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KAW VALLEY ENGINEERING, INC.

June 13, 2006
A06D2806

Mr. Scott Lindebak
City of Wichita Public Works
455 N. Main – 7th Floor
Wichita, Kansas 67202
Phone (316) 268-4545

RE: Home Depot 47th Street South & Broadway Avenue
Wichita, Kansas

Dear Scott Lindebak,

Kaw Valley Engineering, Inc. has prepared the following drainage analysis for the City of Wichita's requirements for the above referenced development.

INTRODUCTION

The project consists of the redevelopment of a portion of Lot 1, Block A, Broadway 47 Plaza 2nd Addition to Wichita, Kansas. The tract of land contains 18.18 acres bound by 47th Street South on the north, Broadway Avenue on the east, 48th Street South on the south, and Water Street on the west. The purpose of this study is to provide an analysis of the proposed storm water detention system and the mediation of future storm water drainage flows associated with the proposed development, and to confirm compliance with the City of Wichita's storm water criteria.

EXISTING CONDITIONS & PROPOSED IMPROVEMENTS

The east half of the project site, approximately 8.36 acres, is currently an abandoned Checkers Grocery Store and associated parking, with the western portion of the tract, 9.82 acres, an open vacant lot with the surface being pervious. The majority of the runoff from the eastern 8.36 acres currently sheet drains to 47th street. The proposed development on the east portion of the tract will not affect the grading and drainage paths north of the existing building line but will provide storm sewer to collect the new building downspouts. The west portion of the tract is very flat with negligible drainage; this area also sheet drains north to 47th street. With the proposed changes the west half will be the most impacted with three proposed buildable lots and a parking lot. A detention pond and pumping system are proposed to mediate increase in runoff created by these improvements.

DRAINAGE ANALYSIS

The storm runoff for the project site was analyzed in two separate parts; the east half with negligible change and the west half. This was performed because of the varying time of concentration between the two halves. The greater time of concentration of the western portion discounted the storm intensity and therefore the existing peak runoff of the entire site.

The eastern half, 8.36 acres, has the following change in impervious areas, pre-developed and post-developed. With the development the runoff from this area will be improved slightly due to the proposed lawn areas around the perimeter of the site.

PRE-DEVELOPED & POST-DEVELOPED RUNOFF COEFFICIENTS EASTERN HALF				
	Pervious Area (Acres)	Impervious Area (Acres)	Weighted "C"	25-Year Flow (cfs)
Pre-developed	0.20	8.16	0.885	52.36
Post-developed	0.68	7.68	0.847	48.98

Hydroflow-Hydrograph Version 2004 Professional was used to perform the runoff and detention basin routing. Runoff from the site was calculated using the rational method with a ascending limb factor of 1 and a receding limb factor of 1.6. Time of concentration (Tc) for the existing and proposed conditions was calculated using the FAA method in Hydroflow-Hydrograph. This analysis contains 9.82 acres of onsite runoff.

PRE-DEVELOPED RUNOFF COEFFICIENT WESTERN HALF					
		Pervious Area (Acres)	Impervious Area (Acres)	Weighted "C"	Time of Concentration (min)
Pre-developed		9.57	0.25	0.315	35
Post-developed		2.34	7.47	0.756	15
	(Detained)	1.33	5.61	0.785	15
	(Un-detained)	1.01	1.86	0.689	15

DETENTION BASIN

The proposed system gravity flows to a pump with a capacity of 45 gal/min or 0.10 cfs at elevation 79.7. As the storm water exceeds the capacity of the pump the pipe network fills to elevation 81.7 where the storage volume of the proposed detention pond can be utilized. The analysis performed did not take into account the storage in the pipes and concentrated on the detention pond. The outflow of the western half of the developed site will be limited to the pump capacity until the detention storage stage reaches elevation 85.6 when an 24 inch overflow pipe will outlet the storm water to the pipe network running behind the proposed building on the south property line ultimately draining into the storm sewer system in Broadway Avenue.

In the event that the outlet pipe would become plugged or during storm events, which would exceed the capacity of the storage basin, the detention system would overtop detention pond and flow into 48th Street South.

DRAINAGE ANALYSIS RESULTS

The results of the Hydroflow-Hydrograph analysis indicated that the proposed storm water detention system provided adequate storm water mitigation by limiting the post-developed discharge of the 5-year,

25-year, and 100-year storm events to less than the pre-developed discharge. The following is a summary of the Hydroflow-Hydrograph analysis of the detention system.

Return Period Storm (yr)	Pre-developed Site Runoff (cfs) HYD 1	Post-developed Site Runoff (Detained) (cfs) HYD 2	Post-developed Site Runoff (Un-detained) (cfs) HYD 3	Maximum Detention System Water Elevation (ft)	Maximum System Storage Volume (cu ft)	Total Site Runoff (Detained & Un-Detained) HYD 7
5	9.53	25.24	9.43	85.11	29,302	9.33
25	12.91	33.38	12.21	85.68	38,815	12.31
100	15.98	40.78	14.92	86.14	46,943	15.02

The proposed storm water detention system will provide adequate storage to limit the developed discharge rate for the 5-year, 25-year, & 100-year storm events to less than that of the pre-developed site for the same events. With the outflow at elevation 85.6 the detention pond has a storage capacity of 37496 Cu.Ft that must be empted by the pump. At a rate of 0.1 cfs for the pump the detention pond would take 4.3 days to drain without factoring in exfiltration & evaporation. The pond was also analysis with the 100-year event using different storm duration factors to see how greater total quantities of storm water at lower intensities would affect the pond. The 100-year storm event was found to cause the greatest stage of the pond with a storm duration factor of 11. The storm produced with a storm duration factor of 11 was 3 hours long and had a constant flow of 10 cfs. The detention pond reached an elevation of 87.61 when this was routed.

EXHIBITS

Exhibit A – Proposed Grading Plan
Exhibit B – Hydroflow-Hydrograph Analysis Output Hydrographs

Paul W. Parrish, E.I.T.
Intern Engineer

Samuel Malinowsky, P.E.
Project Manager

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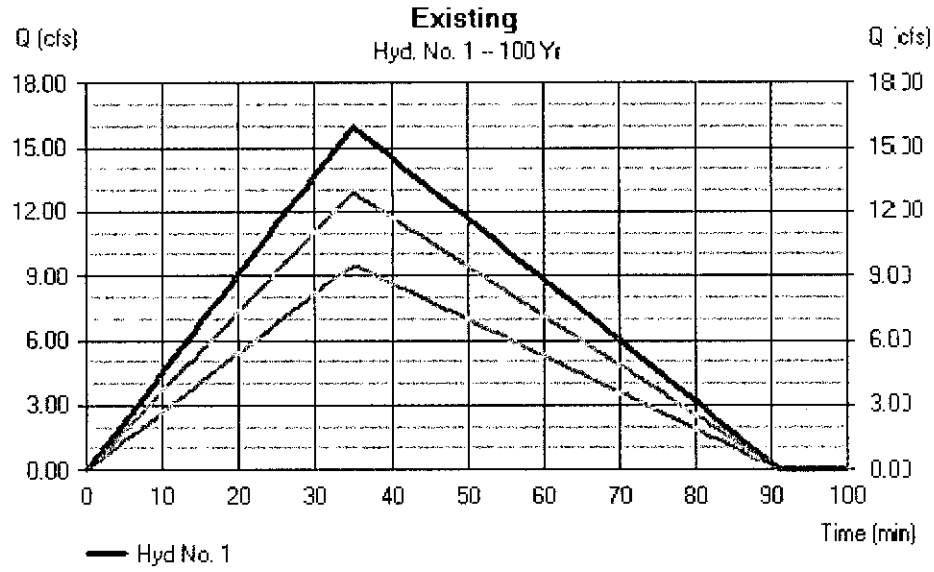
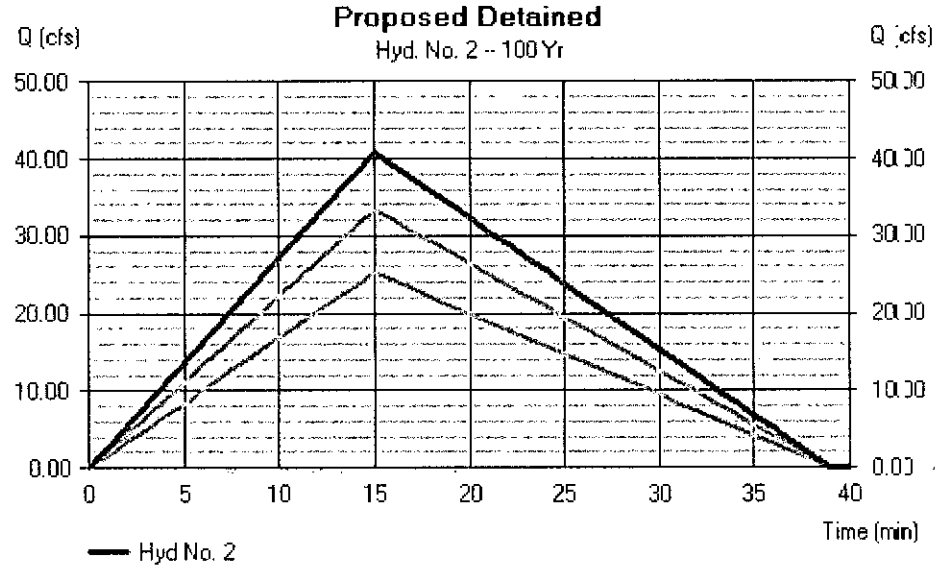
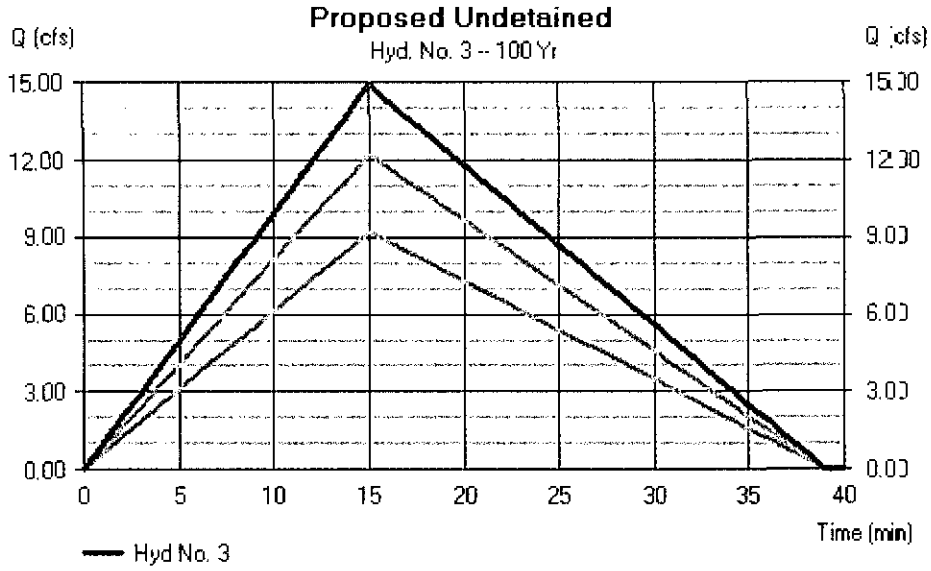
Exhibit B – Hydroflow-Hydrograph Analysis Output Hydrographs



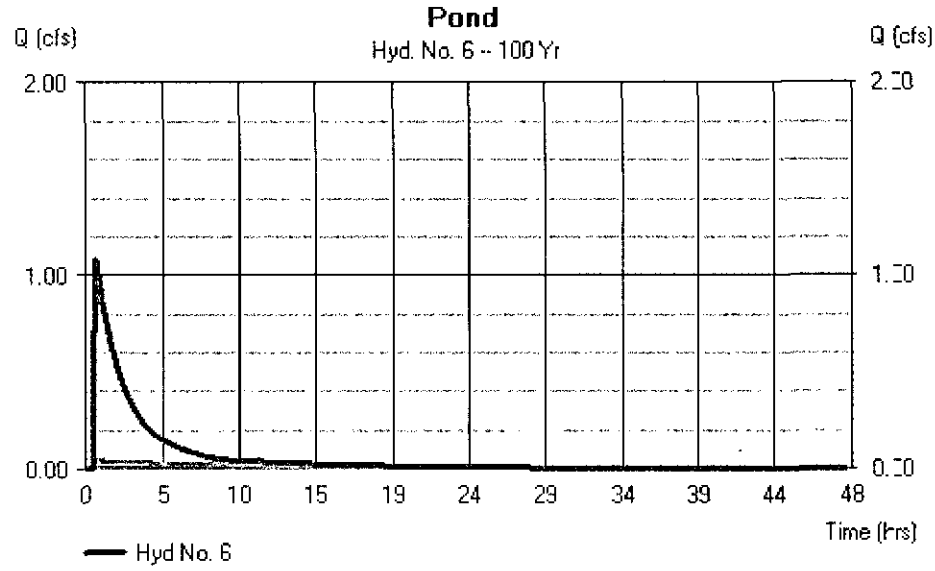
Pre-Developed Rational Method Hydrographs
Red- 100-Year Storm
Gray 25-Year, & 5 Year Storm



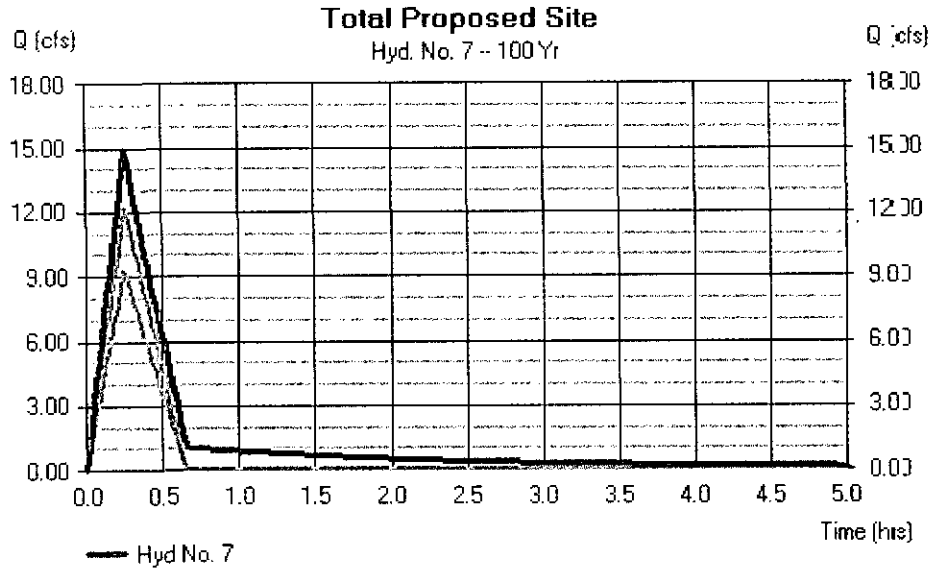
Post-Developed Detained Rational Method Hydrographs
Red- 100-Year Storm
Gray 25-Year, & 5 Year Storm



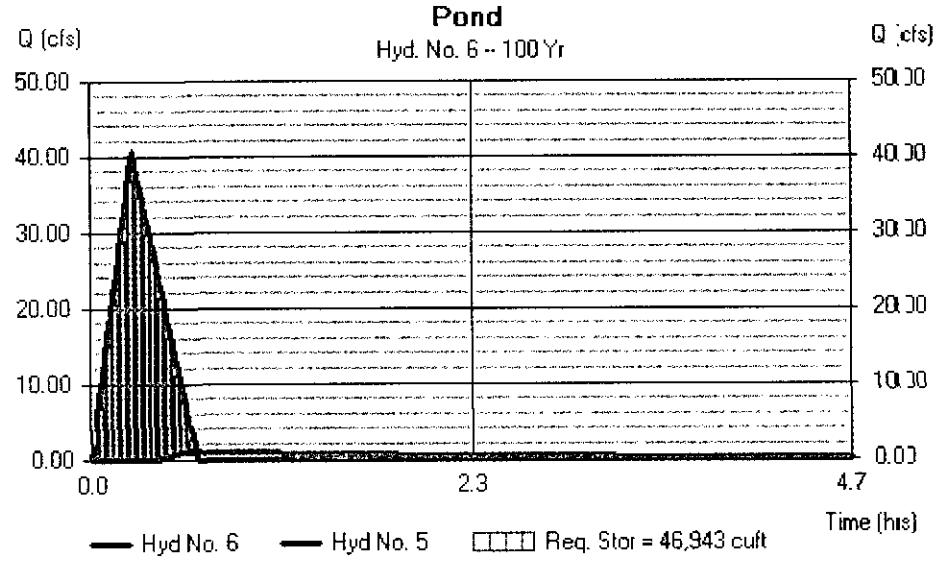
Post-Developed Un-detained Rational Method Hydrographs
Red- 100-Year Storm
Gray 25-Year, & 5 Year Storm



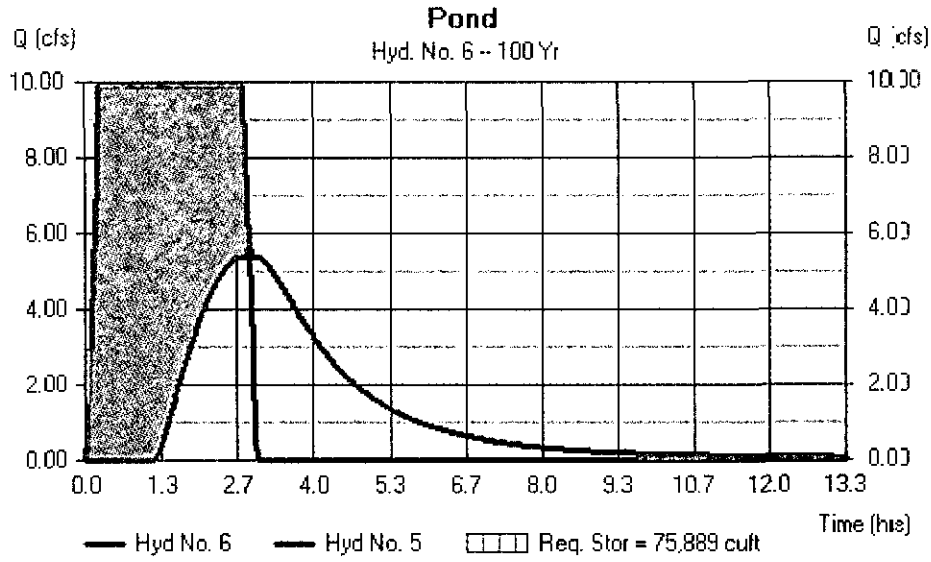
Post-Developed Pond Outflow Rational Method Hydrographs
Red- 100-Year Storm
Gray 25-Year, & 5 Year Storm (No Outlet)



Post-Developed Total Site Runoff Rational Method Hydrographs
Red- 100-Year Storm
Gray 25-Year, & 5 Year Storm



Pond Storage Rational Method Hydrographs
Red- 100-Year Storm Pond Outflow
Blue 100-Year Detained Area Inflow



Pond Storage Modified Rational Method Hydrographs (Duration Factor 1 1)
Red- 100-Year Storm Pond Outflow
Blue 100-Year Detained Area Inflow