"AS BUILT" June 17, 2008
Storm Water Hydraulic Calculations

for

Kingsmill Crossing

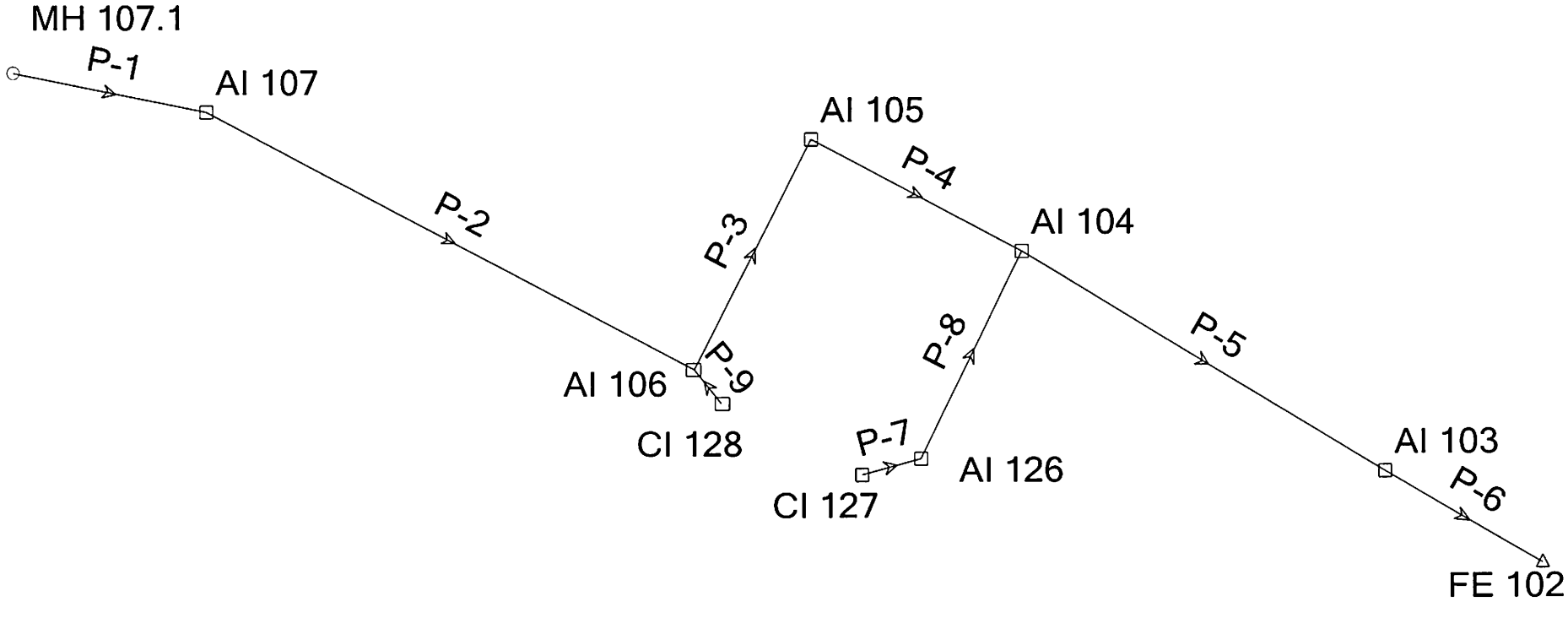
FE 102 through MH 107.1 and
FE 129 through CI 139

Prepared By:

ZAVRADINOS ENGINEERING, INC.
2094 S. OLD HWY. 94
ST. CHARLES, MO 63303
(636) 946-5555

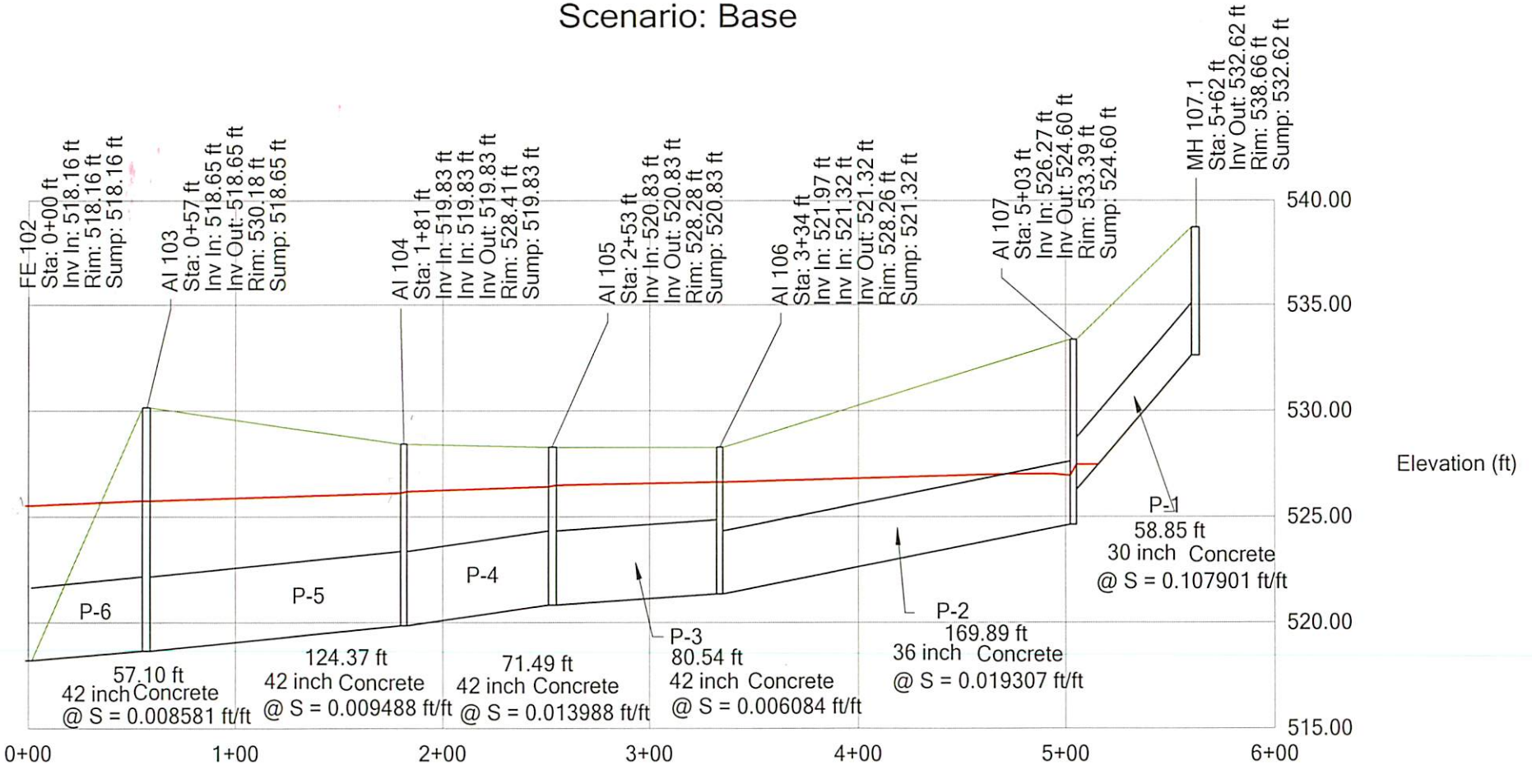
ZPS Project # 96119
June 30, 2008

Scenario: Base



Profile: FE 102 TO MH 107.1

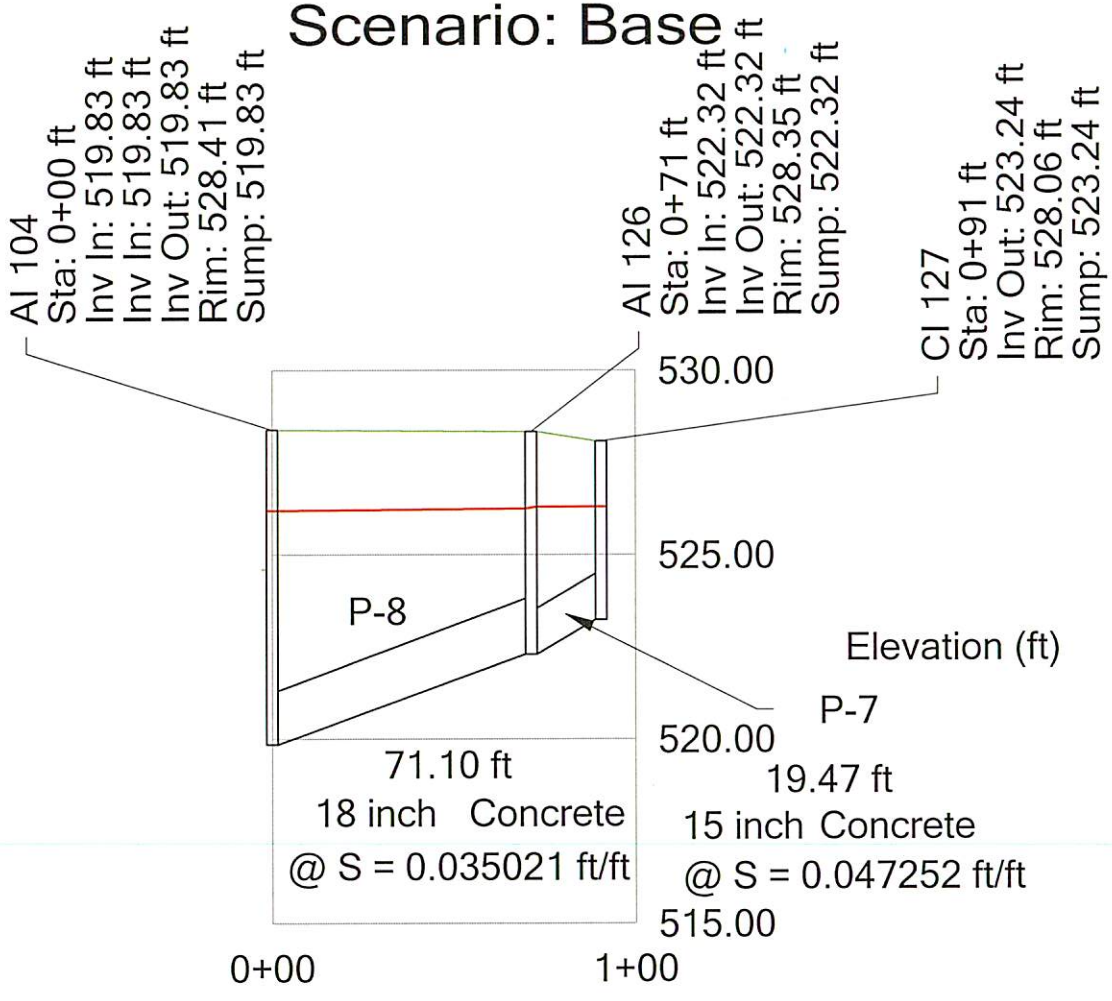
Scenario: Base



Zavradinos & Associates, Inc.
37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

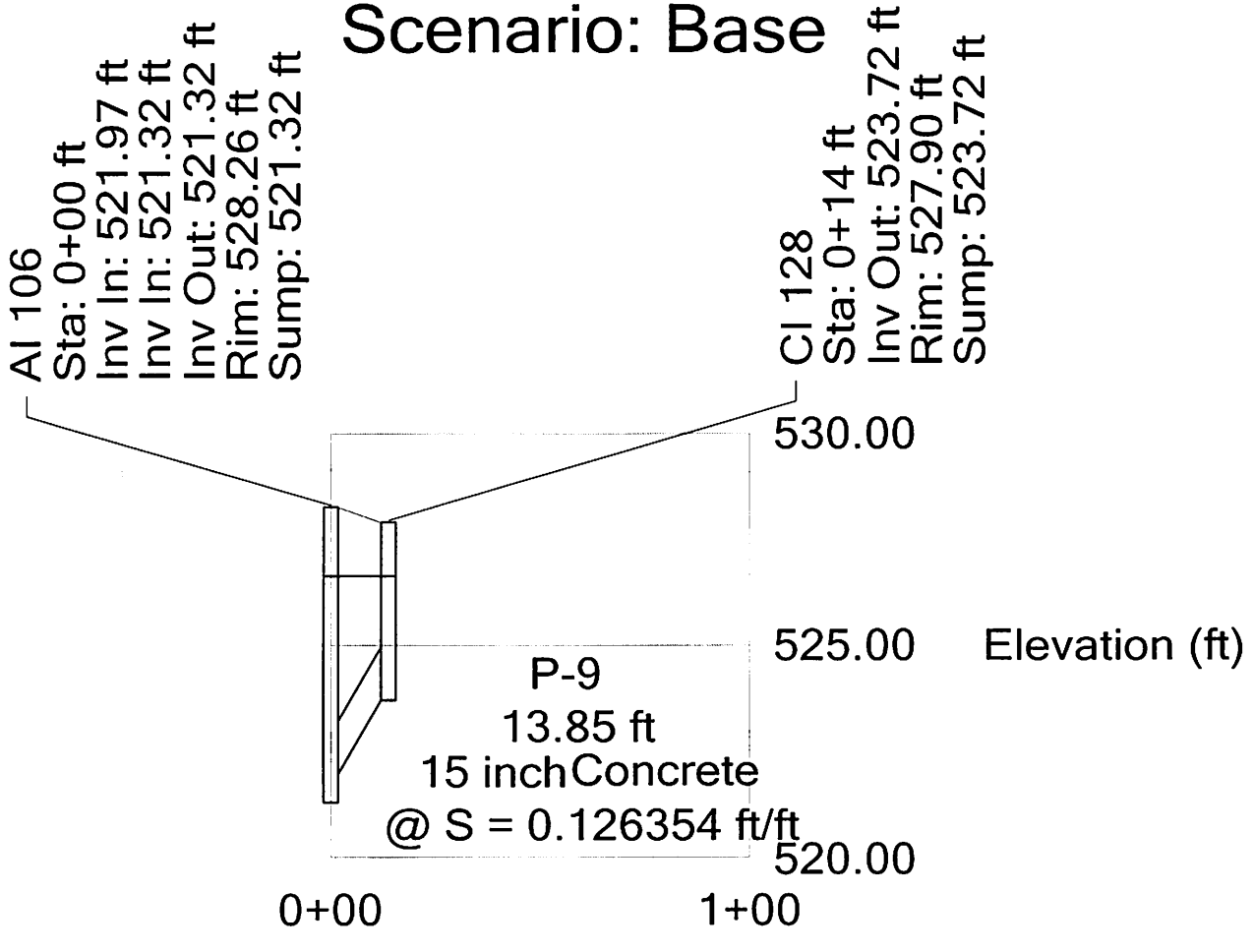
Profile: AI 104 TO CI 127

Scenario: Base



Profile: AI 106 TO CI 128

Scenario: Base



Calculation Results Summary

==========
Scenario: Base

>>>> Info: Subsurface Network Rooted by: FE 102
>>>> Info: Subsurface Analysis iterations: 2
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
AI 103	Generic Inlet	Generic Default 100%	1.63	0.00	100.0	0.00	0.00
AI 104	Generic Inlet	Generic Default 100%	1.59	0.00	100.0	0.00	0.00
AI 105	Generic Inlet	Generic Default 100%	4.50	0.00	100.0	0.00	0.00
AI 106	Generic Inlet	Generic Default 100%	11.33	0.00	100.0	0.00	0.00
AI 107	Generic Inlet	Generic Default 100%	16.61	0.00	100.0	0.00	0.00
AI 126	Generic Inlet	Generic Default 100%	1.86	0.00	100.0	0.00	0.00
CI 127	Generic Inlet	Generic Default 100%	0.58	0.00	100.0	0.00	0.00
CI 128	Generic Inlet	Generic Default 100%	0.58	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: FE 102

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-6	1	42 inch	Circular	57.10	56.82	5.91	525.74	525.56
P-5	1	42 inch	Circular	124.37	55.19	5.74	526.15	525.77
P-8	1	18 inch	Circular	71.10	2.44	1.38	526.26	526.22
P-4	1	42 inch	Circular	71.49	51.16	5.32	526.40	526.22
P-7	1	15 inch	Circular	19.47	0.58	0.47	526.29	526.28
P-3	1	42 inch	Circular	80.54	46.65	4.85	526.65	526.48
P-2	1	36 inch	Circular	169.89	34.74	12.17	526.95	526.65
P-9	1	15 inch	Circular	13.85	0.58	0.47	526.65	526.65
P-1	1	30 inch	Circular	58.85	0.00	0.00	532.62	527.48

Calculation Results Summary

Label	Total System Flow (cfs)	TOP Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	FREE BOARD
FE 102	56.82	518.16	525.56	525.56	
AI 103	56.82	530.18	525.77	525.74	4.41
AI 104	55.19	528.41	526.22	526.15	2.19
AI 126	2.44	528.35	526.28	526.26	2.07
AI 105	51.16	528.28	526.48	526.40	1.80 ←
CI 127	0.58	528.06	526.29	526.29	1.77 ←
AI 106	46.65	528.26	526.65	526.65	1.61 ←
AI 107	34.74	533.39	527.48	526.95	5.91
CI 128	0.58	527.90	526.66	526.65	1.24 ←
MH 107.1	0.00	538.66	532.62	532.62	6.04

Completed: 06/30/2008 07:49:11 AM

Scenario: Base

Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Length (ft)	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	Upstream Inlet Rational Flow (cfs)	Section Size	Full Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Description
P-1	MH 107.1	AI 107	58.85	N/A	N/A	N/A	0.00	N/A	30 inch	134.73	0.00	532.62	526.27	0.107901	
P-2	AI 107	AI 106	169.89	4.28	1.00	4.28	4.28	16.61	36 inch	92.67	12.17	524.60	521.32	0.019307	
P-3	AI 106	AI 105	80.54	2.92	1.00	2.92	7.35	11.33	42 inch	78.47	4.85	521.32	520.83	0.006084	
P-4	AI 105	AI 104	71.49	1.16	1.00	1.16	8.51	4.50	42 inch	118.99	5.32	520.83	519.83	0.013988	
P-5	AI 104	AI 103	124.37	0.41	1.00	0.41	9.55	1.59	42 inch	97.99	5.74	519.83	518.65	0.009488	
P-6	AI 103	FE 102	57.10	0.42	1.00	0.42	9.97	1.63	42 inch	93.20	5.91	518.65	518.16	0.008581	
P-7	CI 127	AI 126	19.47	0.15	1.00	0.15	0.15	0.58	15 inch	14.04	0.47	523.24	522.32	0.047252	
P-8	AI 126	AI 104	71.10	0.48	1.00	0.48	0.63	1.86	18 inch	19.66	1.38	522.32	519.83	0.035021	
P-9	CI 128	AI 106	13.85	0.15	1.00	0.15	0.15	0.58	15 inch	22.96	0.47	523.72	521.97	0.126354	

Scenario: Base

DOT Report

Label	-Node- Upstream Downstream	Upstream Inlet Area (acres)	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-1	MH 107.1	N/A	N/A	0.00	538.66	532.62	0.00	Circular	58.85	0.00	
	AI 107				533.39	527.48	134.73	30 inch			
P-2	AI 107	4.28	4.28	4.28	533.39	526.95	34.74	Circular	169.89	12.17	
	AI 106				528.26	526.65	92.67	36 inch			
P-3	AI 106	2.92	2.92	7.35	528.26	526.65	46.65	Circular	80.54	4.85	
	AI 105				528.28	526.48	78.47	42 inch			
P-4	AI 105	1.16	1.16	8.51	528.28	526.40	51.16	Circular	71.49	5.32	
	AI 104				528.41	526.22	118.99	42 inch			
P-5	AI 104	0.41	0.41	9.55	528.41	526.15	55.19	Circular	124.37	5.74	
	AI 103				530.18	525.77	97.99	42 inch			
P-6	AI 103	0.42	0.42	9.97	530.18	525.74	56.82	Circular	57.10	5.91	
	FE 102				518.16	525.56	93.20	42 inch			
P-7	CI 127	0.15	0.15	0.15	528.06	526.29	0.58	Circular	19.47	0.47	
	AI 126				528.35	526.28	14.04	15 inch			
P-8	AI 126	0.48	0.48	0.63	528.35	526.26	2.44	Circular	71.10	1.38	
	AI 104				528.41	526.22	19.66	18 inch			
P-9	CI 128	0.15	0.15	0.15	527.90	526.65	0.58	Circular	13.85	0.47	
	AI 106				528.26	526.65	22.96	15 inch			

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
FE 102					9.97				22.06	3.85	38.69					56.82	518.16	518.16	525.56
AI 103	0.42	1.00	0.42	0.00	9.97	20.00	0.00	21.90	21.90	3.85	38.69	0.00	0.00	0.00	18.13	56.82	530.18	530.18	525.77
AI 104	0.41	1.00	0.41	0.00	9.55	20.00	0.00	21.54	21.54	3.85	37.06	0.00	0.00	0.00	18.13	55.19	528.41	528.41	526.22
AI 105	1.16	1.00	1.16	0.00	8.51	20.00	0.00	20.76	20.76	3.85	33.03	0.00	0.00	0.00	18.13	51.16	528.28	528.28	526.48
AI 106	2.92	1.00	2.92	0.00	7.35	20.00	0.00	20.49	20.49	3.85	28.52	0.00	0.00	0.00	18.13	46.65	528.26	528.26	526.65
AI 107	4.28	1.00	4.28	0.00	4.28	20.00	0.00	0.00	20.00	3.85	16.61	18.13	0.00	0.00	0.00	34.74	533.39	533.39	527.48
MH 107.1					0.00				0.00	0.00	0.00					0.00	538.66	538.66	532.62
AI 126	0.48	1.00	0.48	0.00	0.63	20.00	0.00	20.68	20.68	3.85	2.44	0.00	0.00	0.00	0.00	2.44	528.35	528.35	526.28
CI 127	0.15	1.00	0.15	0.00	0.15	20.00	0.00	0.00	20.00	3.85	0.58	0.00	0.00	0.00	0.00	0.58	528.06	528.06	526.29
CI 128	0.15	1.00	0.15	0.00	0.15	20.00	0.00	0.00	20.00	3.85	0.58	0.00	0.00	0.00	0.00	0.58	527.90	527.90	526.66

Scenario: Base

Node Report

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
525.56			
525.74	3.85	1.63	
526.15	3.85	1.59	
526.40	3.85	4.50	
526.65	3.85	11.33	
526.95	3.85	16.61	
532.62			
526.26	3.85	1.86	
526.29	3.85	0.58	
526.65	3.85	0.58	

Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	System Intensity (in/hr)	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)
P-1	MH 107.1	AI 107	N/A	N/A	N/A	0.00	0.00	0.00	58.85	0.107901	30 inch	0.013	134.73	532.62	526.27	538.66	533.39
P-2	AI 107	AI 106	4.28	1.00	4.28	4.28	3.85	34.74	169.89	0.019307	36 inch	0.013	92.67	524.60	521.32	533.39	528.26
P-3	AI 106	AI 105	2.92	1.00	2.92	7.35	3.85	46.65	80.54	0.006084	42 inch	0.013	78.47	521.32	520.83	528.26	528.28
P-4	AI 105	AI 104	1.16	1.00	1.16	8.51	3.85	51.16	71.49	0.013988	42 inch	0.013	118.99	520.83	519.83	528.28	528.41
P-5	AI 104	AI 103	0.41	1.00	0.41	9.55	3.85	55.19	124.37	0.009488	42 inch	0.013	97.99	519.83	518.65	528.41	530.18
P-6	AI 103	FE 102	0.42	1.00	0.42	9.97	3.85	56.82	57.10	0.008581	42 inch	0.013	93.20	518.65	518.16	530.18	518.16
P-7	CI 127	AI 126	0.15	1.00	0.15	0.15	3.85	0.58	19.47	0.047252	15 inch	0.013	14.04	523.24	522.32	528.06	528.35
P-8	AI 126	AI 104	0.48	1.00	0.48	0.63	3.85	2.44	71.10	0.035021	18 inch	0.013	19.66	522.32	519.83	528.35	528.41
P-9	CI 128	AI 106	0.15	1.00	0.15	0.15	3.85	0.58	13.85	0.126354	15 inch	0.013	22.96	523.72	521.97	527.90	528.26

Scenario: Base

Pipe Report

Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Flow / Full Capacity (%)	Description
3.54	4.62	532.62	527.48	0.0	
5.79	3.94	526.95	526.65	37.5	
3.44	3.95	526.65	526.48	59.5	
3.95	5.08	526.40	526.22	43.0	
5.08	8.03	526.15	525.77	56.3	
8.03	-3.50	525.74	525.56	61.0	
3.57	4.78	526.29	526.28	4.1	
4.53	7.08	526.26	526.22	12.4	
2.93	5.04	526.65	526.65	2.5	

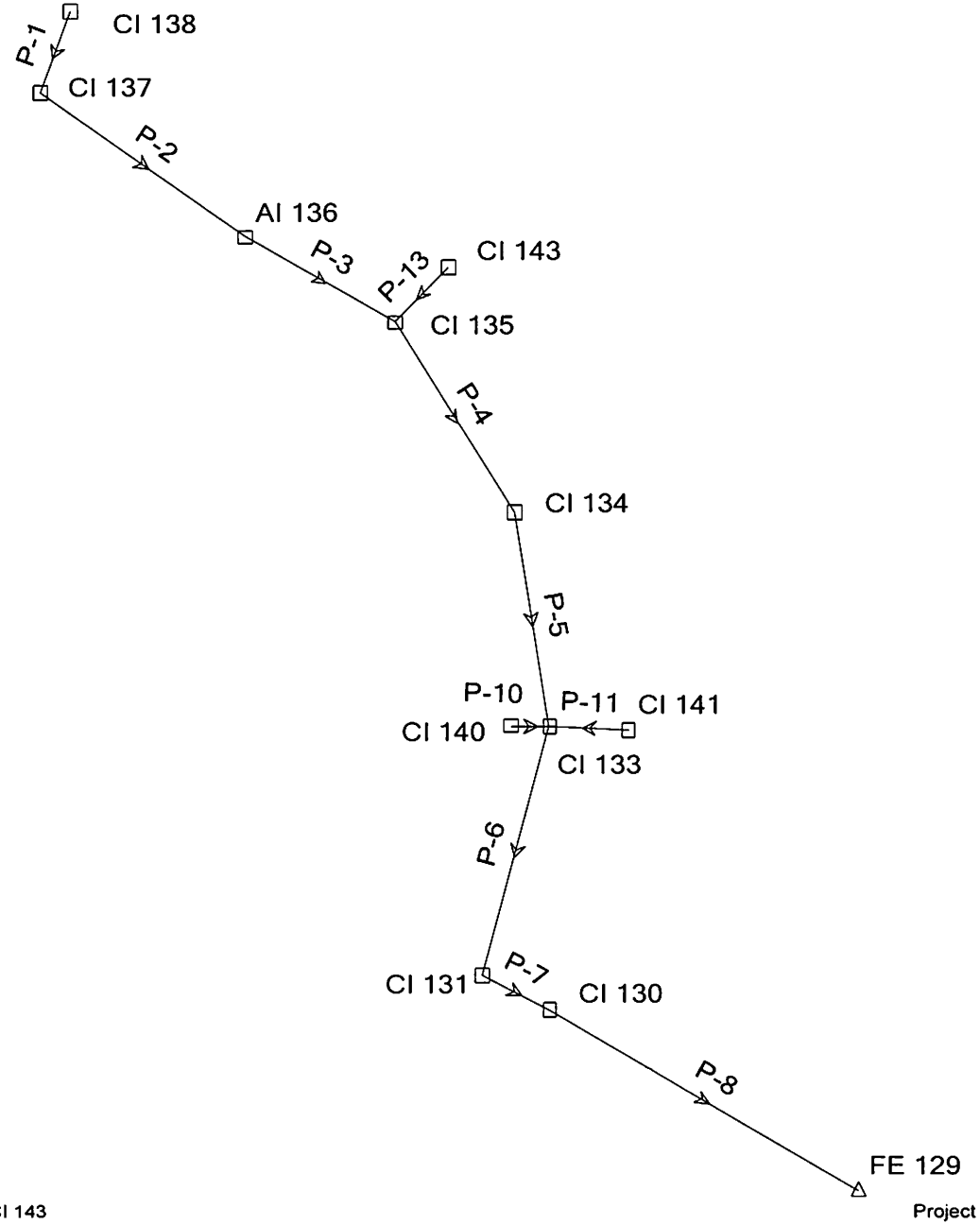
 Zavradinos & Associates, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Scenario: Base

Outlet Report

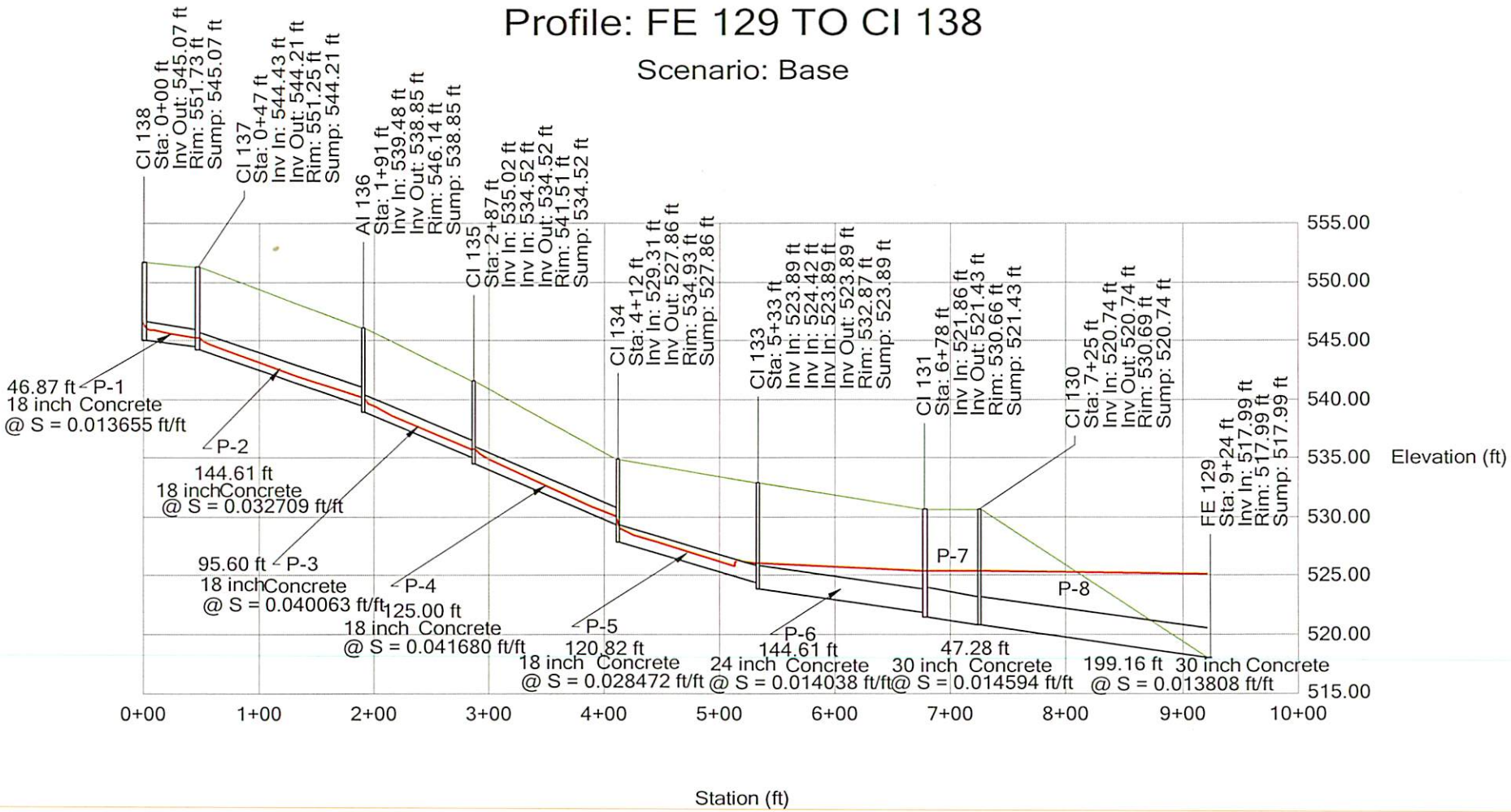
Label	Station (ft)	Ground Elevation (ft)	Set Rim Equal to Ground Elevation?	Rim Elevation (ft)	Sump Elevation (ft)	Tailwater Condition	Tailwater Elevation (ft)	Description
FE 102	0+00	518.16	true	518.16	518.16	User-Specifie	525.56	

Scenario: Base



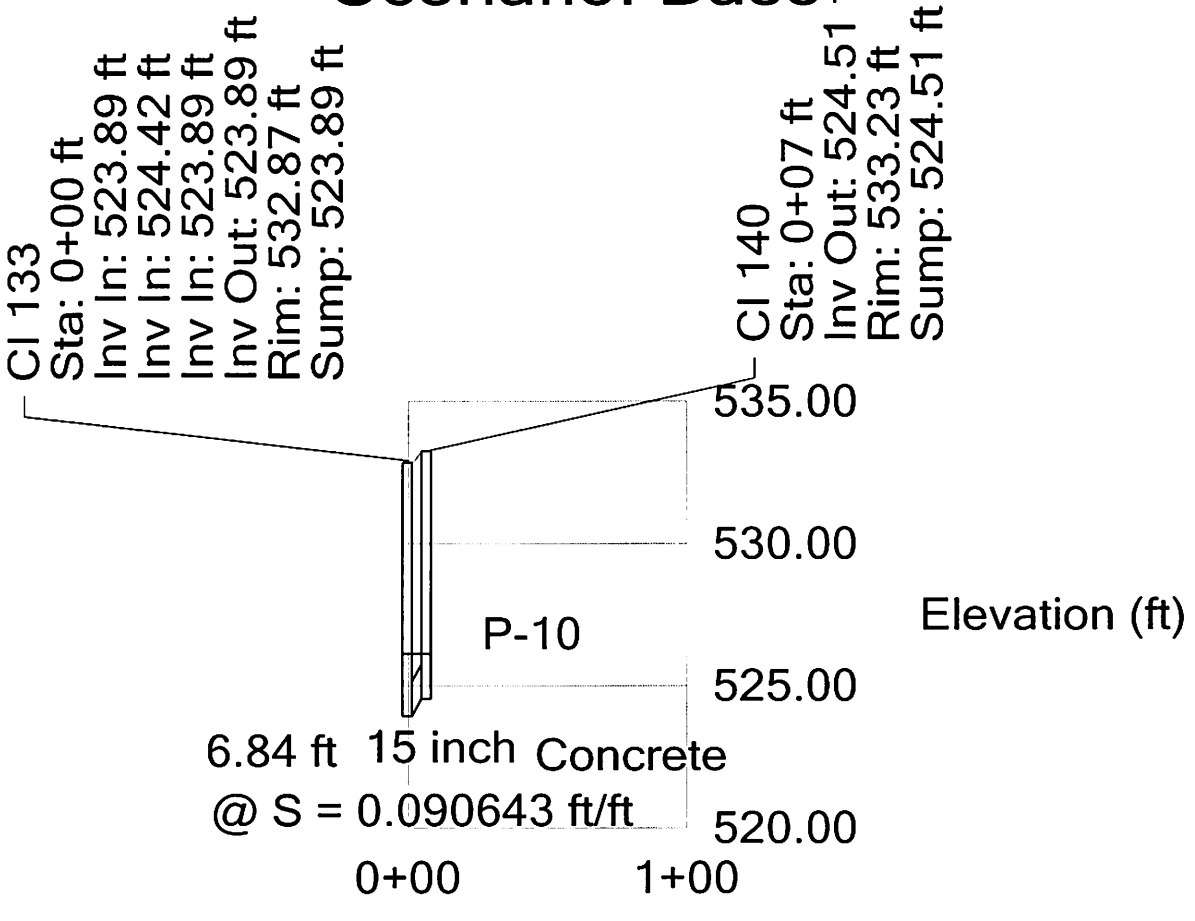
Zavradinos & Associates, Inc.

37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666


Profile: FE 129 TO CI 138
Scenario: Base
CI 138
Sta: 0+00 ft
Inv Out: 545.07 ft
Rim: 551.73 ft
Sump: 545.07 ft
CI 137
Sta: 0+47 ft
Inv In: 544.43 ft
Inv Out: 544.21 ft
Rim: 551.25 ft
Sump: 544.21 ft
AI 136
Sta: 1+91 ft
Inv In: 539.48 ft
Inv Out: 538.85 ft
Rim: 546.14 ft
Sump: 538.85 ft
CI 135
Sta: 2+87 ft
Inv In: 535.02 ft
Inv In: 534.52 ft
Inv Out: 534.52 ft
Rim: 541.51 ft
Sump: 534.52 ft
CI 134
Sta: 4+12 ft
Inv In: 529.31 ft
Inv Out: 527.86 ft
Rim: 534.93 ft
Sump: 527.86 ft
CI 133
Sta: 5+33 ft
Inv In: 523.89 ft
Inv In: 524.42 ft
Inv In: 523.89 ft
Inv Out: 523.89 ft
Rim: 532.87 ft
Sump: 523.89 ft
CI 131
Sta: 6+78 ft
Inv In: 521.86 ft
Inv Out: 521.43 ft
Rim: 530.66 ft
Sump: 521.43 ft
CI 130
Sta: 7+25 ft
Inv In: 520.74 ft
Inv Out: 520.74 ft
Rim: 530.69 ft
Sump: 520.74 ft
FE 129
Sta: 9+24 ft
Inv In: 517.99 ft
Rim: 517.99 ft
Sump: 517.99 ft
46.87 ft P-1
18 inch Concrete
@ S = 0.013655 ft/ft
P-2
144.61 ft
18 inchConcrete
@ S = 0.032709 ft/ft
95.60 ft P-3
18 inchConcrete
@ S = 0.040063 ft/ft
P-4
125.00 ft
18 inch Concrete
@ S = 0.041680 ft/ft
P-5
120.82 ft
18 inch Concrete
@ S = 0.028472 ft/ft
P-6
144.61 ft
24 inch Concrete
@ S = 0.014038 ft/ft
P-7
47.28 ft
30 inch Concrete
@ S = 0.014594 ft/ft
P-8
199.16 ft 30 inch Concrete
@ S = 0.013808 ft/ft
555.00
550.00
545.00
540.00
535.00
530.00
525.00
520.00
515.00
Elevation (ft)
0+00
1+00
2+00
3+00
4+00
5+00
6+00
7+00
8+00
9+00
10+00
Station (ft)

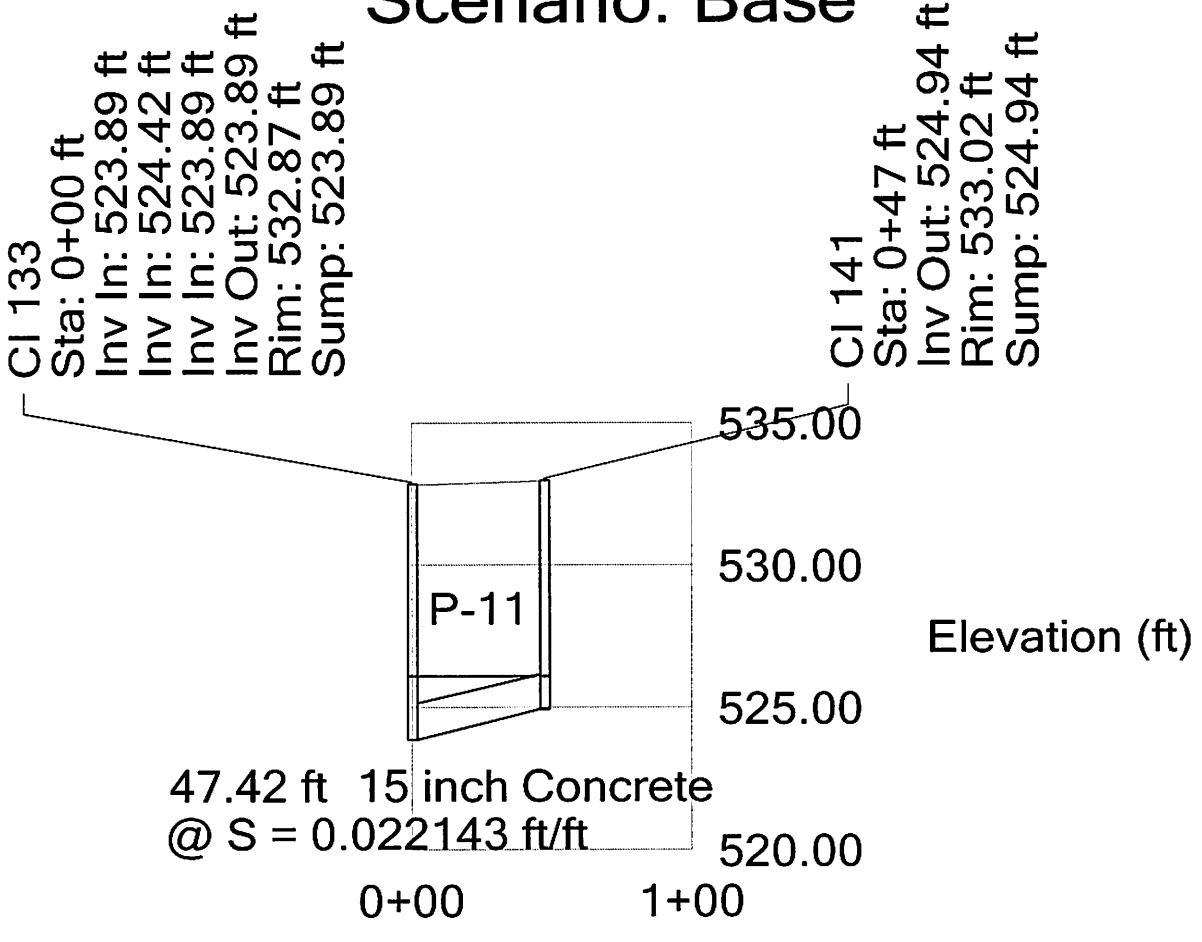
Profile: CI 133 TO CI 140

Scenario: Base



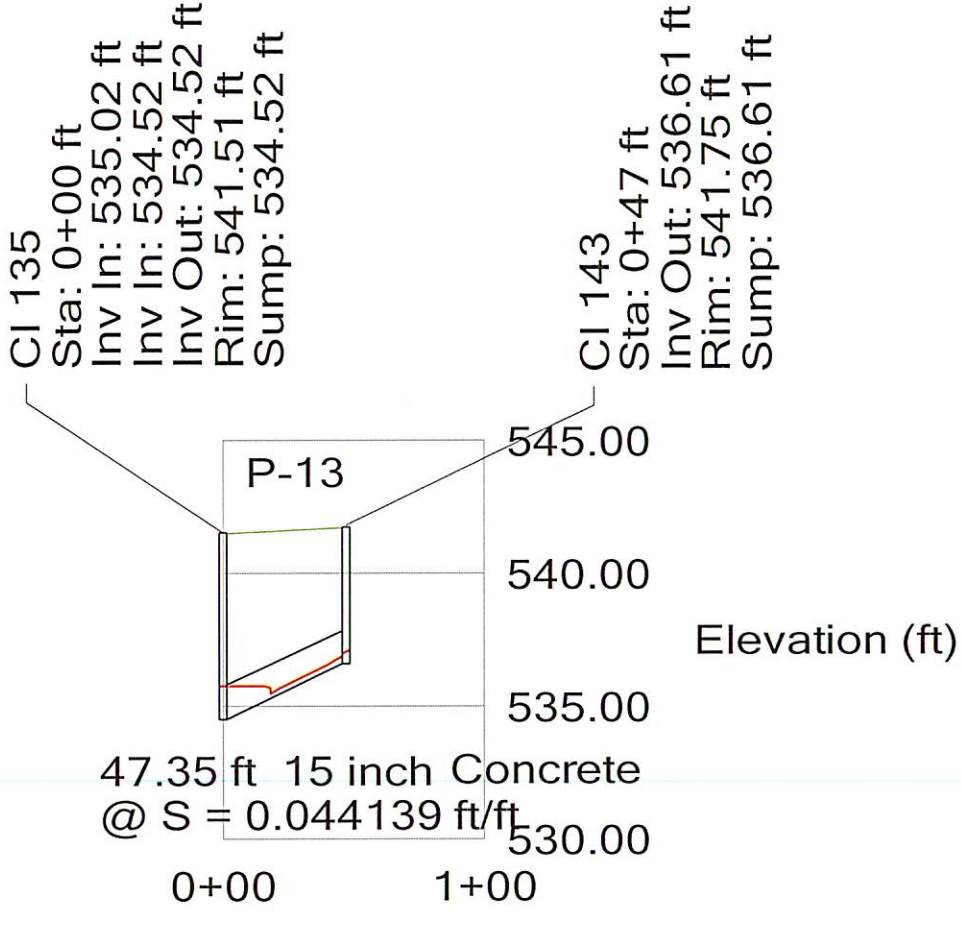
Profile: CI 133 TO CI 141

Scenario: Base



 Zavradinos & Associates, Inc. 37 Brookside Road Waterbury, CT 06708 USA +1-203-755-1666

Profile: CI 135 TO CI 143
Scenario: Base



Calculation Results Summary

==========
Scenario: Base

>>>> Info: CI 130 No bypass target specified. Bypass is assumed
to travel to FE 129.
>>>> Info: CI 131 No bypass target specified. Bypass is assumed
to travel to FE 129.

>>>> Info: Subsurface Network Rooted by: FE 129
>>>> Info: Subsurface Analysis iterations: 2
>>>> Info: Convergence was achieved.

CALCULATION SUMMARY FOR SURFACE NETWORKS

Label	Inlet Type	Inlet	Total Intercepted Flow (cfs)	Total Bypassed Flow (cfs)	Capture Efficiency (%)	Gutter Spread (ft)	Gutter Depth (ft)
CI 130	Generic Inlet	Generic Default 100%	0.43	0.00	100.0	4.49	0.09
CI 141	Generic Inlet	Generic Default 100%	0.78	0.00	100.0	5.62	0.11
CI 143	Generic Inlet	Generic Default 100%	1.01	0.00	100.0	4.78	0.10
CI 138	Generic Inlet	Generic Default 100%	7.49	0.00	100.0	11.48	0.23
CI 131	Generic Inlet	Generic Default 100%	0.43	0.00	100.0	4.49	0.09
CI 133	Generic Inlet	Generic Default 100%	0.43	0.00	100.0	4.49	0.09
CI 134	Generic Inlet	Generic Default 100%	0.35	0.00	100.0	3.95	0.08
CI 135	Generic Inlet	Generic Default 100%	0.93	0.00	100.0	4.64	0.09
CI 137	Generic Inlet	Generic Default 100%	1.01	0.00	100.0	5.42	0.11
AI 136	Grate Inlet	Grate DI-1	1.24	0.00	100.0	8.90	0.18
CI 140	Generic Inlet	Generic Default 100%	1.63	0.00	100.0	0.00	0.00

CALCULATION SUMMARY FOR SUBSURFACE NETWORK WITH ROOT: FE 129

Label	Number of Sections	Section Size	Section Shape	Length (ft)	Total System Flow (cfs)	Average Velocity (ft/s)	Hydraulic Grade Upstream (ft)	Hydraulic Grade Downstream (ft)
P-8	1	30 inch	Circular	199.16	15.72	3.20	525.43	525.14
P-7	1	30 inch	Circular	47.28	15.29	3.11	525.51	525.44
P-6	1	24 inch	Circular	144.61	14.86	4.73	526.13	525.51
P-10	1	15 inch	Circular	6.84	1.63	1.33	526.14	526.13
P-11	1	15 inch	Circular	47.42	0.78	4.70	526.14	526.13

Calculation Results Summary

P-5	1	18 inch	Circular	120.82	12.03	10.78	529.18	526.13
P-4	1	18 inch	Circular	125.00	11.68	12.39	535.82	530.10
P-3	1	18 inch	Circular	95.60	9.74	11.67	540.05	535.74
P-13	1	15 inch	Circular	47.35	1.01	6.48	537.00	535.82
P-2	1	18 inch	Circular	144.61	8.50	10.45	545.34	540.18
P-1	1	18 inch	Circular	46.87	7.49	7.29	546.13	545.29

TOP

Label	Total System Flow (cfs)	Ground Elevation (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	FREE BOARD
FE 129	15.72	517.99	525.14	525.14	
CI 130	15.72	530.69	525.44	525.43	5.26
CI 131	15.29	530.66	525.51	525.51	5.15
CI 133	14.86	532.87	526.13	526.13	6.74
CI 140	1.63	533.23	526.16	526.14	7.09
CI 141	0.78	533.02	526.14	526.14	6.88
CI 134	12.03	534.93	530.01	529.18	5.75
CI 135	11.68	541.51	535.82	535.82	5.69
AI 136	9.74	546.14	540.05	540.05	6.09
CI 143	1.01	541.75	537.15	537.00	4.75
CI 137	8.50	551.25	545.34	545.34	5.91
CI 138	7.49	551.73	546.62	546.13	5.60

Completed: 06/30/2008 01:56:39 PM

Scenario: Base

Combined Pipe\Node Report

Label	Upstream Node	Downstream Node	Length (ft)	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	Upstream Inlet Rational Flow (cfs)	Section Size	Full Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Constructed Slope (ft/ft)	Description
P-1	CI 138	CI 137	46.87	1.93	1.00	1.93	1.93	7.49	18 inch	12.27	7.29	545.07	544.43	0.013655	
P-2	CI 137	AI 136	144.61	0.26	1.00	0.26	2.19	1.01	18 inch	19.00	10.45	544.21	539.48	0.032709	
P-3	AI 136	CI 135	95.60	0.32	1.00	0.32	2.51	1.24	18 inch	21.02	11.67	538.85	535.02	0.040063	
P-4	CI 135	CI 134	125.00	0.24	1.00	0.24	3.01	0.93	18 inch	21.44	12.39	534.52	529.31	0.041680	
P-5	CI 134	CI 133	120.82	0.09	1.00	0.09	3.10	0.35	18 inch	17.72	10.78	527.86	524.42	0.028472	
P-6	CI 133	CI 131	144.61	0.11	1.00	0.11	3.83	0.43	24 inch	26.80	4.73	523.89	521.86	0.014038	
P-7	CI 131	CI 130	47.28	0.11	1.00	0.11	3.94	0.43	30 inch	49.55	3.11	521.43	520.74	0.014594	
P-8	CI 130	FE 129	199.16	0.11	1.00	0.11	4.05	0.43	30 inch	48.20	3.20	520.74	517.99	0.013808	
P-10	CI 140	CI 133	6.84	0.42	1.00	0.42	0.42	1.63	15 inch	19.45	1.33	524.51	523.89	0.090643	
P-11	CI 141	CI 133	47.42	0.20	1.00	0.20	0.20	0.78	15 inch	9.61	4.70	524.94	523.89	0.022143	
P-13	CI 143	CI 135	47.35	0.26	1.00	0.26	0.26	1.01	15 inch	13.57	6.48	536.61	534.52	0.044139	

Scenario: Base

DOT Report

Label	-Node- Upstream Downstream	Upstream Inlet Area (acres)	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	-Ground- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	Section Discharge Capacity (cfs)	-Section- Shape Size	Length (ft)	Average Velocity (ft/s)	Description
P-1	CI 138	1.93	1.93	1.93	551.73	546.13	7.49	Circular	46.87	7.29	
	CI 137				551.25	545.29	12.27	18 inch			
P-2	CI 137	0.26	0.26	2.19	551.25	545.34	8.50	Circular	144.61	10.45	
	AI 136				546.14	540.18	19.00	18 inch			
P-3	AI 136	0.32	0.32	2.51	546.14	540.05	9.74	Circular	95.60	11.67	
	CI 135				541.51	535.74	21.02	18 inch			
P-4	CI 135	0.24	0.24	3.01	541.51	535.82	11.68	Circular	125.00	12.39	
	CI 134				534.93	530.10	21.44	18 inch			
P-5	CI 134	0.09	0.09	3.10	534.93	529.18	12.03	Circular	120.82	10.78	
	CI 133				532.87	526.13	17.72	18 inch			
P-6	CI 133	0.11	0.11	3.83	532.87	526.13	14.86	Circular	144.61	4.73	
	CI 131				530.66	525.51	26.80	24 inch			
P-7	CI 131	0.11	0.11	3.94	530.66	525.51	15.29	Circular	47.28	3.11	
	CI 130				530.69	525.44	49.55	30 inch			
P-8	CI 130	0.11	0.11	4.05	530.69	525.43	15.72	Circular	199.16	3.20	
	FE 129				517.99	525.14	48.20	30 inch			
P-10	CI 140	0.42	0.42	0.42	533.23	526.14	1.63	Circular	6.84	1.33	
	CI 133				532.87	526.13	19.45	15 inch			
P-11	CI 141	0.20	0.20	0.20	533.02	526.14	0.78	Circular	47.42	4.70	
	CI 133				532.87	526.13	9.61	15 inch			
P-13	CI 143	0.26	0.26	0.26	541.75	537.00	1.01	Circular	47.35	6.48	
	CI 135				541.51	535.82	13.57	15 inch			

Scenario: Base

Pipe Report

Label	Upstream Node	Downstream Node	Upstream Inlet Area (acres)	Upstream Inlet Rational Coefficient	Upstream Inlet CA (acres)	Upstream Calculated System CA (acres)	System Intensity (in/hr)	Total System Flow (cfs)	Length (ft)	Constructed Slope (ft/ft)	Section Size	Mannings n	Full Capacity (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Upstream Ground Elevation (ft)	Downstream Ground Elevation (ft)
P-1	CI 138	CI 137	1.93	1.00	1.93	1.93	3.85	7.49	46.87	0.013655	18 inch	0.013	12.27	545.07	544.43	551.73	551.25
P-2	CI 137	AI 136	0.26	1.00	0.26	2.19	3.85	8.50	144.61	0.032709	18 inch	0.013	19.00	544.21	539.48	551.25	546.14
P-3	AI 136	CI 135	0.32	1.00	0.32	2.51	3.85	9.74	95.60	0.040063	18 inch	0.013	21.02	538.85	535.02	546.14	541.51
P-4	CI 135	CI 134	0.24	1.00	0.24	3.01	3.85	11.68	125.00	0.041680	18 inch	0.013	21.44	534.52	529.31	541.51	534.93
P-5	CI 134	CI 133	0.09	1.00	0.09	3.10	3.85	12.03	120.82	0.028472	18 inch	0.013	17.72	527.86	524.42	534.93	532.87
P-6	CI 133	CI 131	0.11	1.00	0.11	3.83	3.85	14.86	144.61	0.014038	24 inch	0.013	26.80	523.89	521.86	532.87	530.66
P-7	CI 131	CI 130	0.11	1.00	0.11	3.94	3.85	15.29	47.28	0.014594	30 inch	0.013	49.55	521.43	520.74	530.66	530.69
P-8	CI 130	FE 129	0.11	1.00	0.11	4.05	3.85	15.72	199.16	0.013808	30 inch	0.013	48.20	520.74	517.99	530.69	517.99
P-10	CI 140	CI 133	0.42	1.00	0.42	0.42	3.85	1.63	6.84	0.090643	15 inch	0.013	19.45	524.51	523.89	533.23	532.87
P-11	CI 141	CI 133	0.20	1.00	0.20	0.20	3.85	0.78	47.42	0.022143	15 inch	0.013	9.61	524.94	523.89	533.02	532.87
P-13	CI 143	CI 135	0.26	1.00	0.26	0.26	3.85	1.01	47.35	0.044139	15 inch	0.013	13.57	536.61	534.52	541.75	541.51

Scenario: Base

Pipe Report

Upstream Cover (ft)	Downstream Cover (ft)	Hydraulic Grade Line In (ft)	Hydraulic Grade Line Out (ft)	Flow / Full Capacity (%)	Description
5.16	5.32	546.13	545.29	61.0	
5.54	5.16	545.34	540.18	44.7	
5.79	4.99	540.05	535.74	46.3	
5.49	4.12	535.82	530.10	54.5	
5.57	6.95	529.18	526.13	67.9	
6.98	6.80	526.13	525.51	55.5	
6.73	7.45	525.51	525.44	30.9	
7.45	-2.50	525.43	525.14	32.6	
7.47	7.73	526.14	526.13	8.4	
6.83	7.73	526.14	526.13	8.1	
3.89	5.74	537.00	535.82	7.4	

Scenario: Base

Node Report

Label	Area (acres)	Inlet C	Inlet CA (acres)	External CA (acres)	System CA (acres)	Time of Concentration (min)	External Time of Concentration (min)	Upstream Time Of Concentration (min)	System Flow Time (min)	System Intensity (in/hr)	System Rational Flow (cfs)	Additional Flow (cfs)	Additional Carryover (cfs)	Known Flow (cfs)	Upstream Additional Flow (cfs)	Total System Flow (cfs)	Ground Elevation (ft)	Rim Elevation (ft)	Hydraulic Grade Line In (ft)
FE 129					4.05				22.63	3.85	15.72					15.72	517.99	517.99	525.14
CI 130	0.11	1.00	0.11	0.00	4.05	20.00	0.00	21.59	21.59	3.85	15.72	0.00	0.00	0.00	0.00	15.72	530.69	530.69	525.44
CI 131	0.11	1.00	0.11	0.00	3.94	20.00	0.00	21.34	21.34	3.85	15.29	0.00	0.00	0.00	0.00	15.29	530.66	530.66	525.51
CI 133	0.11	1.00	0.11	0.00	3.83	20.00	0.00	20.83	20.83	3.85	14.86	0.00	0.00	0.00	0.00	14.86	532.87	532.87	526.13
CI 134	0.09	1.00	0.09	0.00	3.10	20.00	0.00	20.64	20.64	3.85	12.03	0.00	0.00	0.00	0.00	12.03	534.93	534.93	530.01
CI 135	0.24	1.00	0.24	0.00	3.01	20.00	0.00	20.47	20.47	3.85	11.68	0.00	0.00	0.00	0.00	11.68	541.51	541.51	535.82
AI 136	0.32	1.00	0.32	0.00	2.51	20.00	0.00	20.34	20.34	3.85	9.74	0.00	0.00	0.00	0.00	9.74	546.14	546.14	540.05
CI 137	0.26	1.00	0.26	0.00	2.19	20.00	0.00	20.11	20.11	3.85	8.50	0.00	0.00	0.00	0.00	8.50	551.25	551.25	545.34
CI 138	1.93	1.00	1.93	0.00	1.93	20.00	0.00	0.00	20.00	3.85	7.49	0.00	0.00	0.00	0.00	7.49	551.73	551.73	546.62
CI 140	0.42	1.00	0.42	0.00	0.42	20.00	0.00	0.00	20.00	3.85	1.63	0.00	0.00	0.00	0.00	1.63	533.23	533.23	526.16
CI 141	0.20	1.00	0.20	0.00	0.20	20.00	0.00	0.00	20.00	3.85	0.78	0.00	0.00	0.00	0.00	0.78	533.02	533.02	526.14
CI 143	0.26	1.00	0.26	0.00	0.26	20.00	0.00	0.00	20.00	3.85	1.01	0.00	0.00	0.00	0.00	1.01	541.75	541.75	537.15

Scenario: Base

Node Report

Hydraulic Grade Line Out (ft)	Local Intensity (in/hr)	Local Rational Flow (cfs)	Description
525.14			
525.43	3.85	0.43	
525.51	3.85	0.43	
526.13	3.85	0.43	
529.18	3.85	0.35	
535.82	3.85	0.93	
540.05	3.85	1.24	
545.34	3.85	1.01	
546.13	3.85	7.49	
526.14	3.85	1.63	
526.14	3.85	0.78	
537.00	3.85	1.01	

Scenario: Base

Outlet Report

Label	Station (ft)	Ground Elevation (ft)	Set Rim Equal to Ground Elevation?	Rim Elevation (ft)	Sump Elevation (ft)	Tailwater Condition	Tailwater Elevation (ft)	Description
FE 129	0+00	517.99	true	517.99	517.99	User-Specifi	525.14	

File
McDonalds Crusher Rd

CORE STATES ENGINEERING

4191 Pleasant Hill Rd. Ste. 400
Duluth, GA 30096
770-242-9550
Fax 770-242-9560
Acct Fax 678-740-0136

44355 Premier Plaza
Suite 240
Ashburn, VA 20147
703-723-9145
Fax 703-723-9657

379 Campus Drive
Suite 150
Somerset, NJ 08873
732-667-9550
Fax 732-667-9501

86 King Street, Ste.200
St. John, New Brunswick
Canada E2L 1G4
506-633-8448
Fax 506-633-8449

One Harris Street
Newburyport, MA 01950
978-462-5788
Fax: 978-462-5723

50 Crestwood Exe.
Suite 500
St. Louis, MO 63126
314-843-4320
Fax 314-843-4323

6802 Lakeview Center Dr.
Suite 500
Tampa, FL 33619
813-490-1755
Fax 813-490-1759

7251 Pineville-Matthews
Suite 200
Charlotte, NC 28226
704-927-8760
Fax 704-927-8761

751 Park of Commerce
Suite 124
Boca Raton, FL 33487
561-997-6273
Fax 561-997-6963

216 E. Poplar Street
Rogers, AR 72756
479-986-4400
Fax 479-986-4400

430 N. Vineyard Ave.
Suite 335
Ontario
CA 91764
909-467-8907
Fax 909-467-8917

To: City of O'Fallon
100 North Main Street
O'Fallon, MO 63366

Attn: Jeannie Greenlee
Phone: 636-379-5557

LETTER OF TRANSMITTAL

Date: 10/1/2008
Project Name: McDonald's
Project Number: MCD-7199 Task Number: 45
Site Location: Crusher Road
O'Fallon, MO

WE ARE SENDING YOU:

[X] Plans [ ] Reports [ ] Letter [ ] Specifications [ ] Photocopies
[ ] Prints [ ] Other:

VIA: [ ] US Mail [X] Courier [ ] Pickup [ ] Other

FedEx Options: [ ] Priority (Before 10:30am) [ ] Standard (Before 3pm) [ ] 2 Day [ ] Express Saver (3 day)

RECEIVED
OCT 01 2008
BUILDING DEPARTMENT

COPIES	DATE OR NO	DESCRIPTION
2		Revised As-Built Plans
1		Storm Sewer Structure Shop Drawings
1		Comment Response Letter
1		As-Built Hydraulic Calculations

RECEIVED
OCT 2 2008

THESE ARE TRANSMITTED AS INDICATED BELOW

[ ] For your use [ ] As requested [ ] For your input [X] For review & comment
[ ] Other _____

Remarks:

Jeannie,
Please let me know if you need any additional information.

Thank-you.

COPIES TO:

SIGNED: Christine Wilson
Project Manager - St. Louis

engineers • constructors • project managers • program managers

K & P PRECAST
SHOP DRAWING

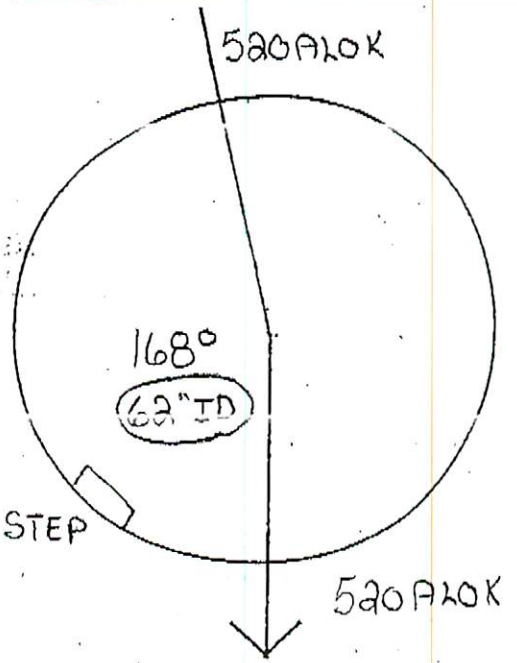
JOB NAME: McDONALD'S

STRUCTURE NUMBER: CI 2

DIA: 42" COATED: _____ OTHER: .20 FALL

TOP: 553.50
FLOW LINE: 544.40
9.16
.109

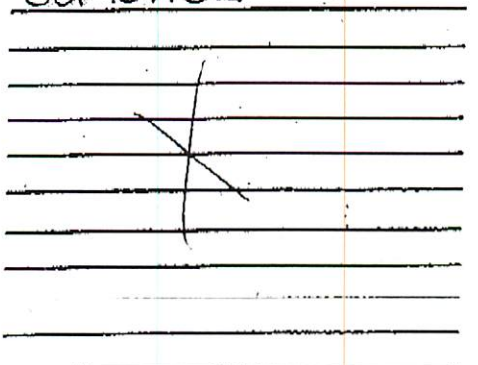
LESS SILL & TOP
OR FRAME & COVER: -19
90



DATE MADE: AI 32 — use Villas at Westmeade on hill by old Tar Tractor

DATE DEL: _____

HEADER COMPONANTS: 32" BASE



K & P PRECAST
SHOP DRAWING

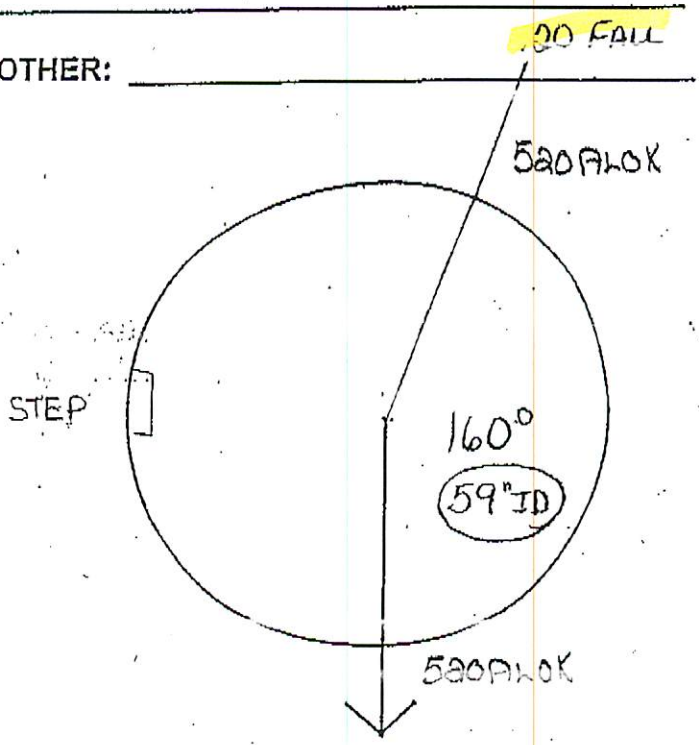
JOB NAME: McDONALD'S

STRUCTURE NUMBER: CI 3

DIA: 42" COATED: _____ OTHER: _____

TOP: 554.11
FLOW LINE: 545.19
8.92
.107

LESS SILL & TOP
OR FRAME & COVER: -19
88



DATE MADE: MAR 1 0 2008

DATE DEL: _____

HEADER
COMPONANTS: 39" BASE

K & P PRECAST
SHOP DRAWING

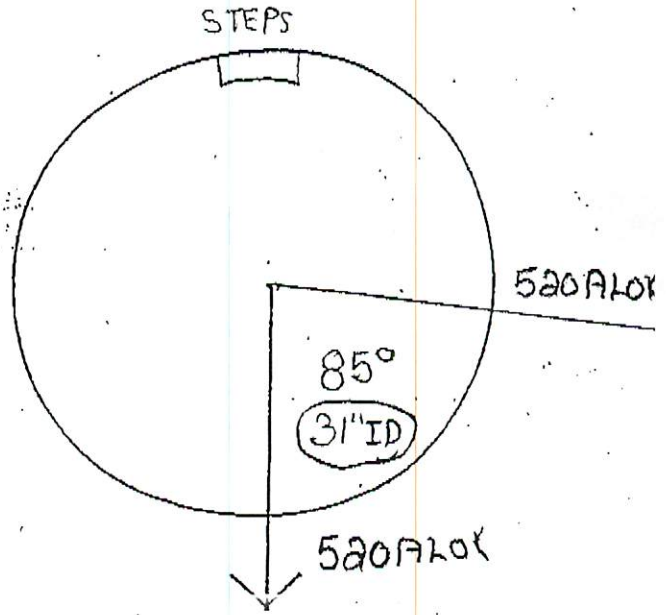
JOB NAME: McDONALD'S

STRUCTURE NUMBER: CI 4

DIA: 42" COATED: _____ OTHER: .20 FALL

TOP: 552.00
FLOW LINE: 546.55
5.45
.65

LESS SILL & TOP
OR FRAME & COVER: -19
46



DATE MADE: MAR 1 0 2008

DATE DEL: _____

HEADER
COMPONANTS: 32" BASE

K & P PRECAST
SHOP DRAWING

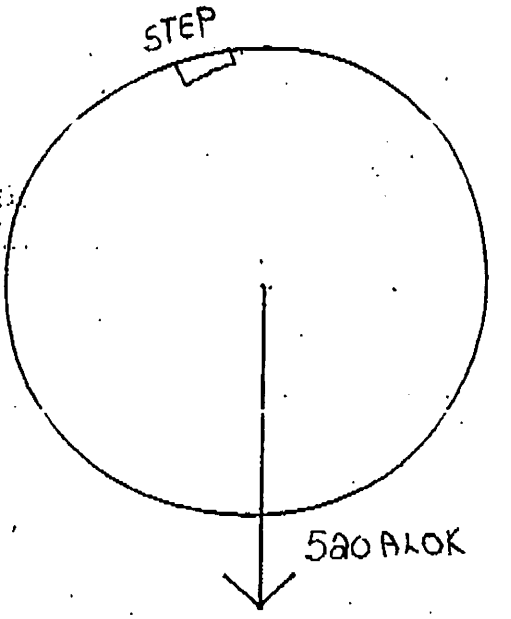
JOB NAME: McDONALD'S

STRUCTURE NUMBER: CI 5

DIA: 42" COATED: _____ OTHER: _____

TOP: 553.00
FLOW LINE: 548.63
4.37
.60

LESS SILL & TOP
OR FRAME & COVER: -19
41



DATE MADE: _____

DATE DEL: _____

HEADER COMPONANTS: 32" BASE

CORE STATES
ENGINEERING

50 Crestwood Executive Center, Suite 500
St. Louis, MO 63126
314.843.4320
fax 314.843.4323

AFFILIATE PEI

October 1, 2008

Jeannie Greenlee
City of O'Fallon
100 North Main Street
O'Fallon, MO 63366

RE: McDonald's – Crusher Road
MCD-7199

Dear Jeannie,

Attached are two-sets of revised As-Built plans for the subject property per your comments dated September 23, 2008, revisions have been made as follows:

1) Benchmark information is shown on Sheet C0-Cover Sheet, General Note 12.
2) See attached for revised hydraulic grade calculations reflecting as-built conditions.
3) See attached storm sewer shop drawings and as-built sewer profile for verification that structures have inverts of at least 0.2 feet difference between inlet and outlet.
4) See attached for revised hydraulic grade calculations reflecting as-built conditions.
5) It is understood that comment may be forthcoming from the City's Construction Inspection Department.

As comments 1-4 have been addressed, we are asking for further review and final approval. Please call if you require any more information. Thank-you.

Sincerely,

Christine Wilson
Project Manager

Cc: Dan Gross – McDonald's Corporation
Jay Haas – Massmann Surveying
Carl Ostmann – Ostmann Construction

Hydraulic Grade Line Computations

Line	Size	Q	Downstream								Len	Upstream								Check		JL coeff	Minor loss
			Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)		Invert elev (ft)	HGL elev (ft)	Depth (ft)	Area (sqft)	Vel (ft/s)	Vel head (ft)	EGL elev (ft)	Sf (%)	Ave Sf (%)	Enrgy loss (ft)		
	(in)	(cfs)									(ft)												
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
1	12	3.77	544.13	545.55	1.00	0.79	4.80	0.36	545.91	1.121	19.320	544.65	545.77	1.00	0.79	4.80	0.36	546.12	1.121	1.121	0.217	0.50	0.18
2	12	3.38	544.67	545.95	1.00	0.79	4.30	0.29	546.23	0.901	109.510	545.84	546.93	1.00	0.79	4.30	0.29	547.22	0.901	0.901	0.987	0.62	0.18
3	12	2.96	546.01	547.11	1.00	0.79	3.77	0.22	547.33	0.691	136.030	547.43	548.16 j	0.73**	0.61	4.82	0.36	548.52	0.887	0.789	n/a	1.50	n/a
4	12	2.32	547.43	548.16	0.73	0.61	3.78	0.22	548.38	0.545	143.610	549.06	549.71 j	0.65**	0.54	4.32	0.29	550.00	0.755	0.650	n/a	1.00	n/a

Crusher | Number of lines: 4 | Run Date: 10-01-2008

Notes: ; ** Critical depth.; j-Line contains hyd. jump. ; c = cir e = ellip b = box

Hydraflow HGL Computation Procedure

General Procedure: Hydraflow computes the HGL using the Bernoulli energy equation. Manning's equation is used to determine energy losses due to pipe friction. In a standard step, iterative procedure, Hydraflow assumes upstream HGLs until the energy equation balances. If the energy equation cannot balance, supercritical flow exists and critical depth is temporarily assumed at the upstream end. A supercritical flow Profile is then computed using the same procedure in a downstream direction using momentum principles.

Col. 1 The line number being computed. Calculations begin at Line 1 and proceed upstream.

Col. 2 The line size. In the case of non-circular pipes, the line rise is printed above the span.

Col. 3 Total flow rate in the line.

Col. 4 The elevation of the downstream invert.

Col. 5 Elevation of the hydraulic grade line at the downstream end. This is computed as the upstream HGL + Minor loss of this line's downstream line.

Col. 6 The downstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 7 Cross-sectional area of the flow at the downstream end.

Col. 8 The velocity of the flow at the downstream end, (Col. 3 / Col. 7).

Col. 9 Velocity head (Velocity squared / 2g).

Col. 10 The elevation of the energy grade line at the downstream end, HGL + Velocity head, (Col. 5 + Col. 9).

Col. 11 The friction slope at the downstream end (the S or Slope term in Manning's equation).

Col. 12 The line length.

Col. 13 The elevation of the upstream invert.

Col. 14 Elevation of the hydraulic grade line at the upstream end.

Col. 15 The upstream depth of flow inside the pipe (HGL - Invert elevation) but not greater than the line size.

Col. 16 Cross-sectional area of the flow at the upstream end.

Col. 17 The velocity of the flow at the upstream end, (Col. 3 / Col. 16).

Col. 18 Velocity head (Velocity squared / 2g).

Col. 19 The elevation of the energy grade line at the upstream end, HGL + Velocity head, (Col. 14 + Col. 18) .

Col. 20 The friction slope at the upstream end (the S or Slope term in Manning's equation).

Col. 21 The average of the downstream and upstream friction slopes.

Col. 22 Energy loss. Average Sf/100 x Line Length (Col. 21/100 x Col. 12). Equals (EGL upstream - EGL downstream) +/- tolerance.

Col. 23 The junction loss coefficient (K).

Col. 24 Minor loss. (Col. 23 x Col. 18). Is added to upstream HGL and used as the starting HGL for the next upstream line(s).

Storm Sewer Summary Report

Line No.	Line ID	Flow rate (cfs)	Line size (in)	Line shape	Line length (ft)	Invert EL Dn (ft)	Invert EL Up (ft)	Line slope (%)	HGL down (ft)	HGL up (ft)	Minor loss (ft)	HGL Junct (ft)	Dns line No.	Junction Type
1		3.77	12	Cir	19.320	544.13	544.65	2.692	545.55*	545.77*	0.18	545.95	End	Curb-Horiz
2		3.38	12	Cir	109.510	544.67	545.84	1.068	545.95*	546.93*	0.18	547.11	1	Curb-Horiz
3		2.96	12	Cir	136.030	546.01	547.43	1.044	547.11	548.16	n/a	548.16 j	2	DropGrate
4		2.32	12	Cir	143.610	547.43	549.06	1.135	548.16	549.71	n/a	549.71 j	3	Curb-Horiz

Crusher

Number of lines: 4

Run Date: 10-01-2008

NOTES: Return period = 10 Yrs. ; *Surcharged (HGL above crown). ; j - Line contains hyd. jump.

Zavradinos Professional Services
17813 Edison Ave., Suite 201
Chesterfield, Mo. 30005
(636) 946-5555 Fax (636) 449-0148

NAME: KINGSMILL CROSSING

JOB NO: 96119

PHASE ONE PRELIMINARY COST ESTIMATE

For: CRUSHER DRIVE (DOES NOT INCLUDE WATERWAY CAR WASH)

Prepared By: G.W.

Checked By: _____

May 2006

ITEM	ESTIMATED TOTAL COST
CLEARING AND DEMOLITION	$ -
EARTHWORK / EROSION CONTROL	$ 12,375.00
STORM SEWERS	$ 101,689.50
SANITARY SEWERS	$ -
WATER SERVICE	$ 16,340.00
ELECTRIC SERVICE	$ -
PAVEMENTS	$ 140,086.00
SIDEWALKS, MISC. PAVEMENT	$ 36,720.00
STREET LIGHTS	$ 2,100.00
MISCELLANEOUS IMPROVEMENTS	$ 52,355.00
TRAFFIC CONTROL	$ -
PLANNING, ENGINEERING AND SURVEYING FEES	$ -
MUNICIPAL & AGENCY FEES AND PERMITS	$ -
TOTAL ESTIMATED LAND DEVELOPMENT COST	$ 361,665.50

BASIS OF ESTIMATE

1. This is an engineer's estimate of site development cost, based on cost data compiled from past projects, municipality unit costs and quantity estimates for this project.

2. No contingencies have been added for inflation, extraordinary circumstances, or changes in laws, or increased costs. The developer should add an amount or percentage to the bottom line of this estimate to cover inflation, extraordinary circumstances, or changes in laws, or increased costs.

3. All rock excavation quantities shown in this proposal, whether or not actual test borings were taken, are approximate only and subject to significant variation. It is not unusual to see variances that equal several times the initial estimate.

4. Since the Engineer has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s) methods of determining prices, or over competitive bidding or market conditions, his opinions of probable project cost and construction cost provided for herein are approximate only. The Engineer can not and does not guarantee that proposals, bids or actual project or construction cost will not vary from this estimate.

The following is a non-exclusive list of some items which are assumed included in building costs, not land development costs, The cost of these items have not been included in this estimate.

* Agency Review or Submittal Fees
* Basement and/or foundation excavation and backfill
* Extra electric service length
* Sanitary connection from end of lateral to building(s)
* Water service from meter to building(s)
* Gas service from street main to building(s)
* Driveways, sidewalks (from driveway to building), patio, porch, and other flatwork items adjacent to the building(s)
* Lot (fine) grading
* Special work and landscaping in the display area
* Individual lot retaining walls
* Entry monument to development
* Special fencing and/or screening
* Clean-up and trash removal
* Swimming pool and shelter, ball field, picnic and play areas, and/or other recreational facilities
* Seed and/or sod for individual lots
* Temporary construction road and utility connections
* Plot plans, building layouts, and final spot survey
* Architect and Attorney fees
* Raw land cost
* Overhead, supervision, and profit
* Interest and Other Cost of Financing
* Street trees
* Individual Lot Surveying (Staking, Final Spot, Corners, etc.)

CLEARING AND DEMOLITION

1. CLEARING

Densely Wooded	_____	acres	@	$3,000	per acre	$ -
Medium Wooded	_____	acres	@	$2,500	per acre	$ -
Lightly Wooded	_____	acres	@	$2,000	per acre	$ -
Non Wooded	_____	acres	@	$1,000	per acre	$ -

2. DEMOLITION

Existing Buildings	_____	each	@	$40,000	each	$ -
House, Barn, Etc.	_____	each	@	$3,500	each	$ -
Water/Sewer disconnect	_____	homes	@	$750	per home	$ -
Private Well (cap & abandon)	_____	each	@	$750	each	$ -
Rem. Sewer Structure	_____	each	@	$350	each	$ -
Rem. Sewer Pipe	_____	lin. ft.	@	$10.20	per lin. Ft.	$ -
Rem. Asphalt Pvm't.	_____	sq. yds.	@	$4.00	per sq. yd.	$ -
Rem. Curb & Gutter	_____	lin. ft.	@	$3.00	per lin. Ft.	$ -
Rem. Conc. Sidewalk	_____	sq. yds.	@	$6.70	per sq. yd.	$ -
Rem. Retaining Wall	_____	sq. ft.	@	$10.00	per sq. ft. (face)	$ -
Rem Tree/Shrub	_____	in./dia.	@	$20.00	per in./dia.	$ -

TOTAL $ -

EARTHWORK (Approximate Quantities)

1. EARTH EXCAVATION

0-5,000 cu. yds.	_____	cu. yds.	@	$2.00	per cu. yd.	$ -
5,000-25,000 cu. yds.	5,500	cu. yds.	@	$2.25	per cu. yd.	$ 12,375.00
25,000-100,000 cu. yds.	_____	cu. yds.	@	$2.00	per cu. yd.	$ -
100,000-150,000 cu. yds.	_____	cu. yds.	@	$2.00	per cu. yd.	$ -
150,000 cu. yds. & up	_____	cu. yds.	@	$1.75	per cu. yd.	$ -

2. BLASTING AND ROCK EXCAVATION

0-1,000 cu. yds.	_____	cu. yds.	@	$50.00	per cu. yd.	$ -
1,000-5,000 cu. yds.	_____	cu. yds.	@	$20.00	per cu. yd.	$ -
5,000 cu. yds. & up	_____	cu. yds.	@	$15.00	per cu. yd.	$ -

3. a. Haul Off Excavation _____ cu. yds. @ $6.00 per cu. yd. $ -
   b. Haul in Borrow _____ cu. yds. @ $4.00 per cu. yd. $ -

4. COMPACTION TESTING

0-5,000 cu. yds.	_____	cu. yds.	@	$0.60	per cu. yd.	$ -
5,000-25,000 cu. yds.	_____	cu. yds.	@	$0.45	per cu. yd.	$ -
25,000-100,000 cu. yds.	_____	cu. yds.	@	$0.25	per cu. yd.	$ -

100,000 cu. yds. & up	_____	cu. yds.	@	$0.20	per cu. yd.	$ -

5. EROSION CONTROL

Erosion Control Blanket	_____	sq. yds	@	$2.00	per sq. yd.	$ -
Strawbales	_____	lin. ft.	@	$2.00	per lin. ft.	$ -
Silt Fence	_____	lin. ft.	@	$2.00	per lin. ft.	$ -

TOTAL $ 12,375.00

STORM SEWERS

Pipe Prices include Bedding Material & Granular Backfill

Description	Quantity			Unit Price		Total
12" R.C.P	294	lin. ft.	@	$19.00	per lin. ft.	$ 5,586.00
15" R.C.P	287	lin. ft.	@	$23.00	per lin. ft.	$ 6,601.00
18" R.C.P.	250	lin. ft.	@	$27.00	per lin. ft.	$ 6,750.00
21" R.C.P.		lin. ft.	@	$60.00	per lin. ft.	$ -
24" R.C.P.	145	lin. ft.	@	$35.00	per lin. ft.	$ 5,075.00
27" R.C.P.		lin. ft.	@	$84.00	per lin. ft.	$ -
30" R.C.P.	474	lin. ft.	@	$42.50	per lin. ft.	$ 20,145.00
36" R.C.P.	329	lin. ft.	@	$54.50	per lin. ft.	$ 17,930.50
42" R.C.P.		lin. ft.	@	$140.00	per lin. ft.	$ -
48" R.C.P.		lin. ft.	@	$157.00	per lin. ft.	$ -
54" R.C.P.		lin. ft.	@	$190.00	per lin. ft.	$ -
60" R.C.P.		lin. ft.	@	$225.00	per lin. ft.	$ -
72" R.C.P.		lin. ft.	@	$335.00	per lin. ft.	$ -
84" R.C.P.		lin. ft.	@	$460.00	per lin. ft.	$ -
96" R.C.P.		lin. ft.	@	$630.00	per lin. ft.	$ -
_____		lin. ft.	@	_____	per lin. ft.	$ -
_____		lin. ft.	@	_____	per lin. ft.	$ -

C.M.P. pipe	_____	lin. Ft. per inch per lin.ft.	of	_____	inch pipe @ $ -
C.M.P. pipe (Alum.)	_____	lin. Ft. per inch per lin.ft.	of	_____	inch pipe @ $ -
A.D.S. pipe	_____	lin. Ft. per inch per lin.ft.	of	_____	inch pipe @ $ -

12" F.E.S	_____	each	@	$400.00	each	$ -
15" F.E.S	_____	each	@	$625.00	each	$ -
18" F.E.S.	_____	each	@	$695.00	each	$ -
21" F.E.S.	_____	each	@	$820.00	each	$ -
24" F.E.S.	_____	each	@	$915.00	each	$ -
27" F.E.S.	_____	each	@	$980.00	each	$ -
30" F.E.S.	1	each	@	$1,060.00	each	$ 1,060.00
36" F.E.S.	1	each	@	$1,375.00	each	$ 1,375.00
42" F.E.S.		each	@	$1,480.00	each	$ -
48" F.E.S.		each	@	$1,750.00	each	$ -
54" F.E.S.		each	@	$1,950.00	each	$ -
60" F.E.S.		each	@	$2,250.00	each	$ -

72" F.E.S.		each	@	$3,150.00	each	$	-
		each	@		each	$	-
		each	@		each	$	-

STORM SEWERS (Continued)

Description	Quantity			Unit Price		Total
Manholes	2	each	@	$1,100.00	each	$ 2,200.00
Single Curb Inlets	17	each	@	$950.00	each	$ 16,150.00
Double Curb Inlets		each	@	$2,380.00	each	$ -
Area Inlets	2	each	@	$925.00	each	$ 1,850.00
Grated Inlets	1	each	@	$1,100.00	each	$ 1,100.00
Grated Troughs		lin. ft.	@	$350.00	per lin. ft.	$ -
*Rock Excavation Class "A" Solid		cu. yds.	@	$110.00	per cu. yd	$ -
*Rock Excavation Class "B" Loose		cu. yds.	@	$50.00	per cu. yd	$ -
Jetting	1,779	lin. ft.	@	$1.00	per lin. ft	$ 1,779.00
Granular Backfill (110 lbs. / cu. ft.)	1,761	tons	@	$8.00	per ton	$ 14,088.00
Concrete Encasement		cu. yds.	@	$175.00	per cu. yd	$ -
Concrete Cradle		cu. yds.	@	$90.00	per cu. yd	$ -
Detention Basin				Lump Sum		$ -
Sinkhole Improvements				Lump Sum		$ -
10'x10' Rip Rap Apron		each	@	$475.00	each	$ -
10' x 10' Rip Rap Apron w/Dissipator		each	@	$2,000.00	each	$ -
Major Creek Structures ___ x ___ Box Culvert		cu. yds.	@	$525.00	per cu. yd	$ -
_____ Each Headwalls		cu. yds.	@	$450.00	per cu. yd	$ -
Rip Rap Channels or Ditches (Grouted)		sq. yds.	@	$48.00	per sq. yd.	$ -
6" Concrete Swale		sq. ft.	@	$3.00	per sq. ft.	$ -
Bore Crossing (avg. size)		lin. ft.	@	$250.00	per lin. ft	$ -
Tunnelling Crossing (avg.)		lin. ft.	@	$500.00	per lin. ft	$ -
Other (Outfall Struct.)		cu. yds.	@	$500.00	per cu. yds.	$ -
					TOTAL	$ 101,689.50

* approximate quantities

SANITARY SEWERS

Pipe Prices include Bedding Material

Description	Quantity			Unit Price		Total
6" P.V.C.(Lateral to Bldg)		lin. ft.	@	$23.50	per lin. ft.	$ -
8" P.V.C. (Trunk)		lin. ft.	@	$14.00	per lin. ft.	$ -

4" P.V.C. (Force Main)	_____	lin. ft.	@	$6.00	per lin. ft.	$ -
Force Main Clean-Out	_____	each	@	$400.00	each	$ -
Line Manholes	_____	each	@	$1,450.00	each	$ -
Drop Manholes w/outside drops	_____	each	@	$1,800.00	each	$ -
*Rock Excavation Class "A" Solid	_____	cu. yds.	@	$110.00	cu. yd.	$ -
*Rock Excavation Class "B" Loose	_____	cu. yds.	@	$50.00	cu. yd.	$ -
Granular Backfill (110 lbs/c.f.)	_____	tons	@	$8.00	per ton	$ -
Concrete Encasement	_____	lin. ft.	@	$60.00	per lin. ft.	$ -
Jetting	_____	lin. ft.	@	$1.00	per lin. ft	$ -
WYE Connection	_____	each	@	$38.00	each	$ -
Cleanouts	_____	each	@	$125.00	each	$ -
Break into Terminal M.H.	_____	each	@	$500.00	each	$ -
Adjusting Manhole to Grade 1.80 ft.	_____	each	@	$200.00	each	$ -
Over 1.80 ft.	_____	each	@	$500.00	each	$ -
Bore Crossing (8 inch)	_____	lin. ft.	@	$150.00	per lin. ft.	$ -
Creek Crossing				Lump Sum		$ -
Connection Fee (MSD)	_____	lots	@	$1,072.00	per lot	$ -
Other RemoveMH	_____		@	_____		
					TOTAL	$ -

* approximate quantities

WATER SERVICE

Pipe Prices include Bedding Material

Description	Quantity			Unit Price		Total
4" P.V.C.	_____	lin. ft	@	$16.00	per lin. ft	$ -
6" P.V.C.	_____	lin. ft	@	$20.00	per lin. ft	$ -

8" P.V.C.	1,520	lin. ft	@	$10.75	per lin. ft	$ 16,340.00
4" D.I.P.		lin. ft	@	$20.00	per lin. ft	$ -
6" D.I.P.		lin. ft	@	$30.00	per lin. ft	$ -
8" D.I.P.		lin. ft	@	$45.00	per lin. ft	$ -
4" Valve w/box		each	@	$350.00	each	$ -
6" Valve w/box		each	@	$500.00	each	$ -
8" Valve w/box		each	@	$650.00	each	$ -
8" meter box control valve		each	@	$6,300.00	each	$ -
4" End Cap		each	@	$65.00	each	$ -
6" End Cap		each	@	$85.00	each	$ -
8" End Cap		each	@	$105.00	each	$ -
4"x4"x4" Tee & Block		each	@	$125.00	each	$ -
4"x4"x6" Tee & Block		each	@	$135.00	each	$ -
6"x6"x4" Tee & Block		each	@	$155.00	each	$ -
6"x6"x6" Tee & Block		each	@	$175.00	each	$ -
6"x6"x8" Tee & Block		each	@	$195.00	each	$ -
8"x8"x6" Tee & Bock		each	@	$210.00	each	$ -
Thrust Blocks		each	@	$75.00	each	$ -
GranularBackfill (110 lbs/c.f.)		tons	@	$10.00	per ton	$ -
2" Blowoff		each	@	$600.00	each	$ -
Fire Hydrants		each	@	$2,000.00	each	$ -
Water Meters				Lump Sum		$ -
Flush Hydrant		each	@	$1,650.00	each	$ -
4" Elbow & Block		each	@	$190.00	each	$ -
6" Elbow & Block		each	@	$205.00	each	$ -
8" Elbow & Block		each	@	$265.00	each	$ -
8"x6" Reducer		each	@	$190.00	each	$ -
6"x4" Reducer		each	@	$155.00	each	$ -
Copper Crossing		each	@		each	$ -
Tap on Fee				Lump Sum		$ -
Tapping Sleeve (8"x36")		each	@	$4,200.00		$ -
					TOTAL	$ 16,340.00

ELECTRIC SERVICE

Buried Electric Relocation		lin. ft.	@	$50	per lin. Ft.	$ -
					TOTAL	$ -

PAVEMENT

1. ASPHALTIC CONCRETE PAVING

2" Type "C" Surface Course	_____	sq. yds	@	$5.00	per sq. yd.	$ -
6" Rock Base Course	_____	sq. yds	@	$5.25	per sq. yd.	$ -
2" Type "C" Surface Course w/6" Type 'X" Base Course	_____	sq.yds	@	$15	each	$ -
Asphaltic Concrete Curbing	_____	lin. ft.	@	$7.75	per lin. ft.	$ -

2. CONCRETE PAVING

26' Wide (6" thick)	_____	lin. ft.	X	26 /	9 =	
(Conc. Slabs)	_____	sq. yds	@	$16.75	per sq. yd.	$ -
39' Wide (7" thick)	1,453	lin. ft.	X	39 /	9 $ 6,296.33	
(Driveway Entrances)	6,296	sq. yds	@	$22.25	per sq. yd.	$ 140,086.00
Permanent Turnarounds						
Cul-de-Sacs	_____	each	@	$9,500	each	$ -
Eyebrows	_____	each	@	$8,000	each	$ -
Roundings	_____	each	@	$800.00	each	$ -
Bus Cul-de-Sacs	_____	each	@	$11,500	each	$ -

3. MISC. PAVEMENT CONSTRUCTION

Misc. Signs	_____	Signs	@	$150.00	each	$ -
4" Granular Base (Type 1)	_____	tons	@	$13.00	per ton	$ -
Pavement Lugs	_____	Lin. ft.	@	$60.00	per lin. ft.	$ -
6" Vertical Conc. Curb (6"W. x 6"H.) Dowelled to Top of Pavement	_____	lin. ft	@	$8.50	per lin. ft.	$ -
6" Vertical Conc. Barrier Curb - Reinforced (6"W. x 18"H.) 12" Below Grade	_____	lin. ft	@	$20.00	per lin. ft.	$ -
2'-6" Conc. Curb & Gutter	_____	lin. ft	@	$14.75	per lin. ft.	$ -
Saw Cut Pavement	_____	lin. ft	@	$2.00	per lin. ft.	$ -
2" Asph. Conc. Overlay	_____	sq. yds.	@	$5.00	per sq. yd.	$ -
Raised Median (4' W.)	_____	lin. ft	@	$30.00	per lin. ft.	$ -

TOTAL $ 140,086.00

SIDEWALKS/MISC. PAVEMENT

Concrete Stairs	_____	cu. yds.	@	$500.00	per cu. yds.	$ -
Concrete Walk (4" thick)	10,840	sq. ft.	@	$3.00	per sq. ft.	$ 32,520.00

Curb Ramp (7" thick)	6 each	@	$700.00	per sq. ft.	$ 4,200.00
Stair Handrail	_____ lin. ft.	@	$20.00	per lin. ft.	$ -
				TOTAL	$ 36,720.00

STREET LIGHTS

Pavement Length = _____ ft. divided by 250 ft. per light =

7 Lights @ $300 per light $ 2,100.00

MISCELLANEOUS IMPROVEMENTS

1. COMMON GROUND

Seeding and Mulching	_____ acres	@	$800	per acre	$ -
Entrance / Signage			Lump Sum		$ -
Street trees	61 each	@	$110	per tree	$ 6,710.00
Chain-Link Fence (4')	_____ lin. ft.	@	$8.00	per lin. ft.	$ -

2. RETAINING WALLS

Railroad Tie Wall (Actual no. of ties x 1.25 for Dead Men & Misc.)

_____ Estimated number of ties @ $25.00 per tie $ -

Bioretention Block Walls

_____ Sq.Ft. @ $14 pe sq.ft. $ -

Segmental Block Wall

2,685 Sq.Ft. @ $17.00 per sq.ft. $ 45,645.00

Wall Handrail _____ lin. ft. @ $20.00 per lin. ft. $ -

3. CONCRETE MONUMENTS (1 monument per 2 Lot Average)

_____ Monuments @ $200 per Monument = $ -

4. SOIL INVESTIGATION

Soils Report Lump Sum $ -

Sinkhole Reports Lump Sum $ -

Seismographic Testing (260 Lin. Ft. Profiles)

_____ Profiles @ _____ each $ -

5. SPECIAL STRUCTURES

Bridge Lump Sum $ -

Sewage Treatment Plant	Lump Sum		$ -
Lift Station	Lump Sum		$ -
Well	Lump Sum		$ -
Water Storage Tank	Lump Sum		$ -
		TOTAL	$ 52,355.00

TRAFFIC CONTROL

Striping (4" white, dashed)	_____ lin. ft.	@	$0.50	per lin. ft.	$ -
Striping (4" yellow, solid)	_____ lin. ft.	@	$0.50	per lin. ft.	$ -
Striping (24"w. stop bar)	_____ lin. ft.	@	$2.00	per lin. ft.	$ -
Thermoplastic Crosswalk (10'W.)	_____ lin. ft.	@	$11.00	per lin. ft.	$ -
Painted Directional Arrow	_____ each	@	$23.50	each	$ -
				TOTAL	$ -

PLANNING, ENGINEERING AND SURVEYING FEES

Preliminary Plans and Zoning Presentation	Lump Sum		$ -
Engineering and Surveying	Lump Sum		
Construction Staking	Lump Sum		$ -
		TOTAL	$ -

MUNICIPAL & AGENCY FEES AND PERMITS

Review Fees & Permits	_____ lots	@	$1,000	per lot	$ -

File

100 NORTH MAIN STREET
O'FALLON, MISSOURI 633(
636.240.2000
FACSIMILE 636.978-4144
www.ofallon.mo.us

August 2, 2006

Zavradinos & Polk
Gary Wilson
17813 Edison Avenue
Chesterfield, MO 63005

RE: Kingsmill Crossing Phase 1

Dear Mr. Wilson:

The revised construction plans for Kingsmill Crossing Phase 1 have been reviewed and approved.

Make sure all City specifications are followed. Additional temporary swales, berms and/or silting basins may be required as construction proceeds and planned siltation control is evaluated for effectiveness. Siltation control is to be erected before construction begins in any area. Copies of any off site easements and pertinent permits or approvals should be on file before any construction off site. Care should be taken to ensure no soil or mud is tracked onto any pavement from the site. Please schedule a pre-construction meeting with Senior Construction Inspector, Jay Herigodt at (636) 379-5416. Please notify the Construction Inspection Division at 636-379-5416 at least 48 hours before construction begins and 24 hours in advance of any required inspections. Upon completion of the improvements and necessary tests, an engineer shall certify that construction took place according to plan with all changes noted. Please insure that the as-builts accurately show the locations and elevations of the water, sanitary sewer, storm sewer, and swales. One set of reproducible as-builts should then be submitted along with three copies. **An e-mail version of the site plan and as-builts must also be supplied.** With this information the City of O'Fallon can proceed to accept the public improvements under its maintenance responsibility.

It is the responsibility of the owner/developer to obtain approval from all other departments and outside organizations as required. All City ordinances and standards shall be followed during the construction of the proposed improvements. This approval is for compliance with city standards and ordinance requirements. The City's approval is not a certification of the calculations or plans. The design engineer is responsible for the technical accuracy, project decisions, engineering judgment, and quality of the plans, calculations, and/or report.

If you have any further questions please call me at (636) 379-5557 or email me at jgreenlee@ofallon.mo.us.

Sincerely,

Jeannie Greenlee

Jeannie Greenlee
Engineer III

cc via email
Bob Lowery – City Administrator
Jack Strick – Managing Director / Community Development
David Woods – Director of Planning and Engineering
Shannon Gerard – Assistant Director of Planning
Steve Bender, P.E. – City Engineer
Nathan Lacey – Director of Building Safety / Building Official
Jay Herigodt –Construction Inspection Manager
File through KL

City of O'Fallon
100 North Main St.
O'Fallon, MO 63366

Invoice Information
Invoice #: 00-00023

Send To: Zavradinos & Polk Engineering
Name: Jim Exler
Address: 17813 Edison Avenue, Suite 201
City/State/Zip: Chesterfield, MO 63005

RE: Construction Site Plan Review Fee
Project Name: Kingsmill Crossing Phase 1
Planning & Zoning File Number: 9984.04
Date of Approved Cost Estimate: May 3, 2006
Total from Cost Estimate: $361,665.50 x 0.02 =

Total Amount Due: $7,233.31

Account Code: 1100004423

Return paid copy to
Employee: Jeannie Greenlee

Please send Payment to:

City of O'Fallon
Cash Receipts – Beth Harper
100 North Main St.
O'Fallon, MO 63366

* Due before Construction Site Plan Approval is issued

TEAM O'FALLON
CITY OF O'FALLON · MISSOURI

TRUST - TEAMWORK
RESPECT - SERVICE

Memorandum

To: Jay Heirgodt
Manager of Construction Inspection

From: Jeannie Greenlee
Engineer III

CC: Steve Bender, P.E.

Date: 8-02-06

Re: Kingsmill Crossing Phase 1

The plans for the above project have been approved through the City. As of today I do not have a copy of the MDNR Land Disturbance Permit. Please have the developer provide a copy of this permit to you prior to any grading operations taking place.

LN 99010801

OK 5-24-06 GB

Licensed to: **Marlene Maag**
Brucker Earth Eng & Testing, Inc.
8706 Manchester Road
Brentwood, MO 63144

License Number: **99010801**

Project Identification:

Project Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

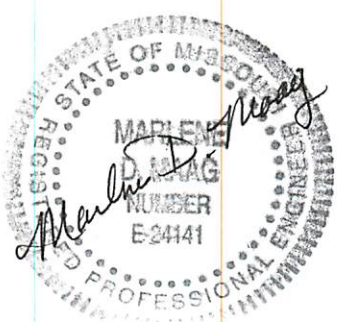
Type of Structure: **Geosynthetic-Reinforced Segmental Retaining Wall**
Design Methodology: **NCMA Method A**

Seismic Analysis Details:

Peak Ground Acceleration (PGA) ratio	**0.00**

Wall Geometry:

Design Wall Height (ft)	**2.67**
Embedment Wall Height (ft)	**0.5**
Exposed Design Wall Height (ft)	**2.17**
Vertical Wall Height including Cap Unit (ft)	**2.97**
Exposed Wall Height including Cap Unit (ft)	**2.47**
Minimum Levelling Pad Thickness (ft)	0.5
Number of Segmental Wall Units	**4**
Hinge Height (ft)	**2.67**
Wall Inclination (degrees)	**1.8**



Slopes:

Front Slope (degrees)	**horizontal**
Back Slope (degrees)	**horizontal**

Uniformly Distributed Surcharges:

Live Load Surcharge	**none**
Dead Load Surcharge	**none**

Soil Data:	*Soil Description:*	*Cohesion (psf)*	*Friction Angle (degrees)*	*Unit Weight (pcf)*
Reinforced Soil	**silty clay**	N/A	**28.0**	**125.0**
Retained Soil	**silty clay**	N/A	**28.0**	**125.0**
Levelling Pad Soil	**one-inch minus rock**	N/A	**35.0**	**135.0**
Foundation Soil	**silty clay**	**0.0**	**28.0**	**125.0**

Segmental Unit Name: **Versa-lok Square foot unit**

Segmental Unit Data:

Cap Height (in)	**3.6**
Unit Height (Hu)(in)	**8.0**
Unit Width (Wu)(in)	**12.0**
Unit Length (in)	**16.0**
Setback (in)	**0.25**
Weight (infilled) (lbs)	**87.0**
Unit Weight (infilled) (pcf)	**97.9**
Center of Gravity (in)	**6.0**

Segmental Unit Interface Shear Data:

Properties	*Ultimate Strength Criteria*	*Service State Criteria*
Minimum (lbs/ft)	**1145.0**	**1145.0**
Friction Angle (degrees)	**35.0**	**35.0**
Maximum (lbs/ft)	**2933.0**	**2933.0**

Geosynthetic Reinforcement Types and Number:

Type	*Number*	*Name*
1	**1**	**MIragrid 3XT**
2	**0**	**Miragrid 5XT**

Geosynthetics Properties:

Strength and Polymer Type:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength (lbs/ft)	**3000.0**	**4300.0**	**N/A**
Polymer Type	**polyester**	**polyester**	**N/A**

Reduction Factors:	*Type 1*	*Type 2*	*Type 3*
Creep	**1.67**	**1.67**	**N/A**
Durability	**1.10**	**1.10**	**N/A**
Installation Damage	**1.25**	**1.25**	**N/A**
Overall Factor of Safety	**1.50**	**1.50**	**N/A**

Allowable Strength:	*Type 1*	*Type 2*	*Type 3*
Ta (lbs/ft)	**870.99**	**1248.41**	**N/A**

Coefficient of Interaction:	*Type 1*	*Type 2*	*Type 3*
Ci	**0.7**	**0.7**	**N/A**

Coefficient of Direct Sliding:	*Type 1*	*Type 2*	*Type 3*
Cds	**0.95**	**0.95**	**N/A**

Connection Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**

Geosynthetic-Segmental Retaining Wall Unit Interface Shear Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**

Coefficients of Earth Pressure and Failure Plane Orientations:

Reinforced Soil (Ka)	**0.309**
Reinforced Soil (Ka horizontal component)	**0.295**
Orientation of failure plane from horizontal (degrees)	**54.12**
Retained Soil (Ka)	**0.305**
Retained Soil (Ka horizontal component)	**0.274**
Orientation of failure plane from horizontal (degrees)	**52.56**

Results of External Stability Analyses:

	Calculated	*Design Criteria*
FOS Sliding	**3.47**	**1.5 OK**
FOS Overturning	**10.34**	**1.5 OK**
FOS Bearing Capacity	**11.47**	**2.0 OK**
Base Reinforcement Length (L) (ft)	**2.6**	**1.6 OK**
Base Eccentricity (e)(ft)	**0.03**	N/A
Base Eccentricity Ratio (e/L-2e)	**0.01**	N/A
Base Reinforcement Ratio (L/H)	**0.97**	**0.6 OK**

Note: calculated values MEET ALL design criteria

Detailed Results of External Stability Analyses: *Calculated Values:*

Total Horizontal Force (lbs/ft)	**121.8**
Total Vertical Force (lbs/ft)	**794.3**
Sliding Resistance (lbs/ft)	**422.4**
Driving Moment (lbs-ft/ft)	**108.2**
Resisting Moment (lbs-ft/ft)	**1119.3**
Bearing Capacity (psf)	**3579.8**
Maximum Bearing Pressure (psf)	**312.0**

Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Length (ft)*	*Anchor Length (ft)* > 1.0	*FOS Over-stress* > 1.0	*FOS Pullout* > 1.5	*FOS Sliding* > 1.5	*Layer Spacing (ft)* < 3.0
2	**1**	**0.67**	**2.6**	**1.14**	**6.64**	**1.62**	**10.73**	**OK**

Note: calculated values MEET ALL design criteria

Detailed Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Allowable Strength (lbs/ft)*	*Tensile Load (lbs/ft)*	*Pullout Capacity (lbs/ft)*	*Sliding Force (lbs/ft)*	*Sliding Capacity (lbs/ft)*
2	**1**	**0.67**	**871.0**	**131.2**	**211.9**	**68.5**	**735.1**

LN 99010801

Results of Facing Stability Analyses:

SRW Unit #	Heel Elev (ft)	Geosynthetic Type	FOS Over-turning > 1.5	FOS Shear (peak) > 1.5	Shear (deformation) < 0.02 x Hu	FOS Connection (peak) > 1.5	Connection (deformation) < 0.75 in
4	2.0	none	17.9	>99	OK	-	-
3	1.33	none	4.57	37.7	OK	-	-
2	0.67	1	2.07	7.22	OK	6.71	OK
1	0.0	none	6.17	-	-	-	-

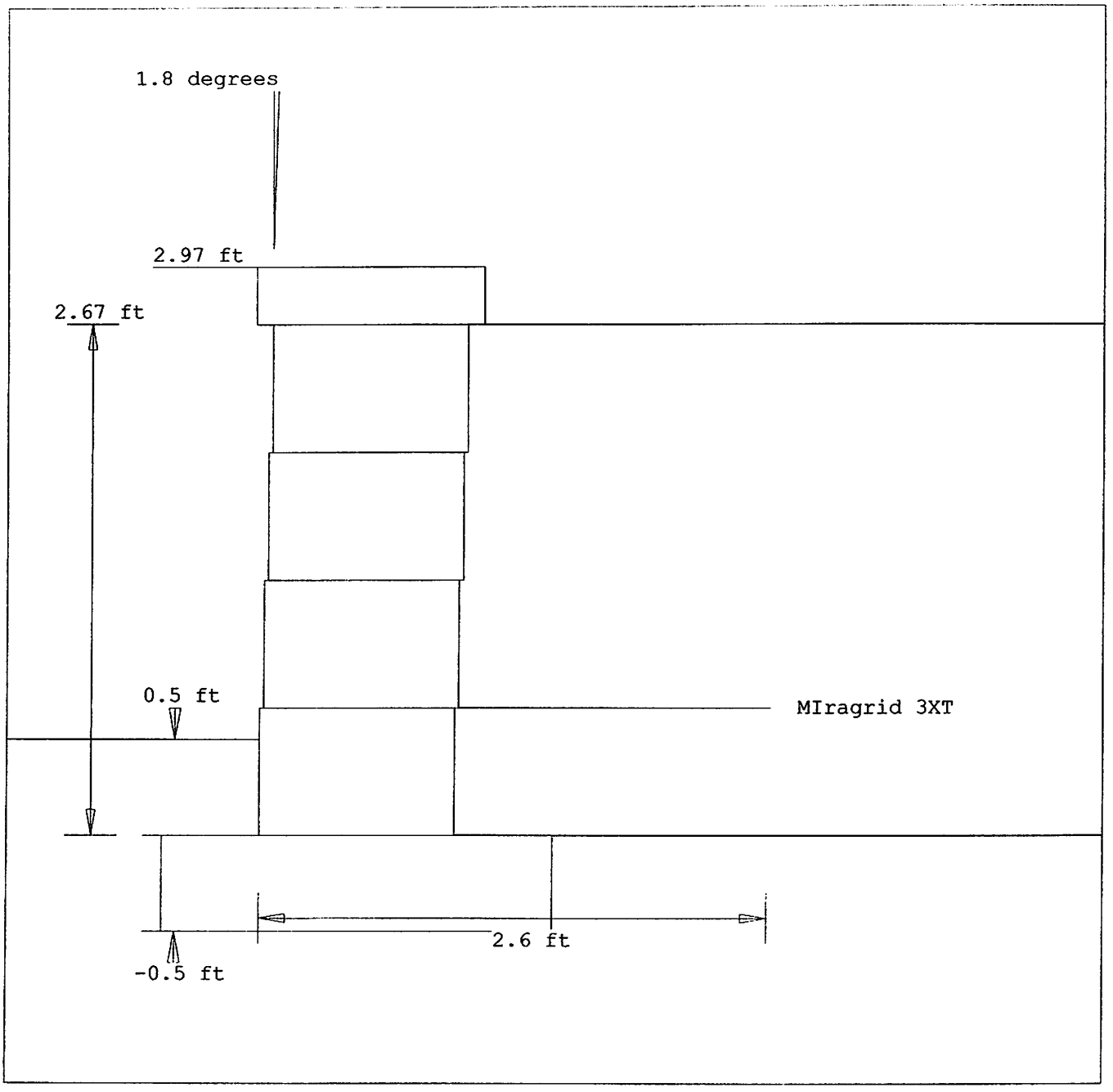
Note: calculated values MEET ALL design criteria

Detailed Results of Facing Stability Analyses (Moment and Shear):

SRW Unit #	Heel Elev (ft)	Geo Type	Drive Moment (lbs-ft/ft)	Resist Moment (lbs-ft/ft)	Shear Load (lbs/ft) +out -in	Shear Capacity (lbs/ft) (peak)	Shear Capacity (lbs/ft) (deformation)
4	2.0	none	1.8	32.6	8.2	1190.7	1190.7
3	1.33	none	14.6	66.6	32.8	1236.4	1236.4
2	0.67	1	49.2	102.0	73.8	533.1	533.1
1	0.0	none	116.6	719.3	0.0	1327.8	1327.8

Detailed Results of Facing Stability Analyses (Connections):

SRW Unit #	Heel Elev (ft)	Geo Type	Connection Load (lbs/ft)	Connection Capacity (peak) (lbs/ft)	Connection Capacity (deformation) (lbs/ft)
2	0.67	1	131.2	880.2	880.2



Project Identification:

Project
Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

Licensed to: **Marlene Maag**
Brucker Earth Eng & Testing, Inc.
8706 Manchester Road
Brentwood, MO 63144

License Number: **99010801**

Project Identification:

Project Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

Type of Structure: **Geosynthetic-Reinforced Segmental Retaining Wall**
Design Methodology: **NCMA Method A**

Seismic Analysis Details:

Peak Ground Acceleration (PGA) ratio	**0.00**

Wall Geometry:

Design Wall Height (ft)	**4.67**
Embedment Wall Height (ft)	**0.5**
Exposed Design Wall Height (ft)	**4.17**
Vertical Wall Height including Cap Unit (ft)	**4.97**
Exposed Wall Height including Cap Unit (ft)	**4.47**
Minimum Levelling Pad Thickness (ft)	0.5
Number of Segmental Wall Units	**7**
Hinge Height (ft)	**4.67**
Wall Inclination (degrees)	**1.8**

Slopes:

Front Slope (degrees)	**horizontal**
Back Slope (degrees)	**horizontal**

Uniformly Distributed Surcharges:

Live Load Surcharge	**none**
Dead Load Surcharge	**none**

Soil Data:	*Soil Description:*	*Cohesion (psf)*	*Friction Angle (degrees)*	*Unit Weight (pcf)*
Reinforced Soil	**silty clay**	N/A	**28.0**	**125.0**
Retained Soil	**silty clay**	N/A	**28.0**	**125.0**
Levelling Pad Soil	**one-inch minus rock**	N/A	**35.0**	**135.0**
Foundation Soil	**silty clay**	**0.0**	**28.0**	**125.0**

Segmental Unit Name: **Versa-lok Square foot unit**

Segmental Unit Data:

Cap Height (in)	**3.6**
Unit Height (Hu)(in)	**8.0**
Unit Width (Wu)(in)	**12.0**
Unit Length (in)	**16.0**
Setback (in)	**0.25**
Weight (infilled) (lbs)	**87.0**
Unit Weight (infilled) (pcf)	**97.9**
Center of Gravity (in)	**6.0**

Segmental Unit Interface Shear Data:

Properties	*Ultimate Strength Criteria*	*Service State Criteria*
Minimum (lbs/ft)	**1145.0**	**1145.0**
Friction Angle (degrees)	**35.0**	**35.0**
Maximum (lbs/ft)	**2933.0**	**2933.0**

Geosynthetic Reinforcement Types and Number:

Type	*Number*	*Name*
1	**2**	**MIragrid 3XT**
2	**0**	**Miragrid 5XT**

Geosynthetics Properties:

Strength and Polymer Type:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength (lbs/ft)	**3000.0**	**4300.0**	**N/A**
Polymer Type	**polyester**	**polyester**	**N/A**

Reduction Factors:	*Type 1*	*Type 2*	*Type 3*
Creep	**1.67**	**1.67**	**N/A**
Durability	**1.10**	**1.10**	**N/A**
Installation Damage	**1.25**	**1.25**	**N/A**
Overall Factor of Safety	**1.50**	**1.50**	**N/A**

Allowable Strength:	*Type 1*	*Type 2*	*Type 3*
Ta (lbs/ft)	**870.99**	**1248.41**	**N/A**

Coefficient of Interaction:	*Type 1*	*Type 2*	*Type 3*
Ci	**0.7**	**0.7**	**N/A**

Coefficient of Direct Sliding:	*Type 1*	*Type 2*	*Type 3*
Cds	**0.95**	**0.95**	**N/A**

Connection Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**

Geosynthetic-Segmental Retaining Wall Unit Interface Shear Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**

Coefficients of Earth Pressure and Failure Plane Orientations:

Reinforced Soil (Ka)	**0.309**
Reinforced Soil (Ka horizontal component)	**0.295**
Orientation of failure plane from horizontal (degrees)	**54.12**
Retained Soil (Ka)	**0.305**
Retained Soil (Ka horizontal component)	**0.274**
Orientation of failure plane from horizontal (degrees)	**52.56**

Results of External Stability Analyses:

	Calculated	*Design Criteria*
FOS Sliding	**2.15**	**1.5 OK**
FOS Overturning	**4.01**	**1.5 OK**
FOS Bearing Capacity	**5.14**	**2.0 OK**
Base Reinforcement Length (L) (ft)	**2.8**	**2.8 OK**
Base Eccentricity (e)(ft)	**0.24**	N/A

LN 99010801

Results of Facing Stability Analyses:

SRW Unit #	Heel Elev (ft)	Geosynthetic Type	FOS Over-turning > 1.5	FOS Shear (peak) > 1.5	Shear (deformation) < 0.02 x Hu	FOS Connection (peak) > 1.5	Connection (deformation) < 0.75 in
7	4.0	none	17.9	>99	OK	-	-
6	3.33	none	4.57	37.7	OK	-	-
5	2.67	1	2.07	7.22	OK	5.3	OK
4	2.0	none	6.17	-	-	-	-
3	1.33	none	5.87	35.26	OK	-	-
2	0.67	1	4.98	4.77	OK	4.1	OK
1	0.0	none	5.06	-	-	-	-

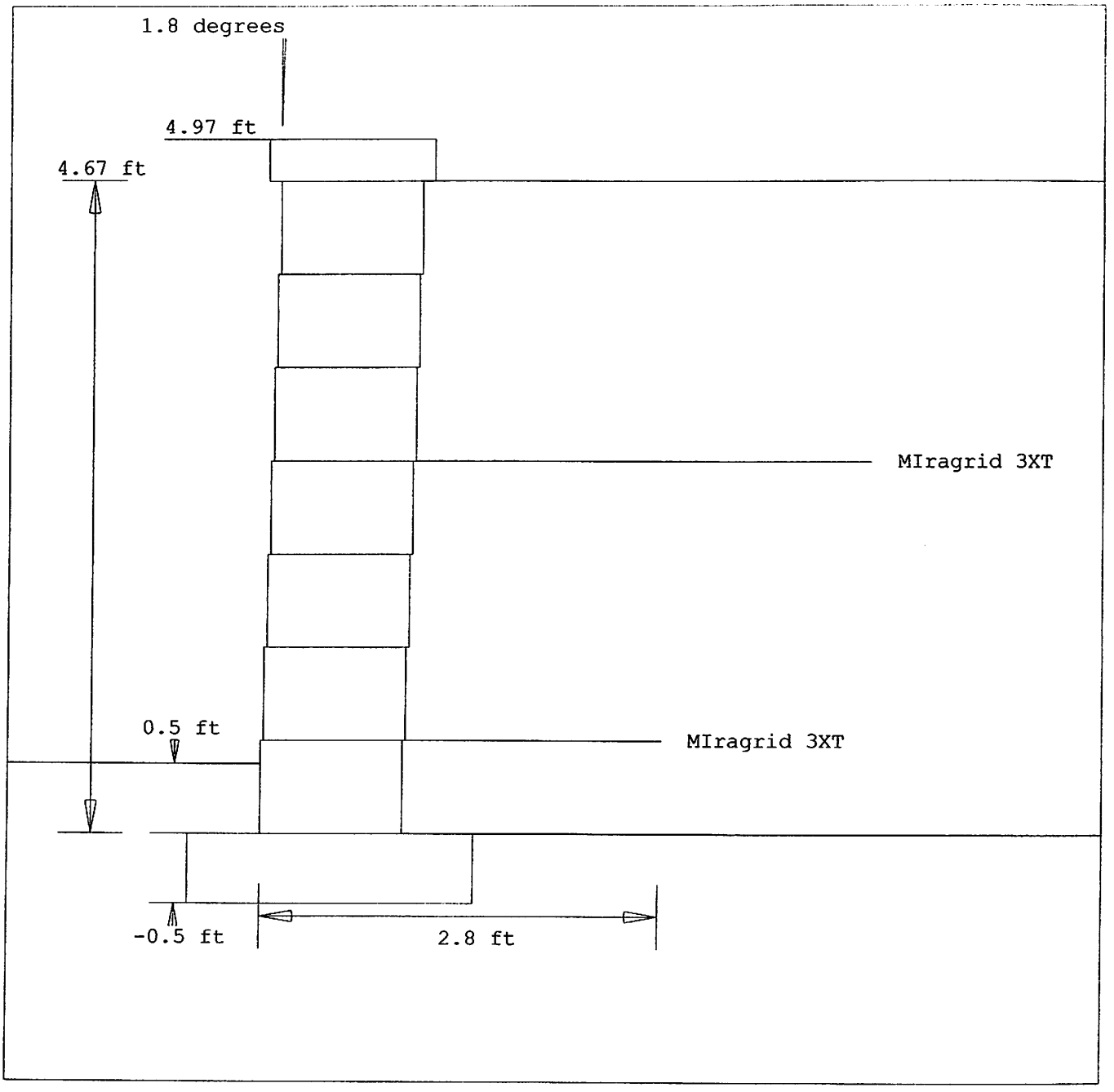
Note: calculated values MEET ALL design criteria

Detailed Results of Facing Stability Analyses (Moment and Shear):

SRW Unit #	Heel Elev (ft)	Geo Type	Drive Moment (lbs-ft/ft)	Resist Moment (lbs-ft/ft)	Shear Load (lbs/ft) +out -in	Shear Capacity (lbs/ft) (peak)	Shear Capacity (lbs/ft) (deformation)
7	4.0	none	1.8	32.6	8.2	1190.7	1190.7
6	3.33	none	14.6	66.6	32.8	1236.4	1236.4
5	2.67	1	49.2	102.0	73.8	533.1	533.1
4	2.0	none	116.6	719.3	-34.8	1327.8	1327.8
3	1.33	none	227.8	1338.0	38.9	1373.4	1373.4
2	0.67	1	393.6	1958.1	129.1	616.2	616.2
1	0.0	none	625.0	3160.2	0.0	1464.8	1464.8

Detailed Results of Facing Stability Analyses (Connections):

SRW Unit #	Heel Elev (ft)	Geo Type	Connection Load (lbs/ft)	Connection Capacity (peak) (lbs/ft)	Connection Capacity (deformation) (lbs/ft)
5	2.67	1	166.0	880.2	880.2
2	0.67	1	235.7	967.3	967.3



Project Identification:

Project
Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

LN 99010801

Licensed to: **Marlene Maag**
Brucker Earth Eng & Testing, Inc.
8706 Manchester Road
Brentwood, MO 63144

License Number: **99010801**

Project Identification:

Project Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

Type of Structure: **Geosynthetic-Reinforced Segmental Retaining Wall**
Design Methodology: **NCMA Method A**

Seismic Analysis Details:

Peak Ground Acceleration (PGA) ratio	**0.00**

Wall Geometry:

Design Wall Height (ft)	**6.67**
Embedment Wall Height (ft)	**1.0**
Exposed Design Wall Height (ft)	**5.67**
Vertical Wall Height including Cap Unit (ft)	**6.97**
Exposed Wall Height including Cap Unit (ft)	**5.97**
Minimum Levelling Pad Thickness (ft)	0.5
Number of Segmental Wall Units	**10**
Hinge Height (ft)	**6.67**
Wall Inclination (degrees)	**1.8**

Slopes:

Front Slope (degrees)	**horizontal**
Back Slope (degrees)	**horizontal**

Uniformly Distributed Surcharges:

Live Load Surcharge	**none**
Dead Load Surcharge	**none**

Soil Data:	*Soil Description:*	*Cohesion (psf)*	*Friction Angle (degrees)*	*Unit Weight (pcf)*
Reinforced Soil	**silty clay**	N/A	**28.0**	**125.0**
Retained Soil	**silty clay**	N/A	**28.0**	**125.0**
Levelling Pad Soil	**one-inch minus rock**	N/A	**35.0**	**135.0**
Foundation Soil	**silty clay**	**0.0**	**28.0**	**125.0**

Segmental Unit Name: **Versa-lok Square foot unit**

Segmental Unit Data:

Cap Height (in)	**3.6**
Unit Height (Hu)(in)	**8.0**
Unit Width (Wu)(in)	**12.0**
Unit Length (in)	**16.0**
Setback (in)	**0.25**
Weight (infilled) (lbs)	**87.0**
Unit Weight (infilled) (pcf)	**97.9**
Center of Gravity (in)	**6.0**

Segmental Unit Interface Shear Data:

Properties	*Ultimate Strength Criteria*	*Service State Criteria*
Minimum (lbs/ft)	**1145.0**	**1145.0**
Friction Angle (degrees)	**35.0**	**35.0**
Maximum (lbs/ft)	**2933.0**	**2933.0**

Geosynthetic Reinforcement Types and Number:

Type	*Number*	*Name*
1	**2**	**MIragrid 3XT**
2	**0**	**Miragrid 5XT**

Geosynthetics Properties: Strength and Polymer Type:	Type 1	Type 2	Type 3
Ultimate Strength (lbs/ft)	**3000.0**	**4300.0**	**N/A**
Polymer Type	**polyester**	**polyester**	**N/A**

Reduction Factors:	Type 1	Type 2	Type 3
Creep	**1.67**	**1.67**	**N/A**
Durability	**1.10**	**1.10**	**N/A**
Installation Damage	**1.25**	**1.25**	**N/A**
Overall Factor of Safety	**1.50**	**1.50**	**N/A**

Allowable Strength:	Type 1	Type 2	Type 3
Ta (lbs/ft)	**870.99**	**1248.41**	**N/A**

Coefficient of Interaction:	Type 1	Type 2	Type 3
Ci	**0.7**	**0.7**	**N/A**

Coefficient of Direct Sliding:	Type 1	Type 2	Type 3
Cds	**0.95**	**0.95**	**N/A**

Connection Strength:	Type 1	Type 2	Type 3
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**

Geosynthetic-Segmental Retaining Wall Unit Interface Shear Strength:	Type 1	Type 2	Type 3
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**

Coefficients of Earth Pressure and Failure Plane Orientations:

Reinforced Soil (Ka)	**0.309**
Reinforced Soil (Ka horizontal component)	**0.295**
Orientation of failure plane from horizontal (degrees)	**54.12**
Retained Soil (Ka)	**0.305**
Retained Soil (Ka horizontal component)	**0.274**
Orientation of failure plane from horizontal (degrees)	**52.56**

Results of External Stability Analyses:

	Calculated	*Design Criteria*
FOS Sliding	**2.55**	**1.5 OK**
FOS Overturning	**5.37**	**1.5 OK**
FOS Bearing Capacity	**6.72**	**2.0 OK**
Base Reinforcement Length (L) (ft)	**4.6**	**4.0 OK**
Base Eccentricity (e)(ft)	**0.28**	N/A
Base Eccentricity Ratio (e/L-2e)	**0.07**	N/A
Base Reinforcement Ratio (L/H)	**0.69**	**0.6 OK**

Note: calculated values MEET ALL design criteria

Detailed Results of External Stability Analyses:	*Calculated Values:*
Total Horizontal Force (lbs/ft)	**761.1**
Total Vertical Force (lbs/ft)	**3652.5**
Sliding Resistance (lbs/ft)	**1942.1**
Driving Moment (lbs-ft/ft)	**1691.3**
Resisting Moment (lbs-ft/ft)	**9078.7**
Bearing Capacity (psf)	**6066.3**
Maximum Bearing Pressure (psf)	**902.9**

Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Length (ft)*	*Anchor Length (ft) > 1.0*	*FOS Over-stress > 1.0*	*FOS Pullout > 1.5*	*FOS Sliding > 1.5*	*Layer Spacing (ft) < 3.0*
8	**1**	**4.67**	**6.0**	**1.77**	**4.25**	**1.61**	**14.42**	**OK**
4	**1**	**2.0**	**4.6**	**2.22**	**1.42**	**1.56**	**4.57**	**OK**

Note: calculated values MEET ALL design criteria

Detailed Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Allowable Strength (lbs/ft)*	*Tensile Load (lbs/ft)*	*Pullout Capacity (lbs/ft)*	*Sliding Force (lbs/ft)*	*Sliding Capacity (lbs/ft)*
8	**1**	**4.67**	**871.0**	**205.0**	**329.3**	**68.5**	**987.7**
4	**1**	**2.0**	**871.0**	**615.0**	**962.1**	**372.9**	**1704.6**

LN 99010801

Results of Facing Stability Analyses:

SRW Unit #	*Heel Elev (ft)*	*Geosynthetic Type*	*FOS Over-turning* > 1.5	*FOS Shear (peak)* > 1.5	*Shear (deformation)* < 0.02 x Hu	*FOS Connection (peak)* > 1.5	*Connection (deformation)* < 0.75 in
10	6.0	none	17.9	>99	OK	-	-
9	5.33	none	4.57	37.7	OK	-	-
8	4.67	1	2.07	7.22	OK	4.29	OK
7	4.0	none	6.17	-	-	-	-
6	3.33	none	5.87	-	-	-	-
5	2.67	none	4.98	15.73	OK	-	-
4	2.0	1	4.13	3.27	OK	1.62	OK
3	1.33	none	4.05	-	-	-	-
2	0.67	none	3.75	-	-	-	-
1	0.0	none	3.4	-	-	-	-

Note: calculated values MEET ALL design criteria

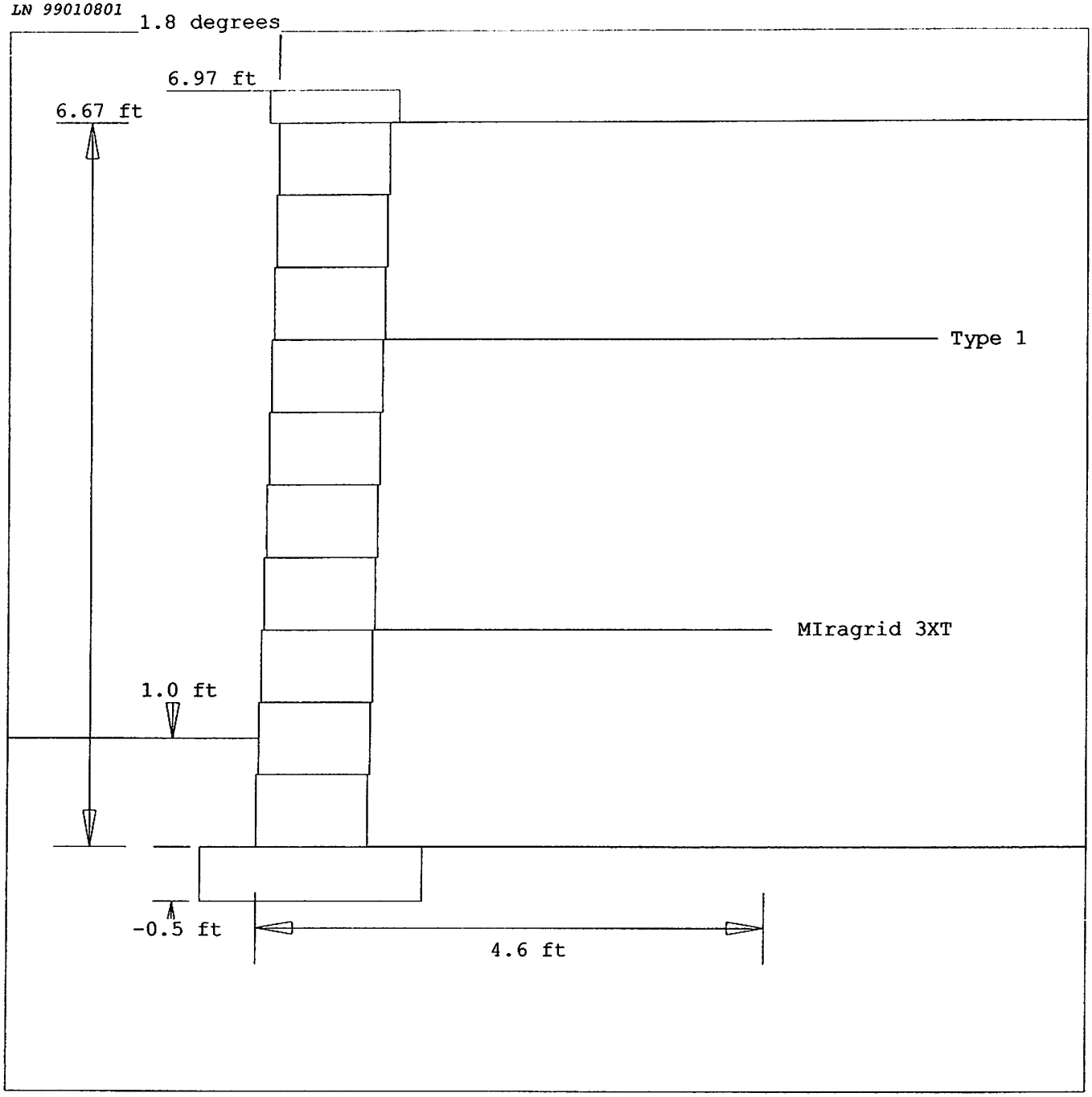
Detailed Results of Facing Stability Analyses (Moment and Shear):

SRW Unit #	*Heel Elev (ft)*	*Geo Type*	*Drive Moment (lbs-ft/ft)*	*Resist Moment (lbs-ft/ft)*	*Shear Load (lbs/ft) +out -in*	*Shear Capacity (lbs/ft) (peak)*	*Shear Capacity (lbs/ft) (deformation)*
10	6.0	none	1.8	32.6	8.2	1190.7	1190.7
9	5.33	none	14.6	66.6	32.8	1236.4	1236.4
8	4.67	1	49.2	102.0	73.8	533.1	533.1
7	4.0	none	116.6	719.3	-73.8	1327.8	1327.8
6	3.33	none	227.8	1338.0	0.0	1373.4	1373.4
5	2.67	none	393.6	1958.1	90.2	1419.1	1419.1
4	2.0	1	625.0	2579.5	196.8	643.9	643.9
3	1.33	none	932.9	3783.0	-295.2	1510.5	1510.5
2	0.67	none	1328.3	4987.8	-155.8	1556.2	1556.2
1	0.0	none	1822.1	6194.0	0.0	1601.9	1601.9

Detailed Results of Facing Stability Analyses (Connections):

SRW Unit #	*Heel Elev (ft)*	*Geo Type*	*Connection Load (lbs/ft)*	*Connection Capacity (peak) (lbs/ft)*	*Connection Capacity (deformation) (lbs/ft)*
8	4.67	1	205.0	880.2	880.2
4	2.0	1	615.0	996.4	996.4

LN 99010801



Project Identification:

Project
Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

LN 99010801

Licensed to: **Marlene Maag**
Brucker Earth Eng & Testing, Inc.
8706 Manchester Road
Brentwood, MO 63144

License Number: **99010801**

Project Identification:

Project Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

Type of Structure: **Geosynthetic-Reinforced Segmental Retaining Wall**
Design Methodology: **NCMA Method A**

Seismic Analysis Details:

Peak Ground Acceleration (PGA) ratio	**0.00**

Wall Geometry:

Design Wall Height (ft)	**8.67**
Embedment Wall Height (ft)	**1.0**
Exposed Design Wall Height (ft)	**7.67**
Vertical Wall Height including Cap Unit (ft)	**8.97**
Exposed Wall Height including Cap Unit (ft)	**7.97**
Minimum Levelling Pad Thickness (ft)	0.5
Number of Segmental Wall Units	**13**
Hinge Height (ft)	**8.67**
Wall Inclination (degrees)	**1.8**

Slopes:

Front Slope (degrees)	**horizontal**
Back Slope (degrees)	**horizontal**

Uniformly Distributed Surcharges:

Live Load Surcharge	**none**
Dead Load Surcharge	**none**

Soil Data:	*Soil Description:*	*Cohesion (psf)*	*Friction Angle (degrees)*	*Unit Weight (pcf)*
Reinforced Soil	**silty clay**	N/A	**28.0**	**125.0**
Retained Soil	**silty clay**	N/A	**28.0**	**125.0**
Levelling Pad Soil	**one-inch minus rock**	N/A	**35.0**	**135.0**
Foundation Soil	**silty clay**	**0.0**	**28.0**	**125.0**

Segmental Unit Name: **Versa-lok Square foot unit**

Segmental Unit Data:

Cap Height (in)	**3.6**
Unit Height (Hu)(in)	**8.0**
Unit Width (Wu)(in)	**12.0**
Unit Length (in)	**16.0**
Setback (in)	**0.25**
Weight (infilled) (lbs)	**87.0**
Unit Weight (infilled) (pcf)	**97.9**
Center of Gravity (in)	**6.0**

Segmental Unit Interface Shear Data:

Properties	*Ultimate Strength Criteria*	*Service State Criteria*
Minimum (lbs/ft)	**1145.0**	**1145.0**
Friction Angle (degrees)	**35.0**	**35.0**
Maximum (lbs/ft)	**2933.0**	**2933.0**

Geosynthetic Reinforcement Types and Number:

Type	*Number*	*Name*
1	**3**	**MIragrid 3XT**
2	**0**	**Miragrid 5XT**

Geosynthetics Properties:

Strength and Polymer Type:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength (lbs/ft)	**3000.0**	**4300.0**	**N/A**
Polymer Type	**polyester**	**polyester**	**N/A**

Reduction Factors:	*Type 1*	*Type 2*	*Type 3*
Creep	**1.67**	**1.67**	**N/A**
Durability	**1.10**	**1.10**	**N/A**
Installation Damage	**1.25**	**1.25**	**N/A**
Overall Factor of Safety	**1.50**	**1.50**	**N/A**

Allowable Strength:	*Type 1*	*Type 2*	*Type 3*
Ta (lbs/ft)	**870.99**	**1248.41**	**N/A**

Coefficient of Interaction:	*Type 1*	*Type 2*	*Type 3*
Ci	**0.7**	**0.7**	**N/A**

Coefficient of Direct Sliding:	*Type 1*	*Type 2*	*Type 3*
Cds	**0.95**	**0.95**	**N/A**

Connection Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**

Geosynthetic-Segmental Retaining Wall Unit Interface Shear Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**

Coefficients of Earth Pressure and Failure Plane Orientations:

Reinforced Soil (Ka)	**0.309**
Reinforced Soil (Ka horizontal component)	**0.295**
Orientation of failure plane from horizontal (degrees)	**54.12**
Retained Soil (Ka)	**0.305**
Retained Soil (Ka horizontal component)	**0.274**
Orientation of failure plane from horizontal (degrees)	**52.56**

Results of External Stability Analyses:

	Calculated	*Design Criteria*
FOS Sliding	**2.23**	**1.5 OK**
FOS Overturning	**4.1**	**1.5 OK**
FOS Bearing Capacity	**4.97**	**2.0 OK**
Base Reinforcement Length (L) (ft)	**5.2**	**5.2 OK**
Base Eccentricity (e)(ft)	**0.47**	N/A
Base Eccentricity Ratio (e/L-2e)	**0.11**	N/A
Base Reinforcement Ratio (L/H)	**0.6**	**0.6 OK**

Note: calculated values MEET ALL design criteria

Detailed Results of External Stability Analyses:	*Calculated Values:*
Total Horizontal Force (lbs/ft)	**1286.2**
Total Vertical Force (lbs/ft)	**5400.4**
Sliding Resistance (lbs/ft)	**2871.4**
Driving Moment (lbs-ft/ft)	**3715.7**
Resisting Moment (lbs-ft/ft)	**15228.4**
Bearing Capacity (psf)	**6294.6**
Maximum Bearing Pressure (psf)	**1266.6**

Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Length (ft)*	*Anchor Length (ft) > 1.0*	*FOS Over-stress > 1.0*	*FOS Pullout > 1.5*	*FOS Sliding > 1.5*	*Layer Spacing (ft) < 3.0*
11	**1**	**6.67**	**7.5**	**1.89**	**4.25**	**1.71**	**15.53**	**OK**
7	**1**	**4.0**	**5.5**	**1.73**	**1.9**	**1.64**	**5.05**	**OK**
3	**1**	**1.33**	**5.2**	**3.28**	**1.21**	**3.1**	**2.93**	**OK**

Note: calculated values MEET ALL design criteria

Detailed Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Allowable Strength (lbs/ft)*	*Tensile Load (lbs/ft)*	*Pullout Capacity (lbs/ft)*	*Sliding Force (lbs/ft)*	*Sliding Capacity (lbs/ft)*
11	**1**	**6.67**	**871.0**	**205.0**	**350.9**	**68.5**	**1063.7**
7	**1**	**4.0**	**871.0**	**459.2**	**751.7**	**372.9**	**1882.0**
3	**1**	**1.33**	**871.0**	**721.6**	**2237.5**	**920.9**	**2700.3**

LN 99010801

Results of Facing Stability Analyses:

SRW Unit #	Heel Elev (ft)	Geosynthetic Type	FOS Over-turning > 1.5	FOS Shear (peak) > 1.5	Shear (deformation) < 0.02 x Hu	FOS Connection (peak) > 1.5	Connection (deformation) < 0.75 in
13	8.0	none	17.9	>99	OK	-	-
12	7.33	none	4.57	37.7	OK	-	-
11	6.67	1	2.07	7.22	OK	4.29	OK
10	6.0	none	6.17	-	-	-	-
9	5.33	none	5.87	-	-	-	-
8	4.67	none	4.98	15.73	OK	-	-
7	4.0	1	4.13	3.27	OK	2.17	OK
6	3.33	none	4.05	-	-	-	-
5	2.67	none	3.75	-	-	-	-
4	2.0	none	3.4	10.28	OK	-	-
3	1.33	1	3.05	2.3	OK	1.54	OK
2	0.67	none	2.92	-	-	-	-
1	0.0	none	2.74	-	-	-	-

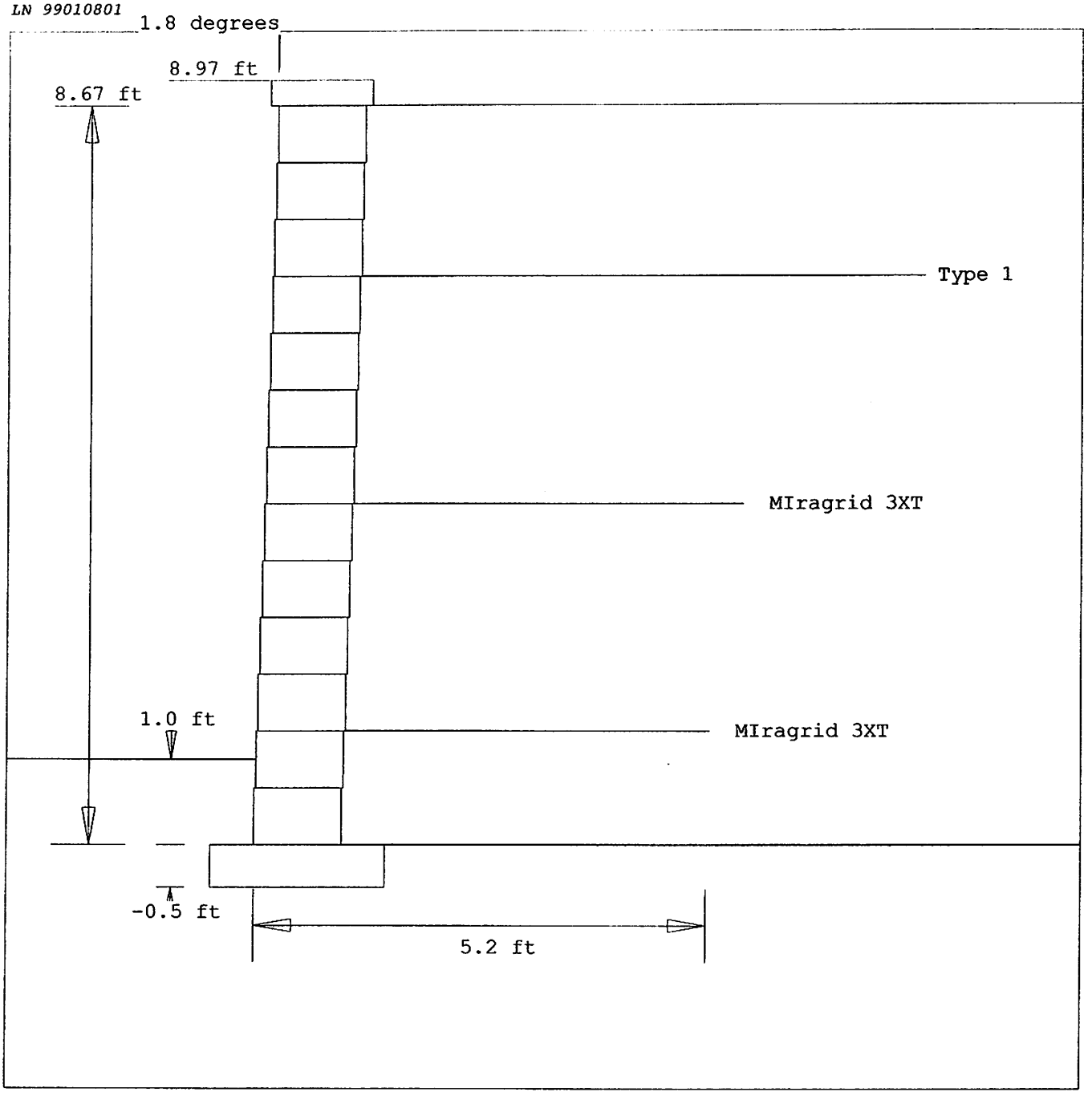
Note: calculated values MEET ALL design criteria

Detailed Results of Facing Stability Analyses (Moment and Shear):

SRW Unit #	Heel Elev (ft)	Geo Type	Drive Moment (lbs-ft/ft)	Resist Moment (lbs-ft/ft)	Shear Load (lbs/ft) +out -in	Shear Capacity (lbs/ft) (peak)	Shear Capacity (lbs/ft) (deformation)
13	8.0	none	1.8	32.6	8.2	1190.7	1190.7
12	7.33	none	14.6	66.6	32.8	1236.4	1236.4
11	6.67	1	49.2	102.0	73.8	533.1	533.1
10	6.0	none	116.6	719.3	-73.8	1327.8	1327.8
9	5.33	none	227.8	1338.0	0.0	1373.4	1373.4
8	4.67	none	393.6	1958.1	90.2	1419.1	1419.1
7	4.0	1	625.0	2579.5	196.8	643.9	643.9
6	3.33	none	932.9	3783.0	-139.4	1510.5	1510.5
5	2.67	none	1328.3	4987.8	0.0	1556.2	1556.2
4	2.0	none	1822.1	6194.0	155.8	1601.9	1601.9
3	1.33	1	2425.3	7401.5	328.0	754.7	754.7
2	0.67	none	3148.7	9191.1	-205.0	1693.3	1693.3
1	0.0	none	4003.2	10982.0	0.0	1739.0	1739.0

Detailed Results of Facing Stability Analyses (Connections):

SRW Unit #	Heel Elev (ft)	Geo Type	Connection Load (lbs/ft)	Connection Capacity (peak) (lbs/ft)	Connection Capacity (deformation) (lbs/ft)
11	6.67	1	205.0	880.2	880.2
7	4.0	1	459.2	996.4	996.4
3	1.33	1	721.6	1112.6	1112.6



Project Identification:

Project
Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

LN 99010801

Licensed to: **Marlene Maag**
Brucker Earth Eng & Testing, Inc.
8706 Manchester Road
Brentwood, MO 63144

License Number: **99010801**

Project Identification:

Project Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

Type of Structure: **Geosynthetic-Reinforced Segmental Retaining Wall**
Design Methodology: **NCMA Method A**

Seismic Analysis Details:

Peak Ground Acceleration (PGA) ratio	**0.00**

Wall Geometry:

Design Wall Height (ft)	**11.33**
Embedment Wall Height (ft)	**1.0**
Exposed Design Wall Height (ft)	**10.33**
Vertical Wall Height including Cap Unit (ft)	**11.63**
Exposed Wall Height including Cap Unit (ft)	**10.63**
Minimum Levelling Pad Thickness (ft)	0.5
Number of Segmental Wall Units	**17**
Hinge Height (ft)	**11.33**
Wall Inclination (degrees)	**1.8**

Slopes:

Front Slope (degrees)	**horizontal**
Back Slope (degrees)	**horizontal**

Uniformly Distributed Surcharges:

Live Load Surcharge	**none**
Dead Load Surcharge	**none**

Soil Data:	*Soil Description:*	*Cohesion (psf)*	*Friction Angle (degrees)*	*Unit Weight (pcf)*
Reinforced Soil	**silty clay**	N/A	**28.0**	**125.0**
Retained Soil	**silty clay**	N/A	**28.0**	**125.0**
Levelling Pad Soil	**one-inch minus rock**	N/A	**35.0**	**135.0**
Foundation Soil	**silty clay**	**0.0**	**28.0**	**125.0**

Segmental Unit Name: **Versa-lok Square foot unit**

Segmental Unit Data:

Cap Height (in)	**3.6**
Unit Height (Hu)(in)	**8.0**
Unit Width (Wu)(in)	**12.0**
Unit Length (in)	**16.0**
Setback (in)	**0.25**
Weight (infilled) (lbs)	**87.0**
Unit Weight (infilled) (pcf)	**97.9**
Center of Gravity (in)	**6.0**

Segmental Unit Interface Shear Data:

Properties	*Ultimate Strength Criteria*	*Service State Criteria*
Minimum (lbs/ft)	**1145.0**	**1145.0**
Friction Angle (degrees)	**35.0**	**35.0**
Maximum (lbs/ft)	**2933.0**	**2933.0**

Geosynthetic Reinforcement Types and Number:

Type	*Number*	*Name*
1	**4**	**MIragrid 3XT**
2	**0**	**Miragrid 5XT**

Geosynthetics Properties:

Strength and Polymer Type:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength (lbs/ft)	**3000.0**	**4300.0**	**N/A**
Polymer Type	**polyester**	**polyester**	**N/A**

Reduction Factors:	*Type 1*	*Type 2*	*Type 3*
Creep	**1.67**	**1.67**	**N/A**
Durability	**1.10**	**1.10**	**N/A**
Installation Damage	**1.25**	**1.25**	**N/A**
Overall Factor of Safety	**1.50**	**1.50**	**N/A**

Allowable Strength:	*Type 1*	*Type 2*	*Type 3*
Ta (lbs/ft)	**870.99**	**1248.41**	**N/A**

Coefficient of Interaction:	*Type 1*	*Type 2*	*Type 3*
Ci	**0.7**	**0.7**	**N/A**

Coefficient of Direct Sliding:	*Type 1*	*Type 2*	*Type 3*
Cds	**0.95**	**0.95**	**N/A**

Connection Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**793.0**	**621.0**	**N/A**
Friction Angle (degrees)	**24.0**	**18.0**	**N/A**
Maximum (lbs/ft)	**1400.0**	**1600.0**	**N/A**

Geosynthetic-Segmental Retaining Wall Unit Interface Shear Strength:	*Type 1*	*Type 2*	*Type 3*
Ultimate Strength Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**
Service State Criterion:			
Minimum (lbs/ft)	**450.0**	**450.0**	**N/A**
Friction Angle (degrees)	**23.0**	**23.0**	**N/A**
Maximum (lbs/ft)	**1300.0**	**1300.0**	**N/A**

Coefficients of Earth Pressure and Failure Plane Orientations:

Reinforced Soil (Ka)	**0.309**
Reinforced Soil (Ka horizontal component)	**0.295**
Orientation of failure plane from horizontal (degrees)	**54.12**
Retained Soil (Ka)	**0.305**
Retained Soil (Ka horizontal component)	**0.274**
Orientation of failure plane from horizontal (degrees)	**52.56**

Results of External Stability Analyses:

	Calculated	Design Criteria
FOS Sliding	**2.25**	**1.5 OK**
FOS Overturning	**4.11**	**1.5 OK**
FOS Bearing Capacity	**4.54**	**2.0 OK**
Base Reinforcement Length (L) (ft)	**6.8**	**6.8 OK**
Base Eccentricity (e)(ft)	**0.63**	N/A
Base Eccentricity Ratio (e/L-2e)	**0.11**	N/A
Base Reinforcement Ratio (L/H)	**0.6**	**0.6 OK**

Note: calculated values MEET ALL design criteria

Detailed Results of External Stability Analyses: *Calculated Values:*

Total Horizontal Force (lbs/ft)	**2199.5**
Total Vertical Force (lbs/ft)	**9323.1**
Sliding Resistance (lbs/ft)	**4957.2**
Driving Moment (lbs-ft/ft)	**8309.2**
Resisting Moment (lbs-ft/ft)	**34151.2**
Bearing Capacity (psf)	**7632.0**
Maximum Bearing Pressure (psf)	**1681.8**

Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Length (ft)*	*Anchor Length (ft)* > 1.0	*FOS Over-stress* > 1.0	*FOS Pullout* > 1.5	*FOS Sliding* > 1.5	*Layer Spacing (ft)* < 3.0
14	**1**	**8.67**	**9.0**	**2.0**	**2.95**	**1.68**	**12.62**	**OK**
10	**1**	**6.0**	**6.8**	**1.64**	**1.66**	**1.56**	**5.39**	**OK**
6	**1**	**3.33**	**6.8**	**3.49**	**1.11**	**3.3**	**3.39**	**OK**
2	**1**	**0.67**	**6.8**	**5.34**	**1.14**	**6.95**	**2.46**	**OK**

Note: calculated values MEET ALL design criteria

Detailed Results of Internal Stability Analyses:

SRW Unit #	*Geosyn Type*	*Elev (ft)*	*Allowable Strength (lbs/ft)*	*Tensile Load (lbs/ft)*	*Pullout Capacity (lbs/ft)*	*Sliding Force (lbs/ft)*	*Sliding Capacity (lbs/ft)*
14	**1**	**8.67**	**871.0**	**295.2**	**496.5**	**121.8**	**1537.0**
10	**1**	**6.0**	**871.0**	**524.8**	**816.3**	**487.1**	**2624.0**
6	**1**	**3.33**	**871.0**	**787.2**	**2598.4**	**1095.9**	**3711.1**
2	**1**	**0.67**	**871.0**	**762.6**	**5296.6**	**1948.3**	**4798.1**

LN 99010801

Results of Facing Stability Analyses:

SRW Unit #	Heel Elev (ft)	Geosynthetic Type	FOS Over-turning > 1.5	FOS Shear (peak) > 1.5	Shear (deformation) < 0.02 x Hu	FOS Connection (peak) > 1.5	Connection (deformation) < 0.75 in
17	10.67	none	17.9	>99	OK	-	-
16	10.0	none	4.57	37.7	OK	-	-
15	9.33	none	2.07	17.37	OK	-	-
14	8.67	1	1.19*	4.27	OK	3.08	OK
13	8.0	none	3.33	-	-	-	-
12	7.33	none	3.5	-	-	-	-
11	6.67	none	3.2	13.74	OK	-	-
10	6.0	1	2.81	2.93	OK	1.95	OK
9	5.33	none	2.88	-	-	-	-
8	4.67	none	2.76	-	-	-	-
7	4.0	none	2.57	9.57	OK	-	-
6	3.33	1	2.37	2.17	OK	1.45*	OK
5	2.67	none	2.31	-	-	-	-
4	2.0	none	2.21	-	-	-	-
3	1.33	none	2.09	7.7	OK	-	-
2	0.67	1	1.96	1.82	OK	1.65	OK
1	0.0	none	1.9	-	-	-	-

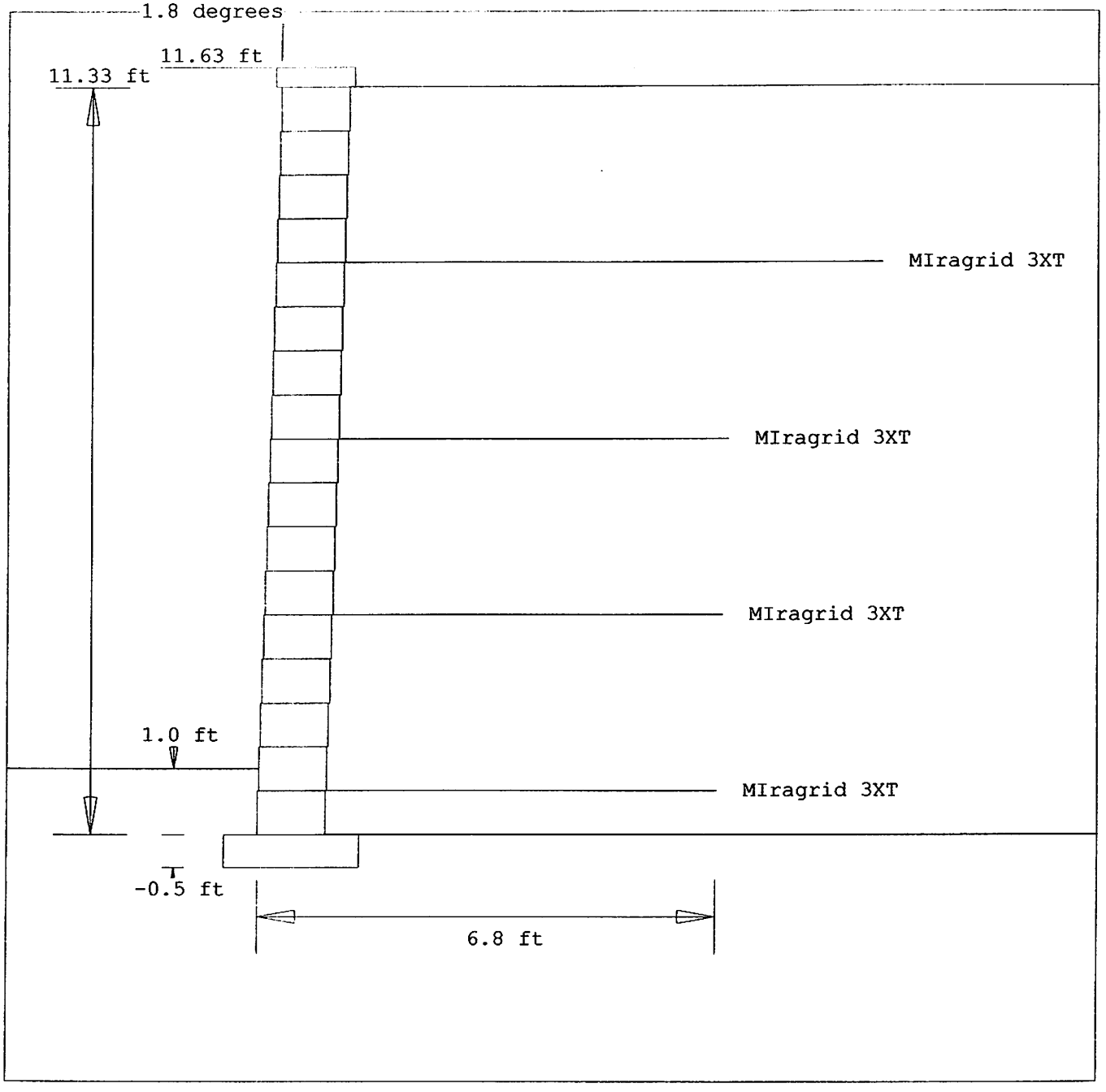
Note: * value does NOT MEET design criterion (2 occurrences)

Detailed Results of Facing Stability Analyses (Moment and Shear):

SRW Unit #	Heel Elev (ft)	Geo Type	Drive Moment (lbs-ft/ft)	Resist Moment (lbs-ft/ft)	Shear Load (lbs/ft) +out -in	Shear Capacity (lbs/ft) (peak)	Shear Capacity (lbs/ft) (deformation)
17	10.67	none	1.8	32.6	8.2	1190.7	1190.7
16	10.0	none	14.6	66.6	32.8	1236.4	1236.4
15	9.33	none	49.2	101.9	73.8	1282.1	1282.1
14	8.67	1	116.6	138.7	131.2	560.8	560.8
13	8.0	none	227.8	757.4	-90.2	1373.4	1373.4
12	7.33	none	393.6	1377.4	0.0	1419.1	1419.1
11	6.67	none	625.0	1998.9	106.6	1464.8	1464.8
10	6.0	1	932.9	2621.7	229.6	671.6	671.6
9	5.33	none	1328.3	3826.5	-155.8	1556.2	1556.2
8	4.67	none	1822.1	5032.7	0.0	1601.9	1601.9
7	4.0	none	2425.3	6240.2	172.2	1647.6	1647.6
6	3.33	1	3148.7	7449.1	360.8	782.4	782.4
5	2.67	none	4003.2	9240.0	-221.4	1739.0	1739.0
4	2.0	none	5000.0	11032.3	0.0	1784.6	1784.6
3	1.33	none	6149.7	12825.9	237.8	1830.3	1830.3
2	0.67	1	7463.5	14620.9	492.0	893.2	893.2
1	0.0	none	8952.2	16997.9	0.0	1921.7	1921.7

Detailed Results of Facing Stability Analyses (Connections):

SRW Unit #	Heel Elev (ft)	Geo Type	Connection Load (lbs/ft)	Connection Capacity (peak) (lbs/ft)	Connection Capacity (deformation) (lbs/ft)
14	8.67	1	295.2	909.2	909.2
10	6.0	1	524.8	1025.4	1025.4
6	3.33	1	787.2	1141.6	1141.6
2	0.67	1	762.6	1257.8	1257.8



Project Identification:

Project
Name: **Kingsmill Crossing**
Section: **detention basin**
Data Sheet:

Owner:
Client: **Walmar Investments**

Prepared by: **mdmaag**
Date: **April 24 2006**
Time: **06:28:43 AM**

Data file: **c:\program files\srwall32\kingsmill**

Missouri
Department
of Transportation

MoDOT

Ed Hassinger, District Engineer

St. Louis Metro District
1590 Woodlake Drive
Chesterfield, MO 63017-5712
(314) 340-4100
Fax (314) 340-4119
www.modot.org
Toll free 1-888 ASK MoDOT

January 5, 2006

Mr. Gary Wilson
Zavradinos Professional Services, Inc.
17813 Edison Avenue, Suite 201
Chesterfield, MO 63005

Dear Mr. Wilson:

We have reviewed your revised plans for the Kingsmill development along Route K at Crusher Drive, in St. Charles County. Your plan is acceptable, as proposed, and a permit will be issued from this office. We will contact the applicant when the permit is ready to be issued.

Please forward two copies of your plans with the revision date of January 4, 2006, along with a copy in the form of a PDF file on a CD-ROM, to this office for our records.

The permit will be prepared, awaiting confirmation from the property owner of his general contractor and bonding information.

Should you have any questions concerning this matter, please feel free to contact me at (314) 340-4334.

Sincerely,

Scotty D. Ward
Senior Traffic Technician

Copy: Mr. Bob Heckman

P/092/K