HYDRAULIC ANALYSIS - PEMBERWICK ROAD - GREENWICH, CT

PEMBERWICK ROAD - EXISTING CONDITIONS MDP - 4/1/09

SPLIT FLOW ANALYSIS (ORIFICE): 10-YEAR STORM

Q_{total} [cfs] =	5.9977

PRIMARY

D_1 [in] =	12
C_1 =	0.82
I_1 =	77.93

SECONDARY

D_2 [in] =	12
C_2 =	0.82
I_2 =	78.02

$Q_{total} = [C_1*A_1*(2g(\triangle H+(I_2-I_1)))^{1/2}]+[C_2*A_2*(2g(\triangle H))^{1/2}]$

USE MS EXCEL SOLVER TO GET $\triangle H$

Q_{total} [cfs] =	5.9977
$\triangle H$ [ft] =	0.2932

$Q_{primary}$ [cfs] =	3.1993	
$Q_{secondary}$ [cfs] =	2.7984	
Q_{total} [cfs] =	5.9977	OKAY

Greenwich, CT **Existing Pipes - Byram River Watershed - Pemberwick Road - 10-Year** MDP - 4/22/09

Pipe I.D.	Design Notes	Pipe Length (ft)	Approx. Slope (ft/ft) (min= 0.005)	10-Yr Storm Peak Rate of Runoff (cfs)	Pipe Diam (in) Existing	*n* (exist 0.015 new 0.013)	Manning's Pipe Velocity (fps)	Manning's Pipe Capacity (cfs)	Sufficient Capacity (Manning's)	Orifice's Pipe Velocity (fps)	Orifice's Pipe Capacity (cfs)	Sufficient Capacity (Orifice)	Watershed Areas contributing to the flow in the pipe	DS Cover	US Cover	DS Invert	US Invert	DS Ground Elev	US Ground Elev
	Notation	L	S		D	*n*	V_m	Q_m		V_o	Q_o					ID	IU		
	Equation Used		(1)				(2)**	(3)**		(4)*	(5)*								
26679	Q from split	123	0.0042	3.2	12	0.015	2.6	2.0	no	7.8	6.2	Qm	5	1.50	0.92	77.41	77.93	79.91	79.85
26680	neg. slope, use actual head	95	0.0000	4.1	12	0.015	0.1	0.1	no	8.1	6.3	Qm	4 & 5	1.00	1.58	77.63	77.63	79.63	79.91
26686		87	0.0190	4.8	12	0.015	5.4	4.3	no	8.1	6.3	Qm	3->5	1.00	1.08	75.90	77.55	77.90	79.63
26685		126	0.0140	3.0	12	0.015	4.7	3.7	yes	7.8	6.2	Qm	1	0.92	1.25	75.98	77.75	77.90	80.00
26687	**OUTFALL**	45	0.0238	9.5	12	0.015	6.1	4.8	no	4.7	3.7	no	1->5	0.00	1.33	74.50	75.57	75.50	77.90
26647		126	0.0945	1.2	12	0.015	12.1	9.5	yes	7.4	5.8	Qm	5	0.75	0.75	81.51	93.42	83.26	95.17
26648		132	0.0268	2.4	12	0.015	6.4	5.1	yes	7.8	6.2	Qm	3->5	1.00	0.92	77.80	81.34	79.80	83.26
26649	Q from split	129	0.0017	2.8	12	0.015	1.6	1.3	no	7.6	6.0	Qm	1	1.00	0.83	77.80	78.02	79.80	79.85
26678	**OUTFALL** - velocity	39	0.0803	7.4	12	0.015	11.1	8.7	yes	4.7	3.7	no	1->5	0.00	1.17	74.50	77.63	75.50	79.80

* Portion of Split at CB-26629

User Input =	
HMS Results =	
Calculated =	
Velocity > 10 fps; OR <3 fps =	

Equations Used:

(1) S = (IU-ID)/L

(2) V_m = (1.486/n)*((D/48)^(2/3))*(S^0.5)

(3) Q_m= Vm*A

(4) V_o = Q_o/A

(5) Q_o = c_d*A*((2*g*h)^0.5)

*When V_m > 10 fps then Q_o will be checked for capacity under orifice equation.

**When Vm < 10 fps then only Q_m and V_m should be used.

HYDRAULIC ANALYSIS - BUENA VISTA DRIVE - GREENWICH, CT

BUENA VISTA - EXISTING CONDITIONS MDP - 5/27/09

SPLIT FLOW ANALYSIS (ORIFICE): 10-YEAR STORM

Q_{total} [cfs] =	67.958

PRIMARY

D_1 [in] =	12
C_1 =	0.82
I_1 =	95.93

SECONDARY

D_2 [in] =	24
C_2 =	0.82
I_2 =	96.33

$Q_{total} = [C_1*A_1*(2g(\triangle H+(I_2-I_1)))^{1/2}]+[C_2*A_2*(2g(\triangle H))^{1/2}]$

USE MS EXCEL SOLVER TO GET $\triangle H$

Q_{total} [cfs] =	67.9580
$\triangle H$ [ft] =	6.8368

$Q_{primary}$ [cfs] =	13.9034	
$Q_{secondary}$ [cfs] =	54.0546	
Q_{total} [cfs] =	67.9580	OKAY

Greenwich, CT **Existing Pipes - Byram River Watershed - Buena Vista Drive - 10-Year** MDP - 5/27/09

Pipe I.D.	Design Notes	Pipe Length (ft)	Approx. Slope (ft/ft) (min= 0.005)	10-Yr Storm Peak Rate of Runoff (cfs)	Pipe Diam (in) Existing	*n* (exist 0.015 new 0.013)	Manning 's Pipe Velocity (fps)	Manning's Pipe Capacity (cfs)	Sufficient Capacity (Manning's)	Orifice's Pipe Velocity (fps)	Orifice's Pipe Capacity (cfs)	Sufficient Capacity (Orifice)	Watershed Areas contributing to the flow in the pipe	DS Cover	US Cover	DS Invert	US Invert	DS Ground Elev	US Ground Elev
	Notation	L	S		D	*n*	V_m	Q_m			V_o	Q_o					ID	IU	
	Equation Used		(1)				(2)**	(3)**			(4)*	(5)*							
26133		365	0.0056	48.4	24	0.015	4.7	14.7	no	11.4	35.8	no	9->11	5.17	4.33	111.62	113.67	118.79	120.00
26134	neg slope/disjointed pipes	157	0.0001	53.0	12	0.015	0.4	0.3	no	8.1	6.3	no	9->12	1.00	6.25	114.00	111.54	116.00	118.79
25574		65	0.0446	58.9	24	0.015	13.2	41.4	no	8.8	27.7	no	9->13	2.80	0.80	110.30	113.20	115.10	116.00
25575		96	0.0039	58.9	24	0.015	3.9	12.2	no	10.7	33.8	no	9->13	1.67	2.90	109.83	110.20	113.50	115.10
25577		61	0.0066	62.5	24	0.015	5.1	15.9	no	10.9	34.3	no	9->14	2.15	1.75	109.35	109.75	113.50	113.50
2295		100	0.0045	62.5	8	0.015	2.0	0.7	no	11.1	3.9	no	9->14	2.53	3.58	108.80	109.25	112.00	113.50
no name	outfall to CB	60	0.0065	62.5	8	0.015	2.4	0.8	no	3.8	1.3	no	9->14	0.00	2.63	108.31	108.70	108.98	112.00
25579		29	0.0183	68.0	12	0.015	5.3	4.2	no	9.3	7.3	no	9->15	1.57	1.50	104.78	105.31	107.35	107.81
25580		18	0.0028	68.0	18	0.015	2.7	4.8	no	9.1	16.1	no	9->15	1.17	1.17	104.63	104.68	107.30	107.35
25581	splits	55	0.1436	68.0	24	0.015	23.7	74.3	yes	8.1	25.3	no	9->15	0.50	0.77	96.63	104.53	99.13	107.30
2300	primary	11	0.0391	13.9	12	0.015	7.8	6.1	no	4.7	3.7	no	9->15	0.00	2.20	95.50	95.93	96.50	99.13
no name	secondary	35	0.0237	54.1	24	0.015	9.6	30.2	no	6.6	20.7	no	9->15	0.00	0.80	95.50	96.33	97.50	99.13

User Input =	
HMS Results =	
Calculated =	
Velocity > 10 fps; OR <3 fps =	

Equations Used:

(1) $S = (IU-ID)/L$

(2) $V_m = (1.486/n)*((D/48)^{(2/3)})*(S^{0.5})$

(3) $Q_m = Vm*A$

(4) $V_o = Q_o/A$

(5) $Q_o = c_d*A*((2*g*h)^{0.5})$

*When V_m > 10 fps then Q_o will be checked for capacity under orifice equation.

**When Vm < 10 fps then only Q_m and V_m should be used.