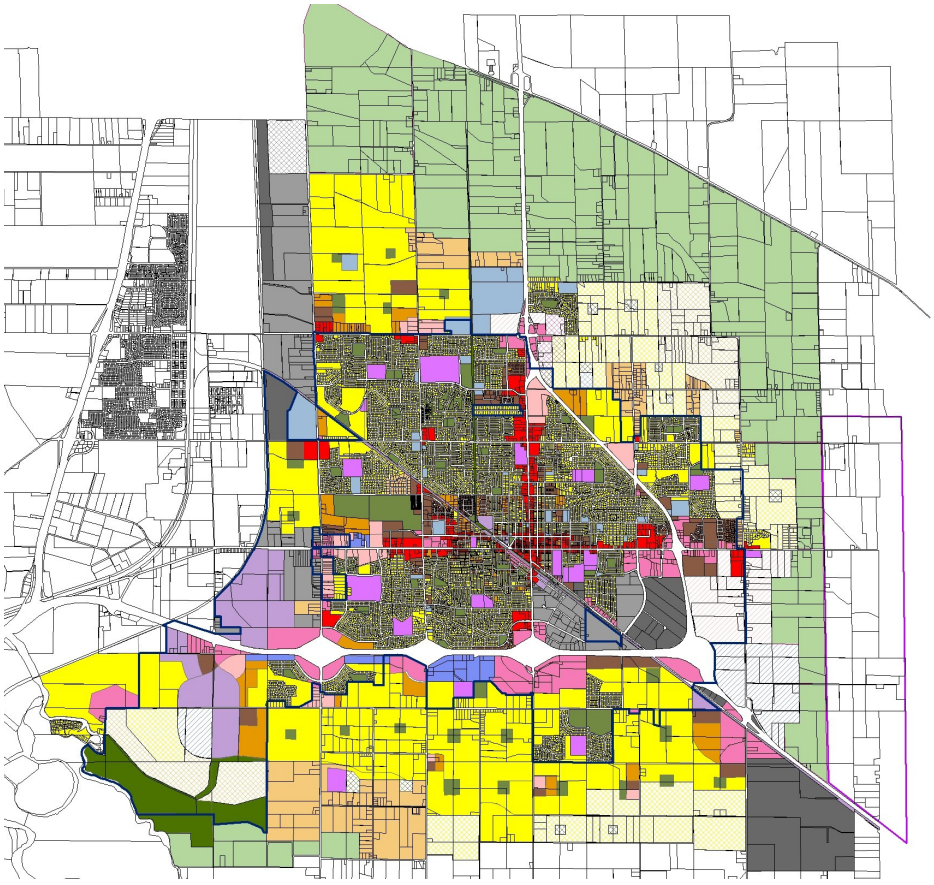
APPENDIX A

WASTEWATER GENERATION FACTORS TECHNICAL MEMORANDUM

CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE

WASTEWATER GENERATION FACTORS

TECHNICAL MEMORANDUM



DRAFT

November 2010

NOLTE

BEYOND ENGINEERING

CITY OF MANTECA

WASTEWATER COLLECTION SYSTEM 2010 MASTER PLAN UPDATE

WASTEWATER GENERATION FACTORS

TECHNICAL MEMORANDUM

DRAFT

November 2010

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CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
WASTEWATER GENERATION FACTORS

TECHNICAL MEMORANDUM
DRAFT

November 2010

A 2010 update (2010 Master Plan) to the 2006 City of Manteca (City) Wastewater Collection System Master Plan Update (2006 Master Plan Update) [1] is under preparation. Consistent with previous documents, the 2010 Master Plan will propose the construction of three large diameter trunk sewers and a series of lift stations/pump stations to collect wastewater from the north, central, and south sections of the City for conveyance to an influent pump station located at the Wastewater Quality Control Facility (WQCF).

The 2010 Master Plan will include modified wastewater generation factors for residential, commercial, and industrial land uses based on upcoming water conservation legislation for residential development and historical water use data from local businesses. The local business parks evaluated in this technical memorandum include Big League Dreams (BLD) commercial properties and Spreckels Park located in Manteca.

Previous Generation Factors

Current wastewater generation factors (WGFs) for residential and industrial land uses as presented in the 2006 Master Plan Update are provided in Table 1. The current WGFs for residential land use range from 530 gallons per day per acre (gpd/acre) for very low density residential to 3,789 gpd/acre for high density residential. These residential WGFs equate to an individual water use rate of approximately 70 gallons per capita per day (gpcd) and were based on an analysis of flows at the WQCF in 2002-2003. The current WGF for both heavy and light industrial land uses is 2,010 gpd/acre.

TABLE 1
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PREVIOUS WASTEWATER GENERATION FACTORS

Land Use	Designation	Population Density[a], persons/edu[b]	Density[c], edu/acre	Wastewater Generation Factor		
				gpcd	gpd/edu[a]	gpd/acre[d]
Very low density residential	VLDR	3.68	Less than 2	72.0	265	530[e]
Low density residential	LDR	3.68	2.1-8	72.0	265	1,338[f]
Medium density residential	MDR	2.68	8.1-15	70.5	189	2,183[g]
High density residential	HDR	2.68	15.1-25	70.5	189	3,789[h]
General commercial	GC	--	--	--	--	1,120
Heavy industrial	HI	--	--	--	--	2,010
Light industrial	LI	--	--	--	--	2,010

[a] Based on February 2004 Wastewater Generation Factor TM [2]
[b] edu = equivalent dwelling unit
[c] Based on the adopted 2003 General Plan [3]
[d] Nonresidential generation factors based on the 1993 Master Plan [4]
[e] Generation factor based on 265 gpd/edu [2] and density of 2.00 dwelling units per acre
[f] Generation factor based on 265 gpd/edu [2] and density of 5.05 dwelling units per acre
[g] Generation factor based on 189 gpd/edu [2] and density of 11.55 dwelling units per acre
[h] Generation factor based on 189 gpd/edu [2] and density of 20.05 dwelling units per acre

Methodology for Updated Generation Factors

The methodology to determine adjustments in WGFs for residential, commercial, and industrial land uses is provided below.

Residential

California recently approved the 2010 California Green Building Standards Code (CALGreen 2010) which requires new buildings in California to become more efficient by mandating new construction to meet minimum standards. CALGreen 2010 requires compliance effective January 1, 2011, as Part 11 of California Code of Regulations (CCR) Title 24.

When addressing residential water use, CALGreen 2010 requires a 20 percent reduction in indoor water use from the 2008 Title 24 baseline, through either prescriptive or performance methods. The prescriptive method requires installation of ultra low fixtures for showerheads, bathroom and kitchen faucets, and toilets. The performance method requires a demonstrated 20 percent reduction in baseline water use, with options for compliance left to the builder. Historical flow rates of water fixtures and clothes washers over time are presented in Table 2.

TABLE 2
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
REQUIRED FLOW RATES OF FIXTURES AND APPLIANCES OVER TIME [a]

	Year				
Fixture/Appliance	**1975**	**1980**	**1992**	**2008**	**2011[d]**
Shower (gpm[b])	3.5	2.5	2.5	2.5	2.0
Toilets (gpf[c])	5.0	3.6	1.6	1.6	1.28
Faucets (gpm)	2.5	2.5	2.5	2.2	1.8
Clothes washers (gal/cu. ft.)	15.0	15.0	15.0	8.5	6.0[e]

[a] *Water Use in the California Residential Home*, January 2010 [5]
[b] gpm = gallons per minute
[c] gpf = gallons per foot
[d] CALGreen 2010 fixture rates for prescriptive method of compliance, effective January 2011
[e] Regulated by CCR Title 20, Div 2, Ch 4, Article 4, Section 1605.3

Other legislation and water conservation programs include the 20x2020 Water Conservation Plan, LEED, Senate Bill (SB) 407, and EPA WaterSense® Program, each of which have similar goals in water use reduction and efficiency to CALGreen.

The 20x2020 Water Conservation Plan (SB7 legislation) requires a statewide 20 percent per capita reduction in urban water demands by 2020 while LEED has a prerequisite to reduce indoor water usage 20 percent beyond 1992 standards. SB407 mandates retrofit of non-compliant plumbing fixtures in pre-1994 homes. Beginning in January 2014, all building alterations or improvements to single-family, multi-family, and commercial properties will require non-compliant fixtures to be replaced for final permit approval by local building departments. Starting in January 2017, a seller or transferor of a property must disclose to the purchaser the requirement for replacing plumbing fixtures. Furthermore, beginning in January 2019, all non-compliant plumbing fixtures in multi-family and commercial properties must be replaced. The EPA WaterSense® program also requires a 20 percent reduction in water use. New homes may be labeled as EPA WaterSense® if specific criteria are met and the home is built by a WaterSense® building partner.

With the new CALGreen legislation and other water conservation programs, indoor water use (and wastewater flows) is expected to decrease significantly for new residential development. Reduced indoor water use estimated from new water conservation legislation and programs is provided in Table 3.

TABLE 3
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
WATER USE CONSIDERING NEW WATER CONSERVATION LEGISLATION AND PROGRAMS

Legislation/Program	Expected Indoor Water Use, gpcd
CALGreen 2010	40.0[a]
EPA WaterSense® Program	39.5[b]
American Water Works Association	43.5[c]

[a] *Water Use in the California Residential Home*, January 2010 [5]
[b] *Water-Efficient Single Family New Home Specification Supporting Statement*, May 2008 [6]
[c] *Water Conservation Measurement Metrics Guidance Report,* January 2010 [7]

Adjusted residential WGFs based on the high-end of the range for projected water use are presented in Table 4. The updated WGF for residential land uses ranges from 320 gpd/acre for very low density residential to 2,337 gpd/acre for high density residential.

TABLE 4
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
PROPOSED FUTURE RESIDENTIAL WASTEWATER GENERATION FACTORS

Land Use	Designation	Population Density[a], persons/edu	Density[b], edu/acre	Wastewater Generation Factor		
				gpcd[c]	gpd/edu	gpd/acre
Very low density residential	VLDR	3.68	2.00	43.5	160	320
Low density residential	LDR	3.68	5.05	43.5	160	808
Medium density residential	MDR	2.68	11.55	43.5	117	1,346
High density residential	HDR	2.68	20.05	43.5	117	2,337

[a] Based on February 2004 Wastewater Generation Factor TM [2]
[b] See Table 1
[c] *Water Conservation Measurement Metrics Guidance Report,* January 2010 [7]

These adjusted residential WGFs will be used for proposed residential areas. The previous residential WGFs from the 2006 Master Plan Update will continue to be used for existing residential areas. Although water use will begin to decrease for existing homes with the SB407 legislation beginning in 2014, the timing and magnitude of long-term reductions are unknown.

Commercial

WGFs for general commercial land uses presented in the 2006 Master Plan Update (Table 1) were based on the 1993 Sewer System Master Plan (1993 Master Plan). These factors were updated after reviewing historical water usage data from existing commercial developments at Spreckels Park and BLD.

The BLD commercial properties are located northwest and adjacent to the intersection of State Route (SR) 120 and Airport Way. Water usage was available for approximately 43.3 acres of commercial businesses in BLD. Spreckels Park is comprised of approximately 313 acres of commercial and industrial businesses located adjacent to and northwest of the SR 99 and SR 120 interchange. Water usage data were available for approximately 48.3 acres of industrial businesses in Spreckels Park. Average wintertime (December to March) water usage for BLD and Spreckels Park commercial properties over recent years is presented in Table 5. A detailed analysis is available in Appendix A. Water usage data for the months of April to November were excluded in the analysis to avoid including landscape irrigation in the WGF. Water usage data varies greatly depending on the type of business. Retail and department stores tend to have low water usage of 50 to 220 gpd/acre. Restaurants, grocery stores, and gas stations have significantly greater water usage of 810 to 9,810 gpd/acre. The average WGF for commercial land use in BLD and Spreckels Park combined is 750 gpd/acre. This WGF includes building and parking areas and is representative of a gross WGF for general commercial land use.

TABLE 5
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
BIG LEAGUE DREAMS AND SPRECKELS PARK COMMERCIAL PROPERTIES
WATER USE AND WASTEWATER GENERATION FACTOR

Item	Value
Range of average wastewater generation factor, gpd/acre[a]	50 – 9,810
Average wastewater generation factor, gpd/acre[a]	750

[a] Average water use from December to March

The average WGF value for the two commercial developments validates reduction of the general commercial WGF. Consistent with the historical BLD and Spreckels Park water use data, a general commercial WGF of 750 gpd/acre is recommended.

Industrial

WGFs for heavy and light industrial land uses presented in the 2006 Master Plan Update (Table 1) were based on the City 1993 Master Plan. These factors were updated after reviewing historical water usage data from existing industrial developments.

Water usage data were available for approximately 193 acres of industrial businesses in Spreckels Park. Average wintertime (December to March) water usage for Spreckels Park over recent years for industrial businesses is presented in Table 6. A detailed analysis of the water usage data is available in Appendix B. Water usage data for the months of April to November were excluded in the analysis to avoid including landscape irrigation in the WGF. The average WGF for industrial land use in Spreckels Park is 193 gpd/acre. The 90th percentile WGF is 600 gpd/acre.

TABLE 6
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SPRECKELS PARK INDUSTRIAL WATER USE AND WASTEWATER GENERATION FACTOR

Item	Value
Total average water use, gal/month[a]	1,054,000
Total average water use, gpd	34,700
Spreckels service area, acres	180
Average wastewater generation factor, gpd/acre	193
90th Percentile wastewater generation factor, gpd/acre	600

[a] Average water use from December to March

The estimated 90th percentile WGF value for the industrial developments in Spreckels Park validates reduction of the light and heavy industrial WGFs. Consistent with the historical Spreckels Park water use data, light and heavy industrial WGFs of 600 gpd/acre are recommended.

Summary of Recommended Wastewater Generation Factors

Updated WGFs for residential and industrial land types are recommended for use in the 2010 Master Plan. The recommended WGFs and a comparison with the previous 2006 Master Plan Update WGFs are presented in Table 7.

TABLE 7
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
SUMMARY OF PROPOSED WASTEWATER GENERATION FACTORS

Land Use	Wastewater Generation Factor, gpd/acre	
	2006 Master Plan Update	Proposed for 2010 Master Plan Update
Existing Development		
Very low density residential	530	530
Low density residential	1,338	1,338
Medium density residential	2,183	2,183
High density residential	3,789	3,789
General commercial	1,120	750
Heavy industrial	2,010	600
Light industrial	2,010	600
New Development		
Very low density residential	530	320
Low density residential	1,338	808
Medium density residential	2,183	1,346
High density residential	3,789	2,337
General commercial	1,120	750
Heavy industrial	2,010	600
Light industrial	2,010	600

REFERENCES

[1] *City of Manteca Wastewater Collection System Master Plan Update*, prepared by Nolte Associates, December 2006.

[2] *City of Manteca Wastewater Collection System Master Plan Wastewater Generation Factor Technical Memorandum*, prepared by Nolte Associates, February 2004.

[3] *City of Manteca General Plan 2023 Policy Document*, adopted October 6, 2003.

[4] *Sewer Master Plan for City of Manteca Public Facilities Implementation Plan*, prepared by Nolte Associates, December 1993.

[5] *Water Use in the California Residential Home*, prepared by ConSol, January 2010.

[6] *Water-Efficient Single Family New Home Specification Supporting Statement*, United States Environmental Protection Agency – Water Sense, May 2008. <http://www.epa.gov/WaterSense/docs/home_suppstat508.pdf>

[7] *Water Conservation Measurement Metrics Guidance Report*, American Water Works Association – Water Conservation Division, January 2010.
<http://www.awwa.org/files/Publications/Streamlines/2010/030210/AWWA%20Metrics%20Guidance%20Report%20Jan-22-2010%20Final%20_3_.pdf>

APPENDIX A

Big League Dreams and Spreckels Park Commercial Properties
Water Use and Wastewater Generation Factors

TABLE A-1
CITY OF MANTECA WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
BIG LEAGUE DREAMS AND SPRECKELS PARK COMMERCIAL WATER USE AND WASTEWATER GENERATION FACTORS

APN	Business	Address	Land Use	Land Use Description	Acreage	Water Use[a] (cu ft/month) Dec	Jan	Feb	Mar	Water Use[a] (gal/month) Dec	Jan	Feb	Mar	Average Water Use (gal/month)	Average Water Use (gpd)	WGF (gpd/acre)
--	Big League Dreams Properties	2120 - 2420 DANIELS ST	GC	GENERAL COMMERCIAL	43.30	90,833	98,645	87,638	88,460	679,427	737,865	655,533	661,678	684,000	22,488	520
22120036	Food 4 Less	131 SPRECKELS AV	GC	GENERAL COMMERCIAL	5.31	26,419	23,801	22,688	21,564	197,615	178,031	169,708	161,296	176,662	5,808	1,090
22120027	Target	280 SPRECKELS AV	GC	GENERAL COMMERCIAL	11.75	9,155	8,567	8,245	7,932	68,479	64,079	61,673	59,329	63,390	2,084	180
22120069	Bank of the West	150 COMMERCE AV	GC	GENERAL COMMERCIAL	0.63	283	227	230	200	2,119	1,695	1,720	1,496	1,758	58	90
22120051	Holiday Inn Express	179 COMMERCE AV	GC	GENERAL COMMERCIAL	1.78	17,738	16,956	15,989	18,127	132,683	126,829	119,595	135,591	128,674	4,230	2,380
22120030	Staples	249 COMMERCE AV	GC	GENERAL COMMERCIAL	2.54	709	437	698	376	5,302	3,266	5,219	2,809	4,149	136	50
22120031	The Home Depot	250 COMMERCE AV	GC	GENERAL COMMERCIAL	12.78	8,977	11,135	13,389	11,401	67,148	83,290	100,150	85,279	83,967	2,761	220
22120057	TJ Maxx	277 COMMERCE AV	GC	GENERAL COMMERCIAL	4.79	1,548	1,362	1,270	1,230	11,579	10,188	9,500	9,200	10,117	333	70
22120032	IHOP	1150 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.86	12,786	12,900	12,779	11,124	95,636	96,492	95,587	83,208	92,731	3,049	3,540
22120016	Chevron	1234 E YOSEMITE AV	GC	GENERAL COMMERCIAL	1.06	29,663	28,911	28,202	26,089	221,882	216,255	210,951	195,146	211,058	6,939	6,550
22120043	AppleBees	1272 E YOSEMITE AV	GC	GENERAL COMMERCIAL	1.30	23,419	23,676	25,612	21,982	175,173	177,093	191,579	164,427	177,068	5,821	4,480
22120041	Jack in the Box	1310 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.86	6,903	5,221	6,176	6,390	51,633	39,056	46,194	47,797	46,170	1,518	1,770
22120053	Gas Depot	1330 E YOSEMITE AV	GC	GENERAL COMMERCIAL	1.11	3,385	3,362	7,528	6,793	25,320	25,145	56,312	50,814	39,398	1,295	1,170
22120067	Mimosa Spa and Salon	1360 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.71	7,057	6,007	4,767	4,650	52,784	44,930	35,655	34,782	42,038	1,382	1,940
22120063	In-N-Out	1490 E YOSEMITE AV	GC	GENERAL COMMERCIAL	0.99	14,010	16,006	14,128	12,496	104,795	119,725	105,677	93,470	105,917	3,482	3,500
22120061	Panda Express	1467 HULSEY WY	GC	GENERAL COMMERCIAL	0.67	34,142	24,950	24,308	23,934	255,382	186,626	181,824	179,026	200,715	6,599	9,810
22120060	Carl's Jr	1489 HULSEY WY	GC	GENERAL COMMERCIAL	1.15	3,238	4,364	3,916	3,566	24,220	32,643	29,292	26,674	28,207	927	810
					91.59									2,097,000	69,000	

[a] Average water usage ranging from 1999 to 2010 for Spreckels Park businesses and from 2005 to 2010 for Big League Dreams businesses.

Average Wastewater Generation Factor	750	gpd/acre
Range of Wastewater Generation Factors	50 - 9810	gpd/acre
Median Wastewater Generation Factor	1,470	gpd/acre
Percentiles		
Wastewater Generation Factor, 80 Percentile	3,540	gpd/acre
Wastewater Generation Factor, 90 Percentile	5,515	gpd/acre
Wastewater Generation Factor, 95 Percentile	7,365	gpd/acre

APPENDIX B

Spreckels Park Industrial Water Use and Wastewater Generation Factors

TABLE B-1
CITY OF MANTECA WASTEWATER COLLECTION SYSTEM
2010 MASTER PLAN UPDATE
SPRECKELS PARK INDUSTRIAL WATER USE AND WASTEWATER GENERATION FACTORS

APN	Business	Address	Land Use	Land Use Description	Acreage (acres)	Water Use[a] (cu ft/month) Dec	Jan	Feb	Mar	Water Use[a] (gal/month) Dec	Jan	Feb	Mar	Average Water Use (gal/month)	Average Water Use (gpd)	WGF (gpd/acre)
22125020	Sexton Chevrolet	321 SPRECKELS AV	LI	LIGHT INDUSTRIAL	6.96	0	160	300	110	0	1,197	2,244	823	1,066	35	5
22125005	Terrell Transportation	600 SPRECKELS AV	HI	HEAVY INDUSTRIAL	27.84	23,995	26,741	17,555	16,277	179,483	200,023	131,311	121,752	158,142	5,199	187
22121017	Millard Refrigerated Services	730 SPRECKELS AV	HI	HEAVY INDUSTRIAL	17.45	34,517	36,257	41,827	35,895	258,185	271,200	312,863	268,495	277,686	9,129	523
22125011	American Modular Systems	787 SPRECKELS AV	LI	LIGHT INDUSTRIAL	30.00	2,575	2,538	3,546	3,504	19,261	18,981	26,526	26,208	22,744	748	25
22121014	Global HVAC Distributors	900 SPRECKELS AV	HI	HEAVY INDUSTRIAL	13.54	3,614	1,100	3,264	10,103	27,035	8,228	24,417	75,569	33,812	1,112	82
22121002	Frito Lay	1190 SPRECKELS AV	HI	HEAVY INDUSTRIAL	7.54	1,161	1,330	1,423	978	8,684	9,948	10,647	7,318	9,149	301	40
22121027	Dance and Cheer Stars	1240 DUPONT CT	HI	HEAVY INDUSTRIAL	0.91	293	265	318	260	2,188	1,982	2,375	1,945	2,122	70	77
22121024	Rose Glass and Aluminum	1252 DUPONT CT	HI	HEAVY INDUSTRIAL	0.54	1,915	2,305	745	35	14,324	17,241	5,573	262	9,350	307	570
22121023	Fun and Game Rentals	1258 DUPONT CT	HI	HEAVY INDUSTRIAL	0.59	208	210	233	245	1,552	1,571	1,739	1,833	1,674	55	93
22121022	Unknown	1262 DUPONT CT	HI	HEAVY INDUSTRIAL	0.58	3,050	1,040	815	775	22,814	7,779	6,096	5,797	10,622	349	601
22121033	JA Clark Construction	1270 DUPONT CT	HI	HEAVY INDUSTRIAL	0.41	50	75	50	82	374	561	374	613	481	16	39
22121032	Elite Roofing	1274 DUPONT CT	HI	HEAVY INDUSTRIAL	0.34	93	78	90	73	692	580	673	542	622	20	58
22121031	Newberry Whell & Tires	1278 DUPONT CT	HI	HEAVY INDUSTRIAL	0.39	1,590	1,410	20	0	11,893	10,547	150	0	5,647	186	481
22121030	EMT Electric	1282 DUPONT CT	HI	HEAVY INDUSTRIAL	0.47	730	247	270	287	5,460	1,845	2,020	2,144	2,867	94	198
-	Cool Roofing Systems	1286 DUPONT CT	HI	HEAVY INDUSTRIAL	0.47	523	660	493	605	3,915	4,937	3,684	4,525	4,265	140	295
22121028	E-M Manufacturing	1290 DUPONT CT	HI	HEAVY INDUSTRIAL	0.58	360	395	363	353	2,693	2,955	2,712	2,637	2,749	90	155
-	Creative Design Interiors	1300 DUPONT CT	HI	HEAVY INDUSTRIAL	5.00	8,778	9,353	13,463	15,733	65,656	69,957	100,700	117,679	88,498	2,910	582
22121019	Dreyer's Grand Ice Cream	1351 DUPONT CT	HI	HEAVY INDUSTRIAL	12.03	56,108	21,962	21,564	22,912	419,688	164,276	161,299	171,382	229,161	7,534	626
22125017	Platt Electric Supply	550 COMMERCE CT	HI	HEAVY INDUSTRIAL	1.08	235	223	168	543	1,758	1,664	1,253	4,058	2,183	72	67
22126001	Multiple Small Businesses	560 COMMERCE CT	HI	HEAVY INDUSTRIAL	3.92	11,762	13,068	12,118	9,280	87,980	97,749	90,643	69,414	86,446	2,842	725
22125031	Ford Motor Co. Sacramento Parts Depot	1260 PHOENIX DR	HI	HEAVY INDUSTRIAL	31.59	3,590	3,096	3,056	3,080	26,853	23,160	22,861	23,038	23,978	788	25
22121005	L S Expediters, Revchem Plastics Inc	1205 MOFFAT BL	HI	HEAVY INDUSTRIAL	14.24	6,890	3,761	3,278	9,270	51,537	28,134	24,516	69,340	43,382	1,426	100
-	Dr's Offices	1140 NORMAN DR	LI	LIGHT INDUSTRIAL	3.22	4,600	5,073	5,350	4,483	34,408	37,949	40,018	33,535	36,477	1,199	373
					180									1,054,000	34,700	

[a] Average water usage ranging from 1999 to 2010.

Average Wastewater Generation Factor	193	gpd/acre
Range of Wastewater Generation Factors	5 - 725	gpd/acre
Percentiles		
Wastewater Generation Factor, 80 Percentile	550	gpd/acre
Wastewater Generation Factor, 90 Percentile	600	gpd/acre
Wastewater Generation Factor, 95 Percentile	620	gpd/acre

APPENDIX B

CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
SOUTH MANTECA TRUNK SEWER								
33	AG-U	33	191.43	0	0			
33	BIP-U	33	27.33	1,200	32,791			
33	CMU-U	33	98.81	2,473	244,356			
33	GC-D	OS	1.71	750	1,285			
33	GC-U	33, OS	79.27	750	59,452			
33	HDR-U	33	18.72	2,337	43,753			
33	LDR-D	33S, OS	61.54	1,338	82,340			
33	LDR-U	33, OS	661.99	808	534,890			
33	OS-U	33	415.02	0	0			
33	VLDR-U	33	186.62	320	59,720			
				TOTAL FLOW, LINK 33		1,058,587	2.29	2,424,950
34A	BIP-U	34A	44.66	1,200	53,592			
34A	CMU-U	34A	23.41	2,473	57,882			
34A	GC-U	34A	24.42	750	18,318			
34A	HDR-U	34A	2.13	2,337	4,977			
				TOTAL FLOW, LINK 34A		134,768	3.58	482,129
34B	BIP-U	34B	178.00	1,200	213,601			
34B	LDR-U	34B	28.62	808	23,127			
34B	MDR-U	34B	48.99	1,346	65,944			
34B	OS-U	34B	13.93	0	0			
34B	VLDR-U	34B	9.39	320	3,003			
				Flow from Link 33	1,058,587			
				Flow from Link 34A	134,768			
				TOTAL FLOW, LINK 34B		1,499,031	2.15	3,222,567
32	BIP-D	32S	1.51	1,200	1,810			
32	GC-D	32N, 32S	88.14	750	66,103			
32	GC-U	32N	1.28	750	959			
32	HI-D	32N	148.96	1,000	148,962			
32	HI-U	32N	26.07	1,000	26,065			
32	LDR-D	32N	22.65	1,338	30,310			
32	LI-D	32N, 32S	56.95	1,000	56,951			
32	LI-U	32N, 32S	23.32	1,000	23,319			
32	P-D	32N	4.42	400	1,767			
				TOTAL FLOW, LINK 32		356,247	3.03	1,079,727

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
32A	LI-D	32A	1.00	1,000	1,000			
32A	LI-U	32A	56.17	1,000	56,166			
32A	P-D	32A	2.25	400	901			
32A	PQP-D	32A	8.97	425	3,812			
				Flow from Link 32	356,247			
					TOTAL FLOW, LINK 32A	418,126	2.92	1,219,533
21	GC-U	21	6.27	750	4,704			
21	HDR-U	21	25.70	2,337	60,061			
21	HI-U	21	11.99	1,000	11,994			
21	LDR-U	21	77.50	808	62,620			
21	LI-U	21	2.14	1,000	2,139			
21	MDR-U	21	41.20	1,346	55,455			
21	PQP-U	21	7.68	425	3,263			
21	P-U	21	1.70	400	680			
					TOTAL FLOW, LINK 21	200,916	3.39	680,741
20	CMU-U	20S	5.01	2,473	12,401			
20	HDR-U	20N	15.33	2,337	35,832			
20	LDR-D	20N	42.17	1,338	56,427			
20	LDR-U	20N, 20S	185.69	808	150,039			
20	MDR-U	20N	14.91	1,346	20,068			
20	P-D	20N	9.51	400	3,803			
20	PQP-D	20N	7.38	425	3,138			
20	PQP-U	20N	8.01	425	3,402			
20	P-U	20S	10.24	400	4,097			
				Flow from Link 21	200,916			
					TOTAL FLOW, LINK 20	490,125	2.80	1,372,562
27N	CMU-U	27N	42.60	2,473	105,350			
27N	GC-U	27N	108.20	750	81,150			
27N	HI-D	27N	0.00	1,000	0			
27N	HI-U	27N	28.50	1,000	28,500			
27N	PQP-D	27N	20.15	425	8,563			
					TOTAL FLOW, LINK 27N	223,563	3.33	744,224
36	AG-U	36N, 36S	472.65	0	0			
36	BIP-U	36W	373.02	1,200	447,624			
36	CMU-U	36N, 36W	185.59	2,473	458,967			
36	HDR-U	36N	15.50	2,337	36,224			
36	HI-U	36S	2.43	1,000	2,433			
36	LDR-U	36W	61.90	808	50,015			
36	MDR-U	36N	9.40	1,346	12,652			
36	NC-U	36N	7.51	1,120	8,409			
36	PQP-U	36N	6.79	425	2,884			
36	P-U	36N	7.00	400	2,800			
36	UR-U	36N, 36S	1,130.55	320	361,775			
36	VLDR-U	36N	46.49	320	14,877			
					TOTAL FLOW, LINK 36	1,398,661	2.17	3,037,816

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
17	HDR-D	17	17.31	3,789	65,586			
17	LDR-D	17	61.28	1,338	81,986			
				Flow from Link 36	1,398,661			
				Flow from Link 32A	418,126			
				Flow from Link 27N	223,563			
				Flow from Link 20	490,125			
					TOTAL FLOW, LINK 17	2,678,047	2.06	5,515,273
16	LDR-D	16	109.25	1,338	146,170			
16	NC-U	16	2.33	1,120	2,612			
16	P-D	16	50.62	400	20,248			
				Flow from Link 17	2,678,047			
					TOTAL FLOW, LINK 16	2,847,077	2.06	5,855,673
16B	CMU-U	16BN	88.65	2,473	219,230			
16B	LDR-D	16BN, 16BS	104.62	1,338	139,986			
16B	LDR-U	16BN	10.26	808	8,294			
16B	PQP-D	16BS	13.23	425	5,622			
				Flow from Link 16	2,847,077			
					TOTAL FLOW, LINK 16B	3,220,210	2.05	6,611,707
25	HDR-U	25	20.30	2,337	47,441			
25	LDR-D	25	0.00	1,338	0			
25	LDR-U	25	276.30	808	223,250			
25	MDR-U	25	19.90	1,346	26,785			
25	P-U	25	17.80	400	7,120			
					TOTAL FLOW, LINK 25	304,597	3.14	955,697
27S	BIP-U	27S	65.10	1,200	78,120			
27S	CMU-U	27S	41.40	2,473	102,382			
27S	HI-U	27S	273.02	1,000	273,025			
27S	OS-U	27S	7.60	0	0			
27S	PQP-U	27S	8.00	425	3,400			
27S	P-U	27S	30.50	400	12,200			
				Flow from Link 25	304,597			
					TOTAL FLOW, LINK 27S	773,724	2.48	1,915,416
22S1	CMU-U	22S1	7.10	2,473	17,559			
22S1	HDR-U	22S1	6.44	2,337	15,043			
22S1	LDR-D	22S1	2.12	1,338	2,840			
22S1	LDR-U	22S1	426.09	808	344,278			
22S1	MDR-U	22S1	12.96	1,346	17,444			
22S1	P-U	22S1	20.10	400	8,040			
				Flow from Link 27S	773,724			
					TOTAL FLOW, LINK 22S1	1,178,927	2.24	2,639,907
22S2	LDR-U	22S2	224.13	808	181,094			
22S2	P-U	22S2	12.22	400	4,890			
				Flow from Link 22S1	1,178,927			
					TOTAL FLOW, LINK 22S2	1,364,910	2.18	2,976,135

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
22	CMU-U	22N	19.58	2,473	48,420			
22	GC-D	22N	3.56	750	2,671			
22	GC-U	22N	64.90	750	48,678			
22	LDR-D	22N, 22W	77.06	1,338	103,107			
22	LDR-U	22N, 22W	518.63	808	419,050			
22	P-U	22W	27.42	400	10,970			
22	VLDR-D	22W	3.00	530	1,588			
22	VLDR-U	22W	35.65	320	11,408			
				Flow from Link 16B	3,220,210			
				Flow from Link 22S2	1,364,910			
					TOTAL FLOW, LINK 22	5,231,012	2.05	10,723,874
22A	GC-D	22A	66.29	750	49,718			
22A	LDR-D	22A	27.69	1,338	37,052			
22A	P-D	22A	5.07	400	2,029			
22A	PQP-D	22A	18.02	425	7,659			
				Flow from Link 22	5,231,012			
					TOTAL FLOW, LINK 22A	5,327,470	2.05	10,921,564
10S	CMU-D	10S	1.92	2,473	4,747			
10S	CMU-U	10S	1.44	2,473	3,570			
10S	HDR-U	10S	4.07	2,337	9,509			
10S	LDR-D	10S	20.59	1,338	27,550			
10S	LDR-U	10S	267.52	808	216,155			
10S	MDR-D	10S	1.06	2,183	2,314			
10S	MDR-U	10S	7.21	1,346	9,709			
10S	P-U	10S	23.88	400	9,554			
10S	VLDR-D	10S	5.89	530	3,120			
10S	VLDR-U	10S	101.12	320	32,358			
					TOTAL FLOW, LINK 10S	318,584	3.11	990,024
10	GC-U	10N	50.68	750	38,007			
				Flow from Link 22A	5,327,470			
				Flow from Link 10S	318,584			
					TOTAL FLOW, LINK 10	5,684,061	2.05	11,652,456
9S	AG-U	9S	19.56	0	0			
9S	LDR-D	9S	28.78	1,338	38,509			
9S	LDR-U	9S	159.14	808	128,585			
9S	P-U	9S	17.21	400	6,885			
9S	VLDR-D	9S	64.01	530	33,923			
9S	VLDR-U	9S	135.70	320	43,423			
					TOTAL FLOW, LINK 9S	251,325	3.26	819,283

APPENDIX B
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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
9	GC-U	9N	2.43	750	1,822			
9	LDR-D	9N	11.42	1,338	15,285			
9	LDR-U	9N	91.03	808	73,553			
9	MDR-U	9N	11.40	1,346	15,346			
9	P-U	9N	9.90	400	3,961			
				Flow from Link 10	5,684,061			
				Flow from Link 9S	251,325			
				TOTAL FLOW, LINK 9		6,045,354	2.05	12,393,044
8S	AG-U	8S	37.04	0	0			
8S	LDR-D	8S	5.00	1,338	6,690			
8S	LDR-U	8S	77.29	808	62,453			
8S	PQP-U	8S	25.44	425	10,811			
8S	P-U	8S	4.78	400	1,914			
8S	VLDR-D	8S	18.10	530	9,594			
8S	VLDR-U	8S	51.35	320	16,432			
				TOTAL FLOW, LINK 8S		107,894	3.66	395,088
8	CMU-U	8N	8.96	2,473	22,159			
8	GC-U	8N	29.95	750	22,466			
8	LDR-D	8N	47.45	1,338	63,492			
8	LDR-U	8N	0.39	808	314			
8	P-D	8N	6.91	400	2,764			
				Flow from Link 9	6,045,354			
				Flow from Link 8S	107,894			
				TOTAL FLOW, LINK 8		6,264,442	2.05	12,842,152
7	CMU-D	7N	10.08	2,473	24,925			
7	GC-D	7N	3.45	750	2,587			
7	GC-U	7N	23.45	750	17,591			
7	LDR-D	7N	70.26	1,338	94,009			
7	LDR-U	7S	152.09	808	122,890			
7	NC-D	7N	1.35	1,120	1,510			
7	P-D	7N	9.24	400	3,695			
7	P-U	7S	5.66	400	2,263			
				Flow from Link 8	6,264,442			
				TOTAL FLOW, LINK 7		6,533,911	2.05	13,394,545
6	AG-D	6S	4.99	0	0			
6	AG-U	6S	54.88	0	0			
6	LDR-D	6N	31.11	1,338	41,630			
6	LDR-U	6N	1.64	808	1,323			
6	MDR-D	6N	0.11	2,183	230			
6	MDR-U	6N	17.41	1,346	23,431			
6	P-D	6N	5.27	400	2,107			
6	VLDR-U	6S	236.59	320	75,709			
				Flow from Link 34B	1,499,031			
				Flow from Link 7	6,533,911			
				TOTAL FLOW, LINK 6		8,177,371	2.05	16,763,613
4	LI-D	4	3.75	1,000	3,750			
4	LI-U	4	46.10	1,000	46,104			
4	PQP-D	4	112.44	425	47,788			
				Flow from Link 6	8,177,371			
				TOTAL FLOW, LINK 4		8,275,013	2.05	16,963,778

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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
3	CMU-U	3E	3.24	2,473	8,011			
3	GC-D	3W	47.05	750	35,285			
3	GC-U	3E, 3W	30.70	750	23,025			
3	LDR-D	3E	54.35	1,338	72,723			
3	MDR-D	3E	10.47	2,183	22,866			
3	NC-U	3E	10.68	1,120	11,967			
3	P-D	3E	5.07	400	2,028			
3	PQP-U	3W	51.60	425	21,929			
3	VLDR-D	3E	7.22	530	3,826			
				Flow from Link 4	8,275,013			
					TOTAL FLOW, LINK 3	8,476,673	2.05	17,377,181
1	LI-D	1	4.27	1,000	4,270			
1	LI-U	1	54.44	1,000	54,436			
				Flow from Link 3	8,476,673			
					TOTAL FLOW, LINK 1	8,535,379	2.05	17,497,528
				TOTAL ADWF, South Manteca Trunk Sewer (gpd)		**8,535,379**	**2.05**	**17,497,528**

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
CENTRAL MANTECA TRUNK SEWER								
100	BIP-D	100	13.14	1,200	15,764			
100	BIP-U	100	1.00	1,200	1,200			
100	CMU-D	100	148.68	2,473	367,692			
100	CMU-U	100	76.18	2,473	188,403			
100	GC-D	100	158.60	750	118,947			
100	GC-U	100	36.36	750	27,274			
100	HDR-D	100	229.06	3,789	867,919			
100	HDR-U	100	34.90	2,337	81,555			
100	HI-D	100	8.77	1,000	8,771			
100	LDR-D	100	1,876.28	1,338	2,510,460			
100	LDR-U	100	155.29	808	125,473			
100	LI-D	100	120.54	1,000	120,540			
100	LI-U	100	7.91	1,000	7,911			
100	MDR-D	100	164.88	2,183	359,923			
100	MDR-U	100	55.91	1,346	75,261			
100	NC-D	100	133.36	1,120	149,365			
100	NC-U	100	13.09	1,120	14,663			
100	P-D	100	271.44	400	108,576			
100	PQP-D	100	335.67	425	142,659			
100	P-U	100	8.61	400	3,443			
100	VLDR-D	100	32.06	530	16,992			
100	VLDR-U	100	6.76	320	2,165			
				TOTAL FLOW, LINK 100		5,314,955	2.05	10,895,915
93S1	CMU-U	93S1	50.46	2,473	124,780			
93S1	GC-D	93S1	4.84	750	3,631			
93S1	GC-U	93S1	10.06	750	7,542			
93S1	LDR-D	93S1	14.40	1,338	19,262			
93S1	LDR-U	93S1	6.81	808	5,504			
93S1	LI-D	93S1	15.08	1,000	15,082			
93S1	P-D	93S1	3.56	400	1,423			
93S1	PQP-D	93S1	46.21	425	19,640			
93S1	VLDR-D	93S1	10.98	530	5,819			
				TOTAL FLOW, LINK 93S1		202,681	3.38	685,767
53	LI-D	53	0.63	1,000	634			
53	LI-U	53	34.60	1,000	34,601			
				Flow from Link 100	5,314,955			
				Flow from Link 93S1	202,681			
				Flow from Link 66	3,206,509			
				Flow from Link 54	314,518			
				Flow from CPS	618,054			
				TOTAL FLOW, LINK 53		9,691,952	2.05	19,868,502
				TOTAL ADWF, Central Manteca Trunk Sewer (gpd)[a]		**5,552,871**	**2.05**	**11,383,553**

APPENDIX B
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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
NORTH MANTECA TRUNK SEWER								
81	AG-D	81	46.73	0	0			
81	AG-U	81	414.53	0	0			
81	GC-D	81	1.45	750	1,088			
81	GC-U	81	1.75	750	1,310			
81	LDR-D	81	86.74	1,338	116,058			
81	LDR-U	81	330.66	808	267,173			
81	NA-D	81	0.01	0	0			
81	UR-D	81	14.95	530	7,922			
81	UR-U	81	578.54	320	185,131			
81	P-U	81	8.79	400	3,515			
81	VLDR-D	81	25.44	530	13,485			
81	VLDR-U	81	60.74	320	19,436			
				TOTAL FLOW, LINK 81		615,120	2.63	1,620,499
80	AG-D	80	12.54	0	0			
80	AG-U	80	225.41	0	0			
				Flow from Link 81	615,120			
				TOTAL FLOW, LINK 80		615,120	2.63	1,620,499
79	AG-D	79	51.96	0	0			
79	AG-U	79	688.39	0	0			
				Flow from Link 80	615,120			
				TOTAL FLOW, LINK 79		615,120	2.63	1,620,499
77	LDR-D	77	2.59	1,338	3,467			
77	LDR-U	77	137.21	808	110,869			
77	P-U	77	6.74	400	2,697			
77	VLDR-D	77	55.30	530	29,311			
77	VLDR-U	77	174.27	320	55,767			
				Flow from Link 79	615,120			
				TOTAL FLOW, LINK 77		817,230	2.44	1,994,135

APPENDIX B
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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
76	AG-D	76	22.45	0	0			
76	AG-U	76	522.39	0	0			
76	LDR-D	76	1.37	1,338	1,833			
76	LDR-U	76	73.49	808	59,380			
76	P-U	76	4.28	400	1,712			
76	VLDR-D	76	23.90	530	12,669			
76	VLDR-U	76	130.90	320	41,887			
				Flow from Link 77	817,230			
					TOTAL FLOW, LINK 76	934,711	2.36	2,204,446
75	AG-D	75_North	28.83	0	0			
75	AG-U	75_North	128.34	0	0			
75	LDR-D	75_North, 75_South	5.24	1,338	7,017			
75	LDR-U	75_North, 75_South	239.86	808	193,807			
75	PQP-U	75_South	11.65	425	4,952			
75	P-U	75_North, 75_South	17.75	400	7,099			
75	VLDR-D	75_South	39.35	530	20,856			
75	VLDR-U	75_South	8.88	320	2,841			
				Flow from Link 76	934,711			
					TOTAL FLOW, LINK 75	1,171,283	2.24	2,626,206
74	AG-D	74	15.94	0	0			
74	AG-U	74	775.23	0	0			
74	CMU-U	74	9.50	2,473	23,487			
74	GC-D	74	2.60	750	1,952			
74	GC-U	74	28.44	750	21,331			
74	LDR-D	74	74.80	1,338	100,087			
74	P-D	74	6.63	400	2,652			
74	PQP-D	74	11.56	425	4,911			
				Flow from Link 75	1,171,283			
					TOTAL FLOW, LINK 74	1,325,703	2.19	2,904,752

APPENDIX B
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CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
73	GC-D	73	14.16	750	10,620			
73	GC-U	73	18.65	750	13,989			
73	HDR-D	73	9.91	3,789	37,555			
73	LDR-U	73	59.34	808	47,948			
73	MDR-U	73	19.74	1,346	26,565			
				Flow from Link 74	1,325,703			
					TOTAL FLOW, LINK 73	1,462,380	2.16	3,154,874
72	CMU-U	72	33.56	2,473	82,994			
72	GC-D	72	5.10	750	3,822			
72	PQP-D	72	13.40	425	5,696			
72	PQP-U	72	141.61	425	60,184			
72	P-U	72	5.43	400	2,173			
72	VLDR-D	72	31.68	530	16,792			
72	VLDR-U	72	10.75	320	3,439			
				Flow from Link 73	1,462,380			
					TOTAL FLOW, LINK 72	1,637,480	2.13	3,480,688
70	CMU-D	70	7.00	2,473	17,302			
70	CMU-U	70	12.72	2,473	31,460			
70	LDR-D	70	9.44	1,338	12,626			
70	LDR-U	70	90.16	808	72,853			
70	OS-D	70	3.34	0	0			
70	OS-U	70	13.15	0	0			
70	P-D	70	10.74	400	4,294			
70	PQP-D	70	24.68	425	10,491			
70	P-U	70	1.00	400	399			
				Flow from Link 72	1,637,480			
					TOTAL FLOW, LINK 70	1,786,905	2.11	3,763,397
69S2	AG-D	69S2_East	93.82	0	0			
69S2	AG-U	69S2_East	534.47	0	0			
					TOTAL FLOW, LINK 69S2	0	4.05	0
69S1	AG-D	69S1_East	20.98	0	0			
69S1	AG-U	69S1_East	741.60	0	0			
69S1	LDR-D	69S1_Southwest	4.77	1,338	6,389			
69S1	LDR-U	69S1_Southwest	152.82	808	123,482			
				Flow from Link 69S2	0			
					TOTAL FLOW, LINK 69S1	129,871	3.59	466,563
69	LDR-U	69_West	135.50	808	109,482			
69	P-U	69_East, 69_West	15.36	400	6,143			
69	VLDR-D	69_West	9.98	530	5,289			
69	VLDR-U	69_East	95.04	320	30,413			
				Flow from Link 69S1	129,871			
					TOTAL FLOW, LINK 69	281,199	3.19	896,935

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
68	CMU-D	68	3.05	2,473	7,543			
68	CMU-U	68	16.58	2,473	41,003			
68	LDR-D	68	54.71	1,338	73,196			
68	LDR-U	68	19.93	808	16,105			
68	MDR-D	68	2.18	2,183	4,763			
68	OS-D	68	9.15	0	0			
68	OS-U	68	2.13	0	0			
68	P-D	68	14.23	400	5,691			
				Flow from Link 70	1,786,905			
				Flow from Link 69	281,199			
				TOTAL FLOW, LINK 68		2,216,404	2.07	4,596,295
67	HDR-U	67	15.19	2,337	35,491			
67	LDR-D	67	21.95	1,338	29,362			
67	LDR-U	67	44.55	808	36,000			
67	MDR-D	67	18.58	2,183	40,571			
67	MDR-U	67	6.39	1,346	8,600			
67	NC-D	67	11.31	1,120	12,672			
67	OS-D	67	2.83	0	0			
67	P-D	67	5.59	400	2,235			
67	P-U	67	4.20	400	1,681			
				Flow from Link 68	2,216,404			
				TOTAL FLOW, LINK 67		2,383,018	2.07	4,925,765
66S4	AG-D	66S4	47.49	0	0			
66S4	AG-U	66S4	344.95	0	0			
				TOTAL FLOW, LINK 66S4		0	4.05	0
66S3	AG-D	66S3_East	12.10	0	0			
66S3	AG-U	66S3_East	162.67	0	0			
66S3	HI-U	66S3_West	48.47	1,000	48,466			
66S3	LI-U	66S3_West	114.45	1,000	114,449			
				Flow from Link 66S4	0			
				TOTAL FLOW, LINK 66S3		162,915	3.49	569,201
66S2	HI-U	66S2_West	47.06	1,000	47,061			
66S2	LDR-U	66S2_East	154.93	808	125,185			
66S2	LI-U	66S2_West	225.26	1,000	225,261			
				Flow from Link 66S3	162,915			
				TOTAL FLOW, LINK 66S2		560,422	2.70	1,514,265
66S1	LDR-U	66S1	135.53	808	109,506			
66S1	PQP-U	66S1	14.73	425	6,262			
66S1	P-U	66S1	4.83	400	1,932			
				Flow from Link 66S2	560,422			
				TOTAL FLOW, LINK 66S1		678,122	2.57	1,739,554

APPENDIX B
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
CUMULATIVE FLOW ESTIMATES BY LINK FOR BUILDOUT CONDITIONS

Link	Land Use	Sewer Shed(s)	Use Area (ac)	Wastewater Generation Factor (gpd/ac)	Link ADWF (gpd)	Cumm. ADWF (gpd)	Peaking Factor	Link PWWF (gpd)
66	LI-D	66	7.44	1,000	7,441			
66	LI-U	66	137.93	1,000	137,928			
				Flow from Link 67	2,383,018			
				Flow from Link 66S1	678,122			
				TOTAL FLOW, LINK 66		3,206,509	2.05	6,583,861
CPS	GC-U	CPS_East	0.89	750	671			
CPS	HI-D	CPS_West	6.84	1,000	6,838			
CPS	HI-U	CPS_West	79.60	1,000	79,600			
CPS	LDR-D	CPS_East	224.10	1,338	299,845			
CPS	LDR-U	CPS_East	21.33	808	17,239			
CPS	LI-D	CPS_West	4.27	1,000	4,270			
CPS	LI-U	CPS_West	139.40	1,000	139,400			
CPS	MDR-U	CPS_East	12.71	1,346	17,105			
CPS	NC-U	CPS_East	3.09	1,120	3,457			
CPS	P-D	CPS_East	20.40	400	8,158			
CPS	PQP-D	CPS_East, CPS_West	97.58	425	41,472			
				TOTAL FLOW, CPS		618,054	2.63	1,626,116
56	HDR-U	56	10.48	2,337	24,491			
56	LDR-D	56	2.74	1,338	3,663			
56	LDR-U	56	174.00	808	140,588			
56	NA-D	56	0.72	0	0			
56	NC-U	56	19.46	1,120	21,794			
56	PQP-D	56	5.54	425	2,353			
56	PQP-U	56	0.83	425	354			
56	P-U	56	14.21	400	5,685			
				TOTAL FLOW, LINK 56		198,928	3.39	675,066
54	GC-U	54	9.46	750	7,096			
54	LDR-D	54	70.07	1,338	93,748			
54	P-D	54	5.59	400	2,237			
54	PQP-D	54	29.43	425	12,509			
				Flow from Link 56	198,928			
				TOTAL FLOW, LINK 54		314,518	3.12	980,104
52	LDR-U	52	10.80	808	8,723			
52	LI-D	52	23.75	1,000	23,751			
52	LI-U	52	25.25	1,000	25,251			
				Flow from Link 53	9,691,952			
				TOTAL FLOW, LINK 52		9,749,677	2.05	19,986,838
51	LI-D	51	4.08	1,000	4,084			
51	PQP-D	51	163.28	425	69,394			
				Flow from Link 52	9,749,677			
				TOTAL FLOW, LINK 51		9,823,155	2.05	20,137,468
				TOTAL ADWF, North Manteca Trunk Sewer (gpd)[b]		**4,270,284**	**2.05**	**8,755,750**
		TOTAL EXISTING AREA (ac)	**25,185.96**	**TOTAL ADWF (gpd)**		**18,358,534**	**2.05**	**37,634,995**

[a] Excludes flow from NMCS Sheds 66, 54, and CPS

[b] Excludes flow from CMCS Sheds 53, 93S1, and 100

APPENDIX C

SR-99 HYDRAULIC DESIGN OF LIFT STATION AND PUMP STATION ALTERNATIVES

Appendix C

SR-99 Hydraulic Design of Lift Station and Pump Station Alternatives

Lift Station and Pump Station Alternatives

Force Main Parameter	Lift Station Alternative	Pump Station Alternative	
		Single Force Main	Dual Force Main
Length (ft)	5	4,120	4,120
Diameter (in)	18	18	12
C_{HW} Value	130	130	130
From Inv.	8.92	8.92	8.92
To Inv.	29.50	24.50	24.50
Flow (gpm)	2,029	2,029	1,014
Velocitiy (ft/s)	2.6	2.6	2.9
h_Z, Elevation Head (ft)	**20.58**	**15.58**	**15.58**
h_V, Velocity Head (ft)	**0.10**	**0.10**	**0.13**
h_F, Friction Head (ft)	**0.01**	**5.34**	**10.67**

Discharge Piping Friction Loss

Discharge Piping Parameter	Lift Station Alternative	Pump Station Alternative	
		Single Force Main	Dual Force Main
Length (ft)	55	55	55
Diameter (in)	10	10	10
Flow (gpm)	1,014	1,014	1,014
Velocity (ft/s)	4.1	4.1	4.1
C_{HW} Value	130	130	130
h_F, Discharge Piping (ft)	**0.35**	**0.35**	**0.35**

Local Losses (Discharge Piping)

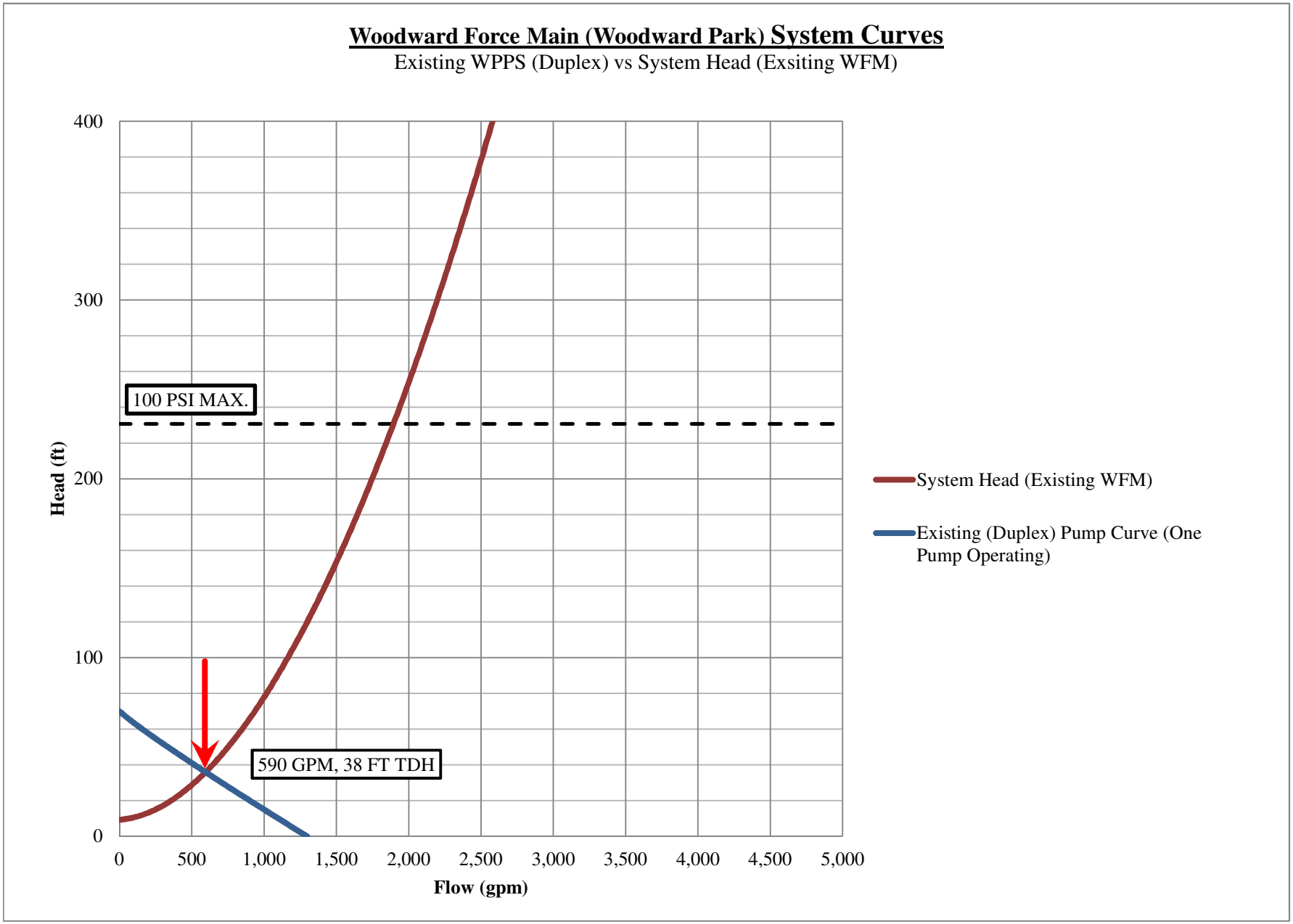
Fitting	Quantity	K-Value	Local Head Loss (ft)		
			Lift Station	Single Force Main	Dual Force Main
Inlet	1	5.00	1.47	1.47	1.47
10" 90-deg Ell	1	0.25	0.07	0.07	0.07
10" Check Valve	1	2.20	0.64	0.64	0.64
10" Plug Valve	1	0.30	0.09	0.09	0.09
10" Tee, Inline	0	2.00	0.00	0.00	0.00
10" Tee, Branch	2	2.00	1.17	1.17	1.17
Reducer	1	5.00	1.47	1.47	1.47
Total Local Head Loss at Fittings			4.91	4.91	4.91
Total Friction Loss at Discharge Piping (Hazen-Williams)			0.35	0.35	0.35
h_L, Discharge Piping Loss (ft)			**5.26**	**5.26**	**5.26**

Total Head Loss Summary

Head Loss (ft)	Lift Station Alternative	Pump Station Alternative (Single Force Main)	Pump Station Alternative (Dual Force Main)
h_Z, Elevation Head	20.58	15.58	15.58
h_V, Velocity Head	0.10	0.10	0.13
h_F, Friction Head	0.01	5.34	10.67
h_L, Discharge Piping Loss	5.26	5.26	5.26
Contingency	20%	20%	20%
Total Dynamic Head (TDH)	**31.1**	**31.5**	**38.0**
Station Configuration	**Triplex**	**Triplex**	**Triplex**
Pump Design Flow (gpm)	**1,014**	**1,014**	**1,014**

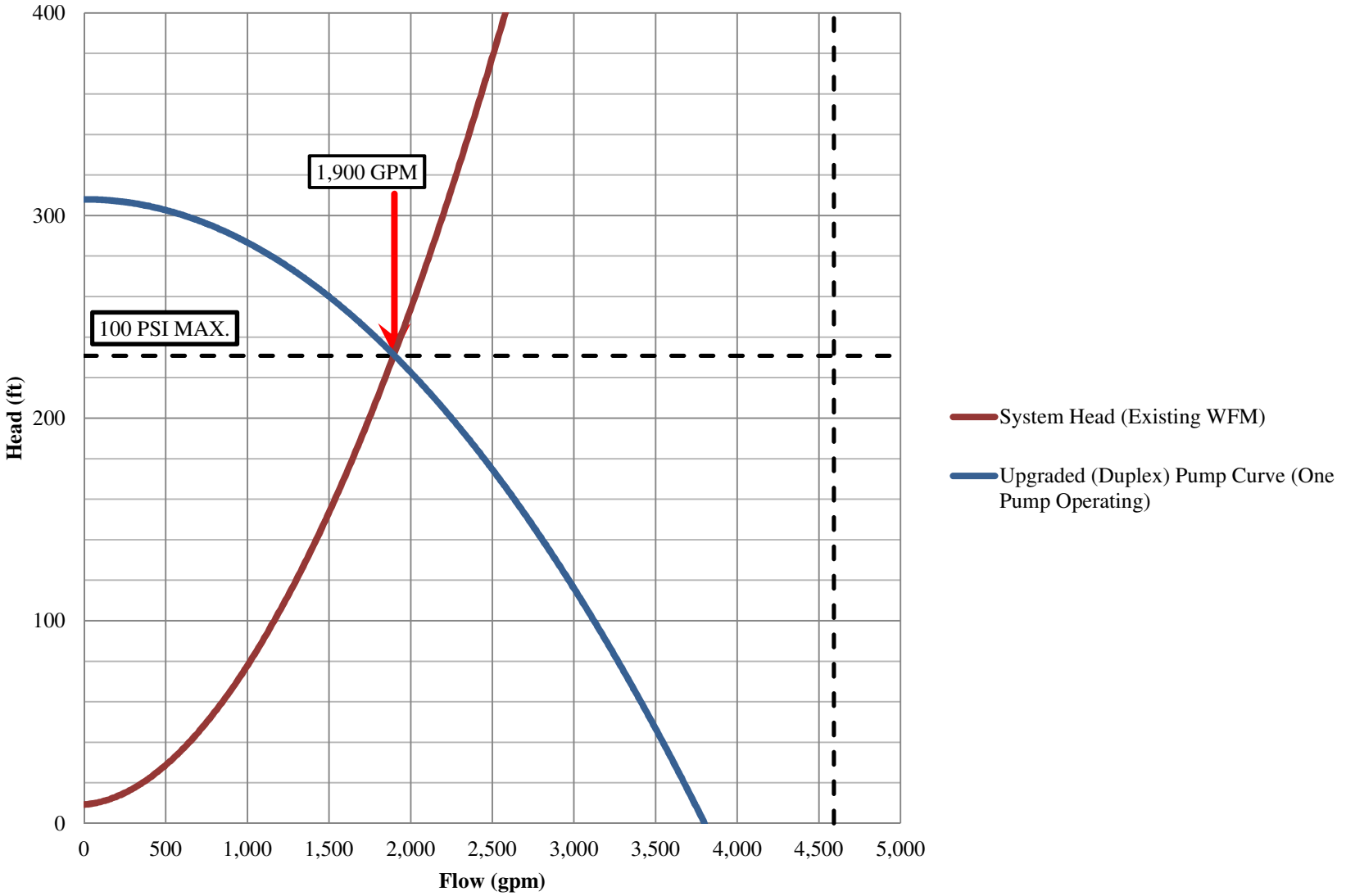
APPENDIX D

WOODWARD FORCE MAIN
SYSTEM HEAD CURVES


Woodward Force Main (Woodward Park) System Curves
Existing WPPS (Duplex) vs System Head (Exsiting WFM)
400
300
200
100
0
Head (ft)
100 PSI MAX.
590 GPM, 38 FT TDH
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
Flow (gpm)
System Head (Existing WFM)
Existing (Duplex) Pump Curve (One Pump Operating)

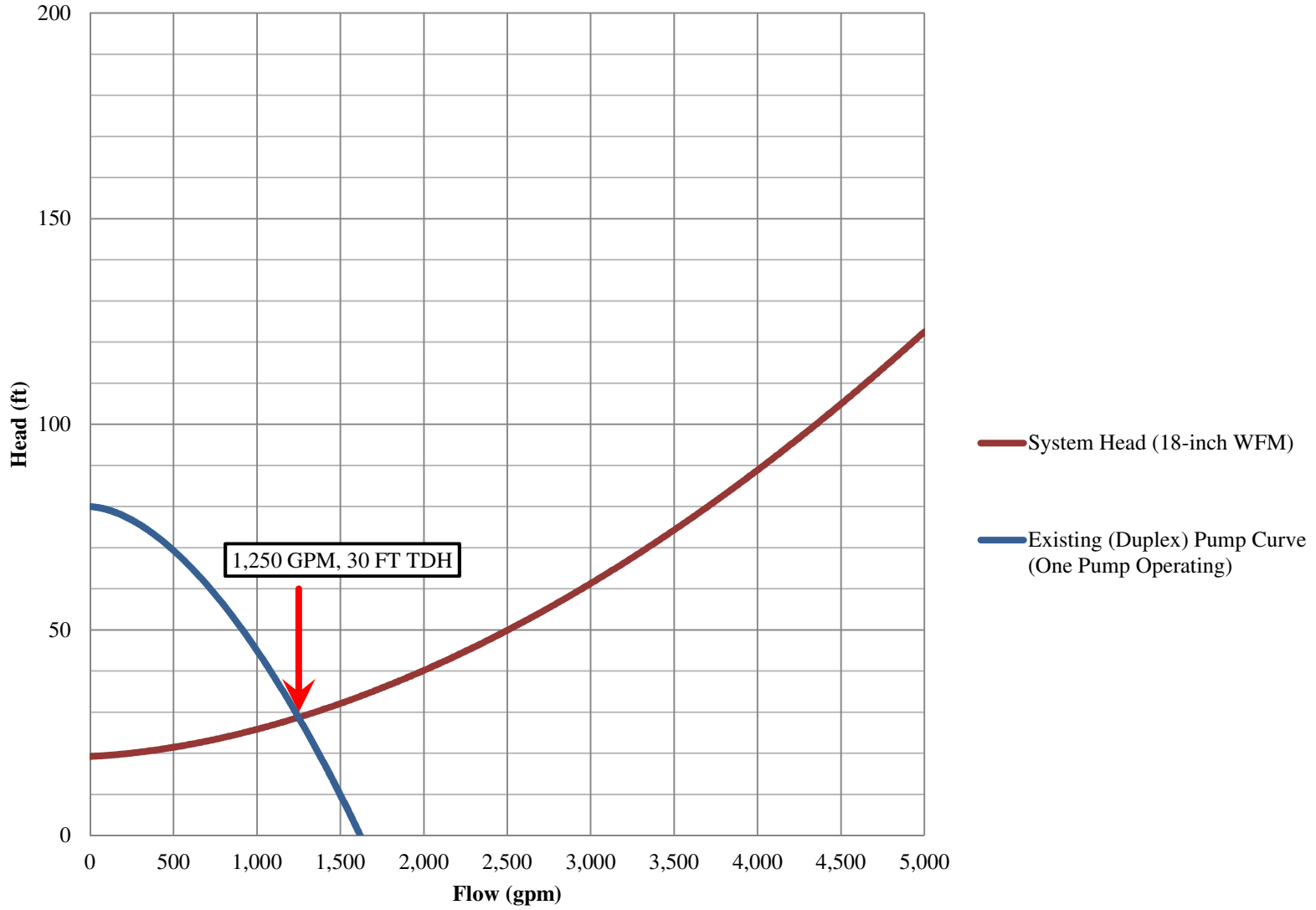
Woodward Force Main (Woodward Park) System Curves

Upgraded WPPS (Duplex) vs System Head (Existing WFM); Peak Flows at 100 psi



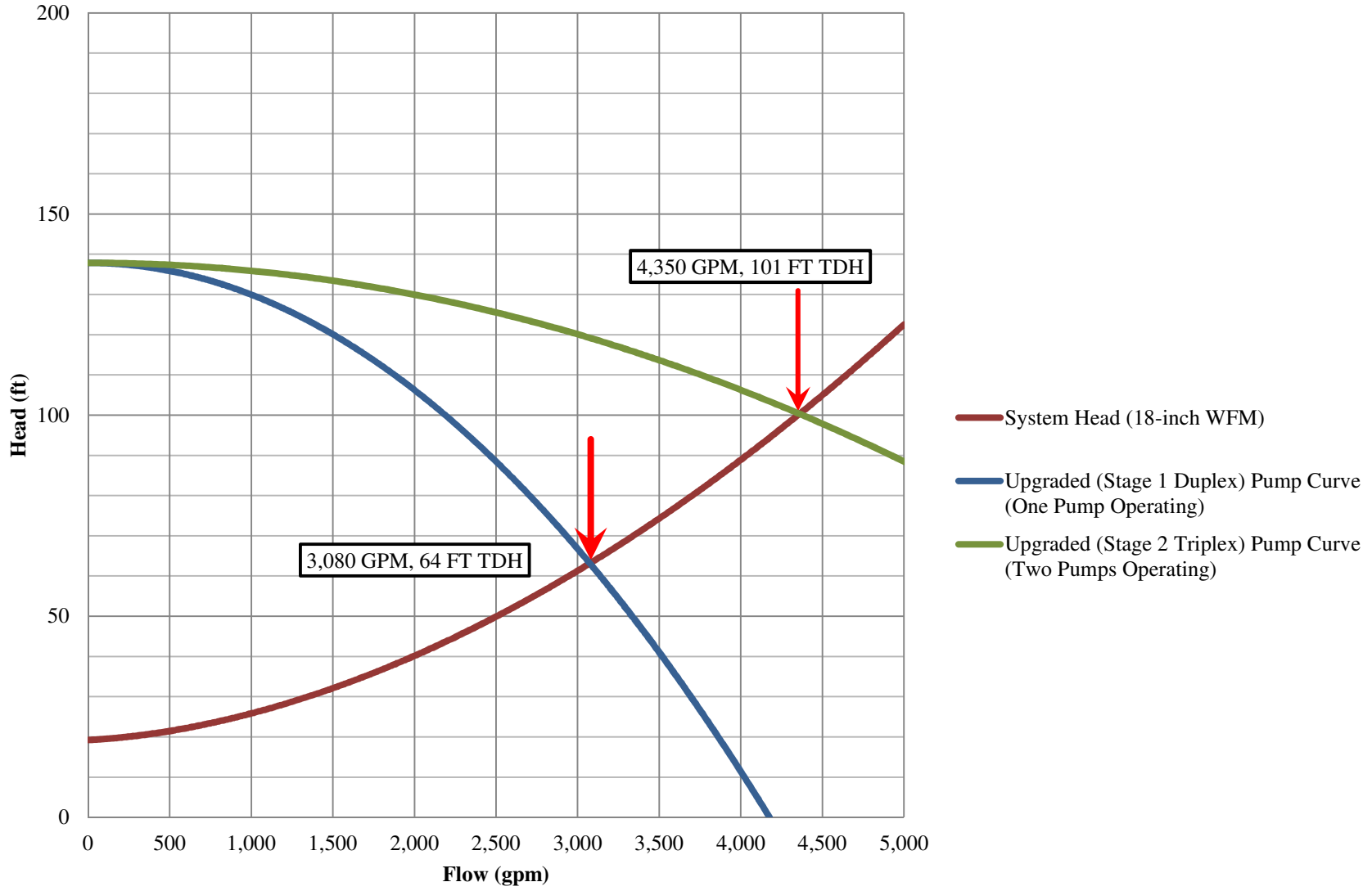
Woodward Force Main (Tara Park) System Curves

Existing TPPS (Duplex) vs System Head (18-inch Force Main)



Woodward Force Main (Tara Park) System Curves

Upgraded TPPS (Stage 1 Duplex and Stage 2 Triplex) vs System Head (18-inch Force Main)



APPENDIX E

SOUTH MANTECA COLLECTION STRATEGY
PHASED IMPROVEMENTS EXISTING FLOW AND
AVAILABLE CAPACITY FOR ADWF AND PWWF LOADING

APPENDIX E
FLOW ESTIMATES FOR SOUTH MANTECA COLLECTION SYSTEM GRAVITY LINKS
EXISTING FLOW AND AVAILABLE CAPACITY FOR ADWF AND PWWF LOADING

Link	Status	Length (ft)	Diameter (in)	Upstream Invert	Downstream Invert	Slope	PWWF Capacity[a]	Peaking Factor[b]	ADWF Capacity[c]	Cummulative ADWF (gpd)	
										Existing	Available Capacity
1A	Constructed	480	60	-3.92	-4.14	0.0005	35,223,022	2.05	17,181,962	1,704,650	15,477,312
1	Proposed	1,000	54	-3.70	-3.92	0.0002	18,425,839	2.05	8,988,214	1,704,650	7,283,563
2	Proposed	686	48	-3.44	-3.70	0.0004	17,665,820	2.05	8,617,473	1,700,381	6,917,092
3	Proposed	1,325	48	-2.95	-3.44	0.0004	17,450,155	2.05	8,512,270	1,700,381	6,811,890
4	Proposed	808	48	-2.67	-2.95	0.0004	16,892,057	2.05	8,240,027	1,563,653	6,676,374
5	Proposed	1,056	48	-2.31	-2.67	0.0003	16,754,385	2.05	8,172,870	1,512,115	6,660,755
6	Constructed	2,637	60	-1.23	-2.31	0.0004	28,856,576	2.05	14,076,379	1,512,115	12,564,263
7	Constructed	1,553	36	1.73	0.37	0.0009	12,424,826	2.05	6,060,858	1,384,524	4,676,334
8	Constructed	1,620	36	3.16	1.73	0.0009	12,430,577	2.05	6,063,664	1,257,799	4,805,865
8S	Proposed	4,835	12	16.80	5.16	0.0024	1,104,318	3.01	366,852	16,284	350,568
9	Constructed	2,602	36	5.44	3.16	0.0009	12,368,349	2.05	6,033,307	1,175,259	4,858,048
9S	Proposed	3,808	12	18.01	10.39	0.0020	1,006,804	3.09	325,507	72,432	253,075
10	Constructed	2,660	36	7.78	5.44	0.0009	12,424,826	2.05	6,060,858	1,087,542	4,973,316
10S	Proposed	4,887	12	23.87	14.09	0.0020	1,006,849	3.09	325,525	37,731	287,795
14A	Proposed	50	36	12.43	12.39	0.0008	11,917,474	2.05	5,813,351	(N/A)	5,813,351
16C	Constructed	507	30	14.31	14.01	0.0006	6,302,979	2.05	3,068,150	697,540	2,370,610
16	Constructed	475	30	14.37	14.31	0.0001	2,912,179	2.19	1,329,789	697,540	632,249
17A	Constructed	568	27	15.00	14.62	0.0007	5,060,424	2.06	2,450,721	531,122	1,919,599
17	Constructed	566	27	15.66	15.00	0.0012	6,680,870	2.05	3,254,228	531,122	2,723,106
18A	Constructed	296	27	15.95	15.66	0.0010	6,123,820	2.06	2,979,725	383,549	2,596,176
18	Constructed	243	27	16.07	15.95	0.0005	4,347,672	2.08	2,089,603	383,549	1,706,054
19	Constructed	500	24	16.90	16.31	0.0012	4,909,119	2.07	2,374,634	71,932	2,302,702
20B	Constructed	501	18	17.90	16.90	0.0020	2,964,652	2.18	1,358,614	63,369	1,295,245
20A	Constructed	417	18	18.75	17.90	0.0020	2,995,946	2.18	1,375,764	63,369	1,312,394
20	Constructed	420	18	19.59	18.75	0.0020	2,967,615	2.18	1,360,239	63,369	1,296,870
21B	Constructed	501	15	21.09	19.59	0.0030	2,232,900	2.35	950,685	0	950,685
21A	Constructed	498	15	22.59	21.09	0.0030	2,239,616	2.35	954,457	0	954,457
21	Constructed	503	15	24.09	22.59	0.0030	2,228,457	2.35	948,190	0	948,190
22A	Constructed	1,200	36	8.83	7.78	0.0009	12,463,593	2.05	6,079,770	1,049,812	5,029,959
22	Proposed	4,050	36	12.39	8.83	0.0009	12,492,136	2.05	6,093,695	953,354	5,140,341
22S	Proposed	5,300	24	32.00	28.00	0.0008	3,926,039	2.10	1,871,926	2,840	1,869,087
22S1	Proposed	6,500	18	25.00	12.00	0.0020	2,967,615	2.18	1,360,239	2,840	1,357,399
22S2	Proposed	1,500	18	12.00	8.90	0.0021	3,016,670	2.17	1,387,104	2,840	1,384,264
25	Proposed	2,650	12	25.00	19.70	0.0020	1,006,540	3.09	325,397	0	325,397
30	Constructed	1,576	18	19.18	17.28	0.0012	2,304,047	2.33	990,657	311,617	679,041
31A	Constructed	1,014	18	20.41	19.18	0.0012	2,311,139	2.32	994,643	311,617	683,027
31	Constructed	350	18	20.83	20.41	0.0012	2,298,705	2.33	987,655	311,617	676,038
32A	Constructed	399	18	21.31	20.83	0.0012	2,301,584	2.33	989,273	311,617	677,656
32	Constructed	376	18	21.76	21.31	0.0012	2,295,646	2.33	985,936	305,904	680,033
33	Proposed	2,975	18	5.50	1.45	0.0014	2,448,367	2.28	1,071,732	83,625	988,107

[a] PWWF Capacity based on d/D = 0.80

[b] Peaking Factor corresponding to PWWF Capacity

[c] ADWF Capacity = PWWF / Peaking Factor

APPENDIX F

SOUTH MANTECA COLLECTION STRATEGY
PHASED IMPROVEMENTS TRIGGER FLOW CALCULATIONS

APPENDIX F
SOUTH MANTECA COLLECTION STRATEGY - PHASED IMPROVEMENTS
TRIGGER FLOW CALCULATIONS

PROJECT: Upgrade WPPS Pumps, Stage 1 Upgrade

Description	WPPS Inflow	
Trigger Flow (PWWF)	849,000 gpd	
Trigger Flow (ADWF)	262,000 gpd	
Existing ADWF to WPPS	843,148 gpd	
Remaing ADWF Capacity to Trigger Flow	**(581,148) gpd**	***Available Flow to WPPS***

PROJECT: Upgrade TPPS Pumps, Stage 1 Upgrade

Description	TPPS Inflow	
Trigger Flow (PWWF)	1,800,000 gpd	
Trigger Flow (ADWF)	710,000 gpd	
Existing Flow (ADWF) from Pump Stations along 12" Force Main (see Appendix D)	289,439 gpd	
Existing ADWF to TPPS	668,968 gpd	
Remaing ADWF Capacity to Trigger Flow	**(248,406) gpd**	***Available Flow to TPPS***

PROJECT: Upgrade TPPS Pumps, Stage 2 Upgrade

Description	TPPS Inflow	
Trigger Flow (PWWF)	4,435,000 gpd	
Trigger Flow (ADWF)	2,134,000 gpd	
Buildout Flow (ADWF) from Pump Stations along 12" Force Main (see Appendix D)	351,968 gpd	
Existing ADWF to TPPS	668,968 gpd	
Remaing ADWF Capacity to Trigger Flow	**1,113,064 gpd**	***Available Flow to TPPS***

PROJECT: Construct Links 1 - 5; Existing 12-inch WFM limiting component (pressure)

Description	WPPS Inflow	
Trigger Flow (PWWF)	2,736,000 gpd	
Trigger Flow (ADWF)	1,232,000 gpd	
Existing Flow (ADWF) to WPPS	843,148 gpd	
Remaing ADWF Capacity to Trigger Flow	**388,852 gpd**	***Available Flow to WPPS / 12-inch WFM***

APPENDIX F
SOUTH MANTECA COLLECTION STRATEGY - PHASED IMPROVEMENTS
TRIGGER FLOW CALCULATIONS

PROJECT: Construct Links 1 - 5; Existing 18-inch WFM limiting component (velocity)

Description	TPPS Inflow		
Trigger Flow (PWWF)	9,136,000	gpd	
Trigger Flow (ADWF)	4,455,000	gpd	
Maximum Flow in 12-inch WFM (ADWF)	1,941,000	gpd	***12-inch WFM Trigger Flow***
Buildout Flow for 12-inch WFM Lift Stations (ADWF)	351,968	gpd	
Buildout Flow for Sheds 1, 3, and 4 (ADWF)	358,008	gpd	
Existing Flow (ADWF) to TPPS	668,968	gpd	
Remaing ADWF Capacity to Trigger Flow	**1,135,057**	**gpd**	***Available Flow to TPPS / 18-inch WFM*** [a]

[a] Assumed that Sheds 1, 3, and 4 have reached buildout

PROJECT: Construct Link 27S (Force Main); Construct SMLS, Link 22S1, Link 22S2, and Link 22S

Description	Link 18		
80% Full Flow Capacity of Link 18 (PWWF)	5,563,000	gpd	
Corresponding ADWF Capacity of Link 18	2,701,796	gpd	
Buildout ADWF in Link 18, Excluding Sheds Tributary to ABPS	2,306,911	gpd	
Remaing ADWF Capacity to Trigger Flow	**394,000**	**gpd**	***Available Flow to Link 18***

APPENDIX G

DEVELOPMENT OF UNIT PIPE INSTALLATION COSTS

APPENDIX G
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM 2012 MASTER PLAN UPDATE
DEVELOPMENT OF UNIT PIPE INSTALLATION COSTS

						Excavation Quantities (per unit length)					Earthwork, Dewatering and Pavement Cost						Piping and Installation Cost					TOTAL (rounded)				
											Earthwork															
Description (Diameter and Depth)	Material	Assumed Trench Depth (ft)	Trench Width (ft)	Surface Width (ft)	Depth for which Surface Width Applies (ft)	Excavation (cy)	Backfill (cy)	Compaction (cy)	Pavement Removal & Replacement (sf)	Water Depth (vlf)	Excavation ($/lf)	Backfill ($/lf)	Compaction ($/lf)	EARTHWORK SUBTOTAL ($/lf)	Dewatering ($/lf)	Pavement Removal & Replacement ($/lf)	Pipe Base Cost ($/lf)	10% Taxes ($/lf)	25% Install. ($/lf)	15% Contractor OH&P ($/lf)	PIPING AND INSTALLATION SUBTOTAL ($/lf)	Earthwork ($/lf)	Dewatering ($/lf)	Pavement Removal & Replacement ($/lf)	Piping and Installation ($/lf)	Total Cost ($/lf)
6-inch; 0-10 ft	VCP	10.50	2.50	4.50	0.00	0.97	0.96	0.96	4.50	0	1.94	1.93	1.93	5.80	0.00	22.50	4.82	0.48	1.21	0.72	7.23	6	0	23	8	37
6-inch; 10-20 ft	VCP	20.50	3.50	5.50	0.00	2.66	2.65	2.65	5.50	5.5	5.31	5.30	5.30	15.92	173.25	27.50	4.82	0.48	1.21	0.72	7.23	16	174	28	8	226
6-inch; 20-25 ft	VCP	25.50	6.50	8.50	0.00	6.14	6.13	6.13	8.50	10.5	12.28	12.26	12.26	36.80	330.75	42.50	4.82	0.48	1.21	0.72	7.23	37	331	43	8	419
8-inch; 0-10 ft	VCP	10.50	2.67	4.67	0.00	1.04	1.02	1.02	4.67	0	2.07	2.05	2.05	6.17	0.00	23.33	6.70	0.67	1.68	1.01	10.06	7	0	24	11	42
8-inch; 10-20 ft	VCP	20.50	3.67	5.67	0.00	2.78	2.77	2.77	5.67	5.5	5.57	5.54	5.54	16.65	173.25	28.33	6.70	0.67	1.68	1.01	10.06	17	174	29	11	231
10-inch; 0-10 ft	VCP	10.50	2.83	4.83	0.00	1.10	1.08	1.08	4.83	0	2.20	2.16	2.16	6.53	0.00	24.17	11.02	1.10	2.75	1.65	16.53	7	0	25	17	49
10-inch; 10-20 ft	VCP	20.50	3.83	5.83	0.00	2.91	2.89	2.89	5.83	5.5	5.82	5.78	5.78	17.38	173.25	29.17	11.02	1.10	2.75	1.65	16.53	18	174	30	17	239
12-inch; 0-10 ft	VCP	10.50	3.00	5.00	0.00	1.17	1.14	1.14	5.00	0	2.33	2.28	2.28	6.88	0.00	25.00	14.76	1.48	3.69	2.21	22.14	7	0	25	23	55
12-inch; 10-20 ft	VCP	20.50	4.00	6.00	0.00	3.04	3.01	3.01	6.00	5.5	6.07	6.02	6.02	18.11	173.25	30.00	14.76	1.48	3.69	2.21	22.14	19	174	30	23	246
12-inch; 20-25 ft	VCP	25.50	7.00	9.00	5.00	6.98	6.95	6.95	9.00	10.5	13.96	13.90	13.90	41.77	330.75	45.00	14.76	1.48	3.69	2.21	22.14	42	331	45	23	441
15-inch; 0-10 ft	VCP	10.50	3.25	5.25	0.00	1.26	1.22	1.22	5.25	0	2.53	2.44	2.44	7.40	0.00	26.25	23.37	2.34	5.84	3.51	35.06	8	0	27	36	71
15-inch; 10-20 ft	VCP	20.50	4.25	6.25	0.00	3.23	3.18	3.18	6.25	5.5	6.45	6.36	6.36	19.18	173.25	31.25	23.37	2.34	5.84	3.51	35.06	20	174	32	36	262
15-inch; 20-25 ft	VCP	25.50	7.25	9.25	5.00	7.22	7.17	7.17	9.25	10.5	14.44	14.34	14.34	43.12	330.75	46.25	23.37	2.34	5.84	3.51	35.06	44	331	47	36	458
18-inch; 0-10 ft	VCP	10.50	3.50	5.50	0.00	1.36	1.30	1.30	5.50	0	2.72	2.59	2.59	7.90	0.00	27.50	32.83	3.28	8.21	4.92	49.24	8	0	28	50	86
18-inch; 10-20 ft	VCP	20.50	4.50	6.50	0.00	3.42	3.35	3.35	6.50	5.5	6.83	6.70	6.70	20.24	173.25	32.50	32.83	3.28	8.21	4.92	49.24	21	174	33	50	278
18-inch; 20-25 ft	VCP	25.50	7.50	9.50	5.00	7.45	7.39	7.39	9.50	10.5	14.91	14.78	14.78	44.46	330.75	47.50	32.83	3.28	8.21	4.92	49.24	45	331	48	50	474
18-inch; 25-30 ft	VCP	30.50	7.50	9.50	5.00	8.84	8.78	8.78	9.50	15.5	17.69	17.55	17.55	52.79	488.25	47.50	32.83	3.28	8.21	4.92	49.24	53	489	48	50	640
21-inch; 0-10 ft	VCP	10.50	3.75	5.75	0.00	1.46	1.37	1.37	5.75	0	2.92	2.74	2.74	8.39	0.00	28.75	43.18	4.32	10.79	6.48	64.76	9	0	29	65	103
21-inch; 10-20 ft	VCP	20.50	4.75	6.75	0.00	3.61	3.52	3.52	6.75	5.5	7.21	7.03	7.03	21.28	173.25	33.75	43.18	4.32	10.79	6.48	64.76	22	174	34	65	295
21-inch; 20-25 ft	VCP	25.50	7.75	9.75	5.00	7.69	7.60	7.60	9.75	10.5	15.38	15.20	15.20	45.78	330.75	48.75	43.18	4.32	10.79	6.48	64.76	46	331	49	65	491
21-inch; 25-30 ft	VCP	30.50	7.75	9.75	5.00	9.13	9.04	9.04	9.75	15.5	18.25	18.07	18.07	54.39	488.25	48.75	43.18	4.32	10.79	6.48	64.76	55	489	49	65	658
24-inch; 0-10 ft	VCP	10.50	4.00	6.00	0.00	1.56	1.44	1.44	6.00	0	3.11	2.88	2.88	8.87	0.00	30.00	57.34	5.73	14.34	8.60	86.01	9	0	30	87	126
24-inch; 10-20 ft	VCP	20.50	5.00	7.00	0.00	3.80	3.68	3.68	7.00	5.5	7.59	7.36	7.36	22.31	173.25	35.00	57.34	5.73	14.34	8.60	86.01	23	174	35	87	319
24-inch; 20-25 ft	VCP	25.50	8.00	10.00	5.00	7.93	7.81	7.81	10.00	10.5	15.85	15.62	15.62	47.09	330.75	50.00	57.34	5.73	14.34	8.60	86.01	48	331	50	87	516
24-inch; 25-30 ft	VCP	30.50	8.00	10.00	5.00	9.41	9.29	9.29	10.00	15.5	18.81	18.58	18.58	55.98	488.25	50.00	57.34	5.73	14.34	8.60	86.01	56	489	50	87	682
27-inch; 0-10 ft	VCP	10.50	4.25	6.25	0.00	1.65	1.51	1.51	6.25	0	3.31	3.01	3.01	9.33	0.00	31.25	68.97	6.90	17.24	10.35	103.45	10	0	32	104	146
27-inch; 10-20 ft	VCP	20.50	5.25	7.25	0.00	3.99	3.84	3.84	7.25	5.5	7.97	7.68	7.68	23.33	173.25	36.25	68.97	6.90	17.24	10.35	103.45	24	174	37	104	339
27-inch; 20-25 ft	VCP	25.50	8.25	10.25	5.00	8.16	8.01	8.01	10.25	10.5	16.32	16.03	16.03	48.38	330.75	51.25	68.97	6.90	17.24	10.35	103.45	49	331	52	104	536
27-inch; 25-30 ft	VCP	30.50	8.25	10.25	5.00	9.69	9.54	9.54	10.25	15.5	19.38	19.09	19.09	57.55	488.25	51.25	68.97	6.90	17.24	10.35	103.45	58	489	52	104	703
30-inch; 0-10 ft	VCP	10.50	4.50	6.50	0.00	1.75	1.57	1.57	6.50	0	3.50	3.14	3.14	9.77	0.00	32.50	83.66	8.37	20.92	12.55	125.50	10	0	33	126	169
30-inch; 10-20 ft	VCP	20.50	5.50	7.50	0.00	4.18	3.99	3.99	7.50	5.5	8.35	7.99	7.99	24.33	173.25	37.50	83.66	8.37	20.92	12.55	125.50	25	174	38	126	363
30-inch; 20-25 ft	VCP	25.50	8.50	10.50	5.00	8.40	8.22	8.22	10.50	10.5	16.80	16.43	16.43	49.66	330.75	52.50	83.66	8.37	20.92	12.55	125.50	50	331	53	126	560
30-inch; 25-30 ft	VCP	30.50	8.50	10.50	5.00	9.97	9.79	9.79	10.50	15.5	19.94	19.58	19.58	59.11	488.25	52.50	83.66	8.37	20.92	12.55	125.50	60	489	53	126	728
33-inch; 0-10 ft	VCP	10.50	4.75	6.75	0.00	1.85	1.63	1.63	6.75	0	3.69	3.25	3.25	10.20	0.00	33.75	100.83	10.08	25.21	15.12	151.24	11	0	34	152	197
33-inch; 10-20 ft	VCP	20.50	5.75	7.75	0.00	4.37	4.15	4.15	7.75	5.5	8.73	8.29	8.29	25.31	173.25	38.75	100.83	10.08	25.21	15.12	151.24	26	174	39	152	391
33-inch; 20-25 ft	VCP	25.50	8.75	10.75	5.00	8.63	8.41	8.41	10.75	10.5	17.27	16.83	16.83	50.93	330.75	53.75	100.83	10.08	25.21	15.12	151.24	51	331	54	152	588
33-inch; 25-30 ft	VCP	30.50	8.75	10.75	5.00	10.25	10.03	10.03	10.75	15.5	20.51	20.07	20.07	60.65	488.25	53.75	100.83	10.08	25.21	15.12	151.24	61	489	54	152	756
36-inch; 0-10 ft	RCP II	10.50	5.00	7.00	0.00	1.94	1.68	1.68	7.00	0	3.89	3.37	3.37	10.62	0.00	35.00	273.00	27.30	68.25	40.95	409.50	11	0	35	410	456
36-inch; 10-20 ft	RCP III	20.50	6.00	8.00	0.00	4.56	4.29	4.29	8.00	5.5	9.11	8.59	8.59	26.29	173.25	40.00	273.00	27.30	68.25	40.95	409.50	27	174	40	410	651
36-inch; 20-25 ft	RCP IV	25.50	9.00	11.00	5.00	8.87	8.61	8.61	11.00	10.5	17.74	17.22	17.22	52.18	330.75	55.00	283.00	28.30	70.75	42.45	424.50	53	331	55	425	864
36-inch; 25-30 ft	RCP IV	30.50	9.00	11.00	5.00	10.54	10.28	10.28	11.00	15.5	21.07	20.55	20.55	62.18	488.25	55.00	283.00	28.30	70.75	42.45	424.50	63	489	55	425	1,032
42-inch; 0-10 ft	RCP II	10.50	5.50	7.50	0.00	2.14	1.78	1.78	7.50	0	4.28	3.57	3.57	11.41	0.00	37.50	294.00	29.40	73.50	44.10	441.00	12	0	38	441	491
42-inch; 10-20 ft	RCP III	20.50	6.50	8.50	0.00	4.94	4.58	4.58	8.50	5.5	9.87	9.16	9.16	28.19	173.25	42.50	294.00	29.40	73.50	44.10	441.00	29	174	43	441	687
42-inch; 20-25 ft	RCP IV	25.50	9.50	11.50	5.00	9.34	8.99	8.99	11.50	10.5	18.69	17.97	17.97	54.63	330.75	57.50	294.00	29.40	73.50	44.10	441.00	55	331	58	441	885
42-inch; 25-30 ft	RCP IV	30.50	9.50	11.50	5.00	11.10	10.75	10.75	11.50	15.5	22.20	21.49	21.49	65.19	488.25	57.50	294.00	29.40	73.50	44.10	441.00	66	489	58	441	1,054
48-inch; 0-10 ft	RCP II	10.50	6.00	8.00	0.00	2.33	1.87	1.87	8.00	0	4.67	3.74	3.74	12.14	0.00	40.00	299.00	29.90	74.75	44.85	448.50	13	0	40	449	502
48-inch; 10-20 ft	RCP III	20.50	7.00	9.00	0.00	5.31	4.85	4.85	9.00	5.5	10.63	9.70	9.70	30.03	173.25	45.00	299.00	29.90	74.75	44.85	448.50	31	174	45	449	699
48-inch; 20-25 ft	RCP IV	25.50	10.00	12.00	5.00	9.81	9.35	9.35	12.00	10.5	19.63	18.70	18.70	57.03	330.75	60.00	299.00	29.90	74.75	44.85	448.50	58	331	60	449	898
48-inch; 25-30 ft	RCP IV	30.50	10.00	12.00	5.00	11.67	11.20	11.20	12.00	15.5	23.33	22.40	22.40	68.14	488.25	60.00	299.00	29.90	74.75	44.85	448.50	69	489	60	449	1,067
54-inch; 0-10 ft	RCP II	10.50	6.50	8.50	0.00	2.53	1.94	1.94	8.50	0	5.06	3.88	3.88	12.81	0.00	42.50	315.00	31.50	78.75	47.25	472.50	13	0	43	473	529
54-inch; 10-20 ft	RCP III	20.50	7.50	9.50	0.00	5.69	5.11	5.11	9.50	5.5	11.39	10.21	10.21	31.81	173.25	47.50	315.00	31.50	78.75	47.25	472.50	32	174	48	473	727
54-inch; 20-25 ft	RCP IV	25.50	10.50	12.50	5.00	10.29	9.70	9.70	12.50	10.5	20.57	19.40	19.40	59.37	330.75	62.50	315.00	31.50	78.75	47.25	472.50	60	331	63	473	927
54-inch; 25-30 ft	RCP IV	30.50	10.50	12.50	5.00	12.23	11.64	11.64	12.50	15.5	24.46	23.28	23.28	71.03	488.25	62.50	315.00	31.50	78.75	47.25	472.50	72	489	63	473	1,097
60-inch; 0-10 ft	RCP II	10.50	7.00	9.00	0.00	2.72	2.00	2.00	9.00	0	5.44	3.99	3.99	13.42	0.00	45.00	335.00	33.50	83.75	50.25	502.50	14	0	45	503	562
60-inch; 10-20 ft	RCP III	20.50	8.00	10.00	0.00	6.07	5.35	5.35	10.00	5.5	12.15	10.69	10.69	33.54	173.25	50.00	341.00	34.10	85.25	51.15	511.50	34	174	50	512	770
60-inch; 20-25 ft	RCP IV	25.50	11.00	13.00	5.00	10.76	10.03	10.03	13.00	10.5	21.52	20.06	20.06	61.65	330.75	65.00	362.00	36.20	90.50	54.30	543.00	62	331	65	543	1,001
60-inch; 25-30 ft	RCP IV	30.50	11.00	13.00	5.00	12.80	12.07	12.07	13.00	15.5	25.59	24.14	24.14	73.87	488.25	65.00	362.00	36.20	90.50	54.30	543.00	74	489	65	543	1,171

APPENDIX H

PUMP AND LIFT STATION
CONSTRUCTION COST ESTIMATES

APPENDIX H
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
1.5 MGD PUMP STATION COST ESTIMATE

ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE ($)	ITEM TOTAL (rounded) ($)
Mobilization and Demobilization	LS	1	$80,000	$80,000
Subtotal-Mobilization				**$80,000**
Grading, Excavation and Site Preparation				
Subtotal-Grading, Site Preparation				**$100,000**
Construct Wet Well				
Excavation	CY	290	$35	$10,141
Backfill	CY	17	$30	$513
Wet well foundation and cover	CY	13	$785	$10,236
Wet well (84" RCP)	LF	34	$795	$27,030
Wet well access hatch	EA	2	$4,405	$8,810
Waterproofing/Lining	LS	1	$52,500	$52,500
Subtotal - Wet Well				**$109,231**
Furnish and Install Pumps and Motors				
Pump	EA	2	$31,500	$63,000
Subtotal - Pumps				**$63,000**
Site Electrical, Control Systems, and Lighting	LS	1	$195,000	$195,000
Subtotal - Site Electrical and Controls				**$195,000**
Install Site Piping and Appurtenances				
Force main	LF	100	$105	$10,500
Sewer (24" @ 20-30' depth)	LF	25	$875	$21,875
10" Check valves	EA	2	$3,700	$7,400
10" Gate valve	EA	4	$2,600	$10,400
10" Magnetic flowmeter	EA	1	$7,900	$7,900
4" Check valve	EA	1	$525	$525
4" Drain pipe (PVC)	LF	100	$50	$5,000
2" Foul air pipe (DIP)	LF	10	$35	$350
4" Foul air pipe (DIP)	LF	50	$50	$2,500
1" Drain pipe (PVC)	LF	10	$50	$500
Pipe fittings and supports	LS	1	$10,500	$10,500
2" Comb air valve	EA	1	$2,900	$2,900
Vault ladders	LF	24	$155	$3,720
Miscellaneous pipe fittings	LS	1	$21,000	$21,000
Subtotal - Site Piping				**$105,070**
Install Manholes and Ancillary Facilities				
Manhole (48")	EA	1	$5,700	$5,700
Traffic bollards	EA	6	$420	$2,520
Concrete pads	CY	17	$525	$9,042
Valve vault and 8' x 8' hatch	EA	1	$36,400	$36,400
Flowmeter vault and 4' 6"x 6' hatch	EA	1	$15,750	$15,750
Bypass vault and 4' 6" x 6' hatch	EA	1	$15,750	$15,750
Subtotal - Manholes and Ancillary Facilities				**$85,162**
Aggregate Base (Class 2)	CY	150	$20	**$3,000**
Asphalt Concrete Paving	TON	62	$95	**$5,890**
Gates and Fencing				
Fencing	LF	250	$35	$8,750
20-foot rolling gate	EA	1	$4,200	$4,200
Subtotal - Gates and Fencing			**$52**	**$12,950**
All Sheeting, Shoring and Bracing				
Pump Station	SF	748	$30	$22,431
Subtotal - Sheeting and Shoring				**$22,431**
TOTAL (rounded)				**$780,000**

APPENDIX H
CITY OF MANTECA
WASTEWATER COLLECTION SYSTEM MASTER PLAN UPDATE
2.0-4.0 MGD PUMP STATION COST ESTIMATE

ITEM	UNIT	ESTIMATED QUANTITY	UNIT PRICE ($)	ITEM TOTAL (rounded) ($)
Mobilization and Demobilization	LS	1	$115,000	$115,000
Subtotal-Mobilization				**$115,000**
Grading, Excavation and Site Preparation				
Subtotal-Grading, Site Preparation				**$100,000**
Construct Wet Well				
Excavation	CY	415	$35	$14,508
Backfill	CY	26	$30	$780
Wet well foundation and cover	CY	31	$785	$24,715
Wet well	CY	103	$785	$80,593
Wet well access hatch	EA	3	$4,405	$13,215
Waterproofing/Lining	LS	1	$52,500	$52,500
Subtotal - Wet Well				**$186,312**
Furnish and Install Pumps and Motors				
Pump	EA	3	$42,000	$126,000
Subtotal - Pumps				**$126,000**
Site Electrical, Control Systems, and Lighting	LS	1	$286,538	$286,538
Subtotal - Site Electrical and Controls				**$286,538**
Install Site Piping and Appurtenances				
Force main	LF	100	$105	$10,500
Sewer (24" @ 20-30' depth)	LF	25	$875	$21,875
10" Check valves	EA	2	$3,700	$7,400
10" Gate valve	EA	4	$2,600	$10,400
12" Magnetic flowmeter	EA	1	$10,500	$10,500
4" Check valve	EA	1	$525	$525
4" Drain pipe (PVC)	LF	100	$50	$5,000
2" Foul air pipe (DIP)	LF	10	$35	$350
4" Foul air pipe (DIP)	LF	50	$50	$2,500
1" Drain pipe (PVC)	LF	10	$50	$500
Pipe fittings and supports	LS	1	$10,500	$10,500
2" Comb air valve	EA	1	$2,900	$2,900
Vault ladders	LF	24	$155	$3,720
Miscellaneous pipe fittings	LS	1	$21,000	$21,000
Subtotal - Site Piping				**$107,670**
Install Manholes and Ancillary Facilities				
Manhole (48")	EA	1	$5,700	$5,700
Traffic bollards	EA	6	$420	$2,520
Concrete pads	CY	34	$525	$17,967
Biofilter	EA	1	$26,200	$26,200
Valve vault and 8' x 8' hatch	EA	1	$36,400	$36,400
Flowmeter vault and 4' 6"x 6' hatch	EA	1	$15,700	$15,700
Bypass vault and 4' 6" x 6' hatch	EA	1	$15,700	$15,700
Subtotal - Manholes and Ancillary Facilities				**$120,187**
Aggregate Base (Class 2)	CY	135	$20	**$2,700**
Asphalt Concrete Paving	TON	68	$95	**$6,460**
Gates and Fencing				
Fencing	LF	270	$35	$9,450
20-foot rolling gate	EA	1	$4,200	$4,200
Subtotal - Gates and Fencing			**$51**	**$13,650**
All Sheeting, Shoring and Bracing				
Pump Station	SF	2,728	$30	$81,840
Subtotal - Sheeting and Shoring				**$81,840**
TOTAL (rounded)				**$1,145,000**