December 21, 2018

Mr. Judd Claussen, P.E.
Phelps Engineering, Inc.
1270 N Winchester
Olathe, KS 66061

Re: City of Lee's Summit, MO
Lee's Summit Apartments

Dear Mr. Claussen:

An analysis was completed to determine the effect of the proposed development on the existing sanitary sewer system. The proposed development consists of approximately 3.5 acres where the existing Lee's Summit United Methodist Church currently resides, near the intersection of 2nd Street and Douglas Street.

A proposed development map was submitted that indicated a new apartment complex be constructed on the site that would consist of a total of 178 units, broken down as follows:

- 3 - Studio Units
- 170 - One Bedroom Units
- 105 - Two Bedroom Units

The projected sanitary sewer flows generated by the proposed development were calculated utilizing the criteria in the City of Lee's Summit Design and Construction Manual. The peak wastewater flows consist of three components: Peak Base Flow, Peak Infiltration, and Peak Inflow and are calculated as indicated below.

Projected Flow Calculations:

Peak Base Flow:
= 300 gpd * EDU
= 300 gpd * [(1 * 173 units) + (2 * 105 units)]
= 114,900 gpd

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Kansas City, MO 64131
T 816.347.1100

Peak Infiltration:

= 500 gpd per area (acre)
= 500 gpd * 3.5 acres
= 1,725 gpd

Peak Inflow:

Q = kiA
Where: i = 5.57 iph (rain intensity chart LSD&C:
$T_c = 18.56*A^{0.2524}$, T_c = 25.4 min)
k = 0.006
A = 3.5 acres

Q = (0.006 * 5.57 * 3.5 acres)
= 0.115 cfs
= 74,528 gpd

Total Flow= Peak Base Flow + Peak Infiltration + Peak Inflow
= 114,900 gpd +1,725 gpd + 74,528 gpd
= 191,200 gpd

The proposed site is located at the top of the West Prairie Lee Watershed, east of the Cedar Creek Watershed. Currently, the flow is conveyed via interceptor to the Tudor Road Pump Station. This route has historically experienced surcharging and backups/overflows. Therefore, due to its proximity to the Cedar Creek Watershed, the evaluation was expanded to analyze the potential for routing the proposed flow west to the Cedar Creek Watershed. Figure 1 indicates the proposed development as well as the two proposed routes.

Alternative 1 - Route 1 through West Prairie Lee Watershed

An analysis was completed to determine the effect of the projected flow from the proposed development on the existing sanitary sewer system. It was assumed that the flow would enter the collection system at Manhole 30-239. The interceptor was evaluated from the point of entry to the discharge at the Tudor Road Pump Station. The extents of the analysis are indicated on the attached Figure 2. The route includes 24-inch parallel pipes that were installed as part of the West Prairie Lee Relief Sewer project. The 2007 Master Plan recommended improvements at the Tudor Road Pump Station to increase the capacity of the

Pump Station to 24 MGD. The Master Plan should be referenced for future planning of these facilities.

Flows were projected for the existing condition using the City of Lee's Summit Design Criteria with the revised k factors for the South Prairie Lee Watershed established in the 2012 Wastewater Master Plan Update.

The focus of this analysis is to identify the impact of the additional flow from the proposed development on the hydraulic grade within the conveyance system. In other words, to determine if the system has the capacity required to adequately convey the projected flow without causing significant negative impacts to the West Prairie Lee Interceptor. The initial analysis indicated a number of segments could be considered as overcapacity.

The attached Table 1 compares the hydraulic grade line under existing conditions, which is the baseline, to the hydraulic grade line of existing conditions plus the proposed development. A positive surcharge depth versus the manhole top indicates the hydraulic grade line is above the manhole rim elevation. Table 2 below summarizes the segments that were indicated as overcapacity, or segments that have insufficient capacity to accommodate the projected flow. If an excess of one foot of surcharging is indicated, it has been highlighted below.

Table 2 – Overcapacity Segments

		Existing Flows		Existing Flows Plus New Development	
Upstream ID	Downstream ID	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Existing Diameter	Surcharge Depth vs Manhole Top (ft)
25-291	25-290	18	-3.02	18	-1.88
25-292	25-291	18	-1.39	18	-0.18
25-293	25-292	18	1.51	18	2.92
32-418	25-293	18	0.79	18	2.41
32-419	32-418	18	0.02	18	1.69
32-420	32-419	18	-1.44	18	0.49
32-421	32-420	18	4.02	18	6.21
32-422	32-421	18	3.03	18	5.32
32-423	32-422	18	3.87	18	6.26
32-424	32-423	18	3.67	18	6.18
31-377	32-424	18	0.81	18	3.38
31-376	31-377	18	-6.59	18	-3.96
31-375	31-376	18	-3.99	18	-1.34
31-374	31-375	18	1.74	18	4.57
31-088	31-374	18	-1.04	18	1.81
31-089	31-088	15	-3.99	15	-0.97
31-090	31-089	15	-4.57	15	-1.35
31-091	31-090	15	2.12	15	5.48
31-115	31-091	15	2.15	15	5.59
31-396	31-115	15	3.05	15	6.51
31-114	31-396	15	3.44	15	7.08
31-117	31-114	15	0.01	15	3.84
31-379	31-117	15	-1.37	15	2.58
31-133	31-379	15	-1.85	15	2.17
31-163	31-133	15	-2.78	15	1.39

After completion of the initial analysis, the City provided flow monitoring data collected in 2016 for the study area. The flow data used to calculate the revised k's for the 2012 update

was over 15 years old. The more recent flow data could be used to calculate revised k's that accurately reflect current conditions. As pipe ages and deteriorates, k values increase.

Flow data was collected at Manhole 31-089 during May 2016 through July 2016. In addition, the City installed a flow meter in Manhole 31-089 this fall to collect additional flow. The data was collected from October through December of 2018. Both sets of data were evaluated to calculate revised k factors to compare to the previous 2012 evaluation. Rain data was also collected for the same time period to establish the relationship between precipitation and sewer system flows.

In analyzing the fall 2018 data, two rain events were identified. The first was on November 4. However, this event was short in duration and low in intensity. The second event took place on December 1. Surcharging occurred during the recording of this event, rendering the data unusable. Therefore, the evaluation will focus on the flow rate data collected in 2016. Figure 3 illustrates the flow and rain hydrograph

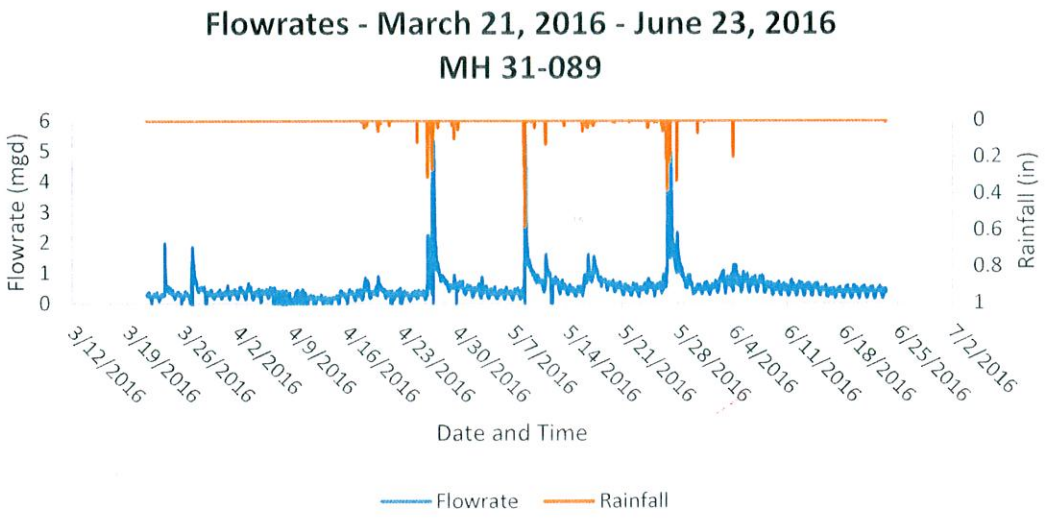


Figure 3 – Flow and Rain Hydrograph

The rainfall data was analyzed to determine the measured rainfall intensity-duration relationship. There were a number of rainfall events recorded, however, most of them were short in duration and low on depth. Three events were identified for further analysis. Each

of these events equated to a less than one year storm. The Lee's Summit Design Criteria is based upon a 50-year storm.

The flow meter recorded data was analyzed to define the average daily dry weather flow, infiltration, and inflow components of the total flow. This information was used to recalculate the k coefficient for the study area, as shown in Table 3 below. At least three storms were evaluated and an average inflow coefficient value was used.

Table 3 – Inflow Coefficient Calculation

Storm Date	Delta TC (min)	Rain Intensity (in/hr)	Peak Flow Rate (mgd)	ADDF	Peak Inflow (mgd)	Peak Inflow (cfs)	Inflow Coefficient k
4/26/16	94	0.44	5.34	0.34	4.77	8.86	0.0178
5/8/16	94	0.79	5.50	0.34	4.99	9.27	0.0104
5/27/16	94	0.47	5.21	0.34	4.80	8.92	0.0167

A revised k coefficient of 0.015 is an average of the storm events. This is an increase from the revised k value utilized in the 2012 update, which averaged between 0.0064 and 0.0012 for the flow monitoring area. The 2012 rev k values were utilized for the area downstream of the flow monitoring location.

The attached Table 4 compares the surcharge depth from the manhole top calculated using the revised k coefficient utilizing actual rain and flow data for both existing condition and existing condition plus the projected additional flow from the development. Further evaluation was completed on the overcapacity segments to review the hydraulic grade, or surcharge conditions. Upsizing or paralleling certain segments will allow the system's hydraulic grade to be within the system. It is recommended that the West Parallel Relief Sewer project be extended upstream with parallel pipes installed from Manhole 31-090 to Manhole 31-220, approximately 5,100 linear feet of pipe. Segments identified for improvement have been indicated in blue.

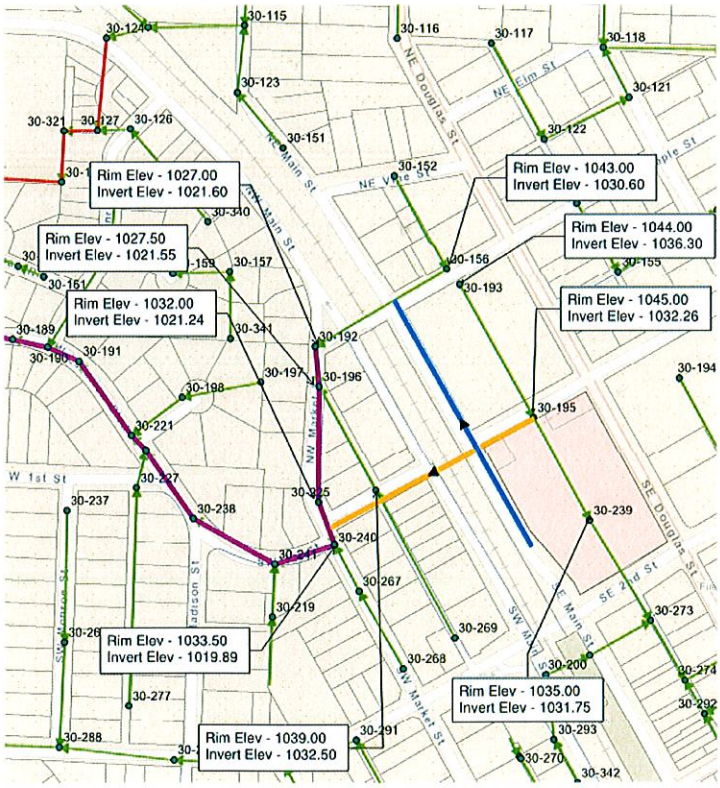
Alternative 2 - Route 2 through Cedar Creek Watershed

Due to the past history of surcharging within the West Prairie Lee Interceptor and the results of the analysis above, an alternative route was evaluated. As stated earlier, the proposed development is located at the top of the West Prairie Lee Watershed. To the west of the proposed development is the Cedar Creek Watershed. The City has recently completed

capacity improvement projects to the Cedar Creek Interceptor and is currently undergoing a study to identify future capacity improvements.

The site was evaluated to determine if the elevations would accommodate the sanitary sewer flow from the proposed development being conveyed to the Cedar Creek Watershed collection system. Two potential tie-in points were located. Flow can be conveyed through a new line to the north, indicated by the blue line on the figure below, where it can tie in to the existing sewer at the location indicated at approximately elevation 1023 ft. Flow could also be conveyed to the west, indicated in orange on the figure below, and tie into the existing line at the location indicated at approximately elevation 1020. The sewer line to the north will require deep excavation of between 20-25 feet and a potential sewer depth in excess of the City's design standards. The proposed sewer line to the west would require boring under the existing railroad. Preliminary cost estimates have been prepared for the two routes and are attached.

Figure 4 – Proposed Routing to Cedar Creek Watershed



An evaluation is currently being completed in the Cedar Creek Watershed on the Downtown Sewer to model the existing system and provide recommendations for capacity improvements. The Downtown Sewer Evaluation should be referenced for future planning of these facilities. The attached Figure 5 indicates the extents of the Downtown Sewer Evaluation in conjunction with the proposed development. For the purpose of this evaluation, the segments upstream of the Downtown Sewer evaluation, Segments 30-192 through 30-186, were analyzed to determine the effect of the projected flow from the proposed development on the existing sanitary sewer system. The results of the analysis are included in Table 5 below. The results indicate the projected flows from the proposed development cause some surcharging but it is contained within the system. The highlighted cells indicate segments which experience an increase in the hydraulic grade line of greater than one foot.

Table 5 – Inflow Coefficient Calculation

		Existing Flows		**Existing Flows Plus New Development**	
Upstream ID	Downstream ID	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Existing Diameter	Surcharge Depth vs Manhole Top (ft)
30-188	30-186	8	-7.88	8	-7.51
30-189	30-188	8	-9.84	8	-9.69
30-190	30-189	8	-5.24	8	-4.46
30-191	30-190	8	-6.00	8	-4.65
30-221	30-191	8	-6.76	8	-6.76
30-226	30-221	8	-6.30	8	-6.30
30-238	30-226	8	-7.50	8	-7.50
30-241	30-238	8	-7.40	8	-7.40
30-240	30-241	8	-14.12	8	-14.12
30-225	30-240	8	-10.92	8	-10.92
30-196	30-225	8	-5.97	8	-5.23
30-192	30-196	8	-5.40	8	-4.56

Alternative 3 – Route Flows between the Two Watersheds

A third alternative was evaluated which would split flows between the two watersheds. This alternative assumes that the southern portion of the property, approximately the southern two acres, will be conveyed to the West Prairie Lee Watershed utilizing the existing collection system., while the northern portion of the property will be conveyed through a new line to the Cedar Creek Watershed. In addition, the property to the north, the First Baptist Church of Lee's Summit, will also be conveyed to the Cedar Creek Watershed. The premise of this alternative is to maintain a net zero change in flow currently conveyed through the West Prairie Lee Interceptor by offloading the existing West Prairie Lee Watershed of the sanitary sewer flows from both the First Baptist Church and the United Methodist Church and conveying an equivalent amount from the proposed development.

Dry weather flows were obtained from the City for the two churches from their current water usage. Each church has an average dry weather flow of approximately 167 gpd.

Wet weather flows were calculated to determine the current projected flow contributed by the sites. The calculations were completed utilizing the City's design criteria.

The projected flow for the First Baptist Church of Lee's Summit is:

Peak Base Flow
= 167 gpd

Peak Infiltration:
= 250 gpd per area (acre)
= 250 gpd * 3.1 acres
= 780 gpd

Peak Inflow:
Q = kiA
Where: i = 5.62 iph (rain intensity chart LSD&C: $T_c = 18.56*A^{0.2524}$, T_c = 24.7 min)
k = 0.003
A = 3.1 acres

Q = (0.003 * 5.62 * 3.1 acres)

= 0.05 cfs
= 33,996 gpd

Total Flow= Peak Base Flow + Peak Infiltration + Peak Inflow
= 167 gpd +780 gpd + 33,996 gpd
= 34,900 gpd

The projected flow for the United Methodist Church of Lee's Summit is:

Peak Base Flow
= 167 gpd

Peak Infiltration:
= 250 gpd per area (acre)
= 250 gpd * 3.5 acres
= 863 gpd

Peak Inflow:
Q = kiA
Where: i = 5.57 iph (rain intensity chart LSD&C: $T_c = 18.56*A^{0.2524}$, T_c = 25.4 min)
k = 0.003
A = 3.5 acres

Q = (0.003 * 5.57 * 3.5 acres)
= 0.06 cfs
= 37,264 gpd

Total Flow= Peak Base Flow + Peak Infiltration + Peak Inflow
= 167 gpd +863 gpd + 37,264 gpd
= 38,300 gpd

Total flow between the two properties is 73,200 gpd. This equates to approximately 55 units that can be conveyed to the West Prairie Lee Watershed.

The total flow conveyed to the Cedar Creek Watershed, northern portion of the property plus the First Baptist Church of Lee's Summit, is projected to be 178,200 gpd. This is less than the 191,200 gpd for the proposed development, therefore the results of the previous analysis are still applicable.

Alternative 3 eliminates the extensive downstream improvements required to the West Prairie Lee Interceptor to mitigate the impact from the proposed development. Additionally, it does not require the on site improvements to the southern portion of the proposed site that would be required for Alternative 2.

If you have any questions, please feel free to contact me at 816-347-1164.

Sincerely,

Amanda Bagwell

Amanda Bagwell, P.E.
Project Manager

CC: Pat Young, HDR

TUDOR ROAD
PUMP STATION

THE MIST

STATION 5B

STATION 5A

LEGEND

- Downtown Sewer Evaluation
- Route 1
- Route 2
- Existing Gravity Mains
- Manhole
- Pump Station
- Major Watershed Boundary
- Study Area
- Parcels

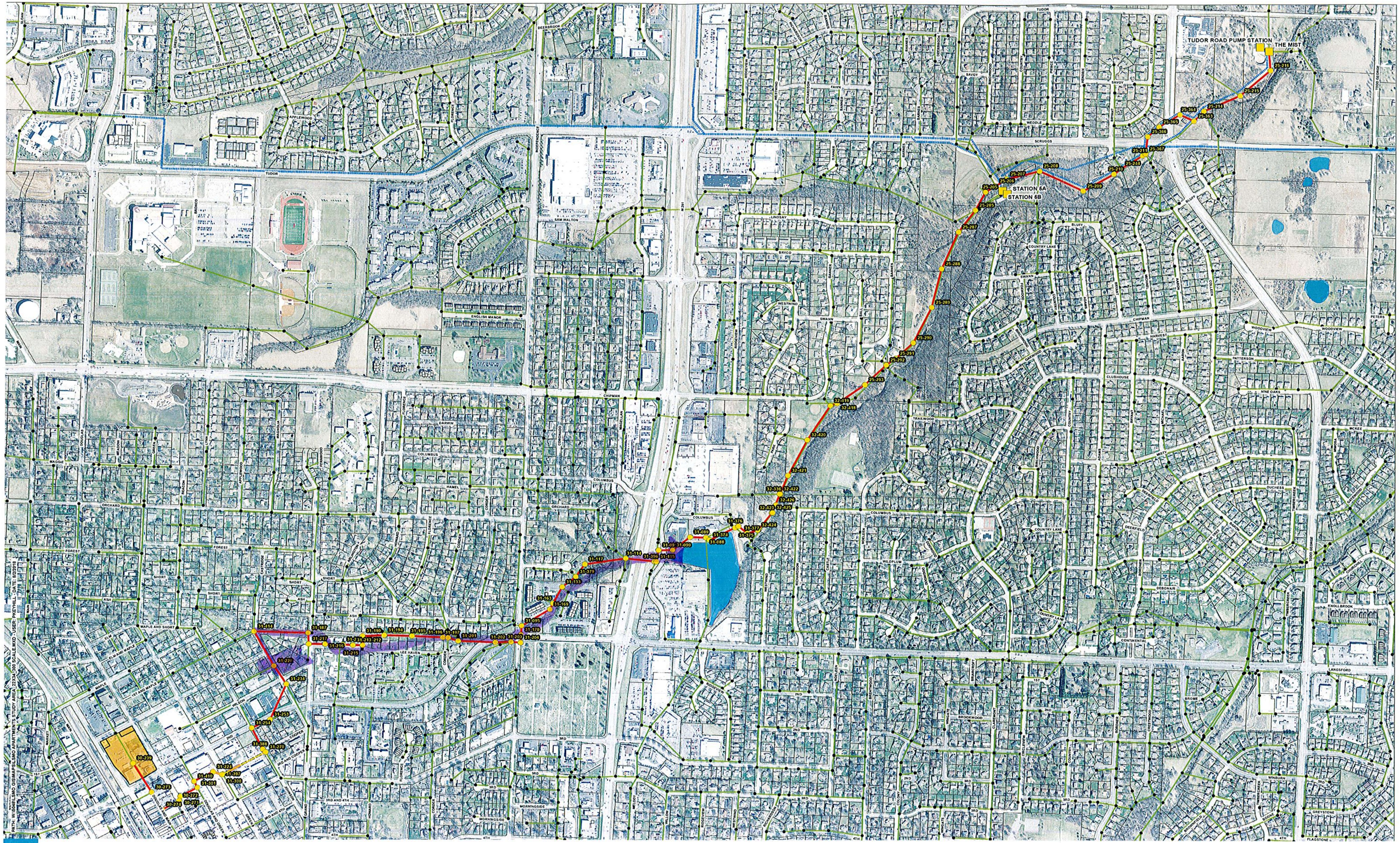
Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hon
OpenStreetMap contributors, and the GIS User Community

CITY OF LEE'S SUMMIT, MO

LEE'S SUMMIT APARTMENTS

FIGURE 1

PATH: - USER: TGRAHAM - DATE: 12/21/2016



HDR

LEE'S SUMMIT APARTMENTS

FIGURE 2

PATH: · USER: TGRAHAM · DATE: 12/21/2018

City of Lee's Summit, Missouri
Lee's Summit Apartments
Table 1

		Existing Condition		Existing Flows Plus New Development	
Upstream ID	Downstream ID	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Existing Diameter	Surcharge Depth vs Manhole Top (ft)
25-216	25-071	30	-8.15	30	-7.86
25-215	25-216	30	-10.86	30	-10.54
25-214	25-215	30	-12.01	30	-12.01
25-363	25-214	30	-14.66	30	-14.66
25-364	25-363	30	-9.48	30	-9.48
25-365	25-364	30	-13.73	30	-13.73
25-366	25-365	30	-19.19	30	-19.19
25-367	25-366	30	-14.81	30	-14.81
25-211	25-367	30	-11.73	30	-11.73
25-244	25-211	30	-12.68	30	-12.68
25-210	25-244	30	-10.98	30	-10.98
25-209	25-210	30	-11.85	30	-11.85
25-208	25-209	30	-14.12	30	-14.12
25-001V	25-208	30	-14.73	30	-14.73
25-207	25-001V	30	-16.30	30	-16.30
25-206	25-207	30	-20.26	30	-20.26
25-205	25-206	30	-17.00	30	-17.00
25-285	25-205	30	-11.58	30	-11.58
25-287	25-285	18	-7.80	18	-7.63
25-288	25-287	18	-6.32	18	-5.88
25-289	25-288	18	-5.56	18	-4.84
25-290	25-289	18	-3.88	18	-2.89
25-291	25-290	18	-3.02	18	-1.88
25-292	25-291	18	-1.39	18	-0.18
25-293	25-292	18	1.51	18	2.92
32-418	25-293	18	0.79	18	2.41
32-419	32-418	18	0.02	18	1.69
32-420	32-419	18	-1.44	18	0.49
32-421	32-420	18	4.02	18	6.21
32-422	32-421	18	3.03	18	5.32
32-423	32-422	18	3.87	18	6.26
32-424	32-423	18	3.67	18	6.18
31-377	32-424	18	0.81	18	3.38
31-376	31-377	18	-6.59	18	-3.96
31-375	31-376	18	-3.99	18	-1.34
31-374	31-375	18	1.74	18	4.57
31-088	31-374	18	-1.04	18	1.81
31-089	31-088	15	-3.99	15	-0.97
31-090	31-089	15	-4.57	15	-1.35
31-091	31-090	15	2.12	15	5.48
31-115	31-091	15	2.15	15	5.59
31-396	31-115	15	3.05	15	6.51
31-114	31-396	15	3.44	15	7.08
31-117	31-114	15	0.01	15	3.84
31-379	31-117	15	-1.37	15	2.58

		Existing Condition		Existing Flows Plus New Development	
Upstream ID	Downstream ID	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Existing Diameter	Surcharge Depth vs Manhole Top (ft)
31-133	31-379	15	-1.85	15	2.17
31-163	31-133	15	-2.78	15	1.39
31-169	31-163	15	-10.12	15	-5.86
31-095	31-169	15	-8.28	15	-3.76
31-170	31-095	15	-7.91	15	-3.34
31-204	31-170	15	-9.41	15	-4.78
31-203	31-204	15	-11.00	15	-7.06
31-202	31-203	15	-9.96	15	-6.56
31-201	31-202	15	-9.07	15	-5.45
31-197	31-201	15	-8.99	15	-5.30
31-196	31-197	15	-9.63	15	-5.91
31-195	31-196	15	-10.52	15	-6.63
31-194	31-195	15	-10.09	15	-9.15
31-190	31-194	15	-8.20	15	-7.45
31-212	31-190	15	-11.72	15	-10.91
31-213	31-212	15	-8.36	15	-7.85
31-214	31-213	15	-8.25	15	-7.73
31-215	31-214	15	-8.11	15	-7.84
31-216	31-215	15	-9.14	15	-9.08
31-217	31-216	15	-10.18	15	-10.06
31-187	31-217	15	-9.34	15	-9.34
31-414	31-187	12	-5.74	12	-5.74
31-220	31-414	12	-6.41	12	-6.11
31-234	31-220	12	-5.93	12	-5.46
31-253	31-234	12	-8.02	12	-8.02
31-254	31-253	12	-6.75	12	-6.75
31-388	31-254	12	-12.25	12	-12.25
31-270	31-388	12	-12.22	12	-12.22
31-300	31-270	12	-5.74	12	-5.74
31-397	31-300	12	-4.90	12	-4.90
31-224	31-397	12	-9.37	12	-9.37
31-410	31-224	12	-7.90	12	-7.90
31-301	31-410	8	-4.16	8	-4.16
30-271	31-301	12	-11.85	12	-11.79
30-272	30-271	15	-12.83	15	-12.77
30-274	30-272	12	-14.30	12	-14.30
30-273	30-274	8	-8.87	8	-8.87
30-239	30-273	8	-9.04	8	-9.04
30-195	30-239	8	-13.25	8	-13.25

Surcharge increase greater than 1 foot from existing condition

City of Lee's Summit, Missouri
Lee's Summit Apartments
Table 4

		Existing Flows		Existing Flows Plus New Development		Proposed Improvements	
Upstream ID	Downstream ID	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Revised Diameter	Surcharge Depth vs Manhole Top (ft)
25-216	25-071	30	-8.07	30	-7.56	30	-7.56
25-215	25-216	30	-10.20	30	-9.66	30	-9.66
25-214	25-215	30	-11.91	30	-11.35	30	-11.35
25-363	25-214	30	-14.65	30	-14.09	30	-14.09
25-364	25-363	30	-9.48	30	-9.48	30	-9.48
25-365	25-364	30	-13.73	30	-13.73	30	-13.73
25-366	25-365	30	-19.19	30	-19.19	30	-19.19
25-367	25-366	30	-14.81	30	-14.81	30	-14.81
25-211	25-367	30	-11.73	30	-11.73	30	-11.73
25-244	25-211	30	-12.68	30	-12.68	30	-12.68
25-210	25-244	30	-10.98	30	-10.98	30	-10.98
25-209	25-210	30	-11.85	30	-11.85	30	-11.85
25-208	25-209	30	-14.12	30	-14.12	30	-14.12
25-001V	25-208	30	-14.73	30	-14.73	30	-14.73
25-207	25-001V	30	-16.20	30	-16.18	30	-16.18
25-206	25-207	30	-20.26	30	-20.26	30	-20.26
25-205	25-206	30	-17.00	30	-17.00	30	-17.00
25-285	25-205	30	-11.58	30	-11.58	30	-11.58
25-287	25-285	18	-7.99	18	-7.99	18	-7.99
25-288	25-287	18	-7.87	18	-7.79	18	-7.79
25-289	25-288	18	-8.48	18	-8.32	18	-8.32
25-290	25-289	18	-8.19	18	-7.95	18	-7.95
25-291	25-290	18	-8.08	18	-7.81	18	-7.81
25-292	25-291	18	-6.81	18	-6.51	18	-6.51
25-293	25-292	18	-4.81	18	-4.45	18	-4.45
32-418	25-293	18	-6.49	18	-6.07	18	-6.07
32-419	32-418	18	-7.48	18	-7.05	18	-7.05
32-420	32-419	18	-10.25	18	-9.75	18	-9.75
32-421	32-420	18	-6.04	18	-5.47	18	-5.47
32-422	32-421	18	-7.32	18	-6.72	18	-6.72
32-423	32-422	18	-6.76	18	-6.12	18	-6.12
32-424	32-423	18	-7.27	18	-6.60	18	-6.60
31-377	32-424	18	-10.30	18	-9.61	18	-9.61
31-376	31-377	18	-17.86	18	-17.15	18	-17.15
31-375	31-376	18	-14.33	18	-14.33	18	-14.33
31-374	31-375	18	-9.09	18	-9.03	18	-9.03
31-088	31-374	18	-11.86	18	-11.80	18	-11.80
31-089	31-088	15	-14.79	15	-14.67	15	-14.67
31-090	31-089	15	-4.61	15	-4.07	15	-15.16
31-091	31-090	15	9.26	15	10.08	15	-8.39
31-115	31-091	15	14.64	15	15.66	15	-8.09
31-396	31-115	15	16.52	15	17.59	15	-6.78
31-114	31-396	15	31.07	15	32.65	15	-5.21
31-117	31-114	15	41.23	15	43.32	15	-7.50
31-379	31-117	15	47.93	15	50.33	15	-8.23
31-133	31-379	15	52.57	15	55.17	15	-7.55
31-163	31-133	15	62.21	15	65.21	15	-7.62
31-169	31-163	15	61.43	15	64.69	15	-14.43
31-095	31-169	15	79.86	15	83.78	15	-11.37
31-170	31-095	15	83.17	15	87.22	15	-10.82
31-204	31-170	15	84.94	15	89.13	15	-10.15

		Existing Flows		Existing Flows Plus New Development		Proposed Improvements	
Upstream ID	Downstream ID	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Existing Diameter	Surcharge Depth vs Manhole Top (ft)	Revised Diameter	Surcharge Depth vs Manhole Top (ft)
31-203	31-204	15	84.79	15	89.09	15	-11.00
31-202	31-203	15	91.43	15	96.02	15	-9.96
31-201	31-202	15	103.50	15	108.65	15	-8.41
31-197	31-201	15	106.15	15	111.44	15	-8.25
31-196	31-197	15	106.85	15	112.22	15	-8.84
31-195	31-196	15	112.12	15	117.84	15	-9.49
31-194	31-195	15	114.76	15	120.79	15	-10.09
31-190	31-194	15	122.38	15	128.76	15	-8.20
31-212	31-190	15	121.19	15	127.71	15	-11.60
31-213	31-212	15	126.53	15	133.18	15	-8.36
31-214	31-213	15	128.82	15	135.61	15	-8.17
31-215	31-214	15	129.90	15	136.76	15	-8.11
31-216	31-215	15	130.89	15	137.88	15	-9.14
31-217	31-216	15	132.84	15	140.03	15	-10.03
31-187	31-217	15	132.73	15	139.98	15	-9.34
31-414	31-187	12	133.90	12	142.02	12	-5.74
31-220	31-414	12	136.97	12	145.72	12	-6.19
31-234	31-220	12	139.60	12	148.74	12	-3.17
31-253	31-234	12	137.46	12	147.08	12	-4.84
31-254	31-253	12	136.56	12	146.42	12	-5.49
31-388	31-254	12	128.51	12	138.63	12	-12.25
31-270	31-388	12	128.40	12	138.55	12	-12.22
31-300	31-270	12	134.54	12	145.09	12	-5.68
31-397	31-300	12	134.85	12	145.40	12	-4.90
31-224	31-397	12	127.95	12	138.58	12	-9.37
31-410	31-224	12	128.39	12	139.17	12	-7.90
31-301	31-410	8	129.06	8	140.26	8	-4.16
30-271	31-301	12	121.62	12	132.95	12	-11.48
30-272	30-271	15	120.67	15	132.00	15	-12.42
30-274	30-272	12	115.82	12	127.25	12	-14.30
30-273	30-274	8	119.31	8	131.47	8	-8.87
30-239	30-273	8	115.21	8	127.72	8	-9.04
30-195	30-239	8	105.23	8	118.07	8	-13.25

Recommended improvement - Parallel Pipe

Surcharge increase greater than 1 foot from existing condition

CITY OF LEE'S SUMMIT, MO

LEE'S SUMMIT APARTMENTS

FIGURE 5

ENGINEER'S PRELIMINARY COST ESTIMATE OF PROBABLE CONSTRUCTION COSTS
LEE'S SUMMIT APARTMENTS - ROUTE 2
LEE'S SUMMIT, MO

December 19, 2018

Item No.	Description	Quantity	Unit	Unit Price $	Price $
1.	Mobilization (3% max of total bid)	1	LS	$7,500.00	$7,500.00
2.	Demolition, Clearing & Grubbing	1	LS	$5,000.00	$5,000.00
3.	8" Sanitary Sewer (PVC SDR-26)	575	LF	$158.00	$90,850.00
4.	Railroad Boring with Casing and Carrier Pipe	100	LF	$850.00	$85,000.00
5.	4' Dia. Manhole (8'-12' Depth)	1	EA	$4,800.00	$4,800.00
6.	Bypass Pumping	1	LS	$10,000.00	$10,000.00
7.	Street Repair	1	LS	$24,000.00	$24,000.00
8.	Erosion Control	1	LS	$5,000.00	$5,000.00
				SUBTOTAL:	**$232,150.00**
				CONTINGENCY (15%):	$34,900.00
				TOTAL CONSTRUCTION:	**$268,000.00**
				Legal, Easements, Engineering, Inspection (20%):	$53,600.00
				PROJECT TOTAL:	**$321,000.00**

ENGINEER'S PRELIMINARY COST ESTIMATE OF PROBABLE CONSTRUCTION COSTS
LEE'S SUMMIT APARTMENTS - ROUTE 1
LEE'S SUMMIT, MO

December 19, 2018

Item No.	Description	Quantity	Unit	Unit Price $	Price $
1.	Mobilization (3% max of total bid)	1	LS	$6,000.00	$6,000.00
2.	Demolition, Clearing & Grubbing	1	LS	$5,000.00	$5,000.00
3.	8" Sanitary Sewer (PVC SDR-26)	720	LF	$190.00	$136,800.00
4.	4' Dia. Manhole (12'-18' Depth)	3	EA	$5,500.00	$16,500.00
5.	Sod	100	SY	$5.00	$500.00
6.	Bypass Pumping	1	LS	$5,000.00	$5,000.00
7.	Street Repair	1	LS	$20,000.00	$20,000.00
8.	Erosion Control	1	LS	$5,000.00	$5,000.00
				SUBTOTAL:	**$194,800.00**
				CONTINGENCY (15%):	$29,300.00
				TOTAL CONSTRUCTION:	**$225,000.00**
				Legal, Easements, Engineering, Inspection (20%):	$45,000.00
				PROJECT TOTAL:	**$270,000.00**

*Outside of City standard sewer depth