Appendix J1: Sewer Analysis

Appendices

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Water Resources
Infrastructure
Construction Management

July 26, 2022

City of Claremont
207 Harvard Avenue
Claremont, CA 91711

Attention: Mr. Vince Ramos
Associate Engineer

Subject: La Puerta / CUSD Sewer Analysis

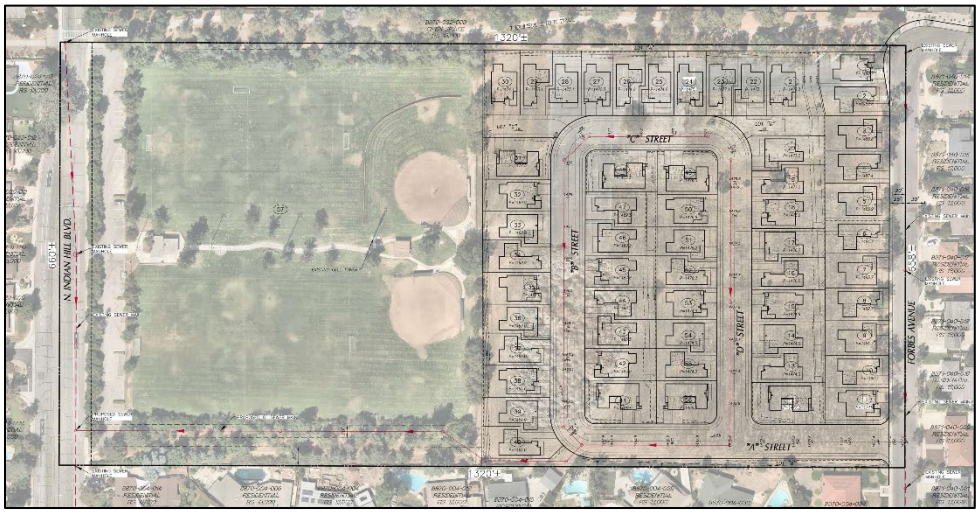
Dear Mr. Ramos:

As requested, we have completed the requested La Puerta / CUSD Sewer Analysis. The results are summarized in this letter.

Scope of Work and Background

The scope of work included a hydraulic evaluation of the sewers downstream of the proposed La Puerta / CUSD development, which includes 56 single family residential dwelling units. The proposed development project is to be located on the southwest corner of Miramar Avenue and Forbes Avenue in Claremont, California as shown on Figure 1. The effect of adding the anticipated sewage loads to the City of Claremont's (City) existing sewer system was analyzed utilizing the City's hydraulic sewer model.

Figure 1
La Puerta/CUSD Site



Flow Monitoring

Flow monitoring was conducted by Utility Systems Science & Software from June 6, 2022 to June 14, 2022 at four key manhole locations downstream of the proposed development as follows:

1. Manhole D08_021 on an 8-inch sewer in Indian Hill south of Mount Caramel Drive
2. Manhole D8_059 on a 12-inch sewer in Forbes Avenue north of Alfred Drive
3. Manhole D10_023 on a 12-inch sewer in Scripps Drive at Hanover Road
4. Manhole B11_057 on a 15-inch sewer in Towne Avenue south of Syracuse Drive

These locations, shown in Figure 2, were selected to verify and adjust the City's sewer hydraulic model data, if necessary. The comparison of the field flow monitoring results and the model results under existing conditions is shown in Table 1.

Table 1

Flow Monitoring Data versus Hydraulic Model Data

					Flow Monitoring Results (6/6/22-6/14/22)				Existing Model Results			
Manhole	Location	Pipe ID	Pipe Dia	Item	Depth (in)	d/D	Vel-ocity (ft/s)	Flow (mgd)	Depth (in)	d/D	Vel-ocity (ft/s)	Flow (mgd)
D08_021	2372 Indian Hill Blvd	D8001-D8021	8"	Average	1.06	0.13	2.07	0.0380	0.07	0.10	2.24	0.0259
				Maximum	1.61	0.20	3.04	0.0920	0.11	0.16	3.01	0.0694
D8_059	2323 Forbes Ave	D8002-D8059	12"	Average	1.86	0.15	3.24	0.1700	0.16	0.16	3.61	0.1924
				Maximum	2.44	0.20	4.07	0.2880	0.25	0.25	4.61	0.4449
D10_023	537 Scripps Dr	D10024-D10023	12"	Average	2.83	0.24	2.24	0.2240	0.33	0.33	3.46	0.4957
				Maximum	3.91	0.33	3.02	0.4240	0.49	0.49	4.23	1.0486
B11_057	1604 Towne Ave	B11056-B11057	15"	Average	3.87	0.26	4.14	0.7050	0.29	0.23	4.87	0.6879
				Maximum	4.75	0.32	5.20	1.0910	0.43	0.34	6.02	1.4442

The flow monitoring data closely matches the existing model results at Manhole D08_021, D8_059, and B11_057. The flow monitoring data does not match well at Manhole D10_023. Further examination of the tributary area has led to the conclusion that the model flows are more reasonable than the flow monitoring data. There is quite a large tributary area tributary to Manhole D10_023, downstream of Manhole D08_021 and D08_059. The sewers of this area are highlighted in green on Figure 2. If the flow monitoring at D10_023 is correct, the total flow generated by this area would only be 16,000 gpd or 0.016 mgd. This is equivalent to about 60-80 dwelling units. In reality, this area provides sewer service to over 1,000 dwelling units. Therefore, for this study, the flow monitoring data at Manhole D10_023 was essentially disregarded and the model was deemed accurate and suitable for use in this study.

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Legend

- Manhole
- Connection to LACSD Sewer
- Sewers tributary to D10_023, downstream of D08_021 and D08_059
- Gravity Sewer
- Gravity Sewer downstream of Proposed Development
- LACSD Sewer
- La Puerta / CUSD Development Site
- Flow Monitoring Location

N

0 400 800 Feet

Proposed La Puerta/CUSD Development Site

Miramar Ave

Bonnie Brae Ave

Mills Ave

Grand Ave

Padua Ave

D8_001 D8_021 D8_020 D8_019 D8_006 D8_002 D8_059 D8_058 D8_004

D9_041 D9_042 D9_014 D9_013 D9_022 D9_031 D9_030 D9_073 D9_072 D9_008 D9_074 D9_007 D9_081 D9_078 D9_079 D9_080 D9_021 D9_077

Indian Hill Blvd

Forbes Ave

Baseline Rd

D10_019 D10_021 D10_020 D10_026 D10_027 D10_023 D10_024 D10_025 D10_022

Radcliffe Dr

Scripps Dr

Oxford Ave

Mountain Ave

Danbury Rd

Towne Ave

B10_049 B10_046 B10_047 C10_035 C10_036 C10_037 C10_032 C10_033 C10_034 C10_028 C10_029 C10_030 C10_031

B10_050 B10_051 B10_052 B10_056

B11_055 B11_056 Syracuse Dr B11_057 B11_079 B11_058

Briarcroft Rd

J1-3

AKM

PROJECT NO:

DATE: July 2022

City of Claremont

La Puerta / CUSD Development Location

Figure 2

Proposed Sewage Flow Estimate

The total average sewage generation or average dry weather flow (ADWF) applied to the sewer model for the proposed development was calculated using a unit flow factor of 250 gpd per dwelling unit. This is based upon future water conservation laws that will require water agencies to reduce water use to a maximum of 50 gpd/person for indoor use. The proposed development consists of 56 single family residential units with 3 to 5 bedrooms each. Assuming an average of 5 people per unit, a unit flow factor of 250 gpd/du was developed and is considered appropriateThe sewage laterals of the 11 dwelling units on Forbes Avenue will be connected to the existing 12-inch sewer in Forbes Avenue, south of Miramar Avenue. A total of 2,750 gpd (11 du x 250 gpd/du) was applied to Manhole D8_006 in the hydraulic model to represent this load.

The remaining 45 dwelling units in the La Puerta / CUSD development will be conveyed west in an easement to Indian Hill Boulevard as shown on Figure 1. A total of 11,250 gpd (45 du x 250 gpd/du) was applied to Manhole D8_021 in the hydraulic model to represent this load.

Hydraulic Analyses

The effect of the proposed residential development on the existing sewer system was determined by adding the estimated sewage loads to the hydraulic model at Manholes D8_006 and D8_021, as previously described.

For this study the following model scenarios were run and the results are shown in Table 2:

1. Existing condition without proposed development loads
2. Existing condition with proposed development loads

The peak dry weather flows (PDWF) are calculated in the model using the following formula:

$$\text{PDWF (mgd)} = 2.0 \times \text{ADWF (mgd)}^{0.92}$$

The City's sewer criteria require existing pipes to flow at a peak dry weather depth to diameter ratio (d/D) less than 0.62. New pipes are required to be designed to flow at a peak dry weather d/D less than 0.50 for pipes 15-inches and smaller, and d/D less than 0.62 for pipes 18-inches and greater.

Per the hydraulic model, all downstream sewers will convey peak dry weather flows at a d/D ratio less than or equal to 0.50 under existing conditions and future conditions with the proposed La Puerta/CUSD development loads. This could change if additional developments and/or redevelopments occur in the area, but none are currently known to be planned at this time.

Conclusions

Based on the existing hydraulic model and estimated sewage loads for the proposed La Puerta/CUSD development, the sewers downstream of the assumed connection points (Manholes D8_006 and D8_021) will be able to convey the estimated PDWF at d/D ratios of 0.50 or less. This is below the City's established d/D criteria of 0.62 for existing pipes. Therefore, estimated sewage generation for the proposed building can be added to the City's sewer system without causing a hydraulic deficiency or triggering any sewer improvement projects.

Should you have any questions or require additional information, please do not hesitate in contacting the undersigned or Mr. Zeki Kayiran.

Sincerely,

Diann Pay, P.E.
AKM Consulting Engineers

Table 2

Hydraulic Model Results for Sewers Downstream of Proposed La Puerta/CUSD Development

General Information							Existing Conditions					Existing Conditions + La Puerta/CUSD Development				
Pipe ID	U/S MH ID	D/S MH ID	Diameter (in)	Length (ft)	Slope	Full Flow (mgd)	Average Dry Weather Flow (ADWF) (mgd)	Peak Dry Weather Flow (PDWF) (mgd)	PDWF Velocity (ft/s)	PDWF d/D	PDWF Water Depth (ft)	Average Dry Weather Flow (ADWF) (mgd)	Peak Dry Weather Flow (PDWF) (mgd)	PDWF Velocity (ft/s)	PDWF d/D	PDWF Water Depth (ft)
D8006-D8002	D8_006	D8_002	12	254	0.0229	3.4961	0.1924	0.4391	4.71	0.24	0.24	0.1952	0.4449	4.72	0.24	0.24
D8002-D8059	D8_002	D8_059	12	35	0.0214	3.3797	0.1924	0.4391	4.59	0.24	0.24	0.1952	0.4449	4.61	0.25	0.25
D8059-D8058	D8_059	D8_058	12	355	0.0195	3.2216	0.1934	0.4412	4.45	0.25	0.25	0.1962	0.4470	4.46	0.25	0.25
D8058-D8004	D8_058	D8_004	12	169	0.0280	3.8626	0.2077	0.4711	5.16	0.24	0.24	0.2105	0.4768	5.17	0.24	0.24
D8004-D9073	D8_004	D9_073	12	225	0.0245	3.6114	0.2097	0.4752	4.93	0.24	0.24	0.2125	0.4810	4.94	0.25	0.25
D9073-D9072	D9_073	D9_072	12	351	0.0292	3.9462	0.2113	0.4785	5.26	0.24	0.24	0.2140	0.4842	5.28	0.24	0.24
D9072-D9008	D9_072	D9_008	12	70	0.0292	3.9480	0.2113	0.4785	5.26	0.24	0.24	0.2140	0.4842	5.28	0.24	0.24
D9008-D9074	D9_008	D9_074	12	275	0.0267	3.7720	0.2132	0.4826	5.10	0.24	0.24	0.2160	0.4883	5.12	0.24	0.24
D9074-D9007	D9_074	D9_007	12	39	0.0398	4.6054	0.2132	0.4826	5.88	0.22	0.22	0.2160	0.4883	5.90	0.22	0.22
D9007-D9081	D9_007	D9_081	12	315	0.0236	3.5491	0.2154	0.4870	4.90	0.25	0.25	0.2181	0.4927	4.92	0.25	0.25
D9081-D9080	D9_081	D9_080	12	299	0.0207	3.3213	0.2163	0.4889	4.68	0.26	0.26	0.2190	0.4946	4.70	0.26	0.26
D9080-D9079	D9_080	D9_079	12	220	0.0186	3.1454	0.2278	0.5127	4.56	0.27	0.27	0.2305	0.5184	4.58	0.27	0.27
D9079-D9078	D9_079	D9_078	12	173	0.0120	2.5325	0.2278	0.5127	3.91	0.31	0.31	0.2305	0.5184	3.92	0.31	0.31
D9078-D9077	D9_078	D9_077	12	46	0.0976	7.2118	0.2288	0.5148	8.23	0.18	0.18	0.2315	0.5205	8.25	0.18	0.18
D9077-D9021	D9_077	D9_021	12	287	0.0172	3.0296	0.2826	0.6253	4.70	0.31	0.31	0.2853	0.6309	4.71	0.31	0.31
D9021-D9022	D9_021	D9_022	12	370	0.0182	3.1120	0.2848	0.6298	4.80	0.31	0.31	0.2875	0.6354	4.81	0.31	0.31
D8001-D8021	D8_001	D8_021	8	332	0.0263	1.2710	0.0259	0.0694	3.01	0.16	0.11	0.0259	0.0694	3.01	0.16	0.11
D8021-D8020	D8_021	D8_020	8	263	0.0252	1.2440	0.0267	0.0714	2.99	0.16	0.11	0.0380	0.0986	3.29	0.19	0.13
D8020-D8019	D8_020	D8_019	8	262	0.0394	1.5549	0.0269	0.0718	3.51	0.15	0.10	0.0381	0.0990	3.86	0.17	0.11
D8019-D9041	D8_019	D9_041	8	291	0.0201	1.1093	0.0324	0.0852	2.91	0.19	0.13	0.0436	0.1121	3.15	0.21	0.14
D9041-D9042	D9_041	D9_042	8	260	0.0162	0.9979	0.0338	0.0887	2.73	0.20	0.13	0.0451	0.1155	2.95	0.23	0.15
D9042-D9014	D9_042	D9_014	8	392	0.0255	1.2500	0.0351	0.0917	3.23	0.18	0.12	0.0463	0.1185	3.49	0.21	0.14
D9014-D9013	D9_014	D9_013	8	295	0.0256	1.2520	0.0403	0.1043	3.36	0.20	0.13	0.0516	0.1308	3.59	0.22	0.15
D9013-D9022	D9_013	D9_022	8	175	0.0190	1.0782	0.0414	0.1068	3.05	0.21	0.14	0.0526	0.1332	3.25	0.24	0.16
D9022-D9031	D9_022	D9_031	12	415	0.0110	2.4243	0.3269	0.7149	4.16	0.37	0.37	0.3409	0.7430	4.20	0.38	0.38
D9031-D9030	D9_031	D9_030	12	310	0.0293	3.9548	0.3302	0.7215	5.93	0.29	0.29	0.3442	0.7496	5.99	0.30	0.30
D9030-D10019	D9_030	D10_019	12	130	0.0446	4.8770	0.3305	0.7223	6.88	0.26	0.26	0.3445	0.7504	6.96	0.27	0.27
D10019-D10021	D10_019	D10_021	12	355	0.0273	3.8153	0.3521	0.7656	5.87	0.30	0.30	0.3661	0.7935	5.93	0.31	0.31
D10021-D10020	D10_021	D10_020	12	407	0.0214	3.3810	0.4810	1.0199	5.83	0.38	0.38	0.4950	1.0472	5.87	0.38	0.38
D10020-D10026	D10_020	D10_026	12	410	0.0212	3.3650	0.4810	1.0199	5.81	0.38	0.38	0.4950	1.0472	5.85	0.38	0.38
D10026-D10022	D10_026	D10_022	12	214	0.0197	3.2424	0.4810	1.0199	5.66	0.39	0.39	0.4950	1.0472	5.70	0.39	0.39
D10022-D10025	D10_022	D10_025	12	288	0.0256	3.6936	0.4826	1.0231	6.22	0.36	0.36	0.4966	1.0504	6.27	0.36	0.36
D10025-D10024	D10_025	D10_024	12	297	0.0126	2.5922	0.4943	1.0460	4.83	0.44	0.44	0.5083	1.0732	4.87	0.45	0.45
D10024-D10023	D10_024	D10_023	12	324	0.0088	2.1646	0.4957	1.0486	4.23	0.49	0.49	0.5097	1.0758	4.26	0.50	0.50
D10023-D10027	D10_023	D10_027	15	247	0.0087	3.8955	0.4989	1.0548	4.17	0.36	0.44	0.5129	1.0820	4.20	0.36	0.45
D10027-C10031	D10_027	C10_031	15	339	0.0059	3.2250	0.5049	1.0665	3.65	0.40	0.49	0.5189	1.0937	3.67	0.40	0.50
C10031-C10030	C10_031	C10_030	15	334	0.0160	5.2947	0.5134	1.0830	5.25	0.31	0.38	0.5274	1.1101	5.28	0.31	0.39

Table 2 (continued)

Hydraulic Model Results for Sewers Downstream of Proposed La Puerta/CUSD Development

General Information							Existing Conditions					Existing Conditions + La Puerta/CUSD Development				
Pipe ID	U/S MH ID	D/S MH ID	Diameter (in)	Length (ft)	Slope	Full Flow (mgd)	Average Dry Weather Flow (ADWF) (mgd)	Peak Dry Weather Flow (PDWF) (mgd)	PDWF Velocity (ft/s)	PDWF d/D	PDWF Water Depth (ft)	Average Dry Weather Flow (ADWF) (mgd)	Peak Dry Weather Flow (PDWF) (mgd)	PDWF Velocity (ft/s)	PDWF d/D	PDWF Water Depth (ft)
C10030-C10029	C10_030	C10_029	15	334	0.0156	5.2305	0.5166	1.0893	5.21	0.31	0.39	0.5306	1.1165	5.24	0.31	0.39
C10029-C10028	C10_029	C10_028	15	304	0.0120	4.5815	0.5236	1.1027	4.75	0.33	0.42	0.5376	1.1298	4.78	0.34	0.42
C10028-C10034	C10_028	C10_034	15	24	0.0123	4.6452	0.6426	1.3315	5.06	0.37	0.46	0.6566	1.3581	5.08	0.37	0.46
C10034-C10033	C10_034	C10_033	15	267	0.0227	6.3030	0.6443	1.3347	6.31	0.31	0.39	0.6583	1.3614	6.34	0.32	0.39
C10033-C10032	C10_033	C10_032	15	280	0.0157	5.2431	0.6454	1.3368	5.52	0.34	0.43	0.6594	1.3634	5.55	0.35	0.43
C10032-C10037	C10_032	C10_037	15	337	0.0155	5.2120	0.6521	1.3496	5.52	0.35	0.43	0.6661	1.3762	5.55	0.35	0.44
C10037-C10036	C10_037	C10_036	15	290	0.0163	5.3441	0.6536	1.3525	5.62	0.34	0.43	0.6676	1.3791	5.65	0.35	0.43
C10036-C10035	C10_036	C10_035	15	306	0.0267	6.8438	0.6637	1.3717	6.74	0.30	0.38	0.6777	1.3983	6.78	0.31	0.38
C10035-B10047	C10_035	B10_047	15	299	0.0212	6.0930	0.6651	1.3743	6.20	0.32	0.40	0.6791	1.4009	6.24	0.33	0.41
B10047-B10046	B10_047	B10_046	15	339	0.0156	5.2255	0.6651	1.3743	5.55	0.35	0.44	0.6791	1.4009	5.58	0.35	0.44
B10046-B10049	B10_046	B10_049	15	184	0.0245	6.5494	0.0000	0.0000	0.00	0.00	0.00	0.0000	0.0000	0.00	0.00	0.00
B10049-B10050	B10_049	B10_050	15	274	0.0191	5.7898	0.0000	0.0000	0.00	0.00	0.00	0.0000	0.0000	0.00	0.00	0.00
B10046-B10056	B10_046	B10_056	12	269	0.0196	3.2328	0.6778	1.3984	6.14	0.46	0.46	0.6918	1.4249	6.17	0.46	0.46
B10056-B10050	B10_056	B10_050	12	196	0.0195	3.2221	0.6809	1.4043	6.13	0.46	0.46	0.6949	1.4308	6.16	0.47	0.47
B10050-B10051	B10_050	B10_051	15	299	0.0193	5.8220	0.6815	1.4054	6.04	0.33	0.42	0.6955	1.4319	6.07	0.34	0.42
B10051-B10052	B10_051	B10_052	15	306	0.0194	5.8300	0.6855	1.4130	6.06	0.34	0.42	0.6995	1.4395	6.09	0.34	0.42
B10052-B11055	B10_052	B11_055	15	270	0.0195	5.8449	0.6858	1.4135	6.07	0.33	0.42	0.6998	1.4401	6.10	0.34	0.42
B11055-B11056	B11_055	B11_056	15	72	0.0181	5.6325	0.6878	1.4173	5.91	0.34	0.43	0.7018	1.4438	5.94	0.35	0.43
B11056-B11057	B11_056	B11_057	15	314	0.0187	5.7269	0.6879	1.4176	5.99	0.34	0.42	0.7019	1.4442	6.02	0.34	0.43
B11057-B11058	B11_057	B11_058	15	202	0.0072	3.5482	0.6886	1.4188	4.22	0.44	0.55	0.7026	1.4454	4.24	0.44	0.56
B11058-B11079	B11_058	B11_079	14	294	0.0071	2.9269	0.6886	1.4188	4.20	0.49	0.57	0.7026	1.4454	4.22	0.50	0.58