir Coeff.	=	3.000

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
694.80	.00	Free Outfall		None contributing
695.05	.00	Free Outfall		None contributing
695.30	.00	Free Outfall		None contributing
695.55	.00	Free Outfall		None contributing
695.80	.00	Free Outfall		None contributing
696.05	.00	Free Outfall		None contributing
696.30	.00	Free Outfall		None contributing
696.55	.00	Free Outfall		None contributing
696.80	.00	Free Outfall		None contributing
697.05	.00	Free Outfall		None contributing
697.30	.00	Free Outfall		None contributing
697.50	.00	Free Outfall	5	
697.55	.54	Free Outfall	5	
697.80	7.89	Free Outfall	5	
698.05	19.38	Free Outfall	5	
698.30	34.32	Free Outfall	5	
698.55	51.64	Free Outfall	5	
698.75	67.08	Free Outfall	5	



SECTION D–D

N.T.S.

W-M Store (West) Bioretention Volume Calculations

Volume calculation formula: ISWM Section 1.2.3.2

$WQ_v=[1.5xR_vxA] / 12$ $R_v= 0.05+0.009i$ i, is % impervious cover

Drainage area tabulation:

Acres	Drainage Area Designation
0.03	B6d5-A
0.03	B6d5-B1
0.03	B6d5-B2
0.02	B6d5-B3
0.03	B6d5-B4
0.03	B6d5-B5
1.05	B6d5-C
0.65	B6d5-D
1.87	total drainage area acres
-0.27	less acres in grass areas
1.60	impervious acres for treatment

WQ Volume calculations:

1.60 retail-comm. Ac.at 90% impervious V = [1.5x0.86x1.60] / 12 = 0.17 acre-feet
Total storage volume required = 0.17 acre-feet

W-M WEST BIORETENTION BASIN VOLUME CALCULATIONS

Elevation (ft)	Planimeter (sq.in)	Area (acres)	A1+A2+sqr(A1*A2) (acres)	Volume (ac-ft)	Volume Sum (ac-ft)
697.00	------	.0248	.0000	.000	.000
698.00	------	.0622	.1263	.042	.042
699.00	------	.1033	.2457	.082	.124
700.00	------	.1475	.3742	.125	.249
701.00	------	.1700	.4759	.159	.407

W-M WEST BIORETENTION OUTLET STRUCTURE INPUT DATA

Structure ID	=	8
Structure Type	=	Inlet Box
# of Openings	=	1
Invert Elev.	=	701.00 ft
Orifice Area	=	9.0000 sq.ft
Orifice Coeff.	=	.600
Weir Length	=	12.00 ft
Weir Coeff.	=	3.000

***** COMPOSITE OUTFLOW SUMMARY ****

WS Elev, Total Q		Converge		Notes
Elev. ft	Q cfs	TW Elev ft	Error +/-ft	Contributing Structures
698.00	.00	Free Outfall		None contributing
698.25	.00	Free Outfall		None contributing
698.50	.00	Free Outfall		None contributing
698.75	.00	Free Outfall		None contributing
699.00	.00	Free Outfall		None contributing
699.25	.00	Free Outfall		None contributing
699.50	.00	Free Outfall		None contributing
699.75	.00	Free Outfall		None contributing
700.00	.00	Free Outfall		None contributing
700.25	.00	Free Outfall		None contributing
700.50	.00	Free Outfall		None contributing
700.75	.00	Free Outfall		None contributing
701.00	.00	Free Outfall	8	
701.25	4.50	Free Outfall	8	
701.50	12.73	Free Outfall	8	
701.75	23.38	Free Outfall	8	
702.00	36.00	Free Outfall	8	

No.	DATE	REVISION DESCRIPTION

Bioretention Basins Plans & Volume Calculations

Rayzor Ranch North
West University Dr. (U.S. Highway 380)
Denton, Texas

STATE OF TEXAS
MICHAEL J. DELLIES
65938
LICENSED PROFESSIONAL ENGINEER

DATE: 7-22-08

JOB No. 2006029
DRAWN BY: BLG
DESIGNED BY: OCS
CHECKED BY: MJD
DATE: July 22, 2008
SCALE: N.T.S.
SHEET: EX. J