Balance Flow between Catch basin outlet & Ex. weir outlet for Existing Lake on hole # 8 : (10 YR) 1/

$AC = (8.20 Ac)(0.30) + 19.75 Ac = 22.21 Ac.$

℄ FROM 48" STM @ STA 51+00, Tylers Place Blvd.

Time of Concentration = 57.7 + 0.3 = 58.0 Min ← FROM Tylers Place Strm Calcs

$Q_{10} = (22.21 Ac)\left(\frac{170}{58.0+23}\right) = 46.61$ cfs

Normal Pool Elev. = 876.20

Outlet Structures : 1) CB-2-2A, 2-2' wide window @ 876.20
2) Ex. 12' wide weir @ 876.20

$$Q_{10} = CL_1 H_1^{3/2} + CL_2 H_2^{3/2} \rightarrow H_1 = H_2$$

$$Q_{10} = H^{3/2}(CL_1 + CL_2)$$

$$H_{10} = \left(\frac{Q_{10}}{CL_1 + CL_2}\right)^{2/3}$$

$$H_{10} = \left(\frac{46.61 \text{ cfs}}{(3.0)(4') + (3.0)(12')}\right)^{2/3} = 0.98'$$ 10 YR Elev. = 876.20 + 0.98' = 877.1

$Q_{\text{thru CB}} = (3.0)(4')(0.93')^{3/2} = 11.64$ cfs

$Q_{\text{thru Weir}} = (3.0)(12')(0.95')^{3/2} = 34.93$ cfs

Check 100YR Elevation: (ignore CB outlet, pipe designed for 10YR only)

$Q_{100} = (22.21\,Ac)\left(\frac{300}{58.0+31}\right) = \underline{74.87\ cfs}$

$$H = \left(\frac{74.87\,cfs - 11.44\,cfs}{(3.0)(12')}\right)^{2/3} = 1.46'$$

100 YEAR Elev. = 876.20 + 1.46' = 877.66. Ok

Design Outlet for Small Lake (100 YEAR FREQUENCY):

Outlet = CB-2-6 w 4/4' wide windows @ 867.50

$$Q_{100} = (115.90\ cfs - 38.73\ cfs) + (74.87\ cfs - 11.64\ cfs) + (1.24)\left(\frac{300}{58.9+31}\right) = 144.5\ cfs$$

$$H_{100} = \left(\frac{144.54\ cfs}{(3.0)(24')}\right)^{2/3} = 1.59'$$

100 YR Elev. = 867.50 + 1.59' = 869.09 ok

bayer-becker engineers
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STORM SEWERS

Project: _____

Formulae Used:
Qr=ACi (required)
$Vp=\frac{1.486}{n} R^{2/3} S^{1/2}$
Qp=ApVp

Designed by: JSD
Reviewed by: _____
Date: 6/22/96
Sheet: _____
Job # 96t001

LOCATION			TOPOGRAPHY				AC Accumulate	TIME			Intensity (Inches/Hour) 10 Year Storm	Qr c.f.s. REQUIRED	DESIGN				Qp c.f.s. PROVIDED	TIMEp		REMARKS
STREET	From	To	Area #	Acres	"C" Value	AC for Area		To Inlet "T" (Minutes)	In Pipe Tp (Minutes)	Concentration "T" (Minutes)			Pipe Size (Inches)	"n" Value	Slope in %	Velocity (ft./sec)		Length	In Pipe Tp (Minutes)	$i_{10}=\frac{170}{t_c+23}$
			1	0.87	0.39	0.34	0.34	10.0	-	10.0	5.15	1.75	12"	0.016	0.50%	2.61	2.05	124'		
Ex. 18" STM / Tylers Place Sta. 47+30			MH	-	-	-	0.93	11.2	0.5	11.7	4.90	4.55	18"	0.014	1.50%	5.92	10.45	185'	0.5	
			2	0.22	0.45	0.10	1.03	11.7	0.5	12.2	4.83	4.97	18"	0.014	0.50%	6.30	11.13	80'	0.4	
			3	0.29	0.82	0.24	1.61	12.2	0.4	12.6	4.78	7.70	18"	0.016	1.00%	4.83	8.53	96'	0.3	
ADD 11.64 cfs from	Area #	4	4	—	—	—	—	57.7	0.3	58.0	2.10	11.64	21"	0.016	1.00%	5.35	12.87	162	0.5	
			MH	-	-	-	—	58.0	0.5	58.5	2.09	11.64	21"	0.016	1.00%	5.35	12.87	63'	0.2	
			5	0.17	0.84	0.14	0.14	58.5	0.2	58.7	2.08	0.29+11.64 = 11.93	21"	0.016	1.30%	6.10	14.68	87'	0.2	
			MH	—	—	—	1.75	58.7	0.2	58.9	2.08	3.63+11.64 = 15.27	24"	0.016	2.70%	9.61	30.20	118'	0.2	

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STORM SEWERS

Project: WETHERINGTON 14

Formulae Used:
Qr=ACi (required)
$Vp=\frac{1.486}{n} R^{2/3} S^{1/2}$
Qp=ApVp

Designed by: JSD
Reviewed by:
Date: 6/21/96
Sheet:
Job # 96k001

LOCATION			TOPOGRAPHY				AC Accumulate	TIME			Intensity (Inches/Hour) 10 Year Storm	Qr c.f.s. REQUIRED	DESIGN				Qp c.f.s. PROVIDED	TIMEp		REMARKS
STREET	From	To	Area #	Acres	"C" Value	AC for Area		To Inlet "T" (Minutes)	In Pipe Tp (Minutes)	Concentration "T" (Minutes)			Pipe Size (Inches)	"n" Value	Slope in %	Velocity (ft./sec)		Length	In Pipe Tp (Minutes)	$t_{10}=\frac{170}{tc+23}$
			10	2.10	0.30	0.63	0.63	13.5	—	13.5	4.66	2.93+35.53 = 38.46	36"	0.016	0.60%	5.94	41.98	162'	0.4	
			MH	—	—	—	0.19	10.4	0.2	10.6	5.06	0.96	12"	0.016	4.40%	7.73	6.07	86'		
			11	0.45	0.33	0.15	0.97	13.5	0.4	13.9	4.61	4.46+35.53 = 40.00	36"	0.016	0.60%	5.94	41.98	129'	0.4	
			12	0.42	0.44	0.18	1.15	13.9	0.4	14.3	4.56	5.24+35.53 = 40.77	36"	0.016	1.00%	7.67	54.19	50'	0.1	
			13	0.12	0.84	0.10	1.25	14.3	0.1	14.4	4.55	5.68+35.53 = 41.21	36"	0.016	0.70%	6.41	45.34	123'	0.3	
			14	0.82	0.71	0.58	0.58	10.0	—	10.0	5.15	2.99	12"	0.016	2.00%	5.21	4.09	119'		
			15	0.61	0.73	0.45	2.28	14.4	0.3	14.7	4.51	10.28+35.53 = 45.81	36"	0.016	0.80%	6.85	48.47	137'	0.3	
			16	0.51	0.70	0.36	2.64	14.7	0.3	15.0	4.47	11.81+35.53 = 47.34	36"	0.016	1.00%	7.67	54.19	118'	0.3	
		→	17	1.30	0.48	0.62	3.26	15.0	0.3	15.3	4.44	14.47+35.53 = 50.00	36"	0.016	0.95%	7.47	52.82	85'	0.2	
			MH	—	—	—	3.26	15.3	0.2	15.5	4.42	14.39+35.53 = 49.92	36"	0.016	0.95%	7.47	52.82	302'		

100 YR: Check Elevation:

Trial #1: Q thru middle weir @ 870.00 = (3.0)(10')(1.50')$^{3/2}$ = 55.11 cfs

$$H_{100} = \left(\frac{115.90\text{ cfs} - 55.11 - 38.73}{(3.0)(33')}\right)^{2/3} = 0.37'$$ Recycle

Trial #2: Q thru middle weir @ 869.92 = (3.0)(10')(1.42')$^{3/2}$ = 50.76 cfs

$$H_{100} = \left(\frac{115.90 - 50.76 - 38.73}{(3.0)(33')}\right)^{2/3} = 0.41'$$ Recycle

Trial #3: Q thru middle weir @ 869.96 = (3.0)(10')(1.46')$^{3/2}$ = 52.92 cfs

$$H_{100} = \left(\frac{115.90 - 52.92 - 38.73}{(3.0)(33')}\right)^{2/3} = 0.39'$$ Recycle

Trial #4: Q thru middle weir @ 869.94 = (3.0)(10')(1.44')$^{3/2}$ = 51.84 cfs

$$H_{100} = \left(\frac{115.90 - 52.92 - 38.73}{(3.0)(33')}\right)^{2/3} = 0.39'$$ ok

100 YEAR = 869.55 + 0.39' = 869.94 ok

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STORM SEWERS

Project: Wetherington Section 14

Formulae Used:
Qr=ACi (required)
$Vp=\frac{1.486}{n} R^{2/3} S^{1/2}$
Qp=ApVp

Designed by: JSD
Reviewed by:
Date: 6-13-96
Sheet:
Job # 96k001

LOCATION			TOPOGRAPHY				AC Accumulate	TIME			Intensity (Inches/Hour) 10 Year Storm	Qr c.f.s. REQUIRED	DESIGN				Qp c.f.s. PROVIDED	TIMEp		REMARKS
STREET	From	To	Area #	Acres	"C" Value	AC for Area		To Inlet "T" (Minutes)	In Pipe Tip (Minutes)	Concentration "t" (Minutes)			Pipe Size (Inches)	"n" Value	Slope in %	Velocity (ft./sec)		Length	In Pipe Tp (Minutes)	$i_{10}=\frac{170}{t_c+23}$
			1	0.34	0.39	0.34	0.34	10.0	-	10.0	5.15	1.75	12"	0.016	0.50%	2.61	2.05	~~124'~~		
Ex. 13'STM/Tylers Place	3rd St	47+30	MH	-	-	-	0.73	11.2	0.5	11.7	4.90	4.55	18"	0.016	1.50%	5.92	10.45	133'	0.5	
			2	0.22	0.45	0.10	1.03	11.7	0.5	12.2	4.33	4.97	18"	0.016	0.50%	6.30	11.13	80'	0.4	
			3	0.29	0.82	0.24	1.61	12.2	0.4	12.6	4.78	7.70	18"	0.016	1.00%	4.83	8.53	96'	0.3	
ADD AC=9.75 FROM 43" STM @ STA 5400 Tylers Place Blvd.			4	8.20	0.30	2.46	22.21	57.7	0.3	58.0	2.10	46.67	36"	0.016	0.80%	6.86	48.47	162'	0.4	
			MH	-	-	-	22.21	58.0	0.4	58.4	2.09	46.38	36"	0.016	0.80%	6.86	48.47	63'	0.2	
			5	0.17	0.84	0.14	22.35	58.4	0.2	58.6	2.08	46.56	36"	0.016	0.80%	6.86	~~48.47~~	75'	0.2	
			~~MH~~	-	-	-	23.96	58.6	0.2	58.8	2.08	49.79	36"	0.016	2.20%	11.37	80.38	120'	0.2	
			Ex.CB	-	-	-	1.71	11.0	0.3	11.3	4.96	8.47	18"	0.016	1.25%	5.40	9.54	72'	0.2	
			MH	-	-	-	1.71	11.3	0.2	11.5	4.93	8.43	18"	0.016	1.25%	5.40	9.54	53'	0.2	
			6	0.30	0.95	0.14	1.85	11.5	0.2	11.7	4.90	9.06	21"	0.016	0.60%	4.15	9.97	135'	0.5	
			7	0.22	0.77	0.17	0.17	10.0	-	10.0	5.15	0.88	12"	0.016	2.00%	5.21	4.09	53'		
			8	0.42	0.56	0.24	2.26	11.7	0.5	12.2	4.83	10.91	24"	0.016	0.50%	4.14	13.00	171'	0.7	
ADD 34.93cfs from Area #4			18	0.48	0.48	0.23	0.23	57.7	0.3	58.0	2.10	0.48+34.93 = 35.41	30"	0.016	1.50%	8.32	40.82	133'	0.3	
			19	1.33	0.58	0.80	1.03	58.0	0.3	58.3	2.09	2.15+34.93 = 37.08	30"	0.016	3.50%	12.70	62.35	50'	0.1	
			MH	-	-	-	1.03	58.3	0.1	58.4	2.09	2.15+34.93 = 37.08	30"	0.016	3.30%	12.33	60.54	47'	0.1	
Add Q=69.35 From Other Lakes			20	0.50	0.42	0.21	0.21	58.9	0	58.9	2.08	0.44+69.35 = 69.79	60"x46"	0.016	2.10%	14.38	224.27	38'	0	100YR = 144.54 cfs
			9	1.64	0.80	1.31	3.50	58.9	0	58.9	2.08	7.26+69.35 = 76.61	60"x46"	0.016	1.10%	10.40	162.32	118'		100YR = 144.54cfs

Design Outlets for Large Lake:

Calculate 10 & 100 YEAR Flowrates to Lake:

$AC = (2.10)(0.3) + 1.75 + 26.07 = 28.45$ Ac.

Time of Concentration = 59.1 min

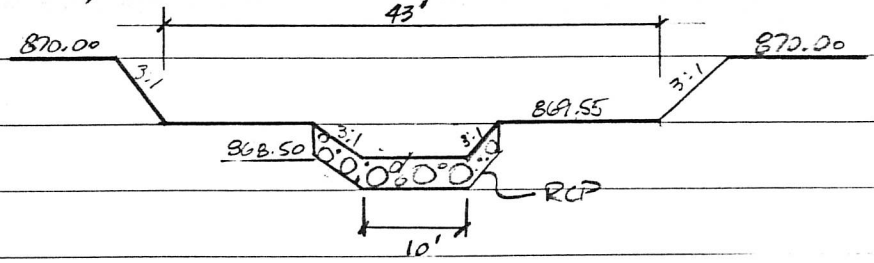
$Q_{10} = (28.45\text{Ac.})\left(\frac{170}{59.1+23}\right) + 11.64\text{cfs} = \underline{70.55\text{ cfs}}$

(11.64 cfs: portion of flow from Hole 8 Lake catch Basin ($Q = CLH^{3/2}$))

$Q_{100} = (28.45\text{Ac.})\left(\frac{300}{59.1+31}\right) + 21.17\text{ cfs} = \underline{115.90\text{ cfs}}$

Outlet Structures: 1) CB-2-4 w/3-4' wide windows @ 868.5

2) Weir as shown below:



10 YEAR =

$Q_{10} = CL_1H_1^{3/2} + CL_2H_2^{3/2} \rightarrow H_1 = H_2$

$Q_{10} = H^{3/2}(CL_1 + CL_2)$

$H_{10} = \left(\frac{Q_{10}}{CL_1+CL_2}\right)^{2/3} = \left(\frac{70.55\text{ cfs}}{(3.0)(12')+(3.0)(10')}\right)^{2/3} = 1.05'$

10 YEAR Elev. = 868.50 + 1.05' = 869.55 ok

$Q_{\text{thru CB}} = (3.0)(12')(1.05')^{3/2} = \underline{38.73\text{ cfs} \cong 38.46\text{ cfs}}$ ok

$Q_{\text{thru Weir}} = (3.0)(10')(1.05')^{3/2} = \underline{32.27\text{ cfs}}$