

Design Point	Storm Event	C f	C	I (in/hr)	A (ac)	Q (cfs)
1	10-yr	1.00	0.35	6.89	6.15	14.83
2	10-yr	1.00	0.35	6.89	4.21	10.15
3	10-yr	1.00	0.80	6.89	1.58	8.71
4	10-yr	1.00	0.50	6.89	2.45	8.44
5	10-yr	1.00	0.50	6.89	3.85	13.26
6	10-yr	1.00	0.50	6.89	2.66	9.16
7	10-yr	1.00	0.50	6.89	1.22	4.20
8	10-yr	1.00	0.35	6.89	4.55	10.97
9	10-yr	1.00	0.50	6.89	4.55	15.67
10	10-yr	1.00	0.25	6.89	4.84	8.34
11	10-yr	1.00	0.35	6.89	4.57	11.02
12	10-yr	1.00	0.50	6.89	5.86	20.19
13	10-yr	1.00	0.25	6.89	3.50	6.03
14	10-yr	1.00	0.50	6.89	2.28	7.85
15	10-yr	1.00	0.25	6.89	5.18	8.92
16	10-yr	1.00	0.40	6.89	4.13	11.38
17	10-yr	1.00	0.35	6.89	2.80	6.75
18	10-yr	1.00	0.35	6.89	3.69	8.90
19	10-yr	1.00	0.35	6.89	3.09	7.45
20	10-yr	1.00	0.35	6.89	2.02	4.87
21	10-yr	1.00	0.50	6.89	1.84	6.34
22	10-yr	1.00	0.50	6.89	0.70	2.41
23	10-yr	1.00	0.50	6.89	2.15	7.41
24	10-yr	1.10	0.90	6.89	1.03	7.03
1	100-yr	1.00	0.35	11.87	6.15	25.55
2	100-yr	1.00	0.35	11.87	4.21	17.49
3	100-yr	1.00	0.80	11.87	1.58	15.00
4	100-yr	1.00	0.50	11.87	2.45	14.54
5	100-yr	1.00	0.50	11.87	3.85	22.85
6	100-yr	1.00	0.50	11.87	2.66	15.79
7	100-yr	1.00	0.50	11.87	1.22	7.24
8	100-yr	1.00	0.35	11.87	4.55	18.90
9	100-yr	1.00	0.50	11.87	4.55	27.00
10	100-yr	1.00	0.25	11.87	4.84	14.36
11	100-yr	1.00	0.35	11.87	4.57	18.99
12	100-yr	1.00	0.50	11.87	5.86	34.78
13	100-yr	1.00	0.25	11.87	3.50	10.39
14	100-yr	1.00	0.50	11.87	2.28	13.53
15	100-yr	1.00	0.25	11.87	5.18	15.37
16	100-yr	1.00	0.40	11.87	4.13	19.61
17	100-yr	1.00	0.35	11.87	2.80	11.63
18	100-yr	1.00	0.35	11.87	3.69	15.33
19	100-yr	1.00	0.35	11.87	3.09	12.84
20	100-yr	1.00	0.35	11.87	2.02	8.39
21	100-yr	1.00	0.50	11.87	1.84	10.92
22	100-yr	1.00	0.50	11.87	0.70	4.15
23	100-yr	1.00	0.50	11.87	2.15	12.76
24	100-yr	1.10	0.90	11.87	1.03	12.10

Water Quality Volume Calculations										
	Area	% Impervious, I	Runoff Coefficient, C	Volumetric Runoff Coefficient, Rv	Water Quality Volume, WQv	Filter Bed Depth (df)	Coefficient of Permeability, k	Average height of water above filter bed, hf	Design Filter Bed Drain Time, tf	Ponding Surface Area, Af
Area	ac	%	-	-	ft3	ft	ft/day	ft	days	ft2
3	1.58	0.70	0.80	0.0563	484.35	4.39	10.00	0.25	0.50	91.65
4	2.45	0.70	0.50	0.0563	751.06	4.39	10.00	0.25	0.50	142.12
6	2.66	0.50	0.50	0.0545	789.36	4.39	10.00	0.25	0.50	149.37
8	4.21	0.35	0.35	0.05315	1218.38	4.39	10.00	0.25	0.50	230.55
11	4.57	0.35	0.35	0.05315	1322.57	4.39	10.00	0.25	0.50	250.26
12	4.80	0.50	0.50	0.0545	1424.41	4.39	10.00	0.25	0.50	269.53
14	3.34	0.50	0.50	0.0545	991.15	4.39	10.00	0.25	0.50	187.55
16	4.13	0.50	0.40	0.0545	1225.59	4.39	10.00	0.25	0.50	231.91

Department of
Park and Recreation



City of Dallas
Texas

scale:
dsnd: BMB
drawn: CZH
approved:

ELM FORK ATHLETIC COMPLEX

for
City of Dallas
Park and Recreation Department



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

Issued for Bid

DECEMBER 20, 2010

HYDRAULIC GRADE LINE CALCULATIONS
COINCIDENTAL PEAKING: 100-YEAR ELM FORK, 10-YEAR LOCAL FLOWS

Manhole or Inlet		Distance between Manhole or Inlet	Drainage Area			Coefficient of Runoff "Kc"	Incremental "KCA"	Accumulated "KCA"	Time of Concentration					Design Frequency (EF Local)	Intensity	Total "Q"	By Pass	Discharge "Q"	Selected Size of Pipe	Selected Size of Box		Flow depth	Flow Area	Slope of Frictional Gradient "S"	Head Loss at Change in Section							Hydraulic Gradient Elevation		HGL at Design Point	Ground Elevations		Notes
From	To		Increment Area		Total Area				Time at Upstream Station	Flow Time in Sewer	Total Time	Width	Height							V ₁	V ₂				V ₂ ²	V ₁ ²	Description of Junction	K _j	H _j	Upstream	Downstream	From	To				
Design Point	Design Point		No.	Area	Total Area																														ft	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	25	26	27	28	29	30	31	32	33	34	35	36		
SD LINE "A"																																					
10+19.96	9+88.42	31.54	14	5.86	5.86	0.65	3.81	3.81	15.00	0.08	15.08	00-10	5.59	21.29	0.00	21.29	24			2	3.14	0.0089	0.00	6.78	0.71	0.00	22.50	1.25	0.89	434.84	434.56	435.73			Inlet		
9+88.42	8+41.05	147.37		0.00	5.86		0.00	3.81	15.08	0.36	15.44	00-10	5.59	21.29	0.00	21.29	24			2	3.14	0.0089	6.78	6.78	0.71	0.71	45.00	0.25	0.18	434.38	433.07	434.56			Bend		
8+41.05	7+25.08	115.97	Line C;12	4.80	10.66	0.65	3.12	6.93	15.44	0.35	15.79	00-10	5.59	38.73	0.00	38.73	36			3	7.07	0.0034	6.78	5.48	0.47	0.71	wye/Lince C	0.50	0.36	432.71	432.32	433.07			4' SDMH; Line C		
7+25.08	4+75.08	250.00		0.00	10.66		0.00	6.93	15.79	0.76	16.55	00-10	5.59	38.73	0.00	38.73	36			3	7.07	0.0034	5.48	5.48	0.47	0.47	22.50	0.20	0.09	432.22	431.37	432.32			Bend		
4+75.08	4+10.36	64.72	Line B;16	4.13	14.79	0.65	2.68	9.61	16.55	0.14	16.69	00-10	5.59	53.74	0.00	53.74	36			3	7.07	0.0065	5.48	7.60	0.90	0.47	wye	0.25	0.78	430.59	430.17	431.37			Wye; Line B		
4+10.36	1+89.21	221.15		0.00	14.79		0.00	9.61	16.69	0.48	17.18	00-10	5.59	53.74	0.00	53.74	36			3	7.07	0.0065	7.60	7.60	0.90	0.90	22.50	0.20	0.18	429.99	428.55	430.17			Bend		
1+89.21	1+71.37	17.84		0.00	14.79	0.65	0.00	9.61	17.18	0.04	17.22	00-10	5.59	53.74	0.00	53.74	36			3	7.07	0.0065	7.60	7.60	0.90	0.90	45.00	0.25	0.22	428.32	428.20	428.55			Bend		
1+71.37	1+61.00	10.37	Lat D=1; 24; Line	9.81	24.60	0.70	6.87	16.48	17.22	0.02	17.24	00-10	5.59	92.13	0.00	92.13	48			4	12.57	0.0041	7.60	7.33	0.83	0.90	wye	0.75	0.16	428.04	428.00	428.20			6' SDMH; Lat D=1, Line D, Line E Starting HGL from 100-yr WSEL in channel; Outfall submerged		
SD LINE "B"																																					
3+52.01	1+00.00	252.01	16	4.13	4.13	0.65	2.68	2.68	15.00	1.37	16.37	00-10	5.59	15.01	0.00	15.01	30			2.5	4.91	0.0013	0.00	3.06	0.15	0.00	inlet	1.25	0.18	431.71	431.37	431.89			4' SDMH		
SD LINE "C"																																					
1+53.54	1+21.55	31.99	12	2.28	2.28	0.65	1.48	1.48	15.00	0.20	15.20	00-10	5.59	8.28	0.00	8.28	24			2	3.14	0.0014	0.00	2.64	0.11	0.00	inlet	1.25	0.11	433.19	433.15	433.30			Inlet		
1+21.55	1+16.55	5.00		0.00	2.28		0.00	1.48	15.20	0.03	15.23	00-10	5.59	8.28	0.00	8.28	24			2	3.14	0.0014	2.64	2.64	0.11	0.11	22.50	0.25	0.03	433.12	433.11	433.15			Bend		
1+16.55	1+00.00	16.55		0.00	2.28		0.00	1.48	15.23	0.10	15.34	00-10	5.59	8.28	0.00	8.28	24			2	3.14	0.0014	2.64	2.64	0.11	0.11	45.00	0.25	0.03	433.09	433.07	433.11			Bend		
SD LINE "D"																																					
5+39.72	2+77.66	262.06	8	4.21	4.21	0.65	2.74	2.74	15.00	0.53	15.53	00-10	5.59	15.30	0.00	15.30	24			1.21	1.98	0.0100	0.00	8.20	1.04	0.00	inlet	1.25	1.04	436.33	433.21	437.37			Inlet; Partial Flow		
2+77.66	1+17.80	159.86	11	4.57	8.78		0.00	2.74	15.53	1.23	16.76	00-10	5.59	15.30	0.00	15.30	36			3	7.07	0.0005	8.20	2.16	0.07	1.04	22.50	0.20	0.21	428.29	428.20	428.50			SDMH Drop; Used pipe FL SDMH; Line A;		
SD LINE "E"																																					
SD LINE "F"																																					
6+32.29	5+89.63	42.66	6	3.34	3.34	0.65	2.17	2.17	15.00	0.18	15.18	00-10	5.59	12.14	0.00	12.14	24			2	3.14	0.0029	0.00	3.86	0.23	0.00	inlet	1.25	0.23	439.39	439.27	439.63			Inlet; Partial Flow		
5+89.63	4+68.35	121.28		0.00	3.34		0.00	2.17	15.18	0.52	15.71	00-10	5.59	12.14	0.00	12.14	24			2	3.14	0.0029	3.86	3.86	0.23	0.23	45.00	0.25	0.06	439.21	438.86	439.27			Bend; Partial Flow		
4+68.35	3+23.53	144.82	3	1.58	4.92	0.65	1.03	3.20	15.71	0.42	16.13	00-10	5.59	17.88	0.00	17.88	24			2	3.14	0.0063	3.86	5.69	0.50	0.23	inlet	0.75	0.33	438.53	437.62	438.86			Inlet; Line G; Partial Flow		
3+23.53	1+00.00	223.53		0.00	4.92		0.00	3.20	16.13	0.37	16.50	00-10	5.59	17.88	0.00	17.88	24			1.51	2.55	0.0150	5.69	10.01	1.56	0.50	SDMH	0.25	0.13	437.49	432.63	437.62			4' SDMH; Partial Flow		
SD LINE "G"																																					
1+62.33	1+26.34	35.99	3	1.58	1.58	0.65	1.03	1.03	15.00	0.74	15.74	00-10	5.59	5.74	0.00	5.74	36			3	7.07	0.0001	0.00	0.81	0.01	0.00	inlet	1.25	0.01	438.89	438.89	438.90			Inlet;		
1+26.34	1+00.00	26.34		0.00	1.58		0.00	1.03	15.74	0.24	15.98	00-10	5.59	5.74	0.00	5.74	24			2	3.14	0.0006	0.81	1.83	0.05	0.01	inlet	0.75	0.01	438.88	438.86	438.89			Bend; Partial Flow		
SD LINE "H"																																					
5+48.20	3+20.42	227.78	4	2.45	2.45	0.65	1.59	1.59	15.00	0.75	15.75	00-10	5.59	8.90	0.00	8.90	18			1.5	1.77	0.0073	0.00	5.04	0.39	0.00	90.00	1.25	0.39	437.45	435.80	437.84			Inlet; 90 Bend;		
3+20.42	1+00.00	220.42		0.00	2.45		0.00	1.59	15.75	0.47	16.22	00-10	5.59	8.90	0.00	8.90	18			1.22	1.14	0.0149	5.04	7.84	0.95	0.39	SDMH	0.75	0.30	435.50	432.22	435.80			4' SDMH ; Partial Flow		
LAT "D-1"																																					
1+50.98	1+00.00	50.98	24	1.03	1.03	0.80	0.82	0.82	15.00	0.04	15.04	00-10	5.59	4.61	0.00	4.61	24			0.28	0.27	0.2366	0.00	19.27	5.77	0.00	inlet	1.25	5.77	435.34	441.11	441.11			Inlet; 90 Bend; Partial Flow		

Department of
Park and Recreation



City of Dallas
Texas

scale:
dsnd: BMB
drawn: CZH
approved:

ELM FORK ATHLETIC COMPLEX

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Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

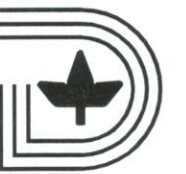
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DECEMBER 20, 2010

DRAINAGE AND
WATER QUALITY
CALCULATIONS
C-7 of 50

HYDRAULIC GRADE LINE COMPUTATIONS
COINCIDENTAL PEAKING: 10-YEAR ELM FORK, 100-YEAR LOCAL FLOWS

Manhole or Inlet		Distance between Manhole or Inlet	Drainage Area			Coefficient of Runoff "Kc"	Incremental "KCA"	Accumulated "KCA"	Time of Concentration			Design Frequency	Intensity	Total "Q"	By Pass	Discharge "Q"	Selected Size of Pipe	Selected Size of Box		Flow depth	Flow Area	Slope of Frictional Gradient Sf	Head Loss at Change in Section						Hydraulic Gradient Elevation		HGL at Design Point	Ground Elevations		Notes	
From	To		Increment Area		Total Area				Time at Upstream Station	Flow Time in Sewer	Total Time							Width	Height				V ₁	V ₂	V ₂ ²	V ₁ ²	Description of Junction	K _j	H _j	Upstream m		Downstream m	From		To
Design Point	Design Point		No.	Area																															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
SD LINE "A"																																			
10+19.96	9+88.42		14	5.86	5.86	0.65	3.81	3.81	15.00	0.05	15.05	0-100	7.99	30.43		30.43	24			2	3.14	0.0183	0.00	9.69	1.46	0.00	22.50	1.25	1.82	436.50	435.93	438.33			Inlet
9+88.42	8+41.05	31.54		0.00	5.86		0.00	3.81	15.05	0.25	15.31	0-100	7.99	30.43	0.00	30.43	24			2	3.14	0.0183	9.69	9.69	1.46	1.46	45.00	0.25	0.36	435.56	432.87	435.93			Bend
8+41.05	7+25.08	147.37	Line C;12	4.80	10.66	0.65	3.12	6.93	15.31	0.25	15.55	0-100	7.99	55.36	0.00	55.36	36			3	7.07	0.0069	9.69	7.83	0.95	1.46	wye/Lince C	0.50	0.73	432.14	431.34	432.87			4' SDMH; Line C
7+25.08	4+75.08	115.97		0.00	10.66		0.00	6.93	15.55	0.53	16.09	0-100	7.99	55.36	0.00	55.36	36			3	7.07	0.0069	7.83	7.83	0.95	0.95	22.50	0.20	0.19	431.15	431.34	431.34			Bend
4+75.08	4+10.36	250.00	Line B;16	4.13	14.79	0.65	2.68	9.61	16.09	0.10	16.19	0-100	7.99	76.81	0.00	76.81	36			3	7.07	0.0133	7.83	10.87	1.83	0.95	wye	0.75	1.12	428.30	429.42	429.42			Wye; Line B
4+10.36	1+89.21	64.72		0.00	14.79		0.00	9.61	16.19	0.34	16.53	0-100	7.99	76.81	0.00	76.81	36			3	7.07	0.0133	10.87	10.87	1.83	1.83	22.50	0.20	0.37	427.07	427.43	427.43			Bend
1+89.21	1+71.37	221.15		0.00	14.79	0.65	0.00	9.61	16.53	0.03	16.55	0-100	7.99	76.81	0.00	76.81	36			3	7.07	0.0133	10.87	10.87	1.83	1.83	45.00	0.25	0.46	423.66	424.11	424.11			Bend
1+71.37	1+61.00	17.84	Lat D=1; 24; Line	9.81	24.60	0.70	6.87	16.48	16.55	0.02	16.57	0-100	7.99	131.68	0.00	131.68	48			4	12.57	0.0084	10.87	10.48	1.71	1.83	wye	0.75	0.33	423.09	423.42	423.42			6' SDMH; Lat D=1, Line D; Line Starting HGL from 100-yr WSEL in channel; Outfall submerged
		10.37												0.00																423.00					
SD LINE "B"																																			
3+52.01	1+00.00	252.01	16	4.13	4.13	0.65	2.68	2.68	15.00	0.96	15.96	00-100	7.99	21.45		21.45	30			2.5	4.91	0.0028	0.00	4.37	0.30	0.00	inlet	0.25	0.07	430.11	429.42	430.18			4' SDMH
SD LINE "C"																																			
1+53.54	1+21.55	31.99	12	2.28	2.28	0.65	1.48	1.48	15.00	0.14	15.14	0-100	7.99	11.84	0.00	11.84	24			2	3.14	0.0028	0.00	3.77	0.22	0.00	inlet	1.25	0.22	433.13	433.04	433.35			Inlet
1+21.55	1+16.55	5.00		0.00	2.28		0.00	1.48	15.14	0.02	15.16	0-100	7.99	11.84	0.00	11.84	24			2	3.14	0.0028	3.77	3.77	0.22	0.22	22.50	0.25	0.06	432.99	432.97	433.04			Bend
1+16.55	1+00.00	16.55		0.00	2.28		0.00	1.48	15.16	0.07	15.24	0-100	7.99	11.84	0.00	11.84	24			2	3.14	0.0028	3.77	3.77	0.22	0.22	45.00	0.25	0.06	432.92	432.87	432.97			Bend
SD LINE "D"																																			
5+39.72	2+27.66	312.06	8	4.21	4.21	0.65	2.74	2.74	15.00	0.63	15.63	0-100	7.99	21.86	0.00	21.86	24			1.21	1.98	0.0100	0.00	8.20	1.04	0.00	inlet	1.25	1.04	436.33	433.21	437.37			Inlet; Partial Flow
2+27.66	1+17.80	109.86	11	4.57	8.78		0.00	2.74	15.63	0.59	16.23	0-100	7.99	21.86	0.00	21.86	36			3	7.07	0.0011	8.20	3.09	0.15	1.04	22.50	0.20	0.21	423.21	423.09	423.42			SDMH Drop; Used pipe FL SDMH; Line A;
SD LINE "E"																																			
SD LINE "F"																																			
6+32.29	5+89.63	42.66	6	3.34	3.34	0.65	2.17	2.17	15.00	0.13	15.13	0-100	7.99	17.35	0.00	17.35	24			2	3.14	0.0059	0.00	5.52	0.47	0.00	inlet	1.25	0.47	441.38	441.12	441.85			Inlet; Partial Flow
5+89.63	4+68.35	121.28		0.00	3.34		0.00	2.17	15.13	0.37	15.49	0-100	7.99	17.35	0.00	17.35	24			2	3.14	0.0059	5.52	5.52	0.47	0.47	45.00	0.25	0.12	441.01	440.29	441.12			Bend; Partial Flow
4+68.35	3+23.53	144.82	3	1.58	4.92	0.65	1.03	3.20	15.49	0.30	15.79	0-100	7.99	25.55	0.00	25.55	24			2	3.14	0.0129	5.52	8.13	1.03	0.47	inlet	0.75	0.67	439.61	437.75	440.29			Inlet; Line G; Partial Flow
3+23.53	1+00.00	223.53		0.00	4.92		0.00	3.20	15.79	0.37	16.16	0-100	7.99	25.55	0.00	25.55	24			1.51	2.55	0.0150	8.13	10.01	1.56	1.03	SDMH	0.25	0.26	437.49	432.63	437.75			4' SDMH; Partial Flow
SD LINE "G"																																			
1+62.33	1+26.34	35.99	3	1.58	1.58	0.65	1.03	1.03	15.00	0.52	15.52	100	7.99	8.21	0.00	8.21	36			3	7.07	0.0002	0.00	1.16	0.02	0.00	inlet	1.25	0.02	440.34	440.34	440.36			Inlet;
1+26.34	1+00.00	26.34		0.00	1.58		0.00	1.03	15.52	0.17	15.68	0-100	7.99	8.21	0.00	8.21	24			2	3.14	0.0013	1.16	2.61	0.11	0.02	inlet	0.75	0.02	440.32	440.29	440.34			Bend; Partial Flow
SD LINE "H"																																			
5+48.20	3+20.42	227.78	4	2.45	2.45	0.65	1.59	1.59	15.00	0.53	15.53	00-100	7.99	12.72	0.00	12.72	18			1.5	1.77	0.0148	0.00	7.20	0.81	0.00	90.00	1.25	0.81	439.08	435.70	439.89			Inlet; 90 Bend;
3+20.42	1+00.00	220.42		0.00	2.45		0.00	1.59	15.53	0.44	15.97	00-100	7.99	12.72	0.00	12.72	18			1.22	1.54	0.0149	7.20	8.27	1.06	0.81	SDMH	0.25	0.20	435.50	432.22	435.70			4' SDMH ; Partial Flow
LAT "D-1"																																			
1+50.98	1+00.00	50.98	24	1.03	1.03	0.80	0.82	0.82	15.00	0.04	15.04	00-100	7.99	6.58	0.00	6.58	24			0.28	0.27	0.2366	0.00	19.27	5.77	0.00	inlet	1.25	5.77	435.34	423.37	441.11			Inlet; 90 Bend; Partial Flow

Department of
Park and Recreation



City of Dallas
Texas

scale:
dsnd: BMB
drawn: CZH
approved:

ELM FORK ATHLETIC COMPLEX

for
City of Dallas
Park and Recreation Department



Freese and Nichols, Inc.
Texas Registered Engineering Firm F-2144

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DECEMBER 20, 2010

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