

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.

Conclusion:

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. DISCHARGE CU. FT.	POND VOLUME CU. FT.	DEPTH FT.	INCR. DISCHARGE CU. FT.	TOTAL DISCHARGE 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	24	24	7923.6	7.37	134.962	0.4
3	11939.4	36	11903.4	0.6	36	36	11873.4	7.37	134.907	0.6
4	15919.2	126	15793.2	0.8	48	48	15745.2	7.37	134.7821	0.8
5	19899	276	19623	1	60	60	19737.4	7.37	134.9689	1.0
6	23878.8	521.6	23357.2	1.19	72	72	23665.2	7.37	135.1529	1.2
7	27858.8	821.6	27037.2	1.39	84	84	27653.2	7.37	135.3345	1.4
8	31838.8	1121.6	30916.8	1.53	96	96	31642.8	7.37	135.5109	1.6
9	35818.8	1421.6	34497.2	1.71	108	108	35640.8	7.37	135.6848	1.8
10	39798	1721.6	38076.4	1.84	120	120	39678	7.37	135.8567	2.0
11	43777.8	2021.6	41756.2	2.06	132	132	43645.8	7.37	136.0265	2.2
12	47757.8	2321.6	45436.2	2.22	144	144	47513.8	7.37	136.1945	2.4
13	51737.8	2621.6	49114.8	2.39	156	156	51381.8	7.37	136.3608	2.6
14	55717.2	2921.6	52793.6	2.56	168	168	55249.6	7.37	136.5254	2.8
15	59697	3221.6	56472.4	2.72	180	180	59117.4	7.37	136.6885	3.0
16	63676.8	3521.6	60151.2	2.89	192	192	62985.2	7.37	136.8501	3.2
17	67656.8	3821.6	63830.2	3.06	204	204	66853.2	7.37	137.0101	3.4
18	71636.8	4121.6	67509.2	3.22	216	216	70721.2	7.37	137.1685	3.6
19	75616.8	4421.6	71188.2	3.39	228	228	74589.2	7.37	137.3254	3.8
20	79596.8	4721.6	74867.2	3.53	240	240	78457.2	7.37	137.4808	4.0
21	83576.8	5021.6	78546.2	3.69	252	252	82325.2	7.37	137.6348	4.2
22	87556.8	5321.6	82225.2	3.84	264	264	86193.2	7.37	137.7873	4.4
23	91536.8	5621.6	85904.2	4.0	276	276	90061.2	7.37	137.9383	4.6
24	95516.8	5921.6	89583.2	4.13	288	288	93929.2	7.37	138.0878	4.8
25	99496.8	6221.6	93262.2	4.29	300	300	97797.2	7.37	138.2358	5.0
26	103476.8	6521.6	96941.2	4.42	312	312	101665.2	7.37	138.3823	5.2
27	107456.8	6821.6	100620.2	4.56	324	324	105533.2	7.37	138.5273	5.4
28	111436.8	7121.6	104299.2	4.72	336	336	109401.2	7.37	138.6708	5.6
29	115416.8	7421.6	107978.2	4.84	348	348	113269.2	7.37	138.8128	5.8
30	119396.8	7721.6	111657.2	5.0	360	360	117137.2	7.37	138.9533	6.0
31	123376.8	8021.6	115336.2	5.13	372	372	121005.2	7.37	139.0923	6.2
32	127356.8	8321.6	119015.2	5.29	384	384	124873.2	7.37	139.2298	6.4
33	131336.8	8621.6	122694.2	5.42	396	396	128741.2	7.37	139.3658	6.6
34	135316.8	8921.6	126373.2	5.56	408	408	132609.2	7.37	139.4993	6.8
35	139296.8	9221.6	130052.2	5.72	420	420	136477.2	7.37	139.6313	7.0
36	143276.8	9521.6	133731.2	5.84	432	432	140345.2	7.37	139.7618	7.2
37	147256.8	9821.6	137410.2	6.0	444	444	144213.2	7.37	139.8908	7.4
38	151236.8	10121.6	141089.2	6.13	456	456	148081.2	7.37	140.0183	7.6
39	155216.8	10421.6	144768.2	6.29	468	468	151949.2	7.37	140.1443	7.8
40	159196.8	10721.6	148447.2	6.42	480	480	155817.2	7.37	140.2688	8.0
41	163176.8	11021.6	152126.2	6.56	492	492	159685.2	7.37	140.3918	8.2
42	167156.8	11321.6	155805.2	6.72	504	504	163553.2	7.37	140.5133	8.4

TIME MIN.	TOTAL RUNOFF CU. FT.	PREV. DISCHARGE CU. FT.	POND VOLUME CU. FT.	DEPTH FT.	INCR. DISCHARGE CU. FT.	TOTAL DISCHARGE CU. FT.	STORAGE CU. FT.	INTENSITY IN./HR.	WSEL	FLOW CFS
43	171136.8	11621.6	159484.2	6.84	516	516	167421.2	7.37	140.6343	8.6
44	175116.8	11921.6	163163.2	7.0	528	528	171289.2	7.37	140.7548	8.8
45	179096.8	12221.6	166842.2	7.13	540	540	175157.2	7.37	140.8743	9.0
46	183076.8	12521.6	170521.2	7.29	552	552	179025.2	7.37	140.9928	9.2
47	187056.8	12821.6	174200.2	7.42	564	564	182893.2	7.37	141.1103	9.4
48	191036.8	13121.6	177879.2	7.56	576	576	186761.2	7.37	141.2268	9.6
49	195016.8	13421.6	181558.2	7.72	588	588	190629.2	7.37	141.3418	9.8
50	198996.8	13721.6	185237.2	7.84	600	600	194497.2	7.37	141.4563	10.0
51	202976.8	14021.6	188916.2	8.0	612	612	198365.2	7.37	141.5693	10.2
52	206956.8	14321.6	192595.2	8.13	624	624	202233.2	7.37	141.6818	10.4
53	210936.8	14621.6	196274.2	8.29	636	636	206101.2	7.37	141.7933	10.6
54	214916.8	14921.6	200000.2	8.42	648	648	210000.2	7.37	141.9038	10.8
55	218896.8	15221.6	203679.2	8.56	660	660	213868.2	7.37	142.0133	11.0
56	222876.8	15521.6	207358.2	8.72	672	672	217736.2	7.37	142.1218	11.2
57	226856.8	15821.6	211037.2	8.84	684	684	221604.2	7.37	142.2293	11.4
58	230836.8	16121.6	214716.2	9.0	696	696	225472.2	7.37	142.3358	11.6
59	234816.8	16421.6	218395.2	9.13	708	708	229340.2	7.37	142.4413	11.8
60	238796.8	16721.6	222074.2	9.29	720	720	233208.2	7.37	142.5458	12.0
61	242776.8	17021.6	225753.2	9.42	732	732	237076.2	7.37	142.6493	12.2
62	246756.8	17321.6	229432.2	9.56	744	744	240944.2	7.37	142.7518	12.4
63	250736.8	17621.6	233111.2	9.72	756	756	244812.2	7.37	142.8533	12.6
64	254716.8	17921.6	236790.2	9.84	768	768	248680.2	7.37	142.9548	12.8
65	258696.8	18221.6	240469.2	10.0	780	780	252548.2	7.37	143.0563	13.0
66	262676.8	18521.6	244148.2	10.13	792	792	256416.2	7.37	143.1568	13.2
67	266656.8	18821.6	247827.2	10.29	804	804	260284.2	7.37	143.2563	13.4
68	270636.8	19121.6	251506.2	10.42	816	816	264152.2	7.37	143.3548	13.6
69	274616.8	19421.6	255185.2	10.56	828	828	268020.2	7.37	143.4523	13.8
70	278596.8	19721.6	258864.2	10.72	840	840	271888.2	7.37	143.5493	14.0
71	282576.8	20021.6	262543.2	10.84	852	852	275756.2	7.37	143.6458	14.2
72	286556.8	20321.6	266222.2	11.0	864	864	279624.2	7.37	143.7413	14.4
73	290536.8	20621.6	269901.2	11.13	876	876	283492.2	7.37	143.8368	14.6
74	294516.8	20921.6	273580.2	11.29	888	888	287360.2	7.37	143.9313	14.8
75	298496.8	21221.6	277259.2	11.42	900	900	291228.2	7.37	144.0258	15.0
76	302476.8	21521.6	280938.2	11.56	912	912	295096.2	7.37	144.1193	15.2
77	306456.8	21821.6	284617.2	11.72	924	924	298964.2	7.37	144.2118	15.4
78	310436.8	22121.6	288296.2	11.84	936	936	302832.2	7.37	144.3033	15.6
79	314416.8	22421.6	291975.2	12.0	948	948	306700.2	7.37	144.3948	15.8
80	318396.8	22721.6	295654.2	12.13	960	960	310568.2	7.37	144.4853	16.0
81	322376.8	23021.6	299333.2	12.29	972	972	314436.2	7.37	144.5758	16.2
82	326356.8	23321.6	303012.2	12.42	984	984	318304.2	7.37	144.6653	16.4
83	330336.8	23621.6	306691.2	12.56	996	996	322172.2	7.37	144.7548	16.6
84	334316.8	23921.6	310370.2	12.72	1008	1008	326040.2	7.37	144.8433	16.8
85	338296.8	24221.6	314049.2	12.84	1020	1020	329908.2	7.37	144.9318	17.0
86	342276.8	24521.6	317728.2	13.0	1032	1032	333776.2	7.37	145.0193	17.2
87	346256.8	24821.6	321407.2	13.13	1044	1044	337644.2	7.37	145.1068	17.4
88	350236.8	25121.6	325086.2	13.29	1056	1056	341512.2	7.37	145.1933	17.6
89	354216.8	25421.6	328765.2	13.42	1068	1068	345380.2	7.37	145.2798	17.8
90	358196.8	25721.6	332444.2	13.56	1080	1080	349248.2	7.37	145.3653	18.0

