Home Depot West Wichita Drainage Report

Introduction:

The purpose of this drainage report was to determine if stormwater detention would be required on the proposed Home Depot site in west Wichita, KS. The report was performed according to standard City of Wichita procedures for calculating stormwater runoff for a 100-year storm.

Site Information:

The site is located in the Carriage House Plaza 2nd Addition, north of west Kellogg (U.S. 54) and east of Tyler Road in west Wichita. The property includes approximately 24 acres, which is currently undeveloped. Storm and sanitary sewer lines have been constructed through this property. The storm sewer includes a 10'x7' reinforced concrete box (RCB) which runs from north to south through the middle of the property. This box carries drainage from this site and from land to the north. This 10'x7' RCB is the main focus of this report.

Drainage Basin:

The drainage area for the 10'x7' RCB includes approximately 186 acres. Land uses for this area include 144 acres of single family housing, 16.5 acres of light commercial development, and 25.5 acres of undeveloped land.

Existing Conditions:

The volume of runoff for existing conditions was calculated based on the rational method for a point at the southeast corner of the drainage area. The flow at this point for a 100-year storm is 438 cfs. The capacity of the 10'x7' RCB at this point is 411 cfs. Therefore, the runoff has exceeded the box capacity for a 100-year storm with the current conditions.

Detention:

According to City of Wichita policies, stormwater detention will be required with any future development on this site. Detention is required if the existing stormwater sewer is not large enough to handle runoff from the site under fully developed conditions. As discussed above, the existing 10'x7' RCB is not large enough to handle runoff under existing conditions, not to mention developed conditions.

Since the entire 186 acre drainage area north of the site drains into the 10'x7' RCB, the ability of this system to function properly depends on the adequacy of the RCB. Therefore, instead of focusing on only the 24 acre site, the detention calculations were based on the 186 acre drainage area.

Runoff calculations were based on a 60 minute time of concentration, which is the time of concentration for the entire drainage area. The runoff generated using the rational method for the 24 acres in an undeveloped state is 57 cfs. Runoff generated by the same 24 acres in developed state will be 73 cfs.

Runoff from the buildings and parking areas to the north of the buildings is calculated at 33 cfs. This is based on 10 acres, with a time of concentration of 60 minutes. Based on preliminary calculations, a detention pond covering approximately 20,000 sq. ft. with a depth of 4 ft. would be adequate for detaining 33 cfs. This pond could be located in the northeast corner, as shown in site plan C1-e. The pond shown is very close to 20,000 sq. ft. The detention pond will drain through an 18" pipe running from the pond to the 10'x7' RCB. At the time of peak runoff, the flow through this pipe will be 15 cfs. (Calculations are shown in Appendix 1)

By draining 33 cfs into the pond, and only allowing 15 cfs into the 10'x7' RCB at the time of peak runoff, 18 cfs is detained. This is greater than the 15 cfs increase caused by development of this 24 acre site. The remaining runoff from the site would be allowed to drain to the south side of the property and enter the 10'x7' RCB through a stormwater sewer system without detention.

Conclusions:

The 10'x7' RCB is not adequate for the 100-year storm under current conditions. Therefore, any future development in this drainage basin will require stormwater detention according to City of Wichita policies. Subject to the City's approval, a detention pond of approximately 20,000 sq. ft., 4 ft. deep in the northeast corner of the property should be adequate. This report is a preliminary analysis of the drainage for the 24 acre site. A design of an on-site stormwater sewer system and detention pond will need to be performed as part of the site development package.

Appendix 1:
DETENTION POND DESIGN
18" OUTFALL PIPE

TIME MIN.	TOTAL RUNOFF CU. FT.	PREV. DISCHAR. CU. FT.	POND VOLUME CU. FT.	DEPTH FT.	INCR. DISCHAR. CU. FT.	TOTAL DISCHAR. CU. FT.	STORAGE CU. FT.	INTENSITY IN./HR.	WSEL	FLOW CFS
1	3979.8	0	3979.8	0.2	12	12	3967.8	7.37	134.2	0.2
2	7959.6	12	7947.6	0.4	60	36	7923.6	7.37	134.3962	0.6
3	11939.4	36	11903.4	0.6	90	126	11813.4	7.37	134.5907	1.5
4	15919.2	126	15793.2	0.8	152	278	15641.2	7.37	134.7821	2.5
5	19899	278	19621	1	243.6	521.6	19377.4	7.37	134.9689	4.05
6	23878.8	521.6	23357.2	1.19	300	821.6	23057.2	7.37	135.1529	5
7	27858.6	821.6	27037	1.39	348	[illegible]	26689	7.37	135.3345	5.8
8	31838.4	1169.6	30668.8	1.533	451.755	[illegible]	30217.05	7.37	135.5109	7.529249
9	35818.2	1621.355	34196.85	1.71	500.0345	2121.389	33696.81	7.37	135.6848	8.333909
10	39798	2121.389	37676.61	1.884	543.4682	2664.858	37133.14	7.37	135.8567	9.057803
11	43777.8	2664.858	41112.94	2.056	583.1939	3248.052	40529.75	7.37	136.0265	9.719898
12	47757.6	3248.052	44509.55	2.225	619.9638	3868.015	43889.58	7.37	136.1945	10.33273
13	51737.4	3868.015	[illegible]	2.393	654.3059	4522.321	47215.08	7.37	136.3608	10.9051
14	55717.2	4522.321	51194.88	2.56	686.6076	5208.929	50508.27	7.37	136.5254	11.44346
15	59697	5208.929	54488.07	2.724	717.1632	5926.092	53770.91	7.37	136.6885	11.95272
16	62035.2	5926.092	56109.11	2.805	731.7354	6657.827	55377.37	7.18	136.7689	12.19559
17	64260	6657.827	57602.17	2.88	744.3051	7402.733	56857.27	7.00	136.8429	12.41508
18	66484.8	7402.733	59082.07	2.954	757.7327	8160.465	58324.33	6.84	136.9162	12.62868
19	68536.8	8160.465	60376.33	3.019	768.7759	8929.241	59607.56	6.68	136.9804	12.81293
20	70524	[illegible]	61594.76	3.08	779.0289	9708.27	60815.73	6.53	137.0408	12.98382
21	72462.6	9708.27	62754.33	3.138	788.6629	10496.93	61965.67	6.39	137.0983	13.14438
22	74368.8	10496.93	63871.87	3.194	797.8376	11294.77	63074.03	6.26	137.1537	13.29729
23	76134.6	11294.77	64839.83	3.242	805.6999	12100.47	64034.13	6.13	137.2017	13.42833
24	77889.6	12100.47	65789.13	3.289	813.3368	12913.81	64975.79	6.01	137.2488	13.55561
25	79650	12913.81	66736.19	3.337	820.8849	13734.69	65915.31	5.90	137.2958	13.68142
26	81291.6	13734.69	67556.91	3.378	827.3704	14562.06	66729.54	5.79	137.3365	13.78951
27	82960.2	14562.06	68398.14	3.42	833.9655	15396.03	67564.17	5.69	137.3782	13.89943
28	84520.8	15396.03	69124.77	3.456	839.6206	16235.65	68285.15	5.59	137.4143	13.99368
29	85973.4	16235.65	69737.75	3.487	844.3617	17080.01	68893.39	5.49	137.4447	14.0727
30	87480	17080.01	70399.99	3.52	849.4541	17929.46	69550.54	5.40	137.4775	14.15757
31	89056.8	17929.46	71127.34	3.556	855.0121	18784.48	70272.32	5.32	137.5136	14.2502
32	90201.6	18784.48	71417.12	3.571	857.2165	19641.69	70559.91	5.22	137.528	14.28694
33	91594.8	19641.69	71953.11	3.598	861.2788	20502.97	71091.83	5.14	137.5546	14.35465
34	93085.2	20502.97	72582.23	3.629	866.0227	21368.99	71716.21	5.07	137.5858	14.43371
35	94500	21368.99	73131.01	3.657	870.1397	22239.13	72260.87	5.00	137.613	14.50233
36	95839.2	22239.13	73600.07	3.68	873.6432	23112.78	72726.42	4.93	137.6363	14.56072
37	97102.8	23112.78	73990.02	3.7	876.5452	23989.32	73113.48	4.86	137.6557	14.60909
38	98290.8	23989.32	74301.48	3.715	878.8562	24868.18	73422.62	4.79	137.6711	14.6476
39	99613.8	24868.18	74745.62	3.737	882.1412	25750.32	73863.48	4.73	137.6932	14.70235
40	100656	25750.32	74905.68	3.745	883.322	26633.64	74022.36	4.66	137.7011	14.72203
41	101844	26633.64	75210.36	3.761	885.5654	27519.21	74324.79	4.60	137.7162	14.75942
42	102967.2	27519.21	75447.99	3.772	887.3113	28406.52	74560.68	4.54	137.728	14.78852
43	104257.8	28406.52	75851.28	3.793	890.2663	29296.79	74961.01	4.49	137.7481	14.83777
44	105258.8	29296.79	75960.01	3.798	891.0613	30187.85	75068.95	4.43	137.7534	14.85102
45	106434	30187.85	76246.15	3.812	893.1501	31081	75353	4.38	137.7677	14.88584
46	107557.2	31081	76476.2	3.824	894.826	31975.82	75581.38	4.33	137.7791	14.91377
47	108626.4	31975.82	76650.58	3.833	896.0941	32871.92	75754.48	4.28	137.7877	14.9349
48	109641.6	32871.92	76769.68	3.838	896.9593	33768.88	75872.72	4.23	137.7936	14.94932
49	110602.8	33768.88	76833.92	3.842	897.4256	34666.3	75936.5	4.18	137.7968	14.95709
50	111510	34666.3	76843.7	3.842	897.4965	35563.8	75946.2	4.13	137.7973	14.95828
51	112638.6	35563.8	77074.8	3.854	899.1719	36462.97	76175.63	4.09	137.8088	14.9862
52	113724	36462.97	77261.03	3.863	900.5197	37363.49	76360.51	4.05	137.818	15.00866
53	114480	37363.49	77116.51	3.856	899.4739	38262.96	76217.04	4.00	137.8109	14.99123
54	115473.6	38262.96	77210.64	3.861	900.1552	39163.12	76310.48	3.96	137.8155	15.00259
55	116424	39163.12	77260.88	3.863	900.5186	40063.64	76360.36	3.92	137.818	15.00864
56	117331.2	40063.64	77267.56	3.863	900.5669	40964.2	76367	3.88	137.8183	15.00945
57	118195.2	40964.2	77231	3.862	900.3024	41864.51	76330.69	3.84	137.8165	15.00504
58	119329.2	41864.51	77464.69	3.873	901.9913	42766.5	76562.7	3.81	137.8281	15.03319
59	120112.2	42766.5	77345.7	3.867	901.1318	43667.63	76444.57	3.77	137.8222	15.01886
60	120852	43667.63	77184.37	3.859	899.9651	44567.59	76284.41	3.73	137.8142	14.99942
61	[illegible]	44567.59	77310.41	3.866	900.8767	45468.47	76409.53	3.70	137.8205	15.01461
62	122871.6	45468.47	77403.13	3.87	901.5467	46370.02	76501.58	3.67	137.8251	15.02578
63	123492.6	46370.02	77122.58	3.856	899.5179	47269.54	76223.06	3.63	137.8112	14.99196
64	124416	47269.54	77146.46	3.857	899.6908	48169.23	76246.77	3.6	137.8123	14.99485
65	125307	48169.23	77137.77	3.857	899.6279	49068.85	76238.15	3.57	137.8119	14.9938
66	126165.6	49068.85	77096.75	3.855	899.3308	49968.19	76197.41	3.54	137.8099	14.98885
67	126991.8	49968.19	77023.61	3.851	898.8011	50866.99	76124.81	3.51	137.8062	14.98002
68	127785.6	50866.99	76918.61	3.846	898.04	51765.03	76020.57	3.48	137.801	14.96733
69	128547	51765.03	76781.97	3.839	897.0485	52662.08	75884.92	3.45	137.7942	14.95081
70	129276	52662.08	76613.92	3.831	895.8277	53557.9	75718.1	3.42	137.7859	14.93046
71	129972.6	53557.9	76414.7	3.821	894.3782	54452.28	75520.32	3.39	137.776	14.9063
72	130636.8	54452.28	76184.52	3.809	892.7006	55344.98	75291.82	3.36	137.7646	14.87834
73	131662.8	55344.98	76317.82	3.816	893.6725	56238.65	75424.15	3.34	137.7712	14.89454
74	132267.6	56238.65	76028.95	3.801	891.5649	57130.22	75137.38	3.31	137.7569	14.85942
75	133245	57130.22	76114.78	3.803	892.1917	58022.41	75222.59	3.29	137.7611	14.86986
76	133790.4	58022.41	75767.99	3.788	889.6568	58912.07	74878.33	3.26	137.7439	14.82761
77	134719.2	58912.07	75807.13	3.79	889.9432	59802.01	74917.19	3.24	137.7459	14.83239
78	135626.4	59802.01	75824.39	3.791	890.0695	60692.08	74934.32	3.22	137.7467	14.83449
79	136085.4	60692.08	75393.32	3.77	886.9099	61578.99	74506.41	3.19	137.7253	14.78183
80	136512	61578.99	74933.01	3.747	883.5235	62462.51	74049.49	3.16	137.7025	14.72539
81	136906.2	62462.51	74443.69	3.722	879.9093	63342.42	73563.78	3.13	137.6782	14.66516
82	137268	63342.42	73925.58	3.696	876.0663	64218.49	73049.51	3.10	137.6525	14.6011
83	137597.4	64218.49	73378.91	3.669	871.9931	65090.48	72506.92	3.07	137.6253	14.53322
84	137894.4	65090.48	72803.92	3.64	867.6882	65958.17	71936.23	3.04	137.5968	14.46147
85	138159	65958.17	72200.83	3.61	863.1499	66821.32	71337.68	3.01	137.5669	14.38583
86	138855.6	66821.32	72034.28	3.602	861.8924	67683.21	71172.39	2.99	137.5586	14.36487
87	139060.8	67683.21	71377.59	3.569	856.9161	68540.13	70520.67	2.96	137.526	14.28193
88	139233.6	68540.13	70693.47	3.535	851.7011	69391.83	69841.77	2.93	137.4921	14.19502
89	139854.6	69391.83	70462.77	3.523	849.9352	70241.77	69612.83	2.91	137.4806	14.16559
90	139968	70241.77	69726.23	3.486	844.2729	71086.04	68881.96	2.88	137.4441	14.07121

98022 Home Depot West | Time of Conc. | 3-12-98 DK

Assume 500' Overland Flow @ 0.5% slope: V= 0.20 ft/sec

500 ft / .20 ft/sec = 2500 sec

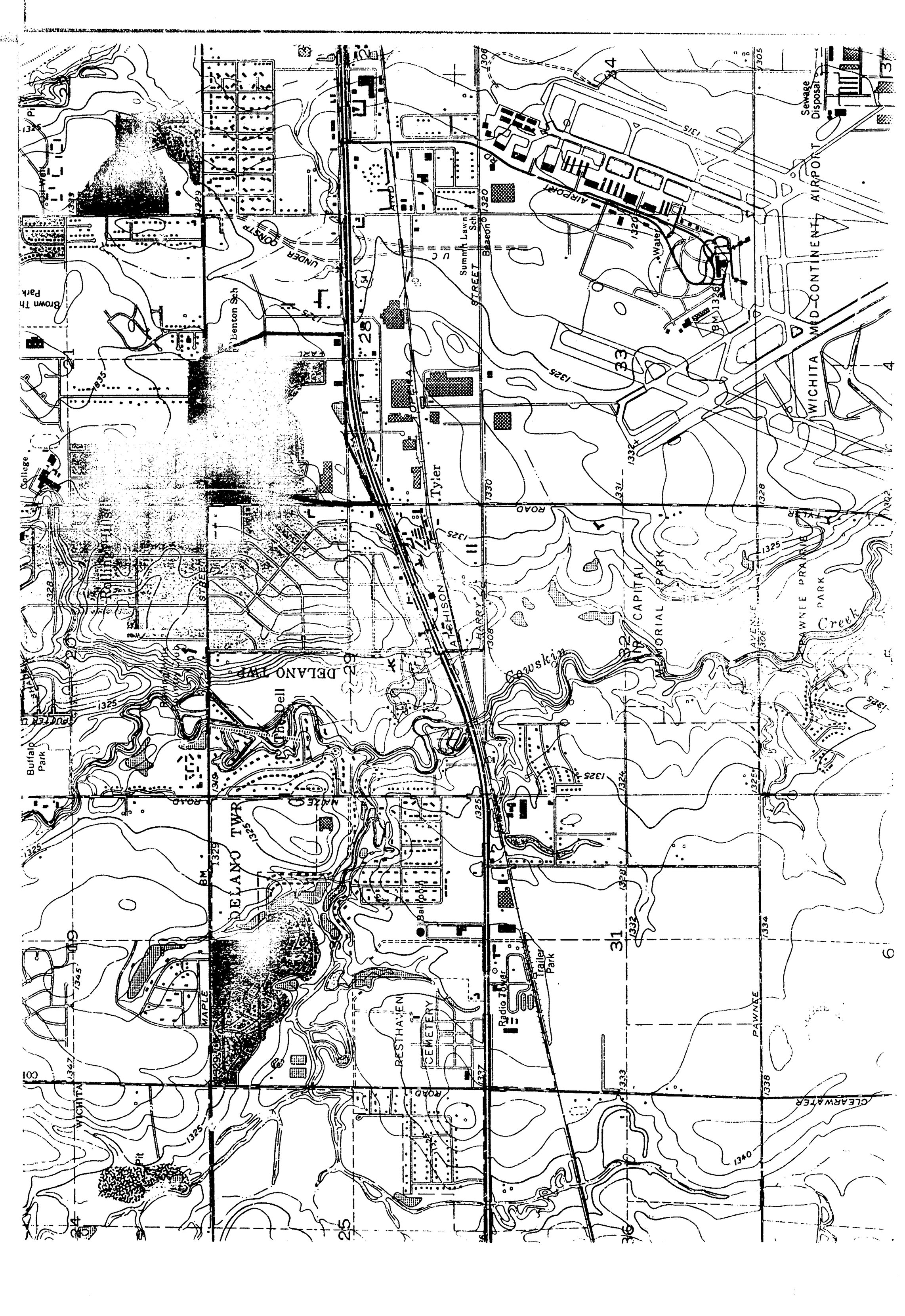
From Inlet @ Woodchuck & Hendryx:

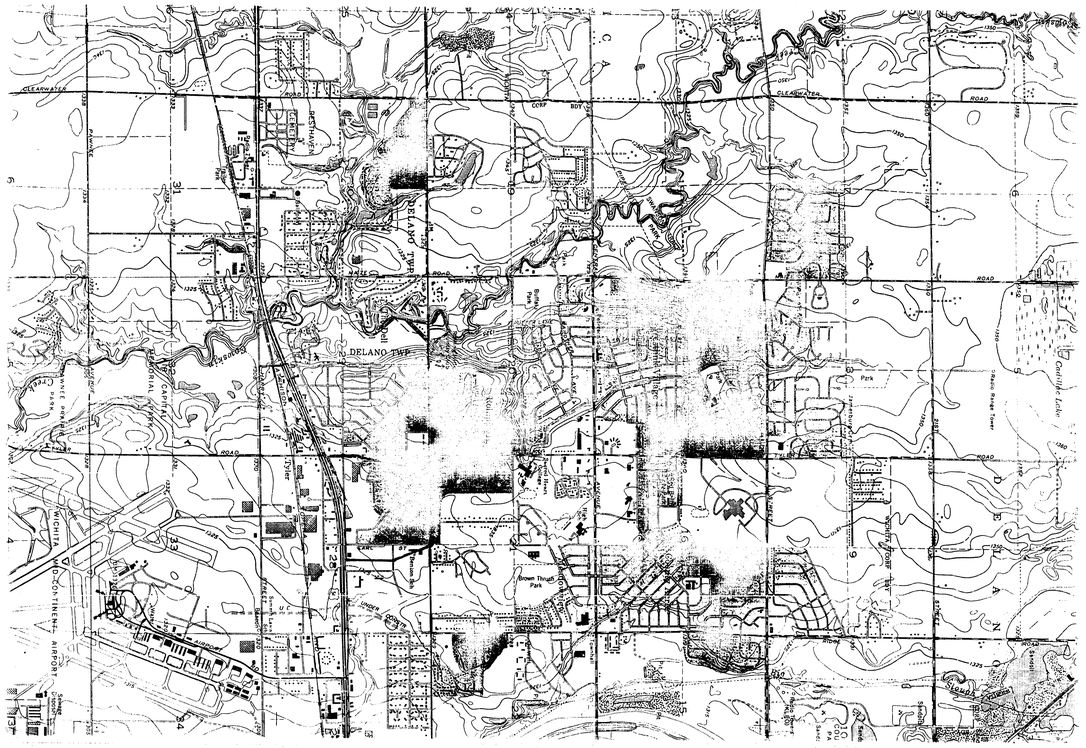
Length	Pipe Size	Slope (%)	Velocity	Time (sec)
282	21"	0.27	2.72	104
103	24"	0.24	2.8	37
475	30"	0.15	2.56	186
492	30"	0.23	3.20	154
55.4	30"	0.34	3.84	14
470	36"	0.13	2.72	172
598	36"	0.26	3.84	156
74	54"	0.26	5.04	15
			TOTAL =	838 sec.

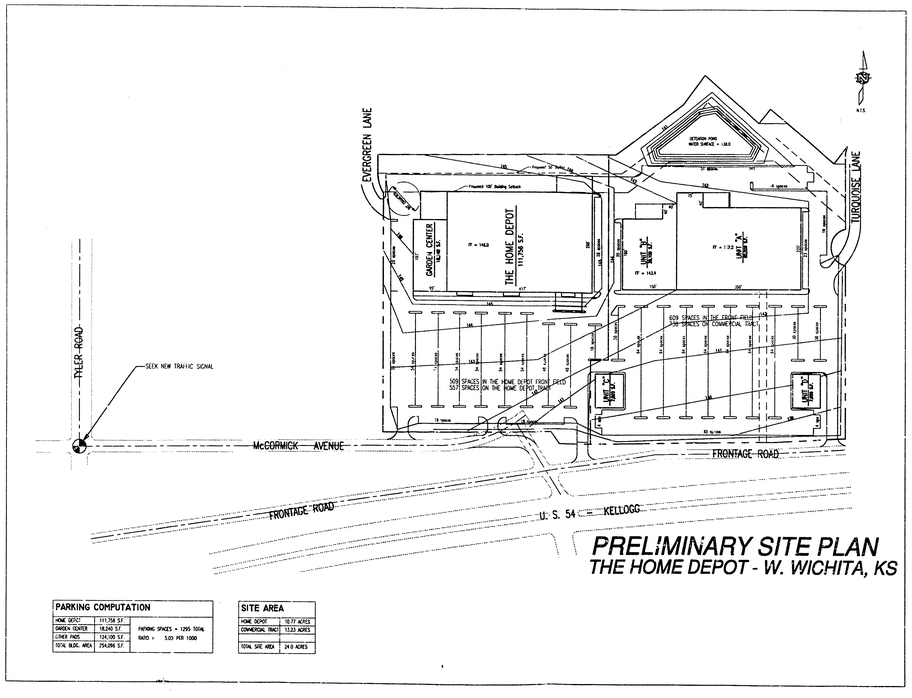
1971' 10'x7' RCB @ 0.10% V= 5.9 ft/sec

1971' / 5.9 ft/sec = 334 sec

Total Toc : 2500 + 838 + 334 = 3672 / 3600 = 1.02 HRS







PRELIMINARY SITE PLAN
THE HOME DEPOT - W. WICHITA, KS

PARKING COMPUTATION		
HOME DEPOT	111,756 S.F.	
GARDEN CENTER	18,240 S.F.	PARKING SPACES = 1295 TOTAL
LINEAR PADS	124,100 S.F.	RATIO = 5.03 PER 1000
TOTAL BLDG. AREA	254,096 S.F.	

SITE AREA	
HOME DEPOT	10.77 ACRES
COMMERCIAL TRACT	13.33 ACRES
TOTAL SITE AREA	24.0 ACRES