

DRAINAGE DESIGN SUMMARY

FOR

DCI Lee's Summit

Lee's Summit, Jackson County, Missouri

July 25, 2019

Revised August 23, 2019

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AUG 26 2019

Development Services



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Drainage Design Summary

General Information

The proposed project consists of constructing a 10,220 sf +/- dialysis clinic with associated parking and site improvements. The existing site is located at 2023 NW Shamrock Avenue in Lee's Summit on Parcel ID 62-240-99-04-00-0-00-000. The property is bordered by NW Shamrock Avenue to the North and NW Pryor Road to the East. The project site is located within the southeast corner of Section 2, Township 47N, Range 32W in the Little Blue River watershed of Kansas City.

Methodology

The following methods were used in this drainage design study to model existing and proposed conditions for stormwater runoff:

- Hydraflow Hydrographs 2018 software
 - SCS/NRCS Curve Number Method
 - 24-Hour SCS Type II Rainfall Distribution
 - SCS TR-55 Method for Time of Concentration

Existing Conditions Analysis

Currently, the ±2.225-acre site is undeveloped with pasture-like land cover. The site is generally drains via sheet flow and shallow concentrated flow from the North to the Southeast corner of the property. Stormwater runoff exiting the site discharges into the existing public stormwater system in NW Pryor Road which eventually discharges into the Little Blue River.

In analyzing the existing conditions, the site was split into two drainage areas. The majority of the site is included in the North Drainage Area with the site outfall point in the Southeast corner of the property. Runoff from the North Drainage Area discharges into the public storm system in NW Pryor Road. The southern edge of the site is included in the South Drainage Area also with the site outfall point in the Southeast corner of the property. Runoff from the South Drainage Area discharges towards the neighboring property to the South and enters the public storm system further south along NW Pryor Road. Since both drainage areas discharge to the same final outfall, the public storm system in NW Pryor Road, the peak flows for the North and South Drainage Areas were combined in the analysis of the pre vs. post peak flows.

The North Drainage Area is 1.94 acres with a curve number of 84 and a time of concentration of 10.0 minutes. The South Drainage Area is 0.29 acres with a curve number of 84 and a time of concentration of 9.7 minutes.

The project site does not lie within a special flood hazard area per the federal emergency management agency, (FIRM) map no. 29095C0416G dated January 20, 2017.

The majority of the existing soil within the project site is Greenton-Urban land complex. A sliver of the existing soil near the Northwest corner of the property is Sharpsburg-Urban land complex. Both soil types are classified as Type D soil. The NRCS Soils Map can be found in Attachment 5.

A pre-developed drainage area map is included in Attachment 1 for a detailed view of the pre-developed site. Routing calculations produced by Hydraflow Hydrographs 2018 software are included in Attachment 2.



The pre-development flows to the site outfall point is as follows:

Pre-Development Peak Flows	
<i>Storm Event</i>	<i>Existing Site Peak Flows (cfs)</i>
2-year	6.303
10-year	11.37
100-year	18.21

Proposed Conditions Analysis

The proposed project consists of constructing a 10,220 sf +/- dialysis clinic with associated parking and site improvements. The proposed dialysis clinic is to be located centrally on the site. Proposed stormwater runoff is to be directed via sheet flow, shallow concentrated flow, and channel flow to an extended dry detention pond that is to be located at the south end of the site. A small portion of the south and eastern edge of the site will bypass the proposed extended dry detention pond and discharge to the public storm system along NW Pryor Road as in the existing conditions. A post-developed drainage area map is included in Attachment 1 for a detailed view of the post-developed site.

Detention and Water Quality Analysis

Per Section 5600 of the Kansas City Metropolitan Chapter APWA Standard Specification & Design Criteria manual, the maximum post-developed peak discharge rates from any development shall not exceed those as follows:

- 50% storm peak rate less than or equal to 0.5 cfs per site acre
- 10% storm peak rate less than or equal to 2.0 cfs per site acre
- 1% storm peak rate less than or equal to 3.0 cfs per site acre

Also, for comprehensive control a 40-hour extended detention of runoff from the local 90% mean annual event (1.37"/24-hour rainfall) must be achieved for the water quality volume.

The required water quality treatment volume was calculated to be 5,015 cf (0.115 ac-ft). See Attachment 4 for the water quality treatment volume calculations.

The proposed BMP practice chosen for this site is the extended dry detention basin. Calculations were generated following Chapter 8.10 of the Manual of Best Management Practices for Stormwater Quality. The proposed extended dry detention pond has a volume of 19,672 cf. The water quality treatment volume to be discharged over 40 hours is met at the elevation 963.5 in the proposed pond. The proposed outlet structure in the pond is to consist of a perforated riser with 6 holes with 4" vertical spacing up to the treatment volume elevation. Stormwater runoff exceeding the water quality treatment volume will discharge through an 8" orifice at an elevation of 963.8 and then a 24" pipe to the existing storm system in NW Pryor Road. The grated casting of the outlet structure is set just above the 100 year storm elevation at 966.20 to serve as an emergency overflow weir. The pond is also designed with an emergency spillway located on the East edge of the pond. The spillway is sized to pass the 1% storm from the contributing drainage area as well as the adjacent Fire department development's 1% storm with 1' of freeboard to the top of the dam assuming zero available storage in the ponds and zero flow through the primary outlet. See Attachment 2 for detention routing calculations.

The overall post-development peak flows to the outfall are as follows:

Post-Development Peak Flows	
<i>Storm Event</i>	<i>Proposed Site Peak Flows (cfs)</i>
2-year	1.308
10-year	3.679
100-year	5.937



Storm Drainage Design

All stormwater pipes and structures have been designed to convey the 10-year storm event. Tailwater elevations were considered to be between the crown and critical depth of the pipes.

Pipe and structures calculations were compiled using Hydraflow Storm Sewers 2018 software and are included as Attachment 3. An Inlet Drainage Area Map detailing the areas discharging to each proposed inlet is included in Attachment 1.

Conclusions and Recommendations

The stormwater management system for the proposed development has been designed per Section 5600 of the Kansas City Metropolitan Chapter APWA Standard Specifications Design Criteria and the Manual of Best Management Practices for Stormwater Quality. Due to the increase in impervious area for the proposed development, water quality and detention requirements are to be met by the use of a proposed extended dry detention basin located on the South portion of the project site. The water quality treatment volume calculated to be 5,015 cf is to be released over 40 hours through a perforated riser. The detention requirements specify maximum release rates based on the lesser of either pre-developed peak flow rates or a predetermined flow rate per site acreage. The post-developed peak flow rates calculated for the 10-year and 100-year storm events are less than their respective allowable peak flow rates. The post-developed peak flow rate for the 2-year storm event exceeds the allowable peak flow rate by 0.2 cfs. This minor exceedance is considered to have negligible impact on the downstream infrastructure. The extended dry detention pond also has more than 2 feet of freeboard for all storm events in order to provide exceptional flood protection during extreme storm events.

Pre- and Post- Peak Flows Comparison					
<i>Storm Event</i>	<i>Pre-dev. Peak Flow (cfs)</i>	<i>Allowable Post-Dev. Peak Flow (cfs)</i>		<i>Post-Dev. Peak Flows (cfs)</i>	<i>Difference (+/-)</i>
2-year	6.303	(0.5 cfs/2.225 ac)	1.1125	1.308	+0.1955
10-year	11.37	(2.0 cfs/2.225 ac)	4.450	3.679	-0.771
100-year	18.21	(3.0 cfs/2.225 ac)	6.675	5.937	-0.738

Attachments:

- Attachment 1 Site Drainage Area Maps
- Attachment 2 *Hydraflow Hydrographs* Routing Calculations
- Attachment 3 *Hydraflow Storm Sewers* Calculations
- Attachment 4 Water Quality Calculations
- Attachment 5 Supporting Documents