APPENDIX K

Sewer Study

SEWER STUDY REPORT

FOR THE

KAISER PERMANENTE
MORENO VALLEY MEDICAL CENTER

DRAFT - January 25, 2019

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MBI JN 169814

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A. Objective

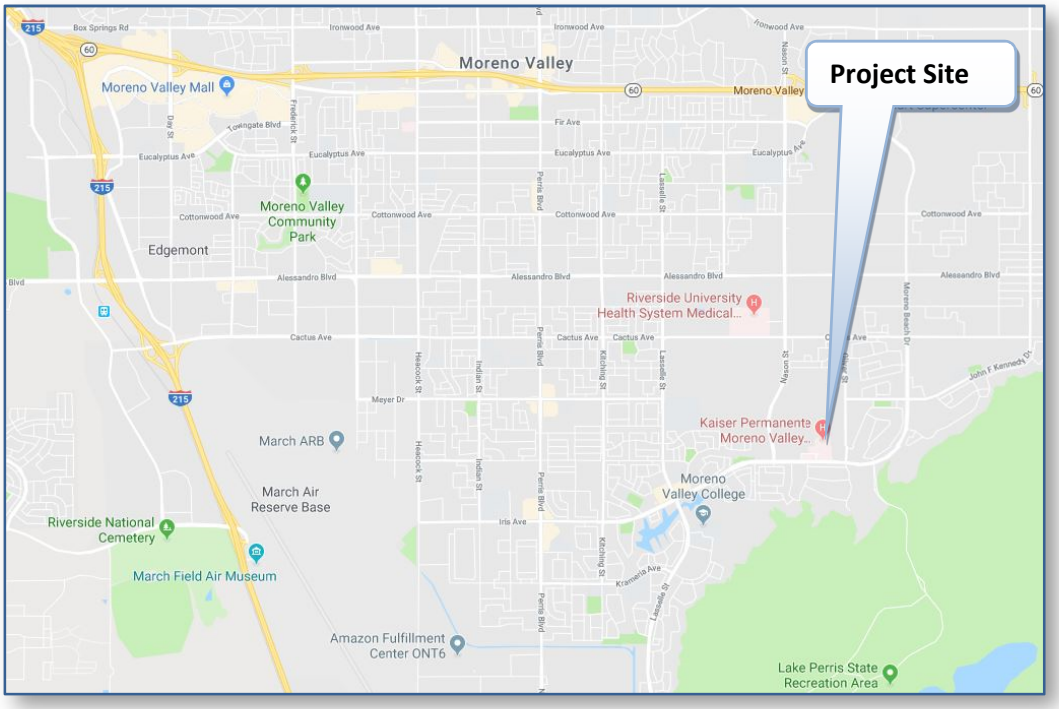
This report provides background data, hydraulic analysis, and a summary of results as part of a sewer study for the proposed Kaiser Permanente Moreno Valley Medical Center Expansion Project (Project). The purpose of this study is to determine the potential impact of the proposed project on the existing private and public wastewater conveyance system and to verify design of the proposed onsite sanitary sewer infrastructure. This study considers both the initial Early Project and future Ultimate Project.

B. Project Description

B.1 Project Location:

The Kaiser Permanente Moreno Valley Medical Center site is comprised of a 29.8-acre dual-parcel (APN 486-310-033 and APN 486-310-034) that is currently developed with a hospital, patient tower, medical offices and onsite parking. Located at 27300 Iris Avenue in Moreno Valley, California, the Project site abuts undeveloped open space to the west, north and east, Fresenius Medical Care – Moreno Valley Dialysis facility to the northeast, and residential single-family homes and golf course located to the east and south. The entire project site was previously graded and is currently developed. The Project site is shown in Figure B-1.

Figure B-1
Project Site (Google Maps)



B.2 Proposed Project:

The proposed Project at 27300 Iris Avenue will be an expansion to the existing medical campus. The Project will be constructed in two (2) segments currently referred to as the Early Project and the Ultimate Project. The Early Project is currently in design phase with construction anticipated starting in 2020. The Ultimate Project is conceptual only but is being included in the Project CEQA and Entitlement Documentation.

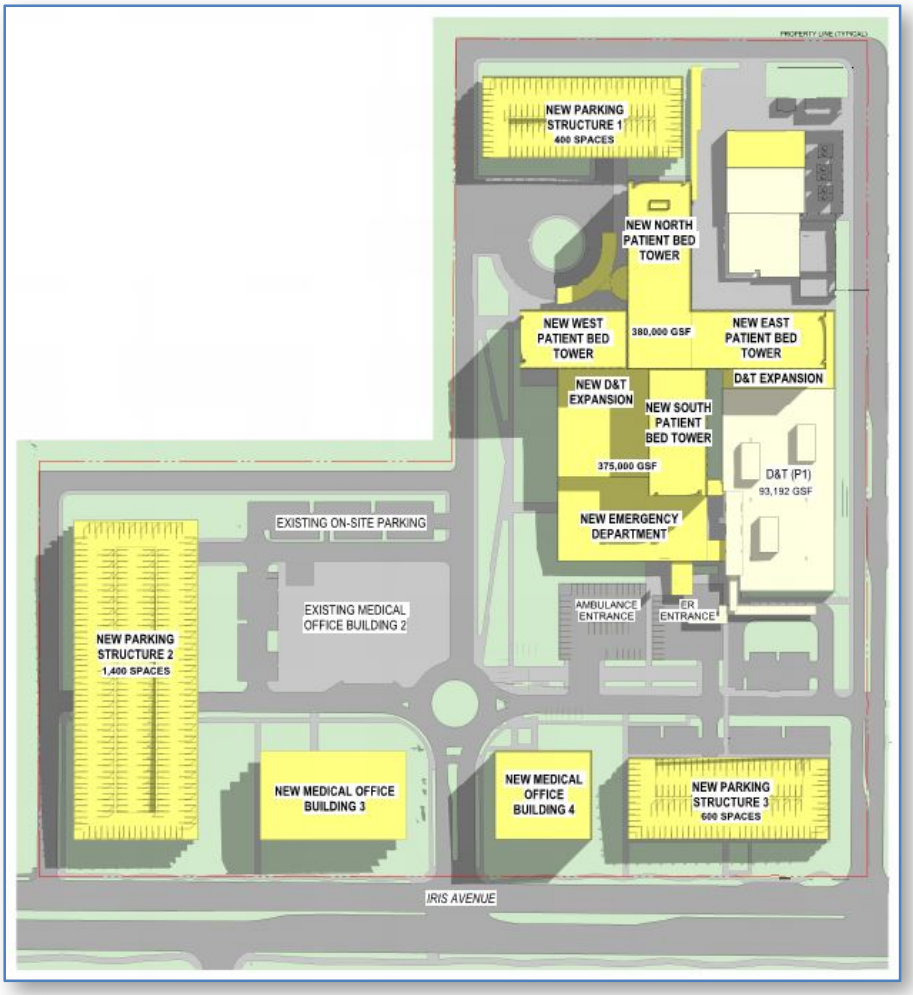
The Ultimate Project is anticipated as a future implementation over a 20-year horizon. This study, however, addresses both the Early Project development and the Ultimate Project development. When complete, the Ultimate Project will comprise four (4) patient bed towers, a Diagnostics and Treatment Center (D&T), and an Emergency Department totaling 458 beds and 850,000 square feet. The Project will also include a Central Utility Plant (CUP) of approximately 28,100 GSF and Parking Structures with a total of 2,550 parking stalls.

Table B-1 summarizes the existing, early, and ultimate project totals at the end of each proposed project segment. The development process for each project segment includes temporary on-site facilities and demolition of existing facilities which are accounted for in the table. Figure B-2 depicts the schematic site layout for the Ultimate Project including the location of the patient bed towers, D&T, Emergency Department, CUP, medical office buildings, and parking structures within the Project area. See Appendix A for existing, early and ultimate project site layouts.

Table B-1
Proposed Project Summary

	Existing Project	Early Project	Ultimate Project
Patient Towers; Emergency Department; D&T Expansion	99 Beds 133,000 SF	105 Beds 260,000 SF	458 Beds 850,000 SF
Energy Center	--	20,100 SF	28,100 SF
Medical Office Buildings	74,400 SF	74,400 SF	234,400 SF
Parking Structure	685 Stalls	730 Stalls	2,550 Stalls

Figure B-2
Proposed Ultimate Site Layout



B.3 Prior Site Planning

The Kaiser Permanente Moreno Valley Community Hospital currently consists of two buildings, hospital and medical office building, respectively built in 1989 and 1997, and provides patient care services. This project currently designates the aging infrastructure as a facility requiring upgrades and renovations to meet current California Office of Statewide Health Planning Development (OSHPD) requirements. The hospital will be demolished and restored in segments, along with demolition to existing on-site parking, to accommodate the proposed Project. The Project area encompasses two zones including community commercial and office commercial per the City of Moreno Valley Zoning Atlas.

B.4 Study Area

The subject study area is roughly bounded by Delphinium Avenue to the north, Oliver Street to the east, Iris Avenue to the south, and Nason Street to the west. The primary zoning for the project area consists of a mixture of community commercial and office commercial along Iris Avenue. In accordance with the requirements specified in the Addendum #1 Entitlement Documents, the proposed project is required to prepare a preliminary sewer study to ensure existing sanitary sewer services have available capacity for the proposed expansion and sufficiently size the proposed on-site sewer mains and laterals.

The on-site sewer system is comprised primarily of public and private 8-inch sewer mains. On-site generated wastewater is transported west, away from the Project. The wastewater is then transported north via 8-inch private main and 8-inch Vitrified Clay Pipe (VCP) public gravity sewer. The flow discharges into a manhole also receiving wastewater via existing 10-inch private sewer main parallel to Iris Avenue and north of the hospital campus. All flow is conveyed off-site via the existing 12-inch public VCP gravity sewer northerly approximately 1,310 feet to the connection with the 33-inch sewer main. The proposed project will expand the on-site sewer conveyance system and connect the new facilities to the existing sewer system. Refer to Appendix B and Appendix C for the Preliminary Utility Plan locating the proposed wastewater mains within the project area.

C. Analysis Criteria

Preliminary sewer generation rates for the proposed development are based on the planning requirements provided in the Eastern Municipal Water District (EMWD) Wastewater Master Plan Update (WWMP), Final Report dated November 2008. Average dry weather flow (ADWF) and peak wet weather flows (PWWF) were obtained for the Early Project and Ultimate Project as shown in the table below. Table C-1 includes additional sewer criteria and requirements per EMWD wastewater standards.

Table C-1
EMWD WWMP Analysis Criteria

Non-Residential Hospital	250 gal/bed
Non-Residential Commercial	1,700 gpd/acre
Minimum Velocity	2 ft/s
Maximum Velocity	10 ft/s
Recommended Velocity	3 ft/s
Manning's coefficient for all pipes	0.015
Peak Dry Weather Peaking Factors	Refer to Table 5.2
Peak Wet Weather Peaking Factor	1.2
Pipes 12-inch and less to not flow more than 50% full during PDWF	
Pipes 15-inch and greater to not flow more than 75% full during PDWF	
Pipes can flow 100% full during PWWF	

D. Sewer Analysis

D.1 Model Methodology

The sewer analysis focuses on the hydraulic analysis of the existing sanitary sewer system with new flows from the Project and the results of the hydraulic analysis.

A Microsoft Excel spreadsheet was utilized to perform the hydraulic analysis of the existing sanitary sewer within the study area. Sanitary sewer infrastructure owned by EMWD will transport all wastewater flow generated onsite, except for softeners, ultimately to a treatment facility. For this study, the hydraulic analysis concludes at the point of connection between the 12-inch sewer and 33-inch sewer main located approximately 1,270 feet west of Oliver Street and 2,680 feet north of Iris Avenue. Each reach, "Main Line" or "Branch", of the existing sanitary sewer system includes the upstream and downstream manhole designations, invert elevations, length, and diameter of the sewer. Proposed sanitary sewer pipes, also labeled as a "Branch" or "Lateral" in the spreadsheet, includes the same information as provided for the existing sanitary sewer system. Sewer lengths and invert elevations were obtained from survey data, EMWD Sewer Map, and City of Moreno Valley as-builts.

The Average Dry Weather Flow (ADWF) was calculated for each reach by the product of the cumulative bed count or facility square footage of 250 gpd/bed and 1,700 gpd/acre, respectively. Peak Dry Weather Flow (PDWF) was calculated for each reach by multiplying the ADWF by the calculated Peaking Factor for Dry Weather Flow (PFDW)[1]. The PFDW, which decreases as the cumulative ADWF increases, ranged between 2.77 and 2.8. Peak Wet Weather Flow (PWWF) was calculated for each reach by multiplying the PDWF by the calculated Peak Factor for Wet Weather Flow (PFWW). The PFWW was maintained at a safety factor of 1.2[2]. The design full pipe capacity (Q_{full}) was calculated utilizing Manning's Equation and a Manning's "n" value of 0.013.

The ratio of actual depth to pipe diameter (d/D) was calculated by using an Excel algorithm to select the appropriate d/D (to the nearest 0.01 increment) based on the corresponding ratio of calculated ADWF, PDWF, and PWWF to full pipe flow (Q/Q_{full}).

The minimum velocity requirement per EMWD's Sanitary Sewer System Planning & Design Guidelines is 2.0 ft/s. In reaches of upstream sewers having very light sewer loads, this would result in very impractical and steep sewer slopes. To address this issue, the hydraulic analysis references use of the Water Environment Federation (WEF) Manual of Practice (MOP) FD-5. WEF MOP FD-5 addresses avoiding steep sewers with low sanitary loads with the use of the "Tractive Force Design" method to determine the ability of a sewer to be self-cleaning. The Tractive Force method is used to design sewers

[1] Peaking Factor for Dry Weather Flow (PFDW) determined per Table 5.4 Recommended Peaking Factors located in the Eastern Municipal Water District's 2006 Wastewater Master Plan Update, Final Report, November 2008.
[2] Peaking Factor for Wet Weather Flow (PWWF) provided in Section 5.1 CIP Capacity & Sizing Criteria located in the Eastern Municipal Water District's 2006 Wastewater Master Plan Update, Final Report, November 2008.

to achieve self-cleaning ability based on calculation of critical shear stresses as recommended in WEF MOP FD-5 and ASCE MOP 60. Critical shear stress is determined from the following equation:

$$\tau c = 0.0181 * (Dp)^{0.277}$$

where: τc = critical shear stress, lb/ft^3
Dp = nominal diameter of design particle, mm (1.0 mm is typically recommended)

The self-cleansing velocity can then be determined for each reach of sewer based on the following equation:

$$v_{sc} = \left(\frac{1.486}{n}\right) R^{1/6} \left(\frac{\tau c}{\gamma}\right)^{1/2}$$

where: v_{sc} = self-cleansing velocity, ft/s
n = Manning's roughness coefficient
R = hydraulic radius, ft
τc = critical shear stress, lb/ft^2
γ = specific weight of water, lb/ft^3

The above equation is used in this flow study to calculate the cleansing-velocity of each reach of sewer. If the actual calculated velocity of the sewer reach (based on the flow, pipe slope and calculated d/D) is greater than the calculated cleansing velocity, then the designed sewer slope is considered adequate for the respective sewer reach.

A total of six (6) models were completed when assessing the hydraulic analysis of the project area. The Early Project (first segment of the expansion) and Ultimate Project (final future expansion build-out) were analyzed under ADWF, PDWF, and PWWF conditions.

D.2 Sewer Generation Rates

The average dry weather flow (ADWF) was calculated on a per bed basis using sewage generation rates listed in the EMWD WWMP. The Early Project segment of the development will include 105 beds and the Ultimate Project segment will result in a total of 458 beds. The development transition from the Early Project to the Ultimate Project will include the addition and removal of hospital beds, as well as demolition, construction and remodeling of the Medical Center campus. Unit wastewater flows for a hospital are established at 250 gallons per day per bed (gpd/bed) and additional facilities located on the campus are considered as commercial non-residential land uses with a unit flow of 1,700 gallon per day per acre (gpd/acre). Sanitary flow generation rates for the Early Project and Ultimate Project are provided in Table D-1 and Table D-2, respectively.

Table D-1
Sewer Generation Rates – Early Project: EMWD WWMP November 2008

Existing Hospital Flow	=	250 (gal/bed) * 105 Beds
		26,250 gpd (or 0.041 cfs)
Medical Office Building	=	(1,700 (gpd/acre) * 74,400 SF) / 43,560 acres
		2,904 gpd (or 0.004 cfs)
Diagnostics and Treatment	=	(1,700 (gpd/acre) * 93,200 SF) / 43,560 acres
		3,637 gpd (or 0.005 cfs)
Energy Center Wastewater	=	1,486 gpd
AVERAGE DRY WEATHER FLOW	=	**34,276 gpd (or 0.053 cfs)**
PEAK DRY WEATHER FLOW	=	**ADWF * Peaking Factor**
	=	**34,276 gpd * 2.8**
	=	**100,131 gpd (or 0.155 cfs)**
PEAK WET WEATHER FLOW	=	**PDWF * Peaking Factor**
	=	**100,131 gpd * 1.2**
	=	**120,157 gpd (or 0.186 cfs)**

Table D-2
Sewer Generation Rates – Ultimate Project: EMWD WWMP November 2008

Existing Hospital Flow	=	250 (gal/bed) * 458 Beds
		114,500 gpd (or 0.177 cfs)
Medical Office Building	=	(1,700 (gpd/acre) * 234,400 SF) / 43,560 acres
		9,148 gpd (or 0.014 cfs)
Diagnostics and Treatment	=	(1,700 (gpd/acre) * 93,200 SF) / 43,560 acres
		3,637 gpd (or 0.005 cfs)
Energy Center Wastewater	=	5,090 gpd
AVERAGE DRY WEATHER FLOW	=	**132,374 gpd (or 0.205 cfs)**
PEAK DRY WEATHER FLOW	=	**ADWF * Peaking Factor**
	=	**132,374 gpd * (2.77 or 2.8)**
	=	**377,517 gpd (or 0.584 cfs)**
PEAK WET WEATHER FLOW	=	**PDWF * Peaking Factor**
	=	**377,517 gpd * 1.2**
	=	**453,020 gpd (or 0.701 cfs)**

The above calculations are preliminary. Dry weather peaking factor and wet weather peaking factor are not applied to the Energy Center Wastewater flow as the peaking factor for the cooling and heating blowdowns are calculated separately since they are impacted by temperature and climatic conditions rather than population and rain events. Detailed calculation based on actual bed counts, facility area, cooling tower blowdown and other miscellaneous flows will be provided and refined as the design progresses.

D.3 Hydraulic Analysis Assumptions

Sewer design guidelines established by EMWD are included in the hydraulic analysis for this study. This study recognizes additional detailed information necessary to complete the hydraulic analysis and assumptions are considered for the sewer model and design of the project area.

New sewer lengths, sizes, invert elevations, and elevations for building points of connection were provided by ARUP under the Early Project conditions. The Ultimate Project new sewer design assumes 6-inch laterals at 2% slope and 8-inch sewer mains at 0.4% slope per EMWD requirements.

Wastewater flow generated from the New Diagnostics & Treatment (D&T) facility in the Early Project is consistent with the D&T facility generated wastewater flow in the Ultimate Project. Although the D&T facility will be expanded in the Ultimate Project, the wastewater generated in the hospital and new patient towers due to the expanded bed count will account for additional wastewater in the D&T expansion.

The existing Central Utility Plant (CUP) and new Energy Center generate blowdown due to heating and cooling loads. Cooling and heating demand for the CUP were provided by ARUP, along with the existing peak and average cooling load. This information was analyzed to determine a peaking factor which was applied to the heating and cooling Early Project and Ultimate Project conditions. The Energy Center cooling towers will employ an innovative make-up water treatment system developed by Water Conservation Technologies International (WCTI). Kaiser previously employed this technology to great success at its new San Diego Central Hospital (opened in January 2017) to great success. The WCTI make-up water treatment system allows very high cycling of the cooling towers (greater than 50 cycles of concentration) to reduce the amount of blowdown to sewer and conserve up to 25% in make-up water use. The cooling tower blowdowns were analyzed at 30 cycles of concentration (COC) and the calculated blowdown was used to assign a wastewater demand to these facilities. The boiler systems for hot water production will be of the low-pressure type which typically operate at 20 COC; therefore, boiler blowdown to sewer was analyzed at 20 COC. The CUP and Energy Center demands exclude additional peaking factors relative to the EMWD WWMP guidelines.

The EMWD sanitary sewer system includes a sewer manhole located north of the project area. According to as-builts and survey data, this manhole includes two (2) points of connections. The southerly connection transports generated wastewater from the Project area via an 8-inch VCP sewer. The easterly connection transports wastewater developed from the Fresenius Medical Care – Moreno Valley Dialysis center via 10-inch sewer. A wastewater demand for Fresenius Medical Care, located east of the project, was calculated based on the facility size and using the non-residential commercial demand factor per the EMWD WWMP. The wastewater from this facility is estimated and does not reflect actual data.

D.4 Hydraulic Analysis Results

The results of the hydraulic analysis model are shown in the Sanitary Sewer Study Summary provided in the tables below. The Early Project analysis is shown under ADWF, PDWF, and PWWF conditions in Table D-3, Table D-4, and Table D-5, respectively. The Ultimate Project analysis is shown under ADWF, PDWF, and PWWF conditions in Table D-6, Table D-7, and Table D-8, respectively. The Early Project and Ultimate Project models correspond with a sanitary sewer design layout displaying existing and proposed sewer mains, branches, and laterals both onsite and offsite which can be found in Appendix B and C.

Table D-3

Proposed Sanitary Sewer Generation Table - Early Project (ADWF)

Manning n: 0.015

JOB NO: 169814 **BY:** SAR **FOR:** Kaiser Permanente Moreno Valley **DATE:** 1/25/2019

Line	Length (ft)	From MH	From I.E. (out)	To MH	To I.E. (in)	ADWF (gpd)	ADWF Cumulative(gpd)	Average Flow (Design Flow) gpm	Average Flow (Design Flow) cfs	Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Pipe Velocity (ft/s)	Remarks
Main Line																	
A	400.00	2	1501.39	1	1500.43	-	34,759	24.14	0.0538	12.00	0.24	1.51	0.036	0.12	1.44	1.01	MH to EMWD 33-inch Sewer Pipe
B	450.00	3	1502.47	2	1501.39	-	34,759	24.14	0.0538	12.00	0.24	1.51	0.036	0.12	1.44	1.01	
C	461.18	4	1503.94	3	1502.47	483	34,759	24.14	0.0538	12.00	0.32	1.74	0.031	0.12	1.44	1.01	Incoming flow from Main Line J
D	283.33	5	1507.03	4	1504.03	-	34,277	23.80	0.0530	8.00	1.06	1.08	0.049	0.15	1.20	1.62	
E	175.11	6	1508.09	5	1507.05	13,873	34,277	23.80	0.0530	8.00	0.59	0.81	0.066	0.17	1.36	1.35	Incoming flow from Branch E1
F	247.70	7	1510.07	6	1508.07	8,750	20,404	14.17	0.0316	8.00	0.81	0.94	0.034	0.12	0.96	1.33	Incoming flow from Lateral F1
G	92.95	8	1511.69	7	1510.11	2,904	11,654	8.09	0.0180	8.00	1.70	1.36	0.013	0.08	0.64	1.38	Incoming flow from Lateral G1
H	199.87	9	1515.35	8	1511.76	-	8,750	6.08	0.0135	8.00	1.80	1.40	0.010	0.06	0.48	1.58	Incoming flow from Branch H1
J	8.94	4-1	1504.00	4	1503.96	483	483	0.34	0.0007	10.00	0.40	1.20	0.001	0.01	0.10	0.81	Incoming flow from Fresenius Medical Care
Branches																	
E1	282.59	1E	1511.70	6	1508.10	8,750	13,873	9.63	0.0215	8.00	1.27	1.18	0.018	0.09	0.72	1.38	Incoming flow from Lateral E4
E2	84.68	2E	1512.60	1E	1511.70	-	5,123	3.56	0.0079	8.00	1.06	1.08	0.007	0.06	0.48	0.93	
E3a	59.81	E6 Lat	1513.85	2E	1512.60	1,486	5,123	3.56	0.0079	8.00	2.09	1.51	0.005	0.05	0.40	1.21	Incoming flow from Lateral E6
E3b	42.22	E7 Lat	1514.73	E6 Lat	1513.85	1,819	3,637	2.53	0.0056	8.00	2.09	1.51	0.004	0.04	0.32	1.20	Incoming flow from Lateral E7
E3c	65.83	3E	1516.10	E7 Lat	1514.73	1,819	1,819	1.26	0.0028	8.00	2.09	1.51	0.002	0.03	0.24	0.92	Incoming flow from Lateral E8
G1	57.94	1G	1523.55	8	1512.01	-	2,904	2.02	0.0045	6.00	19.92	2.17	0.002	0.03	0.18	2.62	Flow into MH 8
G2	175.80	2G	1525.31	1G	1523.55	-	2,904	2.02	0.0045	6.00	1.00	0.49	0.009	0.06	0.36	0.93	
H1	292.81	1H	1527.15	9	1515.35	-	8,750	6.08	0.0135	8.00	4.03	2.10	0.006	0.05	0.40	2.07	Flows into MH 9
Laterals																	
E4	84.00	4E	1517.80	1E	1511.70	8,750	8,750	6.08	0.0135	6.00	7.26	1.31	0.010	0.07	0.42	2.24	Existing Hospital

E5	225.63	2E	1512.60	5E	1510.35												Flow transports to new 30k-gal Emergency Storage Tank Exclude from calculations
E6	90.52	6E	1515.66	E3	1513.85	1,486	1,486	1.03	0.0023	6.00	2.00	0.69	0.003	**0.04**	**0.24**	0.87	New Energy Center Sewer POC (6E) calculated to achieve 2% lateral slope
E7	73.05	7E	1516.19	E3	1514.73	1,819	1,819	1.26	0.0028	6.00	2.00	0.69	0.004	**0.04**	**0.24**	1.07	New D&T Expansion/Addition Sewer POC (7E) calculated to achieve 2% lateral slope. Branch E3 shown as 3 segments (E3a, E3b, & E3c) to account for incoming flow from laterals E6, E7, & E8.
E8	70.53	8E	1517.55	3E	1516.10	1,819	1,819	1.26	0.0028	6.00	2.06	0.70	0.004	**0.04**	**0.24**	1.07	New D&T Expansion/Addition
F1	67.00	1F	1514.50	7	1510.21	8,750	8,750	6.08	0.0135	6.00	6.40	1.23	0.011	**0.07**	**0.42**	2.24	Existing Hospital
G3	16.69	3G	1525.64	2G	1525.31	2,904	2,904	2.02	0.0045	6.00	1.98	0.68	0.007	**0.05**	**0.30**	1.22	Existing MOB 2
H2	118.95	2H	1530.67	1H	1527.15	8,750	8,750	6.08	0.0135	8.00	2.96	1.80	0.008	**0.06**	**0.48**	1.58	Existing Hospital

NOTES:

1. Existing sewer information obtained from survey data, EMWD Sewer Map, and as-builts.
2. Sanitary sewer demands per facility from EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).

Table D-4

Proposed Sanitary Sewer Generation Table - Early Project (PDWF)

Manning "n": 0.015
Design Particle Nom Dia (mm): 1.0 (recommended size is 1.0 mm with a sp. Gravity of 2.70)
Specific Wt of Water (lbs/ft^3) 62.4
PWWF Factor: 1.0

JOB NO: 169814 **BY:** SAR **FOR:** Kaiser Permanente Moreno Valley **DATE:** 1/25/2019

Line	Length (ft)	From MH	From I.E.	To MH	To I.E.	ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow) mgd	Peak Wet Weather Flow (PWWF) (Design Flow) cfs	Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
Main Line																						
A	400.00	2	1501.39	1	1500.43	-	35,761	2.80	100,131	1.00	0.10013	0.1549	12.00	0.24	1.51	0.102	0.21	2.52	1.29	1.19	Yes	MH to EMWD 33-inch Sewer Pipe
B	450.00	3	1502.47	2	1501.39	-	35,761	2.80	100,131	1.00	0.10013	0.1549	12.00	0.24	1.51	0.102	0.21	2.52	1.29	1.19	Yes	
C	461.18	4	1503.94	3	1502.47	483	35,761	2.80	100,131	1.00	0.10013	0.1549	12.00	0.32	1.74	0.089	0.20	2.40	1.39	1.19	Yes	Incoming flow from Main Line J
D	283.33	5	1507.03	4	1504.03	-	35,278	2.80	98,780	1.00	0.09878	0.1528	8.00	1.06	1.08	0.142	0.25	2.00	2.24	1.15	Yes	
E	175.11	6	1508.09	5	1507.05	14,875	35,278	2.80	98,780	1.00	0.09878	0.1528	8.00	0.59	0.81	0.189	0.29	2.32	1.82	1.17	Yes	Incoming flow from Branch E1
F	247.70	7	1510.07	6	1508.07	8,750	20,404	2.80	57,130	1.00	0.05713	0.0884	8.00	0.81	0.94	0.094	0.20	1.60	1.78	1.11	Yes	Incoming flow from Lateral F1
G	92.95	8	1511.69	7	1510.11	2,904	11,654	2.80	32,630	1.00	0.03263	0.0505	8.00	1.70	1.36	0.037	0.13	1.04	1.89	1.04	Yes	Incoming flow from Lateral G1
H	199.87	9	1515.35	8	1511.76	-	8,750	2.80	24,500	1.00	0.02450	0.0379	8.00	1.80	1.40	0.027	0.11	0.88	1.81	1.01	Yes	Incoming flow from Branch H1
J	8.94	4-1	1504.00	4	1503.96	483	483	2.80	1,351	1.00	0.00135	0.0021	10.00	0.40	1.20	0.002	0.03	0.30	0.44	0.85	No	Incoming flow from Fresenius Medical Care
Branches																						
E1	282.59	1E	1511.70	6	1508.10	8,750	14,875	2.80	41,650	1.00	0.04165	0.0644	8.00	1.27	1.18	0.055	0.15	1.20	1.96	1.06	Yes	Incoming flow from Lateral E4
E2	84.68	2E	1512.60	1E	1511.70	-	6,125	2.80	17,150	1.00	0.01715	0.0265	6.00	1.06	0.50	0.053	0.15	0.90	1.44	1.01	Yes	
E3a	59.81	3E	1516.10	2E	1512.60	2,488	6,125	2.80	17,150	1.00	0.01715	0.0265	6.00	5.85	1.18	0.023	0.10	0.60	2.60	0.95	Yes	Incoming flow from Lateral E6, E7, & E8
E3b	42.22	E7 Lat	1514.73	E6 Lat	1513.85	1,819	3,637	2.80	10,184	1.00	0.01018	0.0158	6.00	2.09	0.70	0.022	0.10	0.60	1.54	0.95	Yes	Incoming flow from Lateral E7 & E8
E3c	65.83	3E	1516.10	E7 Lat	1514.73	1,819	1,819	2.80	5,092	1.00	0.00509	0.0079	6.00	2.09	0.70	0.011	0.07	0.42	1.30	0.90	Yes	Incoming flow from Lateral E8
G1	57.94	1G	1523.55	8	1512.01	-	2,904	2.80	8,130	1.00	0.00813	0.0126	6.00	19.92	2.17	0.006	0.05	0.30	3.43	0.85	Yes	Flow into MH 8
G2	175.80	2G	1525.31	1G	1523.55	-	2,904	2.80	8,130	1.00	0.00813	0.0126	6.00	1.00	0.49	0.026	0.11	0.66	1.07	0.96	Yes	Incoming flow from Lateral G3
H1	292.81	1H	1527.15	9	1515.35	-	8,750	2.80	24,500	1.00	0.02450	0.0379	8.00	4.03	2.10	0.018	0.09	0.72	2.44	0.98	Yes	Flows into MH 9
Laterals																						
E4	84.00	4E	1517.80	1E	1511.70	8,750	8,750	2.80	24,500	1.00	0.02450	0.0379	6.00	7.26	1.31	0.029	0.11	0.66	3.23	0.96	Yes	Existing Hospital
E5	225.63	2E	1512.60	5E	1510.35																	Flow transports to new 30k-gal Emergency Storage Tank Exclude from calculations
E6	90.52	6E	1515.66	E3	1513.85	2,488	2,488	1.00	2,488	1.00	0.00249	0.0038	6.00	2.00	0.69	0.006	0.05	0.30	1.05	0.85	Yes	New Energy Center Sewer POC (6E) calculated to achieve 2% lateral slope
E7	73.05	7E	1516.19	E3	1514.73	1,819	1,819	2.80	5,092	1.00	0.00509	0.0079	6.00	2.00	0.69	0.011	0.07	0.42	1.30	0.90	Yes	New D&T Expansion/Addition Sewer POC (7E) calculated to achieve 2% lateral slope. Branch E3 shown as 3 segments (E3a, E3b, & E3c) to account for incoming flow from laterals E6, E7, & E8.
E8	70.53	8E	1517.55	3E	1516.10	1,819	1,819	2.80	5,092	1.00	0.00509	0.0079	6.00	2.06	0.70	0.011	0.07	0.42	1.30	0.90	Yes	New D&T Expansion/Addition
F1	67.00	1F	1514.50	7	1510.21	8,750	8,750	2.80	24,500	1.00	0.02450	0.0379	6.00	6.40	1.23	0.031	0.12	0.72	2.84	0.98	Yes	Existing Hospital
G3	16.69	3G	1525.64	2G	1525.31	2,904	2,904	2.80	8,130	1.00	0.00813	0.0126	6.00	1.98	0.68	0.018	0.09	0.54	1.44	0.93	Yes	Existing MOB 2

Table D-4

Proposed Sanitary Sewer Generation Table - Early Project (PDWF)

Manning "n": **0.015**
Design Particle Nom Dia (mm): **1.0** (recommended size is 1.0 mm with a sp. Gravity of 2.70)
Specific Wt of Water (lbs/ft^3) **62.4**
PWWF Factor: **1.0**

JOB NO: **169814** **BY:** **SAR** **FOR:** **Kaiser Permanente Moreno Valley** **DATE:** **1/25/2019**

Line	Length (ft)	From		To		ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow)		Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
		MH	I.E.	MH	I.E.						mgd	cfs										
H2	118.95	2H	1530.67	1H	1527.15	8,750	8,750	2.80	24,500	1.00	0.02450	0.0379	8.00	2.96	1.80	0.021	0.10	0.80	2.09	1.00	Yes	Existing Hospital

NOTES:

1. Peaking Factor for Dry Weather Flow (PFDW) was determined per Table 5.4 Recommended Peaking Factors located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
2. Peaking Factor for Wet Weather Flow (PFWW) was determined per Section 5.1 CIP Capacity & Sizing Criteria located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
3. Self cleansing velocity determined from "Tractive Force Method" for low flows from WEF MOP FD-5. Critical shear stress $\tau c = 0.0181*(Dp)^{0.277}$ as determined by Rath & McCauley (where Dp = design grit particle nom diameter of 1.0 mm as recommended).
4. Existing sewer information obtained from survey data, EMWD Sewer Map, and as-builts.
5. Sanitary sewer demands per facility from EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).

Table D-5

Proposed Sanitary Sewer Generation Table - Early Project (PWWF)

Manning "n": 0.015
Design Particle Nom Dia (mm): 1.0 (recommended size is 1.0 mm with a sp. Gravity of 2.70)
Specific Wt of Water (lbs/ft^3) 62.4
PWWF Factor: 1.2

JOB NO: 169814 **BY:** SAR **FOR:** Kaiser Permanente Moreno Valley **DATE:** 1/25/2019

Line	Length (ft)	From MH	From I.E.	To MH	To I.E.	ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow) mgd	Peak Wet Weather Flow (PWWF) (Design Flow) cfs	Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
Main Line																						
A	400.00	2	1501.39	1	1500.43	-	35,761	2.80	100,131	1.20	0.12016	0.1859	12.00	0.24	1.51	0.123	0.23	2.76	1.36	1.21	Yes	MH to EMWD 33-inch Sewer Pipe
B	450.00	3	1502.47	2	1501.39	-	35,761	2.80	100,131	1.20	0.12016	0.1859	12.00	0.24	1.51	0.123	0.23	2.76	1.36	1.21	Yes	
C	461.18	4	1503.94	3	1502.47	483	35,761	2.80	100,131	1.20	0.12016	0.1859	12.00	0.32	1.74	0.107	0.22	2.64	1.45	1.20	Yes	Incoming flow from Main Line J
D	283.33	5	1507.03	4	1504.03	-	35,278	2.80	98,780	1.20	0.11854	0.1834	8.00	1.06	1.08	0.170	0.27	2.16	2.41	1.16	Yes	
E	175.11	6	1508.09	5	1507.05	14,875	35,278	2.80	98,780	1.20	0.11854	0.1834	8.00	0.59	0.81	0.227	0.32	2.56	1.90	1.19	Yes	Incoming flow from Branch E1
F	247.70	7	1510.07	6	1508.07	8,750	20,404	2.80	57,130	1.20	0.06856	0.1061	8.00	0.81	0.94	0.113	0.22	1.76	1.86	1.12	Yes	Incoming flow from Lateral F1
G	92.95	8	1511.69	7	1510.11	2,904	11,654	2.80	32,630	1.20	0.03916	0.0606	8.00	1.70	1.36	0.044	0.14	1.12	2.04	1.05	Yes	Incoming flow from Lateral G1
H	199.87	9	1515.35	8	1511.76	-	8,750	2.80	24,500	1.20	0.02940	0.0455	8.00	1.80	1.40	0.032	0.12	0.96	1.92	1.03	Yes	Incoming flow from Branch H1
J	8.94	4-1[3]	1504.00	4	1503.96	483	483	2.80	1,351	1.20	0.00162	0.0025	10.00	0.40	1.20	0.002	0.03	0.30	0.53	0.85	No	Incoming flow from Fresenius Medical Care
Branches																						
E1	282.59	1E	1511.70	6	1508.10	8,750	14,875	2.80	41,650	1.20	0.04998	0.0773	8.00	1.27	1.18	0.065	0.17	1.36	1.97	1.08	Yes	Incoming flow from Lateral E4
E2	84.68	2E	1512.60	1E	1511.70	-	6,125	2.80	17,150	1.20	0.02058	0.0318	6.00	1.06	0.50	0.064	0.17	1.02	1.44	1.03	Yes	
E3a	59.81	3E	1516.10	2E	1512.60	2,488	6,125	2.80	17,150	1.20	0.02058	0.0318	6.00	5.85	1.18	0.027	0.11	0.66	2.71	0.96	Yes	Incoming flow from Lateral E6, E7, & E8
E3b	42.22	E7 Lat	1514.73	E6 Lat	1513.85	1,819	3,637	2.80	10,184	1.20	0.01222	0.0189	6.00	2.09	0.70	0.027	0.11	0.66	1.61	0.96	Yes	Incoming flow from Lateral E7 & E8
E3c	65.83	3E	1516.10	E7 Lat	1514.73	1,819	1,819	2.80	5,092	1.20	0.00611	0.0095	6.00	2.09	0.70	0.013	0.08	0.48	1.28	0.92	Yes	Incoming flow from Lateral E8
G1	57.94	1G	1523.55	8	1512.01	-	2,904	2.80	8,130	1.20	0.00976	0.0151	6.00	19.92	2.17	0.007	0.05	0.30	4.11	0.85	Yes	Flow into MH 8
G2	175.80	2G	1525.31	1G	1523.55	-	2,904	2.80	8,130	1.20	0.00976	0.0151	6.00	1.00	0.49	0.031	0.12	0.72	1.13	0.98	Yes	Incoming flow from Lateral G3
H1	292.81	1H	1527.15	9	1515.35	-	8,750	2.80	24,500	1.20	0.02940	0.0455	8.00	4.03	2.10	0.022	0.10	0.80	2.50	1.00	Yes	Flows into MH 9
Laterals																						
E4	84.00	4E[4]	1517.80	1E	1511.70	8,750	8,750	2.80	24,500	1.20	0.02940	0.0455	6.00	7.26	1.31	0.035	0.12	0.72	3.41	0.98	Yes	Existing Hospital
E5	225.63	2E	1512.60	5E	1510.35																	Flow transports to new 30k-gal Emergency Storage Tank Exclude from calculations
E6	90.52	6E	1515.66	E3	1513.85	2,488	2,488	1.00	2,488	1.00	0.00249	0.0038	6.00	2.00	0.69	0.006	0.05	0.30	1.05	0.85	Yes	New Energy Center Sewer POC (6E) calculated to achieve 2% lateral slope
E7	73.05	7E	1516.19	E3	1514.73	1,819	1,819	2.80	5,092	1.20	0.00611	0.0095	6.00	2.00	0.69	0.014	0.08	0.48	1.28	0.92	Yes	New D&T Expansion/Addition Sewer POC (7E) calculated to achieve 2% lateral slope. Branch E3 shown as 3 segments (E3a, E3b, & E3c) to account for incoming flow from laterals E6, E7, & E8.
E8	70.53	8E	1517.55	3E	1516.10	1,819	1,819	2.80	5,092	1.20	0.00611	0.0095	6.00	2.06	0.70	0.014	0.08	0.48	1.28	0.92	Yes	New D&T Expansion/Addition
F1	67.00	1F[4]	1514.50	7	1510.21	8,750	8,750	2.80	24,500	1.20	0.02940	0.0455	6.00	6.40	1.23	0.037	0.13	0.78	3.03	0.99	Yes	Existing Hospital
G3	16.69	3G	1525.64	2G	1525.31	2,904	2,904	2.80	8,130	1.20	0.00976	0.0151	6.00	1.98	0.68	0.022	0.10	0.60	1.48	0.95	Yes	Existing MOB 2

Table D-5

Proposed Sanitary Sewer Generation Table - Early Project (PWWF)

Manning "n": **0.015**

Design Particle Nom Dia (mm): **1.0** (recommended size is 1.0 mm with a sp. Gravity of 2.70)

Specific Wt of Water (lbs/ft^3) **62.4**

PWWF Factor: **1.2**

JOB NO: **169814** **BY:** **SAR** **FOR:** **Kaiser Permanente Moreno Valley** **DATE:** **1/25/2019**

Line	Length (ft)	From		To		ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow)		Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
		MH	I.E.	MH	I.E.						mgd	cfs										
H2	118.95	2H[4]	1530.67	1H	1527.15	8,750	8,750	2.80	24,500	1.20	0.02940	0.0455	8.00	2.96	1.80	0.025	0.10	0.80	2.50	1.00	Yes	Existing Hospital

NOTES:

1. Peaking Factor for Dry Weather Flow (PFDW) was determined per Table 5.4 Recommended Peaking Factors located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
2. Peaking Factor for Wet Weather Flow (PFWW) was determined per Section 5.1 CIP Capacity & Sizing Criteria located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
3. Self cleansing velocity determined from "Tractive Force Method" for low flows from WEF MOP FD-5. Critical shear stress $\tau c = 0.0181*(Dp)^{0.277}$ as determined by Rath & McCauley (where Dp = design grit particle nom diameter of 1.0 mm as recommended).
4. Existing sewer information obtained from survey data, EMWD Sewer Map, and as-builts.
5. Sanitary sewer demands per facility from EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).

Table D-6

Proposed Sanitary Sewer Generation Table - Ultimate Project (ADWF)

Manning n: 0.015

JOB NO: 169814 **BY:** SAR **FOR:** Kaiser Permanente Moreno Valley **DATE:** 1/25/2019

Line	Length (ft)	From MH	From I.E. (out)	To MH	To I.E. (in)	ADWF (gpd)	ADWF Cumulative(gpd)	Average Flow (Design Flow) gpm	Average Flow (Design Flow) cfs	Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Pipe Velocity (ft/s)	Remarks
Main Line																	
A	400.00	2	1501.39	1	1500.43	-	132,857	92.26	0.2056	12.00	0.24	1.51	0.136	0.24	2.88	1.42	MH to EMWD 33-inch Sewer Pipe
B	450.00	3	1502.47	2	1501.39	-	132,857	92.26	0.2056	12.00	0.24	1.51	0.136	0.24	2.88	1.42	
C	461.18	4	1503.94	3	1502.47	483	132,857	92.26	0.2056	12.00	0.32	1.74	0.118	0.23	2.76	1.51	Incoming flow from Main Line J
D1	13.52	0C Lat	1504.17	4	1504.03	8,727	132,375	91.93	0.2048	8.00	1.06	1.08	0.190	0.29	2.32	2.44	Incoming flow from Branch C1
D2	269.81	5	1507.03	0C Lat	1504.17	-	123,648	85.87	0.1913	8.00	1.06	1.08	0.178	0.28	2.24	2.39	
E	175.11	6	1508.09	5	1507.05	38,167	123,648	85.87	0.1913	8.00	0.59	0.81	0.237	0.33	2.64	1.90	Incoming flow from Lateral E1
F	247.70	7	1510.07	6	1508.07	38,167	85,481	59.36	0.1323	8.00	0.81	0.94	0.141	0.25	2.00	1.94	Incoming flow from Lateral F1
G	92.95	8	1511.69	7	1510.11	2,904	47,315	32.86	0.0732	8.00	1.70	1.36	0.054	0.15	1.20	2.23	Incoming flow from Branch G1 and Lateral G4
H	199.87	9	1515.35	8	1511.76	44,411	44,411	30.84	0.0687	8.00	1.80	1.40	0.049	0.15	1.20	2.09	Incoming flow from Lateral H5 & Branch H1a
J	8.94	4-1	1504.00	4	1503.96	483	483	0.34	0.0007	10.00	0.40	1.20	0.001	0.01	0.10	0.81	Incoming flow from Fresenius Medical Care
Branches																	
C1	381.60	1C	1505.70	0C	1504.17	-	8,727	6.06	0.0135	8.00	0.40	0.66	0.020	0.09	0.72	0.87	Flows into MH 4-1
C2	236.21	2C	1506.64	1C	1505.70	-	8,727	6.06	0.0135	8.00	0.40	0.66	0.020	0.09	0.72	0.87	
C3	158.23	3C	1507.28	2C	1506.64	-	8,727	6.06	0.0135	8.00	0.40	0.66	0.020	0.09	0.72	0.87	
C4a	46.67	C5 Lat	1507.70	3C	1507.28	5,090	8,727	6.06	0.0135	8.00	0.90	0.99	0.014	0.08	0.64	1.03	Incoming flow from Lateral C5
C4b	41.66	C6 Lat	1508.07	C5 Lat	1507.70	1,819	3,637	2.53	0.0056	8.00	0.90	0.99	0.006	0.05	0.40	0.86	Incoming flow from Lateral C6
C4c	66.39	4C	1508.67	C6 Lat	1508.07	1,819	1,819	1.26	0.0028	8.00	0.90	0.99	0.003	0.03	0.24	0.92	Incoming flow from Lateral C7
G1	57.94	1G	1523.55	8	1512.01	-	2,904	2.02	0.0045	6.00	19.92	2.17	0.002	0.03	0.18	2.62	Flows into MH 8
G2	175.80	2G	1525.31	1G	1523.55	2,904	2,904	2.02	0.0045	6.00	1.00	0.49	0.009	0.06	0.36	0.93	
H1a	151.23	H4 Lat	1521.39	9	1515.35	3,708	41,874	29.08	0.0648	8.00	4.00	2.09	0.031	0.12	0.96	2.73	Incoming flow from Lateral H4
H1b	141.54	1H	1527.05	H4 Lat	1521.39	38,167	38,167	26.50	0.0591	8.00	4.00	2.09	0.028	0.11	0.88	2.83	Incoming flow from Laterals H2 & H3

Laterals																	
C5	32.67	5C	1508.35	C4	1507.70	5,090	5,090	3.53	0.0079	6.00	2.00	0.69	0.011	**0.07**	**0.42**	1.30	New Energy Center
C6	19.92	6C	1508.47	C4	1508.07	1,819	1,819	1.26	0.0028	6.00	2.00	0.69	0.004	**0.04**	**0.24**	1.07	New D&T Expansion/Addition
C7	19.92	7C	1509.07	C4	1508.67	1,819	1,819	1.26	0.0028	6.00	2.00	0.69	0.004	**0.04**	**0.24**	1.07	New D&T Expansion/Addition
E1	83.95	1E	1509.17	6	1508.10	38,167	38,167	26.50	0.0591	8.00	1.27	1.18	0.050	**0.15**	**1.20**	1.80	New Hospital
F1	67.00	1F	1514.50	7	1510.21	38,167	38,167	26.50	0.0591	6.00	6.40	1.23	0.048	**0.14**	**0.84**	3.53	New Hospital
G3	16.69	3G	1525.64	2G	1525.31	2,904	2,904	2.02	0.0045	6.00	1.98	0.68	0.007	**0.05**	**0.30**	1.22	Existing MOB 2
G4	417.29	4G	1512.01	8	1512.01												Future Parking Structure 2
H2	187.07	2H	1530.89	1H	1527.15	38,167	38,167	26.50	0.0591	6.00	2.00	0.69	0.086	**0.19**	**1.14**	2.27	New Hospital
H3	121.47	3H	1527.05	1H	1527.05												Future Parking Structure 3
H4	111.87	4H	1523.63	H1	1521.39	3,708	3,708	2.57	0.0057	6.00	2.00	0.69	0.008	**0.06**	**0.36**	1.19	Future MOB 4
H5	246.86	5H	1520.29	9	1515.35	2,537	2,537	1.76	0.0039	6.00	2.00	0.69	0.006	**0.05**	**0.30**	1.07	Future MOB 3

NOTES:

1. Existing sewer information obtained from survey data, EMWD Sewer Map, and as-builts.
2. Sanitary sewer demands per facility from EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).

Table D-7

Proposed Sanitary Sewer Generation Table - Ultimate Project (PDWF)

Manning "n": 0.015
Design Particle Nom Dia (mm): 1.0 (recommended size is 1.0 mm with a sp. Gravity of 2.70)
Specific Wt of Water (lbs/ft^3) 62.4
PWWF Factor: 1.0

JOB NO: 169814 **BY:** SAR **FOR:** Kaiser Permanente Moreno Valley **DATE:** 1/25/2019

Line	Length (ft)	From MH	From I.E.	To MH	To I.E.	ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow) mgd	Peak Wet Weather Flow (PWWF) (Design Flow) cfs	Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
Main Line																						
A	400.00	2	1501.39	1	1500.43	-	136,288	2.77	377,517	1.00	0.37752	0.5841	12.00	0.24	1.51	0.386	0.43	5.16	1.81	1.32	Yes	MH to EMWD 33-inch Sewer Pipe
B	450.00	3	1502.47	2	1501.39	-	136,288	2.77	377,517	1.00	0.37752	0.5841	12.00	0.24	1.51	0.386	0.43	5.16	1.81	1.32	Yes	
C	461.18	4	1503.94	3	1502.47	483	136,288	2.77	377,517	1.00	0.37752	0.5841	12.00	0.32	1.74	0.335	0.39	4.68	2.06	1.30	Yes	Incoming flow from Main Line J
D1	13.52	0C Lat	1504.17	4	1504.03	12,157	135,805	2.77	376,180	1.00	0.37618	0.5821	8.00	1.06	1.08	0.540	0.52	4.16	3.17	1.26	Yes	Incoming flow from Branch C1
D2	269.81	5	1507.03	0C Lat	1504.17	-	123,648	2.77	342,505	1.00	0.34250	0.5300	8.00	1.06	1.08	0.492	0.49	3.92	3.12	1.25	Yes	
E	175.11	6	1508.09	5	1507.05	38,167	123,648	2.77	342,505	1.00	0.34250	0.5300	8.00	0.59	0.81	0.657	0.59	4.72	2.47	1.27	Yes	Incoming flow from Lateral E1
F	247.70	7	1510.07	6	1508.07	38,167	85,481	2.80	239,347	1.00	0.23935	0.3704	8.00	0.81	0.94	0.394	0.43	3.44	2.58	1.23	Yes	Incoming flow from Lateral F1
G	92.95	8	1511.69	7	1510.11	2,904	47,315	2.80	132,481	1.00	0.13248	0.2050	8.00	1.70	1.36	0.150	0.26	2.08	2.84	1.15	Yes	Incoming flow from Branch G1 and Lateral G4
H	199.87	9	1515.35	8	1511.76	44,411	44,411	2.80	124,351	1.00	0.12435	0.1924	8.00	1.80	1.40	0.137	0.25	2.00	2.82	1.15	Yes	Incoming flow from Lateral H5 & Branch H1a
J	8.94	4-1	1504.00	4	1503.96	483	483	2.80	1,351	1.00	0.00135	0.0021	10.00	0.40	1.20	0.002	0.03	0.30	0.44	0.85	No	Incoming flow from Fresenius Medical Care
Branches																						
C1	381.60	1C	1505.70	0C	1504.17	-	12,157	2.80	34,040	1.00	0.03404	0.0527	8.00	0.40	0.66	0.080	0.19	1.52	1.14	1.10	Yes	Flows into MH 4-1
C2	236.21	2C	1506.64	1C	1505.70	-	12,157	2.80	34,040	1.00	0.03404	0.0527	8.00	0.40	0.66	0.080	0.19	1.52	1.14	1.10	Yes	
C3	158.23	3C	1507.28	2C	1506.64	-	12,157	2.80	34,040	1.00	0.03404	0.0527	8.00	0.40	0.66	0.080	0.19	1.52	1.14	1.10	Yes	
C4a	46.67	C5 Lat	1507.70	3C	1507.28	8,520	12,157	2.80	34,040	1.00	0.03404	0.0527	8.00	0.90	0.99	0.053	0.15	1.20	1.60	1.06	Yes	Incoming flow from Lateral C5
C4b	41.66	C6 Lat	1508.07	C5 Lat	1507.70	1,819	3,637	2.80	10,184	1.00	0.01018	0.0158	8.00	0.90	0.99	0.016	0.08	0.64	1.20	0.96	Yes	Incoming flow from Lateral C6
C4c	66.39	4C	1508.67	C6 Lat	1508.07	1,819	1,819	2.80	5,092	1.00	0.00509	0.0079	8.00	0.90	0.99	0.008	0.06	0.48	0.92	0.92	Yes	Incoming flow from Lateral C7
G1	57.94	1G	1523.55	8	1512.01	-	2,904	2.80	8,130	1.00	0.00813	0.0126	8.00	19.92	4.67	0.003	0.03	0.24	4.12	0.82	Yes	Flows into MH 8
G2	175.80	2G	1525.31	1G	1523.55	2,904	2,904															
H1a	151.23	H4 Lat	1521.39	9	1515.35	3,708	41,874	2.80	117,248	1.00	0.11725	0.1814	8.00	4.00	2.09	0.087	0.19	1.52	3.93	1.10	Yes	Incoming flow from Lateral H4
H1b	141.54	1H	1527.05	H4 Lat	1521.39	38,167	38,167	2.80	106,867	1.00	0.10687	0.1654	8.00	4.00	2.09	0.079	0.19	1.52	3.58	1.10	Yes	Incoming flow from Laterals H2 & H3
Laterals																						
C5	32.67	5C	1508.35	C4	1507.70	8,520	8,520	1.00	8,520	1.00	0.00852	0.0132	6.00	2.00	0.69	0.019	0.09	0.54	1.51	0.93	Yes	New Energy Center
C6	19.92	6C	1508.47	C4	1508.07	1,819	1,819	2.80	5,092	1.00	0.00509	0.0079	8.00	2.00	1.48	0.005	0.05	0.40	1.21	0.89	Yes	New D&T Expansion/Addition
C7	19.92	7C	1509.07	C4	1508.67	1,819	1,819	2.80	5,092	1.00	0.00509	0.0079	8.00	2.00	1.48	0.005	0.05	0.40	1.21	0.89	Yes	New D&T Expansion/Addition
E1	83.95	1E	1509.17	6	1508.10	38,167	38,167	2.80	106,867	1.00	0.10687	0.1654	8.00	1.27	1.18	0.140	0.25	2.00	2.42	1.15	Yes	New Hospital
F1	67.00	1F	1514.50	7	1510.21	38,167	38,167	2.80	106,867	1.00	0.10687	0.1654	8.00	6.40	2.65	0.062	0.16	1.28	4.59	1.07	Yes	New Hospital
G3	16.69	3G	1525.64	2G	1525.31	2,904	2,904	2.80	8,130	1.00	0.00813	0.0126	8.00	1.98	1.47	0.009	0.06	0.48	1.47	0.92	Yes	Existing MOB 2
G4	417.29	4G	1512.01	8	1512.01																	Future Parking Structure 2
H2	187.07	2H	1530.89	1H	1527.15	38,167	38,167	2.80	106,867	1.00	0.10687	0.1654	8.00	2.00	1.48	0.112	0.22	1.76	2.90	1.12	Yes	New Hospital
H3	121.47	3H	1527.05	1H	1527.05																	Future Parking Structure 3
H4	111.87	4H	1523.63	H1	1521.39	3,708	3,708	2.80	10,381	1.00	0.01038	0.0161	6.00	2.00	0.69	0.023	0.10	0.60	1.57	0.95	Yes	Future MOB 4

Table D-7

Proposed Sanitary Sewer Generation Table - Ultimate Project (PDWF)

Manning "n": **0.015**
Design Particle Nom Dia (mm): **1.0** (recommended size is 1.0 mm with a sp. Gravity of 2.70)
Specific Wt of Water (lbs/ft^3) **62.4**
PWWF Factor: **1.0**

JOB NO: **169814** **BY:** **SAR** **FOR:** **Kaiser Permanente Moreno Valley** **DATE:** **1/25/2019**

Line	Length (ft)	From		To		ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow)		Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
		MH	I.E.	MH	I.E.						mgd	cfs										
H5	246.86	5H	1520.29	9	1515.35	2,537	2,537	2.80	7,103	1.00	0.00710	0.0110	6.00	2.00	0.69	0.016	0.08	0.48	1.49	0.92	Yes	Future MOB 3

NOTES:

1. Peaking Factor for Dry Weather Flow (PFDW) was determined per Table 5.4 Recommended Peaking Factors located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
2. Peaking Factor for Wet Weather Flow (PFWW) was determined per Section 5.1 CIP Capacity & Sizing Criteria located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
3. Self cleansing velocity determined from "Tractive Force Method" for low flows from WEF MOP FD-5. Critical shear stress $\tau c = 0.0181*(Dp)^{0.277}$ as determined by Rath & McCauley (where Dp = design grit particle nom diameter of 1.0 mm as recommended).
4. Existing sewer information obtained from survey data, EMWD Sewer Map, and as-builts.
5. Sanitary sewer demands per facility from EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).

Table D-8

Proposed Sanitary Sewer Generation Table - Ultimate Project (PWWF)

Manning "n": 0.015
Design Particle Nom Dia (mm): 1.0 (recommended size is 1.0 mm with a sp. Gravity of 2.70)
Specific Wt of Water (lbs/ft^3) 62.4
PWWF Factor: 1.2

JOB NO: 169814 **BY:** SAR **FOR:** Kaiser Permanente Moreno Valley **DATE:** 1/25/2019

Line	Length (ft)	From MH	From I.E.	To MH	To I.E.	ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow) mgd	Peak Wet Weather Flow (PWWF) (Design Flow) cfs	Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
Main Line																						
A	400.00	2	1501.39	1	1500.43	-	136,288	2.77	377,517	1.20	0.45302	0.7010	12.00	0.24	1.51	0.464	0.47	5.64	1.93	1.33	Yes	MH to EMWD 33-inch Sewer Pipe
B	450.00	3	1502.47	2	1501.39	-	136,288	2.77	377,517	1.20	0.45302	0.7010	12.00	0.24	1.51	0.464	0.47	5.64	1.93	1.33	Yes	
C	461.18	4	1503.94	3	1502.47	483	136,288	2.77	377,517	1.20	0.45302	0.7010	12.00	0.32	1.74	0.402	0.44	5.28	2.11	1.32	Yes	Incoming flow from Main Line J
D1	13.52	0C Lat	1504.17	4	1504.03	12,157	135,805	2.77	376,180	1.20	0.45142	0.6985	8.00	1.06	1.08	0.648	0.58	4.64	3.33	1.27	Yes	Incoming flow from Branch C1
D2	269.81	5	1507.03	0C Lat	1504.17	-	123,648	2.77	342,505	1.20	0.41101	0.6360	8.00	1.06	1.08	0.590	0.55	4.40	3.23	1.26	Yes	
E	175.11	6	1508.09	5	1507.05	38,167	123,648	2.77	342,505	1.20	0.41101	0.6360	8.00	0.59	0.81	0.788	0.66	5.28	2.60	1.28	Yes	Incoming flow from Lateral E1
F	247.70	7	1510.07	6	1508.07	38,167	85,481	2.80	239,347	1.20	0.28722	0.4444	8.00	0.81	0.94	0.472	0.48	3.84	2.68	1.25	Yes	Incoming flow from Lateral F1
G	92.95	8	1511.69	7	1510.11	2,904	47,315	2.80	132,481	1.20	0.15898	0.2460	8.00	1.70	1.36	0.180	0.28	2.24	3.07	1.16	Yes	Incoming flow from Branch G1 and Lateral G4
H	199.87	9	1515.35	8	1511.76	44,411	44,411	2.80	124,351	1.20	0.14922	0.2309	8.00	1.80	1.40	0.165	0.27	2.16	3.04	1.16	Yes	Incoming flow from Lateral H5 & Branch H1a
J	8.94	4-1[3]	1504.00	4	1503.96	483	483	2.80	1,351	1.20	0.00162	0.0025	10.00	0.40	1.20	0.002	0.03	0.30	0.53	0.85	No	Incoming flow from Fresenius Medical Care
Branches																						
C1	381.60	1C	1505.70	0C	1504.17	-	12,157	2.80	34,040	1.20	0.04085	0.0632	8.00	0.40	0.66	0.095	0.20	1.60	1.27	1.11	Yes	Flows into MH 4-1
C2	236.21	2C	1506.64	1C	1505.70	-	12,157	2.80	34,040	1.20	0.04085	0.0632	8.00	0.40	0.66	0.095	0.20	1.60	1.27	1.11	Yes	
C3	158.23	3C	1507.28	2C	1506.64	-	12,157	2.80	34,040	1.20	0.04085	0.0632	8.00	0.40	0.66	0.095	0.20	1.60	1.27	1.11	Yes	
C4a	46.67	C5 Lat	1507.70	3C	1507.28	8,520	12,157	2.80	34,040	1.20	0.04085	0.0632	8.00	0.90	0.99	0.064	0.17	1.36	1.61	1.08	Yes	Incoming flow from Lateral C5
C4b	41.66	C6 Lat	1508.07	C5 Lat	1507.70	1,819	3,637	2.80	10,184	1.20	0.01222	0.0189	8.00	0.90	0.99	0.019	0.09	0.72	1.22	0.98	Yes	Incoming flow from Lateral C6
C4c	66.39	4C	1508.67	C6 Lat	1508.07	1,819	1,819	2.80	5,092	1.20	0.00611	0.0095	8.00	0.90	0.99	0.010	0.06	0.48	1.11	0.92	Yes	Incoming flow from Lateral C7
G1	57.94	1G	1523.55	8	1512.01	-	2,904	2.80	8,130	1.20	0.00976	0.0151	8.00	19.92	4.67	0.003	0.04	0.32	3.22	0.86	Yes	Flows into MH 8
G2	175.80	2G	1525.31	1G	1523.55	2,904	2,904															
H1a	151.23	H4 Lat	1521.39	9	1515.35	3,708	41,874	2.80	117,248	1.20	0.14070	0.2177	8.00	4.00	2.09	0.104	0.21	1.68	4.09	1.12	Yes	Incoming flow from Lateral H4
H1b	141.54	1H	1527.05	H4 Lat	1521.39	38,167	38,167	2.80	106,867	1.20	0.12824	0.1984	8.00	4.00	2.09	0.095	0.20	1.60	3.99	1.11	Yes	Incoming flow from Laterals H2 & H3
Laterals																						
C5	32.67	5C	1508.35	C4	1507.70	8,520	8,520	1.00	8,520	1.00	0.00852	0.0132	6.00	2.00	0.69	0.019	0.09	0.54	1.51	0.93	Yes	New Energy Center
C6	19.92	6C	1508.47	C4	1508.07	1,819	1,819	2.80	5,092	1.20	0.00611	0.0095	8.00	2.00	1.48	0.006	0.05	0.40	1.45	0.89	Yes	New D&T Expansion/Addition
C7	19.92	7C	1509.07	C4	1508.67	1,819	1,819	2.80	5,092	1.20	0.00611	0.0095	8.00	2.00	1.48	0.006	0.05	0.40	1.45	0.89	Yes	New D&T Expansion/Addition
E1	83.95	1E	1509.17	6	1508.10	38,167	38,167	2.80	106,867	1.20	0.12824	0.1984	8.00	1.27	1.18	0.168	0.27	2.16	2.61	1.16	Yes	New Hospital
F1	67.00	1F[4]	1514.50	7	1510.21	38,167	38,167	2.80	106,867	1.20	0.12824	0.1984	8.00	6.40	2.65	0.075	0.18	1.44	4.64	1.09	Yes	New Hospital
G3	16.69	3G	1525.64	2G	1525.31	2,904	2,904	2.80	8,130	1.20	0.00976	0.0151	8.00	1.98	1.47	0.010	0.07	0.56	1.41	0.94	Yes	Existing MOB 2
G4	417.29	4G	1512.01	8	1512.01																	Future Parking Structure 2
H2	187.07	2H	1530.89	1H	1527.15	38,167	38,167	2.80	106,867	1.20	0.12824	0.1984	8.00	2.00	1.48	0.134	0.24	1.92	3.08	1.14	Yes	New Hospital
H3	121.47	3H	1527.05	1H	1527.05																	Future Parking Structure 3
H4	111.87	4H	1523.63	H1	1521.39	3,708	3,708	2.80	10,381	1.20	0.01246	0.0193	6.00	2.00	0.69	0.028	0.11	0.66	1.64	0.96	Yes	Future MOB 4

Table D-8

Proposed Sanitary Sewer Generation Table - Ultimate Project (PWWF)

Manning "n": **0.015**

Design Particle Nom Dia (mm): **1.0** (recommended size is 1.0 mm with a sp. Gravity of 2.70)

Specific Wt of Water (lbs/ft^3) **62.4**

PWWF Factor: **1.2**

JOB NO: **169814** **BY:** **SAR** **FOR:** **Kaiser Permanente Moreno Valley** **DATE:** **1/25/2019**

Line	Length (ft)	From		To		ADWF (gpd)	ADWF Cumulative (gpd)	Peaking Factor for DWF (PFDW)[1]	PDWF (gpd)	Peaking Factor for WWF (PFWW)[2]	Peak Wet Weather Flow (PWWF) (Design Flow)		Pipe Size Diameter (in)	Pipe Slope (%)	Full Pipe Flow (cfs)	Q/Qfull	Calculated d/D	Calculated Normal Depth (d_n)	Actual Pipe Velocity (ft/s)	Min. Self Cleansing Velocity (ft/s)	Sewer Self Cleansing[3]	Remarks
		MH	I.E.	MH	I.E.						mgd	cfs										
H5	246.86	5H	1520.29	9	1515.35	2,537	2,537	2.80	7,103	1.20	0.00852	0.0132	6.00	2.00	0.69	0.019	0.09	0.54	1.51	0.93	Yes	Future MOB 3

NOTES:

1. Peaking Factor for Dry Weather Flow (PFDW) was determined per Table 5.4 Recommended Peaking Factors located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
2. Peaking Factor for Wet Weather Flow (PFWW) was determined per Section 5.1 CIP Capacity & Sizing Criteria located in the EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).
3. Self cleansing velocity determined from "Tractive Force Method" for low flows from WEF MOP FD-5. Critical shear stress $\tau c = 0.0181*(Dp)^{0.277}$ as determined by Rath & McCauley (where Dp = design grit particle nom diameter of 1.0 mm as recommended).
4. Existing sewer information obtained from survey data, EMWD Sewer Map, and as-builts.
5. Sanitary sewer demands per facility from EMWD 2006 Wastewater Master Plan Update (Final Report November 2008).

All six (6) sewer models were analyzed to detect any sewer flow impacts from the Project to the existing EMWD sanitary sewer mains. The results are summarized as follows and addresses EMWD sewer infrastructure, including the 8-inch sewer main within the project area and 12-inch sewer main located downstream:

1. Early Project (ADWF) – The d/D ratios for proposed average flows along Main Lines D through G range between 0.06 and 0.17. The d/D ratio for Main Lines A through C is 0.12. Normal depths along the 8-inch sewers range from 0.64 to 1.36 inches with pipe velocities ranging from 1.33 to 1.62 ft/s. Normal depths along the 12-inch sewers are 1.44 inches with pipe velocities of 1.01 ft/s.

2. Early Project (PDWF) – The d/D ratios for proposed peak dry weather flows along Main Lines D through G range between 0.13 and 0.25. The d/D ratio for Main Lines A through C is 0.21. Normal depths along the 8-inch sewers range from 1.04 to 2.32 inches with pipe velocities ranging from 1.78 to 2.24 ft/s. Normal depths along the 12-inch sewers are 1.44 inches with pipe velocities of 1.29 ft/s. The pipe velocities for each main line are less than the required minimum velocity, except Main Line D. However, the pipe velocities for each main line exceed the minimum self-cleansing velocities per the "Tractive Force Method" and sewer self-cleansing is met for each main line.

3. Early Project (PWWF) – The d/D ratios for proposed peak dry weather flows along Main Lines D through G range between 0.14 and 0.32. The d/D ratio for Main Lines A through C range between 0.22 and 0.23. Normal depths along the 8-inch sewers range from 1.12 to 2.56 inches with pipe velocities ranging from 1.86 to 2.41 ft/s. Normal depths along the 12-inch sewers range from 2.64 to 2.76 inches with pipe velocities ranging from 1.36 to 1.45 ft/s. The pipe velocities for each main line are less than the required minimum velocity, except Main Lines D and G. However, the pipe velocities for each main line exceed the minimum self-cleansing velocities per the "Tractive Force Method" and sewer self-cleansing is met for each main line.

4. Ultimate Project (ADWF) – The d/D ratios for proposed average flows along Main Lines D1 through G range between 0.15 and 0.33. The d/D ratio for Main Lines A through C range between 0.23 and 0.24. Normal depths along the 8-inch sewers range from 1.20 to 2.64 inches with pipe velocities ranging from 1.90 to 2.44 ft/s. Normal depths along the 12-inch sewers range between 2.76 and 2.88 inches with pipe velocities ranging from 1.42 to 1.51 ft/s.

5. Ultimate Project (PDWF) – The d/D ratios for proposed average flows along Main Lines D1 through G range between 0.26 and 0.59. The d/D ratio for Main Lines A through C range between 0.39 and 0.43. Normal depths along the 8-inch sewers range from 2.08 to 4.72 inches with pipe velocities ranging from 2.47 to 3.17 ft/s. Normal depths along the 12-inch sewers range between 4.68 and 5.16 inches with pipe velocities ranging from 1.81 to 2.06 ft/s. Main Lines C, E, F, and G are above the required minimum velocity and Main Lines D1 and D2 exceed the recommended velocity. Main Lines A and B are less than the required minimum velocity.

However, the pipe velocities for these main lines exceed the minimum self-cleansing velocities per the "Tractive Force Method" and sewer self-cleansing is met for each main line.

6. Ultimate Project (PWWF) – The d/D ratios for proposed average flows along Main Lines D1 through G range between 0.28 and 0.66. The d/D ratio for Main Lines A through C range between 0.44 and 0.47. Normal depths along the 8-inch sewers range from 2.24 to 5.28 inches with pipe velocities ranging from 2.60 to 3.33 ft/s. Normal depths along the 12-inch sewers range between 5.28 and 5.64 inches with pipe velocities ranging from 1.93 to 2.11 ft/s. Main Lines C, E, and F are above the required minimum velocity and Main Lines D1, D2, and G exceed the recommended velocity. Main Lines A and B are less than the required minimum velocity. However, the pipe velocities for these main lines exceed the minimum self-cleansing velocities per the "Tractive Force Method" and sewer self-cleansing is met for each main line.

E. Conclusion

Based on the discussion provided in Section C and analysis results provided in Section D regarding the Project, the following recommendations are provided:

1. Under the ADWF, PDWF, and PWWF for Early Project conditions, the d/D ratio for the 8-inch and 12-inch sanitary sewers transporting wastewater from the project area are less than the required pipe flow capacity for upsizing. The pipe velocities under PDWF and PWWF conditions are below the recommended velocity of 3 ft/s. The pipe velocities under these conditions are also below the required pipe velocity of 2 ft/s, except for Main Line D (PDWF + PWWF) and Main Line G (PWWF). All 8-inch and 12-inch lines transporting flow offsite exceed the minimum self-cleansing velocity determined from the Tractive Force Method per WEF MOP FD-5.

2. Pipe velocities for the main lines are lower than the required minimum velocity of 2 ft/s under ADWF condition for the Ultimate Project. Pipe velocities for the main lines under PDWF and PWWF conditions for the Ultimate Project are above the required minimum velocity or recommended velocity, except for Main Line A and B.

3. The d/D ratio for Main Lines A-G for both the Early Project and Ultimate Project do not attain full flow under PWWF conditions. The maximum d/D ratio is 0.66 for Main E located in the Ultimate Project PWWF sewer generation table.

4. Under PDWF conditions for the Ultimate Project, Main Lines D1 and E exceed a d/D ratio of 0.50. Per EMWD requirements, Main Lines D (Da + D2) and E should be considered for upsizing in the future to produce pipe capacity of less than 50% full.

5. Pipe velocities for new and existing sewer mains vary and result in velocities that meet the minimum required velocity, meet the recommended velocity, or do not meet either requirement. However, velocities for all new sewer mains and laterals, except new Branch C4 (C4a + C4b + C4c) under the Ultimate Project PWWF conditions, per the minimum requirements

obtain the minimum self-cleansing velocity to achieve self-cleansing velocities as determined under the "Tractive Force Method" from WEF MOP FD-5. It is recommended to adjust the slope for Branch C4 to a minimum velocity of 0.9% to achieve the required minimum velocity.

F. Appendices

A. Proposed Project Site Layouts

B. Early Project Sanitary Sewer Model Exhibit

C. Ultimate Project Sanitary Sewer Model Exhibit

D. EMWD Wastewater Master Plan Update, Final Report, November 2008 – Recommended Unit Flow Factors

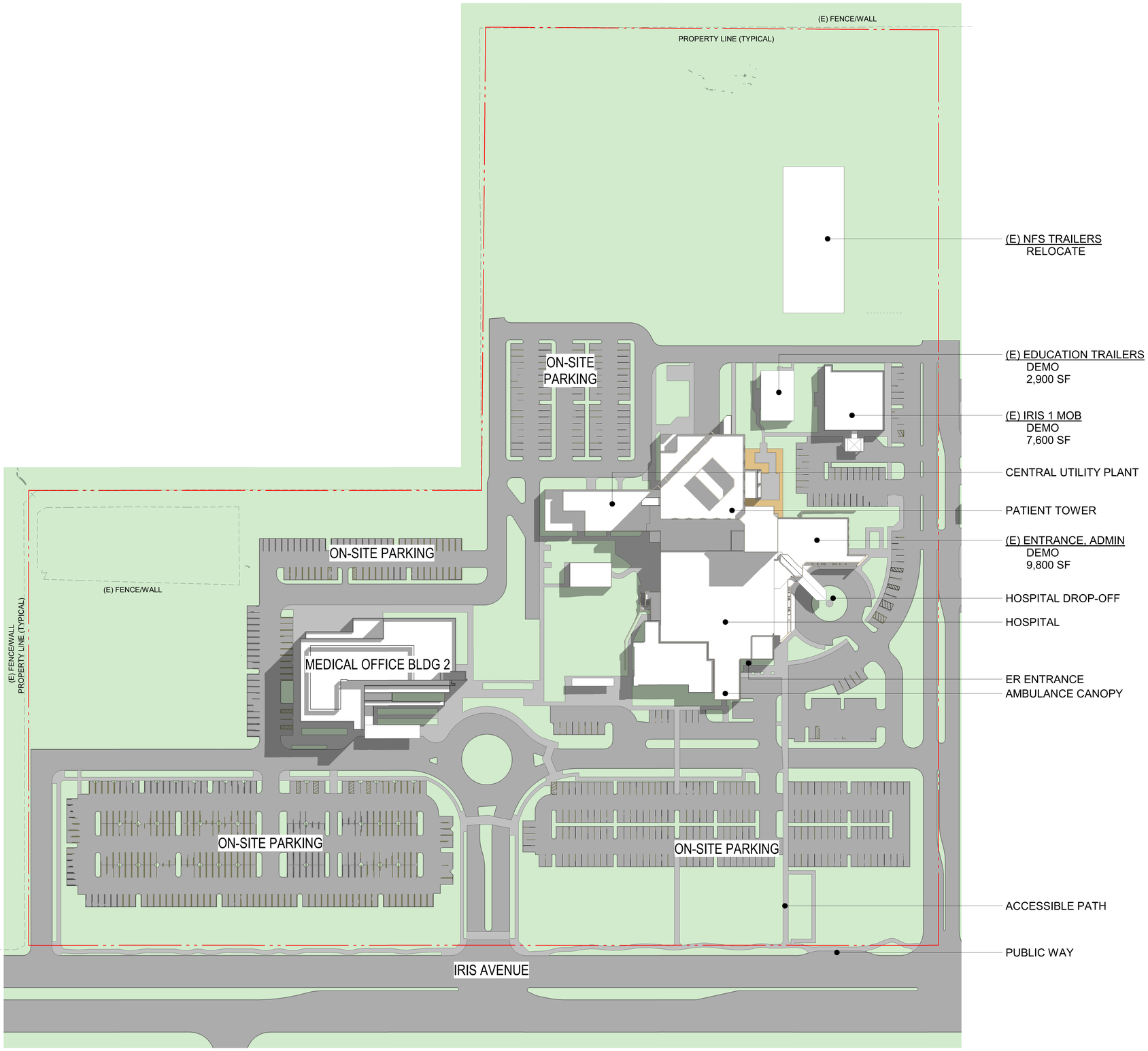
E. EMWD Wastewater Master Plan Update, Final Report, November 2008 – Recommended Peaking Factors

F. EMWD Local Limits Applicable to Permitted Users (Table I)

APPENDIX A – PROPOSED PROJECT SITE LAYOUTS

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DIAGNOSTIC & TREATMENT ADDITION

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KAISER Proj: K0130 OSHPD FACILITY: 106334048

OSHPD PROJECT #

KEY PLAN

N

SITE PLAN - EXISTING

SCALE: 1" = 60'-0"
DATE OF ISSUE: NOVEMBER 30, 2018

SCHEMATIC DESIGN
CO PROJECT NO.: 17009.000

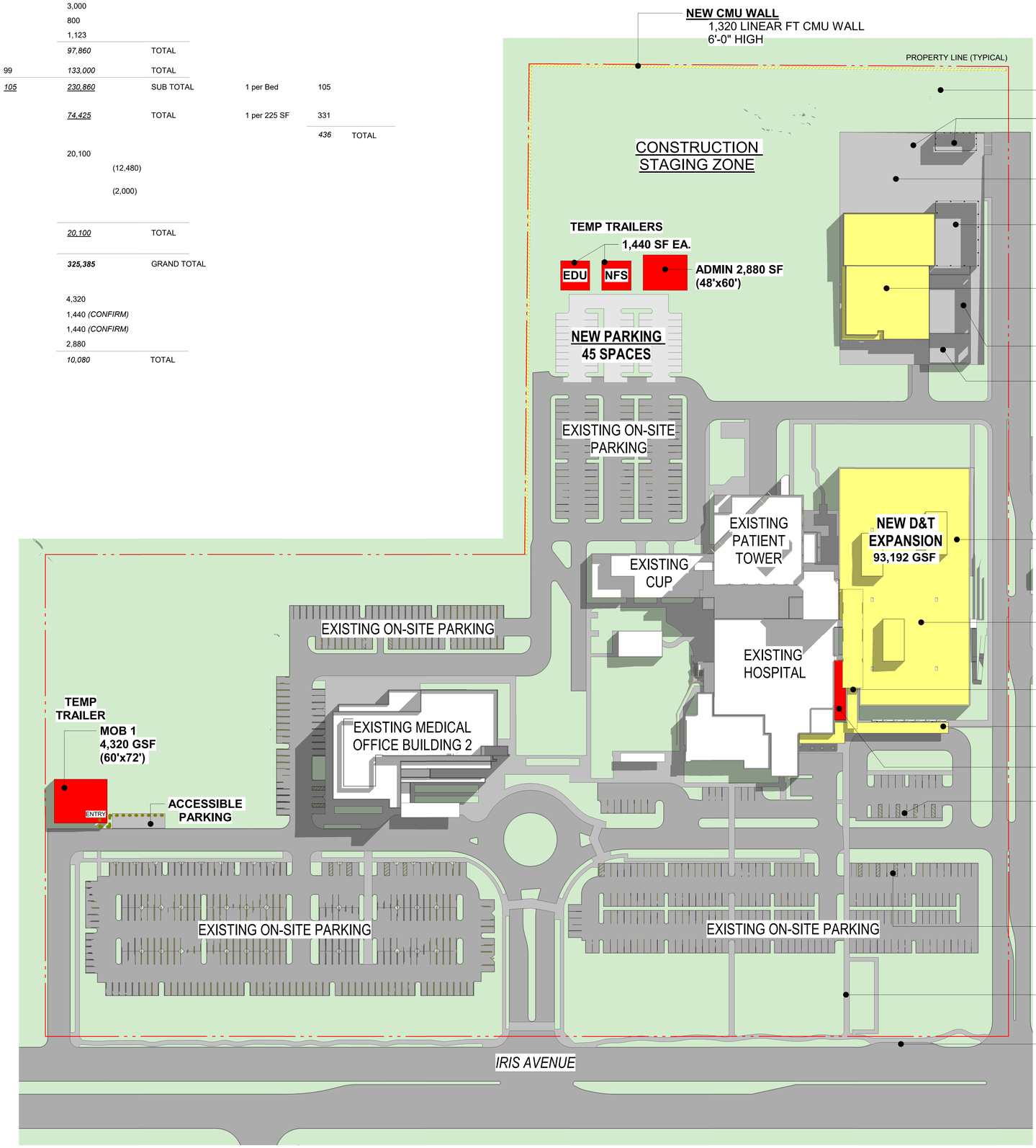
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PROGRAM SUMMARY - EARLY PROJECT

	Beds	GSF		Parking Factor	Parking Required
New D&T Expansion	6 (NICU)	93,192			
Drop-off Canopy (covered)		3,000			
Entrance Canopy (covered)		800			
Entrance		1,123			
		97,860	TOTAL		
Existing Hospital	99	*133,000*	TOTAL		
	105	*230,860*	SUB TOTAL	1 per Bed	105
Existing MOB 2		*74,425*	TOTAL	1 per 225 SF	331
					436 TOTAL
New CUP					
Energy Center		20,100			
Yard - Cooling Towers, Emergency Gen., SCE (uncovered)			(12,480)		
Yard - O2, Pump (uncovered)			(2,000)		
Underground Tanks					
		20,100	TOTAL		
		325,385	GRAND TOTAL		
New Temp Trailers					
MOB 1		4,320			
EDU		1,440 *(CONFIRM)*			
NFS		1,440 *(CONFIRM)*			
Admin		2,880			
		10,080	TOTAL		

Parking Spaces		
Existing	685	
New Temporary	45	
	730	TOTAL



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SITE PLAN - EARLY PROJECT

SCALE: As indicated
DATE OF ISSUE: NOVEMBER 30, 2018

SCHEMATIC DESIGN
CO PROJECT NO.: 17009.000

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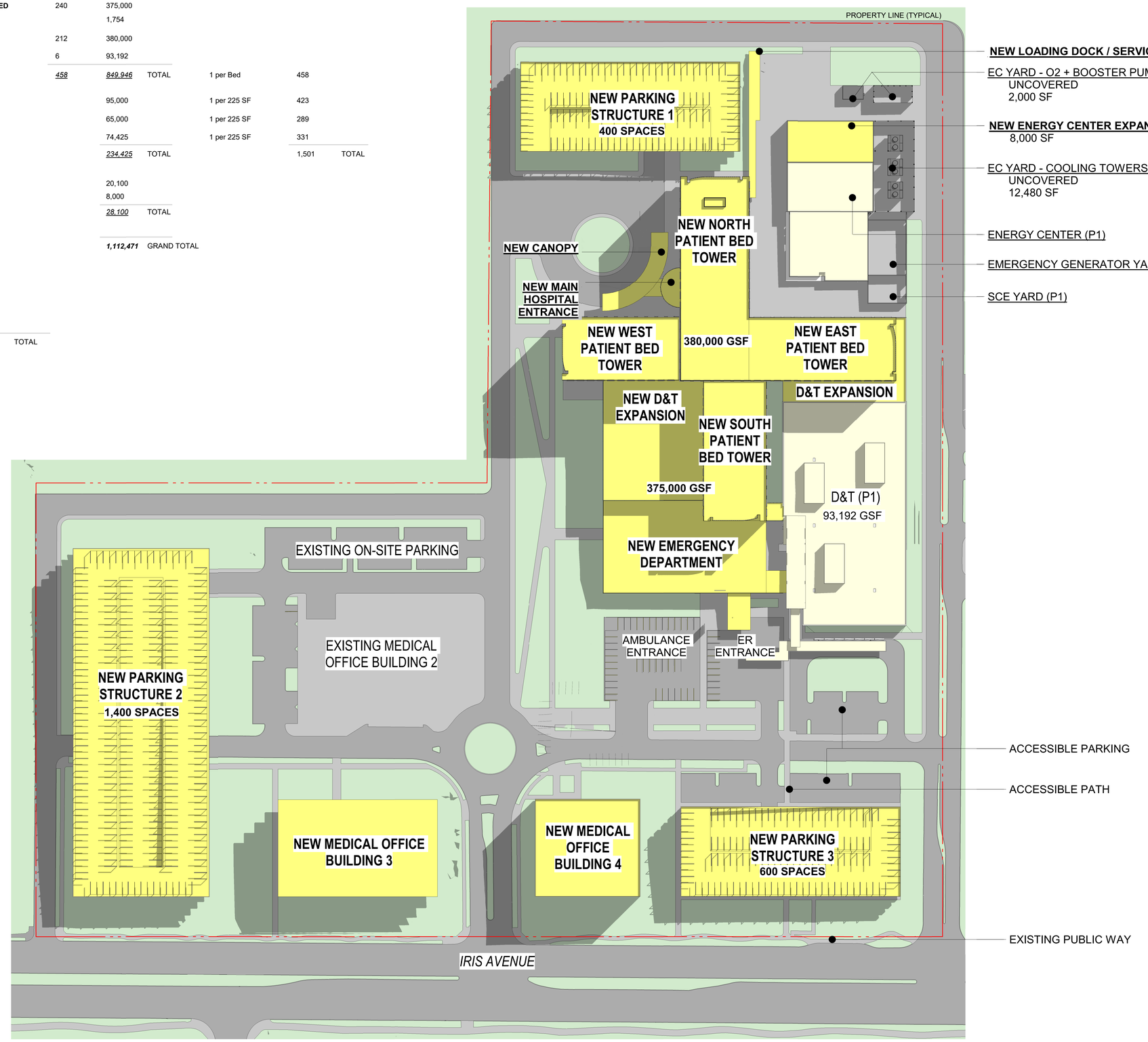
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PROGRAM SUMMARY - ULTIMATE PROJECT

	Beds	GSF		Parking Factor	Parking Required	
New Patient Bed Towers, D&T Expansion, and ED	240	375,000				
ED Entrance Canopy		1,754				
New Patient Bed Towers and D&T Expansion (P2)	212	380,000				
D&T (P1)	6	93,192				
	458	*849,946*	TOTAL	1 per Bed	458	
New MOB 4		95,000		1 per 225 SF	423	
New MOB 3		65,000		1 per 225 SF	289	
Existing MOB 2		74,425		1 per 225 SF	331	
		234,425	TOTAL		1,501	TOTAL
CUP (P1)		20,100				
New CUP Expansion		8,000				
		28,100	TOTAL			
		1,112,471	GRAND TOTAL			

Parking Spaces

Existing	150	
New Structure 1	400	
New Structure 2	1,400	
New Structure 3	600	
	2,550	TOTAL



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SITE PLAN - ULTIMATE PROJECT

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APPENDIX B – EARLY PROJECT SANITARY SEWER MODEL EXHIBIT

LEGEND

1	MANHOLE
A	MAIN LINE
	EXISTING
	PROPOSED

SEE NEXT PAGE FOR CONTINUATION

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NO.	REVISION	INIT.	DATE

NORTH

SCALE 1" = 200'

MAPS & RECORDS

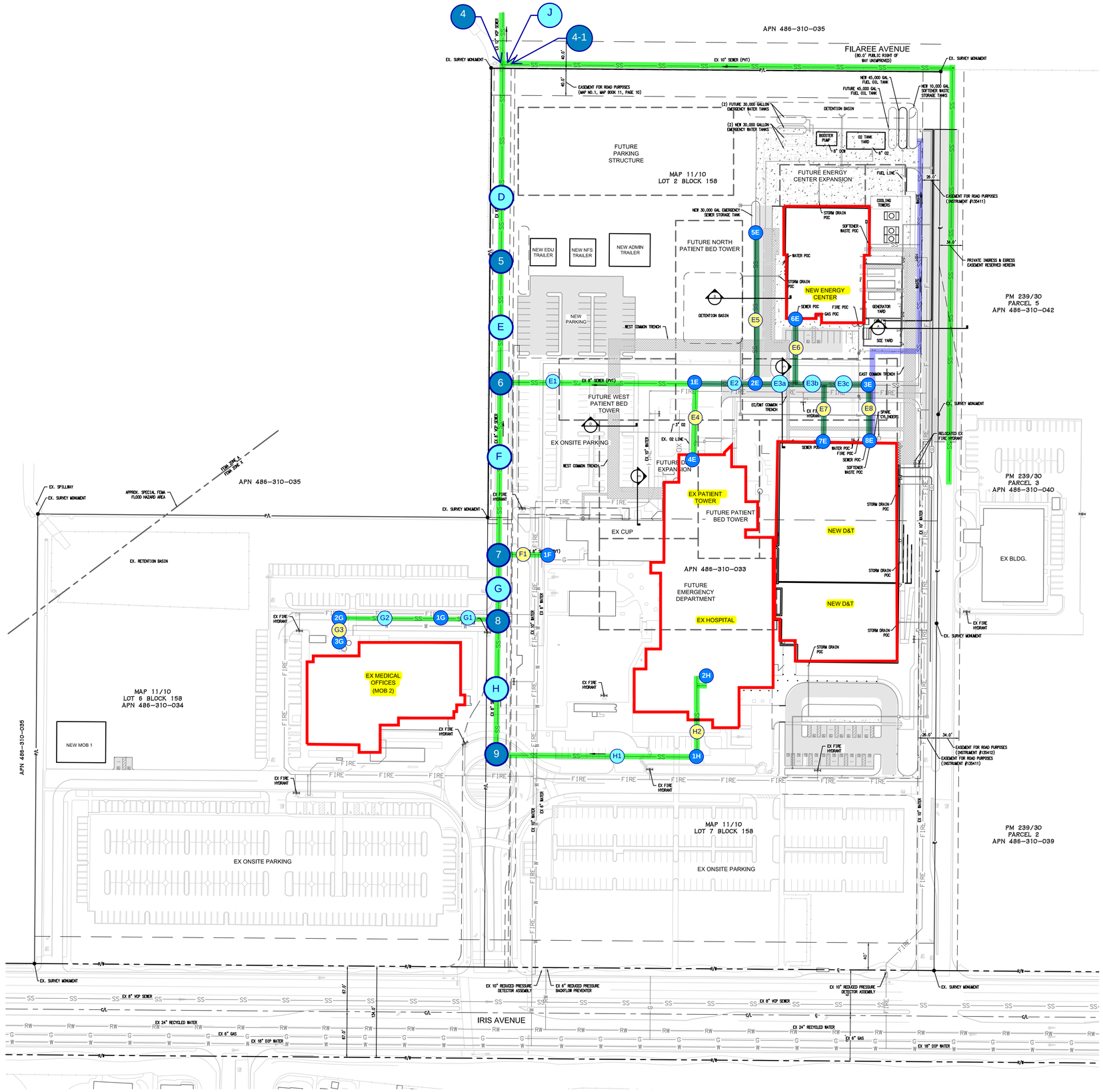
SCALE sewer MAP

sewer

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LEGEND

STORM DRAIN
SANITARY SEWER
FIRE MAIN
DOMESTIC WATER

UTILITY INFORMATION PROVIDED BY TRADES TEAM

ELECTRICAL
COMMUNICATION
FUEL OIL
GAS
MA, MV, 02
WATER UTILITIES

MEP COMMON TRENCH

EXISTING UTILITIES:

EXISTING ELECTRICAL LINE — E
EXISTING SEWER LINE — SS
EXISTING WATER LINE — W
EXISTING FIRE LINE — FIRE
EXISTING STORM DRAIN — SD
EXISTING GAS LINE — G
EXISTING COMMUNICATION LINE — COM
EXISTING TELEPHONE LINE — T

LEGEND

1 — MANHOLE
A — MAIN LINE
1A — POINT OF CONNECTION OR BRANCH MANHOLE
A1a — BRANCH LINE
A1 — LATERAL
EXISTING
PROPOSED

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KEY PLAN

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60 30 0 60 120 180
SCALE: 1"=60'

PHASE 1 - COLOR UTILITY EXHIBIT

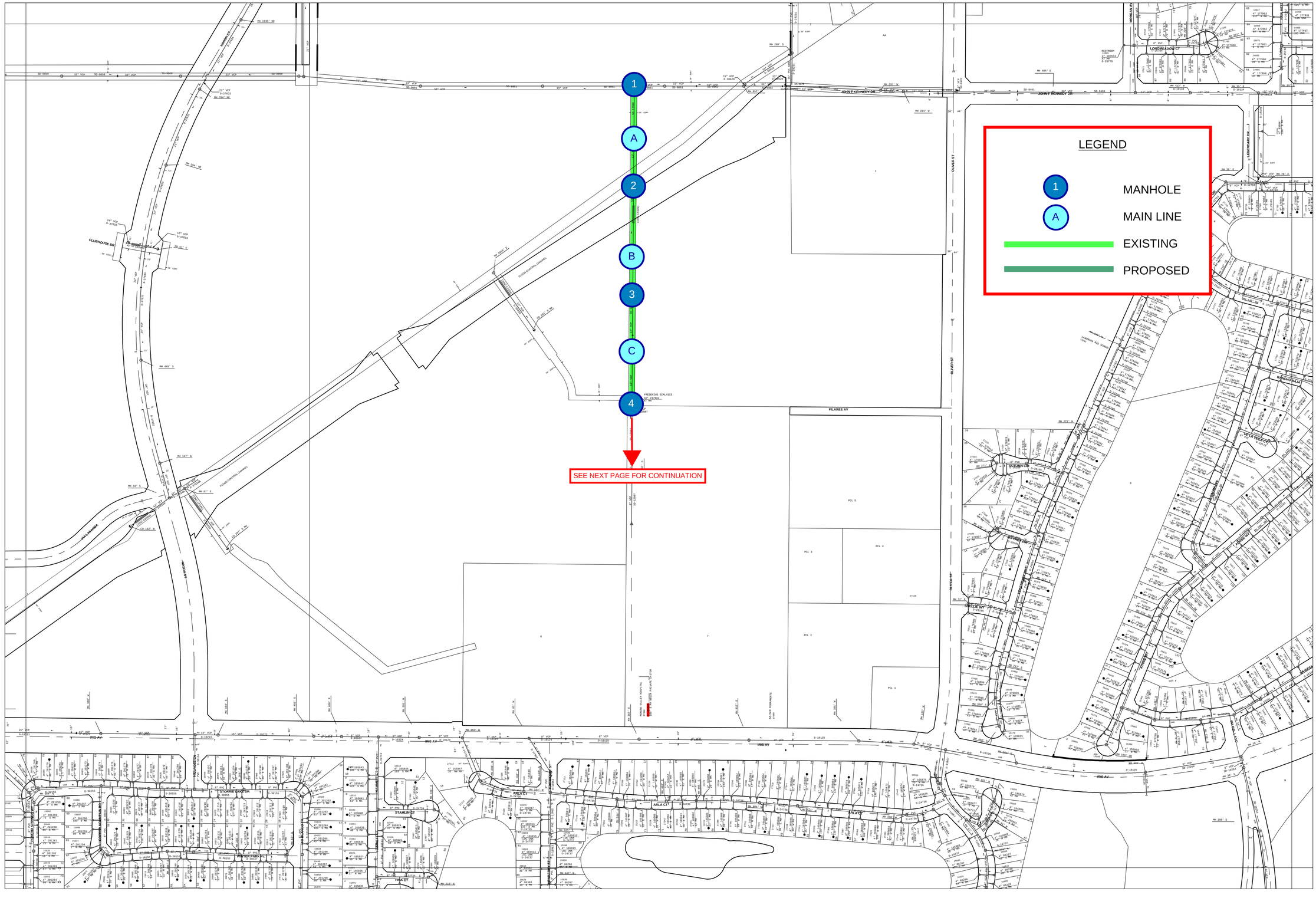
SCALE: AS INDICATED
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APPENDIX C – ULTIMATE PROJECT SANITARY SEWER MODEL EXHIBIT



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NORTH

SCALE 1" = 200'

SCALE sewer MAP

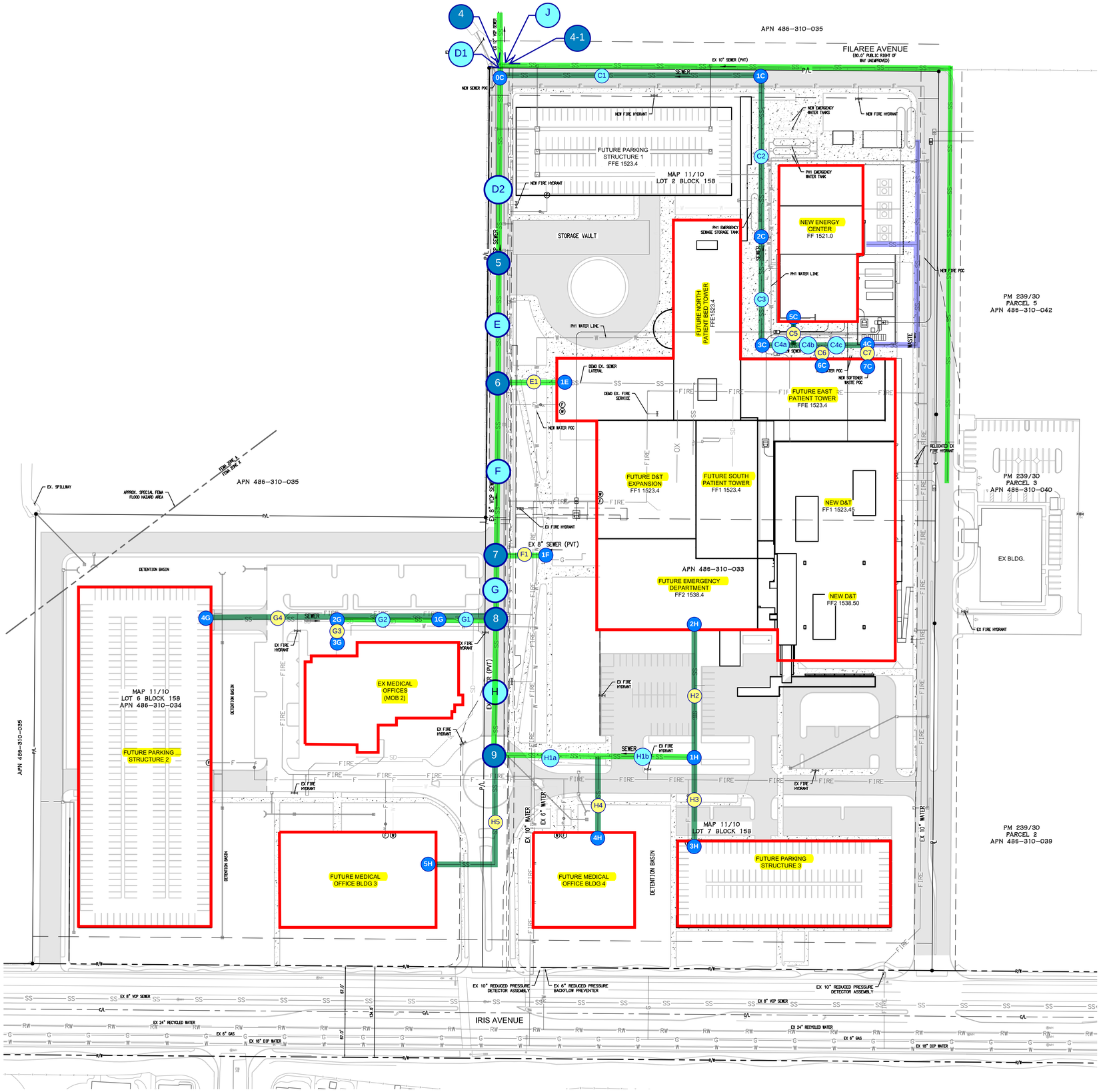
sewer

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MAPS & RECORDS

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LEGEND

STORM DRAIN
SANITARY SEWER
FIRE MAIN
DOMESTIC WATER

UTILITY INFORMATION PROVIDED BY TRADES TEAM:

ELECTRICAL
COMMUNICATION
FUEL OIL
GAS
OXYGEN
WATER FEATURE UTILITIES

EXISTING UTILITIES:

EXISTING ELECTRICAL LINE — E
EXISTING SEWER LINE — SS
EXISTING WATER LINE — W
EXISTING FIRE LINE — FIRE
EXISTING STORM DRAIN — SD
EXISTING GAS LINE — G
EXISTING COMMUNICATION LINE — COM
EXISTING TELEPHONE LINE — T

LEGEND

- 1 — MANHOLE
- A — MAIN LINE
- 1A — POINT OF CONNECTION OR BRANCH MANHOLE
- A1a — BRANCH LINE
- A1 — LATERAL
- EXISTING
- PROPOSED

60 30 0 60 120 180
SCALE: 1"=60'

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KEY PLAN

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MASTER PHASE - COLOR UTILITY EXHIBIT

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APPENDIX D – EMWD WASTEWATER MASTER PLAN UPDATE, FINAL REPORT, NOVEMBER 2008 – RECOMMENDED UNIT FLOW FACTORS

Table 5.3
Recommended Unit Flow Factors

Category	Unit Flow Factor	Comment
Residential		
Single Family Residential	265 gpd/EDU	
Multi-Family Residential	165 gpd/EDU	Apartments, duplexes and condominiums.
Multi-Family Residential	150 gpd/EDU	Mobile Homes, Trailer Parks and Age restricted communities.
Non-Residential		
Commercial	1,700 gpd/acre	
Industrial	1,700 gpd/acre	
Institutional or Public Facility (non-school)	1,000 gpd/acre	
Hospital	250 gpd/bed	
School	20 gpd/student	
Housing Density		
Low Density Residential	2.5 edu/acre	
Medium Density Residential	4.5 edu/acre	
Medium High Density Residential	8.0 edu/acre	
High Density Residential	12 edu/acre	
Very High Density Residential	17 edu/acre	

Note: gpd = gallons per day. EDU = equivalent dwelling unit.

5.4 PEAKING FACTORS

In conjunction with evaluating the design criteria for unit flow factors, the peaking factors were also evaluated. Flow data from sixty-seven (67) monitoring sites was evaluated from 1999 to 2007. The average dry weather flow (ADWF) was compared to the peak hourly dry weather flow (PDWF) from each monitoring site. Within this dataset, the ADWF ranged from 0.010 to 7.01 mgd and the hourly peaking factors ranged from 1.21 – 2.55. Of the 67 monitoring sites, 65 sites

APPENDIX E – EMWD WASTEWATER MASTER PLAN UPDATE, FINAL REPORT, NOVEMBER 2008 – RECOMMENDED PEAKING FACTORS

had an ADWF less than 3.0 mgd. A summary of this flow monitoring data is provided in Appendix B.

A graph of the peaking factor versus ADWF is presented in Figure 5.1. Also presented on Figure 5.1 is the trend-line that represents the recommendation for the peaking factor design criteria. In general, the recommendation for updating the peaking factor design criteria is higher than the existing design criteria for low flows, and comparable to the existing design criteria for larger flows. This essentially preserves the design criteria for the small diameter pipelines where a higher degree of variability is seen in both the unit flow factors and peaking factors, and lowers the design criteria for the larger diameter pipelines. The recommended peaking factor design criteria is presented in Table 5.4.

Table 5.4
Recommended Peaking Factors

Flow (mgd)	Peaking Factor	Flow (mgd)	Peaking Factor
<0.1	2.8	2.0	2.15
0.1	2.77	2.2	2.09
0.2	2.73	2.4	2.03
0.3	2.70	2.6	1.96
0.4	2.67	2.8	1.90
0.5	2.64	3.0	1.84
0.6	2.60	3.5	1.70
0.8	2.54	4.0	1.60
1.0	2.48	4.5	1.55
1.2	2.42	5.0	1.53
1.4	2.35	6.0	1.51
1.6	2.28	7.0	1.50
1.8	2.22	>7.0	1.50

Note: mgd = million gallons per day.

In summary, the recommended changes to the District's design criteria (unit flow factors and peaking factors) remains conservative for the smaller 8-inch and 10-inch diameter pipelines. For the larger diameter pipelines, the recommendation lowers the criteria in order to correlate much more closely with field data and to ensure that the larger collection system facilities are not being grossly oversized based on inflated build-out flow projections.

APPENDIX F – EMWD LOCAL LIMITS APPLICABLE TO PERMITTED USERS (TABLE I)

TABLE I
Eastern Municipal Water District
Local Limits Applicable to Permitted Users[1]

Constituent	Maximum Concentration (mg/L)	Condition
Arsenic (As)	0.38	
Biochemical Oxygen Demand (BOD)	250 lbs/day or 300 mg/l	If discharge meets domestic waste quality at 300 mg/L then no flow restriction.
Boron (B)[2]	5.8	
Cadmium (Cd)	0.32	
Chloride (Cl)[2]	700 mg/L for less than 275 lbs/day or 250 mg/l	If discharge meets domestic waste quality at 250 mg/L then no flow restriction.
Chromium Total (Cr)	5.0	
Copper (Cu)	5.1	
Cyanide, Total (CN)	0.54	
Iron (Fe)[2]	125	
Lead (Pb)	1.7	
Manganese (Mn)[2]	2.3	
Mercury (Hg)	0.2	
Molybdenum (Mo)	1.47	
Nickel (Ni)	4.2	
Selenium (Se)	0.37	
Silver (Ag)	4.2	
Sulfate (SO4)[2]	450 mg/L for less than 275 lbs/day or 250 mg/l	If discharge meets domestic waste quality at 250 mg/L then no flow restriction.
Total Dissolved Solids (TDS)	2200 mg/L for less than 250 lbs/day or 250mg/l over source water	If discharge meets domestic waste quality at 250 mg/L plus source water quality then no flow restriction.
Total Inorganic Nitrogen (TIN)	30 lbs/day or 60 mg/l	If discharge meets domestic waste quality at 60 mg/L then no flow restriction.
Total Suspended Solids (TSS)	Narrative[3]	
Zinc (Zn)	4.23	

[1] Not applicable to permitted Liquid Waste Haulers, refer to Table II

[2] Only Applies to the Temecula Valley Regional Water Reclamation Facility

[3] Wastewater containing TSS in such quantities to cause or to contribute significantly to (1) disruptions of treatment plant operations; or (2) exceedances of discharge limitations for TSS is prohibited. Significant dischargers, as identified by EMWD, of TSS must implement best practicable technologies for reducing the TSS content of their discharges.