



August 24, 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 two alignments 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 Sewer Alignment – Option 1 and Sewer Alignment – Option 2 tributary maps on sheet 1 and sheet 4, respectively.

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. Additionally, Option 1, of our analysis, would require that the existing 8" PVC connection between MH 65-092 and MH 65-226 and the existing 15" PVC connection between MH 65-226 and MH 65-225 be upsized to 24" PVC. For Option 2, our analysis 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 capacity concerns for the pipe segments between MH 65-158 and MH 65-157, MH 65-114 and MH 65-104, MH 65-150 and MH 65-149, and MH 65-145 and ending manhole. The current as-built slope in these pipe segments will not provide the desired flow capacity for future developments.

In conclusion, we have shown two options that would require the installation of 12" and 24" PVC for full build out requirements. Approximately 1,160 LF of 24" PVC and 583 LF of 12" PVC would need to be installed for Option 1. Option 2 would require approximately 1,085 LF of 24" PVC and 583 LF of 12" PVC. We've shown that the existing sewer conditions would not provide the required capacity for serve Blue Parkway and future developments.

It is our understanding that the City will pay the sizing increase for a full buildout compared to only the Blue Parkway Development requirements. Profiles showing only peak flows from Blue Parkway for Option 1 and Option 2 can be seen on sheet 2 and sheet 5, respectively. These two profiles highlight the installation of approximately 1,603 LF and 1,668 LF of 12" PVC for Option 1 and Option 2, respectively.

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
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/piw
Enclosures



08.24.2021

Mark Breuer, P.E.
Principal/Project Engineer
913-492-5158
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Project Name: Blue Parkway Development
 Project #: 20-205
 Date: 8/19/2021

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 (226) (School) BLDG@64,000 S.F.	0.8	22.62	300	15,360	0.0236
	Area 7 to MH 65-225 (226)	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
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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 (226) (school)	22.62	250	5,655	0.0087
	Area 7 to MH 65-225 (226)	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

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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 (226) (school)	22.62	40.78	4.36	0.003	0.2959
	Area 7 to MH 65-225 (226)	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 (226) (school)	0.0236	0.0087	0.2959	0.3282
	Area 7 to MH 65-225 (226)	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

OPTION 1 - FULL BUILD OUT

ID	Type	From	To (Outlet)	Length	Inlet	Outlet	Average	Diameter	Manning's	Peak	Design Flow	Peak Flow	Peak Flow	Peak Flow
		(Inlet)			Invert	Invert	Slope		Roughness	Flow	Capacity	Velocity	Depth	Depth/
					Elevation	Elevation								Total Depth
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)	(ft/sec)	(ft)	Ratio
P-01	Pipe	65-102	A9	377.20	976.50	969.00	1.9900	12.000	0.0140	1.26	4.67	4.94	0.40	0.40
P-02	Pipe	A9	A8	175.98	968.70	968.30	0.2300	12.000	0.0140	1.25	1.58	2.51	0.61	0.61
P-03	Pipe	A8	A7	30.15	968.00	967.93	0.2300	12.000	0.0140	1.25	1.59	2.58	0.62	0.62
P-04	Pipe	A7	A6	360.00	967.63	966.80	0.2300	24.000	0.0140	3.22	10.09	3.06	0.74	0.37
P-05	Pipe	A6	A5	207.17	966.50	966.02	0.2300	24.000	0.0140	3.22	10.11	3.08	0.73	0.37
P-06	Pipe	A5	A4	51.97	965.72	965.60	0.2300	24.000	0.0140	3.22	10.09	3.11	0.73	0.36
P-07	Pipe	A4	65-161	340.83	963.87	963.46	0.1200	24.000	0.0140	5.26	7.29	2.79	1.26	0.63
P-08	Pipe	65-161	65-160	400.00	963.34	962.68	0.1700	24.000	0.0140	5.96	8.53	3.07	1.26	0.63
P-09	Pipe	65-160	65-159	394.84	962.50	961.97	0.1300	24.000	0.0140	5.96	7.70	2.96	1.30	0.65
P-10	Pipe	65-159	65-158	364.76	961.78	961.17	0.1700	24.000	0.0140	6.41	8.59	2.84	1.44	0.72
P-11	Pipe	65-158	65-157	134.57	961.10	960.78	0.2400	24.000	0.0140	6.77	10.24	2.84	1.57	0.78
P-12	Pipe	65-157	65-118	357.85	960.72	960.35	0.1000	24.000	0.0140	6.77	6.75	2.77	1.60	0.80
P-13	Pipe	65-118	65-114	218.01	960.35	959.88	0.2200	24.000	0.0140	6.77	9.75	2.91	1.62	0.81
P-14	Pipe	65-114	65-104	381.23	959.88	959.58	0.0800	24.000	0.0140	6.94	5.89	3.17	1.31	0.66
P-15	Pipe	65-104	65-103	75.38	947.98	947.26	0.9600	24.000	0.0140	7.72	20.53	5.29	0.94	0.47
P-16	Pipe	65-103	65-092	282.37	947.22	944.72	0.8900	24.000	0.0140	7.72	19.77	5.66	0.90	0.45
P-17	Pipe	65-092	65-226	400.00	937.32	935.20	0.5300	24.000	0.0140	7.72	15.29	4.75	1.03	0.51
P-18	Pipe	65-226	65-225	140.60	934.30	929.89	3.1400	24.000	0.0140	9.72	37.20	9.28	0.73	0.37
P-19	Pipe	65-225	65-151	305.59	929.10	926.50	0.8500	24.000	0.0140	9.72	19.38	5.90	1.04	0.52
P-20	Pipe	65-151	65-150	355.24	926.30	924.30	0.5600	24.000	0.0140	9.72	15.76	3.94	1.47	0.73
P-21	Pipe	65-150	65-149	189.18	924.20	924.00	0.1100	24.000	0.0140	10.02	6.83	3.80	1.56	0.78
P-22	Pipe	65-149	65-148	399.96	923.90	922.00	0.4800	24.000	0.0140	10.02	14.48	4.86	1.26	0.63
P-23	Pipe	65-148	65-147	380.78	921.70	919.80	0.5000	24.000	0.0140	11.91	14.84	5.13	1.43	0.72
P-24	Pipe	65-147	65-146	158.14	919.50	918.70	0.5100	24.000	0.0140	12.08	14.94	4.97	1.70	0.85
P-25	Pipe	65-146	65-145	182.44	918.50	917.30	0.6600	24.000	0.0140	12.82	17.04	4.45	1.96	0.98
P-26	Pipe	65-145	END	160.00	917.20	916.64	0.3500	24.000	0.0140	13.27	12.43	4.22	2.00	1.00

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OPTION 2 - FULL BUILD OUT

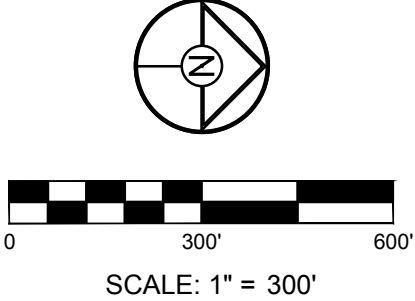
ID	Type	From	To (Outlet)	Length	Inlet	Outlet	Average	Diameter	Manning's	Peak	Design Flow	Peak Flow	Peak Flow	Peak Flow
		(Inlet)			Invert	Invert	Slope		Roughness	Flow	Capacity	Velocity	Depth	Depth/
					Elevation	Elevation								Total Depth
				(ft)	(ft)	(ft)	(%)	(in)		(cfs)	(cfs)	(ft/sec)	(ft)	Ratio
P-01	Pipe	65-102	A9	377.20	976.50	969.00	1.9900	12.000	0.0140	1.26	4.67	4.94	0.40	0.40
P-02	Pipe	A9	A8	175.98	968.70	968.30	0.2300	12.000	0.0140	1.25	1.58	2.51	0.61	0.61
P-03	Pipe	A8	A7	30.15	968.00	967.93	0.2300	12.000	0.0140	1.25	1.59	2.58	0.62	0.62
P-04	Pipe	A7	A6	360.00	967.63	966.80	0.2300	24.000	0.0140	3.22	10.09	3.06	0.74	0.37
P-05	Pipe	A6	A5	207.17	966.50	966.02	0.2300	24.000	0.0140	3.22	10.11	3.08	0.73	0.37
P-06	Pipe	A5	A4	51.97	965.72	965.60	0.2300	24.000	0.0140	3.22	10.09	3.11	0.73	0.36
P-07	Pipe	A4	65-161	340.83	963.87	963.46	0.1200	24.000	0.0140	5.26	7.29	2.79	1.26	0.63
P-08	Pipe	65-161	65-160	400.00	963.34	962.68	0.1700	24.000	0.0140	5.96	8.53	3.06	1.26	0.63
P-09	Pipe	65-160	65-159	394.84	962.50	961.97	0.1300	24.000	0.0140	5.96	7.70	2.96	1.30	0.65
P-10	Pipe	65-159	65-158	364.76	961.78	961.17	0.1700	24.000	0.0140	6.41	8.59	2.84	1.44	0.72
P-11	Pipe	65-158	65-157	134.57	961.10	960.78	0.2400	24.000	0.0140	6.77	10.24	2.84	1.57	0.78
P-12	Pipe	65-157	65-118	357.85	960.72	960.35	0.1000	24.000	0.0140	6.77	6.75	2.77	1.60	0.80
P-13	Pipe	65-118	65-114	218.01	960.35	959.88	0.2200	24.000	0.0140	6.77	9.75	2.91	1.62	0.81
P-14	Pipe	65-114	65-104	381.23	959.88	959.58	0.0800	24.000	0.0140	6.94	5.89	3.17	1.31	0.66
P-15	Pipe	65-104	65-103	75.38	947.98	947.26	0.9600	24.000	0.0140	7.72	20.53	5.29	0.94	0.47
P-16	Pipe	65-103	A3	282.37	947.22	944.72	0.8900	24.000	0.0140	7.72	19.77	5.66	0.90	0.45
P-17	Pipe	A3	A2	266.61	944.42	935.97	3.1700	24.000	0.0140	7.72	37.40	9.06	0.63	0.32
P-18	Pipe	A2	A1	108.84	935.67	932.40	3.0000	24.000	0.0140	7.72	36.41	8.50	0.66	0.33
P-19	Pipe	A1	65-225	89.89	932.10	929.40	3.0000	24.000	0.0140	7.72	36.41	9.30	0.73	0.37
P-20	Pipe	65-225	65-151	305.59	929.10	926.50	0.8500	24.000	0.0140	9.72	19.38	5.90	1.04	0.52
P-21	Pipe	65-151	65-150	355.24	926.30	924.30	0.5600	24.000	0.0140	9.72	15.76	3.95	1.47	0.73
P-22	Pipe	65-150	65-149	189.18	924.20	924.00	0.1100	24.000	0.0140	10.02	6.83	3.80	1.56	0.78
P-23	Pipe	65-149	65-148	399.96	923.90	922.00	0.4800	24.000	0.0140	10.02	14.48	4.86	1.26	0.63
P-24	Pipe	65-148	65-147	380.78	921.70	919.80	0.5000	24.000	0.0140	11.91	14.84	5.13	1.43	0.72
P-25	Pipe	65-147	65-146	158.14	919.50	918.70	0.5100	24.000	0.0140	12.08	14.94	4.97	1.70	0.85
P-26	Pipe	65-146	65-145	182.44	918.50	917.30	0.6600	24.000	0.0140	12.82	17.04	4.45	1.96	0.98
P-27	Pipe	65-145	END	160.00	917.20	916.64	0.3500	24.000	0.0140	13.27	12.43	4.22	2.00	1.00

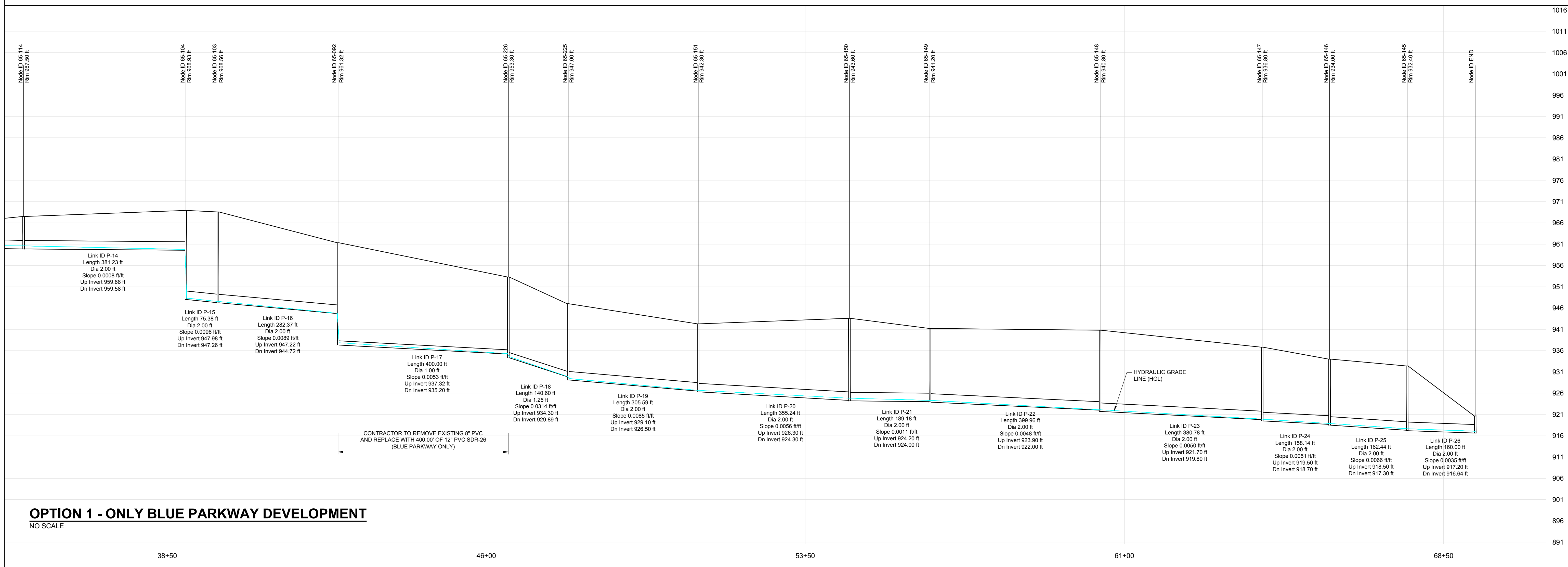
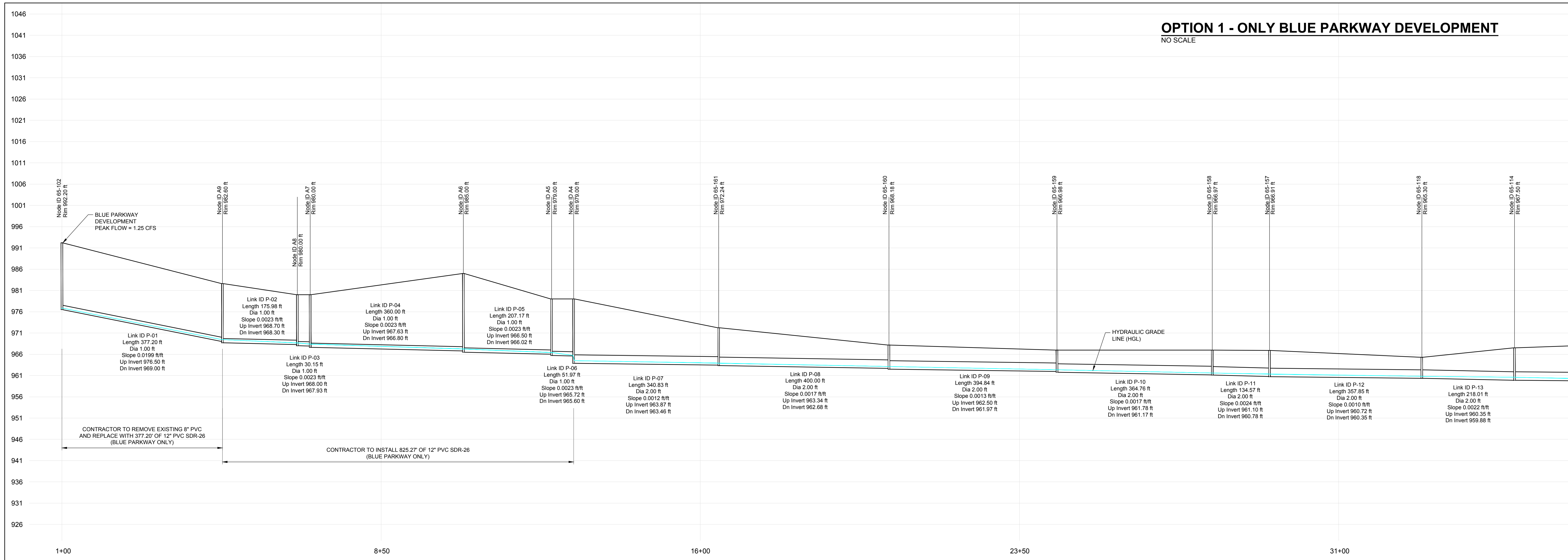
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PREPARED BY:

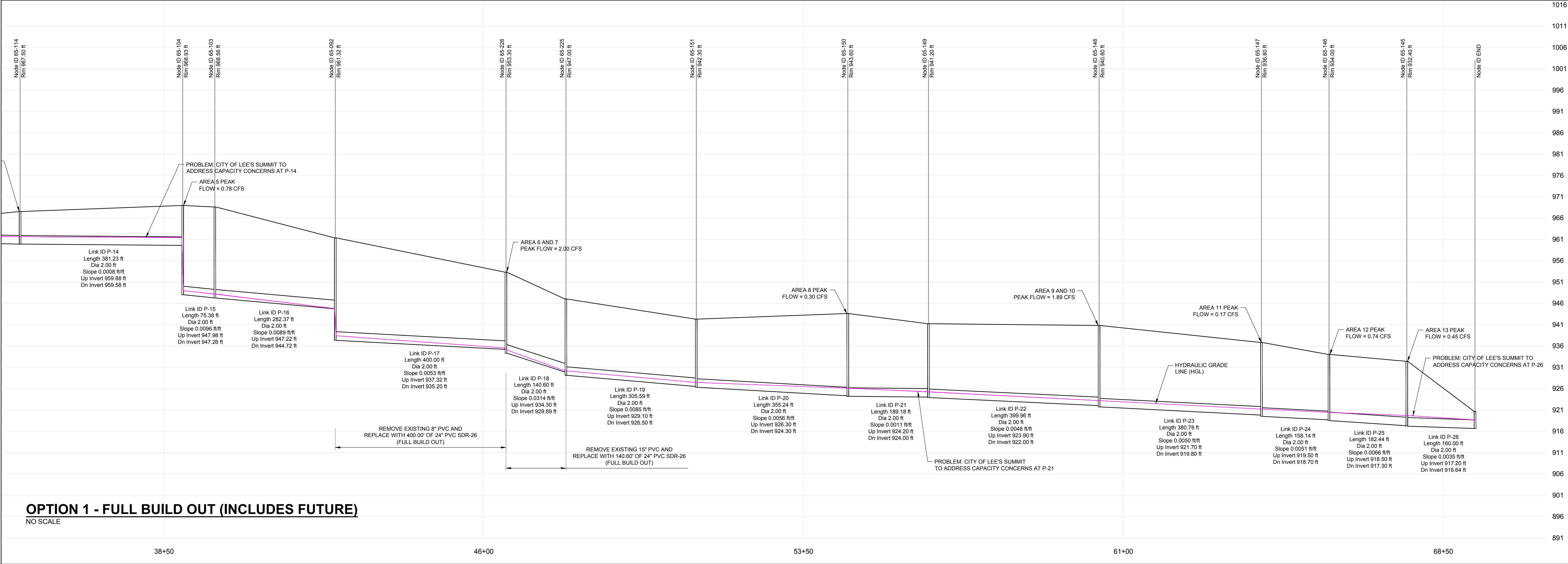
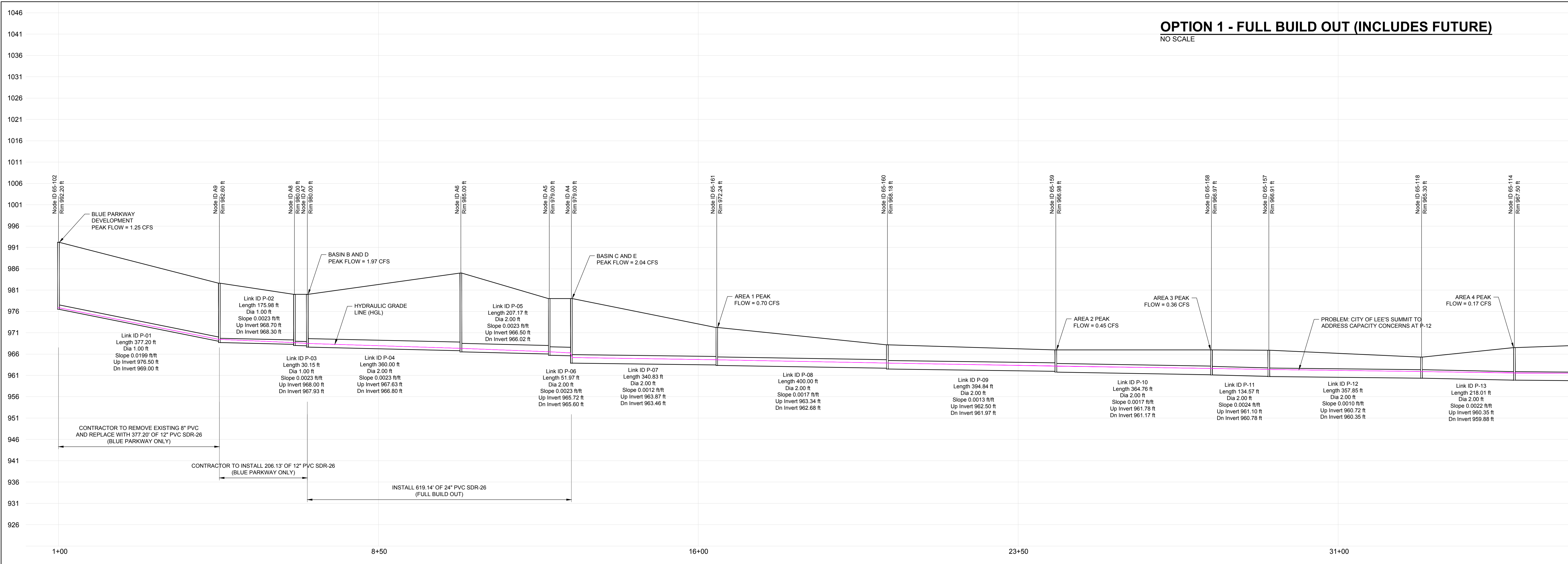
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BLUE PARKWAY DEVELOPMENT
SANITARY SEWER ANALYSIS

BLUE PARKWAY AND BLACKWELL ROAD
LEE'S SUMMIT, MISSOURI

SHEET 2	OPTION 1 - BLUE PARKWAY			DRAWN BY:	A	REVISION DATE:		DESCRIPTION
				P. WOODWARD	A			
				CHECKED BY:	A			
				M. BREUER	A			
				DATE PREPARED:	A			
				8/19/2021	A			
				PROJ. NUMBER:	A			
				20-206	A			

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BLUE PARKWAY DEVELOPMENT
SANITARY SEWER ANALYSIS

BLUE PARKWAY AND BLACKWELL ROAD
LEE'S SUMMIT, MISSOURI

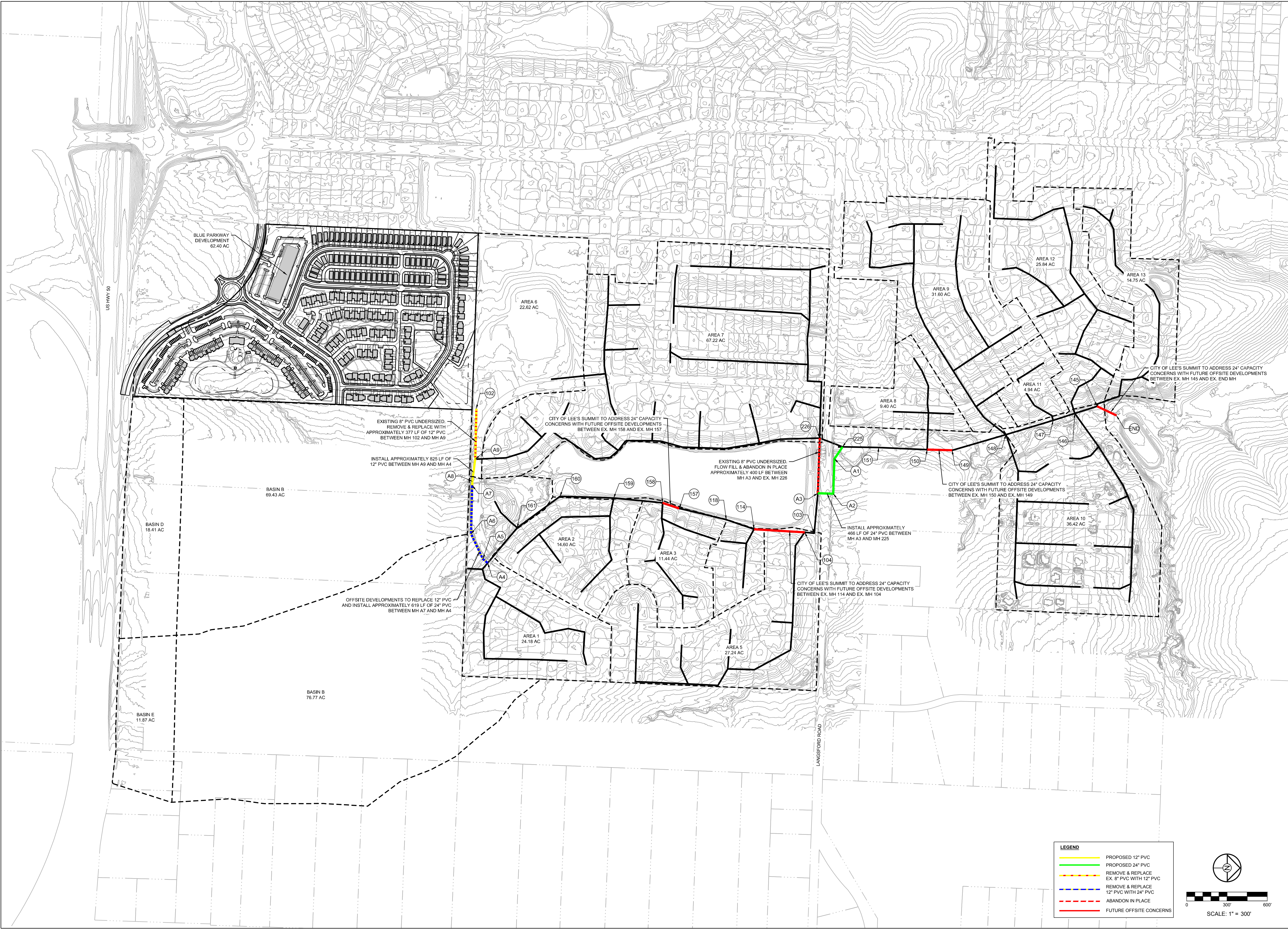
REVISION	DATE	DESCRIPTION
1	8/19/2021	20-205

OPTION 1 - FULL BUILD OUT

SHEET

3

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BLUE PARKWAY DEVELOPMENT
SANITARY SEWER ANALYSIS

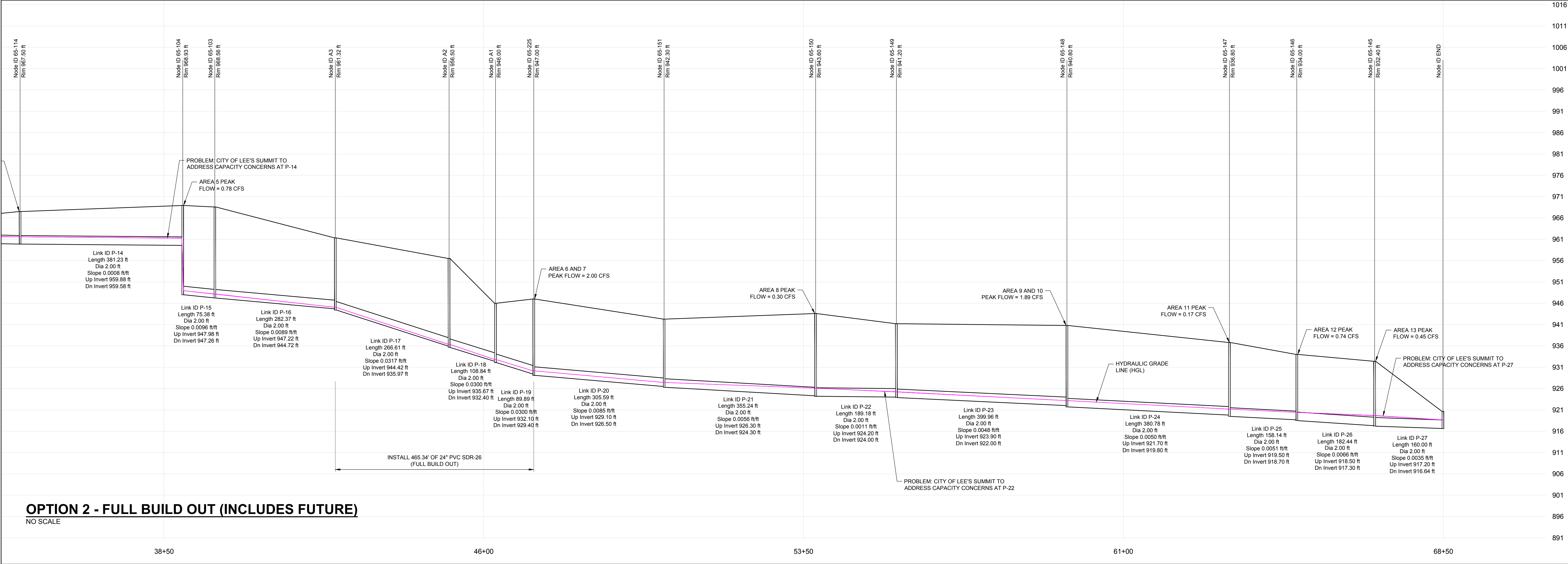
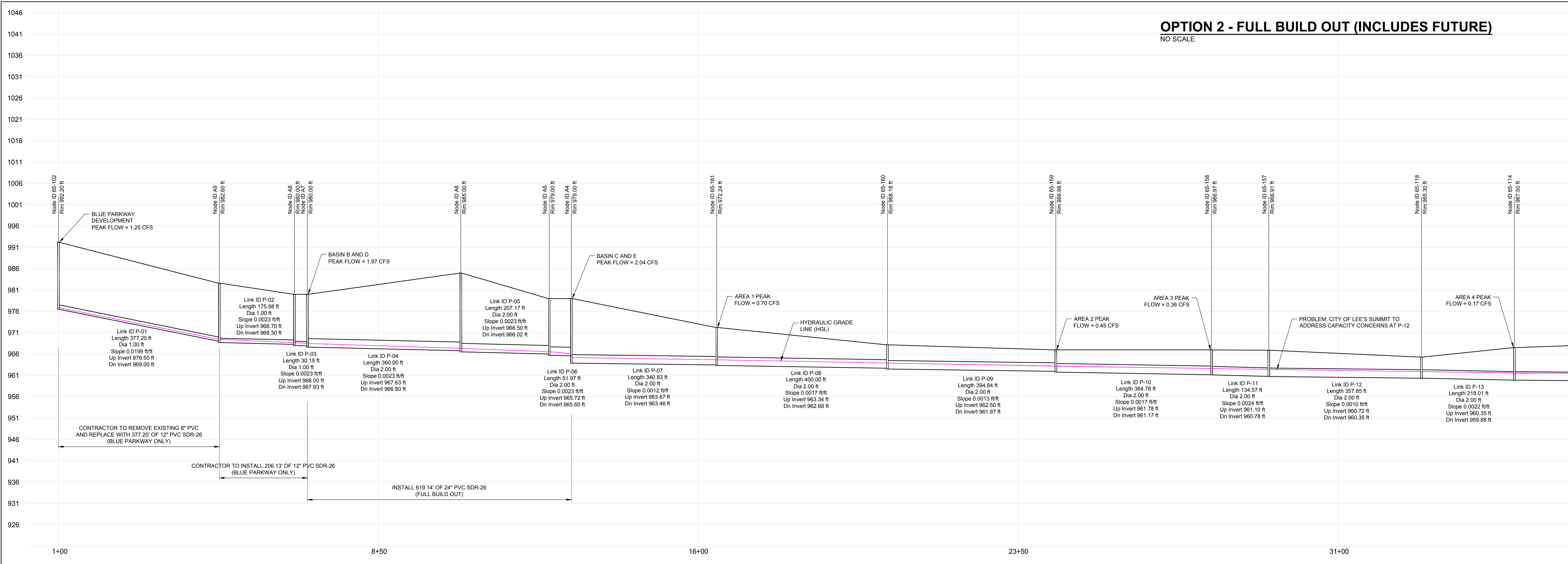
BLUE PARKWAY AND BLACKWELL ROAD
LEE'S SUMMIT, MISSOURI

REVISION DATE	DESCRIPTION
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DRAWN BY: P. WOODARD	CHECKED BY: M. BREUER	DATE PREPARED: 8/19/2021	PROJ. NUMBER: 20-205
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SEWER ALIGNMENT - OPTION 2
SHEET 4

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**BLUE PARKWAY DEVELOPMENT
SANITARY SEWER ANALYSIS**
**BLUE PARKWAY AND BLACKWELL ROAD
LEE'S SUMMIT, MISSOURI**

REVISION		DESCRIPTION
1	DATE	
2	DATE	
3	DATE	
4	DATE	
5	DATE	
6	DATE	
7	DATE	
8	DATE	
DRAWN BY:		P. WOODARD
CHECKED BY:		M. BREUER
DATE PREPARED:		8/19/2021
PROJ. NUMBER:		20-205
OPTION 2 - FULL BUILD OUT		
SHEET		
6		