



August 2, 2021

Gene Williams, Senior Staff Engineer
City of Lee's Summit
220 SE Green Street
Lee's Summit, MO 64063

RE: "ARTISAN POINT – SANITARY SEWER CAPACITY" BY TANNER CONSULTING LLC.

Dear Mr. Williams:

We are submitting the following information in connection with the Blue Parkway development preliminary plan. This project was previously submitted as "Artisan Point – Sanitary Sewer Capacity" report, dated August 20th, 2018, prepared by Tanner Consulting LLC. The report analyzed a proposed 34 acre residential development, Artisan Point, located north of Blue Parkway and east of Blackwell Road. The purpose of the report was to analyze the existing sanitary sewer main capacity in place.

Tanner Consulting analyzed different alignments that would accommodate proposed flows for Artisan Point development. Their analysis started at the existing upstream manhole MH 65-102 and ended at the downstream existing manhole MH 65-145. The analysis highlighted portions of the existing sanitary sewer main that were undersized and would not accommodate the proposed flow rates for the development.

To determine wastewater flow impact of the Blue Parkway development, we have analyzed an alignment connecting to the upstream existing manhole MH 65-102, as originally proposed by the Artisan Point analysis. All pipe has been assigned a manning's "n" of 0.014. The pipe capacity was analyzed at 94% flow. Additionally, we propose the entire 62.40 acre Blue Parkway development can be routed to the north. This results in a 1.25 cfs increase in the existing system. Reference Exhibit A – Tributary Map.

To accommodate the proposed flow rates from Blue Parkway, the 8" PVC connection between MH 65-102 and MH 65-100 would need to be upsized to a 12" PVC. A connection would be made to the existing 24" PVC main upstream of MH 65-161, off Millstone Avenue. Further downstream, our analysis also shows a new alignment will be required in order to connect sewage across Langsford Road since the existing main is currently undersized to handle additional flows.

Offsite future developments were taken into account with this analysis. The offsite future commercial development was assumed to have an EDU of 1 with an average building

footprint of 15,000 S.F. only one story high. Future flows were calculated for approximately 146 acres of offsite residential and 30 acres of offsite commercial land. These future developments add approximately 4 cfs to the sewer system. At full buildout, the sewer system would have approximately a total peak flow of 13.27 cfs. With a full buildout, the City would need to look at the pipe segment between MH 65-114 and MH 65-104 as the current slope would not provide the desire capacity for the future developments.

In summary, we have shown that the existing sewer conditions would not provide the required capacity to serve Blue Parkway and future developments. Approximately 1,085 LF of 24" PVC and 583 LF of 12" PVC would need to be installed for full buildout. It is our understanding that the City will pay the sizing increase for a full buildout compared to only the Parkway Development requirements.

If you have any concerns or questions regarding this analysis, please let us know and we'll be happy to discuss in more detail our methodology.

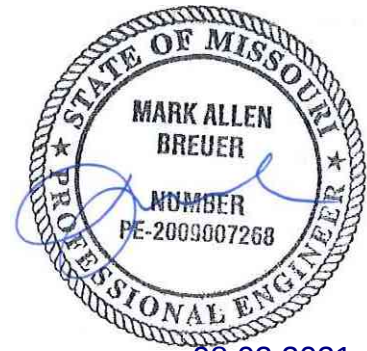
Sincerely,

Schlagel & Associates, P.A.



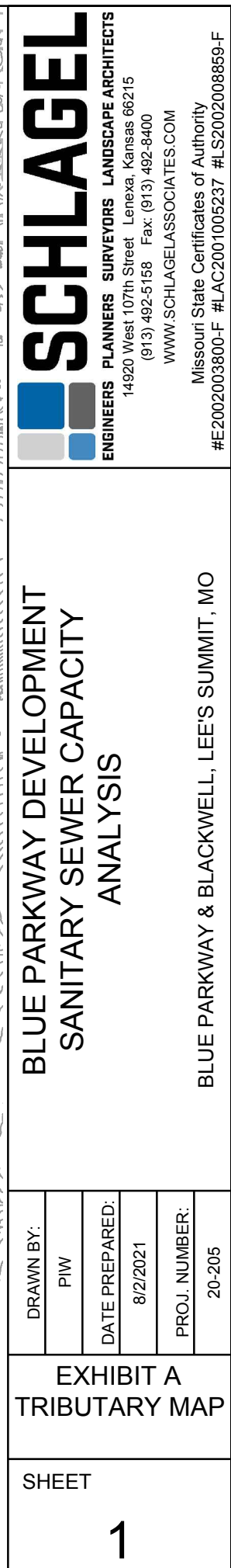
Paul Woodard
Design Engineer
913-322-7153
pw@schlagelassociates.com

/piw
Enclosures



08.02.2021

Mark Breuer, P.E.
Principal/Project Engineer
913-492-5158
mab@schlagelassociates.com



Project Name: Blue Parkway Development
 Project #: 20-205
 Date: 8/2/2021

Designed By: P.Woodard
 Checked By: M.Breuer
 Location: Lee's Summit, MO

Peak Base Flow (PBF)						
Proposed	Basin	Equivalent Development Units (EDU)	Area (AC.)	Peak Base Flow (GPD/AC)	Peak Flow (GPD)	Peak Flow (CFS)
	RP-1 (Residential)	1	12.46	1,500	18,690	0.0288
	RP-3 (Townhomes)	118	24.55	300	35,400	0.0545
	RP-4 (Apartments)	252	19.21	300	75,600	0.1164
	CP-1 (Commercial) BLDG@37,956 S.F.	0.2	6.18	300	2,277	0.0035
Existing						
	Area 1 to MH 65-161	1	24.18	1,500	36,270	0.0558
	Area 2 to MH 65-159	1	14.6	1,500	21,900	0.0337
	Area 3 to MH 65-158	1	11.44	1,500	17,160	0.0264
	Area 4 to MH 65-114	1	4.99	1,500	7,485	0.0115
	Area 5 to MH 65-104	1	27.24	1,500	40,860	0.0629
	Area 6 to MH 65-225 (School) BLDG@64,000 S.F.	0.8	22.62	300	15,360	0.0236
	Area 7 to MH 65-225	1	67.22	1,500	100,830	0.1552
	Area 8 to MH 65-150	1	9.4	1,500	14,100	0.0217
	Area 9 to MH 65-148	1	31.6	1,500	47,400	0.0730
	Area 10 to MH 65-148	1	36.42	1,500	54,630	0.0841
	Area 11 to MH 65-147	1	4.94	1,500	7,410	0.0114
	Area 12 to MH 65-146	1	25.84	1,500	38,760	0.0597
	Area 13 to MH 65-145	1	14.75	1,500	22,125	0.0341
Peak Base Flow Total (PRO & EX)=						0.8563
Offsite Future						
	Area B (Residential)	1	69.43	1,500	104,145	0.1603
	Area C (Residential)	1	76.77	1,500	115,155	0.1773
	Area D (Commercial) AVG BLDG@15,000 S.F.	1	18.41	300	4,500	0.0069
	Area E (Commercial) AVG BLDG@15,000 S.F.	1	11.87	300	4,500	0.0069
Peak Base Flow Total=						1.2077

Residential
 $PBF = 1500 \text{ GPD/AC} * \text{Area}$

Non-Residential
 $PBF (\text{non-res}) = \text{EDU} * \text{Building Area} * \text{Stories} * 300 \text{ GPD}$

Project Name: Blue Parkway Development
 Project #: 20-205
 Date: 8/2/2021

Designed By: P.Woodard
 Checked By: M.Breuer
 Location: Lee's Summit, MO

Peak Infiltration Flow (PIF)					
Proposed	Basin	Area (AC.)	Peak Base Flow (GPD/AC)	Peak Flow (GPD)	Peak Flow (CFS)
	RP-1 (Residential)	12.46	500	6,230	0.0096
	RP-3 (Townhomes)	24.55	250	6,138	0.0094
	RP-4 (Apartments)	19.21	250	4,803	0.0074
	CP-1 (Commercial)	6.18	250	1,545	0.0024
Existing					
	Area 1 to MH 65-161	24.18	500	12,090	0.0186
	Area 2 to MH 65-159	14.6	500	7,300	0.0112
	Area 3 to MH 65-158	11.44	500	5,720	0.0088
	Area 4 to MH 65-114	4.99	500	2,495	0.0038
	Area 5 to MH 65-104	27.24	500	13,620	0.0210
	Area 6 to MH 65-225 (school)	22.62	250	5,655	0.0087
	Area 7 to MH 65-225	67.22	500	33,610	0.0517
	Area 8 to MH 65-150	9.4	500	4,700	0.0072
	Area 9 to MH 65-148	31.6	500	15,800	0.0243
	Area 10 to MH 65-148	36.42	500	18,210	0.0280
	Area 11 to MH 65-147	4.94	500	2,470	0.0038
	Area 12 to MH 65-146	25.84	500	12,920	0.0199
	Area 13 to MH 65-145	14.75	500	7,375	0.0114

Peak Infiltration Flow Total (PRO & EX)= 0.2473

Offsite Future					
	Area B (Residential)	69.43	500	34,715	0.0534
	Area C (Residential)	76.77	500	38,385	0.0591
	Area D (Commercial)	18.41	250	4,603	0.0071
	Area E (Commercial)	11.87	250	2,968	0.0046

Peak Infiltration Flow Total = 0.3715

Project Name: Blue Parkway Development
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 Date: 8/2/2021

Designed By: P.Woodard
 Checked By: M.Breuer
 Location: Lee's Summit, MO

Peak Inflow Rate (PIR)						
Proposed	Basin	Area (AC.)	Time of Concentration (minutes)	Rainfall Intensity 50-Year Event (inches/hour)	Inflow Factor (K)	Peak Inflow Rate (Q=A*I*K)
	RP-1 (Residential)	12.46	35.08	4.69	0.006	0.3506
	RP-3 (Townhomes)	24.55	41.63	4.31	0.003	0.3174
	RP-4 (Apartments)	19.21	39.13	4.46	0.003	0.2570
	CP-1 (Commercial)	6.18	29.39	5.06	0.003	0.0938
Existing						
	Area 1 to MH 65-161	24.18	41.47	4.32	0.006	0.6267
	Area 2 to MH 65-159	14.6	36.51	4.61	0.006	0.4038
	Area 3 to MH 65-158	11.44	34.33	4.73	0.006	0.3247
	Area 4 to MH 65-114	4.99	27.85	5.26	0.006	0.1575
	Area 5 to MH 65-104	27.24	42.74	4.25	0.006	0.6946
	Area 6 to MH 65-225 (school)	22.62	40.78	4.36	0.003	0.2959
	Area 7 to MH 65-225	67.22	53.68	3.62	0.006	1.4600
	Area 8 to MH 65-150	9.4	32.67	4.83	0.006	0.2724
	Area 9 to MH 65-148	31.6	44.37	4.16	0.006	0.7887
	Area 10 to MH 65-148	36.42	45.99	4.06	0.006	0.8872
	Area 11 to MH 65-147	4.94	27.78	5.27	0.006	0.1562
	Area 12 to MH 65-146	25.84	42.17	4.28	0.006	0.6636
	Area 13 to MH 65-145	14.75	36.61	4.60	0.006	0.4071
Peak Inflow Rate Total (PRO & EX)=						8.1574
Offsite Future						
	Area B (Residential)	69.43	54.12	3.60	0.006	1.4997
	Area C (Residential)	76.77	55.51	3.52	0.006	1.6214
	Area D (Commercial)	18.41	38.71	4.48	0.003	0.2474
	Area E (Commercial)	11.87	34.66	4.71	0.003	0.1677
Peak Inflow Rate Total=						11.6936

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Total Peak Flows					
Proposed	Basin	PBF (CFS)	PIF (CFS)	PIR (CFS)	Total (CFS)
	RP-1 (Residential)	0.0288	0.0096	0.3506	0.3890
	RP-3 (Townhomes)	0.0545	0.0094	0.3174	0.3814
	RP-4 (Apartments)	0.1164	0.0074	0.2570	0.3808
	CP-1 (Commercial)	0.0035	0.0024	0.0938	0.0997
				Total (PRO)=	1.2509
Existing					
	Area 1 to MH 65-161	0.0558	0.0186	0.6267	0.7012
	Area 2 to MH 65-159	0.0337	0.0112	0.4038	0.4488
	Area 3 to MH 65-158	0.0264	0.0088	0.3247	0.3599
	Area 4 to MH 65-114	0.0115	0.0038	0.1575	0.1728
	Area 5 to MH 65-104	0.0629	0.0210	0.6946	0.7785
	Area 6 to MH 65-225 (school)	0.0236	0.0087	0.2959	0.3282
	Area 7 to MH 65-225	0.1552	0.0517	1.4600	1.6670
	Area 8 to MH 65-150	0.0217	0.0072	0.2724	0.3014
	Area 9 to MH 65-148	0.0730	0.0243	0.7887	0.8860
	Area 10 to MH 65-148	0.0841	0.0280	0.8872	0.9993
	Area 11 to MH 65-147	0.0114	0.0038	0.1562	0.1714
	Area 12 to MH 65-146	0.0597	0.0199	0.6636	0.7431
	Area 13 to MH 65-145	0.0341	0.0114	0.4071	0.4525
Total (PRO & EX)=					9.2610
Offsite Future					
	Area B (Residential)	0.1603	0.0534	1.4997	1.7134
	Area C (Residential)	0.1773	0.0591	1.6214	1.8577
	Area D (Commercial)	0.0069	0.0071	0.2474	0.2614
	Area E (Commercial)	0.0069	0.0046	0.1677	0.1792

TOTAL= 13.2728

BLUE PARKWAY DEVELOPMENT

	<u>PIPE SEGMENT</u>	<u>PIPE LENGTH (FT)</u>	<u>PIPE DIAMETER (IN)</u>	<u>PIPE SLOPE (FT/FT)</u>	<u>FULL FLOW PIPE CAPACITY (CFS)</u>	<u>94% FULL FLOW PIPE CAPACITY (CFS)</u>	<u>2/3 PIPE FLOW CAPACITY (CFS)</u>	<u>1/2 PIPE FLOW CAPACITY (CFS)</u>	<u>EXISTING FLOW (CFS)</u>	<u>EXISTING EXCESS (CFS)</u>	<u>BLACKWELL DEVELOPMENT (CFS)</u>	<u>OTHER FUTURE (CFS)</u>	<u>PROPOSED TOTAL FINAL FLOW (CFS)</u>	<u>EXCESS PIPE CAPACITY (CFS)</u>	<u>PERCENTAGE OF 94% FLOW (%)</u>
(RE: TANNER)	145-END	159.00	24	0.0050	14.89	16.02	11.67	7.45	8.01	8.01	1.25	4.01	13.27	2.75	82.85%
	146-145	174.70	24	0.0053	15.33	16.49	12.02	7.67	7.56	8.94	1.25	4.01	12.82	3.67	77.72%
	147-146	169.00	24	0.0047	14.44	15.53	11.32	7.22	6.81	8.72	1.25	4.01	12.08	3.46	77.75%
	148-147	366.90	24	0.0052	15.19	16.34	11.91	7.59	6.64	9.70	1.25	4.01	11.91	4.43	72.87%
	149-148	417.30	24	0.0048	14.59	15.70	11.44	7.30	4.76	10.94	1.25	4.01	10.02	5.68	63.84%
	150-149	186.00	24	0.0054	15.48	16.65	12.13	7.74	4.76	11.89	1.25	4.01	10.02	6.63	60.18%
	151-150	361.30	24	0.0049	14.74	15.86	11.56	7.37	4.46	11.40	1.25	4.01	9.72	6.14	61.28%
	225-151	269.60	24	0.0075	18.24	19.62	14.30	9.12	4.46	15.17	1.25	4.01	9.72	9.90	49.53%
	MH A1-225	89.98	24	0.0050	14.89	16.02	11.67	7.45	2.46	13.56	1.25	4.01	7.72	8.30	48.21%
	MH A2-MH A1	108.84	24	0.0050	14.89	16.02	11.67	7.45	2.46	13.56	1.25	4.01	7.72	8.30	48.21%
	MH A3-MH A2	266.61	24	0.0050	14.89	16.02	11.67	7.45	2.46	13.56	1.25	4.01	7.72	8.30	48.21%
REPLACE 092	103-MH A3	298.80	24	0.0084	19.30	20.77	15.13	9.65	2.46	18.30	1.25	4.01	7.72	13.04	37.20%
	104-103	70.40	24	0.0102	21.27	22.88	16.68	10.64	2.46	20.42	1.25	4.01	7.72	15.16	33.75%
	114-104	378.10	24	0.0008	5.96	6.41	4.67	2.98	1.68	4.73	1.25	4.01	6.95	(0.54)	108.38%
	118-114	218.90	24	0.0022	9.88	10.63	7.74	4.94	1.51	9.12	1.25	4.01	6.77	3.85	63.73%
	157-118	357.85	24	0.0010	6.66	7.16	5.22	3.33	1.51	5.65	1.25	4.01	6.77	0.39	94.53%
	158-157	134.57	24	0.0024	10.32	11.10	8.09	5.16	1.51	9.59	1.25	4.01	6.77	4.33	61.02%
	159-158	964.76	24	0.0017	8.68	9.34	6.81	4.34	1.15	8.19	1.25	4.01	6.41	2.93	68.65%
	160-159	394.84	24	0.0013	7.59	8.17	5.95	3.80	0.70	7.47	1.25	4.01	5.96	2.21	73.01%
	161-160	400.00	24	0.0017	8.68	9.34	6.81	4.34	0.70	8.64	1.25	4.01	5.96	3.38	63.84%
	MH A4-161	340.83	24	0.0012	7.30	7.85	5.72	3.65	0.00	7.85	1.25	4.01	5.26	2.59	67.05%
	MH A5-MH A4	51.97	24	0.0023	10.10	10.87	7.92	5.05	0.00	10.87	1.25	1.97	3.23	7.64	29.69%
	MH A6-MH A5	207.17	24	0.0023	10.10	10.87	7.92	5.05	0.00	10.87	1.25	1.97	3.23	7.64	29.69%
	MH A7-MH A6	360.00	24	0.0023	10.10	10.87	7.92	5.05	0.00	10.87	1.25	1.97	3.23	7.64	29.69%
	MH A8-MH A7	30.15	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25	0.00	1.25	0.46	73.09%
REPLACE 100	MH A9-MH A8	175.98	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25	0.00	1.25	0.46	73.09%
	109-MH A9	377.20	12	0.0199	4.68	5.03	3.67	2.34	0.00	5.03	1.25	0.00	1.25	3.78	24.85%

PROBLEM

BLUE PARKWAY DEVELOPMENT (WITH NO OFFSITE FUTURE DEVELOPMENT)

	<u>PIPE SEGMENT</u>	<u>PIPE LENGTH (FT)</u>	<u>PIPE DIAMETER (IN)</u>	<u>PIPE SLOPE (FT/FT)</u>	<u>FULL FLOW PIPE CAPACITY (CFS)</u>	<u>94% FULL FLOW PIPE CAPACITY (CFS)</u>	<u>2/3 PIPE FLOW CAPACITY (CFS)</u>	<u>1/2 PIPE FLOW CAPACITY (CFS)</u>	<u>EXISTING FLOW (CFS)</u>	<u>EXISTING EXCESS (CFS)</u>	<u>BLACKWELL DEVELOPMENT (CFS)</u>	<u>OTHER FUTURE (CFS)</u>	<u>PROPOSED TOTAL FINAL FLOW (CFS)</u>	<u>EXCESS PIPE CAPACITY (CFS)</u>	<u>PERCENTAGE OF 94% FLOW (%)</u>
(RE: TANNER)	145-END	159.00	24	0.0050	14.89	16.02	11.67	7.45	8.01	8.01	1.25		9.26	6.76	57.81%
	146-145	174.70	24	0.0053	15.33	16.49	12.02	7.67	7.56	8.94	1.25		8.81	7.69	53.40%
	147-146	169.00	24	0.0047	14.44	15.53	11.32	7.22	6.81	8.72	1.25		8.07	7.47	51.92%
	148-147	366.90	24	0.0052	15.19	16.34	11.91	7.59	6.64	9.70	1.25		7.89	8.44	48.32%
	149-148	417.30	24	0.0048	14.59	15.70	11.44	7.30	4.76	10.94	1.25		6.01	9.69	38.28%
	150-149	186.00	24	0.0054	15.48	16.65	12.13	7.74	4.76	11.89	1.25		6.01	10.64	36.09%
	151-150	361.30	24	0.0049	14.74	15.86	11.56	7.37	4.46	11.40	1.25		5.71	10.15	35.99%
	225-151	269.60	24	0.0075	18.24	19.62	14.30	9.12	4.46	15.17	1.25		5.71	13.91	29.09%
	MH A1-225	89.98	24	0.0050	14.89	16.02	11.67	7.45	2.46	13.56	1.25		3.71	12.31	23.17%
	MH A2-MH A1	108.84	24	0.0050	14.89	16.02	11.67	7.45	2.46	13.56	1.25		3.71	12.31	23.17%
	MH A3-MH A2	266.61	24	0.0050	14.89	16.02	11.67	7.45	2.46	13.56	1.25		3.71	12.31	23.17%
REPLACE 092	103-MH A3	298.80	24	0.0084	19.30	20.77	15.13	9.65	2.46	18.30	1.25		3.71	17.05	17.88%
	104-103	70.40	24	0.0102	21.27	22.88	16.68	10.64	2.46	20.42	1.25		3.71	19.17	16.22%
	114-104	378.10	24	0.0008	5.96	6.41	4.67	2.98	1.68	4.73	1.25		2.93	3.47	45.78%
	118-114	218.90	24	0.0022	9.88	10.63	7.74	4.94	1.51	9.12	1.25		2.76	7.87	25.98%
	157-118	357.85	24	0.0010	6.66	7.16	5.22	3.33	1.51	5.65	1.25		2.76	4.40	38.53%
	158-157	134.57	24	0.0024	10.32	11.10	8.09	5.16	1.51	9.59	1.25		2.76	8.34	24.87%
	159-158	964.76	24	0.0017	8.68	9.34	6.81	4.34	1.15	8.19	1.25		2.40	6.94	25.70%
	160-159	394.84	24	0.0013	7.59	8.17	5.95	3.80	0.70	7.47	1.25		1.95	6.22	23.90%
	161-160	400.00	24	0.0017	8.68	9.34	6.81	4.34	0.70	8.64	1.25		1.95	7.39	20.90%
	MH A4-161	340.83	24	0.0012	7.30	7.85	5.72	3.65	0.00	7.85	1.25		1.25	6.60	15.94%
	MH A5-MH A4	51.97	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25		1.25	0.46	73.09%
	MH A6-MH A5	207.17	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25		1.25	0.46	73.09%
	MH A7-MH A6	360.00	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25		1.25	0.46	73.09%
	MH A8-MH A7	30.15	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25		1.25	0.46	73.09%
REPLACE 100	MH A9-MH A8	175.98	12	0.0023	1.59	1.71	1.25	0.80	0.00	1.71	1.25		1.25	0.46	73.09%
	109-MH A9	377.20	12	0.0199	4.68	5.03	3.67	2.34	0.00	5.03	1.25		1.25	3.78	24.85%