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PRELIMINARY DRAINAGE REPORT FOR

Ellis Glen Lee's Summit, Missouri

PROJECT NUMBER: 2202010120 OWNER: Pam Hatcher

REVISED DATE: DATE: Pam Hatcher, Ellis Glen LLC. 120 T Street. Lake Lotawana. MO 64083 July 12, 2022 June 14, 2022

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General Information

Purpose

The purpose of this report is to evaluate drainage conditions for a proposed office and multifamily development in Lee's Summit, Missouri. This report reviews existing drainage conditions and evaluates proposed drainage conditions as a result of the proposed improvements to the site and its conformance with the City requirements for managing stormwater runoff. The preliminary report has been revised to address city comments. This report replaces and supersedes the previous report dated June 14, 2022 by MKEC Engineering. This report has addressed comprehensive control measures for the site.

Location

The proposed development is 1.2 acres and located on southwest Market Street, north of southwest 2nd Street, in the City of Lee's Summit, Jackson County, Missouri. The property is in Section 6, Township 47 North, Range 31 West and is shown on the USGS Quadrangle, Appendix A and Aerial Photograph, Appendix B.

Development

The site is located in an existing urban area that includes five residential single-family lots with associated housing and driveway structures. The proposed mixed-use complex includes commercial and multi-family development. The multi-family use is located above the commercial use. The site plan is included as Appendix C.

Datum

The site is shown in NAVD 88.

Soils

The drainage areas on site are comprised of the following soil types according to the Natural Resources Conservation Service (NRCS) Soil Survey, Appendix D:

• Arisburg-Urban land complex, 1 to 5 percent slopes, HSG "C"

The Hydraulic Soil Group (HSG) for selection of runoff curve numbers (CN) is HSG "C".

Flood Insurance Rate Map (FIRM)

The site is shown on FEMA FIRM Panels 29095C0417G, effective January 20, 2017, Appendix E. This site is in Zone X (unshaded), areas determined to be outside the 1% annual chance floodplain. The site is located in the Big Creek Watershed.

Drainage Patterns

Hydrologic Methods

The existing and proposed drainage areas were modeled using Hydraflow Hydrographs by AutoCAD, Appendix F. The SCS Method, Type II, 24-hour rainfall, was used in calculations with rainfall depths determined from the NOAA Atlas 14 Lees Summit Reed WR (Site ID: 23-4850), as shown in Table 1. Time of Concentration was calculated using the TR-55 Method in Hydraflow Hydrographs, Appendix F.

	1-Yr	90% Rainfall	2-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Y
Lee's Summit, Missouri	3.10	1.37	3.70	4.73	5.65	6.98	8.08	9.23

Yr

Table 1. Rainfall Depths (inches) for 24- Hour Design Storm

Drainage Conditions

Existing Conditions

Under existing conditions, the site drains from southeast to northwest as it sheet flows across the northwestern property line. The existing site area contains residential lots with associated homes and drives for an existing curve number of 82 to represent the current 1/4 acre single-family development. The site receives stormwater runoff from offsite areas. The existing drainage areas are shown in Appendix G. Table 2 describes existing drainage area conditions.

Offsite Drainage Area is 0.2 acres and includes the backyards of the adjacent residential lots. The stormwater sheet flows across the existing site area. Existing Site Area is 1.2 acres and sheet flows from the southeast to the northwest as the runoff eventually drains between the residential lot's northwest of the site. The stormwater runoff eventually drains to Southwest 1st Street.

Table 2. Existing Drainage Conditions

	Area (acres)	Tc (min)	CN	2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)
Offsite Drainage Area	0.2	5.0	82	0.9	1.6	2.9
Existing Site Drainage Area	1.2	5.0	82	3.9	7.3	13.5
Exist	4.8	8.8	16.4			

Comprehensive Control Conditions

Comprehensive control measures were analyzed for the site to address runoff control strategies. Post development peak discharge rates from the site are held to a standard flow rate per acre for the 2-year, 10-year, and 100-year design storm, as outlined in Section 5601.5.A-4. For the 1.2-acre site, the flow rate for site development is to not exceed 0.6 cfs, 2.4 cfs, and 3.6 cfs for the 2-yr, 10-yr, and 100-yr storms. The offsite drainage area is not included in the comprehensive control strategy and will combine with the comprehensive control flow rates to establish the control flow from the site, Table 3. Proposed flow rates from the site will be compared to the allowable release rate as detailed in the comprehensive control release rate strategy.

Table 3. Comprehensive Control Drainage Conditions

	Area (acres)	Tc (min)	CN	2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)
Offsite Drainage Area	0.2	5.0	82	0.9	1.6	2.9
Comprehensive Control Runoff Limits from Site	1.2	-	-	0.6	2.4	3.6
Cont	1.5	4.0	6.5			

Proposed Conditions

Under proposed conditions, the site will continue to drain from southeast to northwest. The proposed site improvements include a proposed parking lot and a proposed multi-family and commercial building. These improvements replace the existing impervious area located on the site. The proposed peak flow from

development will be required to be less than the control flow from the site as noted in Table 3. The offsite drainage area and the majority of the proposed development will be routed to an underground detention facility in order to detain the increase in runoff. The increase in impervious area has increased the curve number to 97 for the site to represent the development. The proposed drainage areas are shown in Appendix H. Table 4 describes proposed drainage area conditions.

	Area (acres)	Tc (min)	CN	2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)
Offsite Drainage Area	0.2	5.0	82	0.9	1.6	2.9
Proposed Site- Undetained Drainage Area	0.2	5.0	82	0.7	1.2	2.2
Proposed Site Drainage Area	1.0	5.0	97	5.0	7.7	12.6
Propos	1.5	3.2	6.4			

Table 4	. Pro	posed	Drainage	Conditions
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*Proposed flows from the site include the flow out of the underground detention facility, undetained site areas, and offsite drains areas.

Offsite Drainage Area is not affected by proposed development and flow rates will remain the same under proposed conditions. The offsite drainage area will be routed to the Proposed Site Drainage Area and will drain to the underground detention facility.

Proposed Site Drainage Area contains the remaining 1.0 acres of site development including the building and parking lot. Curb and area inlets will drain the area to an underground detention facility located at the northwestern portion of the site under the proposed parking lot. The underground system is made up of twelve chamber rows for an installed storage volume of 13,600 cubic feet. The outlet for the underground detention facility includes a two-tier orifice plate in a junction box in order to control the various design storms. A 7-inch orifice plate will be set at the lowest elevation in order to control the 2-year design storm. A 10-inch orifice plate will be set two feet above the lower orifice in order to control the larger storm events. These orifice plates will control the flow rates from the underground detention facility to hit comprehensive control runoff conditions. The underground stormwater detention facility will be constructed due to the increase in impervious area and will provide storage volume to reduce peak flows from the site for comprehensive control. See plan details for the layout of the system. See Appendix I for the proposed detention facility location and design documents provided by ADS. The detention basin was designed with "comprehensive control" release rate strategy in conformance with the KC Metro APWA 5601.5.A.4.a. Details for the proposed detention facility are shown in Table 5. This facility will outfall to a plunge pool located west of the parking lot as it combines with the undetained area to flow from the site. The plunge pool area has been designed to address velocity from the site, slow runoff, and disperse the runoff over a non-concentrated level-spreader. In addition, a landscape buffer with year-round vegetation plant material will be installed at the property line to provide additional velocity mitigation. Additional details will be provided for the plunge pool with the final drainage study. The proposed plunge pool is significantly larger than want is required by traditional calculations based on the site area and runoff conditions.

Proposed Site- Undetained is 0.2 acres and contains the areas outside of the proposed parking lot, including a proposed swale on the western property line. This swale outfalls to the plunge pool where the swale velocity will be mitigated before the leaves the site. The undetained area on the north side of the site will continue to sheet flow from the site, as it does in existing conditions. With the proposed underground detention on site, peak flows are being reduced <u>significantly</u> compared to existing conditions. Currently runoff is sheet flowing unimpeded through the residential backyards. Runoff in the proposed site conditions will travel through an onsite storm system, into an isolator row chamber for treatment, through multiple additional chambers, through an aggregate layer, and finally through an outlet structure with orifice plates. The runoff will be released at the same location that the drainage travels today. Peak flows have been reduced by 62- 72% when compared to existing conditions, and by 5- 38% when compared to comprehensive control conditions. Peak flow rates from the site are compared in Table 6 and Table 7. In

addition to the peak flow reduction and benefits of the underground detention facility, measures are being provided at the detention outfall to mitigate velocity. This will be in the form of a plunge pool, level spreader, and landscaping. These measures will slow velocity, as well as provide outflow conditions over a flat area to reduce concentration. Further details will be provided with the construction drawings and final drainage study.

Basin Name	2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)		
Flow In (cfs)	5.8	9.2	15.5		
Flow Out (cfs)	0.8	1.8	4.6		
Storage Vol. (cu-ft)	5,900	9,000	13,400		
Outlet Structure	7" Orifice Plate at 1028.3'				
Oulier Oridolare	10" Orifice Plate at 1029.8'				

Table 5. Underground Detention Facility.

Table 6 below shows the comparison of peak runoff from the site compared to the Comprehensive Control peak flow limits.

	2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)
Comprehensive Control	1.5	4.0	6.5
Proposed	1.4	2.5	6.2
Decrease	7%	38%	5%

In addition, by exceeding the Comprehensive Control peak flow limits, results in a significant reduction in peak flow from the site compared to existing conditions. See Table 7 below for the reductions in the 2, 10, and 100yr storm events.

Table 7. Flow Rate Comparison from the Site- Existing and Proposed.

	2-Yr (cfs)	10-Yr (cfs)	100-Yr (cfs)
Existing	4.8	8.8	16.4
Proposed	1.4	2.5	6.2
Decrease	71%	72%	62%

Utilities

Water

A proposed water line will extend to service the proposed building.

Sanitary Sewer

A sanitary sewer line will be extended to service the proposed building.

Stormwater Sewer

Proposed stormwater sewer lines will convey runoff from the proposed site improvements to the underground detention facility. The underground detention facility will daylight at the north property line. The storm sewer system will be designed using APWA 5600 design criteria. These systems will be sized for a minimum of a 10-year design storm with escape routes for larger storm events.

Water Quality

For the increase in impervious surfaces on-site, an ADS underground isolator row chamber will be utilized for to provide the necessary Water Quality. The isolator row will treat a majority of the storm runoff that drains from the site. The level of service calculations are provided in Appendix J. The final sizing calculations for the ADS isolator row will be provided in the final drainage report.

Permitting

U.S. Army Corps of Engineers

Since there are no potential wetlands on the site and there is no blue line stream on the site, permitting through the U.S. Army Corps of Engineers will not be required.

Federal Emergency Management Agency (FEMA)

There are no FEMA floodplains on the site; therefore permitting through FEMA will not be required.

Missouri Department of Natural Resources (MoDNR)

The site disturbs more than 1.0 acre; therefore, a Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) will be prepared.

Water Structures, Channel Changes, and Floodplain Fill

Since all of the drainage areas draining through the site are under 640 acres, water structures, channel change, and floodplain fill permits should not be required.

Water Appropriations

A water appropriations permit will not be required.

Missouri Department of Conservation (MDC)

The MDC will be contacted during the MoDNR NOI permitting process. It is not anticipated that there will be any concerns.

Missouri Historical Society (MHS)

The MHS will be contacted during the NOI permitting process. Since there are no historical buildings on site, it is not anticipated that there will be any concerns.

Summary

The Ellis Glen development is located in Lee's Summit, Missouri. The site improvements include a proposed building, parking lot, and underground detention facility. The site improvements will replace the existing buildings and driveways currently on the site. The site includes an underground detention facility which provides detention for the increased impervious surface. A proposed ADS StormTech Isolator Row will be utilized to meet Water Quality BMP requirements.

In conclusion, the site improvements will substantially reduce peak flow rates from the site in all design storm and will provide adequate detention storage volume for the site. The flow rates from the site do not exceed the maximum release rate from the development under the comprehensive control runoff strategy. The decreased flow rates will improve the downstream conditions by the reduced peak flows from the site.

Appendix A - USGS Quadrangle



Appendix B - Aerial Photograph



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37.5 75

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APPROVED BY: KLA

DRAWN BY: LES

DESIGNED BY: LES

Appendix C - Site Plan

