



Introduction

This letter report is to serve as the Final Sanitary Study for the Development of 11.04 serviceable acres at the southwest corner of Colbern Road and Blackwell Road. The proposed development will provide 42 single family residential units on the subject property. The downstream sanitary sewer system is contained wholly within Woodland Shores where sewerage is collected by a pump station and conveyed via a forcemain further downstream. The proposed development will connect directly to City Manhole 26-274, which connects to an 8 inch sanitary main. Design flows for the proposed development along with the existing development area will be calculated per Section 6500 of the City of Lee's Summit Design and Construction Manual.

Background

The following Figures from the Wastewater Master Plan were utilized to identify any known issues within the area.

Figure 7-3 High Inflow Areas in Existing System Plan

Figure 8-1 2015 Condition of Conveyance/Collection System Bottlenecks

Figure 8-2 2015 Condition Recommended Improvements

Figure 7-3 does not identify the subject watershed as having I&I issues. Figure 8-1 does identify sections of both the north and east interceptors just upstream of the pump station as having potential future capacity issues based upon capacity analysis methodology proposed in the Wastewater Master Plan and subsequently adopted by the City. Figure 8-2 recommended new sections of gravity interceptor where it was anticipated through age and growth that the system may begin experiencing capacity issues. The current system has not had any issues to date regarding conveyance to the pump station. Pump station data provided by the City was reviewed during this study, see attached. No capacity issues were evident with the pump station based upon pump start and cycle times.

Ultimate Buildout

The sanitary sewer analysis was terminated at the Woodland Shores pump station wetwell labeled 62-002PS, see Sanitary Sewer Map attached for both the existing sanitary sewer system layout along with proposed development location and tie-in point. There are 86.28 +/- acres tributary to wetwell 62-002PS, see Sanitary Sewer Area Exhibit attached form CES. The serviceable area outlined by CES appears to be reasonable and has been utilized for this analysis. The proposed development will utilize the north branch of the sewer system to convey flow. All tributary area has been accounted for to wetwell 62-002PS as stipulated by the City's design criteria. The proposed development consists of 11.04 acres of tributary area. The proposed development may be served by the existing downstream sewer system with little to no surcharging as outlined in the attached sanitary sewer analysis.

Conclusions

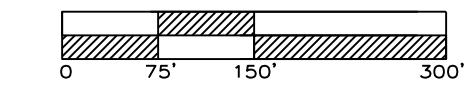
The sanitary sewer analysis shows there is excess capacity in the system both pre and post development of the Woodland Oaks single-family housing project. The analysis anticipates minimal surcharging in the system at ultimate buildout flows. The surcharging would be minimal with no sewerage overflowing and leaving the system. No improvements are necessary due to the development of this site. The existing system will continue to convey sanitary sewage without problem.

Matthew J Schlicht, PE 2006019708



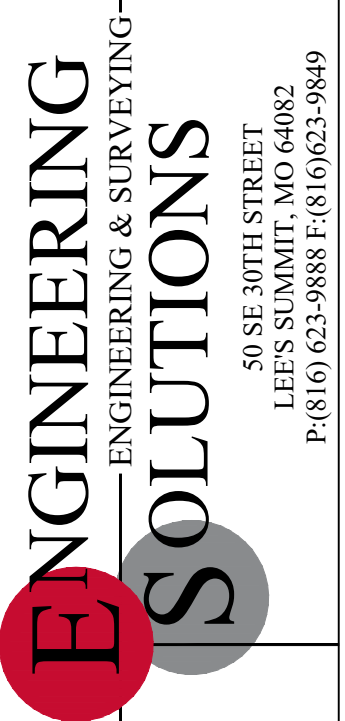
SANITARY SEWER MAP

SCALE: 1" = 150'



Proposed Woodland Oaks Single-Family Development
42 Residences

Woodland Shores Single-Family Development
194 Residences

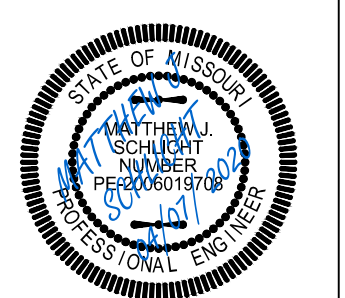


Professional Registration
Missouri
Engineering 2005002188-D
Surveying 2005008319-D
Kansas
Engineering E-1685
Surveying LS-218
Oklahoma
Engineering 6254
Nebraska
Engineering CA2821

Part of the Southeast 1/4
Section 27, Township 48 North, Range 31 West
Lee's Summit, Jackson County, Missouri

Project:
WOODLAND OAKS
LSMO
Issue Date:
February 25, 2020

Existing Sanitary Sewer Map
Preliminary Development Plans for:
Lots 1 thru 42
WOODLAND OAKS
Lee's Summit, Jackson County, Missouri



Matthew J. Schlicht
MO PE 2006019708
KS PE 19071
OK PE 25226
NE PE E-14335

REVISIONS
City Comments 3-24-20
City Comments 3-31-20

Woodland Oaks Sanitary Sewer Capacity Analysis: City of Lee's Summit Criteria at Ultimate Buildout

D.S. Str.	U.S. Str.	U.S. Str. Area	Branch Area	Cum. Area	PBF	PI	Peak Inflow	Tc	Rainfall Intensity	Tc less	Tc more	iph less	iph more	K	Peak Flow	Cum. Peak Flow	FL IN	FL OUT	Length	Slope	Dia	n	Capacity	Segment Condition	HGL	Rim El.	Surcharge Depth	U.S. Str.
26-273	26-274	1.78	11.04	12.82	0.029	0.010	0.468	21.468	6.078	15	30	6.91	4.98	0.006	0.507	0.507	941.15	945	236.58	0.0163	0.67	0.014	1.836	GRAVITY	945.67	956.92	0.00	26-274
26-271	26-273	2.19	5.2	7.39	0.017	0.006	0.263	22.621	5.929	15	30	6.91	4.98	0.006	0.286	0.793	939.63	940.95	218.3	0.0060	0.67	0.014	1.119	GRAVITY	941.62	952.87	0.00	26-273
26-270	26-271	1.61	1.34	2.95	0.007	0.002	0.109	20.931	6.147	15	30	6.91	4.98	0.006	0.118	0.910	937.97	939.13	192.27	0.0060	0.67	0.014	1.118	GRAVITY	939.80	956.52	0.00	26-271
26-269	26-270	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	0.911	936.76	937.7	157.4	0.0060	0.67	0.014	1.112	GRAVITY	938.37	944.26	0.00	26-270
26-268	26-269	0.84		0.84	0.002	0.001	0.033	17.761	6.555	15	30	6.91	4.98	0.006	0.036	0.947	935.33	936.26	154.98	0.0060	0.67	0.014	1.115	GRAVITY	936.93	953.2	0.00	26-269
26-267	26-268	0.97		0.97	0.002	0.001	0.038	18.418	6.470	15	30	6.91	4.98	0.006	0.041	0.987	930.6	934.83	210.85	0.0201	0.67	0.014	2.039	GRAVITY	935.50	950.1	0.00	26-268
26-266	26-267	1.34		1.34	0.003	0.001	0.050	19.983	6.269	15	30	6.91	4.98	0.006	0.055	1.042	929.4	930.4	167.63	0.0060	0.67	0.014	1.112	GRAVITY	931.07	942.61	0.00	26-267
26-265	26-266	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	1.042	928.26	929.2	156.8	0.0060	0.67	0.014	1.114	GRAVITY	929.87	937.07	0.00	26-266
26-264	26-265	1.82		1.82	0.004	0.001	0.066	21.588	6.062	15	30	6.91	4.98	0.006	0.072	1.114	926.7	928.06	225.48	0.0060	0.67	0.014	1.118	GRAVITY	928.73	943.5	0.00	26-265
26-262	26-264	1.7		1.7	0.004	0.001	0.062	21.220	6.110	15	30	6.91	4.98	0.006	0.068	1.182	922.08	924.86	147.9	0.0188	0.67	0.014	1.973	GRAVITY	925.53	935.4	0.00	26-264
26-261	26-262	1.43	0.81	2.24	0.005	0.002	0.084	20.314	6.226	15	30	6.91	4.98	0.006	0.091	1.272	919.94	921.08	284.53	0.0040	0.67	0.014	0.911	SURCHARGE	922.70	929.81	0.95	26-262
26-260	26-261	1.25		1.25	0.003	0.001	0.047	19.635	6.314	15	30	6.91	4.98	0.006	0.051	1.323	919.03	919.74	177.8	0.0040	0.67	0.014	0.909	SURCHARGE	920.85	930.3	0.44	26-261
26-259	26-260	1.75		1.75	0.004	0.001	0.064	21.376	6.090	15	30	6.91	4.98	0.006	0.069	1.393	918.08	918.53	109.7	0.0041	0.67	0.014	0.922	SURCHARGE	919.57	936.74	0.37	26-260
26-258	26-259	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	1.393	917.48	917.58	25.56	0.0039	0.67	0.014	0.900	SURCHARGE	918.84	922.57	0.59	26-259
26-253	26-258	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	1.394	916.92	917.28	89.24	0.0040	0.67	0.014	0.914	SURCHARGE	918.68	921.75	0.73	26-258
26-238	26-253	0.37		0.37	0.001	0.000	0.016	14.441	7.025	10	15	7.94	6.91	0.006	0.017	1.411	916.17	916.42	64.2	0.0039	0.67	0.014	0.898	SURCHARGE	918.10	925.37	1.01	26-253
26-237	26-238	1.77	12.19	13.96	0.032	0.011	0.509	21.437	6.082	15	30	6.91	4.98	0.006	0.552	1.963	915.06	915.82	153.59	0.0049	0.83	0.014	1.793	SURCHARGE	917.85	923.27	1.20	26-238
26-236	26-237	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	1.964	914.4	914.76	84.68	0.0043	0.83	0.014	1.662	SURCHARGE	916.62	924.26	1.03	26-237
26-235	26-236	1.17		1.17	0.003	0.001	0.045	19.310	6.355	15	30	6.91	4.98	0.006	0.048	2.012	914	914.25	82.11	0.0030	0.83	0.014	1.407	SURCHARGE	916.03	936.02	0.95	26-236
26-234	26-235	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	2.012	913.27	913.8	134.43	0.0039	0.83	0.014	1.601	SURCHARGE	915.63	932.6	1.00	26-235
26-233	26-234	1.62		1.62	0.004	0.001	0.060	20.963	6.143	15	30	6.91	4.98	0.006	0.065	2.077	912.42	912.87	82.84	0.0054	0.83	0.014	1.879	SURCHARGE	914.77	924.09	1.07	26-234
26-232	26-233	1.77		1.77	0.004	0.001	0.065	21.437	6.082	15	30	6.91	4.98	0.006	0.070	2.147	911.71	911.91	52.9	0.0038	0.83	0.014	1.568	SURCHARGE	914.04	927.24	1.30	26-233
26-192	26-232	0.01	3.36	3.37	0.008	0.003	0.184	5.805	9.098	5	10	9.32	7.94	0.006	0.194	2.341	910.8	911.35	75.95	0.0072	0.83	0.014	2.170	SURCHARGE	913.71	920.61	1.53	26-232
26-174	26-192	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	2.342	910.39	910.72	138.65	0.0024	0.67	0.014	0.702	SURCHARGE	912.66	920.5	1.27	26-192
26-173	26-174	1.31	1.51	2.82	0.006	0.002	0.106	19.869	6.284	15	30	6.91	4.98	0.006	0.115	2.457	909.88	910.29	164.5	0.0025	0.67	0.014	0.719	SURCHARGE	912.12	933.94	1.16	26-174
26-170	26-173	0.9		0.9	0.002	0.001	0.035	18.073	6.515	15	30	6.91	4.98	0.006	0.038	2.495	907.29	908.78	273.56	0.0054	0.67	0.014	1.062	SURCHARGE	911.46	924.38	2.01	26-173
26-169	26-170	2.17	1.64	3.81	0.009	0.003	0.136	22.568	5.936	15	30	6.91	4.98	0.006	0.147	2.642	906.27	907.09	151.9	0.0054	0.67	0.014	1.057	SURCHARGE	909.04	923.04	1.28	26-170
26-168	26-169	0.96		0.96	0.002	0.001	0.037	18.370	6.476	15	30	6.91	4.98	0.006	0.040	2.682	905.37	906.12	129.15	0.0058	0.67	0.014	1.097	SURCHARGE	907.71	923.32	0.92	26-169
26-167	26-168	0.72		0.72	0.002	0.001	0.029	17.083	6.642	15	30	6.91	4.98	0.006	0.031	2.713	904.12	905.17	71.13	0.0148	0.67	0.014	1.749	SURCHARGE	906.49	921.47	0.65	26-168
26-166	26-167	0.01	19.65	19.66	0.045	0.015	1.073	5.805	9.098	5	10	9.32	7.94	0.006	1.134	3.847	903	903.96	14.7	0.0653	0.67	0.014	3.678	SURCHARGE	905.23	916.68	0.60	26-167
26-002PS	26-166	0.01		0.01	0.000	0.000	0.001	5.805	9.098	5	10	9.32	7.94	0.006	0.001	3.848	902	902.9	7.37	0.1221	0.67	0.014	5.029	GRAVITY	903.57	916.07	0.00	26-166



**Construction
Engineering
Services, Inc.**

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Missouri State Certificate of Authority
3001001857
Kansas Business Entity
PE - 834 LS - 136
kris@engineeringkc.com

Prepared For:
Carl Huff
656 SE BAYBERRY LN #101
LEES SUMMIT MO 64063

REV. NO.	DATE	BY
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Horizontal Scale 1" = 50'
Vertical Scale N/A
Date: 2-27-18
Designed: KNB

Exhibit A
Sanitary Sewer Area
Woodland Oaks

Lee Bodenheimer, MO LS 2114
Lee Bodenheimer, MO PE 018496
Lee Bodenheimer, KS LS 638
Lee Bodenheimer, KS PE 9731