APPENDIX A
Water Demand Forecasting

Rainbow MWD SDCWA Water Deliveries -- Total District -- 2007-2015

DRAFT 1/15/16

	Calendar Years (AF)									Calendar Years (MGD)								
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2007	2008	2009	2010	2011	2012	2013	2014	2015
Jan	2,329	557	1,541	637	836	1,222	717	1,860	788	24.5	5.9	16.2	6.7	8.8	12.8	7.5	19.6	8.3
Feb	911	398	925	384	855	1,124	785	1,304	1,303	10.6	4.5	10.8	4.5	10.0	12.6	9.1	15.2	15.2
Mar	2,173	1,619	1,990	886	548	952	1,428	978	1,489	22.8	17.0	20.9	9.3	5.8	10.0	15.0	10.3	15.7
Apr	2,569	2,372	2,439	1,132	1,414	1,114	2,283	2,131	1,960	27.9	25.8	26.5	12.3	15.4	12.1	24.8	23.1	21.3
May	3,195	2,186	2,713	1,968	1,973	2,017	1,977	2,540	1,380	33.6	23.0	28.5	20.7	20.7	21.2	20.8	26.7	14.5
Jun	3,363	2,741	2,387	2,500	2,055	2,795	2,218	2,286	1,617	36.5	29.8	25.9	27.2	22.3	30.4	24.1	24.8	17.6
Jul	3,755	2,786	3,119	2,476	2,615	2,461	2,813	2,483	1,767	39.5	29.3	32.8	26.0	27.5	25.9	29.6	26.1	18.6
Aug	3,982	2,858	3,091	2,573	2,644	2,748	2,440	2,663	1,965	41.9	30.0	32.5	27.0	27.8	28.9	25.6	28.0	20.7
Sep	3,461	2,746	3,005	2,527	2,424	2,790	2,393	2,209	1,919	37.6	29.8	32.6	27.4	26.3	30.3	26.0	24.0	20.8
Oct	3,069	2,992	2,573	1,310	1,931	2,288	1,854	2,300	1,510	32.3	31.5	27.0	13.8	20.3	24.0	19.5	24.2	15.9
Nov	2,498	2,024	2,371	1,229	866	1,650	1,315	1,385	1,272	27.1	22.0	25.8	13.3	9.4	17.9	14.3	15.0	13.8
Dec	561	850	740	699	1,117	759	1,303	486	898	5.9	8.9	7.8	7.4	11.7	8.0	13.7	5.1	9.4
Year	**31,865**	**24,128**	**26,894**	**18,322**	**19,276**	**21,918**	**21,526**	**22,625**	**17,868**	**28.4**	**21.5**	**24.0**	**16.4**	**17.2**	**19.5**	**19.2**	**20.2**	**16.0**

	Fiscal Year (AF)									Fiscal Year (MGD)								
	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Jul	4,024	3,755	2,786	3,119	2,476	2,615	2,461	2,813	2,483	42.3	39.5	29.3	32.8	26.0	27.5	25.9	29.6	26.1
Aug	3,782	3,982	2,858	3,091	2,573	2,644	2,748	2,440	2,663	39.8	41.9	30.0	32.5	27.0	27.8	28.9	25.6	28.0
Sep	3,598	3,461	2,746	3,005	2,527	2,424	2,790	2,393	2,209	39.1	37.6	29.8	32.6	27.4	26.3	30.3	26.0	24.0
Oct	2,932	3,069	2,992	2,573	1,310	1,931	2,288	1,854	2,300	30.8	32.3	31.5	27.0	13.8	20.3	24.0	19.5	24.2
Nov	3,117	2,498	2,024	2,371	1,229	866	1,650	1,315	1,385	33.9	27.1	22.0	25.8	13.3	9.4	17.9	14.3	15.0
Dec	1,193	561	850	740	699	1,117	759	1,303	486	12.5	5.9	8.9	7.8	7.4	11.7	8.0	13.7	5.1
Jan	2,329	557	1,541	637	836	1,222	717	1,860	788	24.5	5.9	16.2	6.7	8.8	12.8	7.5	19.6	8.3
Feb	911	398	925	384	855	1,124	785	1,304	1,303	10.2	4.6	10.8	4.5	9.6	13.1	9.1	15.2	14.6
Mar	2,173	1,619	1,990	886	548	952	1,428	978	1,489	22.8	17.0	20.9	9.3	5.8	10.0	15.0	10.3	15.7
Apr	2,569	2,372	2,439	1,132	1,414	1,114	2,283	2,131	1,960	27.9	25.8	26.5	12.3	15.4	12.1	24.8	23.1	21.3
May	3,195	2,186	2,713	1,968	1,973	2,017	1,977	2,540	1,380	33.6	23.0	28.5	20.7	20.7	21.2	20.8	26.7	14.5
Jun	3,363	2,741	2,387	2,500	2,055	2,795	2,218	2,286	1,617	36.5	29.8	25.9	27.2	22.3	30.4	24.1	24.8	17.6
Year	**33,186**	**27,198**	**26,251**	**22,407**	**18,495**	**20,819**	**22,104**	**23,217**	**20,062**	**29.5**	**24.3**	**23.4**	**20.0**	**16.5**	**18.6**	**19.7**	**20.7**	**17.9**

Source: Monthly delivery data provided by SDCWA

Rainbow MWD Water District -- Non-Revenue Water -- 2007-2015

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	Fiscal Year SDCWA DELIVERIES (MGD)								Fiscal Year Potable SALES (MGD)							
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Jul	39.5	29.3	32.8	26.0	27.5	25.9	29.6	26.1	34.5	26.8	22.9	23.9	23.4	23.0	22.7	22.8
Aug	41.9	30.0	32.5	27.0	27.8	28.9	25.6	28.0	36.3	28.8	29.2	24.0	22.0	25.5	24.7	26.0
Sep	37.6	29.8	32.6	27.4	26.3	30.3	26.0	24.0	43.1	29.7	29.0	29.0	25.2	30.1	26.3	23.0
Oct	32.3	31.5	27.0	13.8	20.3	24.0	19.5	24.2	27.3	25.1	26.5	21.0	20.6	24.0	21.9	23.5
Nov	27.1	22.0	25.8	13.3	9.4	17.9	14.3	15.0	30.3	29.0	23.2	11.2	18.5	22.0	18.7	20.2
Dec	5.9	8.9	7.8	7.4	11.7	8.0	13.7	5.1	16.6	13.7	15.0	10.4	7.9	14.1	10.2	12.5
Jan	5.9	16.2	6.7	8.8	12.8	7.5	19.6	8.3	6.0	7.0	8.1	5.4	11.8	5.1	13.6	4.7
Feb	4.6	10.8	4.5	9.6	13.1	9.1	15.2	14.6	5.0	13.5	4.4	11.5	12.0	9.0	16.2	9.6
Mar	17.0	20.9	9.3	5.8	10.0	15.0	10.3	15.7	5.6	6.8	2.8	5.3	10.3	8.7	12.3	10.3
Apr	25.8	26.5	12.3	15.4	12.1	24.8	23.1	21.3	17.9	18.4	13.5	9.6	9.7	14.2	12.6	18.4
May	23.0	28.5	20.7	20.7	21.2	20.8	26.7	14.5	22.2	23.4	12.7	15.7	10.4	18.5	21.2	18.8
Jun	29.8	25.9	27.2	22.3	30.4	24.1	24.8	17.6	21.1	22.4	21.0	18.1	24.0	22.0	24.6	11.2
Year	**24.3**	**23.4**	**20.0**	**16.5**	**18.6**	**19.7**	**20.7**	**17.9**	**22.2**	**20.4**	**17.4**	**15.4**	**16.3**	**18.0**	**18.8**	**16.8**

	NON-REVENUE WATER (MGD)								NON-REVENUE WATER (as % of Deliveries)								
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Avg.'11-15
Jul	5.0	2.5	9.9	2.1	4.0	2.9	6.9	3.3	13%	8%	30%	8%	15%	11%	23%	13%	14%
Aug	5.6	1.2	3.3	3.1	5.8	3.4	0.9	2.0	13%	4%	10%	11%	21%	12%	4%	7%	11%
Sep	(5.5)	0.1	3.6	(1.5)	1.1	0.2	(0.3)	1.0	-15%	0%	11%	-6%	4%	1%	-1%	4%	1%
Oct	4.9	6.3	0.5	(7.2)	(0.3)	0.1	(2.4)	0.7	15%	20%	2%	-53%	-2%	0%	-13%	3%	-13%
Nov	(3.2)	(7.0)	2.6	2.1	(9.1)	(4.1)	(4.5)	(5.1)	-12%	-32%	10%	16%	-97%	-23%	-31%	-34%	-34%
Dec	(10.7)	(4.8)	(7.2)	(3.1)	3.9	(6.1)	3.5	(7.4)	-181%	-54%	-92%	-42%	33%	-77%	26%	-144%	-41%
Jan	(0.1)	9.2	(1.4)	3.3	1.0	2.4	6.0	3.5	-2%	57%	-21%	38%	8%	32%	30%	43%	30%
Feb	(0.3)	(2.7)	0.1	(1.9)	1.1	0.1	(1.1)	5.1	-7%	-25%	3%	-19%	8%	1%	-7%	35%	4%
Mar	11.4	14.1	6.5	0.5	(0.3)	6.3	(2.0)	5.4	67%	67%	70%	9%	-3%	42%	-20%	34%	13%
Apr	7.8	8.1	(1.2)	5.7	2.4	10.6	10.6	2.9	30%	30%	-10%	37%	20%	43%	46%	13%	32%
May	0.8	5.1	8.0	5.1	10.8	2.3	5.5	(4.3)	3%	18%	39%	24%	51%	11%	21%	-30%	15%
Jun	8.7	3.5	6.2	4.2	6.3	2.1	0.2	6.4	29%	13%	23%	19%	21%	9%	1%	36%	17%
Year	**2.1**	**3.1**	**2.6**	**1.0**	**2.3**	**1.7**	**2.0**	**1.1**	**9%**	**13%**	**13%**	**6%**	**12%**	**9%**	**10%**	**6%**	**8.6%**

	Fiscal Year SDCWA DELIVERIES, 2-month trailing average (MGD)								Fiscal Year Potable SALES (MGD)							
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Jul	38.0	29.5	29.4	26.6	24.9	28.1	26.8	25.5	34.5	26.8	22.9	23.9	23.4	23.0	22.7	22.8
Aug	40.7	29.7	32.6	26.5	27.6	27.4	27.6	27.0	36.3	28.8	29.2	24.0	22.0	25.5	24.7	26.0
Sep	39.7	29.9	32.6	27.2	27.1	29.6	25.8	26.0	43.1	29.7	29.0	29.0	25.2	30.1	26.3	23.0
Oct	34.9	30.6	29.8	20.6	23.3	27.2	22.7	24.1	27.3	25.1	26.5	21.0	20.6	24.0	21.9	23.5
Nov	29.7	26.7	26.4	13.6	14.9	21.0	16.9	19.6	30.3	29.0	23.2	11.2	18.5	22.0	18.7	20.2
Dec	16.5	15.5	16.8	10.3	10.6	12.9	14.0	10.1	16.6	13.7	15.0	10.4	7.9	14.1	10.2	12.5
Jan	5.9	12.6	7.2	8.1	12.3	7.8	16.6	6.7	6.0	7.0	8.1	5.4	11.8	5.1	13.6	4.7
Feb	5.2	13.5	5.6	9.2	13.0	8.3	17.4	11.5	5.0	13.5	4.4	11.5	12.0	9.0	16.2	9.6
Mar	10.8	15.8	6.9	7.7	11.5	12.1	12.7	15.1	5.6	6.8	2.8	5.3	10.3	8.7	12.3	10.3
Apr	21.4	23.7	10.8	10.6	11.0	19.9	16.7	18.5	17.9	18.4	13.5	9.6	9.7	14.2	12.6	18.4
May	24.4	27.5	16.5	18.0	16.6	22.8	24.9	17.9	22.2	23.4	12.7	15.7	10.4	18.5	21.2	18.8
Jun	26.4	27.2	23.9	21.5	25.8	22.4	25.8	16.0	21.1	22.4	21.0	18.1	24.0	22.0	24.6	11.2
Year	**24.4**	**23.5**	**19.8**	**16.6**	**18.2**	**19.9**	**20.6**	**18.1**	**22.2**	**20.4**	**17.4**	**15.4**	**16.3**	**18.0**	**18.8**	**16.8**

	NON-REVENUE WATER (2-mn. trailing avg. deliveries less sales) (MGD)								NON-REVENUE WATER (as % of Deliveries)								
	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	Avg.'11-15
Jul	3.5	2.7	6.4	2.7	1.5	5.1	4.2	2.7	9%	9%	22%	10%	6%	18%	15%	11%	12%
Aug	4.4	0.8	3.4	2.5	5.7	1.9	2.9	1.0	11%	3%	10%	10%	21%	7%	10%	4%	10%
Sep	(3.3)	0.2	3.5	(1.7)	1.9	(0.5)	(0.5)	3.0	-8%	1%	11%	-6%	7%	-2%	-2%	12%	2%
Oct	7.6	5.5	3.3	(0.4)	2.7	3.2	0.8	0.6	22%	18%	11%	-2%	11%	12%	4%	3%	6%
Nov	(0.6)	(2.2)	3.2	2.3	(3.7)	(1.0)	(1.9)	(0.6)	-2%	-8%	12%	17%	-25%	-5%	-11%	-3%	-5%
Dec	(0.0)	1.7	1.8	(0.1)	2.7	(1.1)	3.8	(2.4)	0%	11%	11%	-1%	26%	-9%	27%	-24%	4%
Jan	(0.1)	5.6	(0.9)	2.6	0.5	2.7	3.0	2.0	-2%	44%	-12%	33%	4%	34%	18%	29%	24%
Feb	0.3	0.0	1.2	(2.3)	0.9	(0.7)	1.1	1.9	5%	0%	22%	-25%	7%	-8%	7%	17%	-1%
Mar	5.2	9.0	4.1	2.4	1.3	3.4	0.4	4.9	48%	57%	59%	32%	11%	28%	3%	32%	21%
Apr	3.5	5.3	(2.7)	0.9	1.3	5.7	4.1	0.0	16%	22%	-25%	9%	12%	28%	25%	0%	15%
May	2.2	4.1	3.8	2.4	6.2	4.3	3.7	(0.9)	9%	15%	23%	13%	38%	19%	15%	-5%	16%
Jun	5.3	4.8	2.9	3.4	1.8	0.5	1.1	4.9	20%	18%	12%	16%	7%	2%	4%	30%	12%
Year	**2.2**	**3.1**	**2.4**	**1.2**	**1.9**	**1.9**	**1.9**	**1.4**	**9%**	**13%**	**12%**	**7%**	**10%**	**9%**	**9%**	**7%**	**8.7%**

SUMMARY

Average Non-Revenue Water FY2010-15, as percent of Deliveries:	**8.6%**
Average Non-Revenue Water FY2010-15, as percent of Sales:	**9.5%**

Source: Delivery data provided by SDCWA. Sales data from District billing system.

Rainbow MWD Monthly Peaking Factors -- CY 2007-2014

DRAFT 1/15/16

	SDCWA Deliveries (MGD)									Monthly Peaking Factor								
	2007	2008	2009	2010	2011	2012	2013	2014		2007	2008	2009	2010	2011	2012	2013	2014	Avg.
Jan	24.5	5.9	16.2	6.7	8.8	12.8	7.5	19.6		0.86	0.27	0.67	0.41	0.51	0.66	0.39	0.97	0.54
Feb	10.6	4.5	10.8	4.5	10.0	12.6	9.1	15.2		0.37	0.21	0.45	0.27	0.58	0.65	0.48	0.75	0.43
Mar	22.8	17.0	20.9	9.3	5.8	10.0	15.0	10.3		0.80	0.79	0.87	0.57	0.33	0.51	0.78	0.51	0.67
Apr	27.9	25.8	26.5	12.3	15.4	12.1	24.8	23.1		0.98	1.20	1.10	0.75	0.89	0.62	1.29	1.15	0.98
May	33.6	23.0	28.5	20.7	20.7	21.2	20.8	26.7		1.18	1.07	1.19	1.26	1.21	1.09	1.08	1.32	1.15
Jun	36.5	29.8	25.9	27.2	22.3	30.4	24.1	24.8		1.28	1.39	1.08	1.66	1.30	1.56	1.25	1.23	1.36
Jul	39.5	29.3	32.8	26.0	27.5	25.9	29.6	26.1		1.39	1.36	1.37	1.59	1.60	1.33	1.54	1.29	1.45
Aug	41.9	30.0	32.5	27.0	27.8	28.9	25.6	28.0		1.47	1.40	1.35	1.65	1.61	1.48	1.33	1.39	1.47
Sep	37.6	29.8	32.6	27.4	26.3	30.3	26.0	24.0		1.32	1.39	1.36	1.68	1.53	1.55	1.35	1.19	1.45
Oct	32.3	31.5	27.0	13.8	20.3	24.0	19.5	24.2		1.13	1.46	1.13	0.84	1.18	1.23	1.01	1.20	1.14
Nov	27.1	22.0	25.8	13.3	9.4	17.9	14.3	15.0		0.95	1.02	1.07	0.82	0.55	0.92	0.74	0.74	0.87
Dec	5.9	8.9	7.8	7.4	11.7	8.0	13.7	5.1		0.21	0.42	0.32	0.45	0.68	0.41	0.71	0.25	0.46
Year	**28.4**	**21.5**	**24.0**	**16.4**	**17.2**	**19.5**	**19.2**	**20.2**		**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**	**1.00**

Rainbow Municipal Water District Demand Forecast Model

Hello -- Here are a few notes on what you have here:

GENERAL DESCRIPTION:

This spreadsheet calculates future potable water demand by Pressure Zone (PZ) and for the District as a whole, and allows sensitivity analysis for alternative base condition demand rates, and future conservation levels.

Forecasts are based on the following:

1) **Existing unit use per account type**, by PZ, per District sales data. A key assumption of the default forecast settings is that CY 2013 water use represents Normal condition use for the District, and therefore is a suitable basis determining unit use per account type. The base demand condition is user-adjustable on a percentage-adjustment basis.
2) **Projected growth in population, housing, and employment**, by PZ, per SANDAG Series 13 Regional Growth Forecast (Final 2015 data). The forecast data is for 2020, 2035, and 2050.
3) **Estimated unit use adjustments over time, by causative factor**, as selected by the user. The user-adjustable factors account for various conservation programs, as well as pricing, and climate, and differentiate between factors affecting existing customers and those affecting new customers only. The default assumptions, subject to revision by the user, assume additional conservation program implementation over the course of the forecast period.

ARCHITECTURE:

The Spreadsheet is structured into worksheets as follows. Additional Development Notes are included in the main worksheets.

- **Hello**: Description, architecture, and general instructions.
- **Unit Use Adjustments**: Calculates unit use adjustments for various factors driving reductions and increases in unit water use, and sums these by customer category and service area, for Existing and New customer categories.
- **Scale Factors**: Calculates growth factors for each account category by PZ, based on the S13 growth forecasts and on user-adjustable growth rates and conservation factors.
- **Forecast:** Generates forecasts by PZ, and for the District as a whole. Also calculates resulting per capita use in GPCD.
- **Forecast Range / Chart**: Using the forecast tool, the Forecast Range worksheet allows What-If analysis of Low, Median, and High forecasts, and graphs the results. The Chart worksheet is formatted to print the graph.
- **Config:** Contains VLookup tables used by drop-down menus.
- **SANDAG S13:** This contains the custom SANDAG Series 13 (Final) data by District PZ.
- **Sum MGD, Sum GPD:** These worksheets provide static summaries of recent historical use by PZ and customer class.

INSTRUCTIONS:

1) **General:** The pale green shaded cells designate user inputs. Use these, and the drop-down boxes, to adjust the forecast parameters. Development Notes included with key calculation worksheets provide additional instruction and documentation.
2) **Interface with Sales Data and SANDAG Data:** The spreadsheet utilizes data on historical sales and per account sales contained in the ZB Sum worksheets. The data in these worksheets is static, and has been pasted in (as Values) from billing system data sorted in the companion Sales Query spreadsheet. If the data in the Sales Query worksheet is updated, those new values will need to be pasted into the Demand Forecast spreadsheet. Also, both worksheets utilize the same SANDAG S13 worksheet. Any changes to the S13 data will need to be entered into both spreadsheets.

VERSION NOTES:

V1 -- 01/04/16: Original version for distribution.

V1a -- 01/08/16: Updated to reflect District reclassification of some accounts to Ag, pere new RWQCB-consistent District account codes.

Rainbow Water Demand Forecast Worksheet

DRAFT 01/08/16

Unit Use Factor Adjustments -- Individual Component Detail

2013 Approximate Use per account (gpd):

District Avg.	SFR -- Total	778
" "	PPH	2.57
" "	SFR -- Outdoor	611
" "	SFR % Outdoor	79%
	MFR -- Total	150
	MFR -- Outdoor	20
	SFR/MFR Indoor Per Cap. -- Typical	65

Price Response / Additional Behavioral

Price-Elasticity Coefficients

RES	COM	AG
-0.20	-0.05	-0.20

Real price Δ by 2050:	Increased 50%	50%
Residential Price-Elasticity		-0.20
COM Price-Elasticity		-0.05
AG Price-Elasticity		-0.20
Expected 2050 response - RES		-10.0%
Expected 2050 response - COM		-2.5%
Expected 2050 response - AG		-10.0%
Estimated RES behavioral component		40%
Adjusted RES 2050 response		-4.0%
RES 2050 change (scale factor)		0.960
COM 2050 change (scale factor)		0.975
C/AG 2050 change (scale factor)		0.900

Source / Notes: Price Increase: District estimate based on SDCWA projections;

P-E: District estimate based on SDCWA Board memo December 2011;

Behavioral Component: This is the non-hardware, behavioral portion of conservation not already accounted for by the other factors. District estimate.

High-Efficiency Clothes Washers

SFR Δ Penetration by 2050 (vs. 2013):	35%
MFR Δ Penetration by 2050 (vs. 2013):	10%
Usage change per (gpd):	-10
SFR 2050 change (gpd):	-4
SFR 2050 change (scale factor):	0.996
MFR 2050 change (gpd):	-1
MFR 2050 change (scale factor):	0.993

Source: Savings rate: EPA WaterSense, adjusted downward from 16 gpd for a four person household, to District PPH = 2.5.

Landscape Ordinance

Outdoor change - New SFR (%)	-20%
Outdoor change - New SFR (gpd)	-122
New SFR 2050 change (scale factor):	0.843
New C/AG 2050 change (%)	0.0%
New C/AG 2050 change (scale factor)	1.000

Source: Reduction percentages are District estimates based on the requirements of the Landscape Ordinance and based on the extensive use of turf in District developments pre-dating the

Weather-Based C/AGigation Controllers

Δ SFR Penetration by 2050 (change vs. 2013):	50%
Outdoor change per controller:	-6%
SFR 2050 change District Avg. (gpd):	-18
SFR 2050 change (scale factor):	0.976
C/AG 2050 change (%)	-3.0%
C/AG 2050 change (scale factor)	0.970

Source: Savings rate: MWDSC/EBMUD for DWR: "Evaluation of California Weather-Based 'Smart' Irrigation Programs", July 2009

Penetration rate: District estimate

Turf Retirement (Existing Customers)

Δ Front yard retirements by 2050 (vs. 2013):	15%
Outdoor useage change per:	-25%
SFR 2050 reduction (gpd):	-23
SFR 2050 reduction (scale factor):	0.971
C/AG retrofits by 2050	0%
C/AG Usage change per:	-20%
C/AG 2050 reduction (scale factor):	1.000

Source: District estimates

Warming Temperatures

ETo change by 2050:	2.9%
SFR 2050 change (gpd):	18
SFR 2050 change (scale factor):	1.023
C/AG 2050 change (scale factor)	1.029

Source: SDCWA 2013 Water Facilities Master Plan, Appendix E: "Analysis of Potential Climate Effects on Water Authority Demands." The ETo percentage increase for 2050 is derived from Table 2, which shows a 1.8% increase for the District

High-Efficiency Toilets

Δ Penetration by 2050 (vs. 2013):	25%
New customer penetration:	100%
Usage change per SFR/MFR (gpd):	-4
Exist. SFR/MFR 2050 change (scale factor):	0.999
New SFR/MFR 2050 change (scale factor):	0.995

Source: Savings rate: Based on District PPH of 2.5, 5 flushes per day per person (AWWARF "Residential End Uses of Water", 1999), and savings of 0.32 gpf (1.28 gpf vs. 1.6 gpf for 1992 Code)

Rainbow Water Demand Forecast Worksheet

Unit Use Factor Adjustments

	Total District		
2013	2020	2035	2050
SUMMARY			
EXISTING ACCOUNTS			
RES	0.99	0.95	0.92
COM	1.00	1.00	1.00
AG	0.99	0.96	0.93
NEW ACCOUNTS			
RES	0.79	0.78	0.77
COM			
AG			

SUMMARY -- BY COMPONENT			
2013 SFR Total per Account (gpd):			778
2013 SFR Outdoor per Account (gpd):			611
EXISTING ACCOUNTS			
RES CUSTOMERS			
Weather-Based Irr. Controllers	1.00	0.99	0.98
Turf Retirement	0.99	0.98	0.97
Warming Temperatures	1.00	1.01	1.02
Subtotal Irrigation (multiplicative)	*0.99*	*0.98*	*0.97*
HE Clothes Washers	1.00	1.00	1.00
HE Toilets	1.00	1.00	1.00
Price Response / Adtl. Behavioral	0.99	0.98	0.96
Subtotal Indoor (additive)	*0.99*	*0.97*	*0.95*
TOTAL	0.99	0.95	0.92
COM CUSTOMERS			
Price Response	1.00	0.99	0.98
Warming Temperatures	1.01	1.02	1.03
TOTAL	1.00	1.00	1.00
AG CUSTOMERS			
Price Response	0.98	0.94	0.90
Warming Temperatures	1.01	1.02	1.03
TOTAL	0.99	0.96	0.93
NEW ACCOUNTS			
RES CUSTOMERS			
Landscape Ordinance	0.84	0.84	0.84
Weather-Based Irr. Controllers	0.95	0.95	0.95
Warming Temperatures	1.00	1.01	1.02
Subtotal Irrigation (multiplicative)	*0.81*	*0.81*	*0.82*
HE Clothes Washers	1.00	1.00	1.00
HE Toilets	0.99	0.99	0.99
Price Response / Adtl. Behavioral	0.99	0.98	0.96
Subtotal Indoor (additive)	*0.98*	*0.97*	*0.95*
TOTAL	0.79	0.78	0.77

Adjusted SANDAG Series 13 Growth Forecast, by PZ					per SANDAG				DRAFT 01/08/16	
Pressure Zone	**Year**	**Total Pop**	**HH Pop**	**GQ Pop**	**Total Housing Units**	**SFR Units**	**MFR Units**	**Mobile Home Units**	**Total Employment**	**PPH (HH pop)**
North	2012	962	962	-	326	319	-	7	1,050	2.95
	2020	1,011	1,011	-	350	343	-	7	1,048	2.89
	2035	1,074	1,074	-	364	357	-	7	1,261	2.95
	2050	1,080	1,080	-	361	354	-	7	1,466	2.99
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.05	1.05	-	1.07	1.08	-	1.00	1.00	0.98
	*2035	1.12	1.12	-	1.12	1.12	-	1.00	1.20	1.00
	*2050	1.12	1.12	-	1.11	1.11	-	1.00	1.40	1.01
U1	2012	337	337	-	181	76	-	105	14	1.86
	2020	552	552	-	276	171	-	105	18	2.00
	2035	869	869	-	430	325	-	105	18	2.02
	2050	993	993	-	487	382	-	105	18	2.04
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.64	1.64	-	1.52	2.25	-	1.00	1.29	1.07
	*2035	2.58	2.58	-	2.38	4.28	-	1.00	1.29	1.09
	*2050	2.95	2.95	-	2.69	5.03	-	1.00	1.29	1.10
Vallecitos	2012	153	153	-	44	44	-	-	60	3.48
	2020	131	131	-	44	44	-	-	96	2.98
	2035	141	141	-	45	45	-	-	99	3.13
	2050	140	140	-	47	47	-	-	242	2.98
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	0.86	0.86	-	1.00	1.00	-	-	1.60	0.86
	*2035	0.92	0.92	-	1.02	1.02	-	-	1.65	0.90
	*2050	0.92	0.92	-	1.07	1.07	-	-	4.03	0.86
Rainbow Heights	2012	493	404	89	146	146	-	-	60	2.77
	2020	519	433	86	147	147	-	-	68	2.95
	2035	665	578	87	191	191	-	-	68	3.03
	2050	712	625	87	205	205	-	-	75	3.05
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.05	1.07	0.97	1.01	1.01	-	-	1.13	1.06
	*2035	1.35	1.43	0.98	1.31	1.31	-	-	1.13	1.09
	*2050	1.44	1.55	0.98	1.40	1.40	-	-	1.25	1.10
Magee	2012	172	172	-	57	57	-	-	11	3.02
	2020	193	193	-	57	57	-	-	22	3.39
	2035	192	192	-	57	57	-	-	22	3.37
	2050	190	190	-	57	57	-	-	22	3.33
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.12	1.12	-	1.00	1.00	-	-	2.00	1.12
	*2035	1.12	1.12	-	1.00	1.00	-	-	2.00	1.12
	*2050	1.10	1.10	-	1.00	1.00	-	-	2.00	1.10
Gomez	2012	262	262	-	105	105	-	-	27	2.50
	2020	324	324	-	114	114	-	-	25	2.84
	2035	419	419	-	141	141	-	-	25	2.97
	2050	451	451	-	151	151	-	-	26	2.99
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.24	1.24	-	1.09	1.09	-	-	0.93	1.14
	*2035	1.60	1.60	-	1.34	1.34	-	-	0.93	1.19
	*2050	1.72	1.72	-	1.44	1.44	-	-	0.96	1.20
Northside	2012	938	938	-	345	345	-	-	158	2.72
	2020	952	952	-	346	346	-	-	97	2.75
	2035	1,065	1,065	-	385	385	-	-	99	2.77
	2050	1,054	1,054	-	383	383	-	-	99	2.75
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.01	1.01	-	1.00	1.00	-	-	0.61	1.01
	*2035	1.14	1.14	-	1.12	1.12	-	-	0.63	1.02
	*2050	1.12	1.12	-	1.11	1.11	-	-	0.63	1.01

Pressure Zone	Year	Total Pop	HH Pop	GQ Pop	Total Housing Units	SFR Units	MFR Units	Mobile Home Units	Total Employment	PPH (HH pop)
Canonita	2012	2,144	2,144	-	961	853	-	108	400	2.23
	2020	2,490	2,490	-	1,086	978	-	108	384	2.29
	2035	2,948	2,948	-	1,233	1,125	-	108	384	2.39
	2050	2,895	2,895	-	1,233	1,125	-	108	384	2.35
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.16	1.16	-	1.13	1.15	-	1.00	0.96	1.03
	*2035	1.38	1.38	-	1.28	1.32	-	1.00	0.96	1.07
	*2050	1.35	1.35	-	1.28	1.32	-	1.00	0.96	1.05
Pala Mesa	2012	4,927	4,918	9	2,011	1,771	10	230	450	2.45
	2020	6,781	6,777	4	2,682	2,442	10	230	650	2.53
	2035	7,634	7,624	10	3,020	2,780	10	230	1,311	2.52
	2050	7,749	7,736	13	3,074	2,834	10	230	1,820	2.52
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.38	1.38	0.44	1.33	1.38	1.00	1.00	1.44	1.03
	*2035	1.55	1.55	1.11	1.50	1.57	1.00	1.00	2.91	1.03
	*2050	1.57	1.57	1.44	1.53	1.60	1.00	1.00	4.04	1.03
South	2012	2,769	2,769	-	1,228	1,062	-	166	1,000	2.25
	2020	3,006	3,006	-	1,265	1,099	-	166	975	2.38
	2035	3,395	3,395	-	1,399	1,233	-	166	1,064	2.43
	2050	3,440	3,440	-	1,423	1,257	-	166	1,239	2.42
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.09	1.09	-	1.03	1.03	-	1.00	0.98	1.05
	*2035	1.23	1.23	-	1.14	1.16	-	1.00	1.06	1.08
	*2050	1.24	1.24	-	1.16	1.18	-	1.00	1.24	1.07
Morro	2012	5,967	5,868	99	2,348	2,028	320	-	1,750	2.50
	2020	6,939	6,851	88	2,678	2,358	320	-	1,655	2.56
	2035	8,917	8,807	110	3,396	3,076	320	-	1,661	2.59
	2050	8,978	8,853	125	3,444	3,124	320	-	1,849	2.57
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.16	1.17	0.89	1.14	1.16	1.00	-	0.95	1.02
	*2035	1.49	1.50	1.11	1.45	1.52	1.00	-	0.95	1.04
	*2050	1.50	1.51	1.26	1.47	1.54	1.00	-	1.06	1.03
Morro Tank	2012	869	869	-	362	362	-	-	180	2.40
	2020	891	891	-	369	369	-	-	67	2.41
	2035	900	900	-	371	371	-	-	67	2.43
	2050	888	888	-	368	368	-	-	67	2.41
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.03	1.03	-	1.02	1.02	-	-	0.37	1.01
	*2035	1.04	1.04	-	1.02	1.02	-	-	0.37	1.01
	*2050	1.02	1.02	-	1.02	1.02	-	-	0.37	1.01
TOTAL DISTRICT	2012	19,993	19,796	197	8,114	7,168	330	616	5,160	2.44
	2020	23,789	23,611	178	9,414	8,468	330	616	5,105	2.51
	2035	28,219	28,012	207	11,032	10,086	330	616	6,079	2.54
	2050	28,570	28,345	225	11,233	10,287	330	616	7,307	2.52
		Ratios vs. 2012 (Scale Factors, Sf)								
	*2020	1.19	1.19	0.90	1.16	1.18	1.00	1.00	0.99	1.03
	*2035	1.41	1.42	1.05	1.36	1.41	1.00	1.00	1.18	1.04
	*2050	1.43	1.43	1.14	1.38	1.44	1.00	1.00	1.42	1.03

Demand Forecast Scale Factors, by Pressure Zone		With Conservation Factors x 1				DRAFT 01/08/16
Pressure Zone		**2020**	**2035**	**2050**	**2013 % of Total Use**	**Notes**
North	Net Δ Unit Use -- RES	-3%	-6%	-9%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.04	1.05	1.01		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
U1	Net Δ Unit Use -- RES	-8%	-15%	-17%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.41	2.05	2.25		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Vallecitos	Net Δ Unit Use -- RES	-1%	-5%	-9%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	0.92	0.93	0.91		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Rainbow Heights	Net Δ Unit Use -- RES	-2%	-9%	-12%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.01	1.23	1.27		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Magee	Net Δ Unit Use -- RES	-1%	-5%	-8%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.03	0.99	0.96		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Gomez	Net Δ Unit Use -- RES	-3%	-9%	-12%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.08	1.27	1.31		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Northside	Net Δ Unit Use -- RES	-1%	-6%	-9%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	0.99	1.05	1.01		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		

Net Change Unit Use: These cells calculate the weighted average of the Existing and New Customer adjustments from the Unit Use Adjustments worksheet, using the appropriate factors from the Scaling Factor table (SFR Units, MFR Units, and Employment). For example, for an SFR growth scaling factor of 1.38 (Zone B, 2050), the calculation is {(1 x Existing) + (0.38 x New)} / 1.38. The MFR and COM calculation cells do the same calculation (using Employment for COM) but check to see if the scaling factor is > 1 and adjust accordingly. The IRR calculates its own scaling factor as the weighted average of the SFR, MFR, and COM scaling factors, weighted by 2013 % of total water use, and uses this to calculate the weighted average of Existing and New. These cells adjust according to the selected Conservation Factor Index selected in the drop-down box in the title bar, e.g., they all go to 0% if the conservation index is set to "Without Conservation."

2013 % of Total Water Use: Calculated from data in the ZB Sum MGD worksheet. The percentages are used in the Net Change in Unit Use calculation for COM customers as described above.

Demand Scale Factors (blue-shaded cells): These calculate the demand increase relative to 2013 for each customer type and service area. For SFR and MFR, the calculation sequence is Growth Scale Factor, x Net Change Unit Use (1 minus the Change %), x a factor to account for any change in the Persons Per Household (PPH) data. The application of the PPH adjustment assumes the change in household size affects only indoor water use, and so applies to the ratio of indoor to outdoor use for account type (SFR, MFR) and service area.

Pressure Zone		2020	2035	2050	2013 % of Total Use	Notes
Canonita	Net Δ Unit Use -- RES	-4%	-8%	-11%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.09	1.19	1.15		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Pala Mesa	Net Δ Unit Use -- RES	-6%	-10%	-13%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.26	1.36	1.34		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
South	Net Δ Unit Use -- RES	-2%	-7%	-10%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.02	1.08	1.06		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Morro	Net Δ Unit Use -- RES	-4%	-10%	-12%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.10	1.31	1.29		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
Morro Tank	Net Δ Unit Use -- RES	-2%	-5%	-8%		
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	RES	1.00	0.98	0.94		
	COM	1.00	1.00	1.00		
	AG	0.99	0.96	0.93		
TOTAL DISTRICT	Net Δ Unit Use -- RES	-4%	-9%	-12%		For error checking only. Not used in forecast calculations. (The forecast for Total District is the sum of the individual ZBs.)
	Net Δ Unit Use -- COM	0%	0%	0%		
	Net Δ Unit Use -- AG	-1%	-4%	-7%		
	Net Δ Unit Use -- TEMP					
	SFR	1.11	1.24	1.22		
	MFR	1.00	1.00	1.00		
	COM	0.99	0.96	0.93		
	IRR					

Rainbow MWD DEMAND FORECAST BY PZ

DRAFT 01/08/16

Baseline Unit Use Adj.	Growth Rate Adj.	Real Price Increase (2050)	Price-Elasticity Coefficients RES	COM	AG
-5.0% Adjustment	per SANDAG	Increased 50%	-0.20	-0.05	-0.20

Calendar Year	2013 MGD	2020 MGD	2035 MGD	2050 MGD	2020 Factor	2035 Factor	2050 Factor
North -- SALES (MGD)							
RES	0.09	0.09	0.09	0.08	1.04	1.05	1.01
COM	0.04	0.04	0.04	0.04	1.00	1.00	1.00
AG	1.71	1.61	1.56	1.51	0.99	0.96	0.93
TEMP	-	-	-	-			
TOTAL	**1.84**	**1.73**	**1.68**	**1.63**	**-6%**	**-9%**	**-11%**
U1 -- SALES (MGD)							
RES	0.06	0.08	0.11	0.12	1.41	2.05	2.25
COM	0.01	0.01	0.01	0.01	1.00	1.00	1.00
AG	0.10	0.09	0.09	0.09	0.99	0.96	0.93
TEMP	-	-	-	-			
TOTAL	**0.16**	**0.17**	**0.21**	**0.21**	**8%**	**27%**	**32%**
Vallecitos -- SALES (MGD)							
RES	0.01	0.01	0.01	0.01	0.92	0.93	0.91
COM	0.00	0.00	0.00	0.00	1.00	1.00	1.00
AG	0.23	0.22	0.21	0.21	0.99	0.96	0.93
TEMP	-	-	-	-			
TOTAL	**0.25**	**0.23**	**0.23**	**0.22**	**-7%**	**-9%**	**-12%**
Rainbow Heights -- SALES (MGD)							
RES	0.06	0.05	0.06	0.07	1.01	1.23	1.27
COM	0.00	0.00	0.00	0.00	1.00	1.00	1.00
AG	0.42	0.39	0.38	0.37	0.99	0.96	0.93
TEMP	-	0.01	0.01	0.01			
TOTAL	**0.48**	**0.46**	**0.46**	**0.45**	**-4%**	**-4%**	**-6%**
Magee -- SALES (MGD)							
RES	0.03	0.02	0.02	0.02	1.03	0.99	0.96
COM	-	-	-	-	1.00	1.00	1.00
AG	0.01	0.01	0.01	0.01	0.99	0.96	0.93
TEMP	-	-	-	-			
TOTAL	**0.03**	**0.03**	**0.03**	**0.03**	**-3%**	**-6%**	**-10%**
Gomez -- SALES (MGD)							
RES	0.04	0.04	0.05	0.05	1.08	1.27	1.31
COM	0.00	0.00	0.00	0.00	1.00	1.00	1.00
AG	0.49	0.46	0.44	0.43	0.99	0.96	0.93
TEMP	-	-	-	-			
TOTAL	**0.53**	**0.50**	**0.49**	**0.48**	**-6%**	**-7%**	**-9%**
Northside -- SALES (MGD)							
RES	0.14	0.13	0.14	0.13	0.99	1.05	1.01
COM	0.01	0.01	0.01	0.01	1.00	1.00	1.00
AG	0.94	0.88	0.86	0.83	0.99	0.96	0.93
TEMP	-	-	-	-			
TOTAL	**1.09**	**1.02**	**1.00**	**0.97**	**-6%**	**-8%**	**-11%**
Canonita -- SALES (MGD)							
RES	0.45	0.47	0.51	0.49	1.09	1.19	1.15
COM	0.04	0.04	0.04	0.04	1.00	1.00	1.00
AG	1.25	1.17	1.14	1.10	0.99	0.96	0.93
TEMP	-	0.01	0.01	0.01			
TOTAL	**1.74**	**1.69**	**1.69**	**1.64**	**-3%**	**-3%**	**-6%**
Pala Mesa -- SALES (MGD)							
RES	0.86	1.03	1.11	1.10	1.26	1.36	1.34
COM	0.05	0.05	0.05	0.05	1.00	1.00	1.00
AG	1.04	0.98	0.95	0.92	0.99	0.96	0.93
TEMP	-	0.01	0.01	0.01			
TOTAL	**1.96**	**2.07**	**2.12**	**2.08**	**6%**	**8%**	**6%**

Rainbow MWD DEMAND FORECAST BY PZ — DRAFT 01/08/16

Baseline Unit Use Adj.	Growth Rate Adj.	Real Price Increase (2050)	Price-Elasticity Coefficients RES	COM	AG
-5.0% Adjustment	per SANDAG	Increased 50%	-0.20	-0.05	-0.20

Calendar Year	2013		2020	2035	2050	2020	2035	2050
South -- SALES (MGD)								
RES	0.22		0.21	0.23	0.22	1.02	1.08	1.06
COM	0.22		0.21	0.21	0.21	1.00	1.00	1.00
AG	4.28		4.01	3.89	3.77	0.99	0.96	0.93
TEMP	-		0.01	0.01	0.01			
TOTAL	**4.72**		**4.44**	**4.34**	**4.21**	**-6%**	**-8%**	**-11%**
Morro -- SALES (MGD)								
RES	1.11		1.16	1.38	1.36	1.10	1.31	1.29
COM	0.15		0.14	0.14	0.14	1.00	1.00	1.00
AG	2.40		2.25	2.18	2.11	0.99	0.96	0.93
TEMP	-		0.01	0.01	0.01			
TOTAL	**3.65**		**3.56**	**3.71**	**3.62**	**-3%**	**2%**	**-1%**
Morro Tank -- SALES (MGD)								
RES	0.13		0.12	0.12	0.11	1.00	0.98	0.94
COM	0.00		0.00	0.00	0.00	1.00	1.00	1.00
AG	0.29		0.27	0.26	0.25	0.99	0.96	0.93
TEMP	-		-	-	-			
TOTAL	**0.42**		**0.39**	**0.38**	**0.37**	**-6%**	**-8%**	**-12%**
TOTAL DISTRICT -- SALES						% Change vs. 2013		
RES	3.19		3.42	3.84	3.78	7%	20%	19%
COM	0.52		0.49	0.50	0.50	-5%	-5%	-5%
AG	13.16		12.33	11.96	11.58	-6%	-9%	-12%
TEMP	-		0.05	0.05	0.05	0%	0%	0%
TOTAL	**16.87**		**16.30**	**16.34**	**15.90**	**-3%**	**-3%**	**-6%**
TOTAL DISTRICT -- DELIVERIES (MGD)					13.9%	% Change vs. 2013		
RES	3.63		3.90	4.37	4.31	7%	20%	19%
COM	0.59		0.56	0.56	0.57	-5%	-5%	-5%
AG	14.99		14.04	13.62	13.19	-6%	-9%	-12%
TEMP	0.00		0.06	0.06	0.06	0%	0%	0%
TOTAL	**19.21**		**18.56**	**18.61**	**18.12**	**-3%**	**-3%**	**-6%**
TOTAL DISTRICT -- DELIVERIES (AF/yr)					1,120	% Change vs. 2013		
RES	4,070		4,370	4,890	4,820	7%	20%	18%
COM	660		630	630	630	-5%	-5%	-5%
AG	16,780		15,730	15,260	14,770	-6%	-9%	-12%
TEMP	-		60	60	60	0%	0%	0%
TOTAL	**21,500**		**20,800**	**20,800**	**20,300**	**-3%**	**-3%**	**-6%**
GPCD (Deliveries)						% Change vs. 2013		
Employment	5,160		5,105	6,079	7,307	-1%	18%	42%
Population	19,993		23,789	28,219	28,570	19%	41%	43%
GPCD	**961**		**780**	**660**	**634**	**SB7 2020 target =**		**1,168 GPCD**
Deliveries @ SB7 Target	26,200		31,100	36,900	37,400			

Notes:

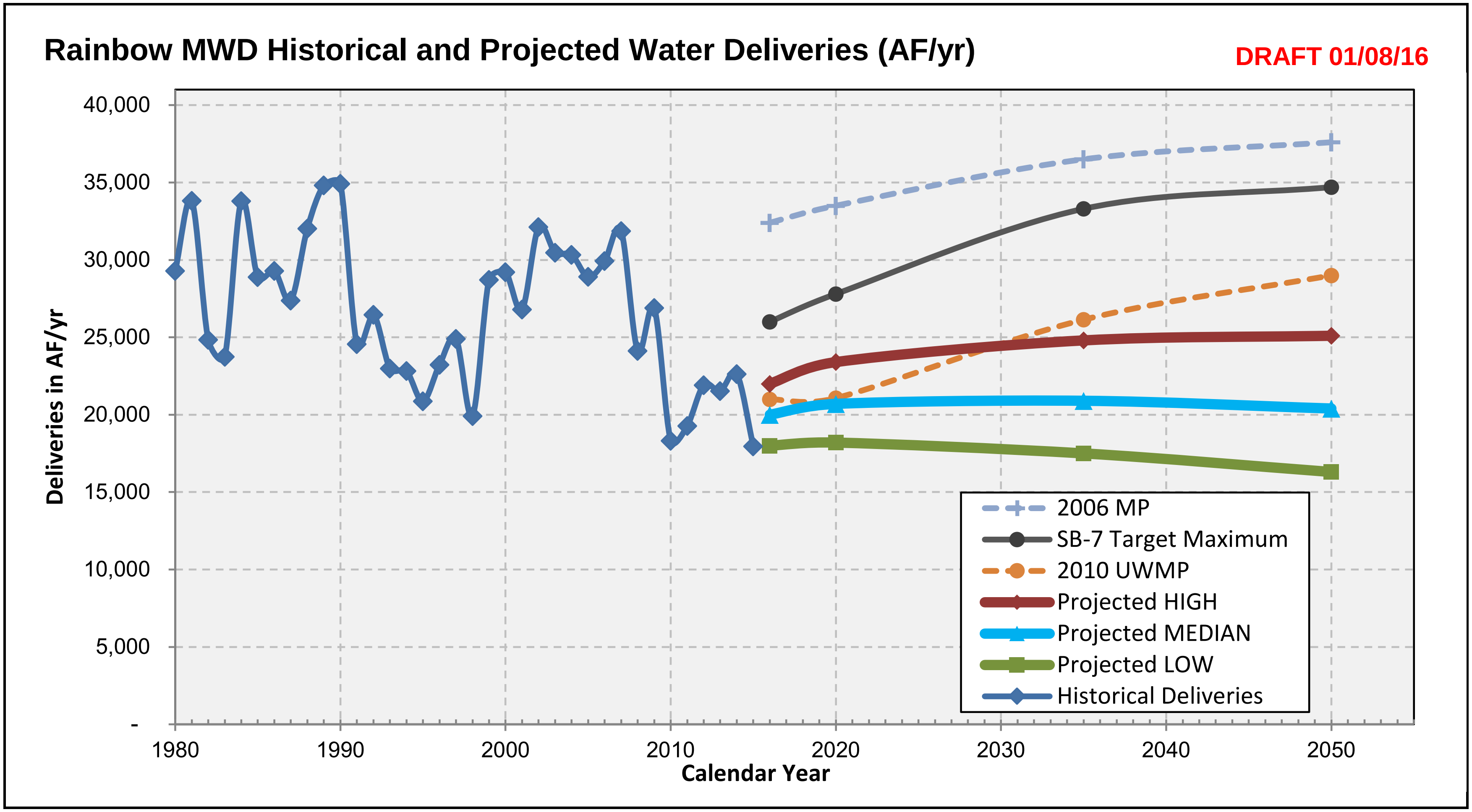
Rainbow MWD PEAK DELIVERY FORECAST BY PZ					DRAFT 01/08/16
Zone	Adjusted to 2035 Deliveries 13.9% MGD	Peak Week Factor	Peak Day Factor	2035 Peak Week Deliveries MGD	2035 Peak Day Deliveries MGD
North					
RES	0.10	1.60	1.80	0.16	0.18
COM	0.04	1.80	2.00	0.07	0.08
AG	1.77	1.80	2.00	3.19	3.55
TEMP	-	2.00	2.50	-	-
TOTAL	**1.91**	1.79	1.99	**3.42**	**3.81**
U1					
RES	0.13	1.60	1.80	0.20	0.23
COM	0.01	1.80	2.00	0.01	0.01
AG	0.10	1.80	2.00	0.19	0.21
TEMP	-	2.00	2.50	-	-
TOTAL	**0.24**	1.69	1.89	**0.40**	**0.44**
Vallecitos					
RES	0.01	1.60	1.80	0.02	0.02
COM	0.00	1.80	2.00	0.01	0.01
AG	0.24	1.80	2.00	0.44	0.49
TEMP	-	2.00	2.50	-	-
TOTAL	**0.26**	1.79	1.99	**0.46**	**0.52**
Rainbow Heights					
RES	0.07	1.60	1.80	0.12	0.13
COM	0.00	1.80	2.00	0.00	0.00
AG	0.44	1.80	2.00	0.78	0.87
TEMP	0.01	2.00	2.50	0.02	0.03
TOTAL	**0.52**	1.78	1.98	**0.92**	**1.03**
Magee					
RES	0.03	1.60	1.80	0.04	0.05
COM	-	1.80	2.00	-	-
AG	0.01	1.80	2.00	0.01	0.01
TEMP	-	2.00	2.50	-	-
TOTAL	**0.03**	1.64	1.84	**0.06**	**0.06**
Gomez					
RES	0.06	1.60	1.80	0.09	0.10
COM	0.00	1.80	2.00	0.00	0.00
AG	0.50	1.80	2.00	0.91	1.01
TEMP	-	2.00	2.50	-	-
TOTAL	**0.56**	1.78	1.98	**1.00**	**1.11**
Northside					
RES	0.16	1.60	1.80	0.25	0.29
COM	0.01	1.80	2.00	0.02	0.02
AG	0.97	1.80	2.00	1.75	1.95
TEMP	-	2.00	2.50	-	-
TOTAL	**1.14**	1.77	1.97	**2.03**	**2.26**
Canonita					
RES	0.58	1.60	1.80	0.93	1.04
COM	0.04	1.80	2.00	0.08	0.09
AG	1.29	1.80	2.00	2.33	2.59
TEMP	0.01	2.00	2.50	0.02	0.03
TOTAL	**1.93**	1.74	1.94	**3.36**	**3.75**
Pala Mesa					
RES	1.27	1.60	1.80	2.03	2.28
COM	0.06	1.80	2.00	0.10	0.12
AG	1.08	1.80	2.00	1.94	2.16
TEMP	0.01	2.00	2.50	0.02	0.03
TOTAL	**2.42**	1.70	1.90	**4.10**	**4.58**

Rainbow MWD PEAK DELIVERY FORECAST BY PZ					DRAFT 01/08/16
Zone	Adjusted to 2035 Deliveries 13.9%	Peak Week	Peak Day	2035 Peak Week Deliveries	2035 Peak Day Deliveries
South					
RES	0.26	1.60	1.80	0.41	0.47
COM	0.24	1.80	2.00	0.43	0.47
AG	4.43	1.80	2.00	7.98	8.86
TEMP	0.01	2.00	2.50	0.02	0.03
TOTAL	**4.94**	1.79	1.99	**8.84**	**9.83**
Morro					
RES	1.57	1.60	1.80	2.52	2.83
COM	0.16	1.80	2.00	0.29	0.32
AG	2.48	1.80	2.00	4.47	4.96
TEMP	0.01	2.00	2.50	0.02	0.03
TOTAL	**4.23**	1.73	1.93	**7.29**	**8.14**
Morro Tank					
RES	0.13	1.60	1.80	0.21	0.24
COM	0.01	1.80	2.00	0.01	0.01
AG	0.30	1.80	2.00	0.53	0.59
TEMP	-	2.00	2.50	-	-
TOTAL	**0.43**	1.74	1.94	**0.76**	**0.84**
TOTAL DISTRICT					
RES	4.37	1.60	1.80	6.99	7.87
COM	0.56	1.80	2.00	1.02	1.13
AG	13.62	1.80	2.00	24.52	27.24
TEMP	0.06	2.00	2.50	0.11	0.14
TOTAL	**18.61**	1.75	1.95	**32.64**	**36.38**

Rainbow MWD DEMAND FORECAST RANGE (DELIVERIES, AF/yr)

DRAFT 01/08/16

		2016	2020	2035	2050	% Change vs. 2013 2020	2035	2050
LOW	TOTAL	18,000	18,200	17,500	16,300	-1%	-3%	-9%
	Baseline Adjustment:		-15%		Real Price Increase:	100%		
	Growth Rate:		Reduced -25%		P-E (R/C/A):	-0.20	-0.05	-0.20
MEDIAN	TOTAL	20,000	20,700	20,900	20,400	2%	3%	0%
	Baseline Adjustment:		-5%		Real Price Increase:	50%		
	Growth Rate:		per SANDAG		P-E (R/C/A):	-0.20	-0.05	-0.20
HIGH	TOTAL	22,000	23,400	24,800	25,100	4%	11%	12%
	Baseline Adjustment:		5%		Real Price Increase:	0%		
	Growth Rate:		Increased 25%		P-E (R/C/A):	-0.20	-0.05	-0.20
HIGH (SB7 gpcd)	TOTAL	22,100	24,000	27,500	28,800	18%	35%	41%
	Other: Water use set at SB7 2020 Target Rate of					900	gpcd.	-1,000
2010 UWMP	TOTAL	21,000	21,070	26,137	29,000	3%	28%	42%
2006 MP	TOTAL	32,400	33,500	36,500	37,600	64%	79%	84%


Rainbow MWD Historical and Projected Water Deliveries (AF/yr)
DRAFT 01/08/16
40,000
35,000
30,000
25,000
20,000
15,000
10,000
5,000
-
Deliveries in AF/yr
1980
1990
2000
2010
2020
2030
2040
2050
Calendar Year
2006 MP
SB-7 Target Maximum
2010 UWMP
Projected HIGH
Projected MEDIAN
Projected LOW
Historical Deliveries

Rainbow MWD -- SANDAG Series 13 Report by Pressure Zone **DRAFT 01/08/16**

	year	population	household population	group quarters population	total housing units	single family housing units	multi-family housing units	home housing units	total households	single family households	multi-family households	mobile home households	employment	PPH
NORTH	2012	962	962	0	326	319	0	7	326	319	0	7	0	2.95
	2020	1,011	1,011	0	350	343	0	7	350	343	0	7	1,048	2.89
	2035	1,074	1,074	0	364	357	0	7	359	352	0	7	1,261	2.95
	2050	1,080	1,080	0	361	354	0	7	354	348	0	6	1,466	2.99
	Δ	118	118	0	35	35	0	0	28	29	0	-1	418	0.04
	Δ (%)	12%	12%	--	11%	11%	--	0%	9%	9%	--	-14%	40%	1%
U1TANK	2012	337	337	0	181	76	0	105	181	76	0	105	0	1.86
	2020	552	552	0	276	171	0	105	276	171	0	105	18	2.00
	2035	869	869	0	430	325	0	105	430	325	0	105	18	2.02
	2050	993	993	0	487	382	0	105	486	381	0	105	18	2.04
	Δ	656	656	0	306	306	0	0	305	305	0	0	0	0.18
	Δ (%)	195%	195%	--	169%	403%	--	0%	169%	401%	--	0%	0%	10%
VALLECITOS	2012	153	153	0	44	44	0	0	44	44	0	0	0	3.48
	2020	131	131	0	44	44	0	0	44	44	0	0	96	2.98
	2035	141	141	0	45	45	0	0	45	45	0	0	99	3.13
	2050	140	140	0	47	47	0	0	47	47	0	0	242	2.98
	Δ	-13	-13	0	3	3	0	0	3	3	0	0	146	-0.50
	Δ (%)	-8%	-8%	--	7%	7%	--	--	7%	7%	--	--	152%	-14%
RAINBOW HEIGHTS	2012	493	404	89	146	146	0	0	146	146	0	0	0	3.38
	2020	519	433	86	147	147	0	0	147	147	0	0	68	3.53
	2035	665	578	87	191	191	0	0	191	191	0	0	68	3.48
	2050	712	625	87	205	205	0	0	205	205	0	0	75	3.47
	Δ	656	656	0	306	306	0	0	305	305	0	0	0	0.18
	Δ (%)	195%	195%	--	169%	403%	--	0%	169%	401%	--	0%	0%	10%
MAGEE	2012	172	172	0	57	57	0	0	57	57	0	0	0	3.02
	2020	193	193	0	57	57	0	0	57	57	0	0	22	3.39
	2035	192	192	0	57	57	0	0	57	57	0	0	22	3.37
	2050	190	190	0	57	57	0	0	57	57	0	0	22	3.33
	Δ	-13	-13	0	3	3	0	0	3	3	0	0	146	-0.50
	Δ (%)	-8%	-8%	--	7%	7%	--	--	7%	7%	--	--	152%	-14%
GOMEZ CREEK	2012	262	262	0	105	105	0	0	105	105	0	0	0	2.50
	2020	324	324	0	114	114	0	0	114	114	0	0	25	2.84
	2035	419	419	0	141	141	0	0	141	141	0	0	25	2.97
	2050	451	451	0	151	151	0	0	151	151	0	0	26	2.99
	Δ	219	221	-2	59	59	0	0	59	59	0	0	7	0.10
	Δ (%)	44%	55%	-2%	40%	40%	--	--	40%	40%	--	--	10%	3%
NORTHSIDE	2012	938	938	0	345	345	0	0	345	345	0	0	0	2.72
	2020	952	952	0	346	346	0	0	345	345	0	0	97	2.75
	2035	1,065	1,065	0	385	385	0	0	382	382	0	0	99	2.77
	2050	1,054	1,054	0	383	383	0	0	379	379	0	0	99	2.75
	Δ	18	18	0	0	0	0	0	0	0	0	0	0	0.32
	Δ (%)	10%	10%	--	0%	0%	--	--	0%	0%	--	--	0%	10%
CANONITA	2012	2,144	2,144	0	961	853	0	108	924	816	0	108	0	2.23
	2020	2,490	2,490	0	1,086	978	0	108	1,023	916	0	107	384	2.29
	2035	2,948	2,948	0	1,233	1,125	0	108	1,208	1,101	0	107	384	2.39
	2050	2,895	2,895	0	1,233	1,125	0	108	1,190	1,085	0	105	384	2.35
	Δ	189	189	0	46	46	0	0	46	46	0	0	1	0.49
	Δ (%)	72%	72%	--	44%	44%	--	--	44%	44%	--	--	4%	20%
PALA MESA	2012	4,927	4,918	9	2,011	1,771	10	230	1,945	1,706	9	230	0	2.45
	2020	6,781	6,777	4	2,682	2,442	10	230	2,573	2,336	9	229	650	2.53
	2035	7,634	7,624	10	3,020	2,780	10	230	2,892	2,655	9	228	1,311	2.53
	2050	7,749	7,736	13	3,074	2,834	10	230	2,943	2,710	9	224	1,820	2.52
	Δ	116	116	0	38	38	0	0	34	34	0	0	2	0.03
	Δ (%)	12%	12%	--	11%	11%	--	--	10%	10%	--	--	2%	1%
SOUTH	2012	2,769	2,769	0	1,228	1,062	0	166	1,139	973	0	166	0	2.25
	2020	3,006	3,006	0	1,265	1,099	0	166	1,172	1,006	0	166	975	2.38
	2035	3,395	3,395	0	1,399	1,233	0	166	1,305	1,139	0	166	1,064	2.43
	2050	3,440	3,440	0	1,423	1,257	0	166	1,319	1,154	0	165	1,239	2.42
	Δ	751	751	0	272	272	0	0	266	269	0	-3	0	0.12
	Δ (%)	35%	35%	--	28%	32%	--	0%	29%	33%	--	-3%	0%	5%

Rainbow MWD -- SANDAG Series 13 Report by Pressure Zone														DRAFT 01/08/16
	year	population	household population	group quarters population	total housing units	single family housing units	multi-family housing units	home housing units	total households	single family households	multi-family households	mobile home households	employment	PPH
MORRO	**2012**	5,967	5,868	99	2,348	2,028	320	0	2,235	1,917	318	0	0	2.54
	2020	6,939	6,851	88	2,678	2,358	320	0	2,565	2,245	320	0	1,655	2.59
	2035	8,917	8,807	110	3,396	3,076	320	0	3,284	2,964	320	0	1,661	2.63
	2050	8,978	8,853	125	3,444	3,124	320	0	3,309	2,989	320	0	1,849	2.61
	Δ	2,822	2,818	4	1,063	1,063	0	0	998	1,004	0	-6	1,170	0.07
	Δ (%)	57%	57%	44%	53%	60%	0%	0%	51%	59%	0%	-3%	180%	3%
MORRO TANK	**2012**	869	869	0	362	362	0	0	343	343	0	0	0	2.40
	2020	891	891	0	369	369	0	0	350	350	0	0	67	2.41
	2035	900	900	0	371	371	0	0	355	355	0	0	67	2.43
	2050	888	888	0	368	368	0	0	348	348	0	0	67	2.41
	Δ	671	671	0	195	195	0	0	180	181	0	-1	264	0.16
	Δ (%)	24%	24%	--	16%	18%	--	0%	16%	19%	--	-1%	27%	7%
TOTAL DISTRICT	**2012**	**19,993**	**19,796**	**197**	**8,114**	**7,168**	**330**	**616**	**7,790**	**6,847**	**327**	**616**	--	**2.46**
	2020	**23,789**	**23,611**	**178**	**9,414**	**8,468**	**330**	**616**	**9,016**	**8,074**	**329**	**614**	**5,105**	**2.53**
	2035	**28,219**	**28,012**	**207**	**11,032**	**10,086**	**330**	**616**	**10,649**	**9,707**	**329**	**613**	**6,079**	**2.56**
	2050	**28,570**	**28,345**	**225**	**11,233**	**10,287**	**330**	**616**	**10,788**	**9,854**	**329**	**605**	**7,307**	**2.54**
	Δ	**8,577**	**8,549**	**28**	**3,119**	**3,119**	**0**	**0**	**2,998**	**3,007**	**2**	**-11**	**2,202**	**0.08**
	Δ (%)	**43%**	**43%**	**14%**	**38%**	**44%**	**0%**	**0%**	**38%**	**44%**	**1%**	**-2%**	**43%**	**3%**

Notes:
1) Custom data sort provided by SANDAG 4/8/15, per boundary shape files provided by District
2) Total employment data for 2012 not provided by SANDAG. Delta values for employment are relative to 2020

APPENDIX B
Population, Employment and Development Forecasting

Table B-1

Rainbow MWD -- SANDAG Series 13 Report by Pressure Zone														
Region / Pressure Zone	year	population	household population	group quarters population	total housing units	single family housing units	multi-family housing units	home housing units	total households	single family households	multi-family households	mobile home households	employment	Persons Per Household
NORTH DISTRICT REGION (SDCWA Connections 1, 9, 10)														
NORTH	2012	962	962	0	326	319	0	7	326	319	0	7	0	2.95
	2020	1,011	1,011	0	350	343	0	7	350	343	0	7	1,048	2.89
	2035	1,074	1,074	0	364	357	0	7	359	352	0	7	1,261	2.99
	2050	1,080	1,080	0	361	354	0	7	354	348	0	6	1,466	3.05
	Δ	118	118	0	35	35	0	0	28	29	0	-1	418	0.10
	Δ (%)	12%	12%	--	11%	11%	--	0%	9%	9%	--	-14%	40%	3%
U1TANK	2012	337	337	0	181	76	0	105	181	76	0	105	0	1.86
	2020	552	552	0	276	171	0	105	276	171	0	105	18	2.00
	2035	869	869	0	430	325	0	105	430	325	0	105	18	2.02
	2050	993	993	0	487	382	0	105	486	381	0	105	18	2.04
	Δ	656	656	0	306	306	0	0	305	305	0	0	0	0.18
	Δ (%)	195%	195%	--	169%	403%	--	0%	169%	401%	--	0%	0%	10%
VALLECITOS	2012	153	153	0	44	44	0	0	44	44	0	0	0	3.48
	2020	131	131	0	44	44	0	0	44	44	0	0	96	2.98
	2035	141	141	0	45	45	0	0	45	45	0	0	99	3.13
	2050	140	140	0	47	47	0	0	47	47	0	0	242	2.98
	Δ	-13	-13	0	3	3	0	0	3	3	0	0	146	-0.50
	Δ (%)	-8%	-8%	--	7%	7%	--	--	7%	7%	--	--	152%	-14%
RAINBOW HEIGHTS	2012	493	404	89	146	146	0	0	146	146	0	0	0	3.38
	2020	519	433	86	147	147	0	0	147	147	0	0	68	3.53
	2035	665	578	87	191	191	0	0	191	191	0	0	68	3.48
	2050	712	625	87	205	205	0	0	205	205	0	0	75	3.47
	Δ	219	221	-2	59	59	0	0	59	59	0	0	7	0.10
	Δ (%)	44%	55%	-2%	40%	40%	--	--	40%	40%	--	--	10%	3%
MAGEE	2012	172	172	0	57	57	0	0	57	57	0	0	0	3.02
	2020	193	193	0	57	57	0	0	57	57	0	0	22	3.39
	2035	192	192	0	57	57	0	0	57	57	0	0	22	3.37
	2050	190	190	0	57	57	0	0	57	57	0	0	22	3.33
	Δ	18	18	0	0	0	0	0	0	0	0	0	0	0.32
	Δ (%)	10%	10%	--	0%	0%	--	--	0%	0%	--	--	0%	10%
GOMEZ CREEK	2012	262	262	0	105	105	0	0	105	105	0	0	0	2.50
	2020	324	324	0	114	114	0	0	114	114	0	0	25	2.84
	2035	419	419	0	141	141	0	0	141	141	0	0	25	2.97
	2050	451	451	0	151	151	0	0	151	151	0	0	26	2.99
	Δ	189	189	0	46	46	0	0	46	46	0	0	1	0.49
	Δ (%)	72%	72%	--	44%	44%	--	--	44%	44%	--	--	4%	20%
NORTHSIDE	2012	938	938	0	345	345	0	0	345	345	0	0	0	2.72
	2020	952	952	0	346	346	0	0	345	345	0	0	97	2.76
	2035	1,065	1,065	0	385	385	0	0	382	382	0	0	99	2.79
	2050	1,054	1,054	0	383	383	0	0	379	379	0	0	99	2.78
	Δ	116	116	0	38	38	0	0	34	34	0	0	2	0.06
	Δ (%)	12%	12%	--	11%	11%	--	--	10%	10%	--	--	2%	2%
SUBTOTAL - NORTH	**2012**	**3,317**	**3,228**	**89**	**1,204**	**1,092**	**0**	**112**	**1,204**	**1,092**	**0**	**112**	**--**	**2.75**
	2020	**3,682**	**3,596**	**86**	**1,334**	**1,222**	**0**	**112**	**1,333**	**1,221**	**0**	**112**	**1,374**	**2.76**
	2035	**4,425**	**4,338**	**87**	**1,613**	**1,501**	**0**	**112**	**1,605**	**1,493**	**0**	**112**	**1,592**	**2.76**
	2050	**4,620**	**4,533**	**87**	**1,691**	**1,579**	**0**	**112**	**1,679**	**1,568**	**0**	**111**	**1,948**	**2.75**
	Δ	**1,303**	**1,305**	**-2**	**487**	**487**	**0**	**0**	**475**	**476**	**0**	**-1**	**574**	**0.00**
	Δ (%)	**39%**	**40%**	**-2%**	**40%**	**45%**	**--**	**0%**	**39%**	**44%**	**--**	**-1%**	**42%**	**0%**

Table B-1

Rainbow MWD -- SANDAG Series 13 Report by Pressure Zone															
Region / Pressure Zone	year	population	household population	group quarters population	total housing units	single family housing units	multi-family housing units	home housing units	total households	single family households	multi-family households	mobile home households	employment	Persons Per Household
CENTRAL DISTRICT REGION (SDCWA Connections 7, 8)														
CANONITA	2012	2,144	2,144	0	961	853	0	108	924	816	0	108	0	2.32
	2020	2,490	2,490	0	1,086	978	0	108	1,023	916	0	107	384	2.43
	2035	2,948	2,948	0	1,233	1,125	0	108	1,208	1,101	0	107	384	2.44
	2050	2,895	2,895	0	1,233	1,125	0	108	1,190	1,085	0	105	384	2.43
	Δ	751	751	0	272	272	0	0	266	269	0	-3	0	0.11
	Δ (%)	35%	35%	--	28%	32%	--	0%	29%	33%	--	-3%	0%	5%
PALA MESA	2012	4,927	4,918	9	2,011	1,771	10	230	1,945	1,706	9	230	0	2.53
	2020	6,781	6,777	4	2,682	2,442	10	230	2,573	2,336	9	229	650	2.64
	2035	7,634	7,624	10	3,020	2,780	10	230	2,892	2,655	9	228	1,311	2.64
	2050	7,749	7,736	13	3,074	2,834	10	230	2,943	2,710	9	224	1,820	2.63
	Δ	2,822	2,818	4	1,063	1,063	0	0	998	1,004	0	-6	1,170	0.10
	Δ (%)	57%	57%	44%	53%	60%	0%	0%	51%	59%	0%	-3%	180%	4%
SUBTOTAL - CENTRAL	**2012**	**7,071**	**7,062**	**9**	**2,972**	**2,624**	**10**	**338**	**2,869**	**2,522**	**9**	**338**	--	**2.46**
	2020	**9,271**	**9,267**	**4**	**3,768**	**3,420**	**10**	**338**	**3,596**	**3,252**	**9**	**336**	**1,034**	**2.58**
	2035	**10,582**	**10,572**	**10**	**4,253**	**3,905**	**10**	**338**	**4,100**	**3,756**	**9**	**335**	**1,695**	**2.58**
	2050	**10,644**	**10,631**	**13**	**4,307**	**3,959**	**10**	**338**	**4,133**	**3,795**	**9**	**329**	**2,204**	**2.58**
	Δ	**3,573**	**3,569**	**4**	**1,335**	**1,335**	**0**	**0**	**1,264**	**1,273**	**0**	**-9**	**1,170**	**0.11**
	Δ (%)	**51%**	**51%**	**44%**	**45%**	**51%**	**0%**	**0%**	**44%**	**50%**	**0%**	**-3%**	**113%**	**4%**
SOUTH DISTRICT REGION (SDCWA Connections 3, 6, 11)														
SOUTH	2012	2,769	2,769	0	1,228	1,062	0	166	1,139	973	0	166	0	2.43
	2020	3,006	3,006	0	1,265	1,099	0	166	1,172	1,006	0	166	975	2.56
	2035	3,395	3,395	0	1,399	1,233	0	166	1,305	1,139	0	166	1,064	2.60
	2050	3,440	3,440	0	1,423	1,257	0	166	1,319	1,154	0	165	1,239	2.61
	Δ	671	671	0	195	195	0	0	180	181	0	-1	264	0.18
	Δ (%)	24%	24%	--	16%	18%	--	0%	16%	19%	--	-1%	27%	7%
MORRO	2012	5,967	5,868	99	2,348	2,028	320	0	2,235	1,917	318	0	0	2.67
	2020	6,939	6,851	88	2,678	2,358	320	0	2,565	2,245	320	0	1,655	2.71
	2035	8,917	8,807	110	3,396	3,076	320	0	3,284	2,964	320	0	1,661	2.72
	2050	8,978	8,853	125	3,444	3,124	320	0	3,309	2,989	320	0	1,849	2.71
	Δ	3,011	2,985	26	1,096	1,096	0	0	1,074	1,072	2	0	194	0.04
	Δ (%)	50%	51%	26%	47%	54%	0%	--	48%	56%	1%	--	12%	2%
MORRO TANK	2012	869	869	0	362	362	0	0	343	343	0	0	0	2.53
	2020	891	891	0	369	369	0	0	350	350	0	0	67	2.55
	2035	900	900	0	371	371	0	0	355	355	0	0	67	2.54
	2050	888	888	0	368	368	0	0	348	348	0	0	67	2.55
	Δ	19	19	0	6	6	0	0	5	5	0	0	0	0.02
	Δ (%)	2%	2%	--	2%	2%	--	--	1%	1%	--	--	0%	1%
SUBTOTAL - SOUTH	**2012**	**9,605**	**9,506**	**99**	**3,938**	**3,452**	**320**	**166**	**3,717**	**3,233**	**318**	**166**	--	**2.58**
	2020	**10,836**	**10,748**	**88**	**4,312**	**3,826**	**320**	**166**	**4,087**	**3,601**	**320**	**166**	**2,697**	**2.65**
	2035	**13,212**	**13,102**	**110**	**5,166**	**4,680**	**320**	**166**	**4,944**	**4,458**	**320**	**166**	**2,792**	**2.67**
	2050	**13,306**	**13,181**	**125**	**5,235**	**4,749**	**320**	**166**	**4,976**	**4,491**	**320**	**165**	**3,155**	**2.67**
	Δ	**3,701**	**3,675**	**26**	**1,297**	**1,297**	**0**	**0**	**1,259**	**1,258**	**2**	**-1**	**458**	**0.09**
	Δ (%)	**39%**	**39%**	**26%**	**33%**	**38%**	**0%**	**0%**	**34%**	**39%**	**1%**	**-1%**	**17%**	**3%**
TOTAL DISTRICT	**2012**	**19,993**	**19,796**	**197**	**8,114**	**7,168**	**330**	**616**	**7,790**	**6,847**	**327**	**616**	--	**2.57**
	2020	**23,789**	**23,611**	**178**	**9,414**	**8,468**	**330**	**616**	**9,016**	**8,074**	**329**	**614**	**5,105**	**2.64**
	2035	**28,219**	**28,012**	**207**	**11,032**	**10,086**	**330**	**616**	**10,649**	**9,707**	**329**	**613**	**6,079**	**2.65**
	2050	**28,570**	**28,345**	**225**	**11,233**	**10,287**	**330**	**616**	**10,788**	**9,854**	**329**	**605**	**7,307**	**2.65**
	Δ	**8,577**	**8,549**	**28**	**3,119**	**3,119**	**0**	**0**	**2,998**	**3,007**	**2**	**-11**	**2,202**	**0.08**
	Δ (%)	**43%**	**43%**	**14%**	**38%**	**44%**	**0%**	**0%**	**38%**	**44%**	**1%**	**-2%**	**43%**	**3%**

Notes:
1) Custom data sort provided by SANDAG 2/3/16, per boundary shape files provided by Atkins
2) Total employment data for 2012 not provided by SANDAG. Delta values for employment are relative to 2020.

Table B-2

Rainbow MWD -- SANDAG Series 13 Report -- Summary by Service Region										
Region / Pressure Zone	year	population	household population	group quarters population	total housing units	single family housing units	multi-family housing units	home housing units	employment	Persons Per Household
NORTH DISTRICT REGION (SDCWA Connections 1, 9, 10)										
(North, Northside, U1, Vallecitos, Rainbow Heights,	2012	3,317	3,228	89	1,204	1,092	0	112	--	2.75
	2020	3,682	3,596	86	1,334	1,222	0	112	1,374	2.76
	2035	4,425	4,338	87	1,613	1,501	0	112	1,592	2.74
	2050	4,620	4,533	87	1,691	1,579	0	112	1,948	2.73
	Δ	1,303	1,305	-2	487	487	0	0	574	-0.02
	Δ (%)	39%	40%	-2%	40%	45%	--	0%	42%	-1%
CENTRAL DISTRICT REGION (SDCWA Connections 7, 8)										
(Canonita, Pala Mesa)	2012	7,071	7,062	9	2,972	2,624	10	338	--	2.38
	2020	9,271	9,267	4	3,768	3,420	10	338	1,034	2.46
	2035	10,582	10,572	10	4,253	3,905	10	338	1,695	2.49
	2050	10,644	10,631	13	4,307	3,959	10	338	2,204	2.47
	Δ	3,573	3,569	4	1,335	1,335	0	0	1,170	0.09
	Δ (%)	51%	51%	44%	45%	51%	0%	0%	113%	4%
SOUTH DISTRICT REGION (SDCWA Connections 3, 6, 11)										
(Gopher Canyon, Morro, Morro Tank)	2012	7,071	7,062	9	2,972	2,624	10	338	--	2.38
	2020	9,271	9,267	4	3,768	3,420	10	338	1,034	2.46
	2035	10,582	10,572	10	4,253	3,905	10	338	1,695	2.49
	2050	10,644	10,631	13	4,307	3,959	10	338	2,204	2.47
	Δ	3,573	3,569	4	1,335	1,335	0	0	1,170	0.09
	Δ (%)	51%	51%	44%	45%	51%	0%	0%	113%	4%
TOTAL DISTRICT										
	2012	19,993	19,796	197	8,114	7,168	330	616	--	2.46
	2020	23,789	23,611	178	9,414	8,468	330	616	5,105	2.53
	2035	28,219	28,012	207	11,032	10,086	330	616	6,079	2.56
	2050	28,570	28,345	225	11,233	10,287	330	616	7,307	2.54
	Δ	8,577	8,549	28	3,119	3,119	0	0	2,202	0.08
	Δ (%)	43%	43%	14%	38%	44%	0%	0%	43%	3%

Notes:
1) Custom data sort provided by SANDAG 2/3/16, per boundary shape files provided by District
2) Total employment data for 2012 not provided by SANDAG. Delta values for employment are relative to 2020.

Table B-3

Rainbow MWD Projected Development

Proposed Development	Units/ Acres	SFR Units	MFR Units	Acreage	Development Type	Pressure Zone
Upstream of District Office						
Horse Creek Ridge	751	751		381	Single Family (hi-med dense)	Pala Mesa
Horse Creek Ridge Business Center	100			104	Commercial	Pala Mesa
Campus Park West	538		283		Mixed	Pala Mesa
Pala Mesa Highlands (Beazer)	130	130		85	Single Family (rural)	Pala Mesa
Palomar College	100			83.30	Commercial	Pala Mesa
Dulan	51	51			Single Family (rural)	Pala Mesa
Pasarelle					Single Family (rural)	Canonita
Possible Annexations (all upstream of Office)						
Meadowood (Via VCMWD Service Agreement)	850	355	489	372	Various (potable component)	North
Warner Ranch						
-- SFR	534	534		210	Single Family (rural)	North
-- MFR	246		246		Multi-Family	North
Subtotal -- In District	**1,670**	**932**	**283**			
Subtotal -- Possible Annexations	**1,630**	**889**	**735**			
Subtotal -- All	**3,300**	**1,821**	**1,018**			
Downstream of Office, Upstream of LS#1						
Vessels	400	392		1,385	Single Family (rural)	South
Golf Green Estates	94	94		27	Single Family (hi-med dense)	Morro
Leatherbury	85	85		178	Single Family (rural)	Pala Mesa
Bonsall Condos	76	76			Single Family (hi-med dense)	South
Olive Hill Estates	37	37		45	Single Family (rural)	Morro
Lake Vista Estates	15	15			Single Family (rural)	Morro
Malabar Ranch	14	14			Single Family (rural)	Morro
Silver Holdings	9			4.35	Commercial	Morro
Subtotal	**730**	**713**	**0**			
Downstream of LS#1, Upstream of LS#2						
Polo Club	156	156		442	Single Family (rural)	Morro
Morris Ranch	89	89		210	Single Family (rural)	South
Hidden Hills	53	53			Single Family (rural)	South
Vista Valley Country Club	5			8.75	Commercial	South
Subtotal	**303**	**298**	**0**			
Totals -- In District	**2,703**	**1,943**	**283**			
Totals -- Possible Annexations & Agreements	**1,630**	**889**	**735**			
Totals -- All	**4,333**	**2,832**	**1,018**			

APPENDIX C
Sewer Flow Generation Forecasting

APPENDIX C

Sewer Flow Generation Forecasting

Sewer Flow Generation

In recent years sewer flows across Southern California have been steadily declining. This decline is the result of several factors, chief among them: water conservation due to drought and increased efficiency of interior fixtures. Declines due to drought have historically rebounded at least to some degree once drought conditions subside, while the implementation of increased efficiency in interior use has become a more permanent change with lower sewer flows.

The Master Plan builds on recent updates of the Sewer Hydraulic Model and analysis which use the Fiscal Year (FY) 2013-2014 as a baseline year for sewer flow forecasting. Upon reviewing the data for sewer flow generation for this and historical years before it, FY 13-14 is considered a fairly representative year for future analysis. As is shown below in **Table C-1**, FY 13-14 flow of 0.70 mgd is slightly below the average for both the past five and ten years of average sewer flows. Dramatically reduced sewer flows in FY 14-15 are believed to be largely attributable to the ongoing severe drought conditions and the District's outreach and public response.

Table C-1 Flow Forecasts

Fiscal Year	Fiscal Year Average Flow (MGD)	Calendar Year	Calendar Year Average Flow (MGD)
14-15	0.57	15	0.54
13-14[1]	0.70	14	0.64
12-13	0.78	13	0.76
11-12	0.76	12	0.79
10-11	0.71	11	0.73
09-10	0.70	10	0.70
08-09	0.73	09	0.70
07-08	0.83	08	0.77
06-07	0.78	07	0.81
05-06	0.81	06	0.80
5 Year Average[2]	0.70		0.69
5 Year Average[3]	0.73		0.72
10 Year Average	0.74		0.72

[1] Selected as the Baseline sewer flow generation condition

[2] from FY 10-FY 14 and CY 11- CY 15

[3] from FY 09-FY 13 and CY 10- CY 14

In Chapter 6, **Table 6-4** presents a summary of water sales in comparison to sewer flows. **Table C-2** of this appendix presents the complete analysis of water use versus estimated sewer flow by water pressure zone within the sewer system. Sewer generation rates for existing users were adjusted to account for increased water demands by water meter billing category. The forecasted unit generation rates for residential land uses was derived from an assumed individual sewage generation rate of 65 gpcd and occupancy rates of 2.4 to 3.1 people per dwelling unit. Larger property types and single family homes are assumed to have higher occupancies (compared to high density projects) and sewer generations. The forecasted per connection sewer generation rates are presented in **Table 6-4**, as well as below in **Table C-3**. Where known developments have prepared specific plans forecasting their water demand and sewer generation, those demands and flows were used in forecasting.

Table C-2 CY 2013 Water Sales versus Estimated Sewer Flow by Water Pressure Zone

ESTIMATED SEWER FLOWS

365

				Sewer Accounts	Water Sales	Estimated Sewer Flow	Sewer Flow Augmentation
Zone:	**Canonita**				**(MGD)**	**(MGD)**	
D	<	*1.00*	*SFR w/ smaller meters*	122	0.04	0.02	
D	>=	*1.00*	*SFR w/ larger meters*	22	0.02	0.00	
MF	>=	*0*	*Multi-Family Residential*	5	0.09	0.07	
C	>=	*0*	*Commercial*	1	0.01	0.00	
A	>=	*0*	*Agriculture*	1	0.01	0.00	
SC	>=	*0*	*SAWR Commercial*	0	0.00	0.00	
SD	>=	*0*	*SAWR Domestic*	2	0.04	0.00	
SW	>=	*0*	*TSAWR*	1	0.05	0.00	
		TOTAL		**154**	**0.27**	**0.10**	
Zone:	**Canonita**				**(GPD)**	**(GPD)**	**(GPD)**
D	<	*1.00*	*SFR w/ smaller meters*	122	300	160	20
D	>=	*1.00*	*SFR w/ larger meters*	22	1,098	220	0
MF	>=	*0*	*Multi-Family Residential*	5	18,066	75%	0
C	>=	*0*	*Commercial*	1	8,358	1,000	0
A	>=	*0*	*Agriculture*	1	8,839	500	0
SC	>=	*0*	*SAWR Commercial*	0	--	500	0
SD	>=	*0*	*SAWR Domestic*	2	21,303	500	0
SW	>=	*0*	*TSAWR*	1	54,425	300	0
		TOTAL		**154**	**1,723**	**632**	
Zone:	**Pala Mesa**				**(MGD)**	**(MGD)**	
D	<	*1.00*	*SFR w/ smaller meters*	861	0.37	0.15	
D	>=	*1.00*	*SFR w/ larger meters*	464	0.30	0.09	

Table C-2 CY 2013 Water Sales versus Estimated Sewer Flow by Water Pressure Zone

MF	>=	0	Multi-Family Residential	3	0.00	0.00	
C	>=	0	Commercial	7	0.02	0.00	
A	>=	0	Agriculture	8	0.01	0.00	
SC	>=	0	SAWR Commercial	1	0.01	0.00	
SD	>=	0	SAWR Domestic	22	0.05	0.01	
SW	>=	0	TSAWR	0	0.00	0.00	
		TOTAL		1,366	0.76	0.26	

Zone:	Pala Mesa				(GPD)	(GPD)	(GPD)
D	<	1.00	SFR w/ smaller meters	861	426	180	20
D	>=	1.00	SFR w/ larger meters	464	640	200	-20
MF	>=	0	Multi-Family Residential	3	976	75%	0
C	>=	0	Commercial	7	3,172	500	-500
A	>=	0	Agriculture	8	1,716	300	-200
SC	>=	0	SAWR Commercial	1	11,848	600	100
SD	>=	0	SAWR Domestic	22	2,186	300	-200
SW	>=	0	TSAWR	0	--	300	0
		TOTAL		1,366	558	193	

Zone:	Gopher Canyon				(MGD)	(MGD)	
D	<	1.00	SFR w/ smaller meters	44	0.03	0.01	
D	>=	1.00	SFR w/ larger meters	17	0.01	0.00	
MF	>=	0	Multi-Family Residential	0	0.00	0.00	
C	>=	0	Commercial	2	0.00	0.00	
A	>=	0	Agriculture	5	0.03	0.00	
SC	>=	0	SAWR Commercial	1	0.00	0.00	
SD	>=	0	SAWR Domestic	15	0.03	0.00	
SW	>=	0	TSAWR	0	0.00	0.00	
		TOTAL		84	0.11	0.02	

Zone:	Gopher Canyon				(GPD)	(GPD)	(GPD)
D	<	1.00	SFR w/ smaller meters	44	775	200	40
D	>=	1.00	SFR w/ larger meters	17	640	220	0
MF	>=	0	Multi-Family Residential	0	--	75%	0
C	>=	0	Commercial	2	1,023	500	-500
A	>=	0	Agriculture	5	6,720	500	0
SC	>=	0	SAWR Commercial	1	826	200	-300
SD	>=	0	SAWR Domestic	15	1,782	300	-200
SW	>=	0	TSAWR	0	--	300	

Table C-2 CY 2013 Water Sales versus Estimated Sewer Flow by Water Pressure Zone

CN	>=	0	Construction	0	--	0	
		TOTAL		84	1,288	247	

Zone:	Morro				(MGD)	(MGD)	
D	<	1.00	SFR w/ smaller meters	269	0.15	0.05	
D	>=	1.00	SFR w/ larger meters	244	0.30	0.06	
MF	>=	0	Multi-Family Residential	26	0.03	0.02	
C	>=	0	Commercial	33	0.10	0.02	
A	>=	0	Agriculture	51	0.15	0.02	
SC	>=	0	SAWR Commercial	4	0.09	0.00	
SD	>=	0	SAWR Domestic	24	0.14	0.01	
SW	>=	0	TSAWR	0	0.00	0.00	
		TOTAL		651	0.96	0.17	

Zone:	Morro				(GPD)	(GPD)	(GPD)
D	<	1.00	SFR w/ smaller meters	269	554	180	20
D	>=	1.00	SFR w/ larger meters	244	1,227	260	40
MF	>=	0	Multi-Family Residential	26	1,039	75%	0
C	>=	0	Commercial	33	3,122	500	-500
A	>=	0	Agriculture	51	2,912	300	-200
SC	>=	0	SAWR Commercial	4	22,653	700	200
SD	>=	0	SAWR Domestic	24	5,933	300	-200
SW	>=	0	TSAWR	0	--	300	
		TOTAL		651	1,475	268	

Zone:	TOTAL DISTRICT				(MGD)	(MGD)	
D	<	1.00	SFR w/ smaller meters	1,296	0.59	0.23	
D	>=	1.00	SFR w/ larger meters	747	0.63	0.16	
MF	>=	0	Multi-Family Residential	34	0.12	0.09	
C	>=	0	Commercial	43	0.14	0.02	
A	>=	0	Agriculture	65	0.20	0.02	
SC	>=	0	SAWR Commercial	6	0.10	0.00	
SD	>=	0	SAWR Domestic	63	0.26	0.02	
SW	>=	0	TSAWR	1	0.05	0.00	
		TOTAL		2,255	2.10	0.555	

Zone:	TOTAL DISTRICT				(GPD)	(GPD)	(GPD)
D	<	1.00	SFR w/ smaller meters	1,296	453	181	

CY 2013 Water Sales versus Estimated Sewer Flow by Water Pressure Zone

Table C-2

D	>=	1.00	SFR w/ larger meters	747	845	221
MF	>=	0	Multi-Family Residential	34	3,538	75%
C	>=	0	Commercial	43	3,154	512
A	>=	0	Agriculture	65	3,149	318
SC	>=	0	SAWR Commercial	6	17,214	600
SD	>=	0	SAWR Domestic	63	4,124	306
SW	>=	0	TSAWR	1	54,425	300

Table C-3 Forecasted per Unit Sewer Generation

Flow Type	Flow (GPD)
Single Family, < 1" Meter	160
Single Family, >= 1" Meter	220
Multi-Family	150
Commercial	500
Agriculture	500
SAWR Agriculture	500

Table C-4 includes the projected known developments within the District, their respective location within the water system (by pressure zone) and their projected sewer flows. **Table C-5** shows the SANDAG Series 13 forecast for the water pressure zones that are within the existing sewer service area. The projected quantity of units in each zone was compared to the SANDAG Series 13 projections which forecasted a specific number of housing units in each zone. In comparing the results of the two analysis it was noted that the District projects more units in the sewer area than SANDAG. However, it should also be noted that the assignment of each development to a specific pressure zone is approximate. Portions of an individual developments could be served by multiple water pressure zones and were not analyzed in detail for the summary in **Table C-5**. Since the number of units projected by the District exceeds the number of units projected by SANDAG in the sewer service area, no infill loading was applied for these areas **Table C-6** includes the model junctions that the projected development flows were assigned.

Inflow and Infiltration

The other component of sewer flow is inflow and infiltration. Sewer systems are designed to handle both PDWF and PWWF with varying criteria for each. Typically, PWWF is the governing design condition regardless of design criteria, especially in an area such as the District which is rural and does not have substantial stormwater management infrastructure. Of the data which was available for this study, the multi-day storm occurring from December 18th-23rd, 2010 is the largest storm which was observed within the county. Single day rainfall totals within the District ranged from 4.5 to 6 inches, 2-day rainfall from 6.5 to 8.5 inches and 7-day rainfall totals well over 10 inches throughout the entire District.

Table C-4 Proposed Development	EDUs	SFR Units	MFR Units	Acreage	Development Type	Water Pressure Zone	Projected Sewer Flow (MGD)	Notes
Upstream of District Office								
Horse Creek Ridge	751	751		381	Single Family (hi-med dense)	Pala Mesa	0.188	
Horse Creek Ridge Business Center	100			104	Commercial	Pala Mesa	0.025	
Campus Park West	538		283		Mixed	Pala Mesa	0.134	Per Atkins 2013
Pala Mesa Highlands (Beazer)	130	130		85	Single Family (rural)	Pala Mesa	0.026	
Palomar College	100			83.30	Commercial	Canonita	0.042	
Dulan	51	51			Single Family (rural)	Pala Mesa	0.010	
Possible Annexations (all upstream of Office)								
Meadowood (Via VCMWD Service Agreement)	850	355	489	372	Various (potable component)	North	0.280	Per D/W 2009
Warner Ranch								
-- SFR	534	534		210	Single Family (rural)	North	0.107	
-- MFR	246		246		Multi-Family	North	0.037	
Subtotal -- In District	**1,670**	**932**	**283**				**0.425**	
Subtotal -- Possible Annexations	**1,630**	**889**	**735**				**0.424**	
Subtotal -- All	**3,300**	**1,821**	**1,018**				**0.849**	
Downstream of Office, Upstream of LS#1								
Vessels	400	392		1,385	Single Family (rural)	South	0.080	
Golf Green Estates	94	94		27	Single Family (hi-med dense)	Morro	0.015	
Leatherbury	85	85		178	Single Family (rural)	Pala Mesa	0.017	
Bonsall Condos	76	76			Single Family (hi-med dense)	South	0.012	
Olive Hill Estates	37	37		45	Single Family (rural)	Morro	0.007	
Lake Vista Estates	15	15			Single Family (rural)	Morro	0.003	
Malabar Ranch	14	14			Single Family (rural)	Morro	0.003	
Silver Holdings	9			4.35	Commercial	Morro	0.002	
Subtotal	**730**	**713**	**0**				**0.140**	
Downstream of LS#1, Upstream of LS#2								
Polo Club	156	156		442	Single Family (rural)	South	0.031	
Morris Ranch	89	89		210	Single Family (rural)	Morro	0.018	
Hidden Hills	53	53			Single Family (rural)	Morro	0.011	
Vista Valley Country Club	5			8.75	Commercial	South	0.004	
Subtotal	**303**	**298**	**0**				**0.064**	
Totals -- In District	**2,703**	**1,943**	**283**				**0.628**	
Totals -- Possible Annexations & Agreements	**1,630**	**889**	**735**				**0.424**	
Totals -- All	**4,333**	**2,832**	**1,018**				**1.052**	

Note: Cells marked in yellow had flow values taken from development planning documentations

Table C-5 SANDAG Series 13 Forecast - SEWER SERVICE AREA

Pressure Zone	year	population	total housing units	total households	PPH
CANONITA	**2012**	2,144	961	924	2.23
	2020	2,490	1,086	1,023	2.29
	2035	2,948	1,233	1,208	2.39
	Δ	804	272	284	0.16
	Δ (%)	38%	28%	31%	7%
PALA MESA	**2012**	4,927	2,011	1,945	2.45
	2020	6,781	2,682	2,573	2.53
	2035	7,634	3,020	2,892	2.53
	Δ	2,707	1,009	947	0.08
	Δ (%)	55%	50%	49%	3%
SOUTH	**2012**	2,769	1,228	1,139	2.25
	2020	3,006	1,265	1,172	2.38
	2035	3,395	1,399	1,305	2.43
	Δ	626	171	166	0.17
	Δ (%)	23%	14%	15%	8%
MORRO	**2012**	5,967	2,348	2,235	2.54
	2020	6,939	2,678	2,565	2.59
	2035	8,917	3,396	3,284	2.63
	Δ	2,950	1,048	1,049	0.08
	Δ (%)	49%	45%	47%	3%
TOTAL SEWER DISTRICT	**2012**	**15,807**	**6,548**	**6,243**	**2.37**
	2020	**19,216**	**7,711**	**7,333**	**2.45**
	2035	**22,894**	**9,048**	**8,689**	**2.49**
	Δ	**7,087**	**2,500**	**2,446**	**0.12**
	Δ (%)	**45%**	**38%**	**39%**	**5%**

Table C-6 Development Model Loading

Proposed Development	Sewer Junction	In District Sewer Flow (gpm)	In District Sewer Flow (MGD)	Out of District Sewer Flow (gpm)	Out of District Sewer Flow (MGD)
Horse Creek Ridge	20000	130	0.19	0	0.00
Horse Creek Ridge Business Center	20002	17	0.02	0	0.00
Campus Park West	20004	93	0.13	0	0.00
Pala Mesa Highlands (Beazer)	290	18	0.03	0	0.00
Palomar College	792	29	0.04	0	0.00
Dulan	10006	7	0.01	0	0.00
Meadowood (Via VCMWD Service Agreement)	20004	0	0.00	194	0.28
Warner Ranch	20002	0	0.00	100	0.14
Vessels	500	56	0.08	0	0.00
Golf Green Estates	1034	10	0.02	0	0.00
Leatherbury	711	12	0.02	0	0.00
Bonsall Condos		8	0.01	0	0.00
Olive Hill Estates	1081	5	0.01	0	0.00
Lake Vista Estates	170	2	0.00	0	0.00
Malabar Ranch	624	2	0.00	0	0.00
Silver Holdings	201	2	0.00	0	0.00
Polo Club	410	22	0.03	0	0.00
Morris Ranch	394	12	0.02	0	0.00
Hidden Hills	1001	7	0.01	0	0.00
Vista Valley Country Club	437	3	0.00	0	0.00
Totals -- In District		**436**	**0.63**		
Totals -- Possible Annexations				**194**	**0.42**
Totals -- All		**631**		**1.05**	

According to National Oceanic and Atmospheric Administration (NOAA) data, this storm was between a 10 and 25 year design storm in the 1-3 day periods, with the 7 day rainfall reaching as high as a 50 year storm. This storm event is larger than typical design storm events used in Southern California for sizing wastewater collection systems. The design flow typically selected to design wastewater infrastructure ranges from 2 to 10 year frequency duration storms. **Table 6-6** includes an analysis of weather design storm frequencies. **Appendix C** also includes reference information on sewer design flows presented by the EPA. As noted in **Chapter 6** the December 2010 storm event was assumed as the basis for peak weather flows for the District sewer system. Many other San Diego County sewer agencies have used this storm event in their sewer master planning and peak wet weather hydraulic modeling.

Infiltration is flow into the sewer system from high groundwater common in sewers located in drainage courses or rivers. Historically, the District has experienced known infiltration problems because a large portion of the sewer interceptor system in located within or adjacent to the San Luis Rey River. In addition, the older “Plant B” Interceptor east of I-15 and north of SR 76 (within Horse Ranch Creek) has been known to have infiltration. This sewer interceptor is planned to be relocated out of the drainage course of Horse Ranch Creek.

In 2009 the District conducted and I&I Study (by IEC) to better quantify inflow and infiltration in the system. A copy of their summary report is also include in this **Appendix C**. The report has been used to validate the assumptions on base infiltration used for the existing sewer system. **Table 6-5** estimated base infiltration by considering “return to sewer flows” from water sales data and comparing to District average dry weather flows. Approximately 0.14 mgd was assumed for base infiltration using this methodology or about 20 percent of the total average flow of 0.70 mgd. The I&I Study estimated base infiltration by summing up four subbasin sewer meters and comparing to the Stallions meter for the total District flow. **Figure 3** and **Table 5** from the I&I Study show the field results and estimated base infiltration. It was estimated that 82 gpm of the total flow of 510 gpm was attributed to base infiltration or approximately 16 percent, which correlated well with the return to sewer methodology presented in **Table 6-5**.

RAINBOW MUNICIPAL WATER DISTRICT

2009 SEWER FLOW MONITORING

PREPARED FOR: RMWD – KIRSTEN PLONKA, P. E.

PREPARED BY: BRYAN KLEMM, E.I.T.; JON WELLS, P.E. (C67782)

REVIEWED BY: SCOTT HUMPHREY, P.E. (C67882)

DATE: MARCH 2010

1.0 Project Summary

The purpose of this report is to present the results of a comprehensive wastewater flow monitoring project conducted by Infrastructure Engineering Corporation (IEC) for the Rainbow Municipal Water District (RMWD). The flow monitoring project was carried out to quantify sanitary sewer flows throughout RMWD. The quantified flows will be used to calibrate RMWD's hydraulic model. The calibrated hydraulic model is a necessary tool for providing a capacity assessment of RMWD's collection system, as mandated for Sanitary Sewer Management Plan (SSMP) compliance. As such, this project represents an important milestone in RMWD's ongoing management of the sewer collection system.

The flow monitoring survey period was 02/24/09 through 04/25/09 for site 1 through site 8, while the survey period for site 9 through site 20 was 03/10/09 to 05/09/09. Site 15 was removed from the study. Results and analysis for each of these sites are presented below.

2.0 Background and Scope

RMWD owns and operates a hydraulic model of its wastewater collection system. This hydraulic model is a tool for capacity analysis of the collection system. In addition to being part of any effective collection system management plan, capacity analysis is a required portion of the Sewer System Management Plan (SSMP) mandated by the State Water Resource Control Boards' *Waste Discharge Requirement 2006-0003*.

The flow monitoring plan was conceived as a means to provide calibration data for the hydraulic model. Because the SSMP requires that the collection system capacity analysis account for peak dry and peak wet flows in the collection system, the flow monitoring plan was developed to divide RMWD's collection system into basins that would provide useful data for both wet weather and dry weather conditions.

Although primarily developed for model calibration purposes, this flow monitoring project provides other valuable information for the management of the wastewater collection system. Through discussion with District Staff, the 19 locations were chosen to maximize the information provided to the District. Results herein confirm existing capacity issues previously identified by RMWD staff, identify areas of high Base Infiltration (BI), and identify areas of high Rainfall Dependant Inflow and Infiltration (RDII). As discussed below, the areas of high BI and RDII can be targeted for more detailed study or rehabilitation in order to preserve system capacity and save money for RMWD in treatment costs.

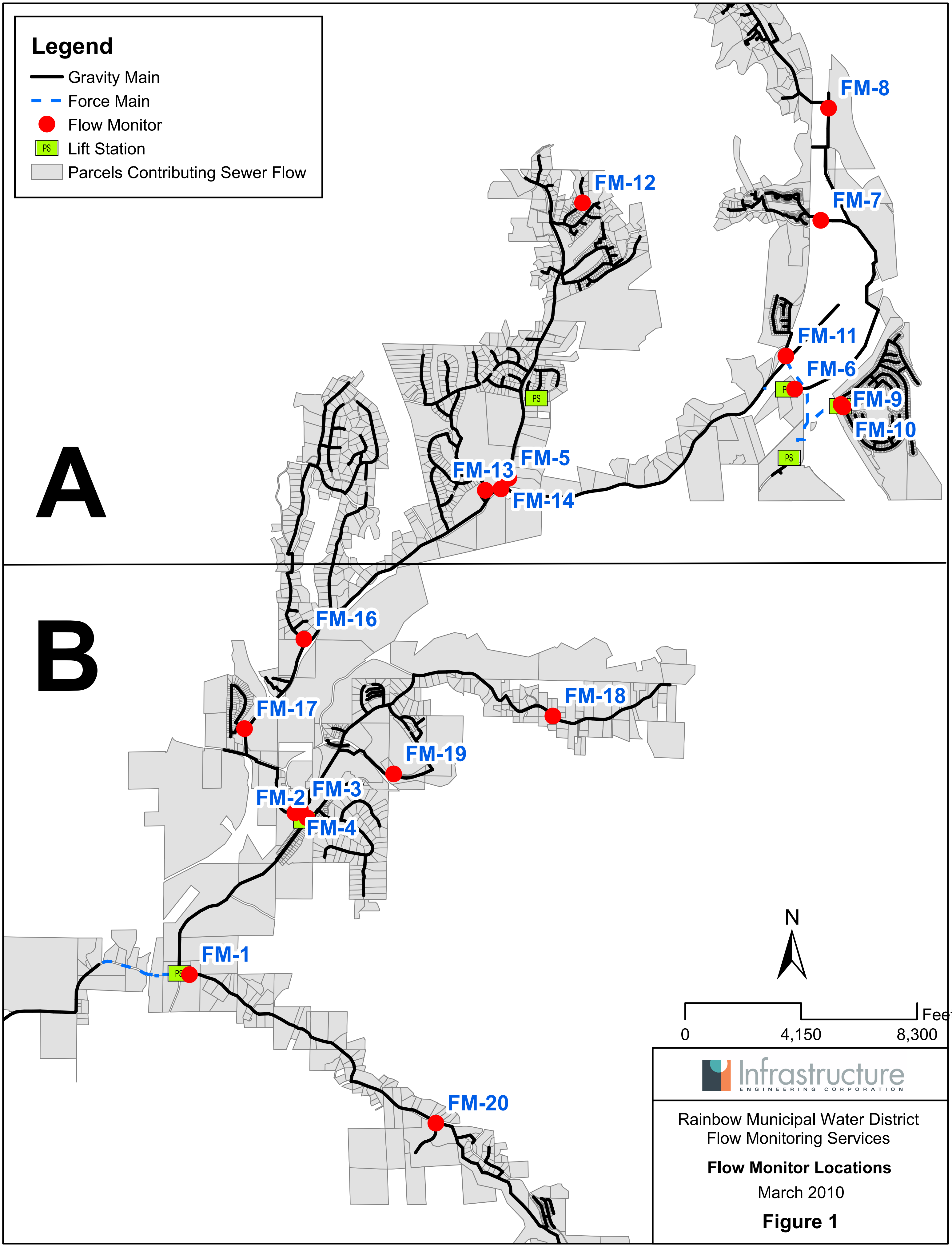
The scope of this study involved the utilization of temporary flow monitors to quantify wet weather wastewater flow at the nineteen (19) designated locations presented in Table 1.

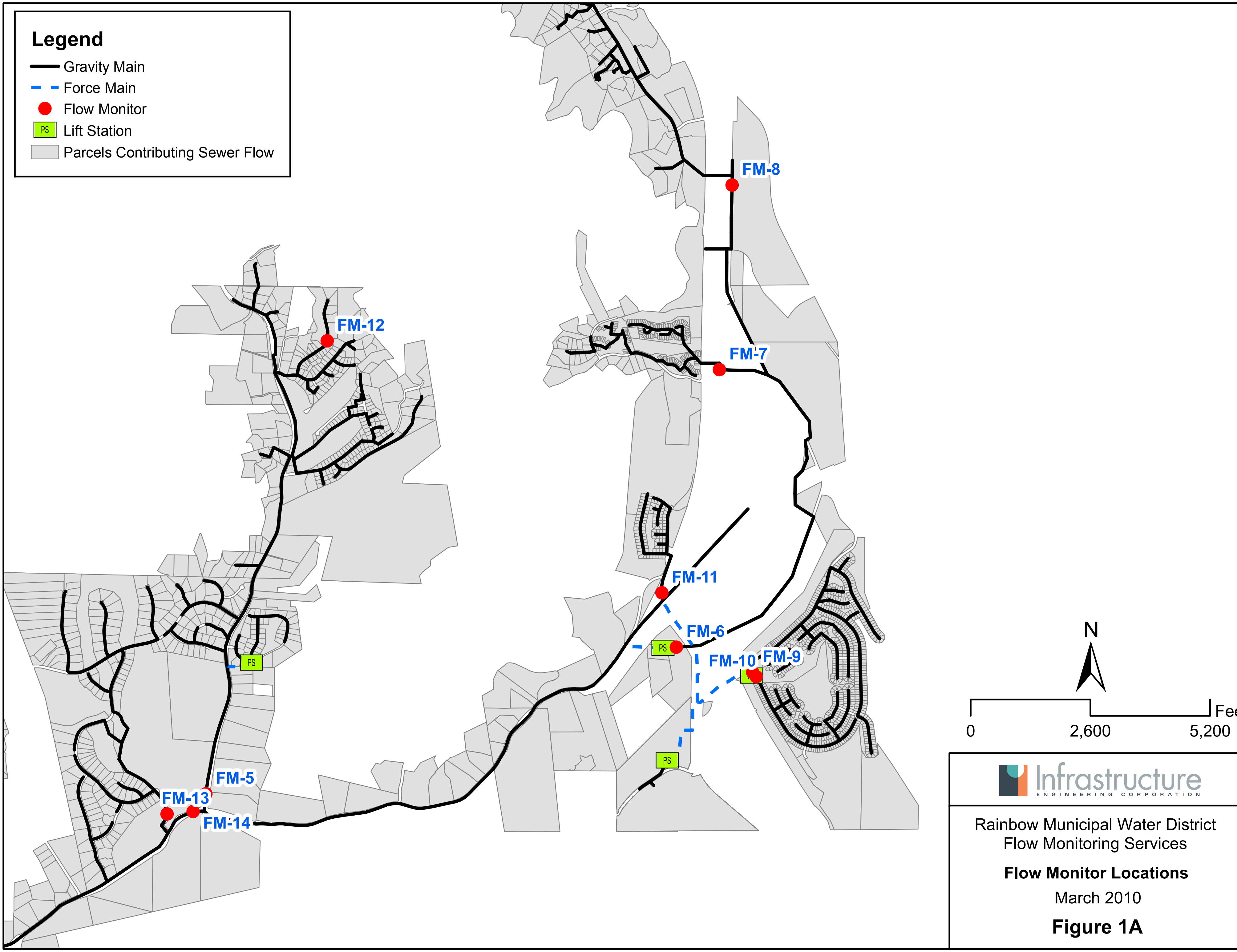
3.0 Location and Data Summary

Area/Velocity flow meters, their identification numbers, location, and metering periods are summarized in Table 1, and illustrated in Figure 1.

Table 1 - Sewer Flow Meter Site Locations

Meter ID	RMWD Manhole No	Existing Diameter (in.)	Installation Date	Removal Date
1	MH5543	8	2/24/2009	4/25/2009
2	MH6053	8	2/24/2009	4/25/2009
3	MH6054	10	2/24/2009	4/25/2009
4	MH5410	12	2/24/2009	4/25/2009
5	MH5721	12	2/24/2009	4/25/2009
6	MH5798	12	2/24/2009	4/25/2009
7	MH5904	8	2/24/2009	4/25/2009
8	MH5965	12	2/24/2009	4/25/2009
9	MH5242	12	3/10/2009	5/9/2009
10	MH6176	8	3/10/2009	5/9/2009
11	MH5826	8	3/10/2009	5/9/2009
12	MH5039	8	3/10/2009	5/9/2009
13	MH6146	8	3/10/2009	5/9/2009
14	MH5719	12	3/10/2009	5/9/2009
16	MH5338	8	3/10/2009	5/9/2009
17	MH5205	8	3/10/2009	5/9/2009
18	MH5569	8	3/10/2009	5/9/2009
19	MH6070	8	3/10/2009	5/9/2009
20	MH5464	8	3/10/2009	5/9/2009


Legend
Gravity Main
Force Main
Flow Monitor
PS
Lift Station
Parcels Contributing Sewer Flow
A
B
FM-1
FM-2
FM-3
FM-4
FM-5
FM-6
FM-7
FM-8
FM-9
FM-10
FM-11
FM-12
FM-13
FM-14
FM-16
FM-17
FM-18
FM-19
FM-20
PS
N
0
4,150
8,300
Feet
Infrastructure
ENGINEERING CORPORATION
Rainbow Municipal Water District
Flow Monitoring Services
Flow Monitor Locations
March 2010
Figure 1

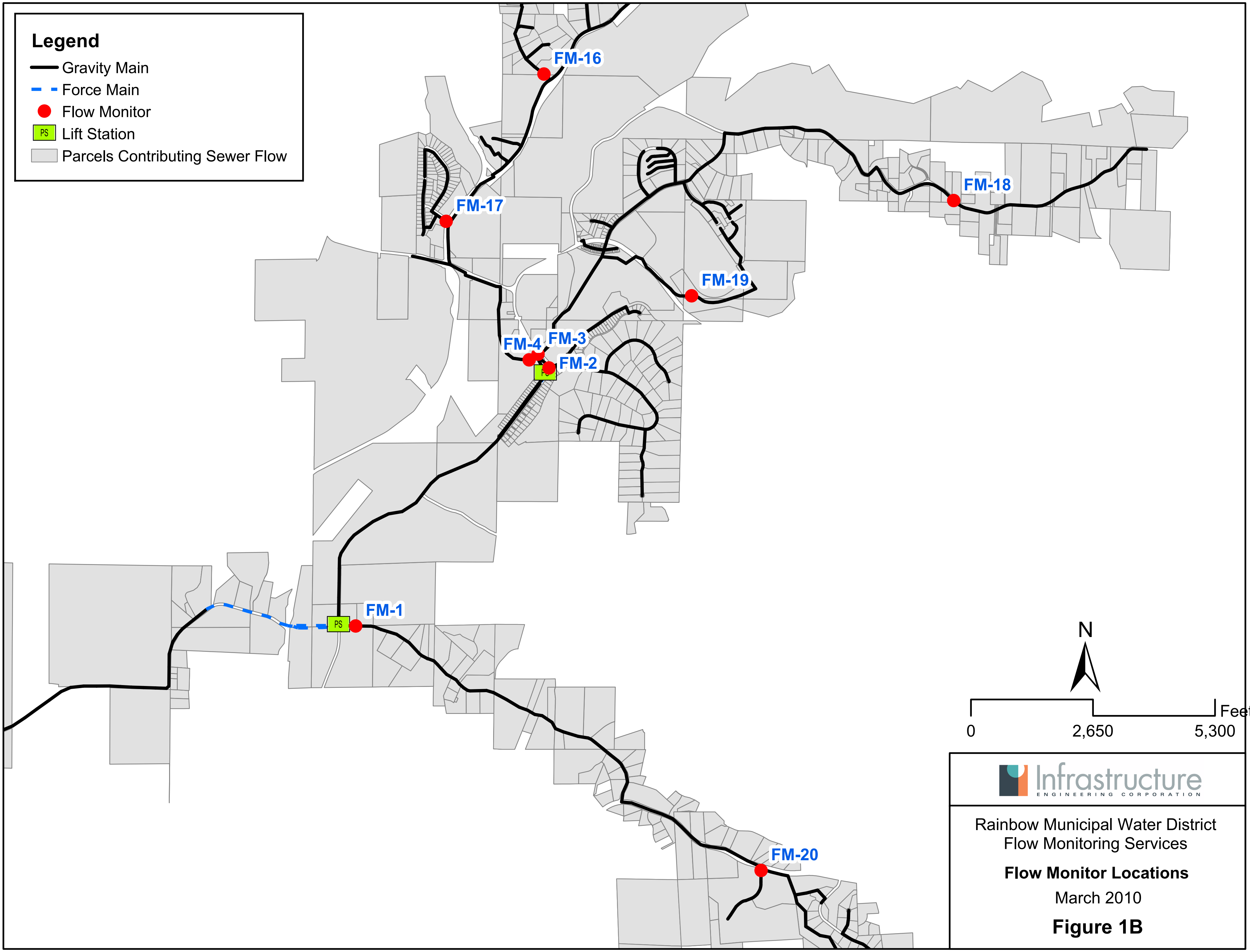


Rainbow Municipal Water District
Flow Monitoring Services

Flow Monitor Locations

March 2010

Figure 1A


Legend
Gravity Main
Force Main
Flow Monitor
PS Lift Station
Parcels Contributing Sewer Flow
FM-16
FM-17
FM-18
FM-19
FM-4
FM-3
FM-2
FM-1
PS
FM-20
N
0
2,650
5,300
Feet
Infrastructure
ENGINEERING CORPORATION
Rainbow Municipal Water District
Flow Monitoring Services
Flow Monitor Locations
March 2010
Figure 1B

In addition to the flow measurement sites presented, one (1) rain gauge was also installed at the RMWD District Office during the wet season flow monitoring period. This gauge was used to identify the intensity and total rainfall within the metered area. In this way the system's wet weather response is compared to the rainfall event and analyses are performed to identify the most likely types of basin defects. Table 2 shows the rainfall events captured by this rain gauge.

Table 2 - Rain Gauge and Event Summary

Rain Gauge	General Location	February 24, 2009 Rainfall (in.)	March 22, 2009 Rainfall (in.)
RMWD District Office	Fallbrook	0.21	0.20

Table 3 presents a summary of measured flow data. As shown, average and peak dry events have been separated into Weekday (Monday through Friday) and Weekend (Saturday and Sunday) classifications, as all nineteen (19) sites experienced their largest peaks on Weekend days except site 7 and site 19.

Table 3 - Flow Monitoring Measurement Summary Table

Site No.	Location	RMWD Manhole No	Existing Diameter (in.)	Average Flow (gpm)	Average Weekday Flow (gpm)	Average Weekend Flow (gpm)	Peak Dry Weekday Flow (gpm)	Peak Dry Weekend Flow (gpm)	Peak Wet Weather Flow (gpm)	Day of Storm	Maximum d/D
1	Little Gopher Canyon Rd.	MH5543	8	21	21	21	32	35	41	3/22/2009	0.33
2	Old River Rd @ Golf Club Rd.	MH6053	8	30	29	34	45	54	60	2/24/2009	0.31
3	Camino Del Rey on Golf Course	MH6054	10	40	40	41	68	75	108	3/22/2009	0.21
4	Camino Del Rey on Golf Course	MH5410	12	312	307	325	401	471	501	3/22/2009	0.60
5	Gird Rd. @ State Route 76	MH5721	12	71	71	73	100	110	122	2/24/2009	0.20
6	CA-76 @ Old Highway 395	MH5798	12	86	85	90	109	123	129	3/22/2009	0.19
7	15N off Freeway	MH5904	8	6	6	6	9	8	11	2/24/2009	0.15
8	15S Ostrich Farm	MH5965	12	78	75	84	109	129	128	2/24/2009	0.20
9	Lake Circle Dr. s/o Dulin Rd.	MH5242	12	70	68	76	121	130	161	3/22/2009	0.25
10	Lake Circle Dr. s/o Dulin Rd.	MH6176	8	17	17	18	28	29	40	3/22/2009	0.41
11	Via Altamira off S Old Highway 395	MH5826	8	4	3	4	7	9	17	3/22/2009	0.11
12	Laketree Dr. e/o Gird Rd.	MH5039	8	9	9	9	12	12	17	3/22/2009	0.30
13	Flowerwood Ln off Highway 76	MH6146	8	5	5	6	8	9	29	3/22/2009	0.14
14	Highway 76 w/o Gird Rd	MH5719	12	333	326	351	426	498	518	3/22/2009	1.00
16	Sweetgrass Ln. off Highway 76	MH5338	8	4	3	6	6	14	18	3/22/2009	0.14
17	Thoroughbred Ln off Highway 76	MH5205	8	18	18	18	27	30	33	3/22/2009	0.24
18	W Lilac Rd w/o Via Ganelli	MH5569	8	0	0	0	0	0	1	3/22/2009	0.10
19	E/o intersection Camino Del Rey & Golf Club Dr	MH6070	8	16	17	14	40	34	69	3/22/2009	0.40
20	Spa Haven Wy s/o Gopher Canyon Rd	MH5464	8	3	3	3	5	8	46	3/22/2009	0.18

4.0 Summary of Findings

4.1 Average and Peak Flows at 19 sites

Average flow, peak dry flow, and peak wet flow were determined for each of the 19 sites, and are presented in Table 4. The peak dry weather flow, as shown in Table 4, is the weekend peak flow. As is typical of a predominantly residential area with a high commuter population, the peak flows for the sites in this study were most often seen late on a weekend morning. The Peak Dry Flow Factor is the result of dividing the peak dry weather flow for a particular site by the average flow for that site.

Because the wet weather events captured by this study did not always occur during peak times, the peak wet weather flow observed during the study at some sites was less than the peak dry weather flows observed. At such sites, the peak rainfall dependant infiltration/inflow (RDII) flow rate was calculated from the data. This flow rate was added to the peak dry weather flow observed at the site in order to calculate an estimated peak wet weather flow rate. The Peak Wet Flow Factor is the result of dividing the peak wet weather flow by the average flow for a site.

Table 4 - Peak Flow Results Summary Table

Site No.	Location	RMWD Manhole No	Existing Diameter (in.)	Average Flow (gpm)	Peak Dry Weather Flow (gpm)	Peak Dry Weather Flow Factor	Peak Wet Weather Flow* (gpm)	Peak Wet Weather Flow Factor
1	Little Gopher Canyon Rd.	MH5543	8	21	35	1.69	44	2.09
2	Old River Rd @ Golf Club Rd.	MH6053	8	30	54	1.77	70	2.30
3	Camino Del Rey on Golf Course	MH6054	10	40	75	1.87	123	3.06
4	Camino Del Rey on Golf Course	MH5410	12	312	471	1.51	531	1.70
5	Gird Rd. @ State Route 76	MH5721	12	71	110	1.55	135	1.89
6	CA-76 @ Old Highway 395	MH5798	12	86	123	1.43	132	1.53
7	15N off Freeway	MH5904	8	6	9	1.49	12	2.03
8	15S Ostrich Farm	MH5965	12	78	129	1.66	147	1.89
9	Lake Circle Dr. s/o Dulin Rd.	MH5242	12	70	130	1.85	177	2.52
10	Lake Circle Dr. s/o Dulin Rd.	MH6176	8	17	29	1.71	41	2.38
11	Via Altamira off S Old Highway 395	MH5826	8	4	9	2.50	9	2.50
12	Laketree Dr. e/o Gird Rd.	MH5039	8	9	12	1.40	16	1.85
13	Flowerwood Ln off Highway 76	MH6146	8	5	9	1.73	29	5.76
14	Highway 76 w/o Gird Rd	MH5719	12	333	498	1.49	559	1.68
16	Sweetgrass Ln. off Highway 76	MH5338	8	4	14	3.62	25	6.54
17	Thoroughbred Ln off Highway 76	MH5205	8	18	30	1.69	45	2.54
18	W Lilac Rd w/o Via Ganelli	MH5569	8	0	0	2.37	1	4.24
19	E/o intersection Camino Del Rey & Golf Club Dr	MH6070	8	16	40	2.56	39	2.45
20	Spa Haven Wy s/o Gopher Canyon Rd	MH5464	8	3	8	2.89	51	17.38

* Peak wet weather flow is calculated based on adding I/I flow to peak dry weekend flow for each flow monitor site.

4.1.1 Rain Dependent Infiltration/Inflow (RDII)

The RDII response of a sanitary sewer collection system to a wet weather event may vary according to many local factors, including the local rainfall intensity, the location of the water table with relation to the pipes of the system, and the soil saturation at the time of the event. For this reason, predicting the response of a system to a future wet weather event based upon a past event is difficult and imprecise. However, characterizing the response of a system or portion of a system (a basin) to a storm(s) can still be useful. Such characterization can be used to prioritize portions of a system for rehabilitation based upon relative response, can be used to evaluate a system or basin based upon industry standards or peer systems, or can be used to evaluate the effectiveness of rehabilitation based upon "before rehabilitation" and "after rehabilitation" characterization.

Characterization of the wet weather response of a collection system to a wet weather event requires normalization of both the event and the collection system. Normalization of the wet weather event requires describing the response per inches of rain during the event or per rainfall intensity (inches/hour). Event normalization ensures that the characterization is valid over a range of wet weather events, and not simply one particular storm. For instance, the wet weather response of Basin A may be characterized as X gallons of flow entering the system per inch of rainfall measured.

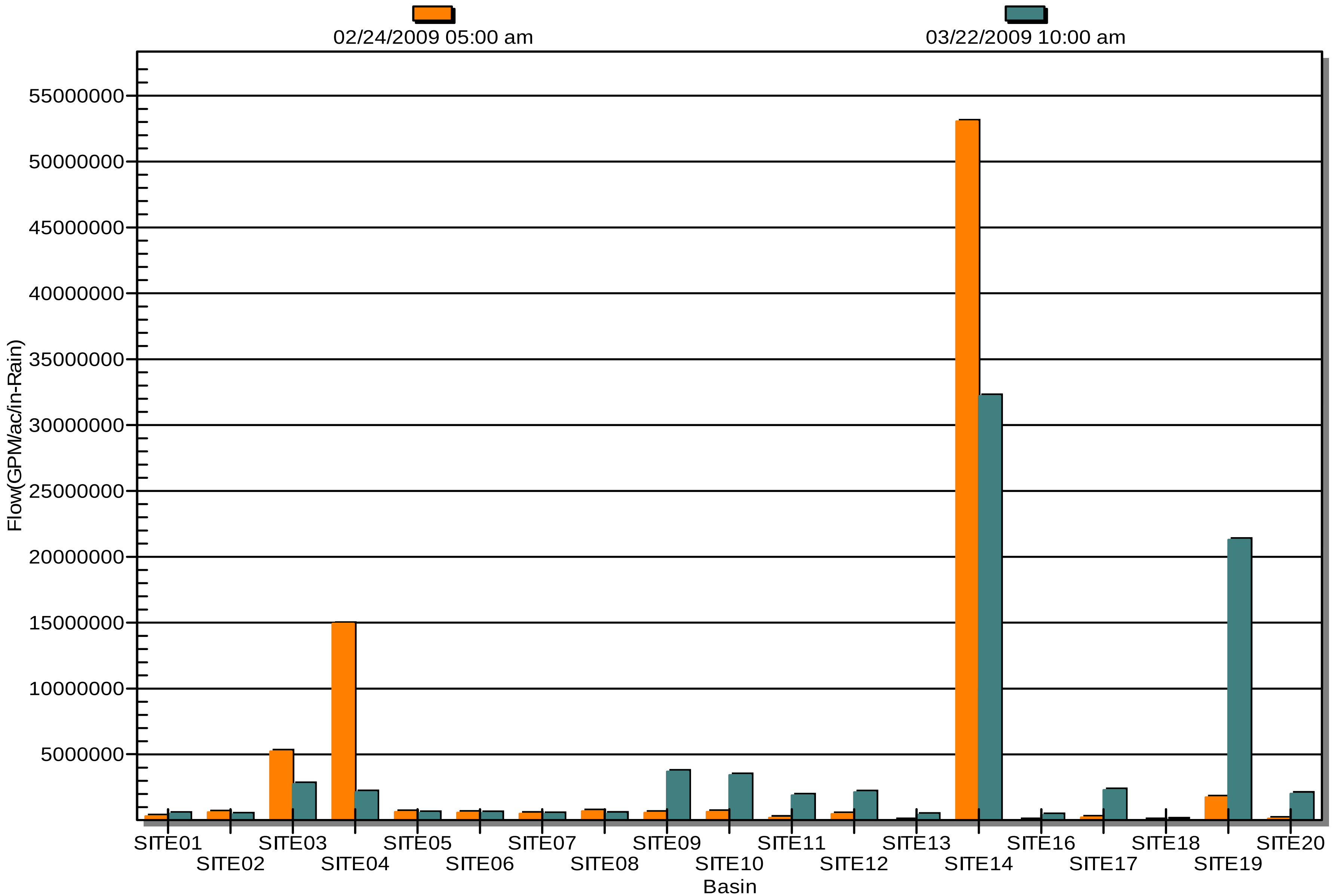
Normalization of the collection system requires expressing the wet weather response in terms of collection system or basin size, most often given in terms of pipe length (feet), pipe footprint (inch diameter-mile), or area served (acres). Because a larger basin presents more opportunity for RDII flows to enter, it is expected that larger basins will see a larger response to a wet weather event in terms of gross RDII flows measured. In order to eliminate the size of the basin as a factor and to more accurately understand the "leakiness" of a basin, the RDII flows are normalized by basin size. For instance, the wet weather response of Basin A may be characterized as X gallons per day of RDII per foot of pipe in the basin.

When the RDII response of a basin is normalized by both the wet weather event and the basin size, a true estimation of the basin's "leakiness" can be determined. In this case, the wet weather response of Basin A may be characterized as X gallons per day of RDII per foot of pipe per inch of rain, or X gallons per day of RDII per inch-diameter mile per inch of rain. This normalized response of Basin A can be compared to that of other basins in the system, to that of other basins across the region or country, or to that of industry standards in order to evaluate rehabilitation priority and options.

Figure 2 illustrates the District's normalized RDII response for each flow monitor site of this study, shown as gallons per day of RDII flow per acre per inch of rain. As can be seen in the figure, the majority of the sites in this study show a minimal RDII response to the storms captured in this study. Site 4 and site 14 show a higher RDII response. The response at these sites may indicate the presence of defects in pipes upstream of the site that are susceptible to flow entry.

Figure 2: Rainfall Dependent Inflow/Infiltration

Net I/I Peak Flow for Various Storms



4.1.2 Base Infiltration (BI)

Base infiltration is defined as any water inflow or infiltration into the sanitary sewer system during dry weather days. This includes water entering the sewer system from the ground through defective pipes, pipe joints, connections, or manhole walls. Furthermore, BI includes water on dry weather days entering the sewer that discharged from cellar and foundation drains, cooling-water discharges, and drains from springs and swampy areas.

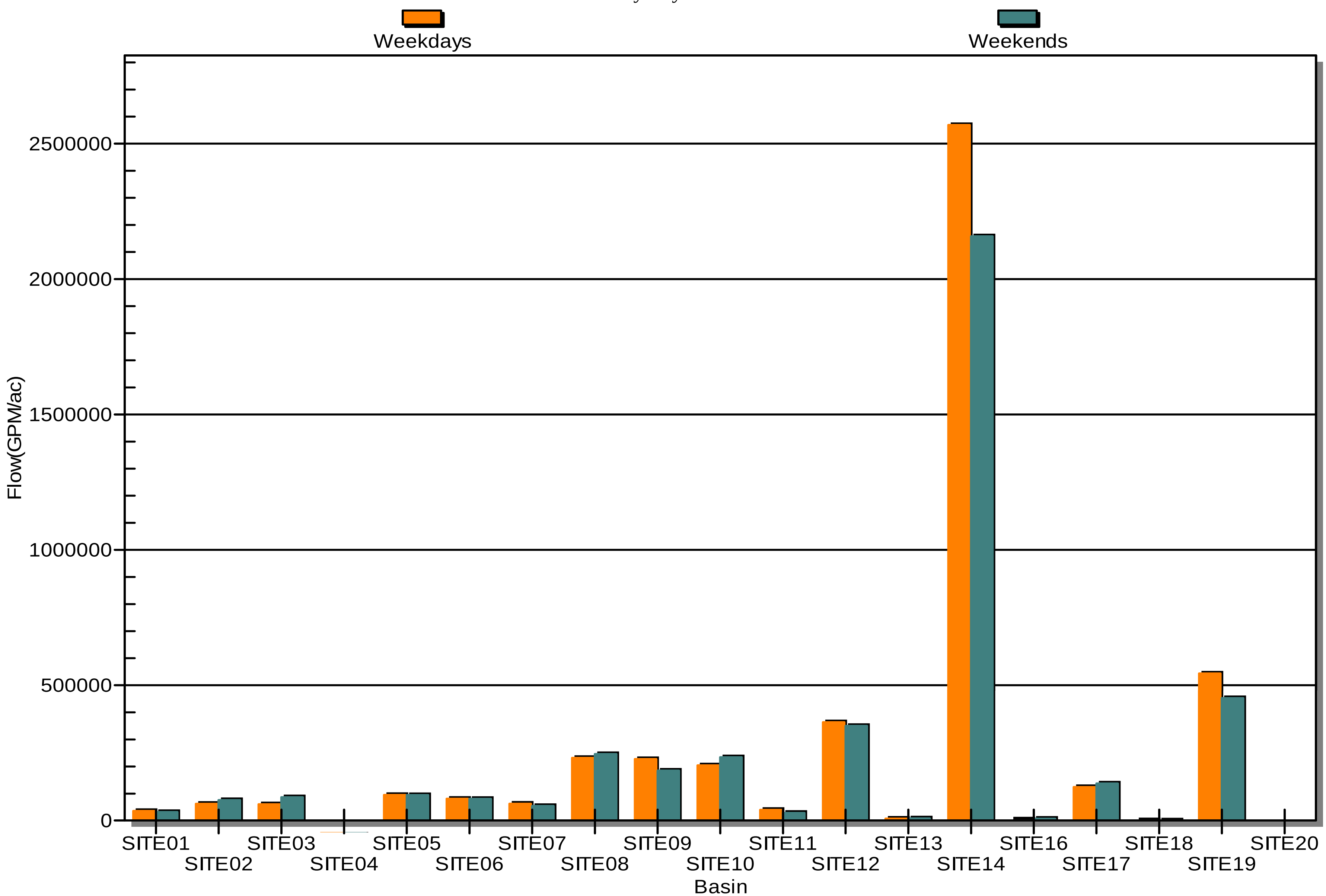
Base infiltration flows can be measured in a sanitary sewer system through sampling temperature and salinity characteristics of flows, and calculating the BI through the effects of the colder, less saline infiltration water on these measurements. Base infiltration flows can also be estimated using statistical models that compare the minimum, average, and peak flows at a particular site in order to estimate the percentage of flow that is BI.

One such statistical model, the Stevens-Schutzbach Equation, was used to estimate BI at the 19 sites in this study. The equation was applied to both typical weekend and typical weekday flows for each site, not because BI is expected to differ based upon day of the week, but because agreement between the two BI estimates provides confidence in results. The BI estimates for each site were normalized by the amount of pipe contributing flow to each site in order to prioritize sites.

The District's normalized base infiltration results are illustrated in Figure 3. As shown, Site 4 and Site 14 shows the highest normalized BI rates, just as they show the highest normalized RDII response. This RDII/BI relationship is typical because the same defects that allow for infiltration during dry periods allow for RDII entry during wet events.

Figure 3: Net Base Infiltration

Dry Day Flow



4.2 Stallion Flow Meter Mass Balance

The District provided IEC with Stallion Flow Meter data for the period observed during this flow monitor study. By performing a mass balance between the total flow seen at the bottom of the flow monitor area (the sum of flow seen at Site 01, Site 02, Site 03, and Site 04) and the flow seen at the Stallion Flow Meter, IEC determined the average unaccounted for difference entering into the Stallion Flow Meter, as shown in Table 5.

Average Difference = Stallion Flow Meter - (Site 1 + Site 2 + Site 3 + Site 4)

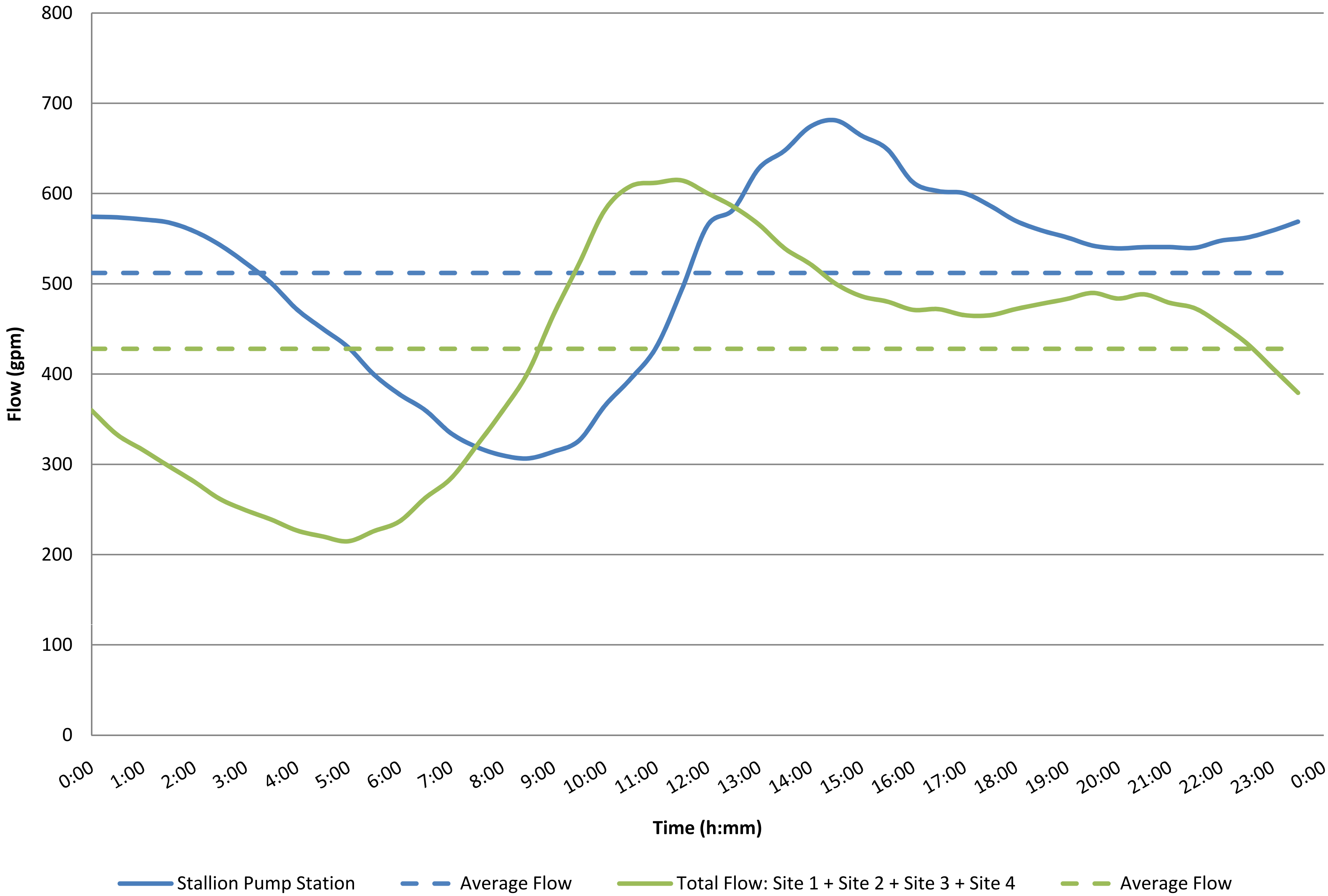
Table 5 - Total Average Difference

Average Stallion Flow Meter (gpm)	Average Observed Flow (gpm)	Average Difference (gpm)
512	420	92

Figure 4 illustrates the total average difference entering into the Stallion Flow Meter. As can be seen in the table and figure, approximately 92 gpm are unaccounted for between the temporary flow monitors and the Stallion Flow Meter. RMWD staff knows of approximately four (4) sanitary connections in the unaccounted for area. It is estimated that these additional connections contribute a maximum of 10 gpm of additional wastewater flow to the average observed flow from Table 5. In summation, the mass balance performed between the temporary flow monitor area and the Stallion Flow Meter indicates significant infiltration in the wastewater conveyance line.

Stallion Flow Meter vs. Total Flow Monitor Flow - Average Flow Mass Balance

Figure 4



4.3 Conclusions and Action Items

The 2009 Flow Monitoring Study for Rainbow Municipal Water District successfully captured dry weather and wet weather data for the wastewater collection system. Although the wet weather events captured during the study were relatively small, portions of the system showed RDII response. The flow monitoring data captured during these events have indicated areas of priority for RMWD.

The following steps can be taken to utilize the results of this study:

- Calibrate the hydraulic model to average dry and peak dry flows. A calibrated hydraulic model is required for existing and future capacity analysis, both of which are required for compliance with the SSMP.
- Use the wet weather data captured in this study to develop a design storm for analysis in wet weather scenarios of the hydraulic model. A wet weather capacity analysis involving a design storm is required for the SSMP.
- Develop land use-based wastewater generation factors for RMWD based upon basin result to help guide assess the wastewater impact of future development. Wastewater generation factors will help RMWD manage the capacity of the collection system into the future.
- Initiate further study and rehabilitation projects into Basin 4 and Basin 14 in order to isolate and remove BI and RDII sources. Removing BI and RDII will lower the risk of sanitary sewer overflows, lower current treatment costs, and free capacity in the system to be sold to future customers.
- Initiate further study and rehabilitation projects into the conveyance pipe leading into Stallion Flow Meter in order to isolate and remove BI

sources. Removing BI will lower the risk of sanitary sewer overflows, lower current treatment costs, and free capacity in the system to be sold to future customers.

- Initiate targeted Inflow and Infiltration (I&I) studies in the system. These studies may include flow monitoring small areas of the system, or prioritizing inspection and condition assessment efforts into areas shown to have noticeable RDII response in this study.

5.0 Equipment and Principles of Operation

5.1 Equipment

Open channel flow for this project was measured with temporary flow meters at twenty-four (24) locations. The flow meters used by IEC use various depth measurement and velocity measurement technologies. Each of the technologies will provide data of high quality when properly applied to specific environmental, hydraulic and physical conditions. The sensors were mounted on an expandable aluminum ring installed in the sewer pipe, normally upstream from the manhole invert. The signal from the sensors was transmitted to the monitor through a communications cable.

IEC carries a variety of flow monitoring products for all pipe capacities and types and are not bound by a specific manufacturer. For this project, IEC utilized the Isco 2150 Area Velocity (AV) flow meter at all sites. The flow meters were programmed to record the measured flow depth and velocity at five-minute intervals.

Data Logging Rain Gauge

For rainfall detection, Onset's Data Logging Rain Gauge RG2 was used. The rain gauge is a self-contained, battery-powered rainfall data collection and recording system. The Data Logging Rain Gauge integrates a HOBO® Event data logger into a tipping-bucket rain gauge. The RG2 automatically records up to 80 inches of rainfall data that can be used to determine rainfall rates, times and duration. A time and date stamp is stored for each 0.01 inch tip event.

2150 Area Velocity Module (AV)

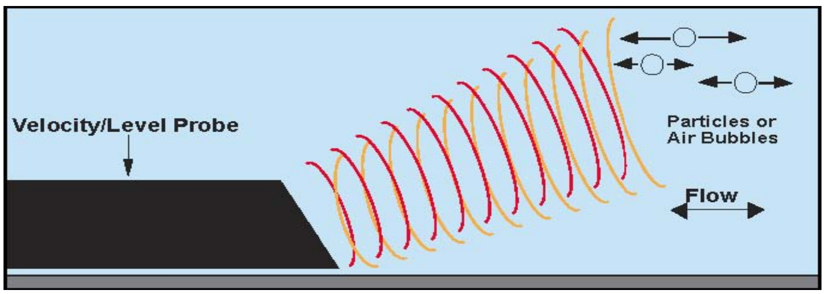
The 2150 Flow Module uses continuous wave Doppler technology to measure mean velocity. IEC typically uses the 2150 area velocity flow meters for pipe sizes ≤30 inches and continuous wave Doppler technology to measure mean velocity. The sensor transmits a continuous ultrasonic wave and measures the frequency shift of returned echoes reflected by air bubbles or particles in the flow. The 500 KHz Doppler is ideal for applications such as sewer flow monitoring, I&I Studies, combined sewer overflow (CSO) monitoring, and storm water runoff monitoring.

5.2 Principles of Operation (2150 AV)

The area velocity method is one method commonly used for automatically measuring open channel flow. A Doppler flow meter (area-velocity meter) operates by emitting into the flow ultrasonic waves of known frequency and duration from a transmitter located in the channel invert. Suspended particles and air bubbles in the flow reflect the emitted waves. The sensor receives and detects the deflected frequencies, and processes them to determine the average velocity.

The area velocity method calculates flow rate by multiplying the area of the flow by its average velocity. This is often referred to as the *continuity equation*, **Q = A * V.** The main advantage of the area velocity method is that it can be used to measure flow under a wide range of conditions such as open channel, surcharged, full pipe, submerged and reverse flow. You don't have to estimate the slope and roughness of the channel, and silt correction allows you to compensate for debris that accumulates on the bottom of the channel.

Figure 6 – Doppler Flow Meter Operations (Courtesy of Teledyne Isco)



6.0 Data and Report Management

Data Management means responsibility for managing the sewer flow data results and making this information available to those that have a stake in the use and management of water and wastewater infrastructure information. This section of the report provides a detailed reporting of the flow meter station information and flow data provided for each metered location.

6.1 Field Investigation Reports

The field investigation reports consist of the temporary flow monitoring Location Information Summary Form. The Location Information Summary Form provides three illustrations of the physical location of each flow monitoring station. Pertinent information relative to pipe details and observations, instrumentation, technician comments, and hydraulic conditions are listed. The Manhole Condition Report Form provides information relative to the manhole, site access, safety and its overall physical condition. All confined space entry permits and site calibration documents are kept on file for reference only.

6.2 Data Summary Sheet

The Data Summary Sheet is provided for a quick overview of the flow monitoring results at each location. It contains the average, minimum, and maximum values for depth of flow, velocity, and flow rate over the duration of the monitoring period.

6.3 Hydrograph Presentation

The Hydrograph is a chart that displays the change of a hydrologic variable over time. A flow data hydrograph illustrating all metered entities is presented in combination with the Data Summary Sheet. A graphical time series presentation of Depth (inches), Average Velocity (ft/s) and Flow Rate (gpm or mgd) is provided for each site. The hydrograph is created using 15-minute averages of the measured data. The stacked axis allows easy visual identification of the location's performance.

6.4 Scattergraphs

Scattergraphs, or X-Y plots of observed average velocities and flow rates versus observed depths, are provided for each site. These plots provide a graphical representation of hydraulic conditions at the sites, and can illustrate the collected data's tendency toward trending to known hydraulic conditions (i.e. Manning's Equation). These graphs are particularly useful for showing a site's hydraulic reaction to conditions such as backwater or surcharge. For this report, there are two different types of scattergraphs, the Flow Rate vs. Depth and the Average Velocity vs. Depth.

6.5 Tabular Data Presentation

Tabular Data time series records of Flow Rate (mgd or gpm), Average Velocity (ft/s) and Depth (inches) are provided as a function of time of day and date. For all monitoring locations, real-time readings are collected every five-minutes for each parameter monitored. Hourly averages are then calculated from these five-minute readings. For example, all discharge measurements recorded from time period 00:00 through 00:59 for any given day are reported as an hourly average on each row of the tabular report.

Hourly averages of the metered data are given for each day of monitoring as well as the average, hourly minimum and maximum and instantaneous minimum and maximum values. At the bottom of each day's column are summary statistics for that day, as follows:

- The *"Mean"* is the average of all instantaneous readings for that day.
- The *"Maximum and Minimum Hourly Means"* are the maximum and minimum hourly averages shown in hours 0 through 24.
- The *"Instantaneous Maximum"* is the greatest single reading data value obtained during the day.
- The *"Instantaneous Minimum"* is the smallest single reading data value obtained during the day.

7.6 Electronic Data Presentation

Final data reports are produced in electronic formats including all data plots and photographs. Flow rate, depth, average velocity and temperature data in 15-minute increments are provided in CSV format. The data are identified by the site number and the manhole identifications.

EPA New England Water Infrastructure Outreach provides tools, examples, and technical assistance for water infrastructure operators and managers, local officials, and other decision-makers for more effective and sustainable water infrastructure management. For more information see http://www.epa.gov/region1/sso/toolbox.html

Guide for Estimating Infiltration and Inflow

June 2014

Purpose

This Guide is intended to provide background and information for managers of wastewater collection systems on estimating the amount of infiltration and inflow (I&I) entering their collection system and for responding to National Pollutant Discharge Elimination System (NPDES) I&I permit reporting requirements.

This Guide provides methods for analyzing wastewater treatment plant influent flow data to estimate the I&I impact from the collection system as a whole. It will assist municipalities in ascertaining whether they have a significant I&I problem and, if so, what kind of problem they have. Areas (sewersheds) served by pump stations that are capable of recording flow can also be evaluated using these methods.

Background

There are three major components of wastewater flow in a sanitary sewer system, base sanitary (or wastewater) flow, groundwater infiltration and rainfall derived inflow and infiltration, more commonly referred to as inflow. Virtually every sewer system has some infiltration and/or inflow. Historically, small amounts of I&I are expected and tolerated. However, infiltration and inflow may be considered excessive when it is the cause of overflows or bypasses, or the cost to transport and treat exceeds the cost to eliminate it. In cases where the I&I may not be considered "excessive" from a cost-to-eliminate perspective but causes health or environmental risks, corrective actions are required.

Even where a system is not suffering from sanitary sewer overflows (SSOs), systems experiencing surcharging may be good candidates for further I&I investigation, as are systems where significant new growth is expected and existing collection system capacity may be inadequate or marginal for handling new customers.

State Revolving Loan Fund (SRF) applicants are generally required to evaluate the impacts of I&I on their overall system. This evaluation usually begins with an initial screening to determine whether a more complete I&I analysis will be required. The screening compares the sewered population to the treatment plant flow to determine gallons per day per person (gpdpp). The gpdpp is compared to a standard to determine if there is excessive infiltration. The states' standards vary between 100 and 150 gpdpp. The existing EPA guidance, which uses 120 gpdpp, was published in 1985 when 3.5 gallon-per-flush toilets were standard (the Energy Policy Act of 1992 required that toilets installed in new construction use a maximum of 1.6 gallon per flush (low-flow toilets)).

Some guidance documents use the term excessive infiltration/inflow. This can mean quantities of I&I which can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the I&I conditions to the total costs for transportation and treatment of the infiltration/inflow. I&I which causes SSOs is considered excessive.

Municipalities will be well served to understand the dimensions and nature of any I&I problems. A clear set of goals is important for keeping an I&I program focused.

The following is a sample of possible goals:

- To reduce ratepayer costs for transporting and treating wastewater by implementing all cost-effective I&I reduction projects within 10 years.
- To minimize liability from water pollution and public health risks by eliminating sanitary sewer overflows in storm events.
- To eliminate sufficient I&I to avoid the capital costs of wastewater treatment plant capacity expansion in anticipation of 10% population growth over the next 20 years.
- To eliminate sufficient I&I to avoid the capital costs of interceptor expansion which will be needed to support the build-out of certain neighborhoods.
- To eliminate enough I&I to offset the environmental and regulatory impact of sewer system expansion and increased water demand over the next 15 years.

In some cases, high levels of infiltration can lower groundwater levels and can cause significant hydrologic impacts to nearby streams. The health of tributary streams is critical to the health of main stem rivers, and reduced flows can impair the fish community by decreasing dissolved oxygen and available habitat, increasing water temperatures, and concentrating pollutant levels.

Finally, just as collection system capacity problems may indicate excessive inflow, the same can be said for treatment plant capacity problems. Your state agency can provide you with treatment plant design standards which can then be compared with your influent flow data. The Ten States Standards for Wastewater Facilities is also a good reference source.

Data Collection

To assess extraneous water entering your system at least a year of influent flow data to the treatment facility should be examined.

For infiltration analysis, flow data collected during the high groundwater periods is used. The Average Dry Weather (ADW) flow can be determined from analyzing a one to two week period during seasonal high water that is not influenced by rainfall. For the northeast, this is usually in the spring when the frost line is receding and the snow is melting. The ADW flow includes the sanitary flow plus infiltration, which can be separated into its individual components.

For inflow analysis, the Average Wet Weather (AWW) flow can be estimated from flow data for a one week period when there has been significant rain. If a single storm event is used to analyze wet weather inflow, it should be an event large enough to cause surface ponding and runoff.

Definitions of terms used in Calculating Inflow and Infiltration

Average Annual Flow - The total annual volume divided by 365 days. This value is approximated by the mean of the twelve monthly average flows.

Average Annual Infiltration - The average of the monthly minimum flows.

Average Annual Inflow - From the average annual flow, subtract the base sanitary flow and average annual infiltration.

Average Dry Weather Flow (ADW) - Flow during a period of extended dry weather (7 to 14 days) and seasonally high groundwater. Flow includes sanitary flow and infiltration, and excludes significant industrial and commercial flows (assumes no inflow during dry weather conditions).

Base Sanitary Flow (BSF) - The portion of wastewater which includes domestic, commercial, institutional, and industrial sewage and specifically excludes infiltration and inflow. (See Estimating Base Flow, below).

Delayed Inflow volume - The portion of total inflow which is generated from indirect connections to the collection system or connections which produce inflow after a significant time delay from the beginning of a storm. Delayed inflow sources include: sump pumps, foundation drains, indirect sewer/drain cross-connections, etc. Rainfall-induced infiltration cannot be distinguished from delayed inflow and is therefore included as part of delayed inflow. Delayed inflow sources have a gradual impact on the collection system and flow decreases gradually upon conclusion of the rainfall event, and after peak inflow caused by direct connections.

Direct Inflow Volume- The portion of total inflow volume which is from direct connections to the collection system such as catch basins, roof leaders, manhole covers, etc. These inflow sources allow stormwater runoff to rapidly impact the collection system.

Dry Weather Flow (DWF) - All flow in a sewer (includes sanitary flow and infiltration) except that caused directly by rainfall. Measured during a period of extended dry weather (7 to 14 days) and seasonally high groundwater.

Groundwater Infiltration (GWI) – Measured during average dry weather flow period (see above). The average of the low nighttime flows (midnight to 6 am) per day for the same time period, minus significant industrial or commercial nighttime flows.

Hydrograph - A graph showing stage (the height of a water surface above an established datum plane), flow, velocity, or other property of water with respect to time.

Infiltration - Water other than sanitary wastewater that enters a sewer system from the ground through defective pipes, pipe joints, connections, or manholes. Infiltration does not include inflow.

Inflow - Water other than sanitary wastewater that enters a sewer system from sources such as roof leaders, cellar/foundation drains, yard drains, area drains, drains from springs and swampy areas, manhole covers, cross connections between storm sewers and sanitary sewers, and catch basins. Inflow does not include infiltration.

Inflow volume - The total volume of inflow from a single storm event including both direct and delayed inflow. Total inflow is the area between the storm event hydrograph and the dry weather hydrograph.

Maximum Daily Flow - The highest flow during a 24 hour period.

Maximum Daily Infiltration - The highest daily flow at seasonal high groundwater after a dry period of three days or more minus the base sanitary flow.

Maximum Weekly Infiltration - The highest 7 day average flow at high groundwater after a dry period of three or more days minus the base sanitary flow.

Maximum Monthly Infiltration - The highest monthly average flow during dry or minimal rain period minus the base sanitary flow.

Maximum Daily Inflow - The highest daily wet weather flow minus the base sanitary flow and the infiltration prior to the rain event.

Maximum Weekly Inflow (includes delayed infiltration) - The highest 7 day average wet weather flow minus the base sanitary flow and the infiltration prior to the rain event.

Maximum Monthly Inflow - The highest monthly flow after subtracting the base sanitary flow and infiltration.

Peak Hourly Dry Weather Flow - The highest one hour flow after a dry period of three or more days.

Peak Hourly Inflow - The highest one hour flow rate during wet weather minus the base sanitary flow and the infiltration prior to the rain event.

Peak Hourly Wet Weather Flow – The highest one hour flow during a significant rain event.

Peak Infiltration- The highest nighttime (midnight to 6 am) flow during high groundwater (usually in early spring).

Peak Instantaneous Wet Weather Flow - The peak flow during a significant rain event day when the ground water is seasonally high.

Peaking Factor - The ratio of peak hourly flow to average daily flow.

Rainfall-Induced Infiltration - The short-term increase in infiltration which is the result of a rain event. Rainfall-induced infiltration is a portion of delayed inflow.

Wet Weather Flow- The highest daily flow during and immediately after a significant storm event. Includes sanitary flow, infiltration and inflow.

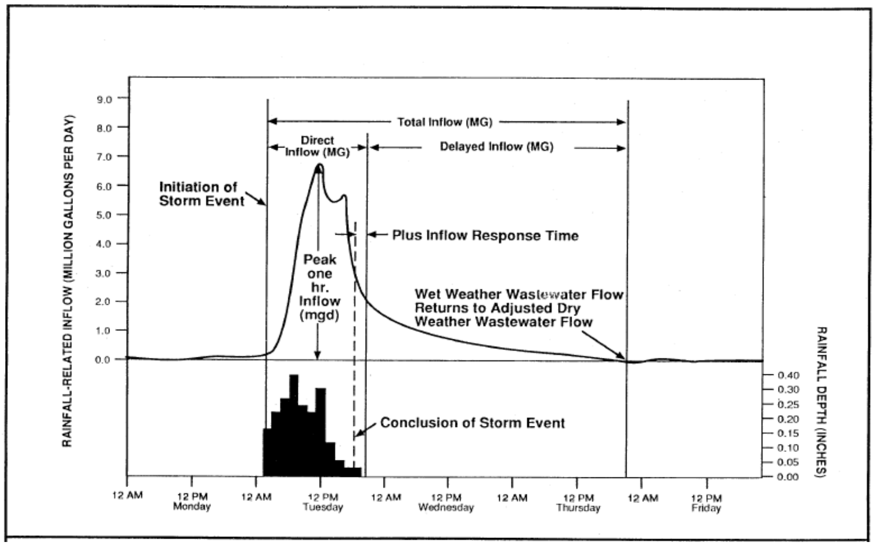


Figure 1: **Hydrograph helps visualize inflow as the response to wet weather flow (from MassDEP 1993)**

Estimating Base Sanitary Flow

The sanitary portion of the wastewater flow can be estimated through two methods, which can be used to 'check' each other - flow meter data and water consumption (if all sewer customers are on metered water).

The first method is to analyze the wastewater flow data at the treatment facility during a dry weather period of 7 to 14 days. It is useful to choose the dry weather period during seasonal high water as you will be able to determine the peak infiltration rate at the same time. From the flow data, calculate the average daily flow for the dry weather period (Average Dry Weather – ADW - flow). The base sanitary flow (BSF) can be estimated by subtracting the groundwater infiltration (GWI) flow from the average daily dry weather wastewater (ADW) flow. (See Estimating Infiltration below).

In the second method, water usage records can be used to estimate the base sanitary flow for the sewered population. The best time to estimate flow using this method would be when outdoor water uses are low and wastewater from a residential area can be assumed to be the same as the billed water use. In the northeast, this would typically be in the winter months prior to landscaping and swimming pool use. Groundwater infiltration can be estimated as the difference between the monitored wastewater flow and the billed water use.

Estimating Infiltration

Groundwater infiltration (GWI) can be estimated from influent flow data collected during a dry weather period at high groundwater. The dry weather period selected should be the same period as for estimating the BSF, however, it is more important to estimate GWI during high seasonal ground water. Dry weather is defined as when it has been at least three days without a rain event. During dry weather, inflow is expected to be zero.

During seasonal high groundwater, which usually occurs after snow melt and soil thaw, infiltration will be at its highest. During this period, the infiltration rate can be quantified by averaging the nighttime flows (midnight to 6 am) over several days, during dry weather conditions. The nighttime flows can be assumed to be mostly groundwater (after subtracting significant industrial or commercial nighttime flows).

In most cases, the GWI rate will approximate the maximum weekly infiltration. The maximum daily infiltration will be higher and maximum monthly infiltration will be lower.

Estimating Inflow

Inflow represents the influence of wet weather on the sewer system and is calculated by subtracting out the sanitary wastewater and infiltration flow during a time that the system has been influence by rain. Flow data during a significant storm event should be compared to the dry weather data immediately preceding the storm when groundwater conditions are similar. The rate and volume of inflow can be estimated by subtracting the base sanitary flow and infiltration flow data from the wet weather flow data.

The peak inflow rate and the total inflow volume can be calculated from the flow records. The peak inflow rate is the largest rate difference, over a one hour period, between the storm event flow data and the dry weather flow prior to the event. The total inflow volume from a storm event can be apportioned into two components: direct inflow and delayed inflow.

Direct inflow is the portion of the inflow which rapidly increases soon after the start of the storm and decreases swiftly upon conclusion of the event. The time it takes for inflow from the nearest sub-basin to reach the treatment facility can be estimated as the time difference between initiation of the storm event and the increase in observed flow. The direct inflow ends at a time after the conclusion of the storm approximately equal to the inflow response time from the furthest sub-basin.

Delayed inflow is the portion of the inflow which decreases gradually upon conclusion of the storm and after the peak inflow caused by direct connections. Delayed inflow is the inflow Beginning at the conclusion of direct inflow and ending at a time when dry weather flow resumes. It is expected that a portion of the delayed inflow includes rainfall-induced infiltration.

In some cases, a second storm will impact the flow data before dry weather flow resumes. When this occurs, the expected delayed inflow can be extrapolated from the flow data collected prior to the second storm.

Estimating Infiltration and Inflow (I&I)

Maximum monthly I&I rate can be estimated by subtracting the BSF from the maximum monthly average flow.

Average annual I&I rate can be estimated by subtracting the BSF rate from average annual flow rate.

Annual I&I volume can be estimated by multiplying the average annual I&I rate by 365 days.

Summary

Sewers and treatment facilities are designed around expected average and maximum flows. Excess storm and groundwater entering the sewer system through I&I robs the system of its valuable capacity, puts a burden on operation and maintenance, and reduces the life expectancy of the treatment facility. Sewer surcharging, back-ups and overflows all require emergency response and contribute to disruption of operations.

Integrating I&I investigation and corrective action into a municipality's normal public works budget can allow an incremental approach to continuous improvement and help defer capacity expansion projects.

References

Computer Tools for Sanitary Sewer System Capacity Analysis and Planning
EPA/600/R-07/111, October 2007

Design Flow and Loading Determination Guidelines for Wastewater Treatment Plants
Minnesota Pollution Control Agency (MNPCA) February, 2002

Guidance for evaluating Infiltration and Inflow for State Revolving Fund Projects
Louisiana DEQ (LA DEQ) October, 2001

Guidelines for Performing Infiltration/Inflow Analyses and Sewer System Evaluation Survey
MassDEP January, 1993

Infiltration/Inflow - I/I Analysis and Project Certification
EPA May, 1985

Minimizing Municipal Costs for Infiltration & Inflow Remediation
Massachusetts EOEA June, 2007

Recommended Standards for Wastewater Facilities, 2004 Edition
(Ten States Standards)

APPENDIX D

RMWD-City of Oceanside Construction, Use, Maintenance and Operation of Wastewater, Transmission, Treatment and Disposal Facilities Agreement

AN AGREEMENT BETWEEN THE CITY OF OCEANSIDE, CALIFORNIA AND THE RAINBOW MUNICIPAL WATER DISTRICT FOR THE CONSTRUCTION, USE, MAINTENANCE AND OPERATION OF WASTEWATER, TRANSMISSION, TREATMENT AND DISPOSAL FACILITIES

THIS AGREEMENT, made and entered into as of the 13th day of February, 2002, by and between the CITY OF OCEANSIDE, California, a municipal corporation, hereinafter referred to as "City", and the RAINBOW MUNICIPAL WATER DISTRICT, a public corporation organized and existing under the Municipal Water District Act of 1911, Division 20 of the Water Code of the State of California hereinafter referred to as "RMWD".

RECITALS

WHEREAS, City and RMWD each provide wastewater collection and conveyance facilities and/or services within the San Luis Rey Basin;

WHEREAS, City owns wastewater conveyance, treatment and disposal facilities located in the City of Oceanside and is willing to treat and dispose of wastewater for RMWD;

WHEREAS, City and RMWD have each determined it is in the best interests of the respective parties to jointly participate in the use, operation, and maintenance of certain existing and future wastewater facilities;

WHEREAS, the Federal Water Pollution Control Act of 1972, as amended (Clean Water Act) (33 U.S.C Sec. 1251 *et seq.*), and the Porter-Cologne Water Quality Act (Water Code, Sec. 13000 *et seq.*) establish goals for the elimination of water pollution of navigable waters;

WHEREAS, in accordance with the aforementioned statutes, the City's treatment and discharge of wastewater into navigable waters must comply with the standards promulgated by the Environmental Protection Agency, the State Water Resources Control Board and the San Diego Regional Water Quality Control Board requirements;

WHEREAS, RMWD, pursuant to Chapter 5, Part 5, Division 20, may enter into contracts with other public agencies to carry out the purposes of RMWD and City, pursuant to Section 37392.1 of the Government Code of the State of California, may enter jointly with public corporations to provide sewers, sewage treatment and disposal facilities;

WHEREAS, City and RMWD previously entered into agreements dated January 2, 1973, and September 10, 1980, to jointly participate in the construction, use, and operation and maintenance of a Wastewater Conveyance and Treatment System (Wastewater System) to serve the City and RMWD;

WHEREAS, City and RMWD are now planning expansion and rehabilitation of said facilities and it is appropriate to revise the previous agreement to reflect current and future needs;

WHEREAS, the City of Oceanside and RMWD acknowledge that they are obligated to comply with the Revenue Program Guidelines of the *Policy for Implementing the State Revolving*

Fund for the Construction of Wastewater Treatment Facilities published by the California State Water Resources Control Board, dated June 18, 1998, or as it may be revised from time to time, because the City has received state and federal grants and loans funding; and

WHEREAS, the City and RMWD desire to enter into an Agreement that reflects and satisfies all Environmental Protection Agency, the California State Water Resources Control Board and the San Diego Regional Water Quality Control Board requirements.

NOW, THEREFORE, in consideration of the mutual promises, covenants and conditions hereinafter set forth, the parties do hereby agree as follows:

Section I. Purpose

The parties enter into this Agreement to provide for the construction, operation, maintenance and replacement of a Wastewater System to serve the respective parties' needs. The parties will finance the construction, operation, maintenance and replacement of the Wastewater System as herein provided.

Section II. Definitions

"Agreement" means this Agreement which is entitled "An Agreement between the City of Oceanside and the Rainbow Municipal Water District For The Construction, Use, Maintenance and Operation of Wastewater, Transmission, Treatment and Disposal Facilities."

"Biochemical Oxygen Demand" (BOD) means the measure of the biologically decomposable material in wastewater, as determined by the procedures specified in the most current edition of "Standard Methods for the Examination of Water and Wastewater", or any successor publication which establishes the industry standard.

"Capacity" means the maximum flow rate for pipes and pumps, and/or the quantity handled during a 24-hour period for wastewater treatment plant facilities.

"Capacity Entitlement" means the contractual right possessed by RMWD to discharge wastewater into the City's System pursuant to this Agreement up to the limit set forth in Exhibit "B" attached hereto.

"Capital Improvement Costs" are costs associated with the planning, design, financing, construction, or reconstruction of facilities.

"City of Oceanside Wastewater System or Wastewater System" shall mean and consist of those facilities and contract rights to facilities which are shown and/or described in Exhibit A attached hereto and incorporated by this reference, including any amendments thereto authorized by this Agreement. This includes the City's Treatment Plants, the Interceptor First Reach, Interceptor Second Reach, the Land Outfall, and the Ocean Outfall.

"City's Treatment Plants" means the San Luis Rey and La Salina Wastewater Treatment Plants located on land owned by the City.

"Fixed Costs" means capacity costs based on equivalent meters and customer costs based on number of customers.

"Flow" means the amount of wastewater discharged by the City and RMWD.

"Flow Rate" means the volume of flow over a specified period of time, expressed as: gallons per minute (gpm), cubic feet per second (cfs), etc.

"HCF" means one hundred cubic feet or 748 gallons and is the standard unit for measure for municipal water service. Also sometimes referred to as a billing unit or CCF.

"Interceptor Sewer - First Reach" means that portion of the interceptor sewer constructed by City from near the intersection of North River Road with College Road to the San Luis Rey Wastewater Treatment Plant and includes the North Valley Sewer Lift Station.

"Interceptor Sewer - Second Reach" means that portion of the interceptor sewer constructed by City from the intersection of North River Road with Stallion Road to near the intersection of North River Road with College Road to connect with First Reach.

"Interceptor Sewer - Third Reach" means that portion of the interceptor sewer constructed by District from the intersection of North River Road with Stallion Road to District's collection system, as shown on said Exhibit "A".

"Land Outfall" means the transmission facilities from City's San Luis Rey Wastewater Treatment Plant to the ocean outfall as shown on said Exhibit "A" and includes the pumping plant.

"MGD" means millions of gallons per day flow rate.

"Ocean Outfall" means the Outfall as shown on said Exhibit "A."

"Point of Delivery" means the location of the meter to measure RMWD's flow of wastewater being delivered to City as shown on said Exhibit "A", said meter being at the westerly end of Interceptor Sewer –Third Reach.

"Operation and Maintenance Costs" are the costs of those items and activities required by sound engineering and management practices to keep the conveyance, treatment and disposal facilities functioning in accordance with all applicable laws, rules, and regulations.

"Replacement Reserve" means a reserve established pursuant to Clean Water Act requirements and funded annually. This reserve is established to provide funds for obtaining and installing equipment, accessories, and/or appurtenances which are necessary during the useful life of the treatment works to maintain the capacity and performance for which such works were designed and constructed.

"Revenue Program" means the rate schedule and analysis that demonstrates that each class of wastewater discharger is paying its fair and equitable share of the cost of operating and maintaining the City of Oceanside Wastewater System, complying with the Revenue Program Guidelines of the *Policy for Implementing the State Revolving Fund for the Construction of Wastewater Treatment Facilities* published by the California State Water Resources Control Board, dated June 18, 1998, or as it may be revised from time to time.

"State Revolving Fund" means the Loan Program created by the Federal Clean Water Act and various California State laws including the Clean Water Bond Law of 1984, the Safe, Clean, Reliable Water Supply Act (1996 Bond Law), and any subsequent bond laws. The primary purpose of the State Revolving Fund is to finance wastewater treatment facilities necessary to prevent water pollution, recycle water, correct nonpoint source and storm drainage pollution problems, and thereby protect and promote the health, safety, and welfare of the inhabitants of the State of California.

"Strength" means the measurement of SS and BOD within the wastewater flow and any other measurement required by law after the date of this Agreement.

"Suspended Solids" (SS) means the insoluble solid matter in wastewater that is separable by laboratory filtration, as determined by the procedures specified in the most current edition of "Standard Methods for the Examination of Water and Wastewater", or any successor publication which establishes the industry standard.

"Transmission System" means the interceptor sewer third reach, second reach, first reach, and the North Valley Lift Station.

"Variable Costs" means transmission system costs based on flow and treatment costs based on flow and sewage strength.

Section III. Scope

The City of Oceanside's Wastewater System is located in San Diego County as outlined on the attached map, attached hereto as Exhibit "A", and incorporated by this reference, consisting of facilities necessary to collect, treat and dispose of sewage in accordance with requirements of local, State and Federal agencies having jurisdiction over such matters.

From time to time the Wastewater System will be upgraded and enlarged in accordance with the provisions of this Agreement and for projects costing more than $250,000, the City will notify RMWD at least 3 months in advance of its intention to perform the work.

Section IV. Ownership and Operation of the Wastewater System

A. Rights of Parties

The City is the owner of the Wastewater System, and of any additions to the System or other facilities constructed pursuant to this Agreement. All decisions with respect to the planning, design, construction, operation and maintenance of the System shall rest with the City.

RMWD shall have a contractual right to use the System. Subject to the terms of this Agreement, and in conformance with all applicable laws, the City may transfer ownership of all or part of the System at any time. In the event of a transfer, the City's successor shall be bound by the terms of this Agreement.

B. Wastewater System Services

The City shall provide wastewater transmission, treatment and disposal services to RMWD through the Wastewater System, under terms set forth in this Agreement. The City shall operate the System in an efficient and economical manner, maintaining it in good repair and working order, all in accordance with recognized sound engineering and management practices. The City shall convey, treat, and dispose of all wastewater received under this Agreement in such a manner as to comply with all applicable laws, rules and regulations.

C. Funding Obligations

Nothing in this Section or in this Agreement shall obligate the City to make any payment for the acquisition, construction, maintenance or operation of the Wastewater System from moneys derived from taxes or from any income and revenue of the City other than moneys ~~in~~ or sewer revenues which go into the Sewer Revenue Fund and from construction funds derived from such outside sources as sewer revenue bonds and State Revolving Fund Loans.

D. Financial Statements

1. The City shall keep appropriate records and accounts of all costs and expenses relating to conveyance, treatment, disposal, and reuse of wastewater; and the acquisition, planning, design, construction, administration, monitoring, operation and maintenance of the Wastewater System.

2. Said records and accounts shall be subject to reasonable inspection by any authorized representative of RMWD at its expense. Further, said accounts and records shall be audited annually by an independent certified public accounting firm appointed by the City pursuant to generally accepted accounting principles. A copy of the Comprehensive Annual Financial Report prepared by the City's independent auditors shall be available to RMWD within 30 days after completion of the audit.

Section V. Capacity Rights

RMWD is responsible for 10.00 percent of the City's construction cost of the interceptor sewer – first reach and 58.25 percent of the City's construction cost of the interceptor sewer – second reach. RMWD is responsible for 100 percent of interceptor sewer third reach. In addition, RMWD has paid for 1 MGD in the San Luis Rey Treatment Facility as well as the City's Land and Ocean Outfall.

The City hereby grants to RMWD and RMWD hereby accepts the following capacity entitlement in the City's current and future treatment facilities, wastewater, transmission facilities, land outfall and ocean outfall:

		2001 Agreement Capacity Entitlement	
	1980 Agreement Capacity	Before Project Entitlement	After Project Completion
Wastewater Treatment Plant	1.00 MGD	1.00 MGD	1.5 MGD
Land Outfall	1.00 MGD	1.00 MGD	1.5 MGD
Ocean Outfall	1.00 MGD	1.00 MGD	1.5 MGD
Transmission Facility First Reach	1.00 MGD	1.00 MGD	1.5 MGD
Transmission Facility Second Reach	1.00 MGD	1.00 MGD	1.5 MGD

RMWD agrees to pay City for its capacity rights in each of said facilities in an amount equal to the percentage of City's construction costs for each facility allocated to RMWD as hereinafter designated. For the entitlement of an additional .5 MGD of capacity RMWD will pay based on the following formula:

Expansion – 6.7 MGD, 62% of construction costs

City	RMWD
6.2 MGD	0.5 MGD
92.54%	7. 46%

Upgrades – 38% of construction costs

City	RMWD
90.48%	9.52%

As identified in Section VII, penalties will be applied should RMWD exceed RMWD's allotted capacity.

RMWD shall not be subject to penalties if completion of construction of the current treatment plant expansion is delayed because of factors beyond the RMWD's ability to control as long as RMWD remains within its allotted capacity.

Section VI. Limitations on Types and Condition of Wastewater

Wastewater discharged by RMWD into the interceptor sewer shall be essentially domestic in character. BOD shall not exceed 250 mg/l, TDS shall not exceed 1200 PPM, and SS shall not exceed 250 mg/l. Volatile organic compounds, abnormal concentrations of heavy metals, or other chemical constituents detrimental to wastewater treatment shall not be permitted in any wastewater discharged into the interceptor sewer. As provided in Section VIII-B of this Agreement RMWD's wastewater flows will be measured for strength.

A. RMWD will comply with all applicable laws, rules, and regulations including its regulatory obligations associated with discharge of wastewater into its respective system and from such system into the City's Wastewater System.

B. RMWD will prevent to the maximum extent practicable, the infiltration and inflow of surface, ground or storm waters into its wastewater system as detailed under Exhibit "B". RMWD will not deliberately discharge stormwater into the City's Wastewater System.

C. In the event a regulatory agency imposes any penalty or takes other enforcement action relating to the conveyance, treatment, or disposal of wastewater in or from the Wastewater System, the City shall determine whether the City or RMWD or any other agency caused or contributed to such penalty or enforcement actions. The City shall allocate the penalty or other relief, including the costs of defense, to the party or parties responsible. Each responsible party shall be obligated to pay its share of such penalty or other relief, and any costs of defense. In the event that the City cannot make such an allocation, the City shall share the cost of such penalty or other relief with RMWD based on each party's respective contribution to Flow and Strength.

D. If RMWD's discharge into the interceptor sewer exceeds these requirements or any additional requirements imposed on the City by the San Diego Regional Water Quality Control Board, the City may perform additional treatment of RMWD's wastewater. The incremental maintenance and operational cost of said treatment shall be paid by RMWD at the time and manner provided for in Section IX hereof.

E. The City has enacted an industrial pretreatment ordinance as well as an Inter-jurisdictional Pretreatment Agreement with RMWD. RMWD shall, by execution of this Agreement, agree to conform to and enforce the Ordinance and Inter-jurisdictional Agreement.

F. RMWD will insure that all industrial users of its wastewater system are regulated by an effective industrial pretreatment program that conforms to all applicable laws, rules and regulations and that is acceptable to the City. RMWD will not discharge any sewage originating outside its respective boundaries into the City's Wastewater System without prior written City approval.

G. When any commercial or industrial activity occurs upstream of the Point of Delivery, RMWD agrees to sample and test monthly for BOD, SS, and TDS, and quarterly for Cd, Cr, Cu, Pb, Ni, and Zn at the Point of Delivery. In addition, RMWD is required to provide the City with a summary of analytical results from an annual full priority pollutant scan. Wastewater sampling and analysis shall be performed in accordance with the City's National Pollutant Discharge Elimination System (NPDES) Order No. 2000-11 and any subsequent amendments thereto. The City may require RMWD to perform such additional testing as may be necessary to identify detrimental elements or compounds.

Section VII. Limitations on Quantities of Wastewater

The City agrees to receive, treat, and discharge RMWD's wastewater in quantities delivered to the City at the Point of Delivery up to a maximum quantity of 1,000,000 gallons during a 24-hour day.

Said maximum quantity shall be considered exceeded if more than 1,000,000 gallons (average dry weather flow – "ADWF") is delivered each 24-hour day for ten (10) or more days in three consecutive calendar months. At such time as the capacity of the San Luis Rey treatment facility is increased and permitted by the Regional Water Quality Control Board to 13,500,000 gallons per day, RMWD's contract capacity will increase to 1,500,000 gallons ADWF during a 24-hour day. At that time said maximum quantity shall be considered exceeded if more than 1,500,000 gallons ADWF is delivered each 24-hour day for ten (10) or more days in any three consecutive calendar months. If the maximum quantity is exceeded for more than ten (10) days in three consecutive calendar months a penalty will apply. The penalty will be seven and a half (7.5) times the current unit cost for capacity, transmission and treatment on flows that exceed RMWD's allocated capacity. The penalty shall last until such time as RMWD meets the flow requirements for three (3) consecutive calendar months.

City will monitor RMWD flows and require RMWD to comply with the City's NPDES permit (Order No. 2000-11), Section G. Reporting Requirements, Paragraph 17. a.-c., to insure adequate future capacity. This shall include:

Upon completion of the expansion, RMWD shall submit a written report to the City within 90 days after the average dry weather influent flow rate for any 30-day period equals or exceeds 75 percent of RMWD's allotted capacity of the waste disposal facilities. RMWD's senior administrative officer shall sign a letter which transmits that report and certifies that the policy-making body is adequately informed about it. The report shall include:

a. Average daily flow for the 30-day period, the date on which the instantaneous peak flow occurred, the rate of that peak flow, and the total flow for that day;

b. RMWD's best estimate of when the average daily dry-weather flow rate will equal or exceed RMWD's allotted capacity of the facilities; and

c. RMWD's intended schedule to control the flow rate before the waste flow rate equals the capacity of the Publicly Operated Treatment Work's present unit operations and processes.

If RMWD exceeds 95 percent of its allotted capacity, RMWD will be required to place a moratorium on sewer connections in its service area.

Section VIII. Flow and Strength Measurements

A. Flow Monitoring

RMWD has installed at the Point of Delivery a meter for the purpose of measuring the amount of wastewater delivered by RMWD to the City. All costs associated with the meter and installation of a replacement meter, if any, shall be paid by RMWD. The City shall approve the type of meter and method of installation of said meter. Flow metering equipment shall include redundant measuring techniques over the entire range of flows for which the station is intended to measure. Flow shall be monitored continuously.

B. Strength Reporting

RMWD shall install a City-approved wastewater strength sampling station adjacent to their existing flow metering station. Strength shall be sampled monthly for the first two years after Execution of this Agreement and then quarterly thereafter. Strength samples shall be collected for 24 uninterrupted hours each month or quarter such that each day of the week is represented over a seven sample period and no day of the week is represented in more than four out of twelve consecutive 24-hour samples. Each 24-hour composite sample shall consist of 24 individual samples, which are combined, such that each sample represents the volume of wastewater discharged during the time between samples. All strength samples shall be taken at the same location as the flow measurement station using an automatic sampling device.

Section IX. System of Charges

A. Charges Authorized

The City agrees to implement and RMWD agrees to abide by a new system of charges. These charges are detailed under Exhibit "C". This new system allows the City to equitably recover from RMWD that district's proportional share of the net Wastewater System Costs through the imposition of a new Wastewater Service Charge (WSC). The charges established by the City shall not discriminate against RMWD's customers, and shall be calculated on the same basis as comparable charges for City customers. Such charges shall be set at the lowest cost consistent with maintaining safe and environmentally sound sewer service to all users.

B. Wastewater Service Charge (WSC)

The City shall determine the WSC based on projected Wastewater System Costs (as defined below and detailed under Exhibit "C") for the forthcoming fiscal year.

1. Wastewater System Costs

The following shall at a minimum be considered Wastewater System Costs for purposes of calculating the annual WSC.

a. Except as provided in Excluded Costs, Subsection 2 below, the annual costs associated with wastewater treatment administration, general administrative allocation, operation, maintenance, annual debt service costs and other periodic financing costs and charges attributable to jointly debt financed facilities, capital improvements, insurance, premiums, claims payments and claims administration costs of the Wastewater System, including projected overhead costs.

b. A share of the annual costs associated with transmission costs of the categories listed above. This includes labor, maintenance, and utilities for the North Valley Sewer Lift Station and other joint transmission system facilities as herein defined.

c. Funding of a replacement reserve as required by the City's approved Revenue Program.

d. Fines or penalties imposed on the City as a result of the operation of the Wastewater System, unless the fine/penalty is allocated to the City or RMWD as provided in Section VI.

e. Costs incurred by the City, including attorneys' fees, necessary to implement the terms of this Agreement.

2. Excluded Costs

The following shall not be considered Wastewater System Costs for purposes of calculating the annual WSC:

a. Costs related to the City's municipal collection system as determined by reasonable calculations.

b. A share of City General Administrative allocation related to the municipal collection system, any bad debts, and administrative charges in lieu of taxes.

c. Costs related to the treatment of sewage from any agency, which is not party to this Agreement.

d. Capital Improvement Costs of any non-Wastewater System facility.

e. Debt service associated with City's municipal collection system capital program.

f. Debt service associated with City's share of wastewater treatment reclamation, transmission, and outfall system capital programs.

C. Calculation of the WSC Rates

1. Variable Operations & Maintenance (O&M) and Capital Costs (These are detailed under Exhibit "C", Sections 3 and 4)

a. Prior to the initial implementation of the new system of charges, the City shall prepare a sample fiscal year estimate based on the City's Water Utilities - Wastewater Division Program FY 2001 Budget setting forth the cost categories, methodologies and sampling data used as a base for Strength Based Billing (SBB). SBB includes not only projected Flow but also Strength (BOD and SS). Until one year's strength baseline is established by the sampling station as defined in Section VIII., paragraph B, RMWD's wastewater strength shall be estimated at 200 BOD and 200 SS, which is equal to residential strength in the City of Oceanside. Projected flow will be based on prior year's flow of 178.9 MG.

b. The City shall determine the unit WSC variable rates by allocating net costs (Variable Wastewater System Costs less Variable Wastewater System Revenues, if any) among the parameters of Flow, BOD, and SS. This allocation is based on the City's approved Revenue Program cost allocation factors for Operation and Maintenance (O&M) and Capital Costs allocated to the three parameters. The City may revise the calculations to include any other measurement required by law after the effective date of this Agreement.

c. The net variable cost allocated to each of the three parameters (Flow, BOD, and SS) shall be divided by the total Wastewater System quantity for that parameter to determine the unit rates for Flow, BOD and SS at the point of delivery into the Oceanside wastewater system.

d. RMWD shall pay for variable transmission cost based on flow as detailed under Exhibit "C", Section 3.

e. RMWD shall pay for variable treatment costs based on flow, BOD, and SS as detailed in Exhibit "C", Section 4.

2. Fixed O&M and Capital Costs
(These are detailed under Exhibit "C", Sections 1 and 2)

a. RMWD shall, on an annual basis, provide City the total number of residential and non-residential units connected to RMWD's sewer system on a per meter size basis. The number of equivalent meters shall be the basis for capacity related fixed cost allocation.

b. The City shall determine the unit WSC capacity related fixed rate by allocating net fixed costs (Fixed Wastewater System Costs less Fixed Wastewater System Revenues) divided by the total Wastewater System number of equivalent meters. This is detailed under Exhibit "C", Section 1.

c. RMWD shall pay for customer related costs on a per account basis as detailed under Exhibit "C", Section 2.

3. Replacement Reserve
(This is detailed under Exhibit "C", Section 5)

a. Pursuant to EPA and SWRCB requirements a separate line item for replacement must be shown in the calculation of the annual revenue requirement for the WSC. Replacement costs include all expenditures required for the Wastewater System to operate for its design life.

b. Annually a deposit will be made by RMWD into a replacement account established by the District for such purposes and acceptable to the City of an amount equal to RMWD's share of straight-line depreciation of the Wastewater System. RMWD's share of the straight line depreciation shall be based on RMWD's then current wastewater flow in the Wastewater System as detailed under Exhibit "C", Section 5. RMWD's bank shall send City monthly statements for the replacement account to the attention of the Water Utilities Director.

c. Funds in the RMWD replacement account will, insofar as possible, be invested, and actual interest accrued to the account. Disbursements from said account shall be made by the RMWD's bank upon vouchers prepared and certified by the City for necessary replacement capital projects.

d. If the amount in the account is insufficient to pay for RMWD's share of the required replacement capital projects, the District shall fund its share of replacement costs from other District funds.

e. If RMWD is unable to forward the requisite funds to the City in a timely fashion, it may request the City to advance the required funds. If the City is required to advance funds the City shall be entitled to interest on the advanced funds equal to the rate of return on the investment of the City's portfolio plus 5 percent. In the event RMWD fails to reimburse the City the required funds, with interest, within 90 calendar days, RMWD shall be liable for additional interest on the outstanding principal and interest owed at the legal rate. Nothing in this section shall construe the City to advance such funds.

D. Estimate and Billing Schedule and Year End Adjustment

1. Estimate – The City shall estimate the WSC rates on an annual basis. The City shall quantify the WSC rates based on costs developed in the annual budget for the Water Utilities – Wastewater Division and by estimating the quantity of Flow, BOD, SS, and equivalent meters for each party, based on that party's actual flow, cumulative data of sampling for BOD and SS over the preceding years, and most recent equivalent meter count. City will provide a copy of its adopted budget to RMWD as part of the budgetary process.

2. The City shall bill RMWD on a monthly basis in an amount equal to 1/12th (one-twelfth) of the annual amount determined above. Each bill shall be paid within thirty (30) days of mailing. Monthly billings will consist of total estimated cost for RMWD, based on RMWD's prior year-metered flow, estimated BOD and SS, and equivalent meter and customer counts.

3. Interest charges shall accrue on the unpaid balance of any monthly billing from the date payment is due at the rate of ten percent (10%) per annum. Acceptance by the City of any partial payment shall not constitute a waiver of the City's right to levy late charges, to collect interest on the full amount due, or to demand payment in full.

4. Year-End Adjustments – At the end of each fiscal year, the City shall determine the actual Wastewater System Costs as set forth in the City's audited Financial Statements and the actual Flow as well as the cumulative strength data and number of equivalent meters. The City shall make any necessary adjustments to the unit rates for Flow, BOD, SS or equivalent meters based on actual costs for the year. The City shall then recalculate the variable and fixed portions of the WSC for the year using actual costs for the year, actual Flow, cumulative strength factors, and equivalent meters for the City and RMWD. The City shall credit any future charges or bill for any additional amounts due, the quarter after the prior year costs have been audited.

Section X. Construction By City

Construction costs shall be prorated to the parties in accordance with capacity rights reserved in that particular segment of work. For the purposes of this Agreement, City's construction cost of each facility shall be determined by computing the total construction cost of each facility, including the cost of land and rights of way, engineering, administrative costs, inspection and legal fees directly attributable to said construction after deducting from said total construction cost the amount of previous Federal and State grant and or loan funds received by City for previous construction. If grants and or loans received by City are not allocated to the respective facilities, the total amount of the grant and or loan received for the entire project shall be allocated to the respective facilities in the proration that the total construction cost of each facility bears to the total construction cost of all the facilities.

A. Administrative Construction Costs

The administrative-construction expense for construction projects will be prorated between the parties based upon the parties' respective capacity rights in the project. RMWD shall pay the City a general administrative overhead charge equaling 2.7 percent of RMWD's share of the cost to design and construct the project.

B. Deposits and Disbursements

1. The City shall have no obligation to proceed with advertising for bids for new construction projects until RMWD deposits in a separate District construction fund account established for such purposes and acceptable to the City RMWD's share of estimated project costs. If the bids for the work indicate the deposit is insufficient, the City shall notify RMWD. RMWD shall within 30 days increase the deposit so that the account will have sufficient funds for RMWD's share of the work. RMWD's bank shall send City monthly statements for the construction fund account to the Water Utilities Director.

2. Funds in the construction fund account will be invested, and actual interest will accrue to the account. Disbursements from said account shall be made by RMWD's bank upon vouchers prepared and certified by the City and approved by RMWD.

3. If RMWD is unable to deposit the requisite funds into the construction fund in a timely fashion, it may request the City to advance the required funds. If the City advances funds, it shall be entitled to interest on the advanced funds equal to the rate of return on the investment of the City's portfolio plus 5 percent. In the event RMWD fails to reimburse the City the required funds, with interest, within 90 calendar days, RMWD shall be liable for additional interest at a rate of 10 percent per year. Nothing in this section shall require the City to advance such funds.

4. If RMWD fails to deposit funds to the construction fund account it shall bear the entire cost of any contract penalties that may be incurred because of District's failure.

Section XI. Reclaimed Water System Operation

Nothing contained herein is intended to limit or govern the rights of either party to own, operate, produce and or distribute reclaimed water independent of the other party, nor is anything contained herein intended to give either party rights to any such existing facilities.

Section XII. Dispute Resolution

The parties shall first attempt to resolve any claim, controversy or other dispute arising under this Agreement by negotiations among the staff of each party. If resolution can not be reached, the parties shall mediate the claim, controversy or other dispute arising under this Agreement. The costs of mediation shall be borne equally by each party.

Any remaining dispute regarding any part of this Agreement shall be resolved by arbitration pursuant to the rules of the American Arbitration Association.

Section XIII. General Provisions

A. Revenue Program Requirements

RMWD shall prepare a Revenue Program as required by the Environmental Protection Agency and State Water Resources Control Board for all agencies benefiting from State and Federal grants and/or State Revolving Fund loans. The Revenue Program shall comply with the applicable Federal and State laws and regulations, including the Revenue Program Guidelines of the *Policy for Implementing the State Revolving Fund for the Construction of Wastewater Treatment Facilities* published by the California State Water Resources Control Board, dated June 18, 1998, or as it may be revised from time to time. Biannually, while this Agreement is in effect, RMWD shall provide the City with a copy of RMWD's Revenue Program for that upcoming fiscal year. Any actions by State or Federal agencies against the City for RMWD's failure to submit a Revenue Program approvable by the State Water Resources Control Board, which results in expense or damage to the City, shall be the sole responsibly of RMWD. RMWD shall reimburse the City for all such expense or damage as provided for in Section IX, Subdivision D.3 hereof.

B. Termination

This Agreement shall continue in full force and effect in perpetuity or until terminated by the mutual agreement, in writing, of the parties hereto.

C. Allocation Upon Total or Partial Termination

If both parties desire to terminate this Agreement or to terminate use of a portion of the Wastewater System by one of the parties, the property acquired hereunder, which use is to be terminated, shall be disposed of by the City and the proceeds thereof divided or distributed to the parties in the same proportion as party's contributions to construction costs for the facility or equipment in question. Property to be disposed of shall have its value determined in a mutually agreeable manner.

D. Defense And Indemnity

1. Claims Arising From Sole Acts or Omissions of the City

The City hereby agrees to defend and indemnify RMWD, its agents, officers and employees from any claim, action or proceeding against RMWD, arising solely out of the acts or omissions of the City in the performance of this Agreement. At its sole discretion, RMWD may participate at its own expense in the defense of any claim, action or proceeding, but such participation shall not relieve the City of any obligation imposed by this Agreement. RMWD shall notify the City of any claim, action or proceeding and cooperate fully in the defense.

2. Claims Arising From Sole Acts or Omissions of RMWD

RMWD hereby agrees to defend and indemnify the City, its agents, officers and employees from any claim, action or proceeding against the City, arising solely out of the acts or omissions of RMWD in the performance of this Agreement. At its sole discretion, the City may participate at its own expense in the defense of any such claim, action or proceeding, but such participation shall not relieve RMWD of any obligation imposed by this Agreement. The City shall notify RMWD promptly of any claim, action or proceeding and cooperate fully in the defense.

3. Claims Arising From Concurrent Acts or Omissions

The City hereby agrees to defend itself, and the RMWD hereby agrees to defend itself, from any claim, action or proceeding arising out of the concurrent acts or omissions of the City and RMWD. In such cases the City and RMWD agree to retain their own legal counsel, bear their own defense costs, and waive their right to seek reimbursement of such costs, except as provided in paragraph 5., below.

4. Joint Defense

Notwithstanding paragraph 3., above, in cases where the City and RMWD agree in writing to a joint defense, the City and RMWD may appoint joint defense counsel to defend the claim, action or proceeding arising out of the concurrent acts or omissions of RMWD and the City. Joint defense counsel shall be selected by mutual agreement of the City and RMWD. The City and RMWD agree to share the costs for such joint defense and any agreed settlement in equal amounts, except as provided in paragraph 5., below. The City and RMWD further agree that neither party may bind the other to a settlement agreement without the written consent of both the City and RMWD.

5. Reimbursement and/or Reallocation

Where a trial verdict or arbitration award allocates or determines the comparative fault of the parties, the City and RMWD may seek reimbursement and/or reallocation of defense costs, settlement payments, judgments and awards, consistent with such comparative fault.

E. Insurance

The City shall maintain, during the life of this Agreement, such public liability and property damage insurance as shall protect parties from claims for damages or personal injury, including accidental death, as well as from claims for property damage, which may arise from its operations under this Agreement, whether such operations be by the City or by any contractor or subcontractor or anyone directly or indirectly employed by the City. The amount of such insurance shall be as from time to time determined by the parties.

RMWD shall maintain, during the life of this Agreement, such public liability and property damage insurance as shall protect parties from claims for damages or personal injury, including accidental death, as well as from claims for property damage, which may arise from its operations under this Agreement, whether such operations be by RMWD or by any contractor or subcontractor or anyone directly or indirectly employed by RMWD. The amount of such insurance shall be as from time to time determined by the parties.

F. Agreement Binding on All Parties

The provisions of this Agreement shall inure to the benefit of, and be binding upon, each of the parties and their successors and assigns.

G. Captions

The captions contained herein are for the convenience of the parties and shall not be considered in interpreting this Agreement, construed as part of this Agreement or as full or accurate descriptions of the terms hereof.

H. Prior Agreements

This Agreement supercedes the prior agreements of the parties and is substituted therefore, provided, however, all apportionment of costs, expenses or liability heretofore made or incurred shall not be affected by terms hereof.

I. Review

The chief executive officer of each party shall examine this Agreement at least every five (5) years and jointly report thereon to the governing Boards of the parties.

J. Amendments and/or Changes to Agreement

Any amendments and/or changes to this Agreement must be in writing, signed by a duly authorized representative of the Parties hereto, and must expressly state the mutual intent of the Parties to amend this Agreement as set forth herein.

K. Notice

1. Any notice required under this Agreement shall be written and shall be served either by personal delivery, mail or fax.

2. In the case of service by personal delivery or fax, no additional time, in days, shall be added to the time in which a right may be exercised and an act may be done.

3. In the case of the service by mail, notice must be deposited in a post office, mailbox, sub-post office, substation, or mail chute, or other like facility regularly maintained by the United States Postal Service, in a sealed envelope, with postage paid, addressed to the representative(s) of the a Party on whom it is to be served, at the office set forth in Section 4 below. The service is complete at the time of deposit. Any period of notice and any right to duty to do any act or make any response within any period or on a date certain after service of notice by mail shall be extended five days. Any period of notice and any right or duty to do any act or make any response within any period or on a date certain after service of notice by Express Mail or other method of delivery providing for overnight delivery shall be extended by two court days.

4. Any notice required this Agreement shall be served on the following representative(s) of the Parties:

City of Oceanside:

Water Utilities Director
City of Oceanside Water Utilities Department
300 North Coast Highway
Oceanside, CA 92054

Rainbow Municipal Water District:

General Manager
Rainbow Municipal Water District
PO Box 2500
Fallbrook, CA 92088-2500

L. Construction of Agreement

Each Party, with the assistance of competent legal counsel, has participated in the drafting of this Agreement and any ambiguity should not be construed for or against any Party on account of such drafting.

M. Severability

Should any non-material provision of the Agreement be held invalid or illegal, such invalidity or illegality shall not invalidate the whole of this Agreement, but, rather, the Agreement shall be construed as if it did not contain the invalid or illegal part, and the rights and obligations of the Parties shall be construed and enforced accordingly.

N. Choice of Law

This Agreement shall be construed and enforced pursuant to the laws of the State of California.

O. Authority to Enter into Agreement

Each Party represents and warrants that its respective obligations herein are legal and binding obligations of such Party, that each Party is fully authorized to enter into this Agreement, and that the person signing this Agreement hereinafter for each Party has been duly authorized to sign this Agreement on behalf of said Party.

P. Attorneys Fees

In any adversarial proceedings between the Parties, the prevailing Party shall be entitled to recover its costs, including reasonable attorneys' fees. If there is no clear prevailing party, the Court shall determine the prevailing party and provide for the award of costs and reasonable attorneys' fees. In considering the reasonableness of either Party's request for attorneys' fees as a prevailing party, the Court shall consider the quality, efficiency, and value of the legal services and similar/prevailing rate for comparable legal services in the local community.

Q. Waiver of Breach

No waiver or indulgence of any breach or series of breaches of this Agreement shall be deemed or construed as a waiver of any other breach of the same or any other provision hereof or affect the enforceability of any part of all of this Agreement. No waiver shall be valid unless executed in writing by the waiving Party.

R. Awareness of Contents/Legal Effect

The Parties expressly declare and represent that they have read the Agreement and that they have consulted with their respective counsel regarding the meaning of the terms and conditions contained herein. The Parties further expressly declare and represent that they fully understand the content and effect of this Agreement and they approve and accept the terms and conditions contained herein, and that this Agreement is executed freely and voluntarily.

Section XIV. Signatures

The individuals executing this Agreement represent and warrant that they have the right, power, legal capacity and authority to enter into and execute this Agreement on behalf of the respective legal entities of the Rainbow Municipal Water District and the City of Oceanside.

RAINBOW MUNICIPAL WATER DISTRICT

BY: ______________________
SIGNATURE

Charles W. Kemp, General Mgr/CEO
NAME/TITLE

____
APPROVED AS TO FORM:
RMWD ATTORNEY

CITY OF OCEANSIDE

BY: ______________________
STEVEN R. JEPSEN
CITY MANAGER

____
ATTEST: CITY CLERK

____
APPROVED AS TO FORM:
CITY ATTORNEY

Section XIV. Signatures

The individuals executing this Agreement represent and warrant that they have the right, power, legal capacity and authority to enter into and execute this Agreement on behalf of the respective legal entities of the Rainbow Municipal Water District and the City of Oceanside.

RAINBOW MUNICIPAL WATER DISTRICT

BY: ______________________________
SIGNATURE

____
NAME/TITLE

____
APPROVED AS TO FORM:
RMWD ATTORNEY
Gregory V. Moser
Foley & Lardner
February 1, 2002

CITY OF OCEANSIDE

BY: ______________________________
STEVEN R. JEPSEN
CITY MANAGER

____
ATTEST: CITY CLERK

____
APPROVED AS TO FORM:
CITY ATTORNEY

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of San Diego } ss.

On 2/1/02 (Date), before me, Charles W. Hughes, Notary Public (Name and Title of Officer (e.g., "Jane Doe, Notary Public")),
personally appeared Charles W. Kemp (Name(s) of Signer(s)),

☐ personally known to me
☑ proved to me on the basis of satisfactory evidence

to be the person(~~s~~) whose name(~~s~~) is/~~are~~ subscribed to the within instrument and acknowledged to me that he/~~she~~/~~they~~ executed the same in his/~~her~~/~~their~~ authorized capacity(~~ies~~), and that by his/~~her~~/~~their~~ signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

CHARLES W. HUGHES
Commission # 1234923
Notary Public - California
San Diego County
My Comm. Expires Oct 15, 2003

Place Notary Seal Above

WITNESS my hand and official seal.

Charles W. Hughes
Signature of Notary Public

OPTIONAL

Though the information below is not required by law, it may prove valuable to persons relying on the document and could prevent fraudulent removal and reattachment of this form to another document.

Description of Attached Document

Title or Type of Document: Agreement

Document Date: February 13, 2002 Number of Pages: 25

Signer(s) Other Than Named Above: Steven R. Jepsen

Capacity(ies) Claimed by Signer

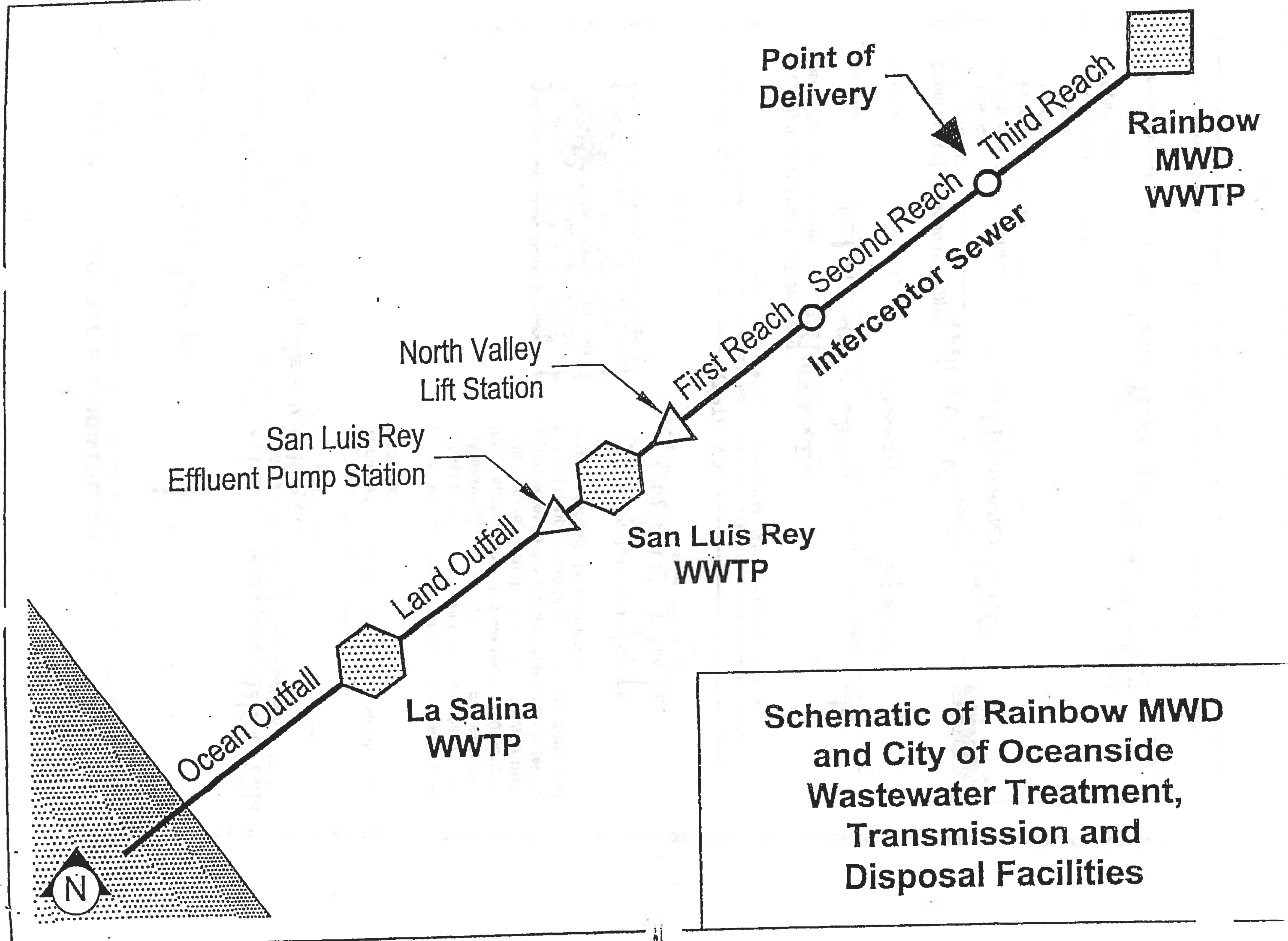
Signer's Name: Charles W. Kemp

☐ Individual
☑ Corporate Officer — Title(s): General Manager/CEO
☐ Partner — ☐ Limited ☐ General
☐ Attorney in Fact
☐ Trustee
☐ Guardian or Conservator
☐ Other:

Signer Is Representing: Rainbow Municipal Water District

RIGHT THUMBPRINT OF SIGNER
Top of thumb here

Exhibit "A"



Schematic of Rainbow MWD and City of Oceanside Wastewater Treatment, Transmission and Disposal Facilities

Exhibit "B"

ALLOWABLE INFILTRATION

The average specification allowance is 500 gallons per day (gpd) in diameter inch per mile (ASCE, Design and Construction of Sanitary and Storm Sewers). This would appear, to be a good estimate of the average infiltration into Reaches One and Two, without making detailed, time-consuming measurements of the actual system.

DETERMINATION OF INFILTRATION FLOWS

Based on the figure of 500 gallons per day in diameter inch per mile, the total infiltration flows shall be as follows:

Reach One:
(500 gpd/in/mile) (54.779 in-miles) = 27,390 GPD

Reach Two:
(500 gpd/in/mile) (16.405 in-miles) = 8,203 GPD

ALLOCATION OF INFILTRATION FLOWS

a. Reach One: Since District's capacity in this reach is 10.00% of design capacity, it shall be assumed that District's share of the infiltration flow in this reach shall be 10.00%.

(10.00%) (27,390 GPD) = 2,739 GPD

b. Reach Two: Since District's capacity in this reach is 58.25% of design capacity, it shall be assumed that District's share of the infiltration flow in this reach shall be 58.25%.

(58.25%) (8,203 GPD) = 4,778 GPD

c. District's total infiltration flow allocation of 2,739 + 4,778 = 7,517 GPD shall be added to the measured flow at the Point of Delivery to determine the gallonage for which the District shall be billed.

Exhibit "B"

ALLOCATION OF INFILTRATION / INFLOW FOR INTERCEPTOR SEWER REACH ONE AND REACH TWO BETWEEN DISTRICT AND CITY

REACH ONE

STA 4+ 58.20 to STA 104 + 80.62

STA 4 + 58.20 to STA 66 + 68.21 → 30" Ø

STA 66 + 68.21 to STA 104 + 80.62 → 27" Ø

6210.01' of 30" Ø → 19.495 in-miles

3812.41' of 27" Ø → 35.284 in-miles

TOTAL .... 54.779 in-miles

REACH TWO

STA 104 + 80.62 to STA 148 + 28.04

STA 104 + 80.62 to STA 132 + 69.19 → 21" Ø

STA 132 + 69.19 to STA 148 + 28.04 → 18" Ø

2788.57' of 21" Ø → 11.091 in-miles

1558.85' of 18" Ø → 5.314 in-miles

TOTAL ....16.405 in-miles

APPENDIX E

Wastewater Treatment / Reclamation Alternatives Study, Technical Memorandum No. 1

FINAL

Rainbow Municipal Water District

Wastewater Treatment / Reclamation Alternatives Study Technical Memo No. 1

September 2015

FINAL

RAINBOW MUNICIPAL WATER DISTRICT

Wastewater Treatment / Reclamation Alternatives Study Technical Memo No. 1

September 2015

Prepared for:
Rainbow Municipal Water District
3707 Old Highway 395
Fallbrook, California 92028

Prepared by:

ATKINS

3570 Carmel Mountain Road, Suite 300
San Diego, California 92130
Atkins Project No.: 100044880

in association with:
Dudek
Gillingham Water
West Coast Civil

REGISTERED PROFESSIONAL ENGINEER
MARK B. ELLIOTT
No. 42064
Exp. 3/31/2016
CIVIL
STATE OF CALIFORNIA

Mark B. Elliott, P.E.
Project Engineer

Contents

Tables

Figures

Abbreviations

AFY	acre feet per year
ASP	activated sludge processes
CIP	Capital Improvement Program
City	City of Oceanside
CWA	San Diego County Water Authority
District	Rainbow Municipal Water District
EDU	equivalent dwelling units
gpm	gallons per minute
I-15	Interstate 15
IPR/DPR	Indirect Potable Reuse/Direct Potable Reuse
LS 1	Lift Station 1
MBR	Membrane Bioreactors
mg/L	milligram per liter
mgd	million gallons per day
MLSS	mixed liquor concentrations
MWD	Metropolitan Water District of Southern California
O&M	operations and maintenance
PDWF	peak dry weather flow
PWWF	peak wet weather flow
RO	reverse osmosis
SLRWRF	San Luis Rey Waste Reclamation Facility
SR-76	State Route 76
SWP	State Water Project
TDS	Total Dissolved Solids
TM	Technical Memorandum
WRF	water recycling facility

1.0 Introduction

Rainbow Municipal Water District (District) is embarking on a 2015 Water and Sewer Master Plan Update during a period of remarkable challenge and opportunity for the District. The decline in water demands and wastewater generation rates, increasing wholesale water rates and wastewater disposal costs, new residential and commercial development poised along the Interstate 15 (I-15) corridor at State Route 76 (SR-76), and heightened scrutiny of the efficiency of the District's operations and charges, together set the stage for the 2015 Master Plan Update.

There is potential for a District-controlled wastewater reclamation plant that economically off-loads the District's reliance on treatment in the City of Oceanside, while simultaneously producing a beneficial new local water supply. There is also the potential for up to $100 million in new water and sewer capacity fees from proposed San Diego County development to help fund a new treatment plant and develop new local water supplies.

This Technical Memorandum (TM No. 1) evaluates these inter-related wastewater and water supply issues and sets the course for planning a new long range Capital Improvement Program (CIP) for wastewater, water, and recycled water infrastructure.

1.1 Summary

Two fundamental wastewater treatment and disposal alternatives are compared:

- **No Project Alternative:** All wastewater generation (current + new developments) is conveyed to Oceanside, with the District continuing to pay Oceanside's billed costs for operations, maintenance, and capital replacement, and additional treatment capacity rights are acquired at San Luis Rey Water Reclamation Facility (SLRWRF). No recycled water is supplied to the District.

- **District Plant Alternative(s):** All or a portion of the future wastewater flows are collected at a District-controlled wastewater reclamation plant, producing a new local supply of recycled water for service to agriculture users and nurseries. District reliance on Oceanside facilities is reduced or eliminated.

A summary of capital and annual operating costs is provided in Table 1-1 below, including a brief synopsis of the District's exposure to risk and uncertainties in implementing each alternative. The District-controlled preferred alternative includes a 0.9 mgd plant located near the District office at I-15 and SR-76.

Detailed cost analysis of each alternative, cost assumptions, and cost sensitivity analyses are presented in **Section 5.0**.

Table 1-1 Comparison of Wastewater Treatment Alternatives

Alternative	Capital Cost (Million $)	Annual Cost (Million $)	Present Worth Cost (Million $)	Risk Elements
No Project	32	1.72	76	• Potential future cost liability for SLR Plant, land outfall, and ocean outfall improvements • No local water supply developed • Requires acquisition of additional future capacity
District Plant	36	1.88	84	• Higher capital costs • Treatment facility staff to operate and maintain • Relies on strong housing market for new revenues • Environmental impacts with siting a wastewater plant • Recycled water system requires grant and/or subsidy funding to be cost-feasible to District. • Potential Oceanside buy back of capacity from Rainbow

1.2 Study Objectives

The District staff and consultant team collaborated early on to develop key success factors and benefits for the Wastewater Treatment/Reclamation Alternatives Study. These include:

1. **Serve as key a North San Diego County Environmental Steward in sustainability.** Reduce treatments costs to Oceanside and reduce ocean disposal.
2. **Provide for a new short-term Recycled Water Supply.** Develop reliable source of local water supply and future plan for Indirect Potable Reuse/Direct Potable Reuse (IPR/DPR).
3. **Save key local Agriculture Businesses due to rising water costs.** Provide drought-proof supply for major agriculture users and nurseries.
4. **Support the County's General Plan and Building Industry during the drought with a water supply offset program.** Serve as a possible water supply offset mitigation plan.

These objectives will serve to guide the team through the initial feasibility planning effort. The following section describes our detailed scope of services for the Wastewater Treatment/Reclamation Alternative Study (TM No. 1).

1.3 Wastewater Treatment/Reclamation Alternatives Study

TM No. 1 consists of the following scope elements:

- Review existing studies/reports on water supply and water and wastewater master planning for studies that have been completed and projects that have been constructed since 2006. Focus will be given to Addendum 1, Wastewater System Expansion Alternatives Analysis, in the 2006 Master Plan *(Dudek).*
- Review projected development within the District and its surrounding areas of influence. The development review is critical to projecting wastewater flows for use in the wastewater treatment study and the water and wastewater models that will support the 2015 Master Plan Update.

- Prepare a thorough evaluation of the potential demand for recycled water within the District. The assessment will involve quantitative and spatial analysis of existing irrigation and agricultural customers that would be eligible to participate in a recycled water system. The assessment will also address the role of development in potential recycled water demands and will propose alternative backbone systems for providing recycled water to potential customers.
- Prepare a feasibility analysis of a District-owned wastewater reclamation plant. The analysis will include an estimate of logical plant capacities, a brief evaluation of sites to optimize wastewater flows collected, a conceptual facilities layout, identification of reuse opportunities, and estimate of construction and operation and maintenance costs.
- Develop a maximum of three treatment capacity scenarios based upon potential development within and adjacent to the District. Compare the alternatives available based on a preliminary life-costs analysis and provide a recommendation regarding a District-owned reclamation plant and City of Oceanside treatment and disposal for the 2015 Master Plan Update.

2.0 Wastewater System Overview

The District is responsible for providing sewer service to over 2,150 customers throughout its sewer service area. The sewer service area is a small portion of the overall service area which encompasses over 7,800 potable water customers, with large agricultural water demands. The sewer service area along with the District boundary is shown on **Figure 2-1.**

Sewer customers currently generate an average dry weather wastewater flow of approximately 0.7 million gallons per day (mgd). The resulting unit sewer generation is approximately 325 gpd per connection. This high of a sewer generation rate is believed to be attributed to large single family homes and high occupancy, as well as infiltration in portions of the sewer interceptor system that are near the San Luis Rey River groundwater basins. Sewer flows are conveyed through a gravity collection system of pipes, six sewer lift stations and nearly two miles of force main, located throughout the sewer service area. This collection system conveys wastewater west out of the District and ultimately to the SLRWRF, located in Oceanside.

Several alternative locations throughout the District have been analyzed for potential wastewater reclamation plant sites based on the ability to collect existing and future flows. Those sites primarily include an area near I-15 and SR-76, including both the Meadowood development plant site and one near the District offices. A plant site was also considered downstream near Lift Station 1 and near Lift Station 2. Sizing of the initial plant capacity is dependent upon the amount of wastewater available for collection and treatment. Total existing wastewater flow tributary to each of the potential reclamation plant sites are presented below in **Table 2-1**. The existing flows represent a potential design flow at start-up assuming no major development activity has occurred. Location of each of the potential plant locations is included in **Section 3.0** and shown on **Figures 3-1** through **3-5**.

In addition to the quantity of flow currently available for initial phase of a reclamation plant, quality of the wastewater available is also essential to the feasibility. Wastewater quality will directly impact the quality of the effluent of the reclamation plant. The majority of recycled water customers within the District are agricultural customers, many of whom have critical thresholds for certain water quality constituents. Of particular concern with many nurseries and growers is Total Dissolved Solids (TDS). Total dissolved solids in irrigation supply can impact crop production, specifically avocados. TDS is also of concern because traditional treatment methods do not substantially reduce the TDS concentration.

Table 2-1 Existing Wastewater Flow Location Tributary Wastewater Flows

Tributary Location	Average Daily Water Flow (gpm)	Average Daily Water Flow (mgd) [2]
Meadowood Site	47	0.07
Near District Office	138	0.20
Lift Station 1	440	0.63
Lift Station 2 [1]	468	0.67

[1] Lift Station 2 is also considered for pumping flow back to a potential plant
[2] Average flow for the entire system is currently 0.69 mgd

The District receives its water supply from the Metropolitan Water District of Southern California (MWD) and San Diego County Water Authority (CWA) aqueduct systems. Filtered potable water from the Lake Skinner filtration plant is delivered to the District through multiple pipeline systems. The sources of the water treated at the Lake Skinner filtration plant are from the State Water Project (SWP) and from the Colorado River. Due to ongoing severe drought currently affecting the State of California, deliveries to MWD and CWA have consisted primarily of Colorado River water, which contains a much higher TDS level than does the SWP supply. **Table 2-2** presents annual average TDS levels for the District's supply and for the District's wastewater for the past six years.

Table 2-2 Potable Water versus Wastewater TDS Concentrations

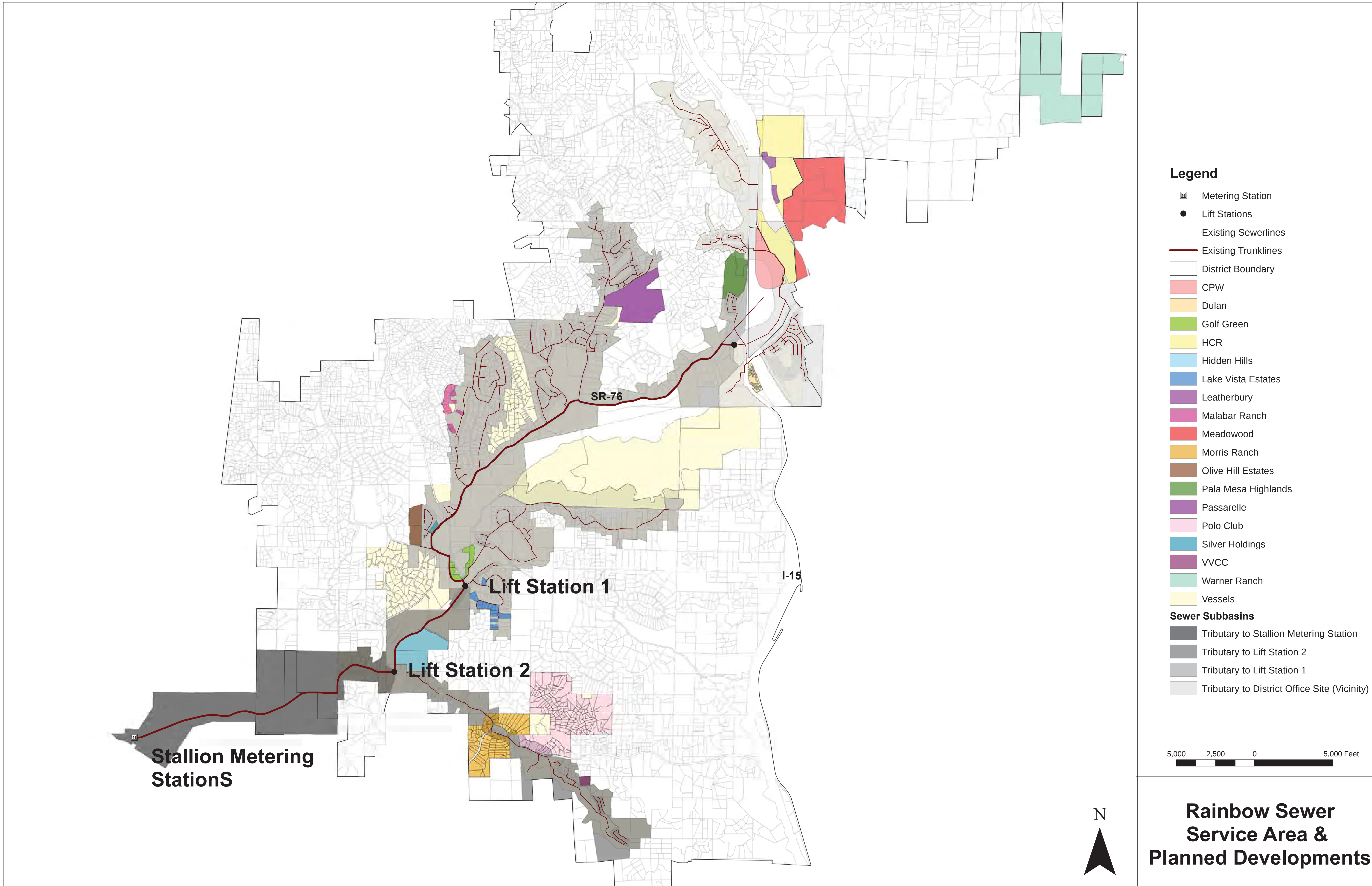
Calendar Year	Potable Water TDS (mg/L)	Wastewater TDS (mg/L)	TDS Increase (mg/L)
2008	541	981	440
2009	596	998	402
2010	563	954	391
2011	413	905	492
2012	386	807	421
2013	477	871	394
Average	496	919	423

TDS = total dissolved solids, mg/L = milligram per liter

As the table shows, typical TDS increases from potable water to wastewater range from 400 to 500 mg/L. Additionally, as mentioned previously, the more recent deliveries have been primarily Colorado River water and TDS of those deliveries has been consistently above 600 mg/L, meaning wastewater TDS levels may be well above 1000 mg/L.

2.1 Existing System Capacity, Conveyance and Pumping

The 2006 Wastewater System Master Plan *(Dudek)* and updates to that plan completed since then have all recognized that there are existing and potential additional future capacity constraints within the District's wastewater conveyance system. Capacity constraints exist both within the gravity system as well as the lift stations. In recent years the District has begun addressing these issues, upsizing two sections of trunk sewer totaling 2.3 miles in length and upgrading capacity at Lift Station 2. Several additional upgrades to the system have been identified for either the near or long term capacity of the system. Upgrades recommended that have not yet been completed are detailed in **Table 2-3**.



Rainbow Sewer Service Area & Planned Developments

Figure 2-1
September 2015

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Table 2-3 shows the need for an estimated 8.3 miles of major gravity sewer as well as lift station upgrades. Additional upgrades to sewer mains and smaller trunks have also been recommended and are not included in **Table 2-3**. The District estimates that the cost to upgrade only the Outfall Sewer system to Oceanside to be approximately $14 million dollars including soft costs and contingencies.

Table 2-3 Recommended Pipeline and Lift Station Capacity Upgrades

Pipeline/Facility	Capacity Constraint	Capacity Constraint Timeframe	Detail
Lift Station 1	PWWF	Existing	Replace existing and increase to 2,700 gpm
Lift Station 1 Force Main	PWWF	Existing	Upsize from 10-inch to 12-inch force main
Trunk Sewer from Sweetgrass Lane to Lift Station 1	PDWF	Existing	Upsize approximately 10,000 feet of pipe from 12-inch to 18-inch (within SR-76)
Trunk Sewer from Lift Station 1 to Lift Station 2	PWWF	Existing	Upsize approximately 7,500 feet of pipe from 12-inch to 18-inch
Outfall Sewer from Lift Station 2 to Stallion Meter	PWWF	Existing	Upsize approximately 16,000 feet of pipe from 15-inch to 30-inch
Plant B Lift Station(1)	PWWF	Existing	Upgrade by Developers
Plant B Force Main	PWWF	Existing	Upgrade by Developers
Trunk Sewer North and East of Lift Station 1	PDWF	Future	Upsize approximately 4,400 feet of pipe from 8/10/12-inch to 12/15-inch
Sewer Main North of Plant B Lift Station	PDWF	Future	Upsize approximately 7,700 feet of 12-inch to 15-inch

(1) Campus Park developer designed new lift station at SR-76 and Pankey Road to replace Plant B Lift Station.

2.2 Oceanside Agreement

The District has rights to 1.5 mgd of sewer treatment and disposal capacity at the SLRWRF, a plant owned and operated by the City of Oceanside. The District's rights to said capacity are defined by an agreement between the City of Oceanside and the District from 2006. The purpose of that agreement is to provide for the construction, operation, maintenance and replacement of the wastewater system serving the respective parties, and to define financial obligations of the two parties relative to those capital and annual costs.

The City of Oceanside is the defined owner of the wastewater facilities, including any future additions or other facilities constructed as a result of the agreement. All decisions with respect to planning, design, construction, operation and maintenance of the facilities are under the sole purview of the City. The District only retains the contractual right to use the system in accordance with the said agreement. The City is obligated to operate the facilities in an economical and efficient manner, maintain the facilities in good repair, and comply with existing and future regulatory requirements.

At present, the District has rights to 1.5 mgd of the 13.5 mgd plant capacity (11.1 percent). As such, the District is responsible for 11.1 percent of the City's construction cost for plant improvements and betterment, including the collection system, pump stations, land outfall, and ocean outfall associated with the plant. The defined 1.5 mgd capacity right applies to all facilities equally. Within the collection system, there are a series of reaches with defined capacity rights based on tributary flow. The District maintains rights to 10 percent of the first reach and 58.25 percent of the second reach. The District has rights to 100 percent of the third reach. The Stallion Metering Station is the point of delivery between the District and City collection systems.

The agreement defines the limitations on the type and quality of wastewater that can be discharged to the SLRWRF and associated facilities. In general, these limitations include a Biological Oxygen Demand of less than 250 mg/L, Total Dissolved Solids of less than 1,200 mg/L, and Total Suspended Solids of less than 250 mg/L. Discharge of volatile organic compounds, heavy metals and other chemical constituents are also limited by the agreement. The quantity of wastewater is limited to a maximum of 1.5 million gallons in a 24-hour period, as measured over a ten day or more period for any three consecutive calendar days. The District is required to pay a penalty of 7.5 times the current unit cost for capacity, transmission and treatment if flows exceed the agreement limitations.

The agreement defines the various means and methods used to compute District cost on a monthly basis. The costs include both fixed and variable cost components. Billing to the District is projected at the beginning of each year based on the City's projected capital and operational costs. The District pays these costs on a monthly basis, with a reconciliation based on actual costs at the end of each fiscal year. In most years, the District receives a credit at the end of the year for overpayment of cost based on the initial cost projections. However, in the event of unforeseen cost events, the District is obligated to participate in all costs incurred at the end of the fiscal year. Interest charges are accrued at a rate of 10 percent per year on any unpaid balance. The City also charges the District an administrative cost of 2.7 percent of the District's identified charges.

2.3 Provisions for District Recycling and for Sell Back of Surplus Capacity

The agreement does not restrict the District from recycling its wastewater nor mandate any discharge quantity from the District. However, as the agreement is based on capacity rights, the District remains responsible for all capital costs based on its capacity right percentage, regardless of the amount of wastewater that is discharged. The aforementioned administrative cost also applies, as well as certain fixed operational costs. At present, based on current capacity rights and discharges, the District is experiencing an average operational cost of approximately $72,000 per month and approximate annual capital costs of approximately $500,000 per year.

The agreement does not address any rights of the District or procedures by which the District could sell back surplus capacity to the City or other parties. This issue is addressed further in **Section 3.2.5**.

2.4 Planned Development

Significant development is anticipated to occur within the I-15 corridor within and directly adjacent to the District's boundaries, largely within the I-15 and SR-76 corridor. Much of this development will be large scale production of single and multi-family homes as well as various commercial developments to support the new residential developments. Much of the District is characterized by low-density development in sparsely populated areas which necessitates the use of septic tanks for treatment of wastewater generated. Much of the new development, however, is anticipated to be higher density, and therefore will be required to be sewered. **Table 2-4** shows the current list of planned or entitled developments, including the type of development and the number of equivalent dwelling units (EDUs) anticipated from each development. Timeframes for the developments listed will vary, however, the majority of those listed are anticipated to be constructed by 2030.

Many of the larger developments noted in **Table 2-4** may require recycled water service were the District to build a reclamation plant and produce recycled water. Additional information regarding the requirements and availability of recycled water to the proposed developments is included in **Section 4.0.**

Table 2-4 Planned Developments and Sewer Flows by Basin

Proposed Reclamation Plant Site Basin (1)	Proposed Development	Proposed EDUs	Development Type	Projected Sewer Flow (mgd)
District Office (I-15/SR-76)	Meadowood(2)	850	Single Family	0.28
	Horse Creek Ridge	751	Single Family	0.14
	Campus Park West	538	Mixed	0.19
	Pala Mesa Highlands (Beazer)	130	Single Family	0.03
	Horse Creek Ridge Business Center	100	Commercial	0.05
	Palomar College	100	Commercial	0.05
	Dulan	51	Single Family	0.01
	Subtotal	2,520		0.73
Lift Station 1	Vessels	400	Single Family	0.09
	Golf Green Estates	94	Single Family	0.02
	Leatherbury	85	Single Family	0.02
	Bonsall Condos	76	Single Family	0.01
	Olive Hill Estates	37	Single Family	0.01
	Subtotal	692		0.15
Lift Station 2	Polo Club	156	Single Family	0.03
	Morris Ranch	89	Single Family	0.02
	Hidden Hills	53	Single Family	0.01
	Subtotal	298		0.07
	Total	**3,510**		**0.95**
Warner Ranch(3)		780	Mixed	0.31

EDU = equivalent dwelling units

(1) The "Basin" for each proposed plant site includes those developments tributary directly to only that location. All developments tributary to the District Office site are also tributary to the Lift Station 1 site, but reach the District Office first and directly.

(2) The Meadowood development is within the Valley Center Municipal Water District and may pursue an Out of Service Sewer Agreement with the District.

(3) Warner Ranch is not included in the analysis.

2.5 Future Sewer Flows

Upgrades and expansions to the wastewater system will be required as planned development comes online, and water demands and sewer flows within the system increase significantly. Sewer flows are of particular concern because the anticipated increases represent as much as a doubling of the current level of flow, whereas the increase in flow through the water infrastructure is small in comparison to the current flow. As shown in **Table 2-3** and already discussed, the District is already aware of a substantial number of upgrades to their existing infrastructure that are needed currently or will be triggered by development. **Table 2-4** includes the anticipated developments and their projected sewer flow, organized by the proposed reclamation plant basin locations. The total increases in flow anticipated in each reclamation plant basin as well as the total future flow in each basin are shown included in **Table 2-5**.

Warner Ranch, a large development outside of the District's service area, which is included above in **Table 2-4**, is not included in the feasibility analysis.

Table 2-5 Projected 2030 Sewer Flows by Reclamation Plant Basin

Proposed Reclamation Plant Site Basin	Project Flow Increase (mgd)	Projected Total Flow (mgd)
District Office (I-15/SR-76)	0.73	0.93
Lift Station 1	0.14	1.49
Lift Station 2	0.08	1.62
mgd = million gallons per day		

3.0 Wastewater Reclamation Plant Evaluation

At present, the District conveys the entirety of the wastewater collected within its sewer service area to the City of Oceanside for treatment and disposal. Conveyance of wastewater to the City is governed by an inter-agency agreement prepared in February of 2006 titled *"An Agreement between the City of Oceanside, California and the Rainbow Municipal Water District for the Construction, Use, Maintenance, and Operation of Wastewater, Transmission, Treatment and Disposal Facilities."* The details of this agreement were discussed further in **Section 2.2** of this report.

In light of recent and ongoing drought conditions within southern California, the District has contemplated whether construction of its own water recycling facility (WRF) would be more cost effective than continued conveyance of wastewater flows to the City. A similar study was completed in the early 2000's, in which it was determined that the District would benefit substantially from recycling its wastewater and developing a drought-tolerant local water supply. Since that time, water demand has decreased significantly, and wastewater flows have decreased similarly. Therefore, the District must reevaluate the issue under current and future flow conditions (defined in **Section 2.0** of this report). Current wastewater generation combined with identified new development within the District forms the basis upon which the wastewater recycling analysis is completed.

3.1 Wastewater Treatment & Disposal Alternatives

As stated, the District currently conveys all of its wastewater to the City for treatment and ultimate disposal. As such, the District received no residual value from the wastewater stream as a local water resource. Wastewater conveyed to the City is subsequently available for recycling at the San Luis Rey Water Reclamation Facility (SLRWRF), thereby available for downstream uses. Under this operations scenario, the District loses its rights to a potential recycled water resource.

A series of available wastewater treatment and disposal alternatives were defined through discussions with District staff. These alternatives comprise wastewater treatment options available to the District, ranging from continuing to convey wastewater to the City to full treatment and use of the water resource within the District service area. The following alternatives were defined for further evaluation:

- **Alternative No. 1: No Project Alternative**. Under this alternative, the District would continue to convey wastewater generated within its service area to the SLRWRF for treatment and disposal. This alternative continues to be governed by the terms and conditions of the 2006 inter-agency agreement, thereby eliminating the potential for a local recycled water resource for revenue generation and reduction of imported water volumes (**Figure 3-1**).

- **Alternative No. 2: Construction of a New Treatment Facility near the District Office Site (I-15/SR-76)**. Under this alternative, the District could construct a 0.9-mgd WRF either on District property adjacent to its current office location or on a suitable site in the vicinity thereof. Construction of such a facility would reduce conveyance to the SLRWRF to approximately 0.72 mgd, thereby reducing capital, operation and maintenance obligations under the inter-agency agreement (**Figure 3-2**).

- **Alternative No. 2X: Construction of a New Treatment Facility near the District Office Site with Conveyance of LS 1 flows to the WRF**. Under this alternative, the District could construct a 1.5-mgd WRF at or near the District office site, with a companion 0.6-mgd lift station at the LS 1 site. Wastewater flow tributary to the LS 1 site is pumped to the new WRF for treatment. Construction of these facilities would reduce conveyance to the SLRWRF to approximately 0.12 mgd, thereby reducing capital, operation and maintenance obligations under the inter-agency agreement (**Figure 3-2X**).

- **Alternative No. 2XL: Construction of a New Treatment Facility near the District Office Site with Conveyance of LS 1 and LS 2 Flows to the WRF**. Under this alternative, the District could construct a 1.62-mgd WRF at or near the District office site, with companion 0.72-mgd and 0.12-mgd lift stations at or near the LS 1 and LS 2 sites, respectively. Wastewater flow tributary to the LS 2 site would be conveyed to the LS 1 site, and all flows tributary to the LS 1 site would be conveyed to the WRF for treatment. Construction of these facilities would eliminate conveyance to the SLRWRF, thereby eliminating capital, operation and maintenance obligations under the inter-agency agreement (**Figure 3-2XL**).

- **Alternative No. 3: Construction of a New Treatment Facility near the existing Lift Station 2 Site** Under this alternative, the District could construct a 1.5-mgd WRF at or near the District's existing Lift Station 1 (LS 1) site. Construction of such a facility would reduce conveyance to the SLRWRF to approximately 0.12 mgd, thereby significantly reducing capital, operation and maintenance obligations under the inter-agency agreement (**Figure 3-3**).[1]

These alternative define a series of progressive steps or phases by which the District may reduce or eliminate the need to continue its obligations under the 2006 inter-agency agreement with the City. As currently written, the 2006 inter-agency agreement defines the District's cost obligations based on the District's allocated capacity rights at the SLRWRF and the District's tributary wastewater flow and strength. As such, it will be necessary to renegotiate the terms of that agreement under any of the With Project alternatives to realize reduced costs relative to the agreement. If the District continues to maintain its current 1.5-mgd capacity rights, cost obligations under the agreement will remain unchanged with the exception of reduce flow and strength calculations. Reducing the District's capacity rights at the SLRWRF

[1] Note: A siting variation of this option would be to locate the plant near the LS 2 site, which may provide potentially more feasible sites with the recent closure of the San Luis Rey Golf Course.

through renegotiation of the 2006 agreement may result in avoided costs that can be subsequently applied to funding construction of its own WRF.

3.2 Wastewater Analysis Assumptions

As can be derived from the aforementioned alternatives, a variety of assumptions are required for analysis of each alternative. These assumptions, applied proportionately between the various alternatives, form the basis of a comparative analysis between the various options. Renegotiation of the 2006 Agreement with the City, future preliminary design efforts and other project refinements will further define project details. For the purposes of this analysis, the following assumptions were applied proportionately to evaluation of each of the previously identified wastewater treatment and disposal alternatives.

3.2.1 Treatment Plant Process

For treatment capacities up to approximately 2.0 mgd, two treatment processes are primarily applicable and found to be most cost effective including Membrane Bioreactor Systems and the Aero-Mod Treatment System. Although other treatment process options are available, the District has expressed a preference for these treatment processes based on past experience and the performance of other local treatment facilities of similar capacity. Selection of the preferred process between these two identified options depends on a variety of factors. The following discussions identify key considerations that differentiate the two treatment processes.

- **Membrane Bioreactors (MBRs):** The facilities operate on the same principle of other extended aeration activated sludge processes (ASPs). The difference between MBRs and conventional ASPs is in the design of the clarifiers. In the MBR facility, the conventional clarifier is replaced with membranes. The membranes act as a physical barrier, separating resulting treatment solids (sludge) from the treated wastewater. The MBR process does not rely on sludge settleability, which allows mixed liquor concentrations (MLSS) to be increased. Operating at higher MLSS concentration, coupled with the absence of large clarifiers, reduces the footprint of an MBR facility compared to that of a conventional ASP of equivalent capacity. MBRs require careful pretreatment to protect the sensitive membranes from damage. Operating costs are often higher for MBRs compared to conventional ASPs, and membrane replacement adds an additional cost component. However, MBRs produce very high quality effluent (no TSS, by definition) which makes this the preferable technology when contemplating recycling of the effluent for the purposes of creating a local water resource.

- **Aero-Mod System**: These facilities are also extended aeration ASPs. Aero-Mod facilities claim reduced footprint compared to conventional ASPs, primarily associated with its shared-wall design. The process requires no submersible pumps, with flow controlled by weirs and air-lift facilities. Aero-Mod employs an aeration scheme that allows for nitrification-denitrification in the same basin. Aero-Mod systems produce secondary effluent that is suitable for further treatment if reuse is desired. An Aero-Mod facility would likely be a less costly alternative to an MBR system, both in capital and O&M, but would require a significantly larger footprint.

After considering the merits of both options, Atkins selected the MBR process for the purposes of this analysis. This decision was primarily associated with the smaller footprint of the resulting facility and the ability to avoid potential odor production from a more conventional treatment process. Therefore, the MBR process was assumed in the evaluation of all identified treatment alternatives.

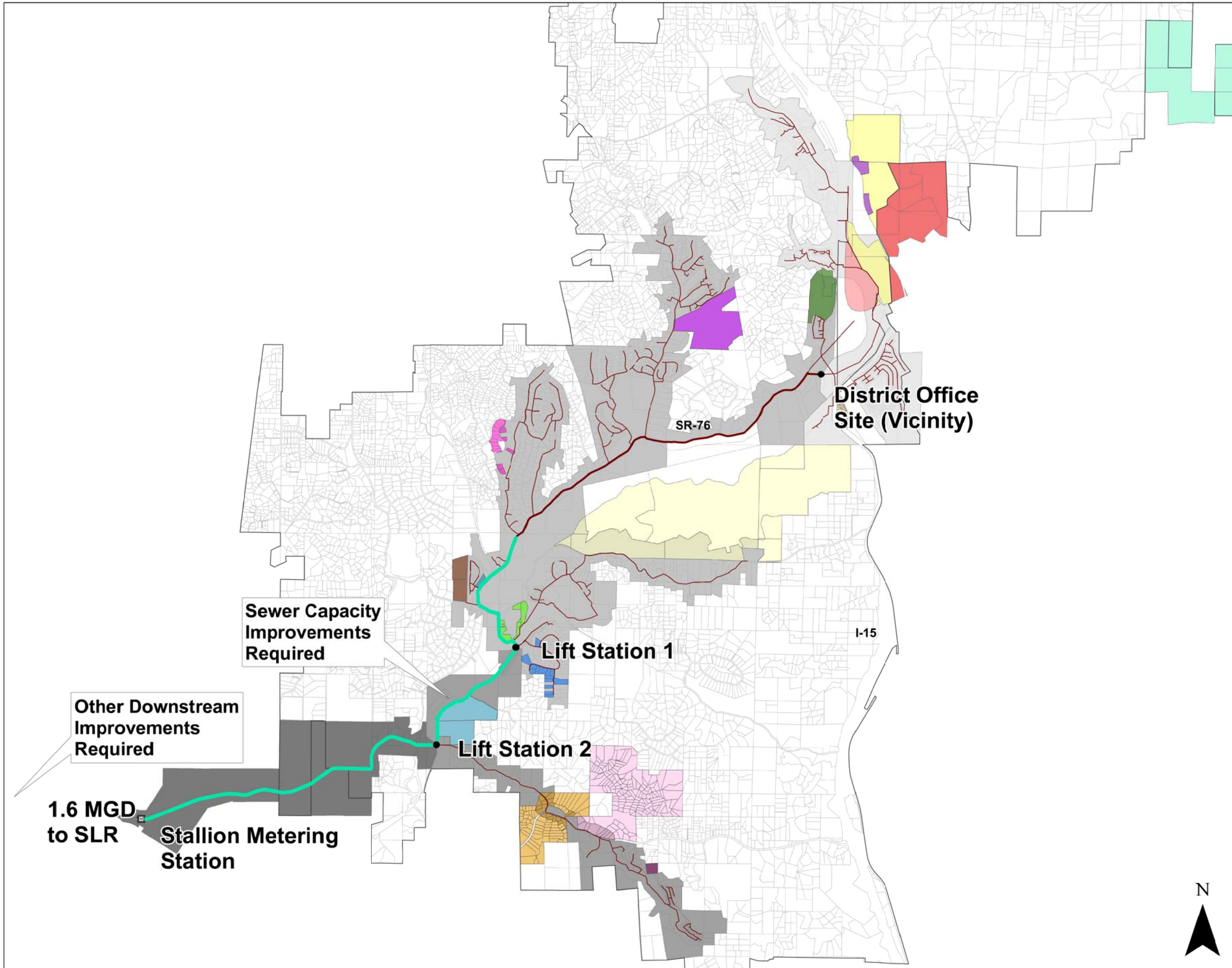

Figure 3-1
Alternative No. 1
No Project / All Flow Treated at SLRWRF
September 2015

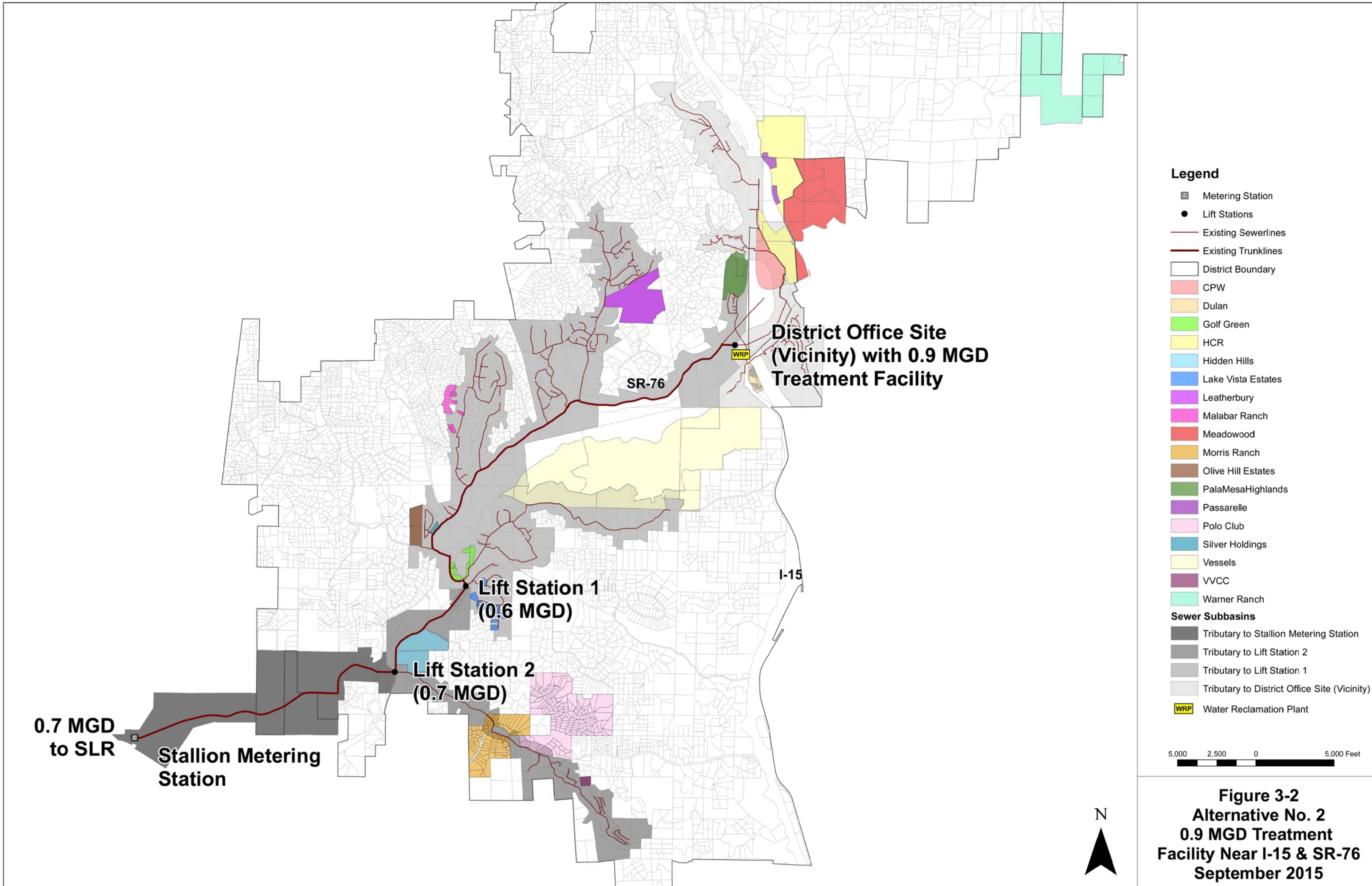

Figure 3-2
Alternative No. 2
0.9 MGD Treatment Facility Near I-15 & SR-76
September 2015

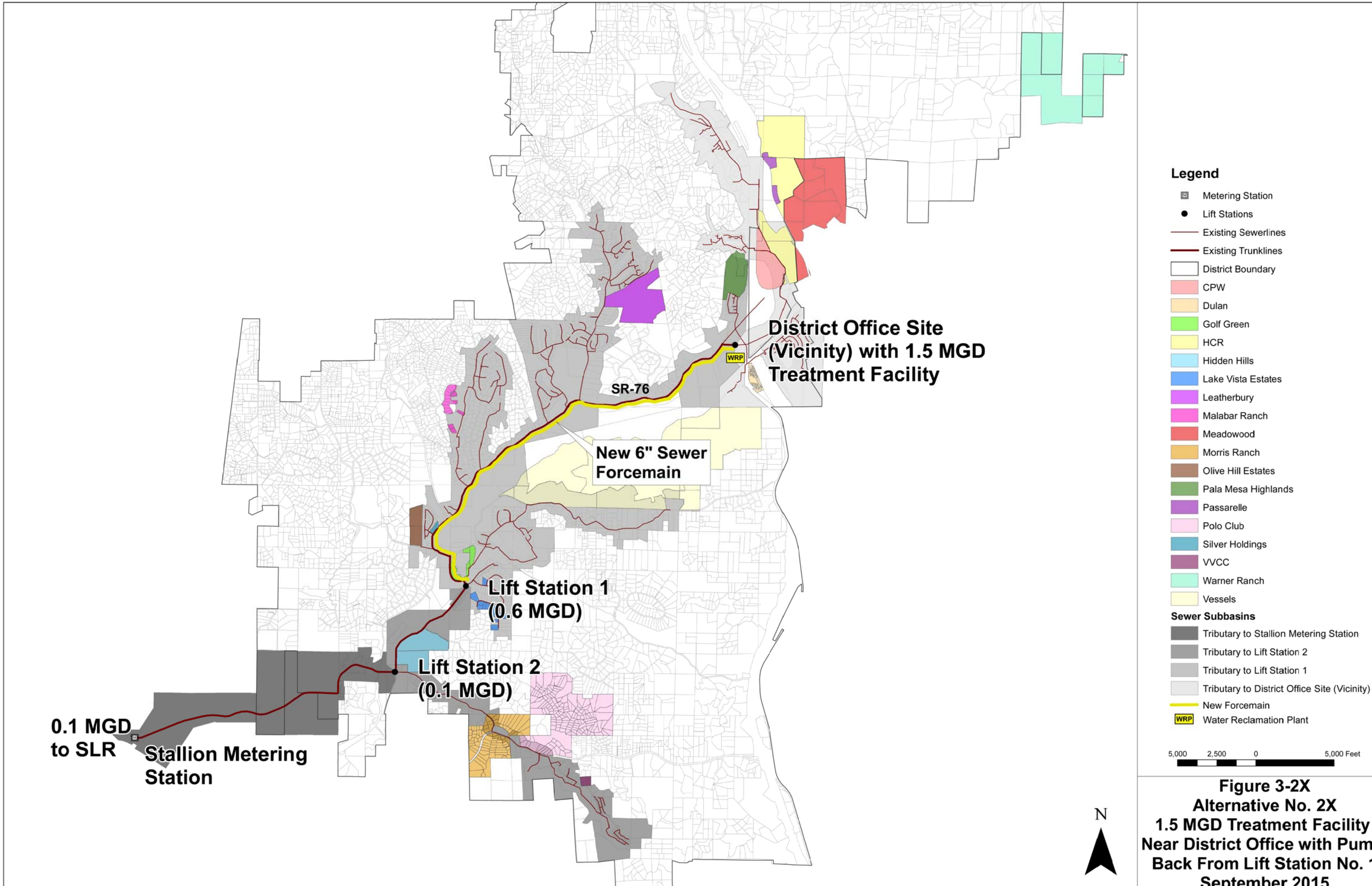

Figure 3-2X
Alternative No. 2X
1.5 MGD Treatment Facility
Near District Office with Pump
Back From Lift Station No. 1
September 2015

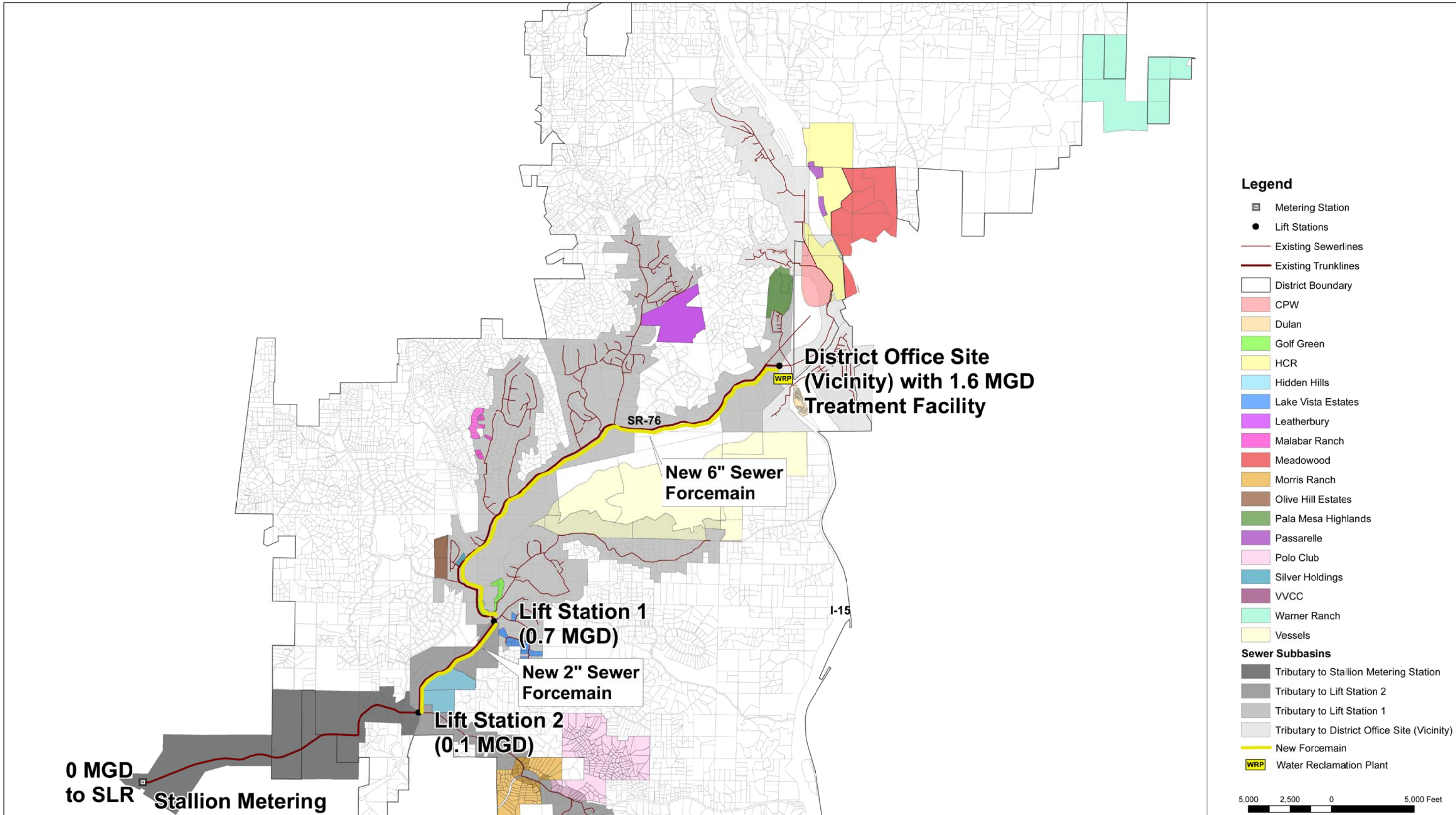

Figure 3-2XL
Alternative No. 5
1.6 MGD Treatment Facility
Near District Office with Pump
Back From LS #1 to LS #2
September 2015

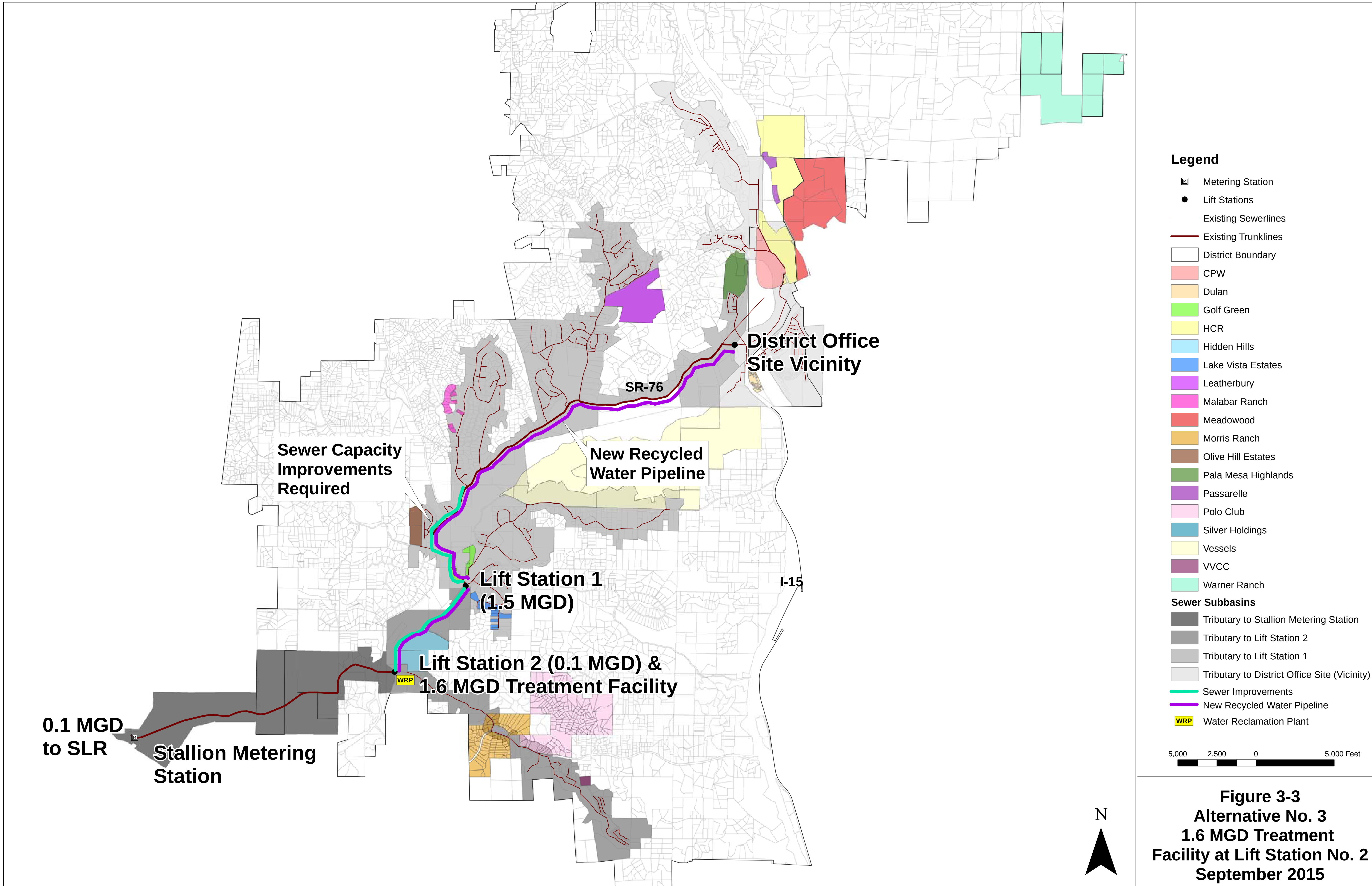

Figure 3-3
Alternative No. 3
1.6 MGD Treatment Facility at Lift Station No. 2
September 2015

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3.2.2 Solids Handling

Under current operations, solids resulting from the treatment process are handled at the SLRWRF. If the District constructs its own WRF, treatment and disposal of solids may be handled in primarily two ways.

- **SLRWRF Solids Handling**: The first method of handling solids could include continuing to discharge treatment solids to the existing conveyance system and continue to pay the City to treat and dispose of the solids. This option would require that the City maintain a proportionate capacity right within the SLRWRF based on the flow and strength discharged. Under this scenario, the flow tributary to SLRWRF would be very low and the strength would be very high.

- **District Solids Handling**: Alternatively, the District could construct solids handling at its new WRF, thereby eliminating the need for maintenance of such capacity at the SLRWRF. The smaller volume of solids produced at the District WRF would result in use of aerobic digestion for treatment of solids, minimizing the potential for odor production. The treated solids would be trucked off for disposal at an appropriate landfill site.

For the purposes of this analysis, it is assumed that the District will provide for solids handling at its new WRF, thereby eliminating the need for continued capacity at the SLRWRF for solids handling.

3.2.3 Capital, Operation & Maintenance Costs

The District has an extensive history of ongoing wastewater treatment and disposal costs under its agreement with the City. For the purposes of this analysis, these historical costs were assumed in the evaluation of alternatives involving continued conveyance to the SLRWRF. Capital improvement and betterment costs are projected based on historical costs based on recent City invoicing to the District.

With respect to a new WRF constructed by the District, local treatment plants of a similar capacity were consulted to define the annual capital and O&M costs associated with the proposed plant. Capital construction costs were derived from recent bidding results for plants of similar capacity and process.

3.2.4 Conveyance Requirements

The existing District conveyance facilities have a design capacity of approximately 1.0 mgd. Recent studies completed by the District identify required improvements to both pipeline and pump station facilities to accommodate the District's existing capacity right of 1.5 mgd at the SLRWRF. Therefore, for the purposes of this analysis, those recent studies were used to define needed improvements and costs relative to the existing conveyance. Similarly, where conveyance flows were found to not exceed a capacity of 1.0 mgd, the existing conveyance system was assumed to be adequate. With respect to LS 1 and LS 2, recent studies were used to define both capacity increase and O&M needs. Where capacity increases were not required, the O&M improvements were included, where appropriate. In some alternatives, LS 1 and LS 2 are no longer required, and were treated appropriately.

3.2.5 Cost Recovery at SLRWRF

As discussed previously, the existing inter-agency agreement establishes cost obligations to the District based on capacity rights at the SLRWRF. Therefore, where the District is reducing conveyance to the SLRWRF, the District would not realize a cost savings if the same capacity right was maintained at SLRWRF. It was assumed that the District would renegotiate its agreement with the City to reduce its capacity right at SLRWRF, and further assumed that such a renegotiation would result in the City purchasing back that capacity from the District. The cost per gallon associated with the City purchasing back treatment capacity was assumed relative to the current proposed treatment capacity changes being considered by the City with Valley Center Municipal Water District and a discussion between the City and District staff regarding future upgrades to the City's treatment and disposal system. As a result of this discussion and knowledge of the City's current proposed treatment capacity charges, the City buy back of treatment capacity costs was included to account for potential cost recovery (assumed to range from $10 to $20 per gallon) that would benefit the District relative to construction of its own WRF.

3.2.6 Recycled Water Production / TDS Reduction

As the primary purpose of this analysis is to evaluate the production of a new local water resource, tertiary treatment facilities were assumed to be included in the District WRF, and a recycled water pump station was included to convey the resulting water off-site to local users and storage. For the purposes of this analysis, recycled water production was assumed to be 90 percent of the identified WRF treatment capacity.

Production of recycled water is also projected to require demineralization facilities to reduce the overall Total Dissolved Solids (TDS). For the purposes of this analysis, a side-stream reverse osmosis (RO) treatment component would be added to the treatment plant facilities. The RO facilities would be used to treat a portion of the recycled water, which would then be blended with the remainder to achieve a product water to reduce the TDS to an acceptable concentration.

Reviewing District records, the average TDS of the wastewater conveyed to SLRWRF normally ranges from 800 to 1000 mg/L. Based on the upper concentration and a recycled water production of 0.9 mgd, the District would be required to treat approximately 0.25 mgd of recycled water prior to blending. The RO treatment process would produce an underflow (brine) of approximately 5 percent of the treated flow or 0.012 mgd. The brine flow cannot be conveyed to the SLRWRF and will require ultimate disposal.

Several brine disposal options were evaluated, including:

- Elimination of RO facilities by blending recycled water with raw water in Beck Reservoir,
- Construction of a separate brine conveyance pipeline from the WRF site to the Fallbrook Land Outfall, and
- Storage, concentration and hauling of brine volumes to a local ocean outfall facility.

It was determined that the added raw water conveyance facilities and raw water pricing would not be as cost effective as disposing of brine. Because of the anticipated capital costs of a lengthy brine line to a local outfall facility as well as the cost to acquire disposal capacity, brine hauling to a local ocean outfall facility was used as the brine disposal method for this study. However, the recurring cost of brine hauling will accumulate as development comes online and the plant treats larger flows. Because of the continuing costs of brine hauling, both options should be considered for further exploration.

4.0 Conceptual Recycled Water System

A conceptual backbone recycled water system was developed to provide recycled water to potential agricultural customers. Potential recycled water demands along a conceptual piping system were identified by pressure zone. Seasonal storage and supplemental raw water to improve water quality were evaluated to assess the benefits of Beck Reservoir becoming part of a recycled water system. The conceptual recycled water system was sized and a cost opinions were developed.

4.1 Recycled Water Conceptual Piping System

The conceptual piping system was developed based on a spatial analysis of existing irrigation and agricultural customers, as well as the role of development in potential recycled water demands. **Figure 4-1** presents the average annual demand in million gallons per day of the known future development projects and existing irrigation and agricultural customers that may potentially be served by a recycled water system.

Based on the concentration of demands and topography, the conceptual recycled water piping system was laid out to include supplying Beck Reservoir with Title 22 effluent, servicing demands south of SR-76 and west of I-15 in a first phase of the recycled system, and servicing the new development projects west of I-15 and northern demands in the Rainbow Valley via Rice Canyon Road. Reservoir include the benefits of Beck Reservoir include both blending and seasonal storage. **Figure 4-2** presents the conceptual recycled water piping system.

Based on the topography, it is anticipated that four pressure zones would be needed to service the conceptual recycled water system. **Figure 4-3** presents a schematic hydraulic grade line profile.

4.2 Potential Recycled Water Demands

From the conceptual piping layout, 73 existing irrigation or agriculture customers were identified as potential recycled water demands along with the known future developments. **Table 4-1** provides a summary of the potential recycled water demands by pressure zone.

Table 4-1 Average Annual Demand Summary by Pressure Zone

Pressure Zone	Description	Demand (AFY)	Demand (mgd)
893 PZ	Beck	918	0.8
1011 PZ	Southern (Closed)	294	0.3
790 PZ	Campus Park	112	0.4
1206 PZ	North	136	1.2
TOTAL		1,460	2.7

AFY = acre feet per year, mgd = million gallons per day
Existing Demands based on Fiscal Year 2014 demands provided by the District
Projected Demands taken from October 2010 County of San Diego Fallbrook Projects Recycled Water Feasibility Study

It is anticipated that the initial phase of the conceptual recycled water system would include serving the 893 Beck and 1011 Southern (Closed) pressure zones serving approximately 1.1 mgd of average annual demand. The second phase would include Campus Park and 1206 North pressure zones serving approximately 1.6 mgd of average annual demand.

4.3 Seasonal Storage and Supplemental Raw Water

Beck Reservoir offers the benefit of providing seasonal storage sufficient to balance seasonal variations in recycled water demands with the constant supply of recycled water produced by a District-owned WRF. Provided below is a summary of seasonal demands and required seasonal storage.

Seasonal demands were evaluated from the 73 identified potential recycled water conversion customers to assess seasonal trends and patterns. **Figure 4-4** presents the minimum, average, and maximum demands by month over the last 10 years. Monthly average demands vary by season largely dictated by climatic conditions. Under average annual conditions, the recycled water system can be expected to supply a minimum month demand of approximately 1.0 mgd and a maximum month demand of approximately 4.0 mgd.

Seasonal storage requirements at Beck Reservoir will largely be dictated by prolonged periods of minimum demand. The California Department of Public Health requires 84 days of emergency storage for recycled water system that do not have a fail-safe. While this doesn't necessarily apply to the proposed recycled water system, it is a benchmark to assess whether the 203 million gallon Beck Reservoir has adequate capacity. **Figure 4-5** presents the seasonal storage required assuming 1.5 mgd of treated effluent is continuously conveyed to Beck Reservoir over the minimum, average, and maximum month demands from the past 10 years. The figure shows that the Beck Reservoir has the capacity to weather prolonged periods of minimum demand.

The District shall provide a raw water source to serve as a back-up to the recycled system, allowing for occasional blending, and potentially supplement supply during peak demands.

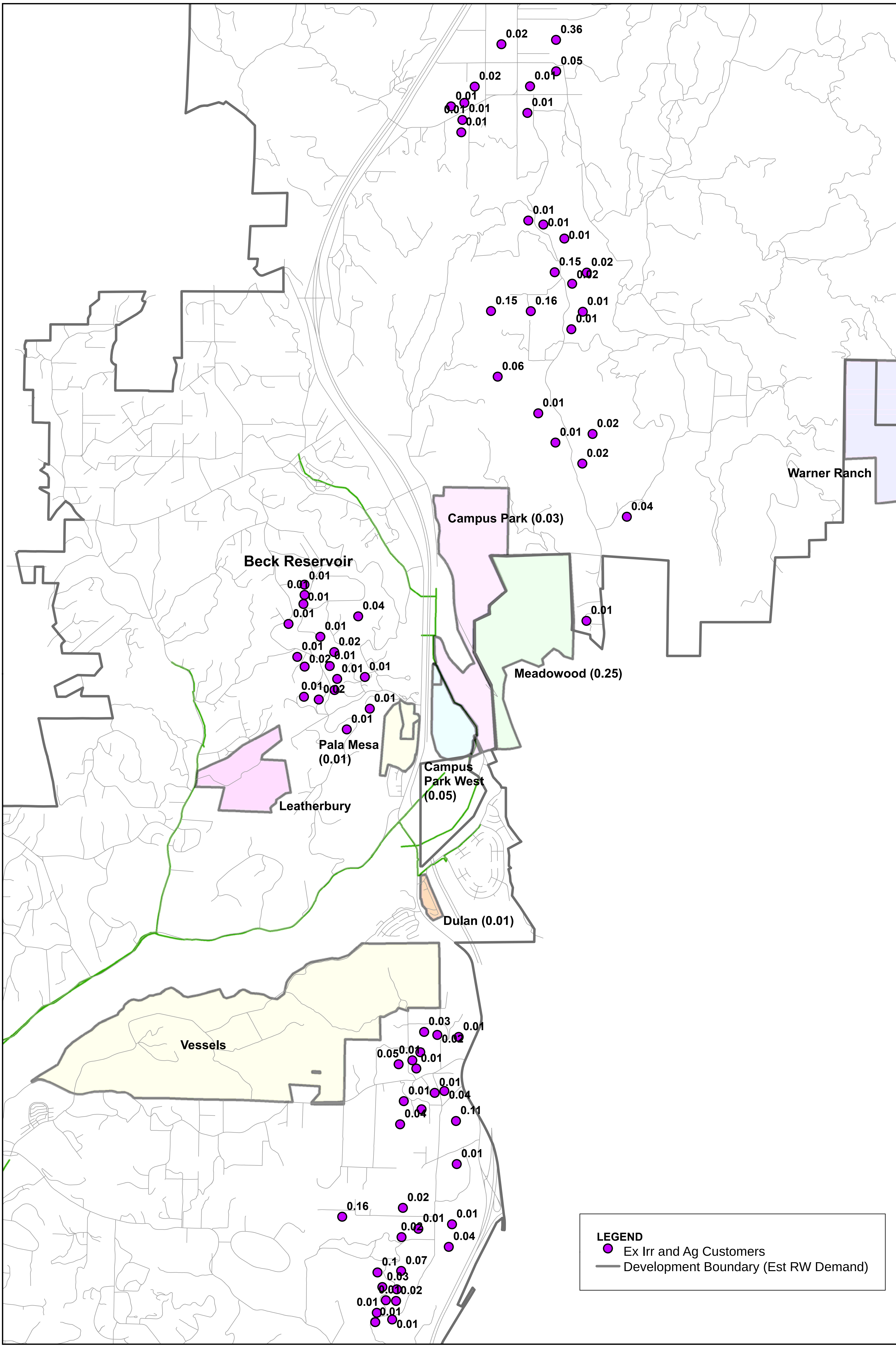

Figure 4-1
Wastewater Treatment / Reclamation Alternatives Study
Existing Large Irrigation and Agricultural Customers
September2015

ATKINS

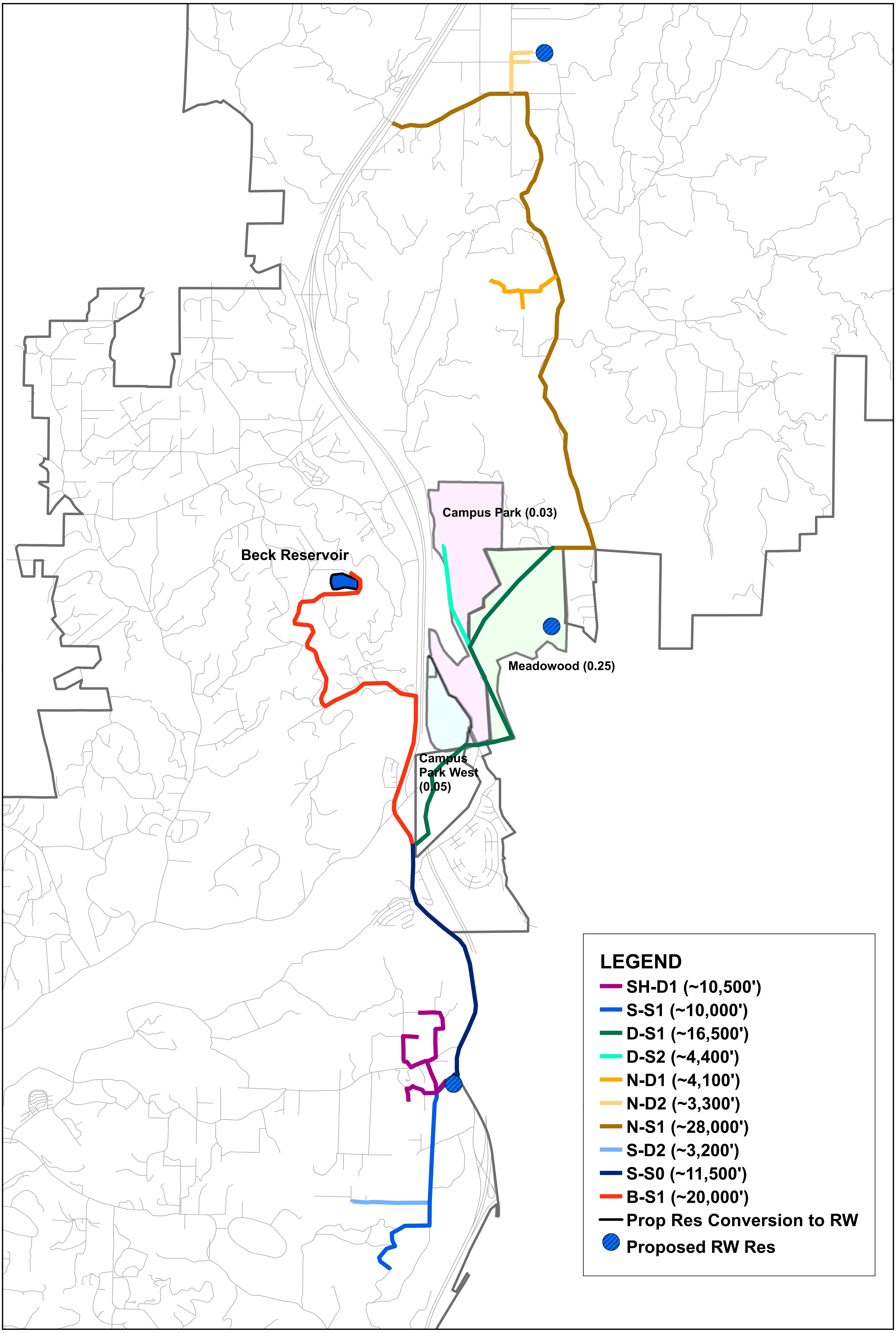

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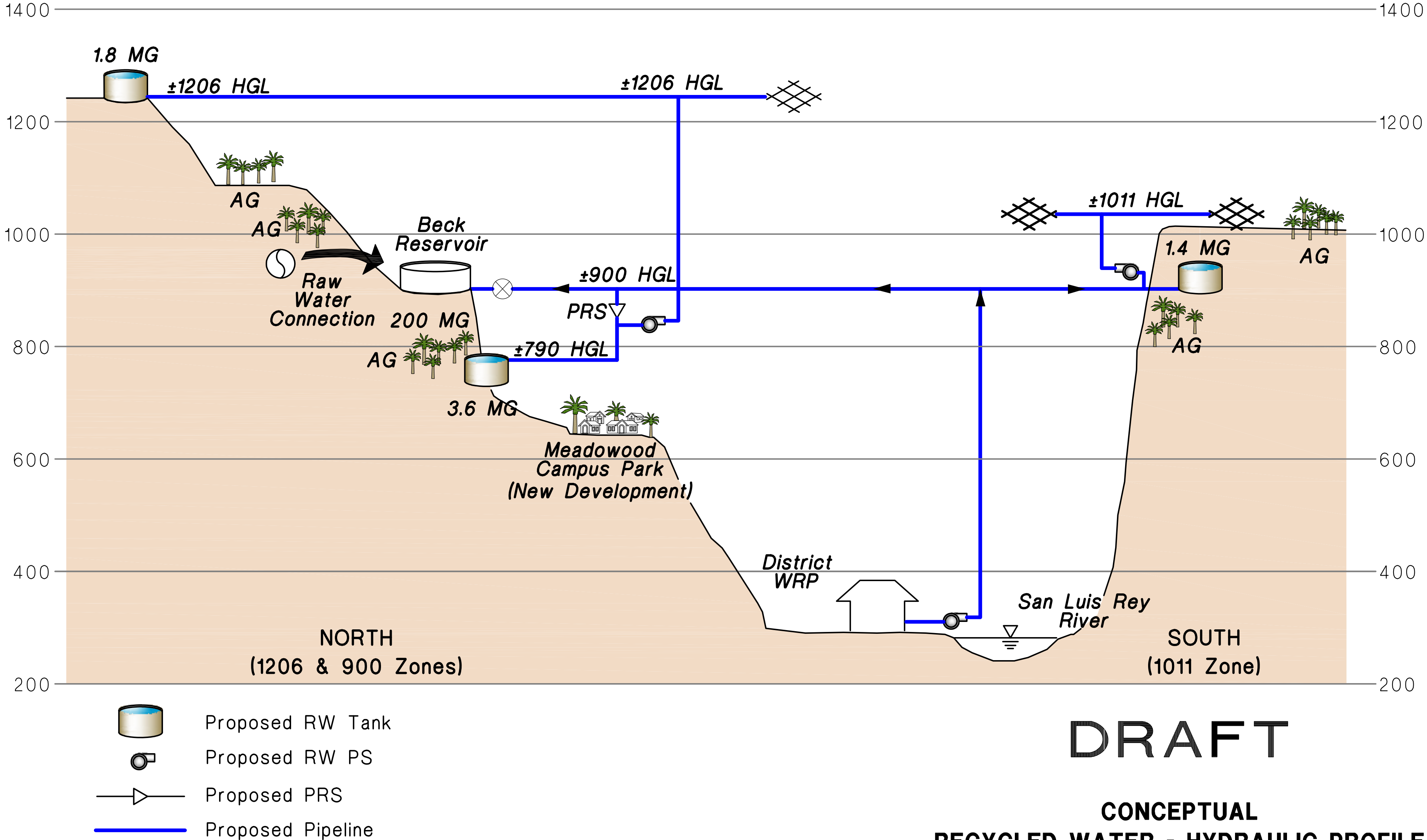
Figure 4-2
Wastewater Treatment / Reclamation Alternatives Study
Existing Large Irrigation and Agricultural Customers
September2015



DRAFT

CONCEPTUAL
RECYCLED WATER - HYDRAULIC PROFILE

FIGURE 4-3

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Figure 4-4 Observed Seasonal Demands

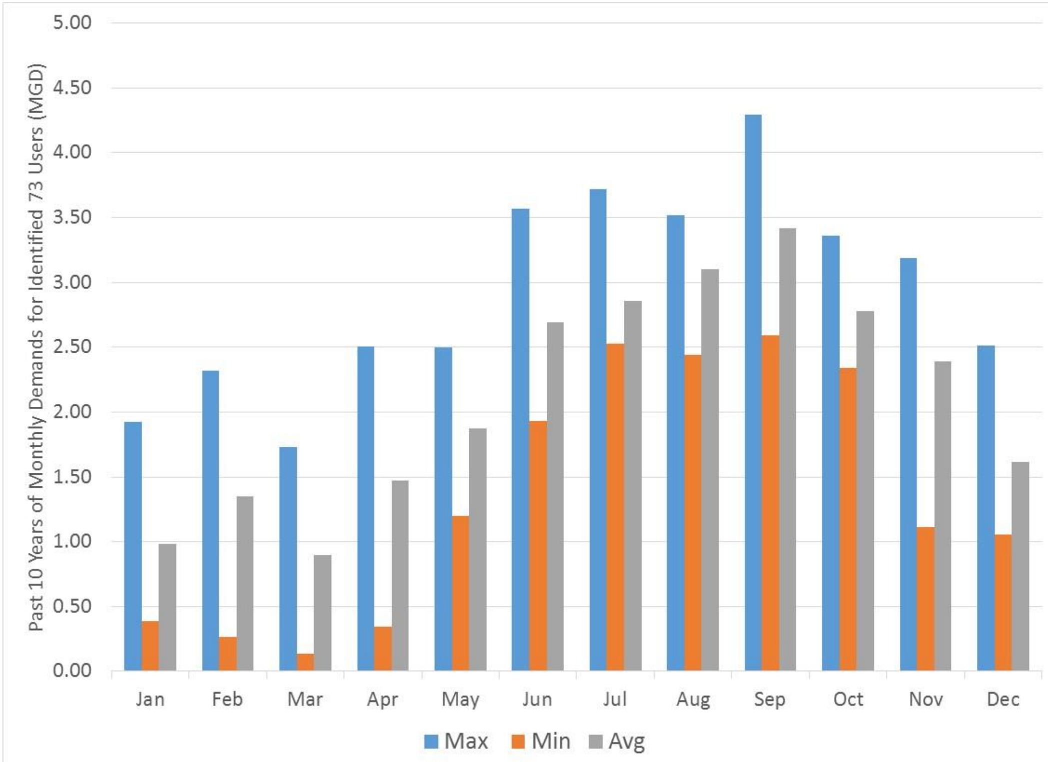
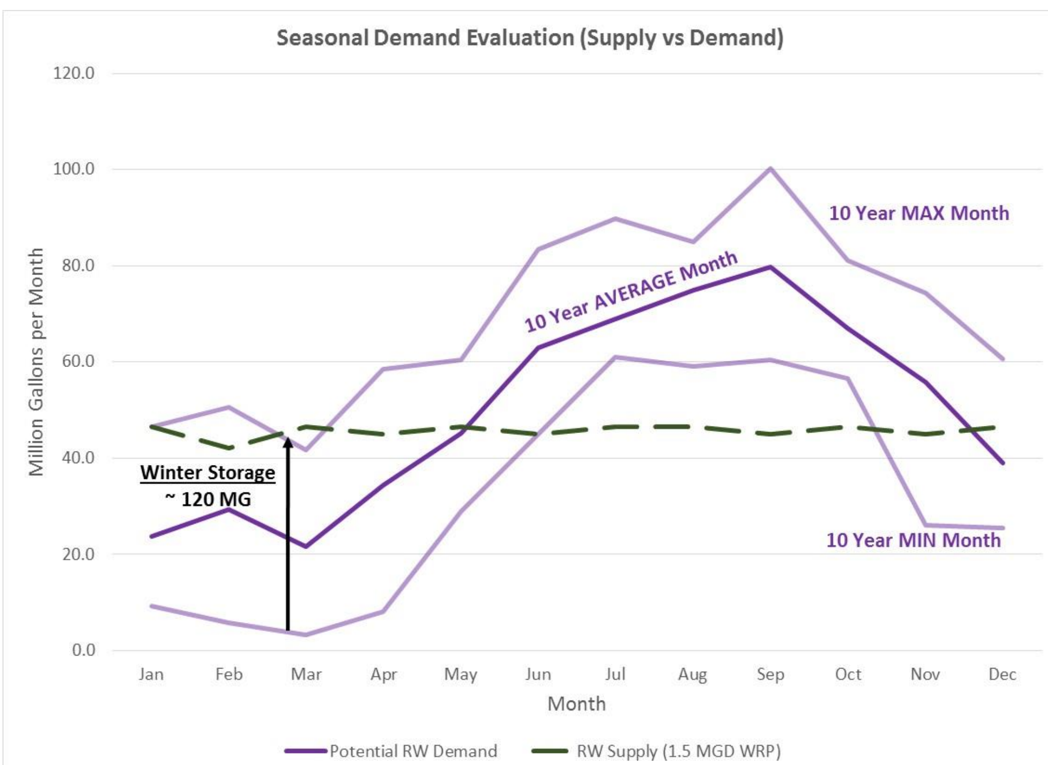


Figure 4-5 Seasonal Storage Evaluation



4.4 System Sizing & Cost Opinion

To develop preliminary level cost opinions, the conceptual recycled water backbone system was sized using planning level criteria and then costs were estimated for individual components. Preliminary system sizing was based on limiting headloss through an extensive piping system while providing the operational storage and pumping capacity needed to supply projected maximum day and peak hour demands, where needed. The cost opinion was developed based on typical unit facility, operation and maintenance, including power costs. **Table 4-2** presents a summary of the anticipated facilities and their respective capital and O&M costs.

Table 4-2 Recycled Water System Cost Summary

Pump Stations

$1.50	per gallon (Capital)
$0.18	per kWh Power Cost
75%	Assumed Energy Efficiency
1.5%	of Capital Cost - Assumed O&M for Pump Station

Name	AAD	Head	Capital Cost	Power Cost	Other O&M	Total O&M	MDD	HP	kWh/yr
South Upper	0.31	136	$1,650,000	$12,000	$25,000	$37,000	1.1	35	64,000
North	1.96	410	$7,350,000	$216,000	$110,000	$326,000	4.9	468	1,200,000
Total			**$9,000,000**	**$228,000**	**$135,000**	**$363,000**		**503**	**1,264,000**
Per MGD (ADD)			$3,285,000	$83,000	$49,000	$132,000		184	461,000

Pipelines

$12.00	per inch Dia per ft-Length (Capital)
1.0%	of Capital Cost - Assumed O&M for Pipelines

Name	Dia	Length	Capital Cost
TP-S1	12	0	$0
B-S1	20	20,005	$4,801,000
S-S0	16	11,357	$2,181,000
S-S1	12	10,150	$1,462,000
S-D2	4	3,242	$156,000
SH-D1	12	13,379	$1,927,`000
D-S1	20	16,624	$3,990,000
D-S2	4	4,397	$211,000
N-S1	16	28,317	$5,437,000
N-D1	8	4,149	$398,000
N-D2	12	3,272	$471,000
Total		**114,892**	**$21,034,000**
Per MGD (ADD)		42,931	$7,677,000

Tanks / Reservoirs

$1.00	per gallon (Capital)
1.0%	of Capital Cost - Assumed O&M for Reservoirs

Name	MG	Capital Cost
897 South	1.4	$1,400,000
790 Dev	3.6	$3,600,000
1206 North	1.8	$1,800,000
Total	**6.8**	**$6,800,000**
Per MGD (ADD)	2.5	$2,480,000

5.0 Life Cycle Cost Analysis

A preliminary life cycle cost analysis was prepared for each wastewater treatment plant alternative. **Table 5-1** presents our initial findings for Alternatives 1, 2 and 3, based on treatment plant capacity and O&M costs, avoided costs to Oceanside and other required District sewer upgrades.

The comparison of No Project to a District-controlled plant alternative is highly sensitive to assumptions about SLR system capacity sell back prices, the unit cost of the District's WRF, and other factors as presented in the spreadsheet. **Nevertheless, it appears reasonable to conclude, at a concept level, that the WRF Project alternatives offer real opportunities for life-cycle cost savings in comparison to the No Project alternative, while developing a new local water supply.**

Table 5-2 summarizes the recycled water analysis. There are many challenges with funding an expansive recycled system. The revenues and avoided purchase costs that accrue to the recycled system fund only approximately 40 percent of the system's life-cycle costs of construction and operation, which is not surprising given the length, pumping and storage needed to construct. The recycled system will require additional funding or subsidies to reach break-even, and the amount is in excess of the potential savings (ability to pay) on the WRF side. Accordingly, the recycled system will need to be funded through grants, new supply offset fees (capacity fees), developer conditions of development, other sources, or a combination of these to be economically sound.

Therefore, an important funding source for the District may reside with future development and capacity/connection fees. A portion of the recycled water system in and around a new plant site near the District office may be partially be funded by new development or constructed by new development as a condition. The initial cost and flow analysis assumes 3,500 new EDUs connected to the District's sewer system. Potential revenue streams include water capacity fees being approximately $46 million ($13,000 per EDU x 3,500 EDUs) and wastewater capacity fees being approximately $60 million ($17,000 per EDU x 3,500 EDUs).

Table 5-1 Rainbow MWD Water Reclamation Plant -- Preliminary Cost Analysis [1]

Project Alternative:		Alt. 1 No Project (All flow to Oceanside)	Alt. 2 Baseline WRP @ Vicinity I-15/76 No pump-back	Alt. 3 (revised) WRP @ LS#2 No pump-back
Flow Parameters				
Total Wastewater Flow, 2030 (MGD)		1.62	1.62	1.62
District WRP Capacity (MGD)		0.00	0.90	1.62
Remaining Flow to SLR (MGD)		1.62	0.72	0.00
District Existing SLR Capacity Right (MGD)		1.50	1.50	1.50
Flow @ PS1 (MGD)		1.50	0.60	1.50
Flow @ PS2 (MGD)		1.62	0.72	-
Addtl. Capacity Required at SLR (MGD)		0.12	-	-
Surplus Capacity Available for Sell-back [2]		-	0.78	1.50
District Share of SLR Existing Capacity	13.5 MGD	12.0%	5.3%	0.0%
District Share of SLR Future Capacity	17.4 MGD	9.3%	4.1%	0.0%

Life-Cycle Cost Summary		**For SLR Capacity Sell-Back Price =**		$10 /gpd
N (yrs): 30	***i* (%/yr):** 3.50%	**Alt. 1** **No Project** (All flow to Oceanside)	**Alt. 2** **Baseline WRP** @ Vicinity I-15/76 No pump-back	**Alt. 3 (revised)** **WRP @ LS#2** No pump-back
	***j* (escalation rate) (%/yr):** 2.50%			
Amortization Factor (A/P, *i*, N):	0.0544			
Capitalization Factor [3] (P/A, *i*, *j*, N):	25.3			
Present-Worth Cost Analysis				
Total Annual O&M		$ 1,720,000	$ 1,880,000	$ 1,790,000
Present-Worth of Annual Costs	Pj = 25.3	$ 43,500,000	$ 47,500,000	$ 45,200,000
Total Capital		$ 32,000,000	$ 36,000,000	$ 79,000,000
Total Present Worth Costs (rounded)		$ 76,000,000	$ 84,000,000	$ 124,000,000
Equivalent Annual Costs (" ")	A/P = 0.0544	**$ 4,100,000**	**$ 4,600,000**	**$ 6,700,000**

Capital Costs					Alt. 1	Alt. 2	Alt. 3
District WRP (pre mark-up)			$25 /gpd			$ 22,500,000	$ 40,500,000
RO Equipment	Q= 27%	Y= 95%	$4.00/gpd			$ 1,000,000	$ 1,700,000
Lift Station and Sewer Main Upgrades							
District Outfall Expansion			$14 MM		$ 8,970,000		
Mission Rd. to LS2	14,000 ft.	18 in.	$15 in./ft.		$ 3,780,000		$ 3,780,000
LS#1 Upgrades	*per mgd flow at LS1*		$3.5 MM		$ 5,250,000	$ 2,100,000	$ 5,250,000
Forcemain (pump back)	28,200 ft.	10 in.	$12 in./ft.				
LS#2 Upgrades	*per mgd flow at LS2*		$0.4 MM		$ 650,000	$ 290,000	$ -
Forcemain (pump back)	7,770 ft.	6 in.	$15 in./ft.				
Recycled (Failsafe) Conveyance & Storage							
Pump Station	*per mgd flow at plant*		$0.6 MM			$ 540,000	$ 970,000
Pipeline to District Site	35,970 ft.	12 in.	$15 in./ft.				$ 6,470,000
Pipeline to Beck	0 ft.	12 in.	$15 in./ft.			$ -	$ -
Beck Improvements			$1.0 MM			$ 1,000,000	$ 1,000,000
Beck Raw Water Connect. Rehab.			$0.5 MM			$ 500,000	$ 500,000
Subtotal (rounded)					$18,700,000	$27,900,000	$60,200,000
Contingency		@	30%		$5,600,000	$8,400,000	$18,100,000
Subtotal Construction					$24,300,000	$36,300,000	$78,300,000
Design/Permitting/Admin.		@	20%		$4,900,000	$7,300,000	$15,700,000
Subtotal Capital Cost					$29,200,000	$43,600,000	$94,000,000
Purchase of Additional SLR Capacity			$20/gpd		$ 2,400,000		
Sell-back of SLR System Capacity		$10 /gpd				$ (7,800,000)	$ (15,000,000)
TOTAL CAPITAL COSTS (rounded)					**$ 32,000,000**	**$ 36,000,000**	**$ 79,000,000**

Annual Costs				Alt. 1	Alt. 2	Alt. 3
District WRP O&M Costs						
Contract O&M Service	$ 15,000	/mn./mgd			$ 160,000	$ 290,000
Maint./Replace. Fund, as % WRP Constr.		1.00%			$ 230,000	$ 410,000
Concetrate Hauling [4]	13,500 gpd/MGD		$90/kgal.		$ 400,000	$ 720,000
Power	e= 75%	$0.18	/kWh			
Pumping to SLR	(Q varies)	@TDH=	120 ft.	$ 52,000	$ 23,000	$ -
Pump-back	(Q varies)	@TDH=	120 ft.			
Recycled PS (District site)		@TDH=	725 ft.		$ 320,000	
Recycled PS (LS2 Site)		@TDH=	850 ft.			$ 370,000
SLR Usage Charges (1.5 mgd cap.)	$85,000	/mn.		$ 1,100,000	$ 490,000	$ -
SLR System Maint./Repl. Fund, District share						
WWTP, as % of Constr. Cost	$435 MM	1.25%		$ 510,000	$ 230,000	$ -
Outfalls, as % of Constr. Cost	$60 MM	1.00%		$ 56,000	$ 25,000	$ -
TOTAL ANNUAL O&M COSTS (rounded)				**$ 1,720,000**	**$ 1,880,000**	**$ 1,790,000**

Notes:
1) PRELIMINARY COSTS: Preliminary cost analysis, subject to review and revision
2) SLR CAPACITY SELL-BACK ASSUMPTIONS: The analysis assumes the sell-back of its unneeded SLR system capacity rights is achievable, and that the District's ownership share and financial responsibility for SLR system costs would decrease proportionate with its decrease in capacity right.
3) CAPITALIZATION FACTOR: The capitalization factor is a percentage gradient series present worth factor, with future annual costs escalating at the rate specified.

Table 5-2 Rainbow Recycled Water System Concept Study – Preliminary Cost Analysis

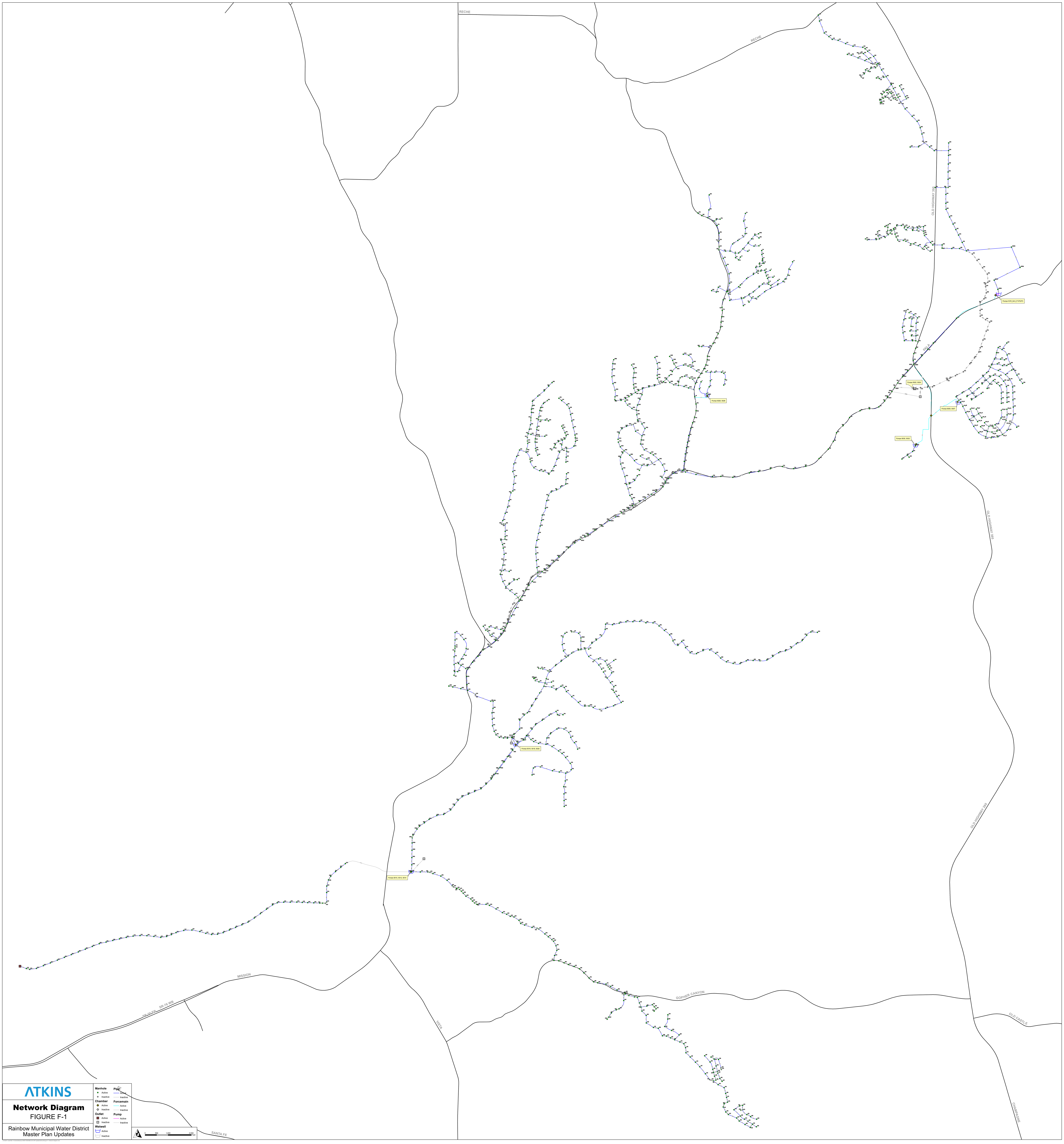
COST SUMMARY – FACILITIES		Capital Cost	Power Cost	Other O&M	Total O&M
Pipelines		$21,000,000	$0	$210,000	$210,000
Pump Stations		$9,000,000	$230,000	$140,000	$370,000
Reservoirs		$7,000,000	$0	$70,000	$70,000
Customer Retrofit Assistance		$2,000,000	$0	$0	$0
System Ops (inc. T22 compliance)		$0	$0	$200,000	$200,000
Subtotal		$39,000,000	$230,000	$620,000	$850,000
Contingency @	30%	$12,000,000	$0	$190,000	$190,000
Subtotal		$51,000,000	$230,000	$810,000	$1,040,000
Design/Permitting/Admin.	20%	$10,000,000	$0	$0	$0
Total		**$61,000,000**	**$230,000**	**$810,000**	**$1,040,000**
Per MGD (ADD)	2.74	$22,000,000	$80,000	$300,000	$380,000
Per AF/yr	3,072	$19,600	$70	$270	$340

ANNUAL COSTS AND OFFSETS				
Calculated on a unit-cost basis			**Blend Ratio**	**Unit Cost ($/AF)**
Facilities O&M Unit Cost Total (from above)				**$340**
Raw Water Blend %	10%			
Avoided Treated Water All-In Cost		-$1,439/AF	1.00	-$1,440
Raw Water All-In Cost		$1,159/AF	0.10	$120
Recycled Purchase Cost		$0/AF	0.90	$0
Sales Price Discount vs. Potable		$300/AF	1.00	$300
Lost Water Revenue for System o/h		$250/AF	1.00	$250
Subtotal				-$770
Total Net of Annual Cost Items				**-$430**

LIFECYCLE COSTS				
Finance Terms	30 yrs	3.5%		
Escalation Rate (%/yr)	2.5%			
Amortization Factor	0.0544			
Capitalization Factor	25.3			
Present-Worth Cost Analysis				**Unit Cost ($/AF)**
Net of Annual Costs, from above				-$430
Present-Worth of Annual Costs	Pj =	25.3		-$10,870
Total Capital (from above)				$19,600
Total Present Worth Costs (rounded)			$8,730	
Equivalent Annual Costs (" ")	A/P =	0.0544		$470
Subsidy Required from WRF to Reach Break-Even				
Remaining Unfunded Unit Life-Cycle Cost ($/AF)				$470
Capitalized Value ($/AF)				$8,600
Capitalized Value ($/mgd)				$10,000,000
Amount per MGD of WRF Capacity, at Specified Blend ($/mgd)				$11,000,000
If funded by new Supply Offset Capacity Fee, per EDU per mgd			3,500 EDU	$3,100

DISCUSSION – LIFE-CYCLE COSTS AND SUBSIDY REQUIREMENTS

- **Recycled System Cost Deficit:** The revenues and avoided purchase costs that accrue to the recycled system fund only 10 percent of the system's life-cycle costs of construction and operation.
- **Subsidy Requirement to Reach Break-Even:** The recycled system will require large subsidies to reach break-even . . . not counting the indirect benefits of local supply.
- **Subsidy amount is beyond the reach of the WRF:** The recycled system would need to be funded through grants, new supply offset fees (capacity fees), other sources, or a combination of these.



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Network Diagram

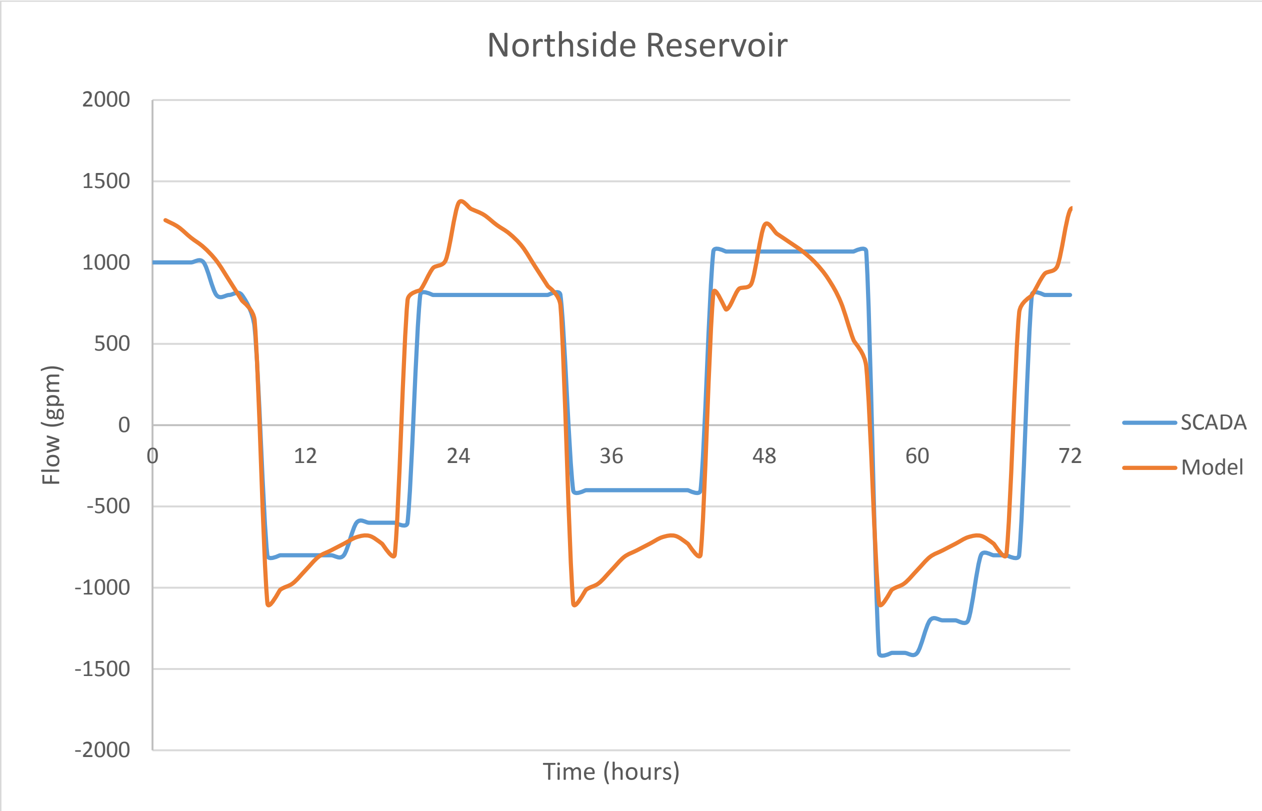
FIGURE F-1

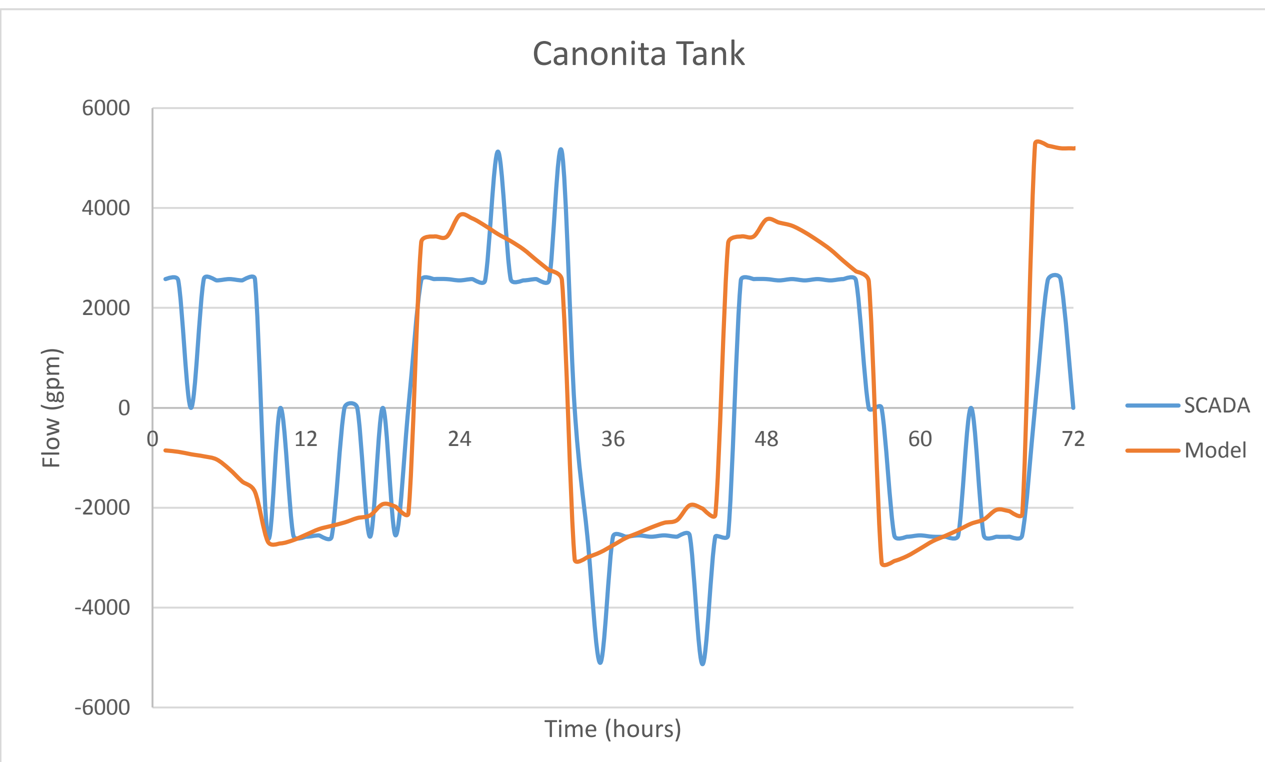
Rainbow Municipal Water District
Master Plan Updates

APPENDIX F
Hydraulic Modeling Results

Water Calibration Data

Morro Tank Filling Scenario – Tank Calibration





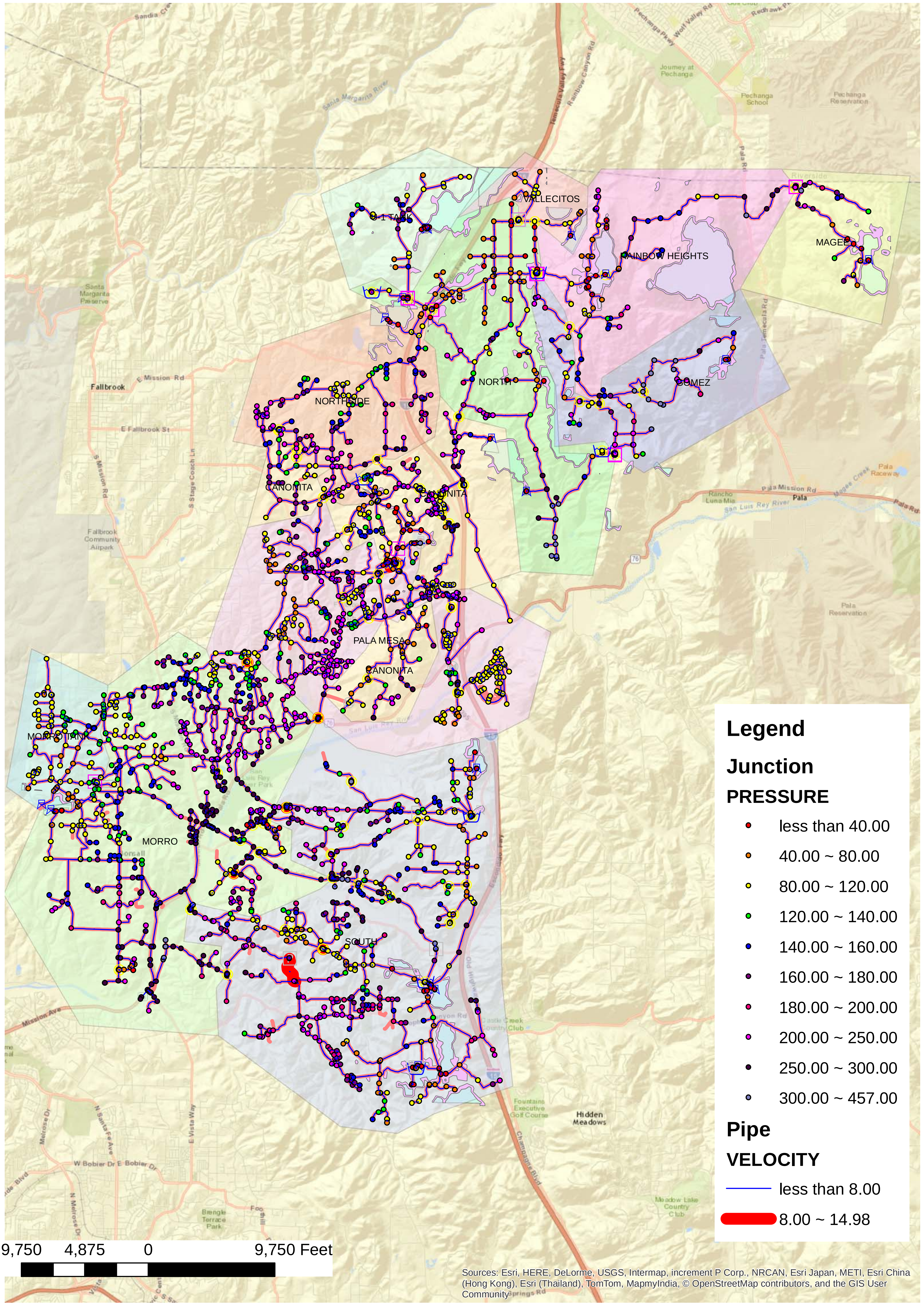

Morro Reservoir
6000
5000
4000
3000
2000
1000
0
Flow (gpm)
0
12
24
36
48
60
72
Time (hours)
SCADA
Model

Pump Station Calibration Information – Morro Tank Filling

Date	PS#2 (U-1)					PS #4 (Northside)				PS #1 (Rainbow Heights)						PS #3 (Vallecitos)			PS#5 (Morro Tank)			PS#7 (Magee)				PS#6 (Gomez/Huntley)				
	Suction	Discharge	#1 Run Hrs	#2 Run Hrs	#3 Run Hrs	Suction	Discharge	A Run Hrs	C Run Hrs	Suction	Discharge	#4 Run Hrs	#5 Run Hrs	#6 Run Hrs	#7 Run Hrs	Suction	Discharge	#2 Run Hrs	Suction	Discharge	Run Hrs	Suction	Discharge	#1 Run Hrs	#2 Run Hrs	Suction	Discharge	#1 Run Hrs	#2 Run Hrs	#3 Run Hrs
8/12/2014	23	170	0	0	2	55	75	0	0	33	355	0	1	10	10	58	105	0	108	122	2	255	330	0	1	29	250	4	4	0
8/13/2014	23	170	0	4	0	48	74	9	0	24	360	0	2	10	10	50		0	110	123	2	235	350	4	1	31	248	9	6	0
8/14/2014	18	170	7	0	3	50	76	11	0	20	355	0	0	15	19	50		0	111	122	3	250	335	1	2	44	250	9	7	0
8/15/2014	18	170	6	0	6	50	73	0	0	22	350	0	4	11	11	48	100	9	110	125	6	252	339	3	2	32	250	8	8	0
8/16/2014	20	170	5	5	0	48	78	12	11	22	350	0	0	12	12	48	110	11	110	125	0	252	339	0	0	32	250	7	7	0
8/17/2014	20	170	0	0	0	48	78	0	0	22	350	0	0	0	0	48	110	8	110	125	6	250	338	0	0	32	250	0	9	0
8/18/2014	20	171	3	3	3	50	74	0	0	22	350	0	0	14	11	48	110	6	110	125	0	250	338	0	0	30	250	9	8	0
8/19/2014	21	171	0	0	0	50	78	12	13	23	350	0	0	12	11	48	104	9	110	125	7	253	339	0	0	30	249	4	4	0
8/20/2014	22	173	0	5	5	50	78	0	0	25	350	0	0	0	0	49	110	8	110	125	0	253	339	0	0	32	250	9	11	0
8/21/2014	22	173	0	0	0	50	75	0	0	21	370	0	14	9	10	48	108	0	110	125	0	252	331	0	0	30	253	5	5	0
8/22/2014	21	172	5	5	0	48	80	2	0	28	255	0	2	1	11	50	108	7	120	126	5	252	331	0	0	30	252	6	0	0
8/23/2014	22	171	0	0	0	50	77	11	0	23	350	0	0	11	10	45	103	8	120	124	0	252	335	0	0	32	250	0	9	0
8/24/2014	22	172	0	0	8	50	77	0	0	24	360	0	4	4	0	47	102	7	120	126	4	252	332	0	0	32	250	4	7	0
8/25/2014	22	170	0	0	0	52	74	0	0	25	350	0	10	10	0	50	105	4	121	126	0	250	339	5	0	34	250	7	0	13
8/26/2014	21	171	5	4	0	48	76	12	0	21	346	0	17	11	12	42	105	6	120	126	6	255	339	0	0	79	250	0	9	9
8/27/2014	21	169	0	0	0	52	74	0	0	22	350	0	0	9	0	46	100	7	120	126	0	250	330	0	0	30	250	9	9	0
8/28/2014	19	170	1	9	4	46	82	12	0	22	352	0	7	9	12	48	105	10	122	128	6	250	330	0	0	32	250	3	2	3
8/29/2014	22	170	0	1	0	50	76	0	0	22	345	0	0	0	0	42	105	7	120	125	0	250	338	0	0	32	250	9	9	0
8/30/2014	21	170	0	10	0	56	84	2	2	27	350	0	12	0	11	41	111	8	120	128	7	250	330	0	0	29	250	0	7	4
8/31/2014	21	170	0	0	0	52	78	1	1	23	360	0	0	16	16	47	102	8	121	125	0	250	330	7	0	34	250	9	0	8
9/1/2014	20	167	0	0	0	50	76	0	0	22	350	0	0	3	3	46	105	8	121	124	0	250	330	1	0	28	250	6	0	5

	PS#2 (U-1)	PS #4 (Northside)	PS #1 (Rainbow Heights)	PS #3 (Vallecitos)	PS#5 (Morro Tank)	PS#7 (Magee)	PS#6 (Gomez/Huntley)
SCADA tot:	109	111	409	131	54	27	280
Model tot:	115	110	393	130	50	28	261
% Diff =	0.05	0.01	0.04	0.01	0.07	0.04	0.07

Maximum Daily Flow Hydraulic Model Output



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Maximum Day Demand - Peak Hour
Pipe Velocity and Juntion Pressure
Model Output

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1	15.72	440	941.11	217.13
10	33.33	510	936.45	184.78
100	0	570	863.46	127.15
1000	5.85	730	1,221.66	213.04
10000	0	210	523.87	136
100000	64.67	590	1,166.59	249.83
100002	0	1,370.00	1,942.05	247.87
100008	0	740	1,221.70	208.72
10001	0	254	853.37	259.71
100010	0	740	970.78	100
100012	0	740	1,221.70	208.72
100014	0	740	970.78	100
100016	38.39	720	1,169.24	194.66
100018	0	660	960.02	130
10002	0	420	930.22	221.08
100020	0	660	985.18	140.9
100022	0	660	1,169.24	220.65
100024	0	660	1,169.24	220.65
100026	0	660	985.18	140.9
100028	0	410	951.84	234.78
10003	0	254	852.97	259.53
100030	0	410	626.74	93.91
100032	0	400	951.84	239.11
100034	0	400	626.74	98.24
100036	0	420	974.89	240.43
100038	0	420	639.25	95
100040	0	350	944.38	257.55
100042	0	350	626.74	119.91
100044	0	350	944.17	257.46
100046	0	350	626.94	120
100048	0	350	522.77	74.86
10005	0	254	940.61	297.51
100050	0	350	943.63	257.22
100052	0	350	523.08	75
100054	0	350	943.31	257.08
100056	1.14	710	956.96	107.01
100058	17.44	700	873.08	75
10006	2.66	360	861.4	217.26
100064	0	400	930.5	229.86
100066	0	400	562.81	70.54
100068	0	400	930.5	229.86
10007	0	254	940.71	297.55
100070	0	400	562.81	70.54
100072	0	400	870.82	204
100074	0	390	551.14	69.82
100076	0	400	870.43	203.84
100078	0	390	551.54	70
10008	20.36	560	868.99	133.89
100088	0	360	867.94	220.09
100090	0	360	613.74	109.94
100092	0	360	867.95	220.09
100094	0	360	613.73	109.94
100096	0	240	869.25	272.66
100098	0	240	493.73	109.94
10010	2.16	730	939.32	90.7
100100	0	240	869.25	272.66
100102	0	240	493.73	109.94
100104	0	240	869.12	272.6
100106	0	240	493.86	110
100108	0	240	869.13	272.6
100110	0	240	493.85	109.99
100112	0	730	892.89	70.58
100114	0	730	856.9	54.99

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
100116	0	690	864.81	75.74
100118	0	690	945.87	110.87
10012	11.94	850	937.83	38.05
100120	0	690	872.46	79.06
100122	0	690	937.95	107.44
100124	13.97	460	855.14	171.22
100126	0	290	571.74	122.08
100128	0	290	571.74	122.08
10013	0	250	852.77	261.18
100138	1.3	280	815.19	231.9
10014	0	660	972.48	135.4
100140	2.22	390	881.5	212.97
100142	0	610	778.47	73
100144	0	610	778.7	73.1
100146	0	540	795.62	110.76
100148	6.5	540	795.62	110.76
10015	0	250	941.09	299.45
100154	0	890	882.49	-3.25
100156	4.97	1,000.00	1,252.12	109.24
100158	3.61	830	882.46	22.73
10016	16.56	1,460.00	1,936.88	206.63
100160	0	810	935.8	54.51
100168	1.99	1,040.00	1,250.28	91.11
10017	0.08	250	940.54	299.21
100172	1.74	580	972.46	170.05
100174	0	660	972.48	135.4
10018	0	1,570.00	1,937.74	159.34
100182	7.95	500	798.87	129.5
10019	0	480	884.5	175.27
1002	2.29	740	1,221.64	208.7
10020	0	1,080.00	1,185.02	45.5
10021	4.14	200	854.81	283.73
10022	0	1,160.00	1,170.33	4.47
10023	0	239	856.34	267.49
10025	0	239	855.78	267.25
10026	0	1,160.00	1,170.32	4.47
10027	0	242	856.22	266.14
10028	0	1,160.00	1,170.30	4.46
10029	0	242	856.14	266.11
1003	4.75	750	1,221.64	204.36
10030	0	1,160.00	1,170.29	4.46
10031	0	242	855.98	266.04
10032	0	1,160.00	1,170.28	4.46
10033	0	242	855.9	266
10034	0	1,160.00	1,170.28	4.46
10035	0	687	964.3	120.15
10036	0	1,150.00	1,199.27	21.35
10037	0	687	964.31	120.16
10038	20.43	670	831.33	69.9
10039	0	280	974.5	300.93
1004	2.93	1,604.00	2,123.33	225.02
10040	0.24	250	815.18	244.89
10041	0	215	817.8	261.19
10042	0.36	520	798.85	120.82
10043	0	230	818.88	255.16
10044	0	600	834.47	101.6
10045	0	215	818.36	261.44
10046	4.73	650	841.66	83.05
10047	0	215	818.61	261.55
10048	0	610	855.57	106.41
10049	0	215	818.24	261.38
1005	0.62	720	1,221.75	217.41
10050	7.68	610	855.54	106.39

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
10051	0	215	818.61	261.55
10052	0	1,360.00	1,937.26	250.13
10053	0	584	829.61	106.42
10054	0	550	864.09	136.1
10055	13.29	582	828.36	106.75
10056	0	690	972.29	122.31
10057	0	586	828.8	105.2
10058	0	680	967.83	124.72
1006	17.96	760	1,221.62	200.02
10060	0	750	1,221.70	204.39
10061	0	586	829.39	105.46
10062	0	750	1,221.70	204.39
10064	0	730	970.78	104.33
10065	0	586	829.39	105.46
10066	0	550	799.74	108.21
10067	0	586	828.8	105.2
10069	1.11	260	832.94	248.26
1007	1.93	840	1,221.95	165.5
10075	18.57	256	492.89	102.64
10076	1.89	690	1,221.68	230.38
10077	23.29	250	493.02	105.3
10079	17.02	250	493.01	105.3
1008	3.72	730	1,221.82	213.11
10081	25.3	256	492.87	102.64
10083	22.29	250	493.01	105.3
10085	20.58	256	492.87	102.64
10087	18.08	260	492.79	100.87
1009	0	770	1,221.95	195.83
10094	0	1,390.00	2,123.33	317.75
10096	0	1,380.00	2,123.33	322.09
10098	0	1,100.00	1,171.98	31.19
101	0	610	862.52	109.42
1010	2.66	770	1,221.95	195.83
10100	0	1,090.00	1,330.13	104.05
10102	0	1,160.00	1,945.48	340.35
10104	0	1,160.00	1,945.10	340.19
10106	0	1,160.00	1,945.10	340.19
10108	0	1,130.00	1,672.29	234.98
1011	13.29	800	1,222.13	182.91
10110	0	1,130.00	1,672.29	234.98
10112	0	1,130.00	1,672.29	234.98
10114	0	1,140.00	1,672.29	230.64
10116	0	1,160.00	1,538.91	164.18
10118	0	1,160.00	1,538.91	164.18
1012	0	1,686.00	2,123.32	189.49
10120	0	1,150.00	1,538.91	168.51
10122	0	1,080.00	1,183.29	44.76
10124	0	1,080.00	1,183.29	44.76
10126	0	1,080.00	1,183.29	44.76
10128	0	535	795.62	112.92
10130	0	535	832.38	128.86
10132	0	200	809.14	263.94
10134	0	200	361.52	69.99
10136	0	200	809.13	263.94
10138	0	200	361.53	69.99
10142	0	150	849.09	302.91
10148	0	640	922.15	122.25
10150	2.5	640	836.17	85
10152	1.89	760	935.96	76.25
10154	0	760	922.6	70.46
10156	26.84	680	841.55	70
10158	0	680	960.16	121.39
1016	0	180	838.86	285.49
10160	0	800	963.48	70.84
10162	0	710	961.87	109.14
10164	0	710	926.26	93.7
10168	0	870	966.04	41.61
1017	0	840	1,222.26	165.63
10172	0	870	966.04	41.61
10174	0	250	946.51	301.8
10176	0	490	743.87	110
10178	0	490	936	193.25
1018	7.68	840	1,222.22	165.62
10180	0	480	743.87	114.33
10182	0	480	936	197.59
10184	0	560	962.75	174.51
10186	0	200	430.48	99.87
10188	0	200	836.43	275.77
1019	0	840	1,225.99	167.25
10190	0	200	424.33	97.2
10192	0	200	842.45	278.37
10194	0	200	845.23	279.58
10196	0	200	844.97	279.47
10198	0	870	1,151.00	121.76
102	0	610	862.26	109.3
1020	0	170	838.56	289.69
10200	0	1,150.00	1,272.00	52.86
10204	0	840	1,297.00	198.02
10206	0	1,040.00	1,251.00	91.43
10208	0	700	1,253.00	239.61
1021	14.1	880	1,222.14	148.25
10210	0	890	1,232.00	148.19
10212	25.97	890	1,110.00	95.33
10214	0	970	1,080.00	47.66
1022	1.13	920	1,222.12	130.91
1023	13.77	910	1,222.12	135.24
1024	0	920	1,222.12	130.91
1025	42.63	820	960.19	60.75
1026	45.37	620	960.38	147.49
1027	0	740	960.26	95.44
1028	0	740	960.26	95.44
1029	11.06	640	960.44	138.85
103	0	570	863.46	127.15
1030	0	640	960.5	138.87
1031	41.45	720	981.3	113.22
1032	4.23	670	960.69	125.95
1033	0	750	981.33	100.24
1034	0	760	981.35	95.91
1035	1.81	730	960.92	100.06
1036	68.26	780	960.82	78.35
1037	6.62	740	960.92	95.72
1038	0	740	960.93	95.73
1039	27.96	870	981.33	48.24
104	5.47	570	713.09	62
1040	3.21	550	952.64	174.46
1041	0	830	981.35	65.58
1042	0	810	981.44	74.28
1043	2.34	600	952.64	152.8
1044	80.27	890	982.13	39.92
1045	0.25	920	982.15	26.93
1046	0	840	981.46	61.3
1047	0	840	981.44	61.28
1048	0	580	978.41	172.63
1049	60.04	890	982.15	39.93
105	0	570	863.46	127.15
1050	26.07	800	961.62	70.03
1051	0	510	978.41	202.96
1052	3.68	570	952.65	165.8
1053	0.32	580	952.65	161.47
1054	155.33	740	978.41	103.3
1055	2.01	580	952.65	161.47
1056	0	620	861.1	104.47

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1057	0	630	953.55	140.19
1058	0	510	950.88	191.03
1059	0	560	952.65	170.14
106	0	610	778.47	73
1060	0	910	981.61	31.03
1061	59.05	790	962.39	74.7
1062	63.72	910	981.61	31.03
1063	21.49	910	981.13	30.82
1064	0	910	982.5	31.41
1065	0	970	984.79	6.41
1066	0	970	985.26	6.61
1067	25.16	910	982.49	31.41
1068	0	970	984.79	6.41
1069	0	980	985.19	2.25
107	0	610	778.51	73.01
1070	0	970	984.79	6.41
1071	16.01	940	982.86	18.57
1072	0	980	985.04	2.18
1073	0	970	985.02	6.51
1074	36.22	970	984.71	6.37
1076	0	980	985.26	2.28
1077	0.78	460	945.78	210.49
1078	0	970	985.24	6.6
1079	0	970	985.19	6.58
108	0	570	773.52	88.19
1080	200.23	880	979.67	43.19
1081	2.98	530	942.69	178.82
1082	0	430	945.12	223.2
1083	63.1	830	962.17	57.27
1084	0.44	840	962.17	52.93
1085	3.13	480	942.75	200.51
1086	2.85	500	942.7	191.82
1087	0	500	942.69	191.82
1088	1.63	550	942.48	170.06
1089	1.35	500	942.63	191.79
109	0	570	773.52	88.19
1090	0	480	979.62	216.49
1091	4.74	790	962.12	74.58
1092	1.51	530	942.48	178.73
1093	2.74	540	942.48	174.39
1094	0	520	979.62	199.16
1095	0	510	942.3	187.32
1096	121.92	500	942.17	191.59
1097	12.14	640	981.58	148.01
1098	4.77	790	962.11	74.57
1099	0	770	981.61	91.69
11	16.35	520	936.49	180.47
110	2.39	590	773.52	79.52
1100	179.9	770	981.58	91.68
1101	1.86	450	941.89	213.14
1102	13.32	770	962.11	83.24
1103	59.37	830	981.16	65.5
1104	5.38	550	979.66	186.17
1105	39.81	840	981.16	61.16
1106	0	520	979.64	199.16
1107	0.08	500	979.62	207.82
1108	26.57	600	937.3	146.15
1109	227.56	810	979.84	73.59
111	9.7	610	778.5	73.01
1110	6.96	520	935.75	180.14
1111	5.78	540	935.75	171.48
1112	19.79	630	979.57	151.47
1113	4.79	410	938.89	229.17
1114	255.8	690	979.58	125.47
1115	2.71	420	938.61	224.71
1116	7.99	450	937.39	211.19
1117	11.69	450	937.42	211.2
1118	4.87	460	937.26	206.8
1119	3.52	420	938.24	224.55
112	0	590	773.52	79.52
1120	0.27	400	938.61	233.38
1121	3.38	440	937.45	215.55
1122	11.83	440	937.49	215.56
1123	30.02	430	937.51	219.9
1124	0	410	979.5	246.76
1125	1.23	490	937.2	193.77
1126	12.79	490	937.19	193.77
1127	0	400	979.5	251.1
1128	16.94	600	935.9	145.55
1129	29.98	720	979.34	112.37
113	14.74	560	773.52	92.52
1130	0.18	500	937.2	189.44
1131	0	400	979.5	251.1
1132	3.94	520	935.83	180.18
1133	5.68	500	936.42	189.1
1134	4.16	490	937.99	194.11
1135	16.46	430	938.24	220.22
1136	12.41	490	937.45	193.88
1137	6.93	520	936.43	180.44
1138	2.1	490	937.99	194.11
1139	0	590	935.83	149.85
114	0	440	855.19	179.9
1140	38.1	600	935.61	145.42
1141	17.53	560	937.18	163.43
1142	12.23	460	937.28	206.81
1143	77.45	910	979.55	30.14
1144	7.08	480	937.28	198.14
1145	8.22	480	937.28	198.14
1146	18.4	400	979.45	251.08
1147	2.32	400	979.45	251.08
1148	4	490	937.66	193.97
1149	11.29	560	936.87	163.3
115	40.14	370	794.9	184.11
1150	2.97	520	936.87	180.63
1151	3.29	520	937.3	180.82
1152	1.39	520	938.21	181.21
1153	24.19	590	937.15	150.42
1154	2.73	550	938.52	168.35
1155	1.67	500	937.41	189.53
1156	2.9	490	937.24	193.79
1157	11.5	570	939.37	160.05
1158	90.93	840	979.55	60.47
1159	4.08	520	938.19	181.2
116	10.32	690	863.27	75.08
1160	5.2	620	943.23	140.06
1161	20.87	640	943.23	131.39
1162	28.57	910	979.58	30.15
1163	0	920	979.59	25.82
1164	0	640	863.32	96.77
1165	0	970	984.4	6.24
1166	0	970	984.38	6.23
1167	2.18	620	945.14	140.88
1168	0	970	984.33	6.21
1169	22.5	560	938.14	163.85
117	0.71	280	824.4	235.89
1170	36.81	940	980.07	17.36
1171	32.47	630	945.69	136.79
1172	0	930	980.07	21.7
1173	0	920	980.08	26.03
1174	0	920	980.02	26.01
1175	37.7	920	979.86	25.94
1176	0	920	979.59	25.82

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1177	0	910	980.38	30.5
1178	0	910	979.59	30.15
1179	0	910	979.59	30.15
118	16.01	510	856.51	150.14
1180	0	910	979.59	30.15
1181	0	910	979.59	30.15
1182	0	890	978.6	38.39
1183	0	890	980.59	39.25
1184	0	890	980.61	39.26
1185	51.11	890	979.59	38.82
1186	41.33	680	945.66	115.11
1187	0	480	943.22	200.71
1188	161.83	820	974.83	67.09
1189	0	590	946.77	154.59
119	22.2	240	797.97	241.77
1190	10.01	660	949.45	125.42
1191	17.06	770	954.83	80.09
1192	238.08	880	966.89	37.65
1193	1.68	750	954.83	88.75
1194	7	750	954.83	88.75
1195	41.96	760	961.17	87.17
1197	47.84	760	961.34	87.24
1198	17.72	730	957.68	98.65
1199	4.53	730	957.53	98.59
12	10.62	460	939.46	207.75
120	12.39	350	853.6	218.21
1200	4.61	720	954.86	101.77
1201	0	780	952.07	74.56
1202	0	780	952.19	74.61
1203	1.92	800	951.45	65.62
1204	11.48	800	951.36	65.58
1205	122.38	600	976.45	163.11
1206	23.42	750	949.24	86.33
1207	3.41	730	948.61	94.72
1208	51.28	740	947.95	90.11
1209	8.36	710	947.91	103.09
121	30.16	520	775	110.49
1210	37	300	972.71	291.48
1211	7.75	650	957.68	133.32
1212	33.11	710	946.75	102.58
1213	13.22	700	946.15	106.66
1214	0	730	972.37	105.02
1215	50.92	280	974.71	301.02
1216	0	690	945.87	110.87
1217	0	690	864.81	75.74
1218	0	690	864.73	75.71
1219	0	680	864.72	80.04
122	30.06	520	775.01	110.5
1220	29.29	730	947.78	94.36
1221	76	660	960.55	130.23
1222	3.03	270	973.65	304.89
1223	13.46	560	960.54	173.55
1224	51.34	620	863.82	105.65
1225	29.46	630	862.94	100.93
1226	18.44	520	960.53	190.88
1227	33.65	580	862.73	122.51
1228	0	570	862.72	126.84
1229	4.27	280	968.48	298.32
123	0.08	300	852.44	239.37
1230	28.2	550	862.67	135.48
1231	44.81	520	862.55	148.43
1232	57.37	500	835.75	145.48
1233	18.91	510	862.55	152.76
1234	7.75	350	968.94	268.19
1235	0	640	922.17	122.26
1236	9.53	260	862.55	261.08

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1237	16.87	450	862.55	178.76
1238	67.94	730	972.24	104.96
1239	5.96	440	862.39	183.02
124	21.34	240	797.95	241.76
1240	15.62	450	862.48	178.73
1242	2.7	450	862.55	178.76
1244	22.29	510	919.88	177.6
1245	0.81	230	862.55	274.08
1246	25.78	460	862.38	174.35
1247	59.49	720	919.95	86.64
1248	9.26	460	862.45	174.38
1249	0	760	922.48	70.4
125	0	420	773.54	153.19
1250	14.15	470	862.45	170.05
1251	3.09	230	862.55	274.08
1252	221.37	580	913.94	144.7
1253	0	660	965.73	132.47
1254	0	230	862.55	274.08
1256	4.23	240	862.55	269.75
1257	0	230	862.55	274.08
1258	0	230	862.55	274.08
1259	2.73	700	965.51	115.04
126	15.17	460	773.57	135.87
1260	30.18	260	571.77	135.09
1261	9.16	240	571.99	143.85
1262	0	760	964.95	88.81
1263	0	280	955.54	292.71
1264	5.28	290	954.86	288.08
1265	0	290	954.83	288.07
1266	0	290	954.83	288.07
1267	0	290	954.83	288.07
1268	0	290	954.83	288.07
1269	0	290	571.74	122.08
127	0.08	300	794.22	214.15
1270	0	290	571.74	122.08
1271	0	290	571.74	122.08
1272	4.81	290	571.74	122.08
1273	3.8	820	959.42	60.41
1274	6.78	240	572.31	143.99
1275	0	240	572.4	144.03
1276	0	290	952.45	287.04
1277	121.57	660	959.01	129.56
1278	6.1	790	1,244.58	196.97
1279	12.34	310	571.74	113.41
128	289.58	470	772.67	131.15
1280	0	280	951.57	290.99
1281	62.07	830	963.95	58.04
1282	12.72	240	572.51	144.08
1283	5.1	240	572.78	144.19
1284	38.23	340	841.25	217.19
1285	44.56	330	571.74	104.74
1286	5.72	240	941.36	303.9
1287	6.72	690	960.17	117.06
1288	0	240	572.78	144.19
1289	0	800	963.57	70.88
129	9.55	520	842.02	139.53
1290	8.98	800	962.21	70.29
1291	27.6	320	950.97	273.4
1292	0	240	946.68	306.21
1293	10.07	250	572.96	139.94
1294	0	250	573.08	139.99
1295	22.36	310	571.96	113.51
1296	48.39	560	841.42	121.94
1297	0	290	572.54	122.42
1298	8.49	280	572.47	126.73
1299	4.5	250	944.67	301

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
13	8.07	490	940.1	195.03
130	0	380	773.54	170.52
1300	14.18	230	851.73	269.4
1301	0.87	250	941.75	299.74
1302	0	240	941.36	303.9
1303	0	240	941.43	303.93
1304	3.07	250	852.7	261.15
1305	0	250	940.54	299.21
1306	128.03	590	949.94	155.96
1307	7.18	290	939.24	281.32
1308	6.74	280	939.58	285.79
1309	7.06	290	939.21	281.3
1310	11.73	760	963.3	88.09
1311	24.29	740	961.68	96.05
1312	32.8	720	959.12	103.61
1313	6.48	320	572.47	109.39
1314	3.25	320	944.66	270.66
1315	291.82	590	955.15	158.22
1316	0	630	955.15	140.89
1317	4.37	330	944.66	266.33
1318	20.53	800	963.29	70.75
1319	12.46	840	963.27	53.41
132	64.82	160	834.64	292.32
1320	4.89	400	939.24	233.65
1321	83.5	400	935.99	232.24
1322	0	800	963.28	70.75
1323	47.15	750	961.73	91.74
1324	7.51	630	959.94	142.96
1325	0	600	959.76	155.88
1326	10.69	410	936.76	228.25
1327	10.94	770	963.31	83.76
1328	110.75	760	956.2	85.01
1329	14.25	680	957.9	120.41
133	4.09	310	794.22	209.81
1330	2.14	480	936	197.59
1331	0	490	936	193.25
1332	4.2	490	743.87	110
1333	134.25	520	933.14	179.01
1334	0	760	1,245.10	210.19
1336	50.85	760	958.5	86.01
1337	62.95	720	957.9	103.08
1338	83.01	730	957.87	98.74
1339	19.62	410	825.2	179.91
1340	6.11	600	928.82	142.48
1341	0	770	963.55	83.86
1342	5.48	550	928.82	164.14
1343	0	540	928.44	168.31
1344	88.04	770	961.62	83.03
1345	16.15	510	825.34	136.64
1346	46.37	790	961.46	74.29
1347	36.08	840	964.03	53.74
1348	6.83	560	825.39	114.99
1349	25.56	520	825.47	132.36
135	0	160	837.31	293.48
1350	0	530	825.37	127.98
1351	34.97	530	825.37	127.98
1352	0	560	825.4	115
1353	71.43	840	964.23	53.83
1354	0	170	846.76	293.24
1355	8.44	510	825.37	136.65
1356	3.59	550	963.57	179.2
1357	8.82	580	963.58	166.2
1358	3.58	710	961.87	109.14
1359	21.65	470	961.96	213.17
136	0	160	849.4	298.72
1360	53.54	770	963.37	83.79
1361	0	870	966.04	41.61
1362	0	870	966.04	41.61
1363	0	870	966.04	41.61
1364	0	870	966.03	41.61
1365	0	870	966.04	41.61
1366	0	870	965.97	41.58
1367	196.4	880	966.04	37.28
1368	0	880	965.97	37.25
1369	7.39	420	961.87	234.79
137	0	150	849.36	303.03
1370	78.77	870	966.06	41.62
1371	17.38	720	964.46	105.92
1372	6.66	590	963.58	161.87
1373	2.1	690	964.98	119.15
1374	15.21	700	964.9	114.78
1375	25.93	770	965.47	84.7
1376	0	610	963.84	153.32
1377	0	600	963.71	157.59
1378	0	600	963.58	157.54
1379	8.06	640	962.99	139.95
138	6.41	160	834.86	292.41
1380	18.77	750	965.49	93.37
1381	0	600	963.71	157.59
1382	1.69	580	962.86	165.89
1384	7.72	520	962.55	191.76
1385	0	580	962.86	165.89
1386	4.04	680	964.31	123.19
1387	31.71	500	962.28	200.31
1388	9.24	440	961.98	226.17
1389	0	370	961.87	256.46
139	78.92	440	794.23	153.49
1390	49.69	630	963.69	144.59
1391	1.01	580	962.99	165.95
1392	5.12	630	964.98	145.14
1393	0	650	963.77	135.96
1394	0	610	963.06	152.98
1395	15.02	610	964.05	153.41
1396	0	610	964.98	153.81
1397	5.21	720	964.07	105.75
1398	7.88	680	966.36	124.08
1399	5.19	680	966.36	124.08
14	0	410	938.18	228.86
140	13.69	330	773.54	192.18
1400	0	560	936.44	163.11
1401	26.09	610	964.02	153.4
1402	0	730	975.66	106.44
1403	0	720	975.66	110.78
1404	0	720	975.71	110.8
1405	0	720	976.19	111.01
1406	4.52	760	975.27	93.28
1407	0	760	978.51	94.68
1408	103.51	710	966.72	111.24
1409	15.68	710	968.2	111.88
141	47.23	300	796.73	215.23
1410	31.5	680	968.22	124.88
1411	0	300	963.06	287.31
1412	0	250	523.87	118.67
1413	38.42	820	974.49	66.94
1414	12.46	870	974.48	45.27
1416	0	210	523.87	136
1417	2.8	790	973.94	79.7
1418	57.44	730	973.94	105.7
1419	4.81	640	972.79	144.2
142	0	150	849.11	302.93
1420	5.17	970	991.85	9.47
1421	0	960	991.87	13.81

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1422	0	300	796.72	215.23
1423	0	200	523.87	140.33
1424	0	200	523.87	140.33
1425	0	740	972.79	100.87
1426	7.78	960	973.81	5.98
1427	0	400	493.72	40.61
1428	0	340	493.72	66.61
1429	0	300	493.72	83.94
143	0	150	849.07	302.91
1430	0	250	493.72	105.6
1431	0	300	493.72	83.94
1432	0	212	817.77	262.48
1433	0	250	493.72	105.6
1434	0.08	230	852.33	269.66
1435	0	340	493.72	66.61
1436	0	270	493.72	96.94
1437	0	300	493.72	83.94
1438	0	310	493.72	79.61
1439	0	250	493.72	105.6
144	0	160	838.53	294.01
1440	6.82	540	852.69	135.49
1441	0	250	493.72	105.6
1442	25.33	320	852.33	230.66
1443	58.53	590	852.19	113.61
1444	12.42	280	492.81	92.21
1445	10.83	320	852.37	230.67
1446	1.99	620	852.69	100.83
1447	0	620	852.69	100.83
1448	1.65	390	852.37	200.35
1449	5.98	430	852.43	183.04
145	14.63	410	855.07	192.85
1450	6.52	330	852.37	226.34
1451	0	240	493.68	109.92
1452	26.12	272	492.81	95.68
1453	1.48	240	829.58	255.46
1454	15.03	274	492.81	94.81
1455	172.09	670	852.72	79.17
1456	0	240	493.61	109.89
1457	9.72	262	492.8	100
1458	0	240	493.73	109.94
1459	0	230	493.72	114.27
146	13.74	340	855.04	223.17
1460	0	230	493.72	114.27
1461	0	240	493.73	109.94
1462	0	240	493.73	109.94
1463	0	240	493.83	109.99
1464	5.97	262	492.8	100
1465	0	240	493.73	109.94
1466	3.2	262	492.79	100
1467	0	240	869.14	272.61
1468	0	240	869.25	272.66
1469	0	240	869.25	272.66
147	0	300	796.49	215.13
1470	0	240	869.25	272.66
1471	0	240	869.25	272.66
1472	0	240	493.72	109.94
1473	0.28	250	922.35	291.33
1474	98.48	700	853.22	66.39
1475	2.5	260	832.94	248.26
1476	132.33	560	852.52	126.75
1477	2.03	280	922.35	278.33
1478	0	240	869.32	272.68
1479	0	240	551.03	134.77
148	65.87	360	795.67	188.77
1480	28.75	280	492.79	92.2
1481	0	240	551.03	134.77
1482	11.49	270	492.79	96.54
1483	0	240	869.35	272.7
1484	5.4	240	493.23	109.72
1485	7.25	250	493.05	105.31
1486	28.48	720	853.88	58.01
1487	0	240	493.28	109.75
1488	5.58	250	493.05	105.31
1489	0	240	493.27	109.74
149	13.1	390	794.22	175.15
1490	5.79	240	493.06	109.65
1491	28.17	740	893.24	66.4
1492	0	190	845.9	284.2
1493	6.9	540	922.35	165.67
1494	11.7	270	838.5	246.33
1495	5.94	250	493.05	105.31
1496	6.31	250	493.06	105.32
1497	8.08	270	492.79	96.54
1498	12.02	270	492.8	96.54
1499	19.61	280	492.81	92.21
15	0	360	937.14	250.08
150	10.3	360	855.04	214.5
1500	3.71	510	794.33	123.2
1502	6.17	280	838.14	241.84
1503	9.24	270	838.53	246.35
1504	10.43	250	493.06	105.32
1505	10.08	250	493.07	105.32
1506	3.13	250	492.87	105.23
1507	0	260	551.03	126.1
1508	4.37	280	838.32	241.92
1509	1.88	280	838.25	241.89
151	9.39	410	842.03	187.2
1510	0	260	551.03	126.1
1511	2.84	270	551.03	121.77
1512	0	260	551.03	126.1
1513	11.2	260	492.79	100.87
1514	7.71	250	492.87	105.24
1515	0.27	270	551.03	121.77
1516	3.32	250	492.87	105.23
1517	15.98	290	492.77	87.86
1518	6.84	280	838.32	241.92
1519	7.3	260	492.87	100.9
152	18.81	450	855.06	175.51
1520	6.08	250	492.87	105.24
1521	12.57	290	838.03	237.46
1522	52.76	810	918.64	47.07
1523	7.69	260	492.83	100.89
1524	10.27	250	492.9	105.25
1525	15.55	280	492.81	92.21
1526	11.3	270	492.81	96.55
1527	24.28	320	839.02	224.89
1528	1.86	280	838.77	242.12
1529	6.84	280	838.69	242.08
153	11.56	390	855.04	201.5
1530	19.11	280	838.65	242.06
1531	10.01	280	492.78	92.2
1532	6.36	280	838.93	242.18
1533	3.68	280	492.78	92.2
1534	12.13	290	838.59	237.71
1535	10.12	250	492.85	105.23
1536	11	350	839.05	211.91
1537	0	310	839.06	229.24
1538	0.97	280	839.16	242.28
1539	0.16	280	839.19	242.3
154	12.66	440	794.22	153.48
1540	13.38	260	492.77	100.86
1541	0	280	839.23	242.31

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1542	8.44	280	492.77	92.19
1543	0	280	839.31	242.35
1544	0	320	869.61	238.14
1546	7.11	310	838.61	229.05
1547	64.28	630	921.41	126.27
1548	11.14	280	492.77	92.19
1549	12.71	260	492.77	100.86
155	3.4	280	819.6	233.81
1550	13.02	700	922.36	96.35
1551	5.92	280	838.61	242.04
1552	0.44	280	839.8	242.56
1553	1.44	400	838.68	190.08
1554	7.49	400	838.68	190.08
1555	8.92	750	922.39	74.7
1556	7.29	270	492.78	96.53
1557	0	260	492.79	100.87
1558	1.92	260	492.79	100.87
1559	6.04	280	840.17	242.72
156	37.87	440	794.22	153.48
1560	27.1	540	794.48	110.27
1561	6.76	760	922.39	70.37
1562	0	520	794.4	118.9
1563	13.3	320	840.15	225.38
1564	10.88	760	922.41	70.37
1565	9.05	270	492.78	96.53
1566	2.45	310	551.03	104.44
1567	42.16	750	922.4	74.7
1568	1.71	290	840.76	238.64
157	1.6	440	794.22	153.48
1570	39.02	530	923.09	170.32
1571	1.19	320	551.03	100.11
1572	17.76	330	550.95	95.74
1573	6.66	290	840.84	238.68
1574	43.25	750	922.37	74.69
1575	9.53	320	840.83	225.68
1576	7.58	320	551.03	100.11
1577	3.02	780	922.49	61.74
1578	18.36	340	550.92	91.39
1579	18.25	780	922.5	61.75
158	0	170	424.22	110.16
1580	5.92	340	846.84	219.61
1581	9.43	340	551.03	91.44
1582	16.5	360	846.84	210.95
1583	2.88	340	551.03	91.44
1584	1.49	330	551.04	95.78
1585	0	330	551.04	95.78
1586	7.41	350	551.02	87.1
1587	0	320	551.04	100.11
1588	9.49	310	551.04	104.44
1589	0.85	340	551.05	91.45
159	0	440	794.21	153.48
1590	1.31	340	551.05	91.45
1591	7.9	390	842.9	196.24
1592	5.03	380	551.07	74.12
1593	1.05	310	842.92	230.92
1594	0	380	551.07	74.12
1595	10.93	420	842.9	183.24
1596	4.73	320	623.82	131.64
1597	10.77	810	923.5	49.18
1598	6.96	330	623.82	127.31
1599	1.09	320	843.52	226.84
16	1.19	310	838.56	229.02
160	5.04	430	842.03	178.53
1600	11.67	890	923.44	14.49
1601	9.35	810	923.73	49.28
1602	0	320	869.98	238.31
1603	0	330	844.15	222.78
1604	4.62	320	844.25	227.16
1605	8.41	350	623.82	118.65
1606	0	340	844.39	218.55
1607	6.61	420	844.24	183.82
1608	1.8	320	846.3	228.05
1609	19.25	600	862.67	113.82
161	41.24	360	795.9	188.88
1610	6.12	360	846.3	210.71
1611	0.75	370	623.87	110
1612	23.02	560	849.59	125.48
1613	14.5	430	926.23	215.02
1614	7.26	480	849.59	160.14
1615	4.19	440	926.3	210.71
1616	1.14	390	845.96	197.57
1618	0	390	845.2	197.24
1619	1.07	470	851.04	165.1
162	10.28	390	796.88	176.3
1620	0	400	845.2	192.9
1621	3.56	400	623.82	96.98
1622	4.53	320	849.21	229.31
1623	10.05	320	623.77	131.62
1624	0.08	530	794.45	114.59
1625	7.87	420	845.88	184.53
1626	24.5	750	923.49	75.17
1627	6.24	400	623.81	96.98
1628	12.37	560	851.06	126.12
1629	22.04	560	851.07	126.12
1630	4.28	430	623.81	83.98
1631	13.11	480	862.69	165.82
1632	10.03	490	851.04	156.44
1633	4.41	390	623.8	101.31
1634	10.09	460	851.03	169.44
1635	3.96	410	623.8	92.64
1636	1.01	390	551.14	69.82
1637	16.52	690	923.46	101.16
1638	1.01	390	551.14	69.82
1639	0	390	551.14	69.82
1640	0	400	870.82	204
1641	9.61	560	869.34	134.04
1642	3.89	500	830.98	143.42
1643	11.81	380	623.79	105.64
1644	0	380	623.79	105.64
1645	0	390	881.5	212.97
1646	26.26	520	846.37	141.42
1647	16.39	560	871.06	134.78
1648	0	560	871.38	134.92
1649	3.38	390	623.79	101.3
1650	19.35	610	854.98	106.15
1651	11.53	340	613.7	118.59
1652	30.89	580	845.73	115.14
1653	41.05	680	866.81	80.94
1654	8.98	670	866.91	85.32
1655	0	320	870.24	238.42
1656	1.77	320	870.24	238.42
1658	0	320	870.24	238.42
1659	0	670	866.89	85.31
1660	8.98	360	613.71	109.93
1662	0	680	866.86	80.97
1663	0.85	320	870.86	238.69
1664	0	320	870.82	238.67
1666	7.85	480	870.94	169.4
1667	0	480	870.94	169.4
1668	11.05	680	866.85	80.96
1669	1.75	360	613.73	109.94
1670	0	360	867.95	220.09

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1671	2.85	360	867.95	220.1
1672	8.24	360	613.7	109.93
1673	0	360	613.73	109.94
1674	1.1	360	613.73	109.94
1675	1.47	320	870.86	238.69
1676	0	320	870.86	238.69
1677	9.47	360	613.7	109.93
1678	0	330	870.85	234.35
1680	17.89	360	857.98	215.77
1681	0	330	870.85	234.35
1682	13.8	360	870.61	221.25
1684	13.04	320	870.86	238.69
1685	0	350	870.87	225.69
1686	6.31	380	613.69	101.26
1687	10.82	440	870.94	186.73
1688	0.43	340	870.86	230.02
1689	1.89	340	870.86	230.02
169	1.83	170	424.22	110.16
1690	0.77	320	870.86	238.69
1691	13.61	370	613.7	105.59
1692	59.12	690	866.79	76.6
1693	2.86	320	870.86	238.69
1694	3.93	400	870.91	204.04
1695	0	390	871.07	208.45
1696	5.4	400	870.94	204.06
1697	0	390	562.93	74.93
1698	0.21	360	870.97	221.4
1699	7.99	400	613.7	92.6
17	0	250	838.56	255.02
170	15.5	310	817.02	219.69
1700	0.91	350	562.78	92.2
1701	4.07	370	562.87	83.57
1702	0	400	562.87	70.57
1703	16.17	470	881.49	178.3
1704	38.27	640	929.8	125.57
1705	12.1	360	562.78	87.86
1706	60.91	660	874.95	93.14
1707	0	490	881.5	169.64
1708	25.88	490	881.5	169.64
171	9.1	170	424.22	110.16
1710	0	410	930.37	225.47
1711	0	410	930.5	225.53
1712	2.9	320	562.74	105.18
1713	0	400	930.5	229.86
1714	5.07	330	562.74	100.85
1715	0	400	562.81	70.54
1716	23.24	400	562.81	70.54
1717	11.25	320	562.74	105.18
1718	2.87	350	562.74	92.18
1719	2.06	370	562.79	83.54
172	8.73	450	842.01	169.86
1720	8.34	320	562.73	105.18
1721	1.96	360	562.78	87.86
1722	9.82	360	562.75	87.85
1723	0.45	370	562.79	83.54
1724	0	370	562.79	83.54
1725	1.12	370	562.79	83.54
1726	1.01	390	861.33	204.23
1727	8.87	450	869.01	181.56
1728	8.68	390	870.62	208.25
1729	7.54	620	930.55	134.56
173	9.22	400	796.9	171.98
1730	5.71	580	881.51	130.64
1731	22.35	490	929.81	190.57
1732	105.96	760	931.53	74.32
1733	1.3	360	860.64	216.93

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1734	12.95	360	932.06	247.87
1735	4.09	390	860.63	203.93
1736	16.81	400	860.63	199.59
1738	2.21	360	861.58	217.33
1739	1.58	490	869.21	164.31
174	0	170	845.57	292.72
1740	58.41	590	929.44	147.08
1741	23.51	400	861.37	199.91
1742	11.94	520	830.9	134.71
1743	0	700	931.51	100.31
1744	19.32	720	931.87	91.8
1745	0	700	881.51	78.65
1746	25.95	700	881.48	78.63
1747	57.7	600	872.69	118.16
1748	21.76	440	870.63	186.59
1749	4.81	520	869.65	151.5
1750	0	400	864.55	201.29
1751	11.27	480	867.76	168.02
1752	0	400	864.57	201.3
1753	10.2	780	932.72	66.17
1754	2.12	780	878.58	42.71
1755	0.08	780	932.77	66.2
1756	1.92	780	932.86	66.24
1757	33.72	550	935.21	166.91
1758	13	760	933.65	75.24
176	1.18	400	791.05	169.44
1760	115.85	580	935.23	153.92
1761	0.13	400	864.98	201.47
1762	0.59	400	865.13	201.54
1763	0	800	882.47	35.73
1764	8.76	420	864.31	192.52
1766	0	900	934.74	15.05
1767	0	900	934.74	15.05
1768	0	900	934.74	15.05
1769	0	920	934.77	6.4
177	5.14	420	842.04	182.87
178	32.71	420	842.04	182.87
1784	0	890	896.01	2.6
1785	0	900	895.38	-2
1786	0	890	895.61	2.43
1788	0	900	934.79	15.08
1789	0	910	934.79	10.74
179	53.78	170	846.9	293.3
1790	0	900	934.79	15.08
1791	0	900	882.49	-7.59
1792	0	850	883.79	14.64
1793	0	900	882.49	-7.59
1794	0	840	882.76	18.53
1795	0	900	934.8	15.08
1796	0	900	882.49	-7.59
1797	0	840	882.52	18.42
1798	1.5	520	830.85	134.69
1799	8.61	640	933.64	127.23
18	0	440	855.61	180.08
180	59.51	400	790.96	169.4
1800	16.27	640	933.64	127.23
1801	0	880	882.49	1.08
1802	0	860	934.85	32.43
1803	14.95	540	863.45	140.15
1804	0	850	934.85	36.76
1805	0	880	882.49	1.08
1806	0	840	934.91	41.12
1807	2.12	830	882.46	22.73
1808	29.58	860	934.98	32.49
181	0.71	370	795.49	184.37
1810	77.98	660	863.33	88.1

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ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1811	12.68	480	864.3	166.52
1812	6.21	530	830.89	130.38
1813	2.39	350	1,188.33	363.25
1814	0	350	1,188.33	363.25
1815	24.39	390	1,188.30	345.9
1816	32.49	780	935.59	67.42
1817	1.17	400	864.51	201.27
1818	80.26	730	933.01	87.96
1819	4.53	400	866.69	202.22
182	0	360	795.55	188.72
1820	3.64	400	864.51	201.27
1821	8.63	410	864.51	196.94
1822	0	810	935.82	54.52
1824	12.19	540	830.89	126.04
1825	80.5	690	955.04	114.84
1826	13.36	810	935.8	54.51
1827	56.09	720	933.47	92.5
1828	4.96	410	1,188.35	337.26
1829	31.02	560	872.32	135.33
1830	2.81	360	1,188.35	358.93
1834	15.35	520	868.99	151.22
1835	0	840	882.46	18.4
1839	32.37	690	937.78	107.36
184	13.63	360	795.53	188.72
1840	7.6	830	935.8	45.84
1842	3.13	840	935.87	41.54
1843	8.93	840	935.95	41.57
1846	1.35	870	936.4	28.77
185	82.19	440	790.27	151.77
1850	0.81	380	1,188.38	350.27
1851	47.93	610	959.95	151.64
1852	16.1	640	871.2	100.18
1853	25.56	610	959.95	151.63
1854	2.52	670	940.39	117.16
1855	40.93	840	937.55	42.27
1856	11.31	600	960.33	156.13
1857	0	610	960.37	151.82
1858	15.23	590	941.03	152.1
1859	3.9	670	940.78	117.33
186	26.63	180	424.23	105.82
1860	59.99	340	943.17	261.35
1861	0	340	943.23	261.38
1862	0	330	943.23	265.71
1863	17.8	860	937.51	33.59
1864	23.68	550	830.82	121.68
1865	0	340	943.18	261.36
1866	6.24	880	937.06	24.72
1867	51.43	540	864.47	140.59
1868	0	330	943.18	265.69
187	23.38	300	842.12	234.9
1870	0	660	941.05	121.78
1871	13.8	720	956.49	102.47
1872	26.11	720	957.09	102.73
1873	9.96	660	941.68	122.05
1874	0	350	943.33	257.09
1875	15.73	680	960.35	121.48
1876	14.98	380	522.76	61.86
1877	0	330	943.33	265.76
1878	22.05	330	943.33	265.75
1879	71.18	700	956.19	111.01
1880	1.39	880	939.11	25.61
1881	4.76	880	939.11	25.61
1882	0	880	939.06	25.59
1883	12.39	880	939.11	25.61
1884	0	350	522.77	74.86
1885	4.08	800	940.01	60.67

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1886	0	350	943.63	257.22
1888	0	350	943.63	257.22
1889	41.13	840	937.38	42.19
189	18.31	440	795.66	154.11
1890	2.2	430	1,188.44	328.63
1891	2.5	430	1,188.44	328.63
1892	36.02	550	1,188.38	276.61
1893	32.5	680	961.74	122.08
1894	0.32	350	944.48	257.59
1895	11.37	760	963.16	88.03
1896	3.22	420	944.06	227.07
1897	5.03	730	939.32	90.7
1898	14.19	720	939.31	95.03
1899	33.08	770	963.25	83.74
19	0	170	838.56	289.69
190	48.81	400	842.07	191.55
1900	0	350	944.38	257.55
1901	2.98	400	944.39	235.88
1902	0	350	944.39	257.55
1903	0	350	944.38	257.55
1904	0	360	944.39	253.22
1905	0	350	626.74	119.91
1906	0.88	430	944.06	222.74
1907	14.94	760	963.15	88.03
1908	38.82	850	937.33	37.84
1909	68.47	440	943.85	218.32
191	0	410	797.04	167.7
1910	25.9	360	944.62	253.31
1911	0.57	370	944.6	248.97
1912	112.61	780	963.27	79.41
1913	0	370	944.62	248.98
1914	7.51	870	939.11	29.94
1915	6.6	360	626.74	115.58
1916	0	360	944.84	253.41
1917	0	360	944.85	253.41
1918	8.93	890	970.77	35
1919	36.98	790	965.04	75.85
192	0	400	797.63	172.29
1920	2.07	470	1,188.64	311.39
1921	1.1	380	626.74	106.91
1922	42.93	690	864.47	75.6
1923	0	390	626.74	102.58
1924	70.76	480	1,188.63	307.05
1925	22.2	380	945.54	245.05
1926	18.99	770	968.42	85.97
1927	0	390	946.04	240.93
1928	14.69	760	970.78	91.33
1929	4.65	400	626.74	98.24
1930	59.07	690	939.2	107.98
1931	15.78	690	1,245.07	240.51
1932	0	760	971.44	91.62
1933	0	760	971.13	91.48
1934	0	760	971.44	91.62
1935	10.11	440	974.99	231.81
1936	1.95	750	971.49	95.97
1937	3.28	400	946.03	236.6
1938	3.07	400	946.03	236.6
194	0	400	797.64	172.3
1940	1.35	400	946.04	236.6
1941	5.08	530	1,188.63	285.38
1942	0	400	626.74	98.24
1944	0	400	626.74	98.24
1946	0.39	690	972.29	122.32
1948	0	400	626.74	98.24
195	3.05	430	797.87	159.4
1950	12.82	850	1,238.96	168.54

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
1951	0.81	700	972.31	117.99
1952	0	400	946.04	236.6
1953	0.41	400	976.19	249.66
1954	0	400	626.74	98.24
1955	24.9	880	1,238.98	155.54
1956	30.72	880	1,239.03	155.57
1957	0	710	972.34	113.67
1958	0	410	951.84	234.78
1959	0	410	950.08	234.02
196	41.4	240	842.25	260.95
1960	0	710	972.34	113.67
1961	0	410	951.84	234.78
1962	1.41	710	1,245.40	231.99
1963	5.91	840	971.52	56.99
1964	14.24	500	798.23	129.22
1965	0	710	1,245.25	231.92
1966	0	840	971.57	57.01
1967	0	840	971.57	57.01
1968	22.84	780	971.48	82.97
1969	0.74	840	971.57	57.01
197	7.3	180	424.24	105.83
1970	0	410	978.96	246.53
1971	0	840	971.75	57.09
1972	8.04	530	830.85	130.36
1973	0	1,180.00	1,188.86	3.84
1974	0	1,180.00	1,188.86	3.84
1975	0	1,170.00	1,188.86	8.17
1976	0	410	952.54	235.08
1977	0	730	972.37	105.02
1978	1.99	840	971.63	57.04
1979	7.68	410	639.24	99.33
198	2.34	180	424.24	105.83
1980	1.69	400	813.69	179.25
1981	0	420	974.99	240.48
1982	0	430	974.89	236.1
1983	0	400	979.32	251.02
1984	7.41	530	1,188.70	285.41
1985	0	420	974.89	240.44
1986	9.75	430	974.81	236.07
1987	15.48	730	972.3	104.99
1988	0	410	979.48	246.76
199	5.95	200	842.43	278.36
1990	5.29	540	972.85	187.55
1991	24.96	410	639.25	99.33
1992	10.27	840	971.56	57.01
1994	17.07	820	1,239.13	181.61
1995	0	400	956.19	241
1996	18.09	470	973.79	218.29
1997	0	490	973.33	209.43
1998	1.61	430	639.25	90.67
1999	0	490	973.39	209.45
2	0	470	936.43	202.11
20	0	160	838.56	294.02
200	0	200	842.45	278.37
2000	1.26	380	813.41	187.8
20001	3.09	440	795.48	154.03
20002	11.13	440	795.48	154.03
20003	0.2	460	795.68	145.45
20004	5.34	510	794.24	123.16
20005	6.41	510	793.37	122.79
20006	7.31	520	794.13	118.78
20007	7.52	520	794.19	118.81
20008	14.95	520	793.38	118.46
20009	9.62	560	792.29	100.65
2001	209.51	490	972.1	208.9
20011	6.07	610	792.12	78.91

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
20013	7.68	640	792.29	65.99
2002	18.57	720	1,245.40	227.66
2003	20.64	690	972.36	122.35
2004	26.01	380	981.42	260.59
2005	0	700	972.54	118.09
2006	5.56	790	1,245.41	197.33
2008	37.43	340	813.11	205
2009	155.01	800	1,245.41	193
201	0	200	842.46	278.38
2010	0	840	1,188.61	151.05
2012	5.26	280	812.41	230.69
2013	0	660	972.48	135.4
2014	0	860	1,188.61	142.39
2015	0	650	972.47	139.73
2016	34.56	610	1,188.34	250.59
2017	0	640	972.43	144.04
2018	0	640	972.44	144.05
2019	0	640	972.43	144.04
202	0	200	424.33	97.2
2020	0	590	972.46	165.72
2022	0	580	972.46	170.05
2023	0	540	972.83	187.55
2024	0	510	973.24	200.72
2025	2.18	510	973.24	200.72
2026	2.54	540	973.05	187.64
2028	8.29	540	972.83	187.55
2029	105.94	790	1,244.61	196.98
203	0	200	842.45	278.37
2030	8.22	320	812.72	213.5
2031	0.26	390	983.2	257.03
2032	10.23	720	1,245.45	227.68
2033	0.12	790	1,244.74	197.04
2034	1.28	760	1,245.07	210.18
2035	4.28	720	1,245.45	227.68
2036	6.46	400	984.45	253.24
2037	51.46	770	966.68	85.22
2038	11.75	580	972.99	170.28
2039	4.11	660	1,246.29	254.04
204	6.78	200	424.32	97.2
2040	8.44	570	973.04	174.64
2041	3.92	750	1,245.50	214.7
2042	6.18	750	1,245.50	214.7
2043	28.99	700	972.91	118.25
2044	0	610	1,246.68	275.87
2045	18.32	760	1,245.48	210.36
2046	23.74	770	1,245.49	206.03
2047	5.93	1,020.00	1,188.60	73.05
2048	0	1,470.00	1,672.32	87.66
2049	37.84	820	1,244.43	183.91
205	2.64	180	424.29	105.85
2050	3.61	410	984.11	248.76
2051	0	1,130.00	1,188.60	25.39
2052	0	1,140.00	1,672.29	230.64
2053	0	1,130.00	1,188.60	25.39
2054	0	1,140.00	1,672.29	230.64
2055	0	1,140.00	1,188.60	21.06
2056	1.92	500	984.11	209.76
2057	0	1,130.00	1,188.60	25.39
2058	0	1,130.00	1,188.60	25.39
2059	0	1,140.00	1,672.29	230.64
2060	0	1,130.00	1,188.60	25.39
2061	0	1,130.00	1,188.60	25.39
2062	0	1,140.00	1,672.29	230.64
2063	8.32	1,380.00	1,672.32	126.66
2064	0	1,130.00	1,672.29	234.98
2065	0	1,130.00	1,188.60	25.39

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ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2066	0	1,130.00	1,188.60	25.39
2067	0	1,120.00	1,188.60	29.72
2068	19.38	770	1,245.47	206.02
2069	0	1,120.00	1,672.29	239.31
207	6.8	440	794.69	153.69
2070	0	1,120.00	1,672.24	239.29
2071	65.94	1,040.00	1,188.60	64.39
2072	4.12	480	984.46	218.58
2073	3.29	470	984.46	222.91
2074	5.12	770	1,239.99	203.65
2075	0	1,040.00	1,188.60	64.39
2076	1.26	410	984.46	248.91
2077	72	770	1,187.99	181.11
2078	0	600	1,247.15	280.41
2079	3.14	600	1,247.14	280.41
208	12.8	510	794.89	123.44
2080	0.66	650	1,247.14	258.74
2081	1.01	650	1,247.14	258.74
2082	32.97	840	1,245.61	175.75
2084	91.34	650	838.04	81.48
2085	12	770	1,240.89	204.04
2086	17.61	600	1,247.17	280.42
2087	0.81	1,170.00	1,672.32	217.65
2088	0	1,170.00	1,672.32	217.65
2089	104.98	1,100.00	1,671.79	247.76
209	54.41	190	424.13	101.45
2090	0	400	985.21	253.57
2091	2.12	400	985.1	253.52
2092	0	400	985.1	253.52
2093	0	400	985.21	253.57
2094	36.2	790	1,245.57	197.4
2095	0	400	985.21	253.57
2096	0	400	985.14	253.54
2097	29.8	770	1,245.55	206.06
2098	0	400	985.19	253.56
2099	0	940	991.29	22.22
21	0	240	838.56	259.36
2100	4.13	660	838.67	77.42
2101	21.26	700	1,246.69	236.88
2102	8.23	440	986.07	236.61
2103	10.47	620	988.09	159.49
2104	1.88	1,120.00	1,671.51	238.97
2105	42.8	1,190.00	1,672.33	208.99
2106	0	430	985.18	240.56
2107	1.82	480	985.18	218.9
2108	95.17	750	1,254.16	218.45
2109	0	680	1,248.01	246.12
211	0	480	794.68	136.35
2110	19.13	840	1,246.34	176.07
2111	82.9	930	1,672.01	321.51
2112	67.12	630	838.62	90.39
2113	4.39	840	1,246.55	176.16
2114	8.25	840	1,246.63	176.19
2115	25.46	1,600.00	1,936.59	145.84
2116	5.54	880	1,246.88	158.97
2117	2.27	880	1,246.94	158.99
2118	0.86	1,600.00	1,936.60	145.85
2119	23.02	1,620.00	1,936.60	137.18
212	0	470	794.67	140.68
2120	15.22	910	1,246.32	145.73
2121	26.02	1,240.00	1,672.41	187.36
2122	0.76	890	1,246.88	154.64
2123	36.26	800	1,255.82	197.51
2124	0.08	680	1,165.49	210.36
2125	4.52	660	985.18	140.9
2126	0	660	985.18	140.9

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2127	0	660	985.18	140.9
2128	22.2	660	960.02	130
2129	13.28	660	1,169.24	220.65
213	20.28	450	794.69	149.35
2130	107.55	700	1,164.74	201.37
2131	0	720	1,165.25	192.92
2132	19.19	880	1,161.52	121.98
2133	0	720	1,165.49	193.03
2134	23.79	1,430.00	1,936.65	219.53
2135	23.18	840	1,255.78	180.16
2136	0.08	820	1,255.90	188.88
2137	15.66	480	985.16	218.89
2138	1.2	810	1,251.77	191.42
2139	4.31	920	1,247.69	141.99
214	3.65	490	794.7	132.03
2140	3.65	920	1,247.69	141.99
2141	4.09	830	1,255.97	184.57
2142	32.42	600	838.62	103.39
2143	8.57	950	1,247.69	128.99
2144	0.29	640	1,165.92	227.88
2145	1.01	830	1,255.97	184.57
2146	21.54	1,260.00	1,669.54	177.45
2148	29.84	1,440.00	1,665.25	97.6
2149	49.36	1,400.00	1,672.55	118.09
215	28.79	480	795.29	136.62
2150	12.37	610	1,664.78	457.04
2152	0	720	1,169.24	194.66
2154	15.58	930	1,248.18	137.87
2155	5.12	970	1,248.18	120.54
2156	0.16	990	1,248.19	111.87
2157	7.88	800	1,256.96	198
2158	5.98	830	1,252.26	182.97
2159	1.44	860	1,252.26	169.97
2160	5.29	860	1,252.28	169.98
2161	8.03	640	1,664.77	444.03
2162	53.73	1,360.00	1,668.27	133.57
2163	7.27	1,360.00	1,668.13	133.51
2164	0	360	869.58	220.8
2165	49.61	1,420.00	1,665.30	106.29
2166	0	320	869.58	238.13
2167	2.52	1,470.00	1,662.04	83.21
2168	5.35	1,470.00	1,661.93	83.17
2169	18.91	730	1,664.74	405.02
217	0	470	794.7	140.69
2170	0	400	636.93	102.66
2171	0.33	870	1,256.75	167.58
2172	0	870	1,256.74	167.57
2173	0	880	1,256.75	163.24
2174	18.79	420	636.93	94
2175	11.17	1,510.00	1,657.39	63.86
2176	2.47	880	1,256.77	163.25
2177	7.21	1,010.00	1,252.12	104.91
2178	0	400	636.93	102.66
2179	114.38	850	1,256.97	176.34
218	13.54	410	794.35	166.54
2180	4.68	980	1,249.54	116.79
2181	3.32	1,270.00	1,672.77	174.52
2182	0	1,360.00	1,670.11	134.37
2183	1.71	1,360.00	1,937.31	250.15
2184	0.89	1,320.00	1,671.24	152.19
2186	6.94	1,030.00	1,250.33	95.47
2187	1.59	1,040.00	1,250.28	91.11
2188	43.06	760	1,256.52	215.14
2189	34.05	1,220.00	1,664.56	192.63
219	0	560	794.12	101.44
2190	0.9	810	1,673.88	374.32

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ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2191	2.52	940	1,673.88	317.99
2192	7	1,030.00	1,250.18	95.4
2193	24.49	1,310.00	1,671.20	156.51
2194	0	380	636.93	111.33
2195	26.57	960	1,146.04	80.61
2196	8.75	1,000.00	1,252.78	109.53
2197	0	1,040.00	1,248.44	90.32
2198	1.99	1,040.00	1,250.18	91.07
22	0	350	935.22	253.58
220	18.43	490	794.02	131.73
2200	3.33	1,040.00	1,250.18	91.07
2201	13.07	960	1,252.78	126.86
2202	10.87	990	1,143.57	66.54
2203	3.63	1,050.00	1,250.23	86.76
2204	1.97	920	1,675.27	327.26
2205	2.96	1,050.00	1,250.22	86.76
2206	12.37	1,010.00	1,250.20	104.08
2208	11.44	1,060.00	1,250.22	82.42
2209	17.7	730	1,170.27	190.77
221	243.31	560	794.02	101.4
2210	0	1,150.00	1,664.97	223.14
2211	0.08	1,100.00	1,143.57	18.88
2212	104.8	1,160.00	1,664.63	218.66
2214	0	880	1,222.22	148.29
2215	0	1,010.00	1,140.24	56.43
2216	264.61	1,040.00	1,128.00	38.13
2217	274.36	960	1,129.28	73.35
2218	168.13	820	1,170.28	151.78
2219	24.67	1,570.00	1,937.50	159.24
222	0	590	792.65	87.81
2220	29.33	1,160.00	1,665.39	218.98
2221	2.68	950	1,256.45	132.79
2222	18.07	1,440.00	1,651.53	91.66
2224	3.6	980	1,254.33	118.87
2225	28.33	830	1,258.68	185.74
2226	6.12	860	1,170.62	134.59
2227	0	840	1,675.96	362.22
2228	0	900	895.15	-2.1
2229	50.96	1,420.00	1,650.44	99.85
223	0	560	794.1	101.44
2230	70.3	1,030.00	1,140.24	47.77
2231	8.45	1,610.00	1,937.57	141.94
2232	0	960	1,254.72	127.7
2234	3.5	850	1,258.70	177.09
2235	10.4	900	1,256.45	154.45
2236	0	920	1,258.65	146.74
2237	0	920	1,258.80	146.8
2238	271.02	1,030.00	1,140.28	47.79
2239	28.55	980	1,675.48	301.35
224	0	590	792.65	87.81
2240	0	950	1,255.32	132.3
2241	0	890	1,256.46	158.79
2242	6.14	960	1,255.32	127.96
2243	0.16	940	1,255.82	136.85
2244	6.95	890	1,256.47	158.79
2245	4.53	1,360.00	1,648.19	124.87
2246	39.87	920	1,171.27	108.87
2247	0	910	1,677.76	332.67
2248	0	900	934.56	14.97
2249	87.05	910	1,257.96	150.77
225	4.43	410	825.09	179.86
2250	0	760	1,676.72	397.21
2251	0	880	1,259.81	164.57
2252	0	920	893.81	-11.35
2253	0	880	1,259.60	164.48
2254	0	1,670.00	1,685.84	6.86

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2256	0	1,670.00	1,685.85	6.87
2258	15.8	1,570.00	1,937.74	159.34
226	0	460	794.7	145.03
2260	0	1,640.00	1,685.66	19.78
2261	1.45	890	1,260.26	160.44
2262	3.08	630	1,174.31	235.85
2263	3.98	1,090.00	1,144.88	23.78
2264	21.07	910	1,171.12	113.14
2265	6.63	960	1,144.88	80.11
2266	34.11	960	1,144.88	80.11
2267	0	1,050.00	1,679.96	272.96
2268	8.02	610	1,174.31	244.52
2269	103.6	950	1,260.83	134.68
227	10.51	220	844.08	270.41
2270	142.12	1,300.00	1,644.55	149.3
2271	17.83	930	1,261.02	143.43
2272	0	1,520.00	1,684.60	71.32
2273	44.29	920	1,171.16	108.83
2274	90.04	1,280.00	1,643.92	157.69
2275	0	1,170.00	1,681.78	221.75
2276	0	800	1,171.15	160.82
2277	0.44	800	1,171.15	160.82
2278	1.55	1,450.00	1,643.75	83.95
2279	2.78	1,450.00	1,643.75	83.95
228	12.92	230	844.11	266.1
2280	150.89	1,630.00	1,938.08	133.49
2281	0	990	1,261.85	117.79
2282	0	990	1,261.85	117.79
2283	16.2	890	1,151.14	113.15
2284	0	1,350.00	1,683.36	144.44
2285	0	1,030.00	1,262.08	100.56
2286	13.41	1,030.00	1,262.09	100.56
2287	19.73	1,610.00	1,939.26	142.67
2288	0	920	893.81	-11.35
2289	12.42	1,440.00	1,643.67	88.25
229	17.43	400	825.09	184.19
2290	8.67	1,440.00	1,939.26	216.33
2291	5.15	1,050.00	1,261.85	91.8
2292	1.89	1,570.00	1,939.26	160
2293	10.78	850	1,171.11	139.14
2294	0	1,220.00	1,262.61	18.46
2295	14.13	1,040.00	1,176.45	59.12
2296	0	1,250.00	1,262.87	5.58
2297	0	1,280.00	1,262.97	-7.38
2298	0.73	1,630.00	1,939.28	134.01
2299	23.2	1,610.00	1,939.28	142.67
23	4.63	360	935.28	249.27
230	17.31	200	844.25	279.15
2300	0	920	934.77	6.4
2301	53.03	1,090.00	1,181.78	39.77
2302	80.32	1,080.00	1,261.80	78.78
2303	13.01	1,720.00	1,939.45	95.09
2304	5.4	1,720.00	1,939.48	95.1
2305	2.47	1,480.00	1,939.27	199
2306	0	1,080.00	1,261.80	78.78
2307	10.54	1,720.00	1,939.46	95.09
2308	1.78	1,010.00	1,176.46	72.13
2309	3.91	1,720.00	1,939.46	95.09
231	0	470	794.7	140.69
2310	21.41	930	1,160.05	99.68
2311	0	1,080.00	1,261.85	78.8
2313	0	1,080.00	1,261.85	78.8
2314	0	1,080.00	1,261.85	78.8
2315	0	1,080.00	1,261.85	78.8
2316	0	1,080.00	1,261.85	78.8
2317	0	1,080.00	1,261.85	78.8

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2318	0	1,080.00	1,261.85	78.8
2319	0	1,080.00	1,183.29	44.76
232	25.57	450	794.69	149.35
2320	0	1,080.00	1,261.85	78.8
2321	0	1,080.00	1,183.29	44.76
2322	0	1,080.00	1,183.29	44.76
2323	0	1,080.00	1,183.29	44.76
2324	0	1,080.00	1,183.29	44.76
2325	0	1,080.00	1,183.29	44.76
2326	0	1,080.00	1,183.28	44.75
2327	7.27	1,790.00	1,940.28	65.12
2328	0	1,080.00	1,186.39	46.1
2329	38.08	1,040.00	1,176.48	59.13
233	8.18	440	794.69	153.69
2330	15.49	1,210.00	1,643.53	187.85
2331	2.53	1,410.00	1,939.27	229.33
2332	1.96	1,080.00	1,186.87	46.31
2333	1.77	1,110.00	1,183.46	31.83
2334	27.77	1,670.00	1,943.43	118.48
2335	3.33	1,100.00	1,643.50	235.5
2336	10.8	1,090.00	1,183.92	40.7
2337	0	1,010.00	1,171.09	69.8
2338	55.04	1,760.00	1,941.32	78.56
2339	40.97	960	1,171.06	91.45
234	13.06	280	825.05	236.17
2340	2.34	1,140.00	1,198.64	25.41
2342	0	1,160.00	1,199.27	17.01
2343	0	1,150.00	1,199.27	21.35
2344	0	1,150.00	1,538.91	168.51
2345	1.53	1,070.00	1,183.79	49.31
2346	0	1,170.00	1,201.56	13.67
2347	0	1,170.00	1,201.66	13.72
2348	9.71	1,130.00	1,643.50	222.5
235	0	200	448.82	107.81
2350	0	1,160.00	1,199.27	17.01
2351	0	1,160.00	1,538.91	164.18
2352	0	1,160.00	1,199.27	17.01
2353	2.73	1,140.00	1,643.50	218.17
2354	0	1,160.00	1,199.27	17.01
2355	0	1,160.00	1,538.91	164.18
2356	0	1,160.00	1,199.27	17.01
2357	10.93	1,080.00	1,182.49	44.41
2358	9.74	1,180.00	1,643.51	200.84
236	0	200	845.72	279.79
2360	4.41	1,080.00	1,183.79	44.97
2361	3.53	1,080.00	1,182.49	44.41
2362	0	1,070.00	1,183.93	49.37
2363	1.27	1,850.00	1,941.71	39.74
2364	227.36	1,080.00	1,185.53	45.73
2365	0	840	1,201.77	156.76
2366	5.23	1,080.00	1,184.04	45.08
2367	0	840	1,201.74	156.74
2368	0	860	884.56	10.64
2369	18.52	1,080.00	1,182.50	44.41
237	0	200	453.58	109.87
2370	0	900	934.74	15.05
2371	0	990	1,201.65	91.71
2372	0	1,150.00	1,538.91	168.51
2373	8.03	1,880.00	1,942.82	27.22
2374	0	1,930.00	1,942.82	5.56
2375	0	1,930.00	1,942.82	5.56
2376	0	1,930.00	1,942.82	5.56
2377	0	1,930.00	1,942.82	5.56
2378	0	1,930.00	1,942.82	5.56
2379	12.25	1,100.00	1,175.51	32.72
238	16.32	440	794.34	153.54

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2380	0	1,930.00	1,942.82	5.56
2381	0	1,930.00	1,942.82	5.56
2382	0	1,150.00	1,198.93	21.2
2384	1.51	1,970.00	2,123.35	66.45
2385	0.08	1,070.00	1,185.02	49.84
2386	0	1,690.00	1,943.49	109.84
2387	15.92	1,070.00	1,170.43	43.52
2388	8.52	1,030.00	1,171.09	61.13
2389	22.28	1,060.00	1,170.44	47.85
239	0	200	845.23	279.58
2390	0	1,050.00	1,170.81	52.35
2391	5.28	1,870.00	1,942.99	31.63
2392	4.65	1,720.00	2,123.35	174.77
2393	15.08	1,870.00	1,942.93	31.6
2394	0	700	881.51	78.65
2395	52.04	1,080.00	1,177.29	42.16
2396	617.47	1,100.00	1,137.12	16.09
2397	0.58	1,870.00	1,942.82	31.55
2398	18.43	1,080.00	1,175.79	41.51
2399	7.87	1,890.00	1,942.53	22.76
24	0	380	934.95	240.46
240	0	200	453.3	109.75
2400	0.08	1,040.00	1,185.02	62.84
2402	8.65	1,070.00	1,175.53	45.73
2403	0	1,930.00	2,123.35	83.78
2404	3.9	1,930.00	2,123.35	83.78
2405	0	1,920.00	1,942.16	9.6
2406	0	1,120.00	1,148.09	12.17
2408	9.42	690	970.72	121.64
241	1.1	200	453.3	109.75
2410	9.82	660	970.64	134.6
2412	15.3	660	969.29	134.01
2413	0	1,160.00	1,170.30	4.46
2414	0	1,160.00	1,944.80	340.05
2415	0	1,160.00	1,170.21	4.42
2416	0	1,160.00	1,170.25	4.44
2417	0	1,160.00	1,170.25	4.44
2418	0	1,160.00	1,944.90	340.1
2419	0	1,160.00	1,944.89	340.09
242	0	200	448.82	107.81
2420	0	1,160.00	1,945.02	340.15
2421	0	1,160.00	1,944.80	340.05
2422	0	460	870.93	178.05
2424	15.03	460	870.89	178.04
2426	0	1,150.00	1,170.28	8.79
2427	0	1,160.00	1,944.80	340.05
2428	0	1,160.00	1,944.80	340.05
2429	0	1,160.00	1,944.80	340.05
243	309.91	200	433.04	100.98
2430	0	1,150.00	1,944.79	344.38
2431	0	1,150.00	1,944.79	344.38
2432	0	340	870.85	230.02
2433	0	1,160.00	1,944.80	340.05
2434	14.44	440	870.86	186.69
2435	0	1,160.00	1,944.80	340.05
2436	3.99	1,040.00	1,173.08	57.66
2437	20.43	1,070.00	1,170.84	43.7
2438	0	1,160.00	1,944.80	340.05
2439	0	1,160.00	1,643.51	209.5
244	11.62	390	825.11	188.53
2440	0	1,160.00	1,215.93	24.24
2441	0	1,160.00	1,170.34	4.48
2442	0	1,160.00	1,170.34	4.48
2443	0	1,160.00	1,170.34	4.48
2444	0	1,160.00	1,170.34	4.48
2445	0	1,150.00	1,170.34	8.81

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2446	0	1,160.00	1,215.93	24.24
2447	0	1,160.00	1,215.93	24.24
2448	0	1,160.00	1,215.93	24.24
2449	0	1,160.00	1,215.93	24.24
245	0	200	433.04	100.98
2450	0	1,160.00	1,215.93	24.24
2451	0	1,040.00	1,185.02	62.84
2452	0	1,150.00	1,422.52	118.08
2453	0	1,150.00	1,168.76	8.13
2454	0.81	1,070.00	1,174.65	45.35
2455	8.42	1,140.00	1,165.77	11.17
2456	5.21	1,840.00	1,942.80	44.54
2457	12.39	1,070.00	1,174.44	45.26
2458	25.56	1,040.00	1,172.92	57.6
2459	0	1,780.00	1,942.13	70.25
246	0	200	845.45	279.68
2460	14.13	410	870.85	199.69
2461	0.9	1,780.00	1,942.13	70.25
2462	1.27	1,380.00	1,538.91	68.85
2463	1.26	1,210.00	1,538.91	142.52
2464	51.62	1,110.00	1,171.52	26.66
2465	0	2,000.00	2,123.35	53.45
2466	0	2,120.00	2,123.35	1.45
2467	1.5	2,000.00	2,123.35	53.45
2468	1.1	2,000.00	2,123.35	53.45
2469	0	2,120.00	2,123.35	1.45
247	12.8	330	825.09	214.52
2470	3.28	560	816.74	111.25
2471	1.87	1,370.00	1,538.91	73.19
2472	5.12	1,840.00	2,123.34	122.77
2473	2.1	1,310.00	1,538.91	99.19
2474	94.55	1,040.00	1,171.50	56.98
2475	0	1,840.00	1,942.79	44.54
2476	0	1,840.00	1,942.79	44.54
2477	5.11	1,840.00	1,942.79	44.54
2478	0.18	1,830.00	1,942.79	48.87
2479	12.78	1,780.00	1,942.78	70.53
2480	19	1,060.00	1,171.79	48.44
2481	30.78	1,080.00	1,172.42	40.05
2482	90.89	1,080.00	1,172.14	39.92
2483	3.21	1,060.00	1,172.29	48.66
2484	21.7	1,060.00	1,172.36	48.69
2485	0	1,620.00	1,942.09	139.56
2486	71.47	1,610.00	1,942.09	143.9
2487	15.86	1,600.00	1,942.05	148.21
2488	4.45	1,600.00	1,942.09	148.23
2489	11.56	1,320.00	1,538.91	94.85
249	0.08	180	846.3	288.71
2490	0	1,600.00	1,942.06	148.21
2491	0.54	1,600.00	1,942.06	148.21
2492	0.08	2,080.00	2,123.35	18.78
2493	1.44	2,080.00	2,123.35	18.78
2494	0.51	2,040.00	2,123.34	36.11
2496	0	1,770.00	1,942.78	74.87
2497	3.22	2,080.00	2,123.34	18.78
2498	4	1,060.00	1,171.69	48.4
2499	86.5	1,040.00	1,171.70	57.06
25	0	210	838.56	272.35
250	19.98	520	794.73	119.04
2500	11.69	1,040.00	1,171.69	57.06
2501	1.54	1,560.00	1,942.08	165.56
2502	0	1,316.00	1,332.03	6.95
2503	0	1,316.00	1,332.04	6.95
2504	14.06	530	816.75	124.25
2505	2.5	1,060.00	1,538.89	207.5
2506	38.66	1,460.00	1,539.26	34.34
2508	56.98	1,130.00	1,538.91	177.18
251	9.37	520	795.24	119.26
2510	0	1,520.00	1,539.44	8.42
2511	0	1,520.00	1,539.43	8.42
2512	0	1,520.00	1,539.43	8.42
2513	4.18	1,870.00	1,942.77	31.53
2514	0	1,520.00	1,539.32	8.37
2516	0	1,520.00	1,539.32	8.37
2517	0	1,520.00	1,539.32	8.37
2518	0	1,520.00	1,539.32	8.37
2519	0	1,520.00	1,539.32	8.37
2520	4.08	1,520.00	1,539.40	8.41
2521	0	1,520.00	1,539.40	8.41
2522	119.31	1,080.00	1,136.76	24.59
2524	5.52	1,480.00	1,539.32	25.7
2525	0	1,830.00	1,942.77	48.86
2526	65.2	1,080.00	1,171.98	39.86
2527	0.36	1,670.00	1,942.77	118.19
2528	5.75	1,970.00	2,123.34	66.44
2529	0.35	1,130.00	1,538.89	177.17
253	14.37	440	793.95	153.37
2530	3.42	1,120.00	1,331.54	91.66
2532	25.15	1,120.00	1,331.64	91.71
2533	146.95	1,100.00	1,331.16	100.16
2534	83.4	1,070.00	1,171.66	44.05
2535	0.96	1,080.00	1,171.79	39.77
2536	13.29	1,080.00	1,330.73	108.64
2537	0.23	1,600.00	1,942.06	148.21
2538	0	1,080.00	1,330.27	108.44
2539	0	1,080.00	1,171.98	39.86
254	16.23	470	793.97	140.38
2540	1.75	1,140.00	1,538.93	172.86
2542	9.25	1,210.00	1,538.91	142.52
2543	3.05	1,870.00	1,942.77	31.53
2544	18.06	1,080.00	1,171.98	39.85
2545	0	1,090.00	1,171.98	35.52
2546	22.76	1,080.00	1,330.13	108.38
2547	0	1,090.00	1,171.98	35.52
2548	0	1,090.00	1,330.13	104.05
2549	0	1,090.00	1,171.98	35.52
255	0	200	846.3	280.04
2550	0	1,090.00	1,171.98	35.52
2551	0	1,090.00	1,330.13	104.05
2552	0	1,100.00	1,171.98	31.19
2553	0	1,100.00	1,330.13	99.71
2554	0	1,100.00	1,330.13	99.71
2555	0.86	1,180.00	1,538.92	155.52
2556	0	1,100.00	1,330.13	99.71
2557	8.76	1,560.00	1,942.07	165.55
2558	97.64	1,610.00	1,942.05	143.88
2559	6.84	1,290.00	1,538.91	107.85
256	3.36	560	791.85	100.46
2560	2.85	1,240.00	1,942.05	304.2
2561	0.24	1,190.00	1,538.89	151.17
2562	0.24	1,300.00	1,538.91	103.52
2563	2.36	1,160.00	1,331.64	74.37
2564	1.82	1,140.00	1,538.96	172.87
2565	0.08	1,610.00	1,942.05	143.88
2566	0.62	1,170.00	1,331.64	70.04
2567	0	1,840.00	2,123.32	122.76
2568	0.08	1,470.00	1,942.77	204.85
2569	25.21	1,160.00	1,538.99	164.22
257	0	190	845.4	283.99
2570	4.29	1,460.00	1,942.77	209.18
2571	7.41	1,730.00	2,123.34	170.43
2572	5.5	1,350.00	1,942.05	256.54

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2573	0	1,200.00	1,538.89	146.84
2574	0	1,200.00	1,538.89	146.84
2575	1.68	1,470.00	1,942.77	204.85
2576	0	1,640.00	2,123.34	209.43
2578	5.94	1,220.00	1,538.89	138.17
2579	0.08	1,170.00	1,538.95	159.87
258	0	200	845.4	279.65
2580	5.4	1,180.00	1,538.95	155.53
2581	83.47	1,110.00	1,170.65	26.28
2582	2.54	1,530.00	2,123.34	257.09
2583	3.69	1,140.00	1,538.95	172.86
2584	1.73	1,760.00	2,123.32	157.43
2585	5.48	1,230.00	1,329.49	43.11
2586	0.64	1,430.00	1,942.77	222.18
2587	0.5	1,440.00	1,942.77	217.85
2588	0.39	1,280.00	1,942.05	286.87
2589	4.55	1,670.00	1,942.05	117.88
259	0	200	845.4	279.65
2590	0	1,720.00	1,942.05	96.21
2591	3.24	1,750.00	2,123.32	161.76
2592	40.07	1,120.00	1,329.62	90.83
2593	5.64	1,320.00	1,538.95	94.87
2594	0.28	1,320.00	1,942.05	269.53
2595	30.48	1,210.00	1,329.50	51.78
2596	5.55	1,120.00	1,329.62	90.83
2597	0	1,120.00	1,329.62	90.83
2598	3.78	1,750.00	2,123.32	161.76
2599	1.03	1,400.00	2,123.33	313.42
26	0	210	838.56	272.35
260	0	200	488.47	125
2600	0.26	1,440.00	1,942.77	217.85
2601	0	1,280.00	1,942.05	286.87
2602	1.1	1,120.00	1,329.62	90.83
2603	13.53	1,350.00	1,538.94	81.87
2604	0	1,370.00	2,123.33	326.42
2605	0	1,370.00	2,123.33	326.42
2606	0	1,370.00	2,123.33	326.42
2607	1.35	1,370.00	1,942.05	247.87
2608	8.46	1,350.00	1,538.74	81.78
2609	0	1,380.00	1,942.05	243.54
261	0	200	488.47	125
2610	0	1,380.00	1,942.05	243.54
2611	0	1,390.00	2,123.33	317.75
2612	0	1,390.00	1,942.05	239.2
2613	0	1,390.00	2,123.33	317.75
2614	0	1,390.00	1,942.05	239.2
2615	0.13	1,120.00	1,329.62	90.83
2616	0	1,390.00	1,942.05	239.2
2617	0	1,390.00	2,123.33	317.75
2618	0	1,530.00	2,123.33	257.09
2619	20.57	1,310.00	1,538.74	99.11
262	0	200	845.4	279.65
2620	1.01	1,130.00	1,329.62	86.5
2621	11.19	1,320.00	1,538.51	94.68
2622	21.54	1,320.00	1,538.46	94.66
2623	3.92	1,370.00	1,538.93	73.2
2624	0	1,210.00	1,329.62	51.83
2625	2.78	1,160.00	1,329.62	73.5
2626	0	267	815.85	237.82
2627	1.11	267	961.07	300.74
2628	0	270	815.87	236.53
2629	0	270	960.81	299.33
263	0	200	845.39	279.65
2630	0	270	815.88	236.53
2631	0	270	960.81	299.33
2632	5.49	510	816.75	132.91

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
2634	3.8	550	815.21	114.91
2636	1.6	540	815.07	119.19
2638	4.94	530	814.9	123.45
264	0	200	488.48	125
2640	22.55	460	814.19	153.47
2642	17.32	300	812.34	222
2644	47.41	220	848.49	272.32
2646	3.33	210	847.52	276.24
2648	23.76	220	843.47	270.15
265	0	200	488.48	125
2650	13.92	210	842.92	274.24
2652	21.28	440	794.52	153.61
2654	28.59	550	832.38	122.36
2656	18.71	570	832.4	113.7
2658	10.23	600	832.42	100.71
266	7.24	180	846.26	288.69
2660	26.62	660	832.03	74.54
2662	75.3	660	926.26	115.37
2664	20.12	610	927.34	137.5
2666	150.28	720	975.07	110.52
2668	24.59	600	960.82	156.34
267	0.65	200	488.47	125
2670	7.05	440	867.23	185.12
2672	57.57	500	942.37	191.68
2674	4.37	490	942.53	196.08
2676	1.99	520	942.48	183.06
2678	6.69	550	952.64	174.47
268	6.16	520	795.24	119.26
2680	4.5	540	952.64	178.8
2682	4.04	580	952.64	161.47
2684	20.49	410	842.02	187.19
2686	7.92	400	881.5	208.64
2688	2.67	380	881.5	217.3
269	0	200	488.47	125
2692	0	1,125.00	1,188.60	27.56
2694	0	1,125.00	1,672.29	237.14
2696	0	430	931.51	217.3
2698	0	190	810.84	269.01
27	0	200	838.56	276.69
270	25.25	430	794.72	158.03
2700	0	250	810.81	243
2702	0	250	810.8	242.99
2704	0	250	810.77	242.98
2706	0	240	845.31	262.28
2708	0	220	238.47	8
271	0	190	845.51	284.03
2710	0	390	981.42	256.26
2716	0	390	636.94	107
272	3.56	190	488.47	129.33
2724	0	200	936.07	318.94
2726	0	190	845.28	283.93
2728	0	240	319.25	34.34
273	1.45	190	845.51	284.03
274	0	250	433.04	79.31
2740	0	390	981.41	256.26
2742	0	390	981.41	256.26
2744	0	390	636.94	107
2746	0	390	636.94	107
2748	0	390	636.94	107
275	8.81	250	429.07	77.59
2750	0	160	849.81	298.89
2752	0	160	850.13	299.03
2754	0	160	849.91	298.94
2756	0	160	849.98	298.97
276	50.68	250	429.06	77.59
277	0	240	429.07	81.93

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
278	13.72	480	794.69	136.35
28	0	190	838.56	281.02
280	8.8	190	846.26	284.36
281	0	190	846.26	284.36
282	7.99	510	794.77	123.39
283	3.36	200	846.07	279.94
284	0	190	846.22	284.34
285	8.73	560	794	101.39
286	5.44	200	845.37	279.64
288	21.77	480	794.74	136.37
289	12.47	190	846.15	284.31
29	94.5	190	808.76	268.11
290	9.96	240	845.36	262.3
291	0	290	429.08	60.26
292	0	160	845.73	297.12
293	35.18	580	794.1	92.77
294	3.05	290	429.08	60.26
295	0	290	429.08	60.26
296	5.76	290	429.08	60.26
297	1.29	190	845.51	284.03
298	9.68	200	846.08	279.95
299	5.42	340	429.08	38.6
3	0	480	936.42	197.77
30	0	430	932.65	217.8
300	0	160	845.79	297.15
301	6.1	430	794.86	158.09
302	3.91	470	794.82	140.75
303	9.39	200	846.07	279.94
304	0	240	429.14	81.96
305	0	170	845.79	292.82
306	0	240	429.15	81.96
307	2.09	240	429.15	81.96
308	2.09	250	429.14	77.62
309	0	170	845.81	292.83
31	4.2	240	809.06	246.57
310	10.18	200	238.47	16.67
311	2.38	530	794.61	114.66
312	0	180	845.82	288.5
313	3.88	580	794.13	92.78
314	3.99	570	794.12	97.11
315	0	180	845.83	288.5
316	18.51	580	794.14	92.79
317	2.11	600	794.11	84.11
318	0	200	845.31	279.61
319	10.1	570	794.11	97.11
32	67.32	430	929.74	216.54
320	0	200	845.31	279.61
321	0	660	791.11	56.81
322	12.96	660	791.11	56.81
323	10.7	210	238.47	12.34
326	0	190	846	284.25
327	0	190	846	284.25
328	0.23	200	846	279.91
329	32.11	460	831.43	160.94
33	5.25	210	809.06	259.57
330	0	200	429.23	99.33
331	0	220	238.47	8
332	0	200	429.39	99.4
333	0	200	429.23	99.33
334	0	200	430.63	99.93
335	0	200	429.23	99.33
336	0	200	840.77	277.65
337	0	200	845.16	279.55
338	0	200	845.16	279.55
339	30.14	410	829.18	181.63
34	0	440	937.39	215.52

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
340	11.1	230	845.24	266.58
341	0	210	845.29	275.27
342	0	190	845.88	284.19
343	17.95	200	846.06	279.94
344	0	210	845.28	275.27
346	0	200	845.28	279.6
347	0	200	845.28	279.6
348	6.43	210	842.91	274.24
349	11.69	430	831.94	174.16
35	21.09	400	853.58	196.54
350	18.93	220	846.06	271.27
351	18.89	230	845.29	266.6
352	10.86	450	831.95	165.5
355	7.47	440	832.36	170.01
356	0	220	845.23	270.91
357	22.61	450	795.08	149.52
358	5.5	300	796.11	214.96
359	1.48	240	842.93	261.25
36	4.86	230	855.61	271.07
360	0	190	845.9	284.2
361	0	240	845.26	262.26
362	0	190	845.9	284.2
363	1.45	240	845.26	262.26
364	6.93	440	795.08	153.85
366	0	200	845.9	279.87
367	0	320	845.15	227.55
368	0	310	845.14	231.88
369	9.94	270	845.15	249.21
37	31.61	470	925.51	197.37
372	0	310	845.14	231.88
373	5.33	240	845.25	262.25
374	0	320	845.13	227.54
375	0	200	845.9	279.87
376	0	750	790.42	17.51
377	9.05	300	845.14	236.21
378	0	750	790.44	17.52
379	14.37	200	846.06	279.94
38	174.6	600	925.56	141.06
380	0.51	750	790.44	17.52
381	0	190	845.89	284.2
382	0	730	790.47	26.2
383	0	730	790.47	26.2
384	0	730	790.47	26.2
386	0	730	790.47	26.2
387	0	730	790.47	26.2
388	0	730	790.47	26.2
389	0	730	790.47	26.2
39	0	240	855.61	266.74
390	0	730	790.47	26.2
391	0	730	790.47	26.2
392	0	730	790.47	26.2
393	0	730	790.47	26.2
394	0	730	790.47	26.2
395	3.08	400	961.58	243.33
396	0	250	845.9	258.2
397	10.09	320	845.14	227.54
398	29.3	320	845.1	227.52
399	9.14	300	845.14	236.21
4	21.22	470	936.42	202.1
40	8.18	270	925.51	284.03
400	6.69	230	845.89	266.87
402	0	420	961.78	234.75
403	3.32	440	832.33	169.99
404	2.27	290	832.33	234.99
405	0	240	845.9	262.53
406	7.94	260	832.26	247.96

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
407	0	250	845.26	257.93
408	0	250	815.53	245.04
409	0	250	815.58	245.06
41	6.37	280	361.4	35.27
410	0	250	815.58	245.07
411	0	250	815.53	245.04
412	0	250	815.52	245.04
413	0	280	832.33	239.33
414	0	250	815.51	245.04
415	93.76	440	796.11	154.3
416	28.23	630	791.95	70.17
417	0	200	845.89	279.87
418	0	200	845.89	279.87
419	0	280	961.14	295.14
42	0	200	809.15	263.94
423	0	250	845.89	258.2
429	7.79	660	833.4	75.14
43	0	200	809.14	263.94
430	0	190	814.87	270.75
431	15.23	410	796.13	167.31
432	0	180	814.67	275
433	16.25	660	833.41	75.14
434	10.1	320	845.87	227.86
435	0.16	490	796.21	132.68
436	0.08	400	796.19	171.67
437	9.4	500	796.16	128.33
438	3.93	700	834.26	58.17
439	0	500	798.49	129.34
44	2.98	200	361.52	69.99
440	1.02	200	810.54	264.55
441	0	200	810.54	264.55
443	0	200	814.39	266.22
444	0	500	795.09	127.86
445	15.89	510	798.49	125
446	6.21	520	796.37	119.75
447	3.93	670	833.85	70.99
448	1.42	490	796.21	132.68
449	7.92	200	810.54	264.54
45	10.96	220	361.5	61.31
450	4.07	710	831.06	52.46
451	0	650	833.49	79.51
452	3.68	300	799.12	216.27
453	3.61	650	833.42	79.47
454	18.2	480	799.1	138.27
455	20.54	200	810.54	264.55
456	23.73	440	799.1	155.6
457	2.71	560	832.38	118.02
458	2.92	330	799.12	203.27
459	1.64	530	795.54	115.06
46	0	260	361.43	43.95
460	0	530	832.38	131.02
461	0	200	814.09	266.08
462	0	530	832.38	131.02
463	0	530	832.38	131.02
464	0	530	832.38	131.02
465	0	530	832.38	131.02
466	0	540	832.38	126.69
467	14.47	630	831.08	87.13
468	6.78	200	810.54	264.55
469	0	540	832.37	126.69
47	0	260	361.41	43.94
470	1.22	620	832.46	92.06
471	6.46	530	832.38	131.02
472	12.05	620	832.45	92.05
473	0	530	795.62	115.09
474	0	530	832.38	131.02
475	0	530	795.62	115.09
476	12.8	440	799.13	155.61
477	0	530	832.38	131.02
478	0	530	795.62	115.09
479	0	530	795.62	115.09
48	3.24	200	854.18	283.46
480	0	530	795.62	115.09
481	0	540	832.38	126.69
482	0	540	832.38	126.69
483	0	540	832.38	126.69
484	9.56	600	831.8	100.44
485	8.4	490	797.61	133.29
486	21.38	200	813.88	266
487	7.73	600	831.81	100.44
488	6.61	590	796.08	89.29
489	1.18	200	810.68	264.61
49	2.59	200	853.64	283.22
490	9.21	200	810.68	264.61
491	8.8	590	796.08	89.29
492	15.79	590	832.31	104.99
493	1.47	630	829.71	86.54
494	27.02	640	829.5	82.11
496	4.7	610	829.59	95.15
497	3.42	630	829.6	86.49
498	39.21	380	800.12	182.04
499	11.84	440	798.5	155.34
5	0	500	936.45	189.11
50	3.41	240	361.41	52.61
500	0	620	829.6	90.82
501	2.65	470	797.37	141.85
502	0.65	230	810.88	251.69
503	1.09	600	829.59	99.48
504	6.83	610	829.59	95.15
505	14.4	230	810.88	251.69
506	1.01	230	810.88	251.69
507	13.85	280	812.34	230.66
508	30.07	470	798.51	142.34
509	3.54	580	829.59	108.15
51	0	250	809.24	242.32
510	8.8	240	809.36	246.7
511	3.09	450	797.62	150.63
512	1.26	240	810.88	247.36
513	4.61	240	810.88	247.36
514	10.96	570	831.44	113.28
516	23.78	520	799.28	121.01
517	21.59	630	831.78	87.43
519	0	450	797.89	150.74
52	41.92	320	861.6	234.67
520	13.71	630	831.32	87.23
521	18.26	520	797.91	120.42
522	2.58	190	813.07	269.98
523	27.16	710	831.77	52.76
524	61.41	570	800.44	99.85
525	9.96	600	831.78	100.43
526	7.38	460	797.95	146.43
527	0	260	810.89	238.7
528	8.96	270	810.73	234.3
529	2.01	240	811.31	247.55
53	2.89	250	809.24	242.32
530	0	240	811.71	247.72
531	28.63	540	800.42	112.84
532	0	240	811.65	247.7
533	13.31	320	809.38	212.05
534	4.47	320	813.08	213.65
535	0	600	802.15	87.59
536	0	620	803.14	79.36

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
538	0.59	240	806.07	245.28
539	18.61	510	797.67	124.65
54	3.65	200	853.44	283.14
540	5.7	200	813.07	265.64
541	6.77	270	808.38	233.28
542	0	330	812.36	209.01
543	16.12	520	830.84	134.69
544	31.71	260	813.03	239.63
545	10.45	320	813.09	213.65
546	2.26	320	813.09	213.65
547	4.73	200	814.39	266.21
548	5.3	240	808.57	246.36
549	17.68	400	811.84	178.45
55	24.28	640	864.59	97.31
550	4.17	280	812.94	230.92
551	2.7	280	812.44	230.71
552	0	280	812.44	230.71
553	18.12	480	798.09	137.83
554	22.87	540	797.71	111.66
555	58.17	650	831.36	78.58
556	6.6	510	803.13	127.01
557	29.45	510	798.09	124.83
558	32.41	620	830.87	91.37
559	25.23	400	812.56	178.76
56	0	150	836.14	297.31
560	3.96	320	815.14	214.54
561	31.5	620	831.29	91.55
562	14.04	550	797.69	107.33
563	29.9	570	802.04	100.54
564	9.46	300	813.16	222.35
565	11.54	260	808.98	237.87
566	2.04	330	803.13	205.01
567	10.85	260	814.39	240.22
569	8.93	260	809.24	237.98
57	0	150	846.61	301.84
570	3.2	200	815.15	266.54
571	5.56	320	815.14	214.54
572	18.54	700	830.9	56.72
573	23.43	320	812.75	213.51
574	19.88	570	797.56	98.6
575	10.08	240	816	249.58
576	33.88	570	797.64	98.64
578	2.63	620	830.76	91.32
579	16.02	530	797.42	115.87
58	12.45	240	809.23	246.65
582	9.63	500	797.4	128.86
583	11.44	540	797.92	111.76
584	6.88	600	830.76	99.99
585	13.72	240	809.72	246.86
586	3.55	510	798.33	124.93
587	25.99	400	813.11	179
588	8.89	510	798.33	124.93
589	5.84	620	830.91	91.39
59	0.08	481	884.7	174.92
590	2.5	240	809.64	246.82
591	16.21	560	830.92	117.39
592	1.84	240	809.64	246.82
593	7.73	400	811.92	178.49
594	11.86	570	797.91	98.75
595	7.18	360	813.83	196.64
596	12.97	320	814.42	214.23
598	6.87	240	815.15	249.21
599	23.83	280	816	232.25
6	19.63	630	936.4	132.76
60	6.46	200	809.28	264
600	4.21	270	809.64	233.83

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
602	0	280	816	232.25
604	0	500	831.05	143.44
605	1.33	500	831.04	143.44
607	5.34	500	798.87	129.5
609	7.42	250	815.15	244.88
61	0.54	190	809.29	268.34
611	0	360	813.82	196.64
612	23.65	650	830.64	78.27
613	0	280	809.61	229.48
614	1.51	570	830.7	112.96
616	4.57	560	830.73	117.31
617	0	560	830.73	117.31
618	6.61	380	812.19	187.27
619	3.14	370	812.2	191.61
62	0	150	847.2	302.1
620	1.47	280	809.6	229.48
621	0	560	830.72	117.3
622	6.92	550	830.86	121.7
623	1.96	550	830.86	121.7
624	0	300	815.81	223.5
625	2.65	550	830.86	121.7
626	13.64	570	797.61	98.62
627	1.59	280	809.6	229.47
628	21.72	480	797.33	137.5
629	0	290	816.36	228.07
63	40.06	250	853.41	261.46
630	20.14	310	809.58	216.47
631	14.45	360	813.82	196.64
632	19.42	440	814.11	162.1
633	0	230	817.14	254.41
634	12.47	330	813.3	209.41
635	7.64	290	809.6	225.14
636	8.21	560	830.68	117.29
637	0	400	813.8	179.3
639	6.12	280	815.19	231.9
64	4.93	280	854.18	248.79
640	31.29	400	813.8	179.3
641	32.21	310	816	219.25
642	0.81	520	830.87	134.7
643	0.6	520	830.86	134.69
644	0	520	830.86	134.69
645	9.37	640	830.57	82.57
646	0.52	520	830.85	134.69
647	6.2	520	798.84	120.82
648	2.13	520	830.86	134.69
649	21.14	380	814.01	188.05
65	83.6	460	872.22	178.62
650	16.97	510	801.39	126.26
651	17.1	290	816.14	227.97
652	16	330	815.18	210.23
653	12.58	250	816.38	245.41
655	8.28	530	830.67	130.28
656	1.65	570	830.56	112.9
658	1.36	580	830.56	108.57
659	1.46	520	798.87	120.84
66	23.97	170	852.24	295.61
660	0	520	798.81	120.81
661	28.27	530	798.71	116.43
663	1.58	580	830.56	108.57
664	1.43	580	830.56	108.57
665	6.74	540	801.4	113.26
666	28.41	520	801.4	121.93
668	3.33	640	830.46	82.53
669	5.09	640	830.46	82.53
67	24.95	380	863.53	209.51
670	1.54	240	816.62	249.85

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
671	0	380	813.79	187.96
672	1.29	520	798.88	120.84
673	15.66	300	816.37	223.74
674	6.93	540	830.65	125.94
675	5.18	520	798.75	120.78
676	16.56	560	798.72	103.44
677	16.87	640	830.45	82.52
678	7.6	360	813.79	196.63
679	24.77	360	816.02	197.59
68	7.43	200	809.49	264.09
680	3.08	400	813.11	179
681	32.26	440	813.94	162.03
682	9.25	400	814.04	179.4
683	11.61	430	814.12	166.44
684	4.58	520	798.72	120.77
685	4.54	400	813.79	179.3
686	5.72	540	799.65	112.51
687	14.72	430	813.09	165.99
688	6.57	630	830.49	86.87
689	3.62	430	813.39	166.12
69	2.65	200	807.37	263.17
690	2.65	430	813.39	166.12
692	1.32	330	805.99	206.25
693	5.94	300	805.98	219.24
694	1.23	320	805.99	210.58
695	7.89	560	799.66	103.84
696	2.34	560	799.65	103.84
699	3.75	520	798.72	120.77
7	0	490	936.45	193.44
70	0	150	832.32	295.65
700	0	461	939.53	207.35
702	10.57	590	798.7	90.43
703	1.1	520	798.71	120.77
704	15.35	390	815.53	184.38
705	16.53	430	813.96	166.37
706	10.88	310	805.97	214.9
707	9.78	400	808.18	176.86
708	9.93	340	815.42	206
71	0	170	831.76	286.74
710	6.26	435	938.89	218.34
711	1.83	630	830.46	86.86
712	31.97	630	830.27	86.78
713	0	560	800.01	103.99
714	0	480	864	166.39
715	23.62	560	799.63	103.83
716	11.9	450	814.64	158
717	5.32	400	814.64	179.66
718	8.09	470	811.6	148.02
719	5.24	370	814.64	192.66
72	0	150	832.32	295.65
720	4.28	470	811.56	148
721	8.61	370	816.02	193.26
722	0.5	360	815.53	197.38
723	21.31	430	811.55	165.32
724	13.67	360	815.54	197.38
725	1.23	310	816.02	219.26
726	12.06	400	804.07	175.08
727	27.22	490	813.94	140.36
728	7.03	470	802.28	143.98
729	19.7	440	811.14	160.82
73	0.09	140	851.07	308.1
730	6.67	640	830.43	82.51
732	15.04	380	815.41	188.66
733	20.91	560	799.64	103.83
734	3.79	480	801.98	139.52
735	5.15	520	798.71	120.77
736	0	640	830.43	82.51
737	0	640	830.43	82.51
738	3.95	580	829.9	108.28
739	1.71	480	802.28	139.65
74	0	140	851.07	308.1
740	0.63	480	802.11	139.57
741	8.26	660	829.9	73.62
742	2.25	640	830.43	82.51
743	23.47	480	811.33	143.57
744	10.38	450	808.19	155.2
745	9	450	814.98	158.15
746	8.1	630	829.9	86.62
747	0	280	816.02	232.26
748	14.42	440	814.98	162.48
749	14.91	490	813.35	140.11
75	0	140	851.07	308.1
750	6.45	480	811.18	143.5
751	8.83	520	815.7	128.13
752	5.81	320	805.62	210.42
753	4.3	450	811.18	156.5
754	7.1	480	804.18	140.47
755	0	480	804.3	140.52
756	8.26	440	807.27	159.14
757	29.69	620	829.94	90.97
758	2.72	360	806.07	193.28
759	13.95	280	837.64	241.63
76	0	390	863.53	205.18
760	4.32	410	806.7	171.89
761	16.4	520	814.64	127.67
762	3.71	450	807.27	154.81
763	12.14	470	815.35	149.64
764	5.19	520	813.34	127.1
765	1.75	470	815.41	149.67
766	12.78	520	815.7	128.13
767	12.93	470	811.19	147.84
768	35.23	430	816.01	167.26
769	2.71	480	808.23	142.22
77	1.12	400	863.77	200.95
770	4.06	480	808.1	142.17
771	2.56	480	808.24	142.23
772	15.52	480	810.1	143.03
773	6.83	540	813.34	118.44
774	5.48	490	811.18	139.17
775	6.99	500	811.22	134.85
776	6.1	490	811.09	139.13
777	3.3	340	837.64	215.63
778	13.79	340	837.64	215.63
779	7.94	520	815.7	128.13
78	6.89	180	824.4	279.22
780	15.63	310	837.64	228.63
781	3.1	490	810.78	138.99
782	6.74	430	816.3	167.38
783	10.05	360	816.29	197.71
784	5.29	470	810.3	147.45
785	3.9	460	809.73	151.54
786	0	470	810.11	147.37
787	2.59	470	809.94	147.3
788	9.87	520	815.99	128.25
789	10.16	460	809.63	151.49
79	49.76	680	863.91	79.69
790	10.32	440	821.4	165.26
791	7.67	480	816.77	145.92
793	10.06	310	837.64	228.63
794	0	510	817.05	133.04
795	2.33	450	810.73	156.31
796	16.07	310	837.67	228.64

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
797	26.17	540	815.53	119.39
798	4.63	510	818.34	133.6
799	1.48	440	810.72	160.63
8	15.79	470	940.11	203.7
80	38.78	720	863.4	62.14
800	8.21	280	838.04	241.8
801	1.37	440	810.72	160.63
802	8.22	280	838.04	241.8
803	11.29	310	837.85	228.72
804	5.69	320	837.9	224.41
805	14.94	500	823.36	140.11
806	6.86	320	838.01	224.45
807	9.78	530	812.13	122.25
808	9.1	560	818.34	111.94
809	0	510	823.65	135.9
81	0	150	851.07	303.77
811	8.5	560	815.47	110.69
812	11.54	320	838.08	224.48
813	5.96	440	821.18	165.17
814	8.87	440	821.41	165.26
815	5.34	560	817.72	111.67
816	1.78	560	817.79	111.7
817	9.18	440	809.36	160.04
818	0.98	570	815.61	106.42
819	10.3	460	809.45	151.42
82	0	450	864.36	179.54
820	3.4	440	809.53	160.12
821	13.74	320	838.23	224.55
822	1.32	390	809.37	181.71
823	3.09	590	816.14	97.99
824	0	590	816.09	97.96
825	10.9	590	815.92	97.89
826	9.25	450	809.44	155.75
827	16.18	520	809.22	125.32
828	24.5	440	837.61	172.29
829	4.33	440	809.37	160.05
83	71.42	370	854.75	210.04
830	9.71	530	809.21	120.98
831	14.1	510	821.16	134.82
832	25.66	560	829.72	116.87
833	29.97	480	837.64	154.97
834	11.95	440	809.39	160.05
835	21.16	440	837.83	172.38
836	12.88	540	834.47	127.59
837	14.22	360	838.23	207.21
838	11.14	550	809.19	112.31
839	7.72	500	809.21	133.98
84	36.61	430	860.19	186.4
840	4.63	560	809.18	107.97
841	4.89	600	833.38	101.12
842	8.2	530	837.67	133.31
843	1	600	834.47	101.6
844	0.16	530	834.47	131.93
845	10.27	520	816.07	128.29
846	22.49	600	816.08	93.63
847	0	560	835.03	119.17
848	0	600	834.47	101.6
85	3.3	640	863.46	96.82
850	0	600	834.47	101.6
851	0	600	834.47	101.6
8510	0	500	831.05	143.44
8512	0	570	773.52	88.19
8514	0	570	773.52	88.19
8516	0	570	773.52	88.19
8518	0	570	713.09	62
852	10.23	480	836.11	154.3

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
8520	0	270	523.87	110
8522	0	270	963.06	300.3
8524	34.85	540	861.05	139.11
8526	43.14	600	856.43	111.11
8528	17.54	350	853.79	218.29
853	51.59	490	846.16	154.33
8530	26.13	640	863.35	96.78
8532	31.86	630	860.11	99.71
8534	41.97	560	855.33	127.97
8536	0	1,150.00	1,215.93	28.57
8538	0	1,150.00	1,422.52	118.08
8540	4.61	320	623.82	131.64
8542	3.77	330	623.82	127.31
8544	7.42	340	623.82	122.98
8546	11.22	390	623.83	101.32
855	37.62	480	846.05	158.61
8550	0	370	846.5	206.47
8554	0	370	846.68	206.54
8556	0	370	846.82	206.6
8558	5.61	500	823.21	140.05
856	8.02	590	837.42	107.21
8560	0	680	972.29	126.65
8562	2.3	680	864.47	79.93
8564	0	280	493.72	92.61
8568	0	620	956.19	145.67
857	13.66	650	837.75	81.35
8570	0	390	871.06	208.45
8572	0	390	562.94	74.93
8574	0	390	562.94	74.93
8576	0	390	871.06	208.45
8578	0	390	563.02	74.97
8580	0	390	870.99	208.41
859	4.3	680	837.74	68.35
8590	62.89	520	935.75	180.15
8592	0	280	957.49	293.56
8598	0	230	850.88	269.03
86	0	640	863.65	96.91
860	7.15	580	837.42	111.54
8604	2.57	160	851.84	299.78
8606	5.12	440	864	183.72
861	0	680	837.74	68.35
8616	5.63	600	925.99	141.25
8618	0	810	1,171.14	156.48
862	0	520	837.28	137.48
8622	21.17	660	954.38	127.55
8624	0.58	1,080.00	1,171.76	39.76
8626	3.54	400	863.73	200.94
8628	9.09	540	937.16	172.09
863	0	520	837.37	137.52
8630	2.41	250	943.68	300.57
8632	0	150	837.64	297.95
8634	0	450	864.4	179.56
8636	5.2	450	864.34	179.53
864	0.08	520	837.52	137.58
8640	5.83	560	963.57	174.87
8642	1.77	310	841.52	230.31
8648	5.15	610	792.29	78.99
865	11.72	650	841.66	83.04
8652	0.53	510	793.37	122.79
8654	1.52	440	795.68	154.11
8658	69.02	1,150.00	1,664.97	223.14
8660	9.76	810	1,664.74	370.36
867	4.33	680	840.01	69.33
868	18.74	590	843.05	109.65
8682	0	1,120.00	1,188.60	29.72
869	71.86	600	845.79	106.5

Node Report – Peak Hour Demand Scenario

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
8692	0.08	470	1,188.63	311.38
87	21.05	650	863.65	92.57
870	1.8	650	841.64	83.04
8702	0	690	964.31	118.86
8704	0	810	882.46	31.4
8706	0	410	977.69	245.98
8710	4.5	1,440.00	1,938.08	215.82
8714	0.36	560	928.24	159.56
872	15.3	650	843.07	83.66
873	11.47	640	843.05	87.98
874	43.68	680	846.48	72.14
875	26.51	680	849.04	73.25
878	3.45	610	855.64	106.44
879	2.34	680	849.04	73.25
880	18.53	680	855	75.83
881	5.51	640	859.45	95.09
882	0.55	720	859.45	60.42
883	0	640	859.8	95.24
885	0	400	864.05	201.07
886	0	480	864	166.39
887	0	660	863.91	88.35
888	8.27	680	864.07	79.76
889	10.6	510	864.03	153.4
89	57.75	450	855.17	175.56
890	1.9	680	864.09	79.77
891	3.19	490	864.06	162.08
892	14.51	470	864.01	170.73
893	15.97	590	864.24	118.83
894	3.82	660	864.18	88.47
896	3.03	550	864.1	136.1
898	9.53	630	864.27	101.51
9	0	510	936.45	184.78
90	0	650	863.22	92.39
900	3.36	690	864.03	75.41
901	18.8	680	864.03	79.74
902	6.08	450	864.09	179.42
903	6.82	720	864.03	62.41
904	3.62	470	864.93	171.12
906	9.64	720	864.03	62.41
907	2.46	400	866.14	201.98
908	9.85	430	865.29	188.61
909	27.05	600	864	114.39
91	25.82	640	863.16	96.69
910	3.82	420	865.36	192.97
911	11.79	690	864.04	75.41
913	10.79	690	864.09	75.43
915	5.85	670	864.16	84.13
917	0	620	864.16	105.8
919	42.13	600	864.4	114.56
92	0	630	863.14	101.02
920	0	600	864.4	114.56
921	4.57	600	864.39	114.56
922	3.63	640	864.16	97.13
923	14.73	470	864.37	170.88
924	0.97	600	864.16	114.46
925	8.62	570	864.33	127.53
926	8.7	550	864.33	136.2
927	7.99	490	863.94	162.03
929	37.19	520	863.95	149.03
93	39.1	440	856.62	180.52
930	18.33	720	970.97	108.75
931	8.83	560	971.35	178.24
932	24.49	600	971.6	161.01
934	20.03	560	971.36	178.24
935	4.12	580	971.61	169.68
937	35.77	540	971.06	186.78

ID	Demand (gpm)	Elevation (ft)	Head (ft)	Pressure (psi)
938	17.11	590	971.2	165.18
939	26.64	660	971.18	134.83
94	2.29	240	824.4	253.22
940	3.48	600	970.77	160.66
941	10.37	580	970.78	169.32
942	7.57	590	970.8	165
943	7.67	590	970.74	164.97
944	89.17	720	965.37	106.32
945	21.78	720	965.38	106.32
946	11.04	730	965.43	102.01
947	7.87	600	970.64	160.6
948	32.34	720	966.72	106.9
949	19.11	630	970.58	147.57
95	13.78	640	863.21	96.72
950	11.76	680	967.83	124.72
951	8.11	680	967.83	124.72
953	19.83	680	970.57	125.9
954	36.31	700	1,233.60	231.21
957	1.45	740	1,235.88	214.86
959	13.1	740	1,235.87	214.86
96	35.64	640	863.6	96.89
960	5.42	760	1,232.12	204.57
963	3.04	760	1,235.86	206.19
964	5.35	760	1,235.86	206.19
965	24.5	700	1,231.32	230.22
966	18.67	780	1,231.40	195.59
967	0	630	970.63	147.59
969	13.6	640	970.62	143.26
97	0	440	855.79	180.16
971	11.52	840	1,235.86	171.53
972	6.62	790	1,235.86	193.19
973	11.56	800	1,235.86	188.86
974	7.3	730	1,223.16	213.68
975	16.15	820	1,229.64	177.5
977	2.83	640	1,221.67	252.04
98	0	610	862.53	109.42
980	4.18	760	1,223.16	200.69
981	0	740	1,222.08	208.89
986	6.21	760	1,221.70	200.06
987	0.86	700	1,221.68	226.05
989	0.86	710	1,221.68	221.71
99	17	210	798.66	255.07
990	7.64	650	1,221.67	247.7
992	6.46	750	1,221.68	204.38
993	43.3	880	1,221.78	148.09
994	30.19	730	1,221.52	212.98
996	8.08	710	1,221.67	221.71
997	0	690	1,221.68	230.38
998	1.57	700	1,221.68	226.05

Pipe Report – Peak Hour Demand Scenario

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
0	517	525	339.18	8	120	9.96	0.06	0	0
1	517	492	1,777.01	6	120	-46.78	0.53	0.53	0.3
10	6	4	1,168.15	8	120	-19.63	0.13	0.02	0.01
100	1068	1065	50.89	12	120	0	0	0	0
1000	947	943	878.94	12	120	-173.29	0.49	0.1	0.11
10000	2630	2628	1	12	120	1,800.00	5.11	0.01	8.73
10002	2629	2631	1	12	120	1,800.00	5.11	0.01	8.73
10004	8000	2628	3	2	120	0	0	0	0
10006	2629	8000	3	4	120	0	0	0	0
10008	8001	2630	3	8	120	1,800.00	11.49	0.19	62.91
1001	949	947	683.51	12	120	-151.83	0.43	0.06	0.09
10010	2631	8001	3	8	120	1,800.00	11.49	0.19	62.93
10016	10013	10015	70.42	14	120	0	0	0	0
10018	10015	1302	120.01	14	120	-1,298.48	2.71	0.27	2.25
1002	946	945	594.43	6	120	21.78	0.25	0.04	0.07
10020	10013	10003	76.36	12	120	-930.33	2.64	0.2	2.57
10022	10015	10007	79.9	12	120	1,298.48	3.68	0.38	4.77
10024	10003	10001	21.61	8	120	-930.33	5.94	0.4	18.53
10026	8004	10001	36.42	8	120	930.33	5.94	0.67	18.53
10028	10005	8004	29.39	8	120	930.37	5.94	0.54	18.53
1003	948	946	741.51	6	120	121.99	1.38	1.3	1.75
10030	10005	10007	21.62	12	120	-1,298.48	3.68	0.1	4.77
10032	8006	10003	34.66	4	120	0	0	0	0
10034	10007	8006	32.65	4	120	0	0	0	0
10036	10017	1305	52.86	8	120	0	0	0	0
1004	2448	2446	15	6	120	0	0	0	0
10040	10019	59	36.33	16	120	-3,003.73	4.79	0.2	5.55
10046	39	10021	874.62	12	120	530.85	1.51	0.8	0.91
10048	10023	52	788.17	8	120	-535.71	3.42	5.26	6.67
1005	2449	2447	14.37	6	120	0	0	0	0
10050	10025	10023	5.66	8	120	0	0	0	0
10052	10027	10029	3	6	120	535.71	6.08	0.08	27.08
10054	10033	10031	3	6	120	-535.71	6.08	0.08	27.08
10056	8010	10031	3	6	120	535.71	6.08	0.08	27.06
10058	10029	8010	3	6	120	535.71	6.08	0.08	27.08
1006	2034	2035	351.65	6	120	-93.71	1.06	0.38	1.07
10060	10027	8008	2.76	3	120	0	0	0	0
10062	8008	10033	3	3	120	0	0	0	0
10064	10023	10027	18.03	8	120	535.71	3.42	0.12	6.67
10066	10025	10033	17.9	8	120	-535.71	3.42	0.12	6.67
10068	10035	10037	14.18	24	120	-1,914.58	1.36	0	0.33
1007	2450	2440	58.23	8	120	0	0	0	0
10070	10037	8702	6.36	24	120	-1,914.58	1.36	0	0.34
10076	10039	1215	115.21	16	120	-1,660.86	2.65	0.21	1.85
1008	2453	2442	128.99	8	120	-745.2	4.76	1.59	12.29
10082	10043	10041	136.84	12	120	0	0	0	0
10084	1453	10043	1,839.34	12	120	1,445.32	4.1	10.7	5.81
10086	10045	10049	3	8	120	1,445.32	9.23	0.13	41.91
10088	8012	10045	3	8	120	1,445.32	9.23	0.13	41.91
1009	2437	2441	1,257.24	24	120	2,107.76	1.49	0.5	0.4
10090	10047	8012	3	8	120	1,445.32	9.23	0.13	41.91
10092	10047	10051	3	4	120	0	0	0	0
10094	8014	10049	3	4	120	0	0	0	0
10096	10051	8014	3	4	120	0	0	0	0
10098	10049	10041	74.63	12	120	1,445.32	4.1	0.43	5.81
101	1070	1068	37.57	12	120	0	0	0	0
1010	2453	2455	242.69	8	120	745.2	4.76	2.98	12.29
10100	10043	10047	46.56	12	120	1,445.32	4.1	0.27	5.81
10102	10055	10053	23.42	14	120	0	0	0	0
10104	10055	809	738.89	14	120	2,279.08	4.75	4.71	6.38
10106	10053	10061	16	12	120	2,292.37	6.5	0.22	13.66
10108	10057	10055	32	12	120	2,292.37	6.5	0.44	13.66
1011	2110	2120	741.11	6	120	15.22	0.17	0.03	0.04

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
10110	10061	8018	3	8	120	2,292.37	14.63	0.3	98.45
10112	8018	10057	3	8	120	2,292.37	14.63	0.3	98.47
10114	10061	10065	3	4	120	0	0	0	0
10116	10065	8016	3	4	120	0	0	0	0
10118	8016	10067	3	4	120	0	0	0	0
1012	2113	2114	119.12	16	120	-958.37	1.53	0.08	0.67
10120	10067	10057	3	4	120	0	0	0	0
10122	1475	10069	942	8	120	1.11	0.01	0	0
10124	1452	10075	1,360.72	12	120	-117.67	0.33	0.08	0.06
10126	10075	10077	1,070.40	12	120	-182.11	0.52	0.13	0.13
10128	10077	1484	940.31	12	120	-244.7	0.69	0.2	0.22
1013	1673	1674	6.36	10	120	68.98	0.28	0	0.06
10130	10077	10079	228.49	8	120	39.31	0.25	0.01	0.05
10132	10075	10081	252.84	8	120	45.87	0.29	0.02	0.07
10134	10079	10083	240.77	8	120	22.29	0.14	0	0.02
10136	10081	10085	228.92	8	120	20.58	0.13	0	0.02
10138	1466	10087	216.93	8	120	18.08	0.12	0	0.01
1014	1670	100092	23.93	10	120	0	0	0	0
10140	700	8	445.41	8	120	-221.51	1.41	0.58	1.3
10142	710	12	477.65	8	120	-210.88	1.35	0.57	1.19
10144	714	886	14.31	20	120	466.71	0.48	0	0.06
10146	8020	960	14.68	8	120	0	0	0	0
10148	8022	2536	25.4	8	120	0	0	0	0
1015	1670	100088	45.18	8	120	68.98	0.44	0.01	0.15
10150	8024	2539	6.54	8	120	0	0	0	0
10152	8026	2443	2.44	8	120	0	0	0	0
10154	8028	2444	2.2	8	120	0	0	0	0
10156	8031	2453	3.86	8	120	0	0	0	0
1016	1671	1670	36.01	10	120	68.98	0.28	0	0.05
10160	8034	2044	14.11	8	120	0	0	0	0
10162	2283	2266	1,686.56	8	120	390.5	2.49	6.26	3.71
10164	8036	8710	7.18	8	120	0	0	0	0
10166	8038	10016	27.06	8	120	0	0	0	0
10168	8040	2163	13.16	10	120	0	0	0	0
1017	1727	1671	1,624.24	6	120	71.82	0.82	1.06	0.66
10170	8042	2190	4.65	8	120	0	0	0	0
10172	8044	2190	11.33	6	120	0	0	0	0
10174	8046	10058	697.94	8	120	0	0	0	0
10176	2606	8048	0.54	12	120	0	0	0	0
10178	8048	100002	0.43	12	120	0	0	0	0
1018	579	582	1,539.91	6	120	9.63	0.11	0.02	0.02
10184	1004	1012	1,103.78	8	110	8.75	0.06	0	0
10186	1012	2598	1,176.78	8	110	8.75	0.06	0	0
1019	579	628	1,312.06	6	120	21.72	0.25	0.09	0.07
102	1066	1069	47.52	12	120	718	2.04	0.08	1.59
1020	574	579	449.41	6	120	47.37	0.54	0.14	0.3
10208	1020	28	535.69	12	120	1.19	0	0	0
1021	576	574	555.12	8	120	67.24	0.43	0.08	0.14
10210	1020	1016	507.88	12	120	-424.52	1.2	0.31	0.6
10212	1056	8532	357.09	8	120	332.99	2.13	0.99	2.76
10214	1164	116	597.39	12	120	148.65	0.42	0.05	0.09
10216	1056	1164	667.98	8	120	-367.84	2.35	2.22	3.32
10218	1977	1214	157.19	20	130	-374.39	0.38	0.01	0.03
1022	576	626	893.63	6	120	13.64	0.15	0.03	0.03
10220	1214	100174	2,229.10	20	130	-442.33	0.45	0.1	0.05
10222	1214	1238	902.73	8	120	67.94	0.43	0.13	0.15
10224	1965	1334	857.57	6	120	34.86	0.4	0.15	0.17
10226	1334	1278	424.11	4	120	34.86	0.89	0.53	1.24
10228	1278	1994	835.17	4	120	85.51	2.18	5.45	6.52
1023	583	576	726.43	8	120	114.77	0.73	0.28	0.38
10230	2033	1278	1,547.08	8	120	56.75	0.36	0.16	0.1
10234	179	143	1,385.86	16	130	-1,643.66	2.62	2.17	1.57
10236	2	1400	822.08	8	120	-15.31	0.1	0.01	0.01
10238	1400	10	805.17	8	120	-15.31	0.1	0.01	0.01
1024	1758	2248	470.32	12	120	-795.46	2.26	0.9	1.92
10242	249	1354	2,932.05	16	120	-437.21	0.7	0.46	0.16

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
10244	1422	147	220.25	12	120	566.86	1.61	0.23	1.03
10246	141	1422	1,146.38	8	120	17.21	0.11	0.01	0.01
10248	360	1492	499.1	12	120	-16.79	0.05	0	0
1025	1767	1766	15.02	18	120	336.68	0.42	0	0.06
10250	1492	342	33.45	12	120	317.9	0.9	0.01	0.35
10252	1492	328	270.81	12	120	-334.69	0.95	0.1	0.39
10254	1500	20004	59.11	8	120	245.35	1.57	0.09	1.57
10256	1560	316	1,682.74	10	120	145.62	0.59	0.34	0.2
10258	1500	1562	849.63	8	120	-50.69	0.32	0.07	0.08
1026	1768	1767	7.56	18	120	336.68	0.42	0	0.05
10260	1562	1624	587.94	8	120	-50.69	0.32	0.05	0.08
10262	1624	1560	344.22	8	120	-50.77	0.32	0.03	0.08
10264	1642	605	372.91	12	120	-203.97	0.58	0.06	0.15
10266	1642	1742	618.62	8	120	63.55	0.41	0.08	0.13
10268	1742	1812	823.48	8	120	18.39	0.12	0.01	0.01
1027	1756	1766	664.48	8	120	-336.68	2.15	1.87	2.82
10270	1812	1824	304.17	8	120	12.19	0.08	0	0.01
10272	1742	1798	1,296.57	8	120	33.21	0.21	0.05	0.04
10274	1964	553	831.15	14	120	314.54	0.66	0.14	0.16
10276	1798	1964	743.47	8	120	0	0	0	0
10278	1798	1972	182.45	8	120	31.72	0.2	0.01	0.04
10280	1972	1864	1,529.05	8	120	23.68	0.15	0.03	0.02
10282	1980	685	60.89	10	120	-473.27	1.93	0.11	1.79
10284	2012	551	107.43	8	120	-96.79	0.62	0.03	0.28
10286	2012	2030	854.47	8	120	-110.89	0.71	0.31	0.36
10288	2030	2008	939.54	8	120	-119.11	0.76	0.39	0.41
10290	2008	2000	1,617.91	8	120	-77.66	0.5	0.3	0.19
10292	2008	2000	1,571.63	8	120	-78.88	0.5	0.3	0.19
10294	1980	2000	396.09	8	120	157.8	1.01	0.27	0.69
10296	2084	842	1,257.06	6	120	47.07	0.53	0.38	0.3
10298	867	2100	463.51	8	120	341.46	2.18	1.34	2.9
103	1072	1069	37.87	10	120	-718	2.93	0.15	3.87
10300	2100	2084	349.45	8	120	263.76	1.68	0.63	1.8
10302	2100	2112	324.7	8	120	73.57	0.47	0.05	0.17
10304	2112	2142	567.47	8	120	6.45	0.04	0	0
10306	2142	1554	2,453.94	8	120	-25.97	0.17	0.06	0.02
10308	2166	1483	1,754.66	18	120	541.59	0.68	0.23	0.13
10310	2166	2164	3,609.16	12	120	0	0	0	0
10314	2170	2174	2,896.26	16	120	18.79	0.03	0	0
10316	2174	2178	3,038.22	16	120	0	0	0	0
10318	2178	2194	3,014.39	16	120	0	0	0	0
1032	1784	1786	30.95	18	120	6,445.00	8.13	0.4	12.86
10320	2228	1785	17.56	18	120	-6,445.00	8.13	0.23	12.86
10324	2368	1792	62.07	18	120	6,315.04	7.96	0.77	12.38
10326	2228	2288	104.78	18	120	6,445.00	8.13	1.35	12.86
10328	1769	2300	5.51	18	120	0	0	0	0
1033	1785	1786	17.73	18	120	-6,445.00	8.13	0.23	12.86
10330	2300	8054	18.81	12	120	0	0	0	0
10332	8054	2252	21.03	12	120	0	0	0	0
10334	2300	8056	18.11	12	120	0	0	0	0
10336	8056	2252	19.97	12	120	0	0	0	0
10338	2252	2288	2.78	18	120	0	0	0	0
10340	2370	1769	57.52	18	120	-1,132.14	1.43	0.03	0.51
10342	2288	PALAMESA_TNK	605.74	18	120	6,445.00	8.13	7.79	12.86
10344	PALAMESA_TNK	2368	193.05	16	120	3,542.42	5.65	1.45	7.53
10346	PALAMESA_TNK	2368	303.91	16	120	2,772.61	4.42	1.45	4.79
10348	2370	2248	95.52	12	120	795.46	2.26	0.18	1.92
10350	8058	1792	24.3	18	120	0	0	0	0
10352	2372	2344	20.47	6	120	0	0	0	0
10354	2382	2340	37.61	18	120	4,974.22	6.27	0.3	7.96
10356	2372	8060	19.1	6	120	0	0	0	0
10358	8060	2382	18.41	6	120	0	0	0	0
1036	583	594	314.61	6	120	11.86	0.13	0.01	0.02
10360	10017	10005	147.95	12	120	-368.11	1.04	0.07	0.46
10362	2394	1730	1,029.58	18	120	60.58	0.08	0	0
10364	2394	8007	35.29	8	120	0	0	0	0

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10368	2627	2626	41.97	24	120	0	0	0	0
10370	2396	2522	886.35	8	120	119.31	0.76	0.37	0.41
10372	2406	2396	911.78	8	120	736.78	4.7	10.97	12.03
10374	2408	10064	720.58	12	120	-147.31	0.42	0.06	0.08
10376	2410	2408	1,011.29	12	120	-137.89	0.39	0.08	0.07
10378	2412	949	850.4	8	120	-240.96	1.54	1.29	1.52
10380	2422	1667	213.44	12	120	-144.14	0.41	0.02	0.08
10382	2432	1688	155.13	12	120	-122.42	0.35	0.01	0.06
10384	2470	2504	570.63	8	120	-3.28	0.02	0	0
10386	2504	2632	390.49	8	120	-17.34	0.11	0	0.01
10388	2632	791	856.73	8	120	-22.82	0.15	0.02	0.02
10390	2634	2636	274.05	14	120	570.19	1.19	0.13	0.49
10392	2636	2638	349.13	14	120	568.59	1.19	0.17	0.49
10394	2638	761	550.26	14	120	563.64	1.17	0.26	0.48
10396	2640	761	991.32	14	120	-547.24	1.14	0.45	0.45
10398	2642	507	686.39	8	120	13.85	0.09	0.01	0.01
104	1070	1073	27.92	12	120	-1,744.20	4.95	0.23	8.24
10400	2644	1300	2,771.93	14	120	-913.08	1.9	3.25	1.17
10402	2646	2644	906.28	14	120	-865.67	1.8	0.96	1.06
10404	2648	2650	581.63	10	120	335.55	1.37	0.55	0.95
10406	2650	201	526.46	10	120	321.62	1.31	0.46	0.87
10408	2652	212	754.51	16	120	-507.85	0.81	0.16	0.21
10410	2654	471	386.97	14	120	71.74	0.15	0	0.01
10412	2656	2654	598.39	14	120	100.33	0.21	0.01	0.02
10414	2658	2656	928.53	14	120	119.04	0.25	0.02	0.03
10416	2660	472	989.5	12	120	-347.2	0.98	0.41	0.41
10418	2662	2664	1,517.31	6	120	-75.3	0.85	1.09	0.72
10420	2664	8714	812.89	6	120	-95.42	1.08	0.9	1.11
10422	2666	1175	2,096.45	14	120	-1,309.04	2.73	4.79	2.28
10424	2668	1221	796.6	8	120	107.89	0.69	0.27	0.34
10426	2670	65	947.47	16	120	-2,920.12	4.66	4.99	5.27
10428	2672	2674	266.98	8	120	-147.83	0.94	0.16	0.61
1043	1788	1790	18.93	18	120	0	0	0	0
10430	2674	1085	344.98	8	120	-152.2	0.97	0.22	0.65
10432	2676	1088	242.96	8	120	1.63	0.01	0	0
10434	2678	2680	613.09	8	120	7.71	0.05	0	0
10436	2680	1040	619.86	8	120	3.21	0.02	0	0
10438	2682	1043	444.3	8	120	2.34	0.01	0	0
1044	1791	1788	9.93	18	120	0	0	0	0
10440	2684	172	1,038.85	8	120	8.73	0.06	0	0
10442	2686	2688	563.95	18	120	4.9	0.01	0	0
10444	2688	1645	206.11	18	120	2.22	0	0	0
10446	2422	2424	395.94	8	120	49.4	0.32	0.03	0.08
10448	2424	2434	782.9	8	120	34.37	0.22	0.03	0.04
1045	1793	1791	5.41	18	120	0	0	0	0
10450	2434	2460	583.82	8	120	19.93	0.13	0.01	0.02
10452	2460	2432	391.66	8	120	5.8	0.04	0	0
10454	2692	2066	22.48	20	120	0	0	0	0
10456	2694	2064	20.15	27	120	0	0	0	0
10458	2692	8005	20.33	8	120	0	0	0	0
1046	1796	1793	5.11	24	120	0	0	0	0
10460	8005	2694	30.77	8	120	0	0	0	0
10462	8007	2696	1.51	8	120	0	0	0	0
10464	2698	8009	22.37	6	120	0	0	0	0
10466	2704	490	319.39	6	120	46.65	0.53	0.09	0.29
10468	2698	2700	65.24	6	100	46.65	0.53	0.03	0.41
1047	1801	100154	377.2	24	120	0	0	0	0
10470	2700	2702	38.91	6	100	46.65	0.53	0.02	0.41
10472	2702	2704	61.29	6	100	46.65	0.53	0.03	0.41
10474	8009	2704	21.29	6	120	0	0	0	0
10476	1843	2724	267.86	8	120	-127.22	0.81	0.12	0.47
10478	8013	2708	12.48	8	120	20.89	0.13	0	0.02
1048	1789	1769	43.21	18	120	1,132.15	1.43	0.02	0.51
10480	2706	8013	9.79	8	120	20.89	0.13	0	0.01
10482	2708	331	232.01	12	120	20.89	0.06	0	0
10488	2716	2170	2,311.35	16	120	18.79	0.03	0	0

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1049	1789	1795	18.79	18	120	-1,132.15	1.43	0.01	0.51
105	1071	1070	234.34	12	120	-1,744.20	4.95	1.93	8.24
1050	1790	1789	13.44	18	120	0	0	0	0
1051	1795	1802	113.71	18	120	-959.84	1.21	0.04	0.38
1053	588	583	761.34	8	120	138.06	0.88	0.41	0.54
10530	359	348	505.53	4	120	6.43	0.16	0.03	0.05
10534	2031	2004	1,234.99	16	120	1,452.18	2.32	1.78	1.44
10536	2004	2710	360.47	16	120	18.79	0.03	0	0
1054	1768	2370	19.83	18	120	-336.68	0.42	0	0.06
10544	2726	363	575.87	20	120	250.55	0.26	0.01	0.02
10546	2726	8033	121.84	8	120	0	0	0	0
10548	8033	2728	373.16	8	120	0	0	0	0
1055	1795	1808	646.1	10	120	-172.3	0.7	0.18	0.28
10550	363	361	33.88	20	120	249.1	0.25	0	0.02
10554	2710	2740	58.9	8	120	18.79	0.12	0	0.01
10556	2740	2742	14.3	8	120	0	0	0	0
10558	2742	8037	22.42	8	120	0	0	0	0
1056	674	655	318.98	4	120	-6.93	0.18	0.02	0.06
10560	2744	2746	15.01	8	120	0	0	0	0
10566	2710	2748	44.71	16	120	0	0	0	0
10568	2748	2716	34.85	16	120	18.79	0.03	0	0
1057	655	658	879.21	10	120	109.33	0.45	0.1	0.12
10570	2740	8035	23.3	4	120	18.79	0.48	0.01	0.4
10572	2746	2748	58.8	8	120	18.79	0.12	0	0.01
10574	8035	2746	19.41	4	120	18.79	0.48	0.01	0.4
10576	8037	2744	20.57	8	120	0	0	0	0
10578	2750	136	227.98	16	120	1,643.66	2.62	0.41	1.82
1058	746	738	537.06	6	120	3.95	0.04	0	0
10580	2750	2752	172.05	16	120	0	0	0	0
10582	2752	2756	81.81	16	120	1,643.66	2.62	0.15	1.82
10584	2754	2750	54.03	16	120	1,643.66	2.62	0.1	1.82
10586	2756	8039	18.74	16	120	1,643.66	2.62	0.03	1.82
10588	2754	8041	34.85	2	120	0	0	0	0
1059	648	644	163.74	6	120	-2.13	0.02	0	0
10590	8039	2754	19.77	16	120	1,643.66	2.62	0.04	1.82
10592	8041	2756	40.87	2	120	0	0	0	0
10594	8636	82	12.47	12	100	-547.81	1.55	0.02	1.35
106	1073	1072	46.24	16	120	-718	1.15	0.02	0.39
1060	1822	1802	1,114.07	14	120	779.29	1.62	0.97	0.87
10602	1940	1952	347.49	6	120	0	0	0	0
1061	1802	1804	20.45	18	120	-180.55	0.23	0	0.01
1062	1805	1807	376.38	36	120	2,615.38	0.82	0.03	0.08
1063	1754	100158	1,610.20	18	120	-2,609.65	3.29	3.88	2.41
1064	1826	100160	465.46	8	120	-10.95	0.07	0	0
1065	1835	8704	2,359.46	42	120	0	0	0	0
1067	1806	1804	69.71	8	120	180.55	1.15	0.06	0.89
1068	664	663	30.79	10	120	5.06	0.02	0	0
1069	664	658	39.55	10	120	-107.97	0.44	0	0.12
107	1092	1093	114.13	8	120	6.36	0.04	0	0
1070	1763	1745	932.17	18	120	1,648.80	2.08	0.96	1.03
1071	1746	1763	1,074.04	20	120	-2,050.86	2.09	0.99	0.92
1072	1797	1763	302.1	36	120	3,699.66	1.17	0.05	0.16
1073	688	664	689.21	10	120	-101.48	0.41	0.07	0.1
1074	1745	2394	92.66	18	120	60.58	0.08	0	0
1075	1743	1744	230.71	12	120	-717.85	2.04	0.37	1.59
1077	737	730	21.1	10	120	-54.44	0.22	0	0.03
1078	921	926	1,232.03	6	120	17.32	0.2	0.06	0.05
1079	921	923	551.15	6	120	14.73	0.17	0.02	0.03
108	1092	1089	403.24	12	120	-333.31	0.95	0.15	0.38
1080	919	910	1,723.92	8	120	-139.78	0.89	0.95	0.55
1081	915	919	1,997.29	8	120	-61.04	0.39	0.24	0.12
1082	730	711	631.95	10	120	-61.11	0.25	0.03	0.04
1083	742	737	34.06	10	120	-2.25	0.01	0	0
1085	1920	1924	479.51	16	120	147.7	0.24	0.01	0.02
1086	746	741	143.55	6	120	8.26	0.09	0	0.01
1087	1884	100052	41.28	2	120	-14.97	1.53	0.31	7.57

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1088	501	511	255.7	20	120	-2,119.78	2.16	0.25	0.98
1089	1888	1874	434.2	10	120	280.26	1.14	0.29	0.68
109	1095	1092	479.5	12	120	-325.43	0.92	0.18	0.37
1090	1884	1876	369.97	6	120	14.98	0.17	0.01	0.04
1091	1900	1888	1,010.16	10	120	295.24	1.21	0.75	0.75
1092	511	485	830.59	6	120	8.4	0.1	0.01	0.01
1093	1921	1905	1,104.38	8	120	-12.34	0.08	0.01	0.01
1094	1903	100044	39.39	2	120	12.34	1.26	0.21	5.3
1095	1894	1927	1,409.15	6	120	-95.48	1.08	1.56	1.11
1096	1904	1901	340.65	6	120	2.98	0.03	0	0
1097	1916	1904	550.32	10	120	310.56	1.27	0.45	0.82
1098	553	526	986.22	14	120	298.2	0.62	0.15	0.15
1099	660	588	1,364.00	14	120	479.29	1	0.48	0.36
11	7	5	83.07	8	120	0	0	0	0
110	1984	1920	1,365.32	16	120	225.94	0.36	0.06	0.05
1100	1925	1909	808.65	14	120	1,246.86	2.6	1.69	2.09
1101	1927	1940	307.4	6	120	7.69	0.09	0	0.01
1102	1925	1917	312.11	10	120	529.51	2.16	0.69	2.2
1103	1927	1925	122.52	14	120	1,798.58	3.75	0.5	4.11
1104	1959	1927	886	14	120	1,901.75	3.96	4.04	4.56
1105	696	715	263.52	6	120	23.62	0.27	0.02	0.08
1106	696	686	222.35	6	120	5.72	0.06	0	0.01
1108	713	10066	209.05	12	120	637.51	1.81	0.27	1.28
1109	1958	100032	41.39	6	120	0	0	0	0
111	1961	1976	297.84	16	120	-1,901.75	3.03	0.71	2.38
1110	1959	1961	736.71	16	120	-1,901.75	3.03	1.75	2.38
1111	1954	1944	200.81	8	120	0	0	0	0
1112	713	734	1,548.90	12	120	-637.51	1.81	1.98	1.28
1113	733	10066	1,538.62	6	120	-20.91	0.24	0.1	0.07
1114	699	735	761.48	6	120	5.15	0.06	0	0
1115	661	660	880.7	6	120	-28.27	0.32	0.1	0.12
1116	675	10042	334.88	6	120	-46.89	0.53	0.1	0.3
1117	675	676	594.91	6	120	16.56	0.19	0.03	0.04
1118	684	675	287.92	6	120	-25.15	0.29	0.03	0.09
1119	699	684	260.19	8	120	-20.57	0.13	0	0.02
112	2010	1924	3,025.63	16	120	-71.86	0.11	0.02	0.01
1120	1962	1965	450.22	6	120	50.63	0.57	0.15	0.34
1121	703	699	10.17	8	120	-11.67	0.07	0	0.01
1122	702	703	961.8	6	120	-10.57	0.12	0.02	0.02
1123	10056	935	1,543.50	12	120	357.71	1.01	0.68	0.44
1124	1922	8562	632.32	16	120	2.3	0	0	0
1125	1890	1850	1,388.09	8	120	35.36	0.23	0.06	0.04
1126	1891	1892	1,285.11	8	120	36.02	0.23	0.06	0.05
1127	1814	1813	178.75	8	120	2.39	0.02	0	0
1128	1830	1850	533.14	8	120	-34.55	0.22	0.02	0.04
1129	1830	1828	740.48	6	120	4.96	0.06	0	0
113	937	942	1,739.48	12	120	202.37	0.57	0.27	0.15
1130	934	937	1,257.88	12	120	256.48	0.73	0.3	0.24
1131	935	934	664.25	12	120	329.1	0.93	0.25	0.38
1132	907	910	557.49	12	120	673.08	1.91	0.79	1.41
1133	10008	1834	116.39	12.1	120	15.35	0.04	0	0
1134	1819	907	387.46	12	120	675.54	1.92	0.55	1.42
1135	1803	1764	811.67	6	120	-92.93	1.05	0.86	1.06
1136	935	932	441.93	8	120	24.49	0.16	0.01	0.02
1137	1946	1951	177.02	16	120	-358.1	0.57	0.02	0.11
1138	1867	1922	2,041.96	16	120	45.23	0.07	0	0
1139	929	927	450.99	6	120	7.99	0.09	0.01	0.01
114	1951	1987	607.21	8	120	15.48	0.1	0.01	0.01
1140	1867	929	1,880.79	6	120	45.18	0.51	0.52	0.28
1141	1752	1817	1,354.85	14	120	155.27	0.32	0.06	0.04
1142	900	901	519.93	8	120	18.8	0.12	0.01	0.01
1143	891	892	194.14	4	120	14.51	0.37	0.05	0.24
1144	889	886	163.13	6	120	36.42	0.41	0.03	0.19
1145	896	889	210.4	6	120	47.01	0.53	0.06	0.3
1146	10054	902	474.66	6	120	6.08	0.07	0	0.01
1147	896	10054	61.52	6	120	23.78	0.27	0.01	0.08

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1148	904	896	1,208.33	6	120	73.83	0.84	0.83	0.69
1149	898	893	699.97	6	120	15.97	0.18	0.03	0.04
115	1977	1957	682.82	20	120	374.39	0.38	0.03	0.04
1151	926	925	139.63	6	120	8.62	0.1	0	0.01
1152	917	924	569.59	6	120	0.97	0.01	0	0
1153	917	922	184.87	8	120	3.63	0.02	0	0
1154	915	917	1,034.39	8	120	4.6	0.03	0	0
1155	913	915	206.48	6	120	-50.59	0.57	0.07	0.34
1156	911	913	232.64	6	120	-39.8	0.45	0.05	0.22
1157	900	903	417.54	8	120	15.49	0.1	0	0.01
1158	888	900	716.34	8	120	37.66	0.24	0.03	0.05
1159	894	888	1,501.16	8	120	45.93	0.29	0.11	0.07
1160	885	1726	894.87	16	120	2,168.79	3.46	2.72	3.04
1161	569	565	379.78	6	120	73.46	0.83	0.26	0.68
1162	585	569	573.18	6	120	82.4	0.93	0.48	0.85
1163	1739	1727	239.23	6	120	80.69	0.92	0.19	0.81
1164	1749	1739	522.87	6	120	82.27	0.93	0.44	0.84
1165	1744	1758	1,064.59	12	120	-737.18	2.09	1.78	1.67
1166	1729	1743	603.1	12	120	-717.85	2.04	0.96	1.59
1167	1805	1797	315.65	36	120	-2,615.38	0.82	0.03	0.08
1168	1829	1747	2,689.86	6	120	-31.02	0.35	0.37	0.14
1169	1808	1816	554.11	8	120	-201.88	1.29	0.61	1.09
117	1963	1968	590.5	6	120	22.84	0.26	0.05	0.08
1170	1859	1870	101.16	8	120	-329.24	2.1	0.27	2.71
1171	1827	1816	708.86	4	120	-56.09	1.43	2.12	2.99
1172	1858	1870	455.92	6	120	-15.23	0.17	0.02	0.04
1173	1856	1857	50.5	6	120	-84.8	0.96	0.04	0.89
1174	1851	1856	546.04	6	120	-73.49	0.83	0.37	0.68
1175	1853	1851	253.2	8	120	-25.56	0.16	0.01	0.02
1177	1872	1871	195.16	6	120	165.48	1.88	0.6	3.07
1178	1800	1818	775.87	6	120	80.26	0.91	0.62	0.8
1179	1842	1840	173.69	8	120	115.16	0.74	0.07	0.39
118	1969	1963	353.21	6	120	28.75	0.33	0.04	0.12
1180	1843	1842	198.02	8	120	118.29	0.75	0.08	0.41
1181	1863	1866	869.69	8	120	134.8	0.86	0.45	0.52
1182	1866	1846	1,391.58	8	120	128.57	0.82	0.66	0.47
1183	1760	1734	1,336.22	6	120	143.81	1.63	3.17	2.37
1184	1877	1878	257.92	8	120	22.05	0.14	0	0.02
1185	1874	1877	224.05	8	120	22.05	0.14	0	0.02
1186	1913	1910	213.11	8	120	25.9	0.17	0.01	0.02
1187	1913	1916	173.53	8	120	-218.95	1.4	0.22	1.27
1188	1906	1911	539.61	8	120	-192.48	1.23	0.54	1
1189	1906	1896	148.62	8	120	3.22	0.02	0	0
119	1967	1966	36.58	6	120	27.47	0.31	0	0.11
1190	1909	1906	217.65	8	120	-188.38	1.2	0.21	0.96
1191	1937	1940	306.01	6	120	-6.35	0.07	0	0.01
1192	1938	1937	113.54	6	120	-3.07	0.03	0	0
1194	1921	1915	250.87	8	120	6.6	0.04	0	0
1195	1942	1948	444.71	8	120	0	0	0	0
1196	1923	1929	425.81	8	120	4.65	0.03	0	0
1197	1923	1921	78.7	8	120	-4.65	0.03	0	0
1198	1942	1923	577.21	8	120	0	0	0	0
1199	937	930	1,737.27	6	120	18.33	0.21	0.09	0.05
12	7	9	300.05	8	120	-25.53	0.16	0.01	0.02
120	1971	1934	768.68	20	120	1,303.91	1.33	0.31	0.4
1200	934	938	599.38	6	120	43.75	0.5	0.16	0.26
1201	934	931	1,011.52	6	120	8.83	0.1	0.01	0.01
1202	1965	1931	630.26	4	120	15.78	0.4	0.18	0.29
1203	1895	1893	691.9	6	120	133.04	1.51	1.42	2.05
1204	1928	8622	1,168.76	6	120	375.61	4.26	16.4	14.03
1205	10000	1416	19.26	8.1	120	0	0	0	0
1206	1924	1941	502.92	6	120	5.08	0.06	0	0
1207	890	887	165.34	10	120	365.03	1.49	0.18	1.11
1208	1819	1762	998.53	6	120	115.09	1.31	1.57	1.57
1209	1762	1761	97.36	6	120	114.51	1.3	0.15	1.55
1210	1761	1764	431.34	6	120	114.38	1.3	0.67	1.55

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1211	1764	1811	392.83	6	120	12.68	0.14	0.01	0.03
1212	1750	8626	307.21	10	120	585.9	2.39	0.82	2.65
1213	1738	10006	68.56	10	120	580.15	2.37	0.18	2.61
1214	894	890	184.33	12	120	366.92	1.04	0.08	0.46
1216	1819	10008	1,194.26	12	120	-795.16	2.26	2.3	1.92
1217	1879	1871	472.25	6	120	-71.18	0.81	0.3	0.64
1218	1839	1854	998.49	8	120	-322.83	2.06	2.61	2.61
1219	1854	1859	146.44	8	120	-325.34	2.08	0.39	2.65
122	1953	1981	879.1	16	120	1,406.97	2.25	1.2	1.36
1220	1840	1800	1,630.10	6	120	105.14	1.19	2.16	1.33
1221	1840	1826	773.78	8	120	2.41	0.02	0	0
1222	1404	1370	1,714.78	16	120	3,027.19	4.83	9.66	5.63
1223	1405	1404	69.21	16	120	3,360.45	5.36	0.47	6.83
1224	1407	1405	340.02	16	120	3,360.45	5.36	2.32	6.83
1225	1380	1370	1,388.26	24	120	-2,142.98	1.52	0.57	0.41
1226	1386	1395	1,111.91	6	120	41.11	0.47	0.26	0.23
1227	1391	1379	376.98	8.1	120	8.06	0.05	0	0
1228	1393	1376	904.44	8	120	-47.25	0.3	0.07	0.07
1229	1397	1386	841.87	8	120	-98.73	0.63	0.24	0.29
123	1953	8706	1,098.50	16	120	-1,407.38	2.25	1.5	1.36
1230	1385	1382	33.27	24.1	120	43.61	0.03	0	0
1231	1384	1382	935.92	24	120	-1,881.91	1.33	0.3	0.32
1232	1387	1384	837.57	24	120	-1,874.19	1.33	0.27	0.32
1233	1352	1351	156.3	6	120	40.83	0.46	0.04	0.23
1234	1280	1276	249.36	14	120	-1,648.27	3.44	0.87	3.5
1235	1285	1279	550.46	6	120	1.75	0.02	0	0
1236	1295	1285	760.56	6	120	46.31	0.53	0.22	0.29
1237	1298	1295	857.38	6	120	68.67	0.78	0.52	0.6
1238	98	102	6.96	4	120	224.05	5.72	0.27	38.83
1239	106	107	1.04	4	120	-214.35	5.47	0.04	35.76
124	1981	1935	981.83	8	120	10.11	0.06	0	0
1240	98	92	149.46	8	120	-410.96	2.62	0.61	4.08
1241	107	100144	5	4	120	-224.05	5.72	0.19	38.83
1242	1373	1392	581	8	120	5.13	0.03	0	0
1243	1392	1396	252.77	8	120	0	0	0	0
1244	1691	1699	267.55	10	120	7.99	0.03	0	0
1246	1616	1625	404.28	6	120	38.75	0.44	0.08	0.21
1248	8542	1596	325.04	6	120	4.73	0.05	0	0
1249	8544	1605	213.39	6	120	-1.61	0.02	0	0
125	1936	1990	1,747.65	12	120	-487.94	1.38	1.36	0.78
1250	1605	1598	212.81	6	120	6.96	0.08	0	0.01
1251	1605	1611	1,023.77	6	120	-16.97	0.19	0.05	0.05
1252	1641	1654	1,424.37	6	120	120.2	1.36	2.42	1.7
1254	1691	1686	539.36	6	120	6.31	0.07	0	0.01
1255	1677	1672	261.18	6	120	8.24	0.09	0	0.01
1256	1660	1651	339.51	6	120	11.53	0.13	0.01	0.02
1257	1606	1603	326.61	18	120	1,393.35	1.76	0.25	0.75
1258	1603	1599	833.76	18	120	1,393.35	1.76	0.63	0.75
1259	1618	1606	1,066.12	18	120	1,393.35	1.76	0.8	0.75
1260	1618	1616	141.25	12	120	-1,393.35	3.95	0.77	5.43
1261	1633	1635	198.89	6	120	3.96	0.04	0	0
1262	1633	1627	268.35	8	120	-33.62	0.21	0.01	0.04
1263	1627	1630	247.05	6	120	4.28	0.05	0	0
1264	1627	1621	127.28	8	120	-44.14	0.28	0.01	0.07
1265	1620	1618	45.97	18	120	0	0	0	0
1266	1615	1613	45.71	12	120	684.14	1.94	0.07	1.46
1267	1613	1615	126.23	4	120	-21.98	0.56	0.07	0.53
1268	1601	1597	180.7	8	120	219.63	1.4	0.23	1.28
1269	1597	1600	659.81	8	120	50.69	0.32	0.06	0.08
127	1994	1956	685.46	8	120	68.44	0.44	0.1	0.15
1270	1656	1658	416.94	12	120	0	0	0	0
1271	1594	1592	62.87	12	120	88.34	0.25	0	0.03
1272	1684	1693	359.8	8	120	3.63	0.02	0	0
1273	1684	1675	254.82	8	120	2.32	0.01	0	0
1274	1687	1666	283.33	8	120	-16.22	0.1	0	0.01
1275	1702	1701	278.52	8	120	4.07	0.03	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1276	1724	1725	53.8	6	120	1.12	0.01	0	0
1277	1724	1723	49.71	10	120	57.73	0.24	0	0.04
1278	1723	1719	60.5	6	120	2.06	0.02	0	0
1279	1723	1721	266.93	10	120	55.22	0.23	0.01	0.03
128	708	732	784.81	8	120	15.04	0.1	0.01	0.01
1280	1721	1705	210.21	8	120	13.02	0.08	0	0.01
1281	1717	1712	104.24	8	120	11.24	0.07	0	0
1282	1722	1718	125.46	8	120	22.54	0.14	0	0.02
1283	1718	1722	216.29	6	120	-7.88	0.09	0	0.01
1284	1721	1722	612.96	8	120	40.25	0.26	0.03	0.06
1285	1718	1714	216.66	8	120	27.56	0.18	0.01	0.03
1286	1717	1714	304.69	6	120	-6.45	0.07	0	0.01
1287	1714	1717	229.29	8	120	16.04	0.1	0	0.01
1288	1712	1720	287.16	8	120	5.65	0.04	0	0
1289	815	816	117.35	14.1	120	-654.42	1.34	0.07	0.61
129	1631	1609	1,000.67	8	120	19.25	0.12	0.01	0.01
1290	816	815	53.2	14	120	984.52	2.05	0.07	1.35
1291	807	799	731.29	12	120	797.22	2.26	1.41	1.93
1292	838	830	622.21	6	120	-15.77	0.18	0.02	0.04
1293	827	839	611.24	6	120	7.72	0.09	0.01	0.01
1294	781	784	302.08	6	120	116.22	1.32	0.48	1.6
1295	786	772	382.76	6	120	15.52	0.18	0.01	0.04
1296	781	776	132.52	6	120	-143.23	1.63	0.31	2.35
1297	818	797	795.88	6	120	26.17	0.3	0.08	0.1
1298	795	801	181.65	6	120	21.58	0.24	0.01	0.07
1299	813	831	735.42	6	120	14.1	0.16	0.02	0.03
13	9	10	39.52	8	120	48.64	0.31	0	0.08
130	1631	1641	960.96	12	120	-1,587.42	4.5	6.65	6.92
1300	814	790	885.13	8	120	10.32	0.07	0	0
1302	850	843	101.19	10	120	14.05	0.06	0	0
1303	848	10044	306.37	18	120	14.05	0.02	0	0
1304	794	788	338.42	8	120	356.75	2.28	1.06	3.14
1305	788	779	317.57	8	120	180.48	1.15	0.28	0.89
1306	841	848	169.1	14	120	-2,297.26	4.79	1.09	6.47
1307	843	836	353.45	8	120	12.88	0.08	0	0.01
1308	864	863	287.71	16	120	843.48	1.35	0.15	0.53
1309	863	862	79.22	20	120	2,199.62	2.25	0.08	1.05
131	1616	8550	94.42	12	120	-1,433.24	4.07	0.54	5.72
1310	862	852	1,007.43	20	120	2,321.54	2.37	1.17	1.16
1311	867	861	894.95	14	120	1,385.85	2.89	2.27	2.54
1312	859	857	145.63	14	120	-111.69	0.23	0	0.02
1313	1593	1591	437.97	6	120	18.83	0.21	0.02	0.05
1314	1552	1553	1,104.48	6	120	90.73	1.03	1.12	1.01
1315	1612	1582	1,818.18	6	120	112.94	1.28	2.76	1.52
1316	1559	1563	610.32	6	120	13.3	0.15	0.02	0.03
1317	1508	1509	214.45	8	120	102.67	0.66	0.07	0.31
1318	1573	1568	62.9	18	120	1,844.63	2.33	0.08	1.27
1319	1552	1543	436.29	18	120	1,732.41	2.18	0.49	1.13
132	842	833	496.06	8	120	38.87	0.25	0.03	0.05
1320	1543	1532	346.64	18	120	1,696.01	2.14	0.38	1.08
1321	1532	1528	176.55	18	120	1,528.88	1.93	0.16	0.9
1322	192	194	91.17	8	120	-70.63	0.45	0.01	0.16
1323	191	192	450.48	6	120	-104.71	1.19	0.59	1.32
1324	1559	1552	299.04	18	120	1,823.58	2.3	0.37	1.24
1325	1753	1704	1,626.32	8	120	263.81	1.68	2.92	1.8
1326	1537	1527	420.69	6	120	24.28	0.28	0.04	0.09
1327	1537	1536	274.19	6	120	11	0.12	0.01	0.02
1328	1543	1541	420.4	6	120	36.41	0.41	0.08	0.19
1329	1593	8642	1,084.19	18	120	1,862.59	2.35	1.4	1.29
133	780	777	462.28	8	120	8.2	0.05	0	0
1330	1550	1493	1,724.06	8	120	9.21	0.06	0.01	0
1331	1555	1550	360.16	6	120	22.23	0.25	0.03	0.07
1332	1579	1577	28.33	8	120	107.64	0.69	0.01	0.34
1333	1577	1561	802.08	8	120	61.38	0.39	0.1	0.12
1334	1566	1510	2,218.58	10	120	3.12	0.01	0	0
1335	1524	1505	804.85	12	120	-240.11	0.68	0.17	0.21

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1336	1505	1489	659.28	12	120	-291.49	0.83	0.2	0.3
1337	1524	1520	213.09	8	120	68.72	0.44	0.03	0.15
1338	1520	1514	255.2	8	120	7.71	0.05	0	0
1339	1520	1516	225.31	8	120	13.75	0.09	0	0.01
134	793	780	553.79	8	120	11.49	0.07	0	0.01
1340	1516	1519	212.57	8	120	7.3	0.05	0	0
1341	1505	1496	228.53	8	120	41.3	0.26	0.01	0.06
1342	1496	1488	237.49	8	120	18.77	0.12	0	0.01
1343	1488	1495	331.78	8	120	5.94	0.04	0	0
1344	1488	1485	207.44	8	120	7.25	0.05	0	0
1345	1496	1504	293.31	8	120	10.43	0.07	0	0
1346	1496	1490	296.34	8	120	5.79	0.04	0	0
1347	1489	1484	172.87	12	120	250.1	0.71	0.04	0.23
1348	832	757	2,199.96	6	120	-25.66	0.29	0.21	0.1
1349	757	746	604.51	6	120	20.31	0.23	0.04	0.06
135	803	835	1,220.24	8	120	21.16	0.14	0.02	0.02
1351	623	591	447.07	8	120	-65.75	0.42	0.06	0.14
1352	591	589	552.97	8	120	24.38	0.16	0.01	0.02
1353	656	663	71.66	6	120	20	0.23	0	0.06
1354	656	668	1,035.76	6	120	25.3	0.29	0.1	0.09
1355	668	677	312.58	6	120	16.87	0.19	0.01	0.04
1356	668	669	297.69	6	120	5.09	0.06	0	0
1357	578	584	243.23	6	120	6.88	0.08	0	0.01
1358	656	636	391.5	6	120	-46.94	0.53	0.12	0.3
1359	616	578	862.81	8	120	-32.07	0.2	0.03	0.04
136	803	804	130.22	8	120	-120.84	0.77	0.06	0.42
1360	643	644	29.52	12	120	127.18	0.36	0	0.06
1362	711	712	1,248.02	6	120	31.97	0.36	0.18	0.15
1363	672	660	162.3	14	120	507.56	1.06	0.06	0.39
1364	672	10066	809.83	12	120	-577.04	1.64	0.86	1.06
1365	758	760	366.32	12	120	-749.83	2.13	0.63	1.72
1366	754	726	661.18	4	120	12.06	0.31	0.11	0.17
1367	756	762	171.88	6	120	3.71	0.04	0	0
1368	758	694	1,434.31	6	120	19.36	0.22	0.08	0.06
1369	694	692	100.59	6	120	1.32	0.01	0	0
137	796	803	764.85	8	120	-88.39	0.56	0.18	0.24
1370	694	693	277.37	6	120	16.82	0.19	0.01	0.04
1371	680	687	440.41	6	120	14.72	0.17	0.02	0.03
1372	718	619	2,343.58	8	120	-92.11	0.59	0.6	0.26
1373	619	680	1,505.94	10	120	-262.79	1.07	0.91	0.6
1374	690	1980	356.35	10	120	-313.79	1.28	0.3	0.84
1375	685	2640	940.45	14	120	-524.69	1.09	0.4	0.42
1376	720	723	522.68	8	120	21.31	0.14	0.01	0.02
1377	1475	1502	887.2	12	120	-1,450.42	4.11	5.19	5.85
1378	768	724	1,037.46	8	120	125.56	0.8	0.47	0.45
1379	1432	10041	4.95	12	120	-1,445.32	4.1	0.03	5.82
138	793	796	374.2	8	120	-46.04	0.29	0.03	0.07
1380	1453	1475	577.69	12	120	-1,446.80	4.1	3.37	5.83
1383	1447	1443	1,113.68	6	120	58.53	0.66	0.5	0.45
1384	1449	1448	954.26	6	120	19	0.22	0.05	0.06
1385	1448	1445	389.77	6	120	10.83	0.12	0.01	0.02
1386	1448	1450	613.08	6	120	6.52	0.07	0	0.01
1387	1446	1447	202.47	10	120	-8.81	0.04	0	0
1388	1441	1438	675.63	8	120	0	0	0	0
1389	602	599	39.41	8	120	-26.9	0.17	0	0.03
139	777	833	1,818.62	8	120	-8.89	0.06	0.01	0
1390	629	633	1,214.74	18	120	-1,276.36	1.61	0.78	0.64
1391	1438	1437	106.84	6	120	0	0	0	0
1392	1439	1436	183.57	6	120	0	0	0	0
1393	1433	1429	381.54	8	120	0	0	0	0
1394	1429	1428	285.68	8	120	0	0	0	0
1395	1433	1430	65.13	8	120	0	0	0	0
1396	1438	1435	272.3	8	120	0	0	0	0
1397	1429	1431	206.32	6	120	0	0	0	0
1398	1435	1427	1,007.42	6	120	0	0	0	0
1399	578	558	1,797.27	8	120	-41.58	0.27	0.11	0.06

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
14	9	11	239.51	8	120	-74.17	0.47	0.04	0.17
140	778	777	67.4	8	120	-13.79	0.09	0	0.01
1400	514	10038	1,649.51	12	120	126.8	0.36	0.11	0.06
1401	558	514	2,309.72	8	120	-90.11	0.58	0.57	0.25
1402	467	493	609.76	4	120	48.06	1.23	1.37	2.24
1403	493	497	254.56	4	120	19.58	0.5	0.11	0.43
1404	497	500	68.57	4	120	10.37	0.26	0.01	0.13
1405	484	467	1,264.65	6	120	66.6	0.76	0.72	0.57
1406	555	523	1,234.04	12	120	-308.65	0.88	0.41	0.33
1407	523	2660	739.21	12	120	-320.58	0.91	0.26	0.36
1408	561	555	987.5	8	120	-45.18	0.29	0.07	0.07
1409	591	561	1,111.03	8	120	-106.34	0.68	0.37	0.33
141	793	828	1,239.19	8	120	24.5	0.16	0.03	0.02
1410	558	543	737.91	6	120	16.12	0.18	0.03	0.04
1411	526	521	684.92	6	120	18.26	0.21	0.04	0.05
1412	526	519	468.8	14	120	272.56	0.57	0.06	0.12
1413	586	1964	549.21	14	120	328.78	0.69	0.1	0.18
1414	519	511	268.05	20	120	2,131.27	2.18	0.27	0.99
1415	519	535	2,895.54	20	120	-2,638.67	2.69	4.26	1.47
1416	527	513	623	6	120	8.81	0.1	0.01	0.01
1417	506	505	336.02	6	120	1.29	0.01	0	0
1418	505	2698	125.54	6	120	46.65	0.53	0.04	0.29
1419	490	489	366	6	120	1.18	0.01	0	0
142	759	796	989.05	8	120	-26.28	0.17	0.02	0.03
1420	542	550	846.62	24	120	-2,812.59	1.99	0.58	0.68
1421	506	502	26.94	6	120	0.65	0.01	0	0
1424	1411	1412	235.91	8	120	0	0	0	0
1425	117	94	462.23	6	120	-0.71	0.01	0	0
1426	138	132	389.27	6	120	64.82	0.74	0.21	0.54
1427	135	138	129.29	6	120	442.57	5.02	2.46	19.01
1428	8598	2752	411.62	16	120	1,643.66	2.62	0.75	1.82
1429	97	93	247.78	14	120	-1,607.35	3.35	0.83	3.34
143	1166	1165	33.28	16	120	-964.29	1.54	0.02	0.68
1430	93	84	937.53	14	120	-1,724.96	3.6	3.57	3.81
1431	84	82	1,053.26	14	120	-1,761.56	3.67	4.17	3.96
1432	93	118	552.3	8	120	78.5	0.5	0.11	0.19
1434	110	96	626.48	6	120	0	0	0	0
1435	1237	1250	1,296.03	6	120	23.42	0.27	0.11	0.08
1436	130	125	245.35	8	120	22.6	0.14	0	0.02
1437	1242	1258	1,379.28	10	120	17.67	0.07	0.01	0
1438	1249	1247	268.45	6	120	303.15	3.44	2.53	9.43
1439	1281	1273	333.97	6	120	368.71	4.18	4.53	13.56
144	1165	STH-TURNER_TNK	11.4	20	120	-3,782.60	3.86	0.03	2.87
1440	99	69	1,306.10	10	120	-963.45	3.94	8.71	6.67
1441	78	68	1,682.78	10	120	1,123.54	4.59	14.92	8.86
1442	72	70	35.01	10	120	0	0	0	0
1443	70	71	147.32	10	120	710.1	2.9	0.56	3.79
1444	58	53	390.44	6	120	-12.45	0.14	0.01	0.03
1445	45	46	554.84	4	120	9.77	0.25	0.07	0.12
1446	47	41	349.69	4	120	6.37	0.16	0.02	0.05
1447	28	27	125.92	12	120	1.19	0	0	0
1448	68	61	911.1	10	120	150	0.61	0.19	0.21
1449	33	29	1,110.89	8	120	94.5	0.6	0.3	0.27
145	1166	1165	13.54	20	120	-2,818.31	2.88	0.02	1.66
1450	33	31	560.54	10	120	4.2	0.02	0	0
1451	81	75	487.35	8	120	0	0	0	0
1452	67	77	208.34	12	120	-602.58	1.71	0.24	1.15
1453	67	76	91.27	6	120	0	0	0	0
1454	39	10025	25.97	8	120	-535.71	3.42	0.17	6.67
1455	49	35	930.84	6	120	21.09	0.24	0.06	0.07
1456	82	77	513.21	12	120	603.7	1.71	0.59	1.15
1457	8634	2670	540.19	16	120	-2,913.07	4.65	2.83	5.24
1458	32	30	109.16	12	120	-3,285.51	9.32	2.9	26.61
1459	1201	1202	16.48	16	120	-3,450.87	5.51	0.12	7.18
146	1168	1166	16.94	20	120	-3,782.60	3.86	0.05	2.87

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1460	1161	1160	213.97	6	120	5.2	0.06	0	0.01
1461	1171	1167	117.21	8	120	445.6	2.84	0.56	4.74
1462	1139	1132	303.86	6	120	3.94	0.04	0	0
1463	1137	1133	280.52	4	120	5.68	0.15	0.01	0.04
1464	1140	1139	155	4	120	-38.1	0.97	0.23	1.46
1465	1139	1137	342.01	4	120	-42.04	1.07	0.6	1.75
1466	1137	1138	545.7	4	120	-54.66	1.4	1.55	2.85
1467	1138	1134	211.29	8	120	4.16	0.03	0	0
1468	15	22	1,449.55	12	120	650.13	1.84	1.92	1.32
1469	1126	1141	1,058.56	8	120	17.53	0.11	0.01	0.01
147	546	540	1,251.34	6	120	8.29	0.09	0.02	0.01
1470	1117	1154	1,397.77	6	120	-79.2	0.9	1.1	0.79
1471	1138	1152	454.25	6	120	-60.91	0.69	0.22	0.48
1472	1143	1114	1,304.23	12	120	-67.97	0.19	0.03	0.02
1473	1743	2696	28.2	8	120	0	0	0	0
1474	1870	1873	52.81	6	120	-344.48	3.91	0.63	11.95
1475	1794	1792	83.77	18	120	-6,315.04	7.96	1.04	12.38
1476	1417	1426	1,687.14	4	120	7.78	0.2	0.13	0.08
1477	1756	1753	76.03	8	120	274.01	1.75	0.15	1.93
1478	1816	1839	1,023.64	8	120	-290.46	1.85	2.2	2.15
1479	1351	1350	27.6	6	120	-2.57	0.03	0	0
148	544	550	342.04	24	120	1,746.91	1.24	0.1	0.28
1480	533	528	718.51	20	120	-3,008.97	3.07	1.35	1.88
1481	541	533	541.51	20	120	-2,986.86	3.05	1	1.85
1482	593	549	1,749.64	6	120	17.68	0.2	0.09	0.05
1483	720	718	53.96	6	120	-84.03	0.95	0.05	0.88
1484	695	696	42.56	6	120	31.68	0.36	0.01	0.14
1485	771	789	723.07	12	120	-795.61	2.26	1.39	1.92
1486	829	834	502.35	6	120	-14.82	0.17	0.02	0.04
1487	1909	1885	1,549.10	14	120	1,366.78	2.85	3.83	2.47
1488	1760	1757	331.19	8	120	33.72	0.22	0.01	0.04
1489	1749	1751	804.2	20	120	3,393.07	3.47	1.89	2.35
149	1178	1179	1.44	24.1	120	0	0	0	0
1490	1748	1749	400.06	20	120	3,480.16	3.55	0.98	2.46
1491	1747	1748	818.63	20	120	3,524.41	3.6	2.06	2.52
1492	1871	1825	1,797.79	6	120	80.5	0.91	1.45	0.81
1493	1872	100056	57.03	12	120	865.55	2.46	0.13	2.25
1494	1912	1872	1,895.10	12	120	1,057.14	3	6.17	3.26
1495	1919	1912	429.39	12	120	1,202.83	3.41	1.78	4.14
1496	1933	1926	482.87	12	120	1,418.15	4.02	2.71	5.61
1497	1926	1919	616.32	12	120	1,399.16	3.97	3.37	5.48
1498	300	292	383.78	14	120	317.9	0.66	0.06	0.17
1499	305	300	47.93	16	120	317.9	0.51	0	0.09
15	1104	1106	315.54	6	120	20.8	0.24	0.02	0.07
150	461	443	668.65	22	120	-1,800.00	1.52	0.3	0.46
1500	309	305	178.97	16	120	317.9	0.51	0.02	0.09
15000	1174	1173	7.29	12.1	120	-1,759.18	4.91	0.06	8.04
15002	1180	1178	9.27	24	120	158.97	0.11	0	0
15004	1228	1227	9.12	10	120	-199.94	0.82	0	0.36
15006	1389	1388	371.27	24	120	-1,811.58	1.28	0.11	0.3
15008	10000	1412	1,352.43	8	120	0	0	0	0
1501	312	309	156.24	16	120	317.9	0.51	0.01	0.09
15010	1471	1469	13.74	18	120	541.59	0.68	0	0.13
15012	1468	100096	12.84	10	120	0	0	0	0
15014	1462	1461	6.94	10	120	0	0	0	0
15016	1461	1458	7.38	10	120	0	0	0	0
15018	1458	1463	45.26	10	120	-541.59	2.21	0.1	2.29
1502	551	552	38	8	120	0	0	0	0
15020	1463	100106	14.05	10	120	-518.65	2.12	0.03	2.12
15022	1467	1469	47.64	10	120	-541.59	2.21	0.11	2.29
15024	178	177	3.21	8	120	58.33	0.37	0	0.11
15028	1590	1589	1.2	10	120	51.1	0.21	0	0
1503	10048	10050	53.57	16.1	120	882.63	1.39	0.03	0.56
15030	1629	1628	3.25	6	120	176.77	2.01	0.01	3.46
15032	1639	1638	7.28	12	120	90.36	0.26	0	0.03
15034	1644	1643	6.61	6	120	0	0	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
15038	1666	1667	2	12	120	144.14	0.41	0	0.09
1504	1489	1487	51.67	16	120	-541.59	0.86	0.01	0.23
15040	1711	1713	11.6	6	120	0	0	0	0
15042	1713	100064	4.25	6	120	0	0	0	0
15044	1715	1716	21.02	6	120	0	0	0	0
15046	10002	1710	70.94	6	120	-130.85	1.48	0.14	1.99
15048	10006	1741	345.76	6	120	23.51	0.27	0.03	0.08
1505	600	585	367.47	6	120	-39.4	0.45	0.08	0.22
15050	10006	1733	315.21	10	120	553.98	2.26	0.75	2.39
1506	627	620	129.31	6	120	-21.73	0.25	0.01	0.07
15060	1794	8058	14.17	18	120	0	0	0	0
15064	10008	1852	1,057.71	12	120	-830.87	2.36	2.21	2.09
1507	620	613	55.84	6	120	-30.85	0.35	0.01	0.14
15074	1861	1862	25.43	8	120	0	0	0	0
15076	1934	1933	35.41	12	120	1,817.38	5.16	0.31	8.89
15078	1883	1882	25.38	14	120	1,256.21	2.62	0.05	2.12
1508	680	689	407.18	10	120	-280.59	1.15	0.28	0.68
15080	1881	1880	4.96	8	120	1.39	0.01	0	0
15082	1865	1860	27.02	8	120	95.16	0.61	0.01	0.27
15084	1888	1886	15.74	6	120	14.98	0.17	0	0.03
15086	1886	100050	18.47	6	120	0	0	0	0
15088	10010	1885	859.18	6	120	-80.44	0.91	0.69	0.81
1509	1157	1154	182.44	6	120	206.86	2.35	0.85	4.65
15090	1898	10010	27.68	8	120	-73.26	0.47	0	0.17
15092	1855	1822	1,317.76	14	120	970.79	2.02	1.73	1.31
15094	10012	1855	168.67	14	120	1,091.67	2.28	0.28	1.63
15096	1891	1890	45.37	8	120	37.56	0.24	0	0.05
15098	1902	1900	5.16	10	120	307.58	1.26	0	0.8
151	1174	1172	33.88	12.1	120	-667.85	1.86	0.05	1.34
1510	1127	1131	76.41	8	120	20.72	0.13	0	0.02
15100	1904	1902	7.67	10	120	307.58	1.26	0.01	0.8
15102	1905	100042	20.24	8	120	0	0	0	0
15104	1903	1900	19.99	8	120	-12.34	0.08	0	0.01
15106	1911	1913	24.67	8	120	-193.05	1.23	0.02	1.01
15108	1917	1916	2.61	10	120	529.51	2.16	0.01	2.2
1511	1124	1127	88.74	8	120	20.72	0.13	0	0.02
15110	1933	1928	91.2	8	120	399.23	2.55	0.35	3.87
15112	1944	1942	17.35	8	120	0	0	0	0
15114	1961	1958	20.84	8	120	0	0	0	0
15116	1958	100028	17	8	120	0	0	0	0
15118	1967	1969	20.98	6	120	39.76	0.45	0	0.22
1512	1131	1146	685.65	6	120	20.72	0.24	0.04	0.07
15120	1982	1986	65.19	16	120	1,362.61	2.17	0.08	1.28
15122	2006	2009	62.91	16	120	-76.18	0.12	0	0.01
15124	10014	100174	23.8	20	120	1,141.30	1.17	0.01	0.31
15126	2018	2017	16.78	20	120	1,303.91	1.33	0.01	0.4
15128	2024	2025	15.95	6	120	2.18	0.02	0	0
1513	1114	1112	770.29	8	120	19.79	0.13	0.01	0.01
15130	2041	2042	33.16	16	120	-367.08	0.59	0	0.11
15132	2064	2062	23.31	27	120	0	0	0	0
15134	2062	2059	22.33	27	120	0	0	0	0
15136	2059	2054	22.33	27	120	0	0	0	0
15138	2054	2052	23.41	27	120	0	0	0	0
1514	1158	1143	368.44	12	120	39.47	0.11	0	0.01
15140	2066	2060	23.47	20	120	0	0	0	0
15142	2060	2057	22.31	20	120	0	0	0	0
15144	2057	2053	22.38	20	120	0	0	0	0
15146	2053	2051	23.37	20	120	0	0	0	0
15148	2098	2093	40.28	12	120	-332.34	0.94	0.02	0.38
1515	1129	1143	1,613.11	6	120	-29.98	0.34	0.21	0.13
15150	2093	2090	25.79	12	120	0	0	0	0
15154	2093	2095	29.22	16	120	-332.34	0.53	0	0.09
15156	2092	2096	16.05	16	120	-2,002.40	3.2	0.04	2.62
15158	2091	2092	10.1	24	120	-2,002.40	1.42	0	0.36
1516	1128	8590	834.09	8	120	75.63	0.48	0.15	0.18
15160	2116	2117	78.95	16	120	-972.92	1.55	0.05	0.69

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
15164	2125	2126	3.93	12	120	22.2	0.06	0	0
15166	2126	2127	0.93	12	120	0	0	0	0
15168	10016	2134	1,355.60	8	120	73.13	0.47	0.23	0.17
1517	1110	1111	341.49	6	120	5.78	0.07	0	0.01
15170	2167	2168	30.65	8	120	380.01	2.43	0.11	3.53
15172	2140	2139	6.55	8	120	-12.22	0.08	0	0.02
15174	2200	2198	5.77	12	120	8.99	0.03	0	0
15176	10018	2231	1,138.28	10	120	124.52	0.51	0.17	0.15
15178	2286	2285	31.37	24	120	2,079.10	1.47	0.01	0.39
1518	1151	1150	316.11	6	120	106.82	1.21	0.43	1.37
15180	2321	2322	5.23	20	120	0	0	0	0
15182	2322	2323	5.27	20	120	0	0	0	0
15184	2342	2352	21.67	12	120	0	0	0	0
15186	2352	2354	18.19	12	120	0	0	0	0
15188	2355	2351	18.2	12	120	0	0	0	0
1519	1116	1118	819.4	8	120	69.9	0.45	0.13	0.15
15190	2351	2344	21.54	12	120	0	0	0	0
15192	10020	2366	966.13	27	120	4,742.39	2.66	0.98	1.01
15194	2347	2346	17.47	18	120	4,227.21	5.33	0.1	5.89
15196	2467	2465	17.54	16	110	-51.44	0.08	0	0.01
15198	2441	2442	15.23	24	120	745.2	0.53	0	0.06
152	1175	1168	525.92	16	120	-3,782.60	6.04	4.47	8.51
1520	1125	1118	472.15	8	120	-65.02	0.42	0.06	0.13
15200	2442	2443	40.54	24	120	0	0	0	0
15202	2443	2444	16.66	24	120	0	0	0	0
15204	2445	2444	39.35	24	120	0	0	0	0
15206	2433	2435	11.55	20	120	0	0	0	0
15208	2435	2438	9.73	20	120	0	0	0	0
1521	1125	1130	80.1	8	120	33.47	0.21	0	0.04
15210	2427	2428	7.77	20	120	0	0	0	0
15212	2428	2429	26.85	20	120	0	0	0	0
15214	2429	2430	26.5	20	120	587.22	0.6	0	0.09
15216	2430	2431	28.46	20	120	974.89	1	0.01	0.24
15218	10022	10026	11.91	20	120	1,362.56	1.39	0.01	0.43
1522	1121	1136	630.36	8	120	12.41	0.08	0	0.01
15220	10026	2433	28.17	20	120	0	0	0	0
15222	10026	10028	42.83	20	120	1,362.56	1.39	0.02	0.43
15224	10028	10030	28.54	20	120	1,362.57	1.39	0.01	0.43
15226	10030	10032	30.1	20	120	775.33	0.79	0	0.15
15228	10032	10034	30.48	20	120	387.66	0.4	0	0.04
1523	1144	1145	81.13	8	120	8.22	0.05	0	0
15230	10034	2426	41	20	120	0	0	0	0
15232	2518	2516	2.77	12	120	0	0	0	0
15234	2517	U-1_TNK_1	2.51	12	120	0	0	0	0
15236	2547	2550	18.69	8	120	0	0	0	0
15238	2550	2552	14.51	8	120	0	0	0	0
1524	1121	1117	614.04	8	120	36.95	0.24	0.03	0.05
15240	2551	2554	19.95	8	120	0	0	0	0
15242	2554	2556	6.56	8	120	0	0	0	0
15244	10036	2382	41.87	18	120	4,974.21	6.27	0.33	7.96
15246	2609	2614	28.65	14	120	0	0	0	0
15248	2614	2616	10.39	14	120	0	0	0	0
1525	1122	1121	406.74	8	120	52.74	0.34	0.04	0.09
15250	2617	2613	10.84	14	120	0	0	0	0
15252	2613	2611	28.22	14	120	0	0	0	0
15254	367	368	16.26	6	120	30.11	0.34	0	0.13
15256	368	372	51.51	6	120	30.11	0.34	0.01	0.13
1526	1148	1154	470.09	6	120	-124.93	1.42	0.86	1.83
15260	480	478	7.38	20.1	120	0	0	0	0
15262	478	475	7.28	20.1	120	0	0	0	0
15264	475	473	5.21	20.1	120	0	0	0	0
15266	482	477	14.71	14.1	120	0	0	0	0
15268	477	474	7.5	14.1	120	0	0	0	0
1527	1155	1148	591.77	8	120	-120.93	0.77	0.25	0.42
15270	474	471	26.23	14.1	120	0	0	0	0
15272	500	504	48.83	4	120	6.83	0.17	0	0.06

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
15274	10038	561	1,061.39	12	120	92.66	0.26	0.04	0.04
15276	545	546	24.59	6	120	15.01	0.17	0	0.03
15278	10040	624	962.21	18	120	-1,297.72	1.64	0.64	0.66
1528	1142	1123	1,051.29	8	120	-85.24	0.54	0.23	0.22
15280	623	625	9.78	8	120	2.65	0.02	0	0
15282	617	616	11.96	8	120	-89.68	0.57	0	0.24
15284	659	672	194.98	12	120	-68.19	0.19	0	0.02
15286	10042	647	170.83	6	120	6.2	0.07	0	0.01
15288	618	619	58.43	10	120	-167.54	0.68	0.02	0.26
1529	1142	1144	309.19	8	120	15.3	0.1	0	0.01
15290	689	690	5.31	12	120	-311.13	0.88	0	0.33
15292	588	586	18.54	14	120	332.33	0.69	0	0.18
15294	10044	850	22.9	18	120	14.05	0.02	0	0
15296	10046	870	6.71	14	120	1,733.44	3.61	0.03	3.84
15298	10048	10050	19.2	14	120	1,063.53	2.22	0.03	1.55
153	1178	1163	554.62	24	120	158.97	0.11	0	0
1530	1156	1142	328.39	8	120	-57.7	0.37	0.04	0.11
15300	10050	875	1,375.23	14	120	1,938.48	4.04	6.5	4.73
15302	10052	8040	10.35	10	120	0	0	0	0
15304	10054	891	607.11	6	120	17.7	0.2	0.03	0.05
15306	921	920	46.51	6	120	-36.61	0.42	0.01	0.19
15308	920	919	8.64	6	120	-36.61	0.42	0	0.18
1531	1123	1122	159.76	8	120	64.57	0.41	0.02	0.13
15310	10056	1946	50.17	16	120	-357.71	0.57	0.01	0.11
15312	1750	1752	37.75	14	120	-585.9	1.22	0.02	0.52
15314	10058	950	33.77	8	120	-8.11	0.05	0	0
15316	10060	986	17.78	12	120	-147.31	0.42	0	0.08
15318	10062	10060	10.75	12	120	-147.31	0.42	0	0.09
1532	1119	1123	827.78	8	120	179.83	1.15	0.73	0.88
15320	10064	100014	47.41	12	120	-135.32	0.38	0	0.07
15322	10066	695	372.56	6	120	39.56	0.45	0.08	0.22
15324	2332	2328	60.47	18	120	4,969.92	6.27	0.48	7.95
15326	2240	2232	449.9	16	120	1,397.60	2.23	0.61	1.35
15328	1391	1385	631.18	8	120	84.44	0.54	0.14	0.22
1533	1115	1119	341.35	8	120	199.81	1.28	0.37	1.07
15330	2073	2072	27.47	8	120	4.12	0.03	0	0
15332	10076	997	17.08	6	120	-15.82	0.18	0	0.04
15334	1800	1799	17.15	6	120	8.61	0.1	0	0.01
15336	1674	1660	477.08	10	120	66.13	0.27	0.02	0.05
15338	1755	1756	27.11	4	120	-60.76	1.55	0.09	3.46
1534	1113	1115	252.2	8	120	202.79	1.29	0.28	1.1
15340	1951	1957	259.01	16	120	-374.39	0.6	0.03	0.12
15342	2159	2138	714.04	8	120	157.22	1	0.49	0.69
15344	1962	2006	1,317.55	16	120	-52.05	0.08	0	0
15346	2033	2034	319.44	6	120	-92.43	1.05	0.33	1.05
15348	1857	1893	1,116.71	6	120	-100.53	1.14	1.36	1.22
1535	14	1113	763.09	12	120	-536.03	1.52	0.71	0.93
1536	1282	1275	241.03	6	120	61.52	0.7	0.12	0.49
1537	1297	1298	71.75	6	120	83.64	0.95	0.06	0.87
1538	1288	1282	381.15	6	120	74.24	0.84	0.27	0.7
15388	10094	2613	20.98	6	120	0	0	0	0
1539	1283	1288	849.95	6	120	-5.1	0.06	0	0
15390	10096	2611	20.98	6	120	0	0	0	0
15394	10100	2551	17.38	2	120	0	0	0	0
15396	10102	2420	14.45	6	120	587.24	6.66	0.46	32.09
15398	10104	2418	13.97	6	120	387.67	4.4	0.21	14.87
154	1173	1177	137.53	18	120	-2,463.84	3.11	0.3	2.17
1540	1291	1280	892.98	8	120	-155.62	0.99	0.6	0.68
15400	10106	2419	14.4	6	120	387.66	4.4	0.21	14.87
15402	10108	2064	27.04	8	120	0	0	0	0
15404	10110	2062	26.39	8	120	0	0	0	0
15406	10112	2059	26.32	6	120	0	0	0	0
15408	10114	2054	27.62	6	120	0	0	0	0
1541	1306	1291	2,183.58	8	120	-128.03	0.82	1.03	0.47
15410	10116	2355	37.58	6	120	0	0	0	0
15412	10118	2351	37.67	6	120	0	0	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
15414	10120	2372	17.08	6	120	0	0	0	0
15416	10122	2323	9	12	120	0	0	0	0
15418	10124	2322	8.38	16	120	0	0	0	0
1542	1314	1317	165.79	6	120	4.37	0.05	0	0
15420	10126	2319	5.46	20	120	0	0	0	0
15422	10128	480	9.67	20.1	120	0	0	0	0
15428	10134	44	11.09	6	120	0	0	0	0
1543	1343	1342	344.64	6	120	-95.78	1.09	0.38	1.12
15432	10138	44	20.59	4	120	23.71	0.61	0.01	0.61
15434	142	10142	14.23	16	120	1,643.66	2.62	0.03	1.82
1544	1338	1328	1,142.50	6	120	110.75	1.26	1.67	1.46
15444	10150	1232	958.18	6	120	57.37	0.65	0.41	0.43
15448	10154	1249	9.1	6	120	363.03	4.12	0.12	13.17
1545	1315	1316	1,294.97	8	120	0	0	0	0
15450	10156	1296	558.22	8	120	86.62	0.55	0.13	0.23
15458	10164	2662	852.22	6	120	0	0	0	0
1546	1312	1315	1,834.71	8	120	291.82	1.86	3.97	2.16
15460	10168	1362	18.72	10	120	-99.25	0.41	0	0.1
15466	1365	10172	33.16	12	120	0	0	0	0
1547	1337	1329	682.58	8	120	14.25	0.09	0.01	0.01
15472	10178	1331	12.69	8	120	-4.2	0.03	0	0
15474	10180	1332	33.57	8	120	0	0	0	0
1548	1336	1337	1,078.83	8	120	139.45	0.89	0.59	0.55
15482	10188	200	19.42	2	120	-111.04	11.34	6.01	309.64
15486	10192	200	8.03	10	120	0	0	0	0
15488	10194	239	10.51	6	120	0	0	0	0
1549	1337	1338	286.42	8	120	62.25	0.4	0.04	0.12
15492	7044	10200	0.51	99	120	0	0	0	0
15496	7048	10204	0.57	99	120	747	0.03	0	0
15498	7050	10206	0.42	99	120	0	0	0	0
155	1181	1185	337.59	18	120	51.11	0.06	0	0
1550	1347	1341	1,111.70	12	120	354.15	1	0.48	0.43
15500	7052	10208	1.6	99	120	1,268.00	0.05	0	0
15502	7054	10210	0.49	99	120	6,445.00	0.27	0	0
15506	7058	10212	0.49	99	120	4,323.97	0.18	0	0
15508	7060	10214	0.54	99	120	718	0.03	0	0
1551	1344	1341	923.2	6	120	-134.41	1.53	1.93	2.09
15510	7056	10198	0.45	99	120	0	0	0	0
1552	1296	1284	3,399.58	8	120	38.23	0.24	0.17	0.05
1553	1287	10158	20.26	8	120	113.46	0.72	0.01	0.38
15532	2163	2165	558.97	8	120	461.98	2.95	2.83	5.07
15534	1697	1694	59.44	8	120	0	0	0	0
15538	100010	10064	89.98	8	120	11.99	0.08	0	0.01
1554	1287	1277	670.43	6	120	121.57	1.38	1.16	1.74
15540	100012	10062	28.58	12	120	-135.32	0.38	0	0.07
15544	100016	100000	1,487.26	12	120	763.8	2.17	2.65	1.78
15546	100018	2128	9.52	8	120	22.2	0.14	0	0.02
1555	1290	1287	1,335.95	8	120	241.74	1.54	2.04	1.53
15550	100022	2129	6.01	12	120	0	0	0	0
15552	100024	2129	9.86	8	120	0	0	0	0
15558	100030	1954	16.07	8	120	0	0	0	0
1556	1289	10160	55.99	8	120	250.72	1.6	0.09	1.63
15562	100034	1954	45.73	6	120	0	0	0	0
15566	100038	1991	57.05	8	120	34.26	0.22	0	0.04
15568	100040	1903	17.52	8	120	0	0	0	0
1557	352	339	956.28	6	120	160.21	1.82	2.77	2.9
15574	100046	1905	37.15	2	120	12.34	1.26	0.2	5.3
15576	100048	1884	19.5	6	120	0	0	0	0
1558	266	249	263.7	16	120	-437.12	0.7	0.04	0.16
15582	100054	1886	41.8	2	120	-14.97	1.53	0.32	7.57
15586	100058	1852	873.95	12	120	846.97	2.4	1.89	2.16
1559	432	430	430.97	22	120	-1,800.00	1.52	0.2	0.46
15594	100066	1715	3.49	6	120	0	0	0	0
15598	100070	1715	10.83	4	120	0	0	0	0
156	1180	1181	20.27	18	120	51.11	0.06	0	0
1560	247	244	841.64	6	120	-12.8	0.15	0.02	0.03

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
15602	100074	1639	22.92	8	120	0	0	0	0
15604	100076	1640	53.05	4	120	-90.36	2.31	0.38	7.23
1561	234	229	1,185.10	6	120	-13.06	0.15	0.03	0.03
15618	100090	1673	46.05	8	120	68.98	0.44	0.01	0.15
15622	100094	1673	24.48	10	120	0	0	0	0
15626	100098	1462	13.69	10	120	0	0	0	0
15628	100100	1468	27.06	4	120	0	0	0	0
1563	1333	1330	461.66	6	120	-241.62	2.74	2.86	6.2
15632	100104	1467	12.29	10	120	-518.64	2.12	0.03	2.12
15636	100108	1467	25.23	4	120	-22.94	0.59	0.01	0.57
1564	1301	8630	847.3	14	120	-1,305.06	2.72	1.92	2.27
15640	100112	1491	12.41	6	120	-549.12	6.23	0.35	28.34
15646	100118	1216	9.65	12	120	0	0	0	0
1565	1300	1304	799.51	14	120	-927.26	1.93	0.96	1.21
15650	100122	1216	19.34	4	120	-799.43	20.41	7.92	409.54
15656	100126	1269	6.49	4	120	0	0	0	0
1566	197	209	1,148.43	8	120	54.41	0.35	0.11	0.1
15668	318	2706	44.39	12	120	20.89	0.06	0	0
1567	171	169	55.73	10	120	1.83	0.01	0	0
15670	100138	639	16.61	8	120	-17.31	0.11	0	0.01
1568	186	171	933.98	10	120	10.93	0.04	0	0
15680	100148	459	73.67	20	120	2,095.20	2.14	0.07	0.96
15682	100146	100148	23.77	20	120	0	0	0	0
15684	1960	1957	24.12	16	120	0	0	0	0
15688	2281	2282	16	20	120	5.15	0.01	0	0
1569	2303	2298	1,498.85	8	120	59.22	0.38	0.17	0.11
15690	100154	1796	2.41	24	120	0	0	0	0
15692	100156	2196	648.43	16	120	-1,202.25	1.92	0.66	1.02
15694	100158	1807	9.2	42	120	-2,613.26	0.61	0	0.04
15696	100160	1806	1,004.31	8	120	180.55	1.15	0.89	0.89
15698	663	736	1,569.95	6	120	23.48	0.27	0.13	0.08
157	1176	1180	72.8	18	120	210.09	0.26	0	0.02
1570	197	186	819.07	10	120	37.56	0.15	0.01	0.02
15700	2313	2316	5.16	27	120	0	0	0	0
15702	221	220	669.97	12	120	18.43	0.05	0	0
15704	100168	2187	31.27	12	120	131.51	0.37	0	0.07
15706	2087	2088	44.36	18	120	8.32	0.01	0	0
15708	100172	2001	2,061.21	6	120	35.1	0.4	0.36	0.17
1571	198	197	42.95	10	120	99.27	0.41	0	0.1
15714	1184	1183	14.09	24	120	4,298.00	3.05	0.02	1.49
15716	1172	1170	196.95	12.1	120	36.81	0.1	0	0.01
1572	205	198	467.84	10	120	101.61	0.42	0.05	0.1
1573	177	2684	742.25	8	120	29.22	0.19	0.02	0.03
1574	177	160	181.72	8	120	23.98	0.15	0	0.02
1575	187	178	954.9	10	120	91.04	0.37	0.08	0.08
1576	196	187	1,000.39	10	120	114.42	0.47	0.13	0.13
1577	196	190	2,302.14	8	120	48.81	0.31	0.18	0.08
1578	199	196	477.82	10	120	204.63	0.84	0.18	0.38
1579	228	227	276.49	4	120	10.51	0.27	0.04	0.13
158	1175	1176	34.79	18	120	4,862.89	6.13	0.27	7.63
1580	230	246	917.56	10	120	-400.05	1.63	1.2	1.31
1581	1348	1349	847.75	6	120	-25.55	0.29	0.08	0.1
1582	339	1349	1,883.19	6	120	130.07	1.48	3.71	1.97
1583	352	329	481.75	4	120	32.11	0.82	0.51	1.06
1584	1388	1359	1,129.94	8	120	21.65	0.14	0.02	0.02
1585	395	402	649.05	24	120	-1,804.20	1.28	0.19	0.3
1586	419	395	1,469.32	24	120	-1,801.12	1.28	0.44	0.3
1587	404	355	871.56	6	120	-13.53	0.15	0.03	0.03
1588	430	414	1,413.98	22	120	-1,800.00	1.52	0.64	0.46
1589	443	432	608.5	22	120	-1,800.00	1.52	0.28	0.46
159	1175	1174	11.02	12	120	-2,427.03	6.88	0.17	15.18
1590	243	245	246.56	6	120	0	0	0	0
1591	243	235	1,606.03	6	120	-309.91	3.52	15.78	9.83
1592	275	274	33.92	8	120	0	0	0	0
1593	275	276	35.78	6	120	39	0.44	0.01	0.21
1594	277	275	52.31	8	120	47.81	0.31	0	0.08

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1595	294	291	51.63	6	120	11.68	0.13	0	0.02
1596	294	295	36.4	6	120	5.42	0.06	0	0.01
1597	296	294	55.66	6	120	20.15	0.23	0	0.06
1598	306	304	44.47	8	120	47.81	0.31	0	0.08
1599	306	308	51.01	6	120	28	0.32	0.01	0.11
16	1109	1105	1,202.62	12	120	-588.61	1.67	1.32	1.1
160	1182	1176	572.39	24	120	-4,652.80	3.3	0.99	1.73
1600	307	306	46.02	8	120	75.8	0.48	0.01	0.18
1601	347	2726	114.44	20	120	250.55	0.26	0	0.02
1602	346	347	31.29	20	120	250.55	0.26	0	0.02
1603	356	344	257.44	6	120	-37.41	0.42	0.05	0.2
1604	369	356	426.51	6	120	-37.41	0.42	0.08	0.2
1605	340	367	740.23	6	120	30.11	0.34	0.1	0.13
1606	257	246	1,179.92	14	120	-151.28	0.32	0.05	0.04
1607	271	257	640.51	14	120	315.16	0.66	0.1	0.16
1608	273	271	86.5	20	120	-2.74	0	0	0
1609	315	342	319.14	14	120	-317.9	0.66	0.05	0.17
161	486	461	445.07	22	120	-1,800.00	1.52	0.2	0.46
1610	292	271	1,300.68	14	120	317.9	0.66	0.22	0.17
1611	179	174	348.34	12	120	1,152.67	3.27	1.33	3.82
1613	179	1354	901.68	16	120	437.21	0.7	0.14	0.16
1617	423	434	947.68	6	120	10.1	0.11	0.02	0.02
1618	417	418	62.09	12	120	0	0	0	0
1619	396	405	254.54	8	120	0	0	0	0
162	1210	2666	1,296.30	14	120	-1,158.76	2.42	2.36	1.82
1620	396	375	192.68	8	120	-2.46	0.02	0	0
1621	400	396	455.23	8	120	-2.46	0.02	0	0
1622	400	381	324.47	8	120	0	0	0	0
1623	366	400	305.66	8	120	4.23	0.03	0	0
1624	366	362	243.37	8	120	0	0	0	0
1625	360	366	319.67	8	120	4.23	0.03	0	0
1627	326	327	33.96	14	120	0	0	0	0
1628	281	266	247.45	26	120	-429.88	0.26	0	0.01
1629	281	280	225.15	8	120	8.8	0.06	0	0
163	1173	1172	8.65	12	120	704.66	2	0.01	1.54
1630	284	281	120.74	14	120	-421.08	0.88	0.03	0.28
1631	289	284	275.11	14	120	-421.08	0.88	0.08	0.28
1632	328	289	790.86	14	120	-334.93	0.7	0.14	0.18
1633	303	283	592.03	8	120	3.36	0.02	0	0
1634	350	303	653.36	8	120	-23.4	0.15	0.01	0.02
1635	379	343	999.16	8	120	-9.9	0.06	0	0
1637	226	217	153.42	12	120	46	0.13	0	0.01
1638	232	233	288.79	8	120	8.18	0.05	0	0
1639	288	270	666.08	8	120	25.25	0.16	0.02	0.02
164	544	486	1,911.16	22	120	-1,778.62	1.5	0.85	0.45
1640	415	358	1,233.43	14	120	5.5	0.01	0	0
1642	446	435	195.11	14	120	773.75	1.61	0.17	0.86
1643	445	439	125.56	8	120	0	0	0	0
1644	302	301	232.28	12	120	-206.02	0.58	0.04	0.16
1645	212	211	87.07	16	120	-117.23	0.19	0	0.01
1646	224	222	333.16	12	120	0	0	0	0
1647	254	253	488.41	6	120	14.37	0.16	0.02	0.03
1648	20006	20007	1,694.23	8	120	-32.37	0.21	0.06	0.04
165	542	2642	487.72	8	120	31.17	0.2	0.02	0.03
1650	256	224	1,381.77	12	120	-417.33	1.18	0.81	0.58
1651	378	380	84.46	36	120	-2,615.54	0.82	0.01	0.08
1652	376	378	30.44	24	120	-2,615.54	1.85	0.02	0.6
1653	438	447	197.29	12	120	833.08	2.36	0.41	2.1
1654	376	MORRO_RES	321.57	36	120	2,615.54	0.82	0.03	0.08
1655	321	322	55.3	12	120	12.96	0.04	0	0
1656	380	321	1,235.07	12	120	-401.01	1.14	0.67	0.54
1657	316	313	245	10	120	87.79	0.36	0.02	0.08
1658	313	314	175.32	12	120	108.96	0.31	0.01	0.05
1659	314	317	443.77	12	120	47.4	0.13	0	0.01
166	559	542	622.79	8	120	104.67	0.67	0.2	0.32
1660	317	293	389.51	8	120	35.18	0.22	0.02	0.04

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1661	317	319	897.36	12	120	10.1	0.03	0	0
1662	316	285	665.6	6	120	39.32	0.45	0.14	0.21
1663	20006	313	362.81	10	120	25.06	0.1	0	0.01
1664	433	429	384.36	6	120	7.79	0.09	0	0.01
1665	433	8648	1,154.05	10	120	0	0	0	0
1667	311	1560	291	10	120	223.5	0.91	0.13	0.45
1668	301	357	853.39	14	120	-404.35	0.84	0.22	0.26
1669	357	8654	2,021.15	14	120	-433.89	0.9	0.6	0.3
167	43	10136	20.03	4	120	23.71	0.61	0.01	0.61
1670	301	282	607.98	12	120	192.23	0.55	0.08	0.14
1671	311	278	867.97	6	120	-23.77	0.27	0.07	0.08
1672	357	364	326.01	6	120	6.93	0.08	0	0.01
1673	282	288	517.77	8	120	47.02	0.3	0.04	0.07
1674	311	302	562.38	10	120	-202.12	0.83	0.21	0.37
1675	328	327	41.31	14	120	0	0	0	0
1677	417	423	469.05	6	120	10.1	0.11	0.01	0.02
168	44	45	355.57	6	120	20.73	0.24	0.02	0.07
1680	360	375	370.57	12	120	12.57	0.04	0	0
1681	375	417	465.79	12	120	10.1	0.03	0	0
1682	315	312	54.92	14	120	317.9	0.66	0.01	0.17
1683	268	251	300.41	6	120	-6.16	0.07	0	0.01
1684	251	215	1,316.98	6	120	-15.53	0.18	0.05	0.04
1685	350	379	668.39	8	120	4.47	0.03	0	0
1686	343	298	655.05	8	120	-27.85	0.18	0.02	0.03
1687	298	303	188.98	8	120	36.15	0.23	0.01	0.05
1688	298	289	400.42	8	120	-73.68	0.47	0.07	0.17
1689	297	273	701.5	12	120	-1.29	0	0	0
169	43	10132	11.12	6	120	0	0	0	0
1690	286	290	463.67	6	120	9.96	0.11	0.01	0.02
1691	341	351	229.64	8	120	18.89	0.12	0	0.01
1692	331	323	284.43	8.1	120	10.7	0.07	0	0
1693	331	310	373.33	8.1	120	10.18	0.06	0	0
1694	374	398	303.68	6	120	29.3	0.33	0.04	0.12
1695	372	377	441.73	6	120	0.81	0.01	0	0
1696	377	399	322.92	8	120	9.14	0.06	0	0
1697	402	1389	307.78	24	120	-1,804.20	1.28	0.09	0.3
1698	346	344	157.31	20	120	-328.44	0.34	0	0.03
1699	341	344	229.21	20	120	365.85	0.37	0.01	0.04
17	1105	1103	17.97	12	120	-229.1	0.65	0	0.19
170	42	43	43.13	6	120	23.71	0.27	0	0.08
1700	359	355	1,784.10	6	120	235.86	2.68	10.57	5.93
1701	355	352	83.2	6	120	214.86	2.44	0.41	4.99
1702	404	413	78.38	6	120	7.94	0.09	0	0.01
1703	413	419	117.63	4	120	0	0	0	0
1704	304	277	909.5	8	120	47.81	0.31	0.07	0.08
1705	1389	1369	354.32	8	120	7.39	0.05	0	0
1706	369	397	295.65	6	120	10.09	0.11	0.01	0.02
1707	377	369	253.91	6	120	-17.38	0.2	0.01	0.05
1709	361	373	385.88	4	120	5.33	0.14	0.01	0.04
171	61	42	906.98	10	120	127.65	0.52	0.14	0.16
1710	361	359	51.36	4	120	243.77	6.22	2.33	45.4
1712	404	403	573.81	4	120	3.32	0.08	0.01	0.02
1713	413	406	907.5	4	120	7.94	0.2	0.07	0.08
1714	276	291	674.2	6	120	-11.68	0.13	0.02	0.02
1715	295	299	349.4	6	120	5.42	0.06	0	0.01
1716	296	308	587.24	6	120	-25.91	0.29	0.06	0.1
1717	352	349	404.18	6	120	11.69	0.13	0.01	0.02
1718	1388	1387	976.86	24	120	-1,842.48	1.31	0.3	0.31
1719	1350	1348	356.02	6	120	-18.72	0.21	0.02	0.05
172	42	33	855.25	10	120	103.94	0.42	0.09	0.11
1720	1377	1381	110.59	8	120	2.44	0.02	0	0
1721	1381	1390	213.51	8	120	49.69	0.32	0.02	0.08
1722	1381	1393	892.56	8	120	-47.25	0.3	0.07	0.07
1723	1351	1355	312.98	6	120	8.44	0.1	0	0.01
1724	1350	1345	617.45	6	120	16.15	0.18	0.03	0.04
1725	1378	1372	184.39	8	120	24.9	0.16	0	0.02

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1726	1372	1357	617.67	8	120	8.82	0.06	0	0
1727	1394	1391	262.05	8	120	93.51	0.6	0.07	0.26
1728	1385	10184	1,838.05	8	120	40.84	0.26	0.1	0.06
1729	1382	1378	2,338.18	24	120	-1,840.00	1.3	0.73	0.31
173	587	559	1,141.45	8	120	129.91	0.83	0.55	0.48
1730	1378	1377	391.76	24	120	-1,864.90	1.32	0.12	0.32
1731	1376	1377	417.96	24	120	1,867.33	1.32	0.13	0.32
1732	1403	1404	55.95	10	120	-333.26	1.36	0.05	0.93
1733	1318	1319	728.43	6	120	12.46	0.14	0.02	0.03
1734	1311	1312	971.45	8	120	324.62	2.07	2.56	2.64
1735	123	120	634.41	16	120	-1,643.74	2.62	1.15	1.82
1736	120	8528	103.34	16	120	-1,656.13	2.64	0.19	1.84
1737	1240	1242	258.85	6	120	-47.36	0.54	0.08	0.3
1738	1230	1237	995.34	10	120	108.02	0.44	0.12	0.12
1739	1250	1248	187.37	6	120	9.26	0.11	0	0.01
174	640	587	1,011.18	8	120	155.9	1	0.69	0.68
1740	1208	1209	220.62	6	120	37.65	0.43	0.04	0.2
1741	1208	1207	253.69	12	120	-934.69	2.65	0.66	2.59
1742	1212	1208	557.88	12	120	-845.76	2.4	1.2	2.16
1743	1213	1212	300.79	12	120	-812.65	2.31	0.6	2
1744	1219	55	1,433.00	6	120	24.28	0.28	0.13	0.09
1745	1219	1218	14.66	12	120	-449.4	1.27	0.01	0.67
1746	1224	1218	884.59	10	120	-350.04	1.43	0.9	1.02
1747	96	1224	1,223.15	6	120	-35.64	0.4	0.22	0.18
1748	110	112	61.36	8	120	3.74	0.02	0	0
1749	616	622	1,011.78	8	120	-62.18	0.4	0.13	0.12
175	1199	1171	1,879.44	8	120	519.4	3.32	11.83	6.3
1750	636	621	336.22	8	120	-64.52	0.41	0.04	0.13
1751	125	110	1,914.67	6	120	6.13	0.07	0.01	0.01
1752	79	1219	1,338.87	12	120	-425.12	1.21	0.81	0.6
1753	1187	1189	920.97	16	120	-2,465.93	3.93	3.55	3.85
1754	34	1187	1,512.96	16	120	-2,465.93	3.93	5.83	3.85
1755	30	34	1,231.81	16	120	-2,465.93	3.93	4.74	3.85
1756	23	1156	2,363.34	8	120	-174.07	1.11	1.96	0.83
1757	22	24	205.02	12	120	650.13	1.84	0.27	1.32
1758	30	24	1,132.60	12	120	-819.58	2.32	2.3	2.03
1759	59	32	1,998.53	12	120	-3,003.81	8.52	45.04	22.54
176	1200	1199	648.64	18	120	-3,481.21	4.39	2.67	4.11
1760	38	32	3,422.08	8	120	-214.38	1.37	4.18	1.22
1761	37	38	836.14	8	120	-39.78	0.25	0.05	0.05
1762	40	37	523.43	6	120	-8.18	0.09	0.01	0.01
1763	10021	48	699.74	12	120	526.71	1.49	0.63	0.9
1764	48	49	616.72	12	120	518.55	1.47	0.54	0.87
1765	54	49	255.38	12	120	-494.87	1.4	0.2	0.8
1766	66	54	1,788.50	12	120	-451.16	1.28	1.2	0.67
1767	48	64	1,173.76	8	120	4.93	0.03	0	0
1768	54	63	579.08	8	120	40.06	0.26	0.03	0.05
1769	36	18	2,125.08	8	120	0	0	0	0
177	1199	1198	28.34	18	120	-4,005.14	5.05	0.15	5.33
1770	52	67	1,811.82	12	120	-577.63	1.64	1.93	1.06
1771	65	10019	2,211.01	16	120	-3,003.73	4.79	12.27	5.55
1772	116	91	1,504.51	12	120	138.33	0.39	0.11	0.08
1773	151	129	778.13	8	120	9.55	0.06	0	0
1774	160	151	537.22	8	120	18.94	0.12	0.01	0.01
1775	89	83	644.9	6	120	71.42	0.81	0.42	0.65
1776	97	89	1,300.37	8	120	129.17	0.82	0.62	0.48
1777	114	97	209.99	14	120	-1,478.18	3.08	0.6	2.86
1778	136	137	18.19	16	120	1,643.66	2.62	0.03	1.82
1779	169	158	30.58	10	120	0	0	0	0
178	1198	1195	648.29	18	120	-4,030.62	5.08	3.5	5.39
1780	133	127	337.54	10	120	0.08	0	0	0
1781	162	141	1,123.45	8	120	64.44	0.41	0.15	0.13
1782	135	70	3,202.44	12	120	710.1	2.01	4.99	1.56
1783	144	135	319.4	12	120	1,152.67	3.27	1.22	3.82
1784	174	144	1,839.18	12	120	1,152.67	3.27	7.03	3.82
1785	155	138	1,110.46	6	120	-371.35	4.21	15.25	13.74

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1786	170	155	191.5	6	120	-367.95	4.18	2.59	13.5
1787	73	8604	531.5	10	120	-424.61	1.73	0.78	1.46
1788	75	74	31.36	10	120	0	0	0	0
1789	75	73	41.42	10	120	0	0	0	0
179	1198	1211	1,030.22	8	120	7.75	0.05	0	0
1790	73	62	890.92	8	120	424.52	2.71	3.86	4.33
1791	62	57	137.58	8	120	424.52	2.71	0.6	4.33
1792	57	1016	1,786.93	8	120	424.52	2.71	7.74	4.33
1793	25	21	458.54	8	120	1.19	0.01	0	0
1794	1252	1247	1,139.73	6	120	-221.37	2.51	6.01	5.27
1795	1262	1281	594.65	14	120	1,111.28	2.32	1	1.69
1796	1259	1262	327.9	14	120	1,111.28	2.32	0.55	1.69
1797	1253	1259	134.79	14	120	1,114.01	2.32	0.23	1.69
1798	1234	1253	1,890.69	14	120	1,114.01	2.32	3.2	1.69
1799	1210	1234	2,194.84	14	120	1,121.76	2.34	3.77	1.72
18	1097	1100	1,237.62	8	120	-12.14	0.08	0.01	0.01
180	671	640	705.39	18	120	-96.12	0.12	0	0.01
1800	1163	1158	491.1	12	120	130.4	0.37	0.03	0.07
1801	1177	1183	383.29	24	120	-2,463.84	1.75	0.2	0.53
1802	1188	1182	894.99	20	120	-4,652.80	4.75	3.77	4.21
1803	1215	1205	886.61	16	120	-1,711.78	2.73	1.74	1.96
1804	1222	10039	455.95	16	120	-1,660.86	2.65	0.84	1.85
1805	1274	1275	183.1	6	120	-61.52	0.7	0.09	0.49
1806	1261	1274	783.86	6	120	-54.74	0.62	0.31	0.4
1807	1260	1261	793.44	6	120	-45.58	0.52	0.22	0.28
1808	1271	1260	793.11	6	120	-15.4	0.17	0.03	0.04
1809	1279	1272	251.27	6	120	-10.59	0.12	0	0.02
181	678	671	355.91	18	120	-96.12	0.12	0	0.01
1810	1229	1222	1,462.48	14	120	-1,657.83	3.46	5.17	3.54
1811	1263	8592	554.72	14	120	-1,653.56	3.45	1.95	3.52
1812	1159	1152	157.8	6	120	-26.58	0.3	0.02	0.1
1813	1221	1226	1,354.35	8	120	18.44	0.12	0.02	0.01
1814	1223	1221	1,359.14	8	120	-13.46	0.09	0.01	0.01
1815	1167	1157	1,122.34	6	120	218.36	2.48	5.77	5.14
1816	1167	1161	350.22	6	120	225.07	2.55	1.9	5.43
1817	1171	1186	559.34	8	120	41.33	0.26	0.03	0.06
1818	1197	1192	1,556.93	20	120	-4,252.89	4.34	5.55	3.56
1819	1195	1197	28.63	18	120	-4,205.06	5.3	0.17	5.83
182	1217	100120	18.68	4	120	-799.43	20.41	7.65	409.54
1820	1192	1188	2,014.65	20	120	-4,490.97	4.59	7.94	3.94
1821	1202	1200	661.01	18	120	-3,450.87	4.35	2.67	4.04
1822	1190	1189	696.58	16	120	2,465.93	3.93	2.68	3.85
1823	1201	1190	674.85	16	120	2,475.95	3.95	2.62	3.88
1824	1206	1204	775.91	12	120	-961.52	2.73	2.12	2.73
1825	1207	1206	239.89	12	120	-938.1	2.66	0.63	2.61
1826	1204	1203	32.14	12	120	-973	2.76	0.09	2.79
1827	1203	1201	222.03	12	120	-974.92	2.77	0.62	2.8
1828	1209	1220	1,019.73	6	120	29.29	0.33	0.13	0.12
1829	870	867	422.58	14	120	1,731.64	3.61	1.62	3.84
183	1216	1213	140.54	12	120	-799.43	2.27	0.27	1.94
1830	872	10046	361.27	14	120	1,749.89	3.65	1.41	3.91
1831	868	873	502.61	8	120	11.47	0.07	0	0.01
1832	872	868	714.6	8	120	30.21	0.19	0.02	0.03
1833	874	872	830.4	14	120	1,795.40	3.74	3.41	4.1
1834	874	855	2,715.93	8	120	70.55	0.45	0.42	0.16
1835	869	855	1,664.00	8	120	-71.86	0.46	0.27	0.16
1836	855	853	515.5	6	120	-38.93	0.44	0.11	0.21
1837	1582	853	672.15	6	120	90.52	1.03	0.68	1.01
1838	1582	1580	301.86	6	120	5.92	0.07	0	0.01
1839	875	879	534.98	8	120	2.34	0.01	0	0
184	1217	100116	9.19	12	120	0	0	0	0
1840	875	874	557.84	14	120	1,909.63	3.98	2.56	4.6
1841	1726	878	1,876.47	16	120	2,167.78	3.46	5.69	3.03
1842	1632	1619	347.13	6	120	1.07	0.01	0	0
1843	1634	1632	220.27	6	120	-10.09	0.11	0	0.02
1844	802	1502	764.66	8	120	-64.17	0.41	0.1	0.13

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1845	1521	802	869.37	8	120	-12.57	0.08	0.01	0.01
1846	830	827	90.88	6	120	-25.48	0.29	0.01	0.1
1847	827	819	699.14	6	120	-49.38	0.56	0.23	0.33
1848	775	767	447.38	8	120	43.37	0.28	0.03	0.06
1849	795	781	526.69	6	120	-23.91	0.27	0.04	0.09
185	1218	1217	41.6	12	120	-799.43	2.27	0.08	1.94
1852	807	775	1,150.51	8	120	170.21	1.09	0.92	0.8
1853	785	787	201.57	6	120	-92.82	1.05	0.21	1.05
1854	787	786	152.8	6	120	-95.41	1.08	0.17	1.11
1855	784	786	124.04	6	120	110.93	1.26	0.18	1.47
1856	776	774	135.95	8	120	-149.33	0.95	0.09	0.63
1857	775	774	99.67	8	120	119.85	0.76	0.04	0.42
1858	774	743	897.3	6	120	-34.96	0.4	0.15	0.17
1859	1464	1466	36.78	8	120	21.28	0.14	0	0.02
186	685	678	984.59	18	120	46.88	0.06	0	0
1860	1464	1457	53.42	8	120	9.72	0.06	0	0
1861	1451	1456	316.47	16	120	541.59	0.86	0.07	0.23
1862	1487	1456	1,413.03	16	120	-541.59	0.86	0.33	0.23
1863	1557	1535	911.33	8	120	-42.09	0.27	0.05	0.06
1864	1557	1558	39.7	8	120	1.92	0.01	0	0
1865	1556	1557	183.07	8	120	-40.17	0.26	0.01	0.06
1866	1556	1565	356.82	8	120	9.05	0.06	0	0
1867	1548	1556	539.54	8	120	-23.82	0.15	0.01	0.02
1868	1548	1549	430.51	8	120	12.71	0.08	0	0.01
1869	1542	1548	192.41	8	120	0.03	0	0	0
187	56	8632	2,501.42	12	120	-423.34	1.2	1.5	0.6
1870	1542	1540	657.91	8	120	13.38	0.09	0	0.01
1871	1533	1542	288.66	8	120	21.85	0.14	0.01	0.02
1872	1531	1517	627.44	8	120	15.98	0.1	0.01	0.01
1873	1533	1531	86.08	8	120	25.99	0.17	0	0.02
1874	1526	1533	420.03	8	120	51.52	0.33	0.04	0.09
1875	1454	1452	63.9	12	120	-91.54	0.26	0	0.04
1876	1454	1444	934.23	8	120	12.42	0.08	0.01	0.01
1877	1464	1454	240.55	8	120	-45.13	0.29	0.02	0.07
1878	1480	1464	694.63	8	120	-8.15	0.05	0	0
1879	1499	1454	1,280.57	12	120	-18.96	0.05	0	0
188	71	56	1,016.32	8	120	-423.34	2.7	4.38	4.31
1880	1498	1480	498.37	8	120	20.6	0.13	0.01	0.02
1881	1497	1482	438.48	8	120	11.49	0.07	0	0.01
1882	1498	1499	251.82	8	120	-29.89	0.19	0.01	0.03
1883	1497	1498	248.46	8	120	-30.77	0.2	0.01	0.03
1884	1513	1497	349.86	8	120	-11.2	0.07	0	0.01
1885	1523	1498	837.57	8	120	33.5	0.21	0.03	0.04
1886	1525	1499	788.54	12	120	30.53	0.09	0	0
1887	1526	1525	122.12	12	120	46.08	0.13	0	0.01
1888	1535	1526	707.36	12	120	108.9	0.31	0.03	0.05
1889	1524	1535	526.97	12	120	161.11	0.46	0.05	0.1
189	1860	1861	33.06	8	120	-258.21	1.65	0.06	1.72
1890	1520	1523	610.01	8	120	41.19	0.26	0.04	0.06
1891	1516	1506	229.94	8	120	3.13	0.02	0	0
1892	1439	1433	673.36	8	120	0	0	0	0
1893	1441	1439	796.61	8	120	0	0	0	0
1894	1654	1659	78.9	8	120	111.23	0.71	0.03	0.36
1895	1731	10002	504.25	6	120	-80.76	0.92	0.41	0.81
1896	1522	1564	3,013.68	12	120	-630.05	1.79	3.77	1.25
1897	1530	1503	1,260.56	8	120	53.89	0.34	0.12	0.09
1898	1538	1537	566.37	6	120	35.27	0.4	0.1	0.18
1899	1539	1538	183.1	6	120	36.24	0.41	0.03	0.18
19	1101	1082	2,052.54	12	120	-712.79	2.02	3.22	1.57
190	1860	1760	3,632.79	8	120	293.38	1.87	7.94	2.19
1900	1541	1539	188.18	6	120	36.41	0.41	0.04	0.19
1901	1587	1588	305.8	8	120	9.49	0.06	0	0
1902	1585	1587	28.79	6	120	9.49	0.11	0	0.01
1903	1583	1581	319.68	6	120	9.43	0.11	0	0.02
1904	1590	1583	196.32	6	120	19.72	0.22	0.01	0.06
1905	1590	1592	372.58	10	120	-72.13	0.29	0.02	0.05

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1906	1576	1584	535.37	10	120	-39.27	0.16	0.01	0.02
1907	1584	1589	235	10	120	-50.26	0.21	0.01	0.03
1908	1544	2166	172.28	18	120	541.59	0.68	0.02	0.13
1909	1483	1478	245.17	18	120	541.59	0.68	0.03	0.13
191	1865	1868	98.99	6	120	0	0	0	0
1910	1602	1544	2,862.84	18	120	541.59	0.68	0.38	0.13
1911	1658	1655	15.27	12	120	0	0	0	0
1912	1664	1656	608.17	12	120	543.36	1.54	0.58	0.95
1913	1676	1684	131.36	8	120	18.99	0.12	0	0.01
1914	1675	1663	107.43	6	120	0.85	0.01	0	0
1915	1693	1690	149.03	6	120	0.77	0.01	0	0
1916	1720	1712	279.6	6	120	-2.69	0.03	0	0
1917	1705	1700	229.06	6	120	0.91	0.01	0	0
1918	1687	1696	493.14	8	120	5.4	0.03	0	0
1919	1662	1653	876.72	8	120	41.05	0.26	0.05	0.06
192	1865	1894	1,177.42	6	120	-95.16	1.08	1.3	1.1
1920	1668	1692	516.47	8	120	59.12	0.38	0.06	0.11
1921	1662	1668	78.14	8	120	70.17	0.45	0.01	0.15
1922	1659	1662	75.37	8	120	111.23	0.71	0.03	0.36
1923	1706	1648	1,549.88	18	120	2,546.62	3.21	3.57	2.3
1924	1704	8616	1,955.79	8	120	275.63	1.76	3.81	1.95
1925	1626	1637	504.78	6	120	16.52	0.19	0.02	0.04
1926	1626	1601	1,044.11	6	120	-41.02	0.47	0.24	0.23
1927	1555	1547	1,826.06	6	120	64.28	0.73	0.97	0.53
1928	1493	1477	756.68	8	120	2.31	0.01	0	0
1929	1561	1555	149.12	12	120	95.42	0.27	0.01	0.04
193	623	622	24.29	8	120	61.15	0.39	0	0.12
1930	1564	1567	890.11	12	120	50.69	0.14	0.01	0.01
1931	1613	1564	2,573.54	12	120	691.62	1.96	3.82	1.48
1932	1573	1575	384.74	6	120	9.53	0.11	0.01	0.02
1933	1568	1559	466.15	18	120	1,842.92	2.32	0.59	1.27
1934	1625	1652	1,109.13	6	120	30.89	0.35	0.15	0.14
1935	1708	1703	326.6	6	120	16.17	0.18	0.01	0.04
1936	1708	1707	30.55	18	120	12.81	0.02	0	0
1937	1730	1708	656.13	18	120	54.87	0.07	0	0
1938	1728	1682	1,412.46	8	120	13.8	0.09	0.01	0.01
1939	1408	1399	931.81	6	120	54.33	0.62	0.36	0.39
194	621	614	215.38	6	120	25.16	0.29	0.02	0.09
1940	1473	1477	527.3	8	120	-0.28	0	0	0
1941	1449	1476	1,063.99	8	120	-50.39	0.32	0.09	0.08
1942	1442	1449	979.76	6	120	-25.41	0.29	0.09	0.1
1943	1434	1442	838.6	6	120	-0.08	0	0	0
1944	1455	1474	975.64	10	120	-239.44	0.98	0.49	0.51
1945	1447	1455	625.61	10	120	-67.34	0.28	0.03	0.05
1946	551	573	1,039.36	8	120	-99.5	0.64	0.31	0.3
1948	1423	1424	177.5	8	120	0	0	0	0
1949	596	609	1,065.11	18	120	-1,318.11	1.66	0.72	0.68
1951	571	598	1,272.44	8	120	-9.52	0.06	0	0
1952	560	571	604.6	8	120	-3.96	0.03	0	0
1953	1984	1975	1,584.86	16	120	-339.92	0.54	0.16	0.1
1954	1997	1999	41.92	12	120	-667.64	1.89	0.06	1.39
1955	1999	2023	1,898.15	16	120	613.23	0.98	0.56	0.29
1956	2001	1997	362.23	6	120	-174.41	1.98	1.23	3.39
1957	1996	1999	347.01	16	120	1,280.87	2.04	0.4	1.15
1960	1990	1997	604.2	12	120	-493.23	1.4	0.48	0.79
1961	2003	1978	1,188.14	6	120	69.22	0.79	0.73	0.61
1962	2015	2003	460.49	8	120	89.87	0.57	0.11	0.24
1963	2017	1971	1,710.28	20	120	1,303.91	1.33	0.68	0.4
1964	2019	2017	41.34	4	120	0	0	0	0
1965	2015	2013	216.55	12	120	-126.7	0.36	0.01	0.06
1966	2022	2015	790.87	12	120	-36.83	0.1	0.01	0.01
1967	2018	100174	297.64	20	120	-698.98	0.71	0.04	0.13
1968	2023	2018	1,380.18	16	120	604.94	0.97	0.39	0.29
1969	2013	10014	1.61	20	120	-126.7	0.13	0	0
1970	2005	10014	145.05	20	120	1,268.00	1.29	0.05	0.38
1971	2066	2065	20.56	8	120	0	0	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
1972	2060	2061	21.52	8	120	0	0	0	0
1973	2057	2058	21.99	8	120	0	0	0	0
1974	2053	2055	21.24	8	120	0	0	0	0
1975	2067	2692	16.46	20	120	0	0	0	0
1976	2069	2694	33.36	27	120	0	0	0	0
1977	2067	8682	48.79	20	120	0	0	0	0
1978	2069	2087	1,769.33	18	120	-156.08	0.2	0.02	0.01
1979	2070	2069	73.64	8	120	-156.07	1	0.05	0.68
198	821	837	574.94	8	120	14.22	0.09	0	0.01
1980	2089	2070	661.24	8	120	-156.07	1	0.45	0.68
1981	2311	2315	7.76	16	120	0	0	0	0
1982	2031	2050	960.74	24	120	-3,354.19	2.38	0.91	0.94
1984	1995	2031	2,793.73	12	120	-1,901.75	5.39	27.01	9.67
1985	10058	951	4.62	4	120	8.11	0.21	0	0.08
1986	950	2412	1,080.76	8	120	-225.66	1.44	1.45	1.34
1987	954	8046	697.94	8	120	0	0	0	0
1988	950	948	980.79	8	120	205.79	1.31	1.11	1.13
1989	2098	2096	67.64	10	120	288.15	1.18	0.05	0.71
199	1534	821	676.95	8	120	137.73	0.88	0.36	0.54
1990	2095	2091	21.15	12	120	1,374.56	3.9	0.11	5.3
1991	2095	2099	3,120.90	16	120	-1,706.90	2.72	6.08	1.95
1992	2107	2098	733.85	12	120	-44.19	0.13	0.01	0.01
1993	2096	2102	473.81	16	120	-1,714.26	2.74	0.93	1.96
1994	2076	2091	665.9	24	120	-3,374.85	2.39	0.64	0.96
1995	2016	1984	1,085.44	8	120	-106.56	0.68	0.36	0.34
1996	2162	2146	1,522.22	8	120	-174.64	1.11	1.27	0.84
1997	10016	10052	1,558.99	8	120	-89.69	0.57	0.38	0.24
1998	2162	2163	24.98	8	120	469.25	3	0.13	5.22
1999	2183	10052	590.33	10	120	89.69	0.37	0.05	0.08
2	1110	1097	2,179.91	8	120	0	0	0	0
20	1077	1085	522.79	8	120	495.81	3.16	3.02	5.78
200	1534	1528	525.81	8	120	-107.05	0.68	0.18	0.34
2000	2182	2162	613.99	8	120	348.34	2.22	1.84	3
20000	20003	8654	808.58	8	120	-0.2	0	0	0
20001	8654	20002	159.78	8	120	212.59	1.36	0.19	1.2
20002	20001	20002	852.83	8	120	-3.09	0.02	0	0
20003	20008	20004	798.56	8	120	-200.12	1.28	0.86	1.08
20004	20002	1500	1,087.14	8	120	198.37	1.27	1.15	1.06
20005	20004	20007	910.07	8	120	39.89	0.25	0.05	0.05
20006	20013	20008	1,389.15	8	120	-168.45	1.08	1.09	0.78
20007	20009	8648	608.32	8	120	-9.62	0.06	0	0
20008	20008	8652	509.72	8	120	16.72	0.11	0.01	0.01
20009	20011	20013	280.92	8	120	-146.02	0.93	0.17	0.6
2001	2126	100020	2.61	8	120	22.2	0.14	0	0.02
20010	20006	20011	1,298.72	10	120	0	0	0	0
20011	8648	20013	505.42	8	120	-14.76	0.09	0	0.01
2002	2125	100026	9.02	8	120	0	0	0	0
2003	2129	2152	990.58	12	120	-13.28	0.04	0	0
2004	2107	2125	1,278.22	12	120	26.72	0.08	0	0
2005	1008	1010	929.64	8	120	-64.99	0.41	0.12	0.13
2006	1009	1007	604.32	8	120	1.93	0.01	0	0
2008	2481	2458	1,015.80	12	120	-382.6	1.09	0.5	0.5
2009	10062	100008	84.62	8	120	11.99	0.08	0	0.01
201	1553	1546	740.19	8	120	55.84	0.36	0.07	0.1
2010	2204	8044	882.54	6	120	0	0	0	0
2011	2204	2191	2,354.55	16	120	893.73	1.43	1.38	0.59
2012	2227	2204	1,177.28	16	120	895.7	1.43	0.7	0.59
2014	2240	2242	139.1	16	120	6.14	0.01	0	0
2015	2243	2240	369.54	16	120	1,403.74	2.24	0.5	1.36
2016	1011	1017	683.64	4	120	-12.75	0.33	0.13	0.19
2017	1022	1024	84.2	6	120	0	0	0	0
2019	1021	1022	543.23	6	120	14.9	0.17	0.02	0.04
202	1546	1534	220.85	8	120	42.81	0.27	0.01	0.06
2020	1022	1023	261.95	8	120	13.77	0.09	0	0.01
2022	2041	2046	366.26	8	120	23.74	0.15	0.01	0.02
2023	2197	1019	1,850.23	4	120	119.56	3.05	22.45	12.13

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2024	2198	2192	189.59	12	120	7	0.02	0	0
2025	2319	2314	14.9	6	120	0	0	0	0
2026	2317	2313	8.09	14	120	0	0	0	0
2027	2318	2316	7.79	10	120	0	0	0	0
2028	2311	2313	5.81	27	120	0	0	0	0
2029	2311	2314	30.24	27	120	0	0	0	0
203	1546	1551	539.06	8	120	5.92	0.04	0	0
2030	2323	2325	21.39	20	120	0	0	0	0
2031	2320	2314	13.09	27	120	0	0	0	0
2032	2326	2324	6.55	14	120	-1,241.11	2.59	0.01	2.07
2033	2333	2324	452.31	20	120	1,241.11	1.27	0.16	0.36
2034	2206	2200	438.65	12	120	99.51	0.28	0.02	0.04
2035	2291	2320	1,517.08	20	120	0	0	0	0
2036	2326	2301	721.22	14	120	1,241.11	2.59	1.49	2.07
2037	2180	2197	1,019.04	4	120	32.36	0.83	1.1	1.08
2038	1005	1008	606.87	8	120	-61.28	0.39	0.07	0.12
2039	996	1000	216.12	4	120	5.85	0.15	0.01	0.05
204	1502	1509	129.8	18	120	-1,520.76	1.92	0.12	0.89
2040	2484	2457	1,019.63	8	120	-282.99	1.81	2.09	2.05
2041	2342	2343	19.28	8	120	0	0	0	0
2042	2352	2350	18.48	8	120	0	0	0	0
2043	2354	2356	19.63	8	120	0	0	0	0
2044	10036	2342	30.37	12	120	0	0	0	0
2045	996	10076	317.74	6	120	-13.93	0.16	0.01	0.03
2046	2340	2332	1,479.05	18	120	4,971.88	6.27	11.76	7.95
2047	2346	10036	287.8	18	120	4,974.21	6.27	2.29	7.96
2048	2463	2355	2,387.45	12	120	0	0	0	0
205	1528	1509	665.71	18	120	1,419.97	1.79	0.52	0.78
2051	981	993	1,161.75	6	120	43.3	0.49	0.3	0.26
2052	971	972	588.08	8	120	6.62	0.04	0	0
2054	2405	8052	41.97	16	120	591.81	0.94	0.01	0.27
2057	2085	2082	1,164.30	8	120	-409.71	2.62	4.72	4.06
2058	2431	2386	3,000.46	20	120	1,362.55	1.39	1.3	0.43
2059	2386	2334	2,266.13	8	120	27.77	0.18	0.06	0.03
206	1508	1518	297.56	8	120	6.84	0.04	0	0
2060	2386	2391	1,188.82	20	120	1,334.78	1.36	0.5	0.42
2063	2435	10022	28.4	20	120	0	0	0	0
2064	963	973	686.01	8	120	11.56	0.07	0	0.01
2068	10034	2417	29.63	10	120	387.66	1.58	0.04	1.24
2069	10032	2416	29.79	10	120	387.67	1.58	0.04	1.23
207	1508	1494	485.17	8	120	-113.88	0.73	0.18	0.38
2070	10030	2415	29.95	10	120	587.24	2.4	0.08	2.67
2071	10028	2413	28.86	10	120	0	0	0	0
2073	2110	2113	359.11	16	120	-887.98	1.42	0.21	0.58
2074	2082	2110	1,350.15	16	120	-853.63	1.36	0.73	0.54
2075	2475	2476	8.23	10	120	5.11	0.02	0	0
2076	2476	2477	25.46	6	120	5.11	0.06	0	0
2077	2478	2475	271.52	10	120	20.17	0.08	0	0.01
2078	2496	2475	1,328.76	10	120	-15.06	0.06	0	0
2079	2042	2082	831.49	16	120	-410.95	0.66	0.12	0.14
208	1494	1503	435.5	8	120	-44.65	0.29	0.03	0.07
2080	2502	2503	32.44	8	120	-58.58	0.37	0	0.11
2081	2503	VALLECIT_TNK	9.58	12	120	-301.15	0.85	0	0.32
2082	2502	2503	16.83	12	120	-242.56	0.69	0	0.21
2083	2532	2502	1,216.97	12	120	-301.15	0.85	0.39	0.32
2084	2035	2041	467.31	16	120	-339.42	0.54	0.05	0.1
2085	2032	2035	47.15	16	120	-241.43	0.39	0	0.05
2086	2045	2042	373.91	8	120	-37.7	0.24	0.02	0.05
2087	2537	2557	1,060.44	18	120	-112.88	0.14	0.01	0.01
2089	2550	10098	20.23	6	120	0	0	0	0
209	1529	1494	951.53	8	120	80.93	0.52	0.19	0.2
2090	2524	2518	114.61	12	120	0	0	0	0
2091	2006	2002	540.68	8	120	18.57	0.12	0.01	0.01
2092	2104	2105	1,349.96	8	120	-146.98	0.94	0.82	0.61
2093	10018	2258	18.58	10.1	120	15.8	0.06	0	0
2094	2105	2111	1,530.65	8	120	82.9	0.53	0.32	0.21

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2095	2172	2188	863.65	6	120	43.06	0.49	0.22	0.25
2096	2171	2172	45.9	6	120	43.06	0.49	0.01	0.26
2097	2176	2171	226.65	8	120	43.39	0.28	0.01	0.06
2098	2176	2179	540.36	10	120	-205.66	0.84	0.21	0.38
2099	2173	2176	83.43	10	120	-159.8	0.65	0.02	0.24
21	1059	1057	206.21	12	120	-1,236.16	3.51	0.9	4.35
210	1529	1530	257.74	8	120	73.01	0.47	0.04	0.17
2100	2145	2173	1,092.62	8	120	-159.8	1.02	0.78	0.71
2101	2145	2141	490.18	6	120	4.09	0.05	0	0
2102	2136	2145	106.24	8	120	-154.7	0.99	0.07	0.67
2103	2136	2123	453.8	6	120	36.26	0.41	0.08	0.18
2104	2135	2136	283.1	8	120	-118.35	0.76	0.12	0.41
2105	2108	2135	1,469.47	6	120	-95.17	1.08	1.62	1.1
2106	2106	2137	1,607.24	8	120	15.66	0.1	0.02	0.01
2107	2218	2209	903	8	120	17.7	0.11	0.01	0.01
2108	2218	2226	469.36	16	120	-1,001.30	1.6	0.34	0.73
2109	100016	2218	2,103.42	16	120	-815.47	1.3	1.04	0.5
211	1423	10000	1,338.38	8	120	0	0	0	0
2110	2133	2124	265.26	6	120	0.08	0	0	0
2111	2131	2130	331.76	12	120	698.76	1.98	0.5	1.51
2112	2133	2131	160.54	12	120	698.76	1.98	0.24	1.51
2113	2144	2133	283.3	12	120	698.84	1.98	0.43	1.51
2114	100000	2144	441.13	12	120	699.14	1.98	0.67	1.52
2115	2152	100016	10.12	12	120	-13.28	0.04	0	0
2116	2099	CANONITA_TNK	138.58	16	120	-3,439.86	5.49	0.99	7.13
2117	2106	2107	134.97	6	120	-15.66	0.18	0.01	0.04
2118	2103	2099	1,598.46	16	120	-1,732.96	2.77	3.2	2
2119	2102	2103	1,016.18	16	120	-1,722.49	2.75	2.01	1.98
212	519	446	1,730.00	14	120	779.95	1.63	1.51	0.88
2120	2073	2036	1,131.61	6	120	6.46	0.07	0.01	0.01
2121	2076	2073	535.15	8	120	13.87	0.09	0	0.01
2122	2050	2076	372.51	24	120	-3,359.72	2.38	0.35	0.95
2123	2050	2056	913.66	8	120	1.92	0.01	0	0
2124	2235	2221	385.09	6	120	2.68	0.03	0	0
2125	2196	2201	314.29	8	120	13.07	0.08	0	0.01
2126	2196	2224	1,469.89	16	120	-1,224.07	1.95	1.55	1.05
2127	2177	100156	48.76	16	120	-7.21	0.01	0	0
2128	2186	100156	442.32	12	120	-1,190.07	3.38	1.79	4.06
2129	2155	2154	634.93	8	120	15.58	0.1	0.01	0.01
213	441	449	219.28	6	120	7.92	0.09	0	0.01
2130	2156	2155	282.49	8	120	20.7	0.13	0	0.02
2131	100168	2180	535.95	4	120	37.04	0.95	0.74	1.39
2132	2205	2206	498.71	12	120	111.89	0.32	0.03	0.05
2133	2205	2208	343.74	12	120	11.44	0.03	0	0
2134	2203	2205	83.37	12	120	126.29	0.36	0.01	0.06
2137	2187	2203	733.56	12	120	129.92	0.37	0.05	0.07
2138	2186	100168	403.33	12	120	170.53	0.48	0.04	0.11
2139	2116	2122	233.61	6	120	0.76	0.01	0	0
214	441	440	149.86	6	120	1.02	0.01	0	0
2140	2156	2186	710.71	12	120	-1,012.60	2.87	2.14	3.01
2141	2117	2139	1,093.49	16	120	-975.2	1.56	0.76	0.69
2142	2114	2116	371.02	16	120	-966.62	1.54	0.25	0.68
2143	2094	2113	1,753.24	6	120	-66	0.75	0.98	0.56
2144	2097	2094	170.43	6	120	-29.8	0.34	0.02	0.13
2145	2045	2068	546.68	8	120	19.38	0.12	0.01	0.01
2146	2086	2109	1,244.40	8	120	-156.02	1	0.84	0.68
2147	2029	2033	696.17	6	120	-35.56	0.4	0.12	0.18
2148	2044	2039	1,051.25	8	120	112.34	0.72	0.39	0.37
2149	2079	2080	456.41	8	120	22.93	0.15	0.01	0.02
215	455	441	390.87	6	120	8.95	0.1	0.01	0.01
2150	2086	2078	894.69	8	120	26.07	0.17	0.02	0.02
2151	2044	2086	1,322.31	8	120	-112.34	0.72	0.49	0.37
2152	2028	8034	1,271.23	8	120	0	0	0	0
2153	2023	2028	470.64	8	120	8.29	0.05	0	0
2154	2038	2043	577.62	6	120	28.99	0.33	0.07	0.12
2155	2026	2038	300.18	6	120	40.74	0.46	0.07	0.23

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2156	2026	2040	978.47	6	120	8.44	0.1	0.01	0.01
2157	2024	2026	517.59	6	120	51.72	0.59	0.18	0.36
2158	2165	2148	363.44	6	120	29.84	0.34	0.05	0.13
2159	2165	2167	911.94	8	120	382.53	2.44	3.26	3.57
216	1419	1425	654.96	6	120	0	0	0	0
2160	1978	1967	101.25	6	120	67.23	0.76	0.06	0.58
2163	100172	2022	18.5	6	120	-36.83	0.42	0	0.19
2164	2020	100172	83.65	6	120	0	0	0	0
2165	1986	1996	809.3	16	120	1,352.86	2.16	1.03	1.27
2166	1981	1982	72.2	16	120	1,396.87	2.23	0.1	1.34
2167	1988	2004	1,416.76	16	120	-1,407.38	2.25	1.93	1.36
2168	1983	1988	117.91	16	120	-1,407.38	2.25	0.16	1.36
2169	1970	1983	266.9	16	120	-1,407.38	2.25	0.36	1.36
217	1413	1414	284.15	6	120	12.46	0.14	0.01	0.03
2170	1976	1995	377.45	12	120	-1,901.75	5.39	3.65	9.67
2171	1985	100036	42.55	8	120	34.26	0.22	0	0.04
2172	2212	2189	1,849.27	8	120	34.05	0.22	0.07	0.04
2173	2210	2212	621.87	8	120	138.85	0.89	0.34	0.55
2174	2220	2210	241.47	8	120	256.95	1.64	0.41	1.71
2175	2239	2220	1,189.67	6	120	286.29	3.25	10.09	8.48
2176	2161	2150	241.26	8	120	-36.7	0.23	0.01	0.05
2177	2169	2161	976.35	8	120	-28.67	0.18	0.03	0.03
2178	2397	2456	832.6	10	120	38.34	0.16	0.01	0.02
2179	2399	2405	746.2	16	120	808.22	1.29	0.36	0.49
218	1410	1419	1,001.01	6	120	-205.02	2.33	4.58	4.57
2180	2391	2393	52.04	16	120	1,329.50	2.12	0.06	1.22
2181	2363	2338	974.8	6	120	55.04	0.62	0.39	0.4
2182	2327	2304	651.69	10	120	387.81	1.58	0.81	1.24
2183	2292	2290	808.51	8	120	8.67	0.06	0	0
2184	2292	2287	303.64	8	120	19.73	0.13	0	0.01
2185	2298	2292	594.83	8	120	30.29	0.19	0.02	0.03
2186	2305	2331	831.8	8	120	2.53	0.02	0	0
2187	2299	2305	966.64	8	120	5	0.03	0	0
2188	2298	2299	213.17	8	120	28.2	0.18	0.01	0.03
2189	2362	2345	388.37	20	120	1,248.82	1.28	0.14	0.37
219	1409	1410	335.53	6	120	-15.68	0.18	0.01	0.04
2190	2345	2333	918.08	20	120	1,242.88	1.27	0.34	0.37
2191	2337	2339	599.06	8	120	40.97	0.26	0.03	0.06
2192	2293	8618	1,434.84	12	120	-63.89	0.18	0.03	0.02
2193	2283	2310	2,225.48	8	120	-406.69	2.6	8.91	4
2195	2266	2265	127.56	6	120	10.61	0.12	0	0.02
2196	2238	2266	1,549.92	8	120	-345.78	2.21	4.59	2.96
2197	2247	2267	2,141.17	16	120	-1,210.54	1.93	2.21	1.03
2198	2250	2227	1,275.04	16	120	895.7	1.43	0.75	0.59
2199	2458	2436	282.64	12	120	-408.16	1.16	0.16	0.56
22	1077	1058	1,221.92	12	120	-1,209.38	3.43	5.11	4.18
220	1419	1418	973.53	8	120	-209.83	1.34	1.14	1.18
2200	2454	2402	395.06	8	120	-296.19	1.89	0.88	2.23
2201	2388	2337	1,423.14	12	120	-12.15	0.03	0	0
2202	2337	2293	1,891.57	12	120	-53.12	0.15	0.02	0.01
2203	2402	2436	1,310.56	20	120	3,003.01	3.07	2.45	1.87
2204	2402	2379	848.38	6	120	12.25	0.14	0.02	0.02
2205	2436	2388	678.62	8	120	344.06	2.2	1.99	2.94
2206	2388	2390	672.12	12	120	347.7	0.99	0.28	0.42
2207	2390	2437	633.83	12	120	-118.61	0.34	0.04	0.06
2208	2389	2390	71.62	8	120	-466.3	2.98	0.37	5.16
2209	2387	2389	287.34	6	120	-15.92	0.18	0.01	0.04
221	1418	1417	321.7	8	120	10.59	0.07	0	0
2210	2389	2310	2,360.43	8	120	428.11	2.73	10.39	4.4
2211	2437	2436	689.8	16	120	-2,246.80	3.59	2.24	3.24
2212	2393	2397	206.49	16	120	855	1.36	0.11	0.54
2213	2393	2373	611.51	16	120	459.41	0.73	0.1	0.17
2214	2373	2363	682.68	10	120	451.38	1.84	1.12	1.64
2215	2363	2327	1,113.42	10	120	395.07	1.61	1.42	1.28
2216	2304	2303	22.82	10	120	367.95	1.5	0.03	1.12
2217	2304	2307	352.84	6	120	14.45	0.16	0.01	0.03

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2218	2397	2399	585.46	16	120	816.09	1.3	0.29	0.5
2219	2405	2459	1,492.25	18	120	216.4	0.27	0.04	0.02
222	1418	1413	825.55	10	120	-277.85	1.14	0.55	0.67
2220	2330	2289	2,454.85	8	120	-41.02	0.26	0.14	0.06
2221	2303	2280	1,828.14	10	120	295.72	1.21	1.37	0.75
2222	2289	8036	5.75	8	120	0	0	0	0
2223	1006	1002	513.56	6	120	-17.96	0.2	0.03	0.05
2224	1002	1003	127.79	6	120	4.75	0.05	0	0
2227	1017	1019	307.14	4	120	-119.56	3.05	3.73	12.13
2228	2485	2461	1,318.83	18	120	-215.5	0.27	0.03	0.02
2229	2589	2565	2,319.54	16	120	-14.92	0.02	0	0
223	1411	1394	2,520.09	8	120	0	0	0	0
2231	2197	2200	257.47	4	120	-87.2	2.23	1.74	6.76
2232	1018	1021	687.21	6	120	29	0.33	0.08	0.12
2234	2224	2160	2,569.78	8	120	169.92	1.08	2.04	0.8
2235	2159	2158	520.26	6	120	5.98	0.07	0	0.01
2236	2160	2159	26.72	8	120	164.64	1.05	0.02	0.75
2237	2179	2157	717.14	6	120	7.88	0.09	0.01	0.01
2238	2236	2179	1,849.92	10	120	327.92	1.34	1.68	0.91
2239	2247	2250	1,761.35	16	120	895.7	1.43	1.04	0.59
224	1410	1408	529.98	6	120	157.84	1.79	1.49	2.82
2240	2247	2239	913.89	8	120	314.83	2.01	2.28	2.49
2242	967	947	1,783.24	8	120	-13.6	0.09	0.01	0.01
2244	989	992	231.71	6	120	6.46	0.07	0	0.01
2247	960	966	317.53	8	120	298.2	1.9	0.72	2.25
2248	966	975	1,044.37	8	120	255.03	1.63	1.76	1.69
2249	960	954	639.05	8	120	-303.62	1.94	1.49	2.33
225	1413	1406	862.58	10	120	-328.74	1.34	0.79	0.91
2250	948	2037	506.56	8	120	51.46	0.33	0.04	0.09
2251	980	974	418.17	6	120	7.3	0.08	0	0.01
2252	966	965	921.99	6	120	24.5	0.28	0.08	0.09
2254	975	980	1,067.65	6	120	238.88	2.71	6.48	6.07
2255	980	981	195.12	6	120	227.4	2.58	1.08	5.54
2256	981	986	100.21	6	120	184.1	2.09	0.38	3.75
2257	2029	2049	912.01	6	120	37.84	0.43	0.18	0.2
2258	2029	2039	1,197.73	6	120	-108.23	1.23	1.68	1.4
2259	2109	2138	1,363.77	6	120	-156.02	1.77	3.76	2.76
226	154	149	1,226.62	12	120	-12.66	0.04	0	0
2260	2080	2101	900.32	4	120	21.26	0.54	0.45	0.5
2261	946	944	249.38	8	120	89.17	0.57	0.06	0.24
2262	942	941	719.7	6	120	13.84	0.16	0.02	0.03
2263	1996	2024	1,420.45	6	120	53.9	0.61	0.55	0.39
2264	1982	1985	30.54	8	120	34.26	0.22	0	0.04
2265	1991	1979	288.19	8	120	7.68	0.05	0	0
2266	1991	1998	393.74	8	120	1.61	0.01	0	0
2267	2345	2360	289.3	8	120	4.41	0.03	0	0
2268	2398	2395	660.6	20	120	-3,338.54	3.41	1.5	2.28
2269	2308	2295	771.94	8	120	14.13	0.09	0.01	0.01
227	149	139	465.09	12	120	-69.4	0.2	0.01	0.02
2270	653	670	313.27	8	120	-167.42	1.07	0.24	0.77
2271	2329	2308	439.52	6	120	15.91	0.18	0.02	0.04
2272	2395	2329	2,116.06	6	120	53.99	0.61	0.82	0.39
2273	2369	2361	330.91	8	120	14.46	0.09	0	0.01
2274	2362	2336	692.84	6	120	10.8	0.12	0.01	0.02
2275	2364	10020	846.99	30	120	4,742.56	2.15	0.51	0.61
2276	2328	2364	1,305.58	30	120	4,969.92	2.26	0.86	0.66
2277	2385	10020	25.13	27	120	-0.16	0	0	0
2278	2451	2400	604.64	10	120	0	0	0	0
2279	2302	2306	198.34	6	120	0	0	0	0
228	139	115	1,966.82	12	120	-313.11	0.89	0.67	0.34
2280	2285	2302	1,378.78	8	120	80.32	0.51	0.27	0.2
2281	NORTH_RES	2347	59.35	18	120	4,227.21	5.33	0.35	5.89
2282	2371	2346	1,629.25	24	120	747	0.53	0.1	0.06
2283	2367	2371	1,441.46	24	120	747	0.53	0.08	0.06
2284	2365	2367	85.51	16	120	747	1.19	0.04	0.42
2285	2273	2264	623.64	6	120	21.07	0.24	0.04	0.07

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2286	2276	2277	182.22	12	120	64.33	0.18	0	0.02
2287	2246	2273	1,508.04	12	120	129.7	0.37	0.1	0.07
2288	2226	2246	873.36	16	120	-1,007.41	1.61	0.64	0.73
2289	2268	2262	1,592.42	8	120	3.08	0.02	0	0
229	99	119	614.58	12	120	593.2	1.68	0.69	1.12
2290	2301	2268	3,912.59	14	120	1,188.08	2.48	7.47	1.91
2291	2241	2235	293.25	6	120	13.09	0.15	0.01	0.03
2292	2282	2291	765.38	20	120	5.15	0.01	0	0
2293	2285	2281	617.31	24	120	1,998.78	1.42	0.22	0.36
2294	2261	2271	969.36	20	120	-1,872.19	1.91	0.76	0.78
2295	2253	2251	137.48	16	120	-1,510.99	2.41	0.21	1.55
2296	2249	2253	1,052.00	16	120	-1,510.99	2.41	1.64	1.55
2297	2249	2244	1,071.71	16	120	1,423.94	2.27	1.49	1.39
2298	2244	2241	371.6	6	120	13.09	0.15	0.01	0.03
2299	2237	2234	712.33	6	120	31.83	0.36	0.1	0.15
23	1083	1061	1,006.19	8	120	-86.37	0.55	0.23	0.23
230	119	1422	1,295.12	12	120	549.65	1.56	1.26	0.97
2300	2251	2237	940.86	10	120	359.75	1.47	1.01	1.08
2301	2271	2269	585.37	8	120	103.6	0.66	0.19	0.32
2302	2294	2286	1,315.22	24	120	2,092.51	1.48	0.52	0.39
2303	2296	2294	665.15	24	120	2,092.51	1.48	0.26	0.39
2304	2297	2296	259.84	24	120	2,092.51	1.48	0.1	0.39
2305	NORTHSIDE_TNK	2297	231.22	24	120	2,092.51	1.48	0.09	0.39
2306	2077	2016	2,151.13	8	120	-72	0.46	0.35	0.16
2307	2215	2230	521.08	8	120	-4.45	0.03	0	0
2308	2211	2202	643.81	6	120	-0.08	0	0	0
2309	2195	2132	2,055.04	8	120	-572.03	3.65	15.47	7.53
231	119	124	1,161.64	8	120	21.34	0.14	0.02	0.02
2310	2132	2130	2,905.46	12	120	-591.22	1.68	3.23	1.11
2311	2215	2202	501.38	8	120	-534.51	3.41	3.33	6.64
2312	2217	2215	1,625.49	8	120	-538.97	3.44	10.96	6.74
2313	2216	2217	705.2	8	120	-264.61	1.69	1.27	1.81
2314	2048	2063	557.49	12	120	8.32	0.02	0	0
2315	2088	2048	971.54	12	120	8.32	0.02	0	0
2316	2047	2014	1,795.00	16	120	-71.86	0.11	0.01	0.01
2317	2071	2047	891.34	16	120	-65.94	0.11	0	0
2318	2075	2071	153.42	27	120	0	0	0	0
2319	2104	2089	819.06	6	120	-51.09	0.58	0.29	0.35
232	2595	2592	678.42	6	120	-35.95	0.41	0.12	0.18
2320	2119	2118	318.21	6	120	0.86	0.01	0	0
2321	2134	2119	647.21	8	120	49.34	0.31	0.05	0.08
2322	2168	8038	28.9	8	120	0	0	0	0
2323	2222	2229	366.18	8	120	345.42	2.2	1.08	2.96
2324	2175	2222	1,801.66	8	120	363.49	2.32	5.86	3.25
2325	2168	2175	1,322.71	8	120	374.66	2.39	4.55	3.44
2326	2219	2183	2,330.83	10	120	91.41	0.37	0.2	0.09
2327	2231	2219	482.1	10	120	116.07	0.47	0.06	0.13
2328	2146	2104	1,897.93	8	120	-196.18	1.25	1.97	1.04
2329	2190	2191	693.36	8	120	-0.91	0.01	0	0
233	2373	2377	159.48	16	120	0	0	0	0
2331	2105	2087	868.36	18	120	165.21	0.21	0.01	0.01
2332	2121	2105	945.58	18	120	437.89	0.55	0.08	0.09
2333	2149	2121	1,377.05	18	120	463.91	0.58	0.14	0.1
2334	2181	2149	1,905.53	18	120	513.27	0.65	0.23	0.12
2335	2184	2193	440.42	6	120	24.49	0.28	0.04	0.09
2336	2181	2184	447.61	8	120	373.71	2.39	1.53	3.42
2337	2191	2181	1,902.33	16	120	890.3	1.42	1.11	0.58
2338	2621	2622	645.71	6	120	21.54	0.24	0.05	0.07
2339	2619	2621	1,521.81	6	120	32.73	0.37	0.23	0.15
234	2119	2115	481.52	8	120	25.46	0.16	0.01	0.02
2340	2569	2603	1,952.62	12	120	79.2	0.22	0.05	0.03
2341	2521	2520	128.93	6	120	4.08	0.05	0	0
2342	2524	2521	327.69	12	120	-268.26	0.76	0.08	0.26
2343	2524	2506	300.09	6	120	38.66	0.44	0.06	0.21
2344	2569	2524	1,792.24	12	120	-224.07	0.64	0.33	0.18
2345	2564	2569	543.82	12	120	-119.67	0.34	0.03	0.06

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2346	2573	2574	41.91	6	120	-9.04	0.1	0	0.01
2347	2579	2583	647.23	8	120	3.69	0.02	0	0
2348	2580	2593	849.37	8	120	5.64	0.04	0	0
2349	2579	2580	206.59	8	120	11.04	0.07	0	0.01
235	2271	2281	951.32	20	120	-1,993.62	2.04	0.83	0.88
2350	2564	2579	738.39	8	120	14.81	0.09	0.01	0.01
2351	2540	2564	635.14	12	120	-103.03	0.29	0.03	0.04
2352	2529	2505	682.11	14	120	2.5	0.01	0	0
2353	2561	2529	815.09	14	120	2.85	0.01	0	0
2354	2573	2561	878.19	12	120	3.09	0.01	0	0
2355	2559	2574	1,094.78	6	120	9.04	0.1	0.02	0.01
2356	2540	2559	2,178.12	8	120	16.12	0.1	0.02	0.01
2357	2555	2542	509.93	6	120	9.25	0.1	0.01	0.01
2358	2540	2555	347.81	6	120	10.11	0.11	0.01	0.02
2359	2508	2540	675.36	12	120	-75.05	0.21	0.02	0.02
236	2522	8022	442.58	8	120	0	0	0	0
2360	2489	2508	2,113.55	12	120	-18.07	0.05	0	0
2361	2244	2243	476.72	16	120	1,403.90	2.24	0.65	1.36
2362	2237	2236	168.81	10	120	327.92	1.34	0.15	0.91
2363	2251	2261	194.84	16	120	-1,870.74	2.99	0.45	2.31
2364	2273	2276	687.05	12	120	64.33	0.18	0.01	0.02
2365	2268	2246	1,625.70	14	120	1,176.98	2.45	3.05	1.88
2366	2306	2332	621.9	6	120	0	0	0	0
2367	2400	2385	892.01	14	120	-0.08	0	0	0
2368	2279	2278	39.53	8	120	-56.22	0.36	0	0.1
2369	2587	2575	918.12	8	120	-1.41	0.01	0	0
237	2455	2406	1,469.46	8	120	736.78	4.7	17.68	12.03
2370	2570	2568	46.93	8	120	-4.29	0.03	0	0
2371	2473	2471	1,195.38	8	120	1.87	0.01	0	0
2372	2473	2463	773.02	12	120	2.53	0.01	0	0
2373	2480	2474	1,079.54	8	120	94.55	0.6	0.29	0.27
2374	2480	2464	769.87	6	120	51.62	0.59	0.27	0.36
2375	2481	2484	1,288.28	8	120	36.88	0.24	0.06	0.05
2376	2482	2481	1,130.32	8	120	-90.89	0.58	0.28	0.25
2377	2499	2484	1,371.72	8	120	-129.8	0.83	0.66	0.48
2378	2494	2493	715.71	14	110	-37.27	0.08	0	0
2379	2591	2584	408.69	8	110	1.73	0.01	0	0
238	2597	2592	211.36	8	120	-10.57	0.07	0	0
2380	2591	2567	2,450.59	8	110	0	0	0	0
2382	2256	2254	49.49	12	120	280.46	0.8	0.01	0.28
2383	2254	2256	21.82	16	120	-930.08	1.48	0.01	0.63
2384	2256	GOMEZ_TNK	8.11	16	120	-1,210.54	1.93	0.01	1.04
2385	2260	2254	174.12	16	120	-1,210.54	1.93	0.18	1.03
2387	2469	MAGEE_TNK	18.81	16	110	-51.44	0.08	0	0
2388	2466	2469	38.31	16	110	-51.44	0.08	0	0.01
2389	2465	2466	803.85	16	110	-51.44	0.08	0	0
239	2597	2596	330.43	8	120	5.55	0.04	0	0
2390	2614	2612	16.07	8	120	0	0	0	0
2391	2611	2605	75.02	14	120	0	0	0	0
2392	2609	2610	15.86	8	120	0	0	0	0
2393	2607	2609	52.87	14	120	0	0	0	0
2394	2604	2618	779.31	8	110	11.68	0.07	0.01	0.01
2395	2604	2599	484.24	14	110	-11.69	0.02	0	0
2396	2601	2607	1,492.77	14	120	1.36	0	0	0
2397	2404	2403	46.67	12	110	1.51	0	0	0
2398	2392	2404	1,112.09	8	110	-4.65	0.03	0	0
2399	2272	2260	1,031.57	16	120	-1,210.54	1.93	1.06	1.03
24	1071	1049	1,272.13	8	120	140.57	0.9	0.71	0.56
240	2602	2597	313.66	8	120	-5.02	0.03	0	0
2400	2284	2272	1,199.67	16	120	-1,210.54	1.93	1.24	1.03
2401	1446	1440	790.07	8	120	6.82	0.04	0	0
2402	1130	8628	834.73	8	120	33.29	0.21	0.03	0.04
2403	652	100138	898.48	8	120	-16	0.1	0.01	0.01
2404	724	704	612.54	8	120	15.35	0.1	0.01	0.01
2405	2079	2078	67.25	8	120	-26.07	0.17	0	0.02
2406	2080	2081	90	8	120	1.01	0.01	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2407	954	957	792.08	8	120	-339.94	2.17	2.27	2.87
2408	957	959	87.78	8	120	51.2	0.33	0.01	0.09
2409	959	971	920.06	8	120	18.15	0.12	0.01	0.01
241	2615	2625	1,169.13	6	120	2.78	0.03	0	0
2411	1009	1011	1,188.72	8	120	-69.59	0.44	0.18	0.15
2412	1011	1018	604.56	8	120	-70.13	0.45	0.09	0.15
2413	1018	2214	1,474.75	8	120	0	0	0	0
2414	1009	1010	12.97	8	120	67.65	0.43	0	0.15
2415	1018	1017	27.8	6	120	-106.81	1.21	0.04	1.37
2416	2143	2140	630.54	8	120	-8.57	0.05	0	0
2417	250	278	921.78	8	120	37.48	0.24	0.04	0.05
2418	250	231	978.1	12	120	79.75	0.23	0.03	0.03
2419	1969	1992	317.5	6	120	10.27	0.12	0.01	0.02
242	2602	2615	250.35	8	120	2.91	0.02	0	0
2420	10038	520	743.39	8	120	13.71	0.09	0.01	0.01
2422	1102	1098	345	8	120	4.77	0.03	0	0
2423	140	130	473.53	8	120	-13.69	0.09	0	0.01
2424	130	126	694.94	8	120	-36.29	0.23	0.03	0.05
2425	126	128	424.93	8	120	289.58	1.85	0.91	2.13
2426	126	122	497.23	8	120	-341.04	2.18	1.44	2.89
2427	122	121	344.65	8	120	30.16	0.19	0.01	0.03
2428	122	106	886.22	8	120	-401.26	2.56	3.46	3.9
2429	92	90	247.09	12	120	-298.45	0.85	0.08	0.31
243	2620	2602	971.66	8	120	-1.01	0.01	0	0
2430	90	95	425.4	8	120	13.78	0.09	0	0.01
2431	90	85	706.67	12	120	-312.23	0.89	0.24	0.34
2432	85	86	453.2	12	120	-354.3	1.01	0.2	0.43
2433	86	87	232.95	8	120	21.05	0.13	0	0.02
2434	85	100	666.93	8	120	0	0	0	0
2435	85	80	1,062.22	8	120	38.78	0.25	0.05	0.05
2436	86	79	536.2	12	120	-375.36	1.06	0.26	0.48
2437	92	91	342.92	12	120	-112.52	0.32	0.02	0.05
244	2624	2620	980.63	8	120	0	0	0	0
2440	125	113	1,269.54	8	120	16.47	0.11	0.01	0.01
2441	113	112	306.7	8	120	-3.74	0.02	0	0
2442	109	113	119.25	8	120	-5.47	0.03	0	0
2443	109	8512	3.68	8	120	0	0	0	0
2444	100	105	4.49	8	120	0	0	0	0
2445	100	103	6.48	4	120	0	0	0	0
2447	108	109	1.04	4	120	-5.47	0.14	0	0
2448	108	8516	1.5	3	120	5.47	0.25	0	0.16
245	2533	2536	986.16	8	120	122.66	0.78	0.43	0.43
2453	460	462	8.58	14	120	-2.71	0.01	0	0
2454	463	466	43.02	12	120	13.62	0.04	0	0
2455	466	465	22.28	12	120	13.62	0.04	0	0
2456	2538	8024	4.35	8	120	0	0	0	0
2457	2548	2551	14.8	8	120	0	0	0	0
2458	106	100142	3.97	8	120	-186.91	1.19	0	0.95
2459	101	98	4.48	8	120	-186.92	1.19	0	0.94
246	2530	2533	1,484.51	12	120	269.6	0.76	0.39	0.26
2462	8052	RBOWHGT_TNK	31.8	12	120	591.81	1.68	0.04	1.11
2463	1266	1268	6.83	4	120	0	0	0	0
2465	1269	100128	10.51	2	120	0	0	0	0
2467	1269	1270	4.51	3	120	0	0	0	0
2468	1269	1271	23	6	120	0	0	0	0
247	2532	2530	382.29	12	120	273.02	0.77	0.1	0.27
2470	2377	2375	8.14	12	120	0	0	0	0
2471	2375	2374	15.32	8	120	0	0	0	0
2472	2377	2380	9.49	16	120	0	0	0	0
2473	2380	2381	8.9	16	120	0	0	0	0
2474	2381	2378	8.16	12	120	0	0	0	0
2475	2378	2374	16.18	8	120	0	0	0	0
2476	2375	2376	9.58	12	120	0	0	0	0
2477	2376	2378	8.76	12	120	0	0	0	0
248	2563	2532	1,097.16	8	120	-2.98	0.02	0	0
2481	863	861	872	20	120	-1,356.14	1.38	0.37	0.43

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2482	861	859	24.47	14	120	29.71	0.06	0	0
2483	145	150	593.86	8	120	35.6	0.23	0.03	0.04
2484	150	146	163.48	8	120	13.74	0.09	0	0.01
2485	150	153	267.06	8	120	11.56	0.07	0	0.01
2486	100124	145	514.37	8	120	69.04	0.44	0.08	0.15
2487	145	152	364.3	8	120	18.81	0.12	0	0.01
2488	598	570	1,054.97	8	120	3.2	0.02	0	0
2489	598	609	181.12	8	120	-19.58	0.12	0	0.01
249	2566	2563	207.45	6	120	-0.62	0.01	0	0
2490	609	639	517.62	8	120	-47.64	0.3	0.04	0.08
2491	639	708	1,442.89	8	120	-71.06	0.45	0.23	0.16
2492	708	722	395.33	8	120	-96.04	0.61	0.11	0.28
2493	724	722	41.81	8	120	96.54	0.62	0.01	0.28
2495	1146	1147	431.68	8	120	2.32	0.01	0	0
2496	1895	1907	454.73	8	120	14.94	0.1	0	0.01
2497	1895	1919	658.2	6	120	-159.35	1.81	1.89	2.87
2498	780	759	761.86	8	120	-12.33	0.08	0	0.01
2499	653	673	571.95	8	120	15.66	0.1	0.01	0.01
25	1097	1084	2,274.67	8	120	0	0	0	0
250	634	678	945.26	8	120	-135.4	0.86	0.49	0.52
2500	599	651	1,163.36	8	120	-60.81	0.39	0.14	0.12
2501	602	629	564.18	18	120	-1,276.36	1.61	0.36	0.64
2502	679	651	974.2	8	120	-61.27	0.39	0.12	0.12
2503	651	653	442.87	8	120	-139.18	0.89	0.24	0.55
2504	602	624	281.63	18	120	1,297.72	1.64	0.19	0.66
2505	609	10040	38.99	18	120	-1,297.48	1.64	0.03	0.66
2506	599	575	646.93	8	120	10.08	0.06	0	0
2507	633	1432	787.93	18	120	-1,445.32	1.82	0.64	0.81
2508	670	633	655.18	8	120	-168.96	1.08	0.52	0.79
2509	435	436	697.22	14	120	123.97	0.26	0.02	0.03
251	1271	1272	10.32	6	120	15.4	0.17	0	0.04
2510	721	679	892.2	8	120	-9.84	0.06	0	0
2511	725	721	449.46	8	120	-1.23	0.01	0	0
2512	759	747	426.06	8	120	0	0	0	0
2513	747	725	538.91	8	120	0	0	0	0
2514	679	641	881.99	8	120	26.67	0.17	0.02	0.03
2515	641	602	653.99	8	120	-5.54	0.04	0	0
2516	436	437	803.27	14	120	123.89	0.26	0.02	0.03
2517	437	431	1,126.41	14	120	114.49	0.24	0.03	0.03
2518	431	415	1,438.85	14	120	99.26	0.21	0.03	0.02
252	1265	1264	8.91	14	120	-1,648.28	3.44	0.03	3.51
2520	2491	2488	3,291.24	8	120	-16.4	0.1	0.03	0.01
2521	2491	2487	435.57	8	120	15.86	0.1	0	0.01
2522	2491	2490	45.83	8	120	0	0	0	0
2523	938	939	919.63	8	120	26.64	0.17	0.02	0.03
2524	1650	878	522.33	8	120	-218.16	1.39	0.66	1.26
2525	1374	1373	197.52	24	120	-2,091.05	1.48	0.08	0.39
2526	1373	1380	1,284.19	24	120	-2,098.28	1.49	0.51	0.4
2527	1091	1102	1,264.75	8	120	18.09	0.12	0.02	0.01
2528	906	909	1,152.87	8	120	27.05	0.17	0.03	0.03
2529	782	783	562.67	8	120	10.05	0.06	0	0
253	886	887	1,399.37	20	120	503.13	0.51	0.1	0.07
2530	798	808	466	8	120	9.1	0.06	0	0
2531	847	2470	359.16	8	120	0	0	0	0
2532	848	847	485.26	20	120	-2,311.31	2.36	0.56	1.15
2533	847	852	938.47	20	120	-2,311.31	2.36	1.08	1.15
2534	782	768	400.34	8	120	160.79	1.03	0.29	0.72
2535	794	791	245.02	8	120	208.08	1.33	0.28	1.16
2536	791	782	544.85	8	120	177.59	1.13	0.47	0.86
2537	805	798	653.35	8	120	578.57	3.69	5.02	7.69
2538	798	794	174.98	8	120	564.83	3.61	1.29	7.36
2539	192	194	86.59	6	120	-34.08	0.39	0.01	0.16
254	885	714	761.5	20	120	471.84	0.48	0.05	0.06
2540	194	195	174.46	6	120	-104.71	1.19	0.23	1.32
2541	894	898	164.7	12	120	-416.67	1.18	0.1	0.58
2542	898	904	1,016.37	12	120	-442.17	1.25	0.66	0.65

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
2543	904	908	409.34	12	120	-519.62	1.47	0.36	0.87
2545	908	910	74.5	12	120	-529.47	1.5	0.07	0.91
2546	1325	1336	1,286.42	8	120	190.3	1.21	1.26	0.98
2547	1323	1324	1,696.22	8	120	197.8	1.26	1.79	1.05
2549	1325	1324	182.86	8	120	-190.3	1.21	0.18	0.98
255	1752	885	351.5	20	120	2,640.63	2.7	0.52	1.47
2550	621	617	24.08	8	120	-89.68	0.57	0.01	0.24
2551	1372	8640	1,189.13	8	120	9.42	0.06	0	0
2552	1820	1821	249.99	8	120	8.63	0.06	0	0
2553	1817	1820	150.96	16	120	154.1	0.25	0	0.02
2554	1820	1867	1,779.60	16	120	141.83	0.23	0.03	0.02
256	1751	1752	1,370.00	20	120	3,381.80	3.45	3.19	2.33
258	1735	1733	149.67	6	120	-20.91	0.24	0.01	0.07
259	1805	1801	76.59	36	120	0	0	0	0
26	1038	1036	180.54	6	120	68.26	0.77	0.11	0.6
260	1797	1794	19.46	18	120	-6,315.04	7.96	0.24	12.39
261	1966	1936	699.68	6	120	27.47	0.31	0.08	0.11
262	1934	1932	14.86	20	120	0	0	0	0
263	1950	1926	544.69	6	120	0	0	0	0
264	1955	1950	641.86	6	120	12.82	0.15	0.02	0.03
265	1956	1955	255.51	6	120	37.72	0.43	0.05	0.2
266	743	720	506.23	6	120	-58.43	0.66	0.23	0.45
267	618	593	372.68	8	120	160.93	1.03	0.27	0.72
268	585	593	1,036.29	6	120	-135.52	1.54	2.2	2.12
269	592	600	323.1	6	120	-4.34	0.05	0	0
27	1035	1037	492.84	6	120	6.62	0.08	0	0.01
270	510	533	1,689.78	6	120	-8.8	0.1	0.02	0.01
271	538	541	1,211.14	20	120	-3,036.71	3.1	2.31	1.91
272	548	541	451.93	6	120	56.62	0.64	0.19	0.42
273	565	548	817.09	6	120	61.93	0.7	0.41	0.5
274	211	213	1,120.18	16	120	-117.23	0.19	0.02	0.01
276	213	207	592.94	8	120	6.8	0.04	0	0
277	231	232	351.4	8	120	33.76	0.22	0.01	0.04
278	208	195	1,022.79	6	120	-160.75	1.82	2.98	2.91
279	214	208	311.9	8	120	-147.95	0.94	0.19	0.62
28	1049	1045	147.69	6	120	0.25	0	0	0
280	231	226	170.77	12	120	46	0.13	0	0.01
281	255	249	358.36	14	120	0	0	0	0
283	228	230	115.62	10	120	-382.73	1.56	0.14	1.21
284	235	242	146.5	6.1	120	0	0	0	0
285	274	245	1,008.08	6	120	0	0	0	0
286	1331	10182	31.94	8	120	0	0	0	0
288	1332	10176	9.61	8	120	-4.2	0.03	0	0
289	1331	1330	76.22	8	120	-4.21	0.03	0	0
29	1049	1044	92.17	8	120	80.27	0.51	0.02	0.2
290	1330	1326	472.64	8	120	-247.97	1.58	0.76	1.6
291	1305	1304	52.21	6	120	0	0	0	0
292	1326	1308	968.39	8	120	-342.16	2.18	2.81	2.91
293	1308	10017	290.51	8	120	-368.03	2.35	0.97	3.33
295	1303	1302	29.88	14	120	1,304.19	2.72	0.07	2.27
296	1304	10013	61.74	14	120	-930.33	1.94	0.07	1.21
297	1302	1286	623.02	10	120	5.72	0.02	0	0
298	1339	244	841.64	8	120	59.34	0.38	0.1	0.11
299	244	229	539.98	8	120	34.92	0.22	0.02	0.04
3	1116	1108	909.6	6	120	26.57	0.3	0.09	0.1
30	1061	1071	2,957.74	12	120	-1,587.63	4.5	20.47	6.92
300	229	225	84.03	8	120	4.43	0.03	0	0
301	1349	1339	1,387.34	8	120	78.96	0.5	0.27	0.19
302	1326	1321	893.36	6	120	83.5	0.95	0.77	0.87
303	1303	1301	140.53	14	120	-1,304.19	2.72	0.32	2.27
304	1309	1307	517.15	4	120	-7.06	0.18	0.03	0.06
305	1308	1307	818.26	4	120	19.12	0.49	0.33	0.41
306	1307	1320	772.33	6	120	4.89	0.06	0	0
307	1342	1340	334.08	6.1	120	6.11	0.07	0	0.01
308	1342	1333	3,131.70	6	120	-107.37	1.22	4.32	1.38
309	1358	10162	8.3	6	120	0	0	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
31	1105	1099	829.03	12	120	-399.32	1.13	0.45	0.54
310	1298	1313	678.55	6	120	6.48	0.07	0.01	0.01
311	1299	1314	1,377.62	6	120	7.63	0.09	0.01	0.01
312	1346	1344	544.67	6	120	-46.37	0.53	0.16	0.29
313	1353	1347	390.08	12	120	390.23	1.11	0.2	0.51
314	1231	1233	91.86	8	120	18.91	0.12	0	0.01
315	1228	1231	1,359.50	8	120	63.73	0.41	0.18	0.13
316	1227	1225	439.09	10	120	-233.59	0.95	0.21	0.48
317	1230	1228	302.56	10	120	-136.22	0.56	0.05	0.18
318	1239	1246	459.63	8	120	25.78	0.16	0.01	0.02
319	1240	1239	601.58	6	120	31.74	0.36	0.09	0.14
32	1103	1067	2,214.11	8	120	-145.74	0.93	1.32	0.6
320	1256	1254	804.98	12	120	13.44	0.04	0	0
321	1245	1236	288.13	12	120	9.53	0.03	0	0
322	1251	1245	706.46	12	120	10.34	0.03	0	0
323	1257	1251	882.78	12	120	13.44	0.04	0	0
324	1254	1257	77.97	12	120	13.44	0.04	0	0
325	801	799	41.5	12.1	120	-78.89	0.22	0	0.03
326	801	820	1,004.88	6	120	99.1	1.12	1.2	1.19
327	799	789	688.04	12	120	716.85	2.03	1.09	1.59
328	809	805	46.46	14.1	120	2,279.08	4.68	0.29	6.16
329	10044	851	111.02	18.1	120	0	0	0	0
33	1104	1080	2,644.87	8	120	-8.69	0.06	0.01	0
330	1612	1614	228.92	6	120	7.26	0.08	0	0.01
331	1591	1595	208.09	6	120	10.93	0.12	0	0.02
332	865	10046	949.06	8	120	-11.72	0.07	0.01	0.01
333	1267	1266	10.26	2	120	0	0	0	0
334	1266	1265	2.12	4	120	0	0	0	0
335	1265	1276	681.49	14	120	1,648.27	3.44	2.39	3.5
336	573	634	1,256.43	8	120	-122.93	0.78	0.55	0.44
337	1264	1263	191.2	14	120	-1,653.56	3.45	0.67	3.52
338	530	2012	636.02	8	120	-202.42	1.29	0.7	1.1
339	142	137	137.66	16	120	-1,643.66	2.62	0.25	1.82
34	1042	1047	87.48	6	120	0	0	0	0
341	143	10142	8.13	16	120	-1,643.66	2.62	0.01	1.81
343	542	530	901.14	24	120	2,886.09	2.05	0.64	0.72
344	532	530	75.82	24	120	-3,088.52	2.19	0.06	0.81
345	1292	1280	1,679.02	14	120	-1,492.65	3.11	4.89	2.91
346	1293	1297	486.09	6	120	83.64	0.95	0.42	0.87
347	1293	1288	227.49	6	120	79.34	0.9	0.18	0.79
348	1294	1293	35.56	6	120	173.05	1.96	0.12	3.34
349	1292	10174	7.14	4	120	173.05	4.42	0.17	24.06
35	1064	1062	416.36	10	120	518.86	2.12	0.88	2.12
350	1299	1292	865.94	14	120	-1,319.60	2.75	2.01	2.32
351	529	532	173.76	20	120	-3,088.52	3.15	0.34	1.97
352	527	529	223.48	20	120	-3,026.75	3.09	0.42	1.9
353	201	199	66.94	10	120	210.59	0.86	0.03	0.4
354	202	10186	19.86	2	120	-111.04	11.34	6.15	309.64
355	203	201	26.44	10	120	-111.04	0.45	0	0.12
356	200	203	40.67	10	120	-111.04	0.45	0	0.12
357	202	10190	6.87	10	120	0	0	0	0
358	204	202	41.06	10	120	-111.04	0.45	0.01	0.12
359	205	204	282.27	10	120	-104.25	0.43	0.03	0.11
36	1074	1064	1,497.36	12	120	689.76	1.96	2.21	1.48
360	228	2648	603.45	10	120	359.3	1.47	0.65	1.07
361	528	527	82.09	20	120	-3,017.94	3.08	0.15	1.89
362	490	455	728.08	6	120	36.26	0.41	0.13	0.18
363	455	468	555.54	6	120	6.78	0.08	0	0.01
364	184	182	32.76	12	120	-358.26	1.02	0.01	0.44
365	189	181	667.25	6	120	42.09	0.48	0.16	0.24
366	181	182	43.44	6	120	-101.5	1.15	0.05	1.24
367	181	176	1,897.53	6	120	142.88	1.62	4.44	2.34
368	182	161	507.53	12	120	-459.76	1.3	0.35	0.7
369	512	506	275.33	6	120	2.94	0.03	0	0
37	1107	1094	1,401.88	6	120	0	0	0	0
370	215	189	1,366.78	6	120	-44.32	0.5	0.37	0.27

Pipe Report – Peak Hour Demand Scenario

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
371	1698	1695	701.2	18	120	-558.63	0.7	0.1	0.14
372	1695	8576	8.05	8	120	86.15	0.55	0	0.23
373	1694	2422	498.29	12	120	-94.74	0.27	0.02	0.04
374	1702	1697	278.38	8	120	-86.15	0.55	0.06	0.23
375	557	508	1,820.96	8	120	-86.75	0.55	0.42	0.23
376	557	553	896.61	8	120	1.78	0.01	0	0
377	1713	100068	11.07	4	120	0	0	0	0
378	554	557	949.24	6	120	-55.52	0.63	0.39	0.41
38	1106	1107	691.67	8	120	20.8	0.13	0.01	0.02
380	1734	1711	785.25	6	120	130.86	1.48	1.56	1.99
381	1746	1747	1,123.91	16	120	3,613.13	5.77	8.78	7.81
382	646	655	412.85	8	120	124.53	0.79	0.18	0.45
383	643	622	560.37	8	120	7.95	0.05	0	0
384	1874	1861	185.88	10	120	258.21	1.05	0.11	0.58
385	1532	1529	328.07	8	120	160.77	1.03	0.24	0.72
386	1553	1554	43.41	6	120	33.45	0.38	0.01	0.16
387	883	881	158.42	12	120	868.15	2.46	0.36	2.26
388	860	862	321.71	8	120	121.92	0.78	0.14	0.43
389	860	856	227.63	8	120	8.02	0.05	0	0
39	1041	1039	826.96	8	120	27.96	0.18	0.02	0.03
390	859	860	597.37	8	120	137.1	0.88	0.32	0.53
392	857	2084	162.78	6	120	-125.35	1.42	0.3	1.84
393	2544	2546	32.33	8	120	0	0	0	0
394	2546	2548	15.59	6	120	0	0	0	0
395	2544	2545	16.14	6	120	0	0	0	0
396	2538	2546	103.39	6	120	109.36	1.24	0.15	1.43
397	2539	2526	653.67	10	120	-18.06	0.07	0	0
398	2544	2539	59.12	8	120	-18.06	0.12	0	0.01
399	346	338	155.54	6	120	77.89	0.88	0.12	0.76
4	1109	1104	3,724.27	6	120	17.49	0.2	0.18	0.05
40	1046	1041	989.38	6	120	27.96	0.32	0.11	0.11
401	320	340	283.76	6	120	41.21	0.47	0.07	0.23
402	286	318	995.14	20	120	446.84	0.46	0.05	0.05
403	320	341	427.1	20	120	384.74	0.39	0.02	0.04
404	320	318	44.61	20	120	-425.95	0.43	0	0.05
406	487	470	784.26	10	120	-311.76	1.27	0.65	0.83
407	484	487	194.61	10	120	-76.16	0.31	0.01	0.06
408	416	388	1,387.79	20	120	2,215.04	2.26	1.48	1.06
409	392	383	10.96	30.1	120	0	0	0	0
41	1034	1033	391.24	8	120	41.45	0.26	0.02	0.06
410	386	387	7.57	30	120	0	0	0	0
411	388	386	3.3	30	120	0	0	0	0
412	382	386	2.74	30.1	120	0	0	0	0
413	383	382	5.97	30.1	120	0	0	0	0
414	383	384	7.56	30.1	120	0	0	0	0
415	394	392	2.37	30.1	120	0	0	0	0
416	393	394	3.44	30.1	120	0	0	0	0
417	391	393	1.24	30.1	120	0	0	0	0
418	390	392	3.4	30.1	120	0	0	0	0
419	391	390	1.13	30.1	120	0	0	0	0
42	1042	1034	1,401.36	8	120	41.45	0.26	0.08	0.06
420	1936	1934	55.28	12	120	513.47	1.46	0.05	0.86
421	1803	1810	614.77	8	120	77.98	0.5	0.12	0.19
422	1857	1875	470.43	6	120	15.73	0.18	0.02	0.04
423	1758	1755	438.84	4	120	45.29	1.16	0.88	2.01
424	10012	1863	481.35	8	120	152.6	0.97	0.31	0.65
425	1830	1814	915.96	8	120	26.78	0.17	0.02	0.03
426	1814	1815	377.71	6	120	24.39	0.28	0.03	0.09
427	881	880	819.23	10	120	862.09	3.52	4.45	5.43
428	880	864	3,352.53	10	120	843.56	3.45	17.48	5.21
429	887	883	746.39	10	120	868.15	3.55	4.1	5.5
43	1046	1042	460.99	8	120	41.45	0.26	0.03	0.06
430	881	882	546.56	6	120	0.55	0.01	0	0
431	878	10048	13.98	14	120	1,946.16	4.06	0.07	4.76
432	1650	1629	904.72	6	120	198.82	2.26	3.91	4.32
433	1628	1632	346.82	6	120	21.19	0.24	0.02	0.07

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
434	1628	1612	623.97	6	120	143.22	1.63	1.47	2.35
435	1704	10002	1,270.75	6	120	-50.1	0.57	0.43	0.34
436	1733	1680	1,202.23	10	120	531.78	2.17	2.67	2.22
437	1615	1729	2,724.51	12	120	-710.31	2.01	4.25	1.56
438	1754	1706	1,506.33	18	120	2,607.53	3.29	3.63	2.41
439	1622	1608	480	8	120	509.35	3.25	2.92	6.07
44	1060	1046	988.58	8	120	69.41	0.44	0.15	0.15
440	1597	1579	1,432.60	8	120	158.16	1.01	1	0.7
441	1567	1579	688.55	6	120	-32.27	0.37	0.1	0.15
442	1561	1567	492.07	12	120	-40.81	0.12	0	0.01
443	1577	1574	478.55	6	120	43.25	0.49	0.12	0.26
444	1600	1570	1,683.73	6	120	39.02	0.44	0.36	0.21
445	1507	1511	100.78	10	120	3.12	0.01	0	0
446	1507	1479	708.18	6	120	0	0	0	0
447	1511	1512	160.34	10	120	0	0	0	0
448	1511	1515	208.75	10	120	0.27	0	0	0
449	1510	1507	488.93	8	120	3.12	0.02	0	0
45	1062	1060	32.84	10	120	69.41	0.28	0	0.05
450	1510	1481	811.26	10	120	0	0	0	0
451	1656	1602	1,963.01	18	120	541.59	0.68	0.26	0.13
452	1592	1566	1,770.77	6	120	11.18	0.13	0.04	0.02
453	1571	1572	218.9	4	120	17.76	0.45	0.08	0.36
454	1576	1578	284.33	4	120	18.36	0.47	0.11	0.38
455	1583	1586	148.97	4	120	7.41	0.19	0.01	0.07
456	1566	1571	218.7	10	120	5.61	0.02	0	0
457	1571	1576	220.34	10	120	-13.34	0.05	0	0
458	1584	1585	33.28	10	120	9.49	0.04	0	0
459	2307	2309	263.86	6	120	3.91	0.04	0	0
46	1054	1048	1,537.07	8	120	0	0	0	0
460	2280	10018	1,821.88	10	120	140.33	0.57	0.34	0.19
461	2245	2229	1,025.49	8	120	-294.46	1.88	2.26	2.2
462	2270	2245	1,698.70	8	120	-289.93	1.85	3.63	2.14
463	2274	2270	1,035.58	8	120	-147.81	0.94	0.64	0.61
464	2278	2274	1,523.88	8	120	-57.77	0.37	0.16	0.11
465	2289	2279	806.91	8	120	-53.43	0.34	0.08	0.09
466	2265	2263	771.64	8	120	3.98	0.03	0	0
467	2238	2230	256.23	8	120	74.76	0.48	0.04	0.17
468	2457	2454	94.98	8	120	-295.38	1.89	0.21	2.21
469	2353	2348	50.25	6	120	13.05	0.15	0	0.03
47	1080	1054	1,864.28	8	120	155.33	0.99	1.26	0.67
470	2348	2335	474.71	6	120	3.33	0.04	0	0
471	2358	2353	181.18	6	120	15.78	0.18	0.01	0.04
472	2358	2330	1,080.38	8	120	-25.52	0.16	0.03	0.02
473	2398	2402	113.56	20	120	3,320.11	3.39	0.26	2.25
474	2395	2369	2,156.96	20	120	-3,444.57	3.52	5.2	2.41
475	2369	2366	629.29	20	120	-3,477.55	3.55	1.55	2.46
476	2366	2362	288.45	20	120	1,259.61	1.29	0.11	0.37
477	1322	1318	198.27	14	120	-80.4	0.17	0	0.01
478	1318	1310	456.14	14	120	-113.39	0.24	0.01	0.02
479	1310	1289	944.95	14	120	-429.78	0.9	0.27	0.29
48	1063	1080	1,330.62	10	120	364.24	1.49	1.46	1.1
480	1289	1281	555.77	14	120	-680.5	1.42	0.38	0.68
481	1322	1327	389.31	14	120	-208.8	0.44	0.03	0.08
482	1311	1323	689.16	8	120	-44.25	0.28	0.05	0.07
483	1310	1311	689.69	8	120	304.66	1.94	1.62	2.34
484	1323	1322	731.7	8	120	-289.2	1.85	1.56	2.13
485	1358	1338	1,994.17	6	120	131.51	1.49	4.01	2.01
486	195	173	1,111.10	6	120	83.94	0.95	0.97	0.87
487	173	162	130.27	8	120	74.72	0.48	0.02	0.17
488	195	170	1,535.36	6	120	-352.45	4	19.14	12.47
49	1062	1063	395.54	10	120	385.73	1.58	0.48	1.22
490	17	16	1,336.74	8	120	1.19	0.01	0	0
491	21	17	412.54	8	120	1.19	0.01	0	0
492	1224	1225	1,464.22	10	120	263.06	1.07	0.88	0.6
493	1258	1256	321.06	12	120	17.67	0.05	0	0
494	1237	1242	12.29	10	120	67.73	0.28	0	0.05

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
495	567	547	791.91	6	120	4.73	0.05	0	0
496	596	567	917.65	6	120	15.58	0.18	0.04	0.04
497	751	766	216.59	8	120	-8.83	0.06	0	0
498	683	765	2,057.42	8	120	-149.18	0.95	1.29	0.62
499	705	727	732.25	8	120	27.22	0.17	0.02	0.03
5	1107	1124	1,931.42	6	120	20.72	0.24	0.13	0.07
50	1067	1064	30.91	10	120	-170.9	0.7	0.01	0.27
500	705	681	631.56	8	120	32.26	0.21	0.02	0.04
5001D	5001	10094	1	8	120	0	0	0	0
5001U	2612	5001	1	8	120	0	0	0	0
5003D	5003	10096	1	8	120	0	0	0	0
5003U	2610	5003	1	8	120	0	0	0	0
5005D	5005	2553	1	6	120	0	0	0	0
5005U	10098	5005	1	6	120	0	0	0	0
5009D	5009	10102	1	10	120	587.24	2.4	0	2.69
5009U	2415	5009	1	10	120	587.24	2.4	0	2.69
501	683	632	1,115.56	8	120	19.42	0.12	0.02	0.01
5011D	5011	10104	1	12	120	387.67	1.1	0	0.61
5011U	2416	5011	1	12	120	387.67	1.1	0	0.49
5013D	5013	10106	1	10	120	387.66	1.58	0	1.22
5013U	2417	5013	1	10	120	387.66	1.58	0	1.22
5015D	5015	2414	1	10	120	0	0	0	0
5015U	2413	5015	1	10	120	0	0	0	0
5017D	5017	10108	1	8	120	0	0	0	0
5017U	2065	5017	1	8	120	0	0	0	0
5019D	5019	10110	1	8	120	0	0	0	0
5019U	2061	5019	1	8	120	0	0	0	0
502	682	683	221.36	8	120	-118.16	0.75	0.09	0.41
5021D	5021	10112	1	8	120	0	0	0	0
5021U	2058	5021	1	8	120	0	0	0	0
5023D	5023	10114	1	8	120	0	0	0	0
5023U	2055	5023	1	8	120	0	0	0	0
5025D	5025	10116	1	8	120	0	0	0	0
5025U	2356	5025	1	8	120	0	0	0	0
5027D	5027	10118	1	8	120	0	0	0	0
5027U	2350	5027	1	8	120	0	0	0	0
5029D	5029	10120	1	8	120	0	0	0	0
5029U	2343	5029	1	8	120	0	0	0	0
503	682	705	421.34	8	120	76	0.49	0.08	0.18
5031D	5031	2318	1	10	120	0	0	0	0
5031U	10122	5031	1	10	120	0	0	0	0
5035D	5035	2315	1	16	120	0	0	0	0
5035U	10126	5035	1	16	120	0	0	0	0
5037D	5037	10130	1	12	120	0	0	0	0
5037U	10128	5037	1	12	120	0	0	0	0
504	649	682	786.19	8	120	-32.9	0.21	0.03	0.04
5045D	5045	1822	1	12	120	0	0	0	0
5045U	8704	5045	1	12	120	0	0	0	0
505	631	649	451.7	8	120	-120.14	0.77	0.19	0.42
506	717	649	1,831.84	8	120	108.37	0.69	0.63	0.35
507	717	719	325.54	8	120	5.24	0.03	0	0
508	717	716	385.03	8	120	11.9	0.08	0	0.01
509	748	717	697.4	8	120	130.84	0.84	0.34	0.49
51	1100	1099	54.42	12.1	120	-334.77	0.93	0.02	0.37
510	748	745	437.79	8	120	9	0.06	0	0
511	763	748	561.45	8	120	154.26	0.98	0.37	0.66
512	631	611	458.14	18	120	-177.61	0.22	0.01	0.02
513	637	631	409.18	18	120	-283.3	0.36	0.02	0.04
514	640	637	45.4	18	120	-283.3	0.36	0	0.04
515	564	545	731.05	6	120	25.46	0.29	0.07	0.1
516	550	564	476.95	18	120	-1,069.85	1.35	0.22	0.46
517	546	534	350.34	6	120	4.47	0.05	0	0
518	540	522	832.71	6	120	2.58	0.03	0	0
519	2267	2275	1,760.44	16	120	-1,210.54	1.93	1.82	1.03
52	1099	1074	1,871.85	12	120	-734.1	2.08	3.1	1.66
520	2590	2589	1,410.08	14	120	-10.38	0.02	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
521	2499	2500	97.08	6	120	15.69	0.18	0	0.04
522	2484	2483	87.5	8	120	168.38	1.07	0.07	0.78
523	2535	2534	1,321.99	8	120	55.79	0.36	0.13	0.1
524	2527	2496	1,422.15	8	120	-15.06	0.1	0.01	0.01
525	2568	2527	1,360.91	8	120	-7.46	0.05	0	0
526	2565	2558	1,581.25	18	120	-15.01	0.02	0	0
527	1974	1973	30.18	12	120	-137.89	0.39	0	0.07
528	1973	RICECYN_TNK	9.42	12	120	-339.92	0.96	0	0.4
529	1974	1973	14.88	12	120	-202.02	0.57	0	0.15
53	1100	1103	732.07	8	120	142.73	0.91	0.42	0.58
530	1975	1974	10.19	12	120	-339.92	0.96	0	0.41
531	2009	2032	811.46	16	120	-231.19	0.37	0.04	0.05
532	2592	2546	2,210.90	8	120	-86.6	0.55	0.5	0.23
533	2536	2538	1,295.29	8	120	109.36	0.7	0.46	0.35
534	942	943	457.12	12	120	180.96	0.51	0.06	0.12
535	941	940	275.91	6	120	3.48	0.04	0	0
536	2510	U-1_TNK_2	5.59	10	120	-272.34	1.11	0	0.65
537	2511	2512	2.49	10	120	272.34	1.11	0	0.64
538	2511	2510	25.68	10	120	-105.81	0.43	0	0.11
539	2511	2510	11.09	10	120	-166.53	0.68	0	0.25
54	1035	1032	745.48	8	120	103.29	0.66	0.24	0.32
540	2521	2512	116.96	12	120	-272.34	0.77	0.03	0.26
541	2519	2518	1.85	12	120	0	0	0	0
542	2517	2514	4.62	12	120	0	0	0	0
543	2516	2514	3.91	12	120	0	0	0	0
544	2519	2517	3.91	12	120	0	0	0	0
545	959	963	695.33	8	120	19.95	0.13	0.01	0.02
546	963	964	81.02	8	120	5.35	0.03	0	0
547	957	2074	1,095.38	8	120	-392.59	2.51	4.11	3.75
548	2074	2085	235.23	8	120	-397.71	2.54	0.9	3.84
549	2037	2035	1,270.68	8	120	0	0	0	0
55	1038	1035	25.5	8	120	111.72	0.71	0.01	0.37
550	488	100148	480.22	20	120	2,101.71	2.15	0.46	0.97
551	523	517	1,334.42	8	120	-15.23	0.1	0.01	0.01
552	462	463	5.13	14	120	-2.71	0.01	0	0
553	462	459	18.57	14	120	0	0	0	0
554	457	460	1,446.48	6	120	-2.71	0.03	0	0
555	469	465	51.01	8	120	-62.57	0.4	0.01	0.12
556	465	464	7.56	12	120	-48.95	0.14	0	0.01
557	473	100146	154.86	20	120	0	0	0	0
558	492	469	509.22	8	120	-62.57	0.4	0.06	0.13
559	464	463	23.48	14	120	16.33	0.03	0	0
56	1050	1038	783.83	8	120	179.98	1.15	0.69	0.88
560	471	464	184.78	14	120	65.27	0.14	0	0.01
561	459	444	475.97	20	120	2,093.56	2.14	0.46	0.96
562	460	448	487.87	14	120	0	0	0	0
563	458	452	429.41	6	120	3.68	0.04	0	0
564	476	458	1,789.44	6	120	6.59	0.07	0.01	0.01
565	476	454	619.81	6	120	18.2	0.21	0.03	0.05
566	476	456	383.09	6	120	23.73	0.27	0.03	0.08
567	480	479	4	20.1	120	0	0	0	0
568	482	481	3.14	14.1	120	0	0	0	0
569	711	688	336.16	10	120	-94.91	0.39	0.03	0.09
57	1061	1050	678.79	8	120	206.04	1.32	0.77	1.14
570	1885	1883	410.26	14	120	1,282.26	2.67	0.9	2.2
571	1882	10012	582.54	14	120	1,256.21	2.62	1.23	2.12
572	737	736	57.59	10	120	52.18	0.21	0	0.03
573	1881	1883	98.28	14.1	120	-13.66	0.03	0	0
574	1881	1914	1,552.76	8	120	7.51	0.05	0	0
575	736	757	680.19	6	120	75.66	0.86	0.49	0.72
576	100160	1822	18.14	8	120	-191.5	1.22	0.02	0.99
579	1200	1193	306.57	6	120	25.73	0.29	0.03	0.1
58	1084	1083	105.85	8	120	-0.44	0	0	0
580	1193	1191	108.85	6	120	17.06	0.19	0.01	0.05
581	1193	1194	337.13	6	120	7	0.08	0	0.01
582	1195	2668	699.55	8	120	132.48	0.85	0.35	0.5

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
583	1205	1183	1,859.23	16	120	-1,834.16	2.93	4.14	2.23
584	1163	1162	220.27	8	120	28.57	0.18	0.01	0.03
585	28	20	735.3	12	120	0	0	0	0
586	39	36	110.42	8	120	4.86	0.03	0	0
587	24	23	413.84	8	120	-169.44	1.08	0.33	0.79
588	2489	2473	240.8	12	120	6.51	0.02	0	0
589	2463	2462	1,002.68	6	120	1.27	0.01	0	0
59	1083	1091	2,159.78	8	120	22.84	0.15	0.04	0.02
590	2459	2461	63.45	18	120	216.4	0.27	0	0.02
591	2483	2480	657.24	8	120	165.17	1.05	0.5	0.75
592	2500	2498	725.64	6	120	4	0.05	0	0
593	2534	2499	1,334.90	8	120	-27.61	0.18	0.04	0.03
595	2361	2357	208.93	6	120	10.93	0.12	0	0.02
596	2526	2535	338.91	8	120	140.79	0.9	0.19	0.56
597	2526	2481	2,365.62	12	120	-224.06	0.64	0.44	0.18
598	2150	8658	2,399.44	8	120	-49.08	0.31	0.19	0.08
599	2234	2225	200.4	6	120	28.33	0.32	0.02	0.12
6	1114	1109	631.36	12	120	-343.55	0.97	0.26	0.41
60	1087	1081	511.32	12	120	2.98	0.01	0	0
600	2139	2156	691.14	16	120	-991.73	1.58	0.49	0.71
601	2014	2010	44.98	16	120	-71.86	0.11	0	0.01
602	2184	2182	376.52	8	120	348.34	2.22	1.13	3.01
603	2132	2077	2,963.09	8	120	0	0	0	0
604	2202	2195	358.89	8	120	-545.46	3.48	2.47	6.89
605	2224	2232	289.86	16	120	-1,397.60	2.23	0.39	1.35
606	2074	2037	1,125.68	8	120	0	0	0	0
607	998	997	109.41	8	120	34.08	0.22	0	0.04
608	987	986	601.83	8	120	-30.58	0.2	0.02	0.03
609	1005	998	563.49	8	120	60.65	0.39	0.07	0.12
61	1086	1087	33.96	12	120	337.63	0.96	0.01	0.39
610	997	990	868.61	8	120	18.26	0.12	0.01	0.01
611	990	977	221.17	8	120	-19.57	0.12	0	0.01
612	977	967	1,093.57	8	120	0	0	0	0
613	967	969	314.13	8	120	13.6	0.09	0	0.01
614	977	987	719.73	8	120	-22.41	0.14	0.01	0.02
615	987	989	46.74	8	120	7.31	0.05	0	0
616	998	1002	442.61	6	120	25.01	0.28	0.04	0.09
619	990	994	1,111.95	6	120	30.19	0.34	0.15	0.13
62	1089	1087	145.42	12	120	-334.66	0.95	0.06	0.39
620	191	189	1,046.98	6	120	104.71	1.19	1.38	1.32
621	217	184	2,037.01	12	120	-344.63	0.98	0.83	0.41
622	513	512	2.5	6	120	4.21	0.05	0	0
623	529	505	929.55	6	120	59.76	0.68	0.43	0.47
624	241	240	27.5	6	120	0	0	0	0
625	237	241	28.16	6	120	311.01	3.53	0.28	9.89
626	239	10196	26.37	6	120	311.01	3.53	0.26	9.89
628	236	239	49.42	6	120	311.01	3.53	0.49	9.89
629	246	236	576.39	14	120	-551.33	1.15	0.27	0.46
63	1093	2676	304.08	8	120	3.62	0.02	0	0
630	241	235	455.84	6	120	309.91	3.52	4.48	9.83
631	236	2646	1,709.96	14	120	-862.34	1.8	1.8	1.05
632	749	689	1,332.32	8	120	-26.93	0.17	0.03	0.03
633	764	749	454.82	6	120	-12.02	0.14	0.01	0.02
634	753	767	258.07	8	120	-30.44	0.19	0.01	0.03
635	262	286	536.02	20	120	462.24	0.47	0.03	0.06
636	262	258	5.62	20	120	-466.44	0.48	0	0.07
637	263	262	6.53	2	120	-4.21	0.43	0	0.72
639	265	264	3.72	2	120	-4.21	0.43	0	0.72
64	1055	2678	418.37	8	120	14.4	0.09	0	0.01
640	261	265	8.28	2	120	-4.21	0.43	0.01	0.72
641	259	258	8.34	8	120	0	0	0	0
643	261	260	4.07	8	120	0	0	0	0
644	267	269	305.33	8	120	0	0	0	0
645	257	258	107.18	20	120	466.44	0.48	0.01	0.06
646	272	267	408.43	8	120	-3.56	0.02	0	0
647	753	750	304.59	8	120	6.45	0.04	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
648	261	267	19.19	8	120	4.21	0.03	0	0
649	729	753	646.97	6	120	-19.7	0.22	0.04	0.06
65	1053	2682	329.74	8	120	6.38	0.04	0	0
650	659	10042	75.05	6	120	53.45	0.61	0.03	0.38
651	592	590	29.96	6	120	2.5	0.03	0	0
652	1363	10172	17.84	12	120	0	0	0	0
654	1362	1363	24.21	24	120	0	0	0	0
655	1364	10168	50.51	10	120	-99.25	0.41	0.01	0.1
656	1364	1367	101.34	20	120	-509.78	0.52	0.01	0.07
657	1366	1364	22.67	10	120	-609.03	2.49	0.06	2.85
658	1366	1368	37.34	12	120	-41.27	0.12	0	0.01
659	1353	1366	1,315.42	12	120	-650.3	1.84	1.74	1.32
66	1053	1052	75.58	8	120	3.68	0.02	0	0
660	1367	1361	148.16	24	120	99.25	0.07	0	0
661	1370	1367	236.95	24	120	805.44	0.57	0.02	0.07
662	1361	1362	28.54	24	120	99.25	0.07	0	0
663	1399	1368	1,665.30	6	120	41.27	0.47	0.39	0.23
664	223	219	47.84	16	120	-621.5	0.99	0.01	0.3
665	314	223	3,304.77	16	120	57.58	0.09	0.01	0
666	219	218	1,334.65	16	120	-456.71	0.73	0.23	0.17
667	221	223	57.07	12	120	-679.08	1.93	0.08	1.44
668	224	221	2,351.18	12	120	-417.33	1.18	1.37	0.58
669	219	159	3,553.17	16	120	-164.79	0.26	0.09	0.03
67	1055	1053	200.34	8	120	10.37	0.07	0	0
670	614	612	783.36	6	120	23.65	0.27	0.07	0.08
671	514	487	817.38	10	120	-227.87	0.93	0.38	0.46
672	330	307	407.59	8	120	77.89	0.5	0.08	0.19
673	332	330	29.67	4	120	77.89	1.99	0.16	5.49
674	338	336	27.34	2	120	77.89	7.95	4.39	160.57
675	337	338	10.77	6	120	0	0	0	0
677	472	470	19.64	12	120	-488.52	1.39	0.02	0.78
678	333	335	9.3	6	120	0	0	0	0
679	330	333	8.88	6	120	0	0	0	0
68	1059	1055	144.77	8	120	26.78	0.17	0	0.03
680	334	332	7.67	2	120	77.89	7.95	1.23	160.57
682	389	391	2.48	30.1	120	0	0	0	0
683	388	380	432.11	36	120	2,215.04	0.7	0.03	0.06
684	467	450	761.94	4	120	4.07	0.1	0.02	0.02
685	509	500	432.83	4	120	-3.54	0.09	0.01	0.02
686	496	503	242.13	6	120	1.09	0.01	0	0
687	410	2626	899.16	24	120	-1,800.00	1.28	0.27	0.3
688	411	409	48.52	14	120	-859.27	1.79	0.05	1.05
689	414	412	30.52	22	120	-1,800.00	1.52	0.01	0.46
69	1058	1059	422.68	12	120	-1,209.38	3.43	1.77	4.18
690	409	410	4.9	20	120	-1,800.00	1.84	0	0.72
691	408	407	2.89	18	120	0	0	0	0
692	497	496	270.58	4	120	5.78	0.15	0.01	0.04
693	411	408	10.41	18	120	-940.73	1.19	0	0.36
694	412	411	1.87	18	120	-1,800.00	2.27	0	1.21
695	409	408	37.97	14	120	940.73	1.96	0.05	1.24
696	407	363	750.51	20	120	0	0	0	0
697	493	494	278.15	4	120	27.02	0.69	0.21	0.77
698	589	572	671.31	8	120	18.54	0.12	0.01	0.01
7	1113	1101	1,769.86	12	120	-743.62	2.11	3.01	1.7
70	1057	1061	2,032.35	12	120	-1,236.16	3.51	8.85	4.35
703	613	600	208.47	6	120	-30.85	0.35	0.03	0.14
704	630	627	190.76	6	120	-20.14	0.23	0.01	0.06
705	635	620	364.78	6	120	-7.64	0.09	0	0.01
706	789	785	105.15	6	120	-88.93	1.01	0.1	0.97
707	771	769	53.76	6	120	22.87	0.26	0	0.08
708	770	771	76.84	12	120	-770.18	2.18	0.14	1.81
709	820	819	167.67	6	120	59.67	0.68	0.08	0.46
71	1085	1086	136.47	12	120	340.48	0.97	0.05	0.4
710	826	820	455.94	6	120	-36.02	0.41	0.08	0.18
711	834	826	542.54	6	120	-26.77	0.3	0.06	0.11
712	817	829	333.92	6	120	-9.18	0.1	0	0.01

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
713	822	829	495.61	6	120	-1.32	0.01	0	0
714	1912	1899	418.19	8	120	33.08	0.21	0.02	0.04
715	1897	10010	17.93	6	120	-5.03	0.06	0	0
716	1930	1898	1,066.03	8	120	-59.07	0.38	0.12	0.11
717	1889	1855	879.41	8	120	-79.95	0.51	0.17	0.2
718	1908	1889	829.9	8	120	-38.82	0.25	0.04	0.05
719	1928	1918	955.04	8	120	8.93	0.06	0	0
72	903	906	678.24	8	120	8.67	0.06	0	0
720	1740	1731	846.24	6	120	-58.41	0.66	0.38	0.45
721	1732	1755	922.62	6	120	-105.96	1.2	1.24	1.35
722	1736	1735	165.75	6	120	-16.81	0.19	0.01	0.04
723	1748	1728	692.76	8	120	22.49	0.14	0.01	0.02
724	107	111	18.64	3	120	9.7	0.44	0.01	0.47
725	2450	2449	10.06	12	120	0	0	0	0
726	2449	2448	16.74	12	120	0	0	0	0
727	2448	8536	10.34	4	120	0	0	0	0
728	2452	8031	5.08	8	120	0	0	0	0
729	2414	2421	17.04	6	120	0	0	0	0
73	906	911	427.03	8	120	-28.02	0.18	0.01	0.03
730	2421	2428	27.13	8	120	0	0	0	0
732	2420	2429	27.62	8	120	587.24	3.75	0.22	7.91
734	2418	2430	27.73	8	120	387.67	2.47	0.1	3.66
736	2419	2431	27.84	8	120	387.66	2.47	0.1	3.67
737	2446	8028	6.62	8	120	0	0	0	0
738	2447	8026	7.43	8	120	0	0	0	0
74	1095	2672	274.75	8	120	-90.26	0.58	0.07	0.25
741	2604	2605	31.13	14	120	0	0	0	0
742	2605	2606	16.28	14	120	0	0	0	0
743	2607	100002	19.26	14	120	0	0	0	0
744	2545	2547	11.34	8	120	0	0	0	0
745	2549	2547	18	3	120	0	0	0	0
746	2553	2554	14.43	4	120	0	0	0	0
747	644	646	36.88	10	120	125.05	0.51	0.01	0.15
75	1096	1095	228.35	12	120	-415.7	1.18	0.13	0.58
750	2319	2321	3.14	20	120	0	0	0	0
751	2321	2324	8.24	20	120	0	0	0	0
754	1608	1604	348.04	8	120	501.44	3.2	2.05	5.9
755	1604	1599	128.56	8	120	490.21	3.13	0.73	5.66
756	1599	1593	451.28	18	120	1,882.47	2.37	0.59	1.32
757	1680	1622	1,419.51	8	120	513.89	3.28	8.76	6.17
758	1608	1610	320.91	6	120	6.12	0.07	0	0.01
759	1604	1607	351.04	6	120	6.61	0.07	0	0.01
76	1101	1096	899.47	12	120	-293.78	0.83	0.27	0.3
760	1660	1677	298.7	10	120	45.62	0.19	0.01	0.02
761	1677	1691	335.56	10	120	27.91	0.11	0	0.01
762	1406	1403	415.45	10	120	-333.26	1.36	0.39	0.93
763	1403	1402	185.57	10	120	0	0	0	0
764	1394	1397	3,822.85	8	120	-93.52	0.6	1.01	0.26
765	1376	10035	1,375.61	24	120	-1,914.58	1.36	0.46	0.33
766	1371	1374	1,133.94	24	120	-2,075.84	1.47	0.44	0.39
767	1360	1353	2,620.50	10	120	-188.64	0.77	0.85	0.33
768	1358	1360	710.67	6	120	-135.1	1.53	1.5	2.11
769	1395	1401	321.21	6	120	26.09	0.3	0.03	0.1
77	1082	1077	419.42	12	120	-712.79	2.02	0.66	1.57
770	1371	1386	247.25	8	120	143.88	0.92	0.14	0.58
771	1380	1375	148.94	6	120	25.93	0.29	0.01	0.1
772	1399	1398	275.7	6	120	7.88	0.09	0	0.01
773	285	254	930.8	8	120	30.6	0.2	0.03	0.03
774	321	256	1,281.14	12	120	-413.97	1.17	0.74	0.57
775	176	180	188.09	6	120	59.51	0.68	0.09	0.46
776	176	185	932.68	6	120	82.19	0.93	0.78	0.84
777	218	238	601.69	8	120	16.32	0.1	0.01	0.01
778	282	250	569.96	12	120	137.22	0.39	0.04	0.07
779	217	212	51.6	12	120	390.63	1.11	0.03	0.52
78	1	1101	443.18	8	120	-261.08	1.67	0.78	1.76
780	218	2652	911.53	16	120	-486.57	0.78	0.17	0.19

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781	213	214	524.78	16	120	-144.3	0.23	0.01	0.02
782	1327	1341	1,321.58	12	120	-219.74	0.62	0.23	0.18
783	800	802	20.16	8	120	-43.37	0.28	0	0.06
784	806	800	602.84	8	120	-35.16	0.22	0.03	0.04
785	806	804	231.43	8	120	126.54	0.81	0.11	0.46
786	812	806	235.68	8	120	98.23	0.63	0.07	0.29
787	821	812	428.88	8	120	109.77	0.7	0.15	0.35
788	846	845	915.45	10	120	10.27	0.04	0	0
789	844	843	931.7	10	120	-0.16	0	0	0
79	8	1	640.98	8	120	-245.37	1.57	1.01	1.57
790	779	765	460.82	8	120	150.93	0.96	0.29	0.64
791	779	766	332.94	8	120	21.61	0.14	0.01	0.02
792	788	763	828.28	8	120	166.39	1.06	0.63	0.76
793	841	10053	584.99	14	120	2,292.37	4.78	3.77	6.45
795	813	814	63.66	14	120	-1,660.78	3.46	0.23	3.55
796	816	813	975.45	14	120	-1,640.73	3.42	3.39	3.47
797	764	773	196.86	6	120	6.83	0.08	0	0.01
798	811	2634	526.89	14	120	573.99	1.2	0.26	0.5
799	818	811	277.85	14	120	582.49	1.21	0.14	0.51
8	14	710	632.8	8	120	-204.63	1.31	0.71	1.12
80	8	13	598.78	8	120	8.07	0.05	0	0
800	838	840	123.51	6	120	4.63	0.05	0	0
801	2478	2456	1,085.68	10	120	-33.13	0.14	0.01	0.01
802	2479	2478	511.81	6	120	-12.78	0.15	0.01	0.03
803	2525	2513	225.43	8	120	4.18	0.03	0	0
8030	2627	2629	117.35	16	120	1,800.00	2.87	0.25	2.15
804	2525	2543	434.73	8	120	3.05	0.02	0	0
805	2527	2525	724.12	8	120	7.23	0.05	0	0
806	2575	2568	124.73	8	120	-3.09	0.02	0	0
807	2486	2485	37.75	18	120	-215.5	0.27	0	0.03
808	2488	2486	99.68	18	120	-144.03	0.18	0	0.01
809	2501	2488	1,346.79	18	120	-123.17	0.16	0.01	0.01
81	12	700	54.18	8	120	-221.51	1.41	0.07	1.3
810	2557	2501	1,501.72	18	120	-121.63	0.15	0.01	0.01
811	2558	2537	1,008.96	18	120	-112.64	0.14	0.01	0.01
812	2559	2562	193.7	6	120	0.24	0	0	0
813	2573	2578	391.29	6	120	5.94	0.07	0	0.01
814	2608	2619	285.77	8	120	-8.46	0.05	0	0
815	2619	2603	1,615.10	8	120	-61.75	0.39	0.2	0.12
816	2623	2603	1,304.82	8	120	-3.92	0.03	0	0
817	2585	2595	1,429.46	6	120	-5.48	0.06	0.01	0.01
818	2600	2587	497.38	8	120	-0.26	0	0	0
819	2586	2587	147.26	8	120	-0.64	0	0	0
82	2	7	461.29	8	120	-25.53	0.16	0.01	0.02
821	20011	416	162.07	20	120	2,243.27	2.29	0.18	1.09
823	444	8652	1,785.69	20	120	2,093.56	2.14	1.71	0.96
824	451	447	170.58	12	120	-829.15	2.35	0.35	2.08
825	453	451	36.43	12	120	-829.15	2.35	0.08	2.08
826	470	453	489.87	12	120	-801.49	2.27	0.96	1.95
827	453	433	992.18	10	120	24.04	0.1	0.01	0.01
828	643	642	180.41	12	120	-135.72	0.39	0.01	0.07
829	438	MORRO_TNK	1,609.45	16	120	-837.02	1.34	0.84	0.52
83	3	2	223.28	8	120	-40.84	0.26	0.01	0.06
830	448	435	1,780.35	14	120	-1.42	0	0	0
831	1420	1421	39.62	16	120	-880.33	1.4	0.02	0.57
832	1421	HUTTON_TNK	13.23	20	120	-3,365.61	3.44	0.03	2.31
833	1420	1421	17.19	20	120	-2,485.28	2.54	0.02	1.32
834	1407	1420	1,952.16	16	120	-3,360.45	5.36	13.34	6.83
835	491	488	22.08	8	120	-8.8	0.06	0	0
836	488	501	1,320.71	20	120	-2,117.12	2.16	1.29	0.98
837	492	491	7.7	8	120	0	0	0	0
838	474	475	29.27	14.1	120	0	0	0	0
839	477	478	29.29	14.1	120	0	0	0	0
84	4	3	64.42	8	120	-40.84	0.26	0	0.06
840	482	483	18.44	14.1	120	0	0	0	0
841	483	10130	20.68	14.1	120	0	0	0	0

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
842	472	2658	744.01	14	120	129.27	0.27	0.02	0.03
843	508	445	1,646.66	8	120	15.89	0.1	0.02	0.01
844	516	476	1,246.92	8	120	61.33	0.39	0.15	0.12
845	524	498	1,498.63	6	120	39.21	0.44	0.32	0.21
846	595	596	909.54	18	120	-1,289.56	1.63	0.59	0.65
847	611	595	410.91	18	120	-177.61	0.22	0.01	0.02
848	564	595	1,373.94	18	120	-1,104.77	1.39	0.67	0.49
849	524	516	833.27	8	120	229.66	1.47	1.16	1.39
85	1048	1051	586.54	8	120	0	0	0	0
8500	607	100182	30.93	12.1	120	7.95	0.02	0	0
8510	604	8510	31.83	12	120	0	0	0	0
8514	8514	108	4.96	4	120	0	0	0	0
8518	8518	104	14.42	3	120	5.47	0.25	0	0.16
852	605	604	57.06	12	120	-205.3	0.58	0.01	0.16
8520	372	374	30.96	6	120	29.3	0.33	0	0.12
8522	1411	8522	54.32	8	120	0	0	0	0
8524	8520	1412	49.88	8	120	0	0	0	0
8526	1746	1745	18.65	16	120	-1,588.22	2.53	0.03	1.71
853	524	531	766.43	8	120	28.63	0.18	0.02	0.03
854	642	1642	1,522.41	12	120	-136.53	0.39	0.11	0.07
855	604	607	61.59	12	120	0	0	0	0
8552	118	8526	684.32	8	120	62.49	0.4	0.09	0.12
8554	8526	8532	1,606.90	8	120	-301.12	1.92	3.69	2.29
8556	8528	114	938.78	16	120	-1,478.18	2.36	1.4	1.49
8558	8528	8534	1,494.56	8	120	-195.49	1.25	1.54	1.03
856	607	659	1,148.22	12	120	-13.28	0.04	0	0
8560	8530	1164	38.31	12	120	516.49	1.47	0.03	0.87
8562	8524	1056	1,267.71	8	120	-34.85	0.22	0.05	0.04
8566	8534	8526	426.9	8	120	-320.47	2.05	1.1	2.57
8568	8534	100124	877.7	8	120	83	0.53	0.19	0.21
857	604	555	1,974.51	12	120	-205.3	0.58	0.31	0.16
8572	8538	2452	4.69	4	120	0	0	0	0
8574	1621	8546	171.65	8	120	-47.7	0.3	0.01	0.08
8576	8540	8542	154.95	8	120	-4.61	0.03	0	0
8578	8542	8544	318.01	8	120	-13.1	0.08	0	0.01
858	535	524	539.75	8	120	358.92	2.29	1.71	3.18
8580	8544	8546	1,063.33	8	120	-18.92	0.12	0.01	0.01
8582	8546	1611	170.74	8	120	-77.84	0.5	0.03	0.19
8584	8550	8554	29.11	12	120	-1,459.50	4.14	0.17	5.92
8586	8550	1646	1,321.69	6	120	26.26	0.3	0.13	0.1
8588	8554	8556	20.88	12	120	-1,555.06	4.41	0.14	6.66
859	563	535	860.49	6	120	-29.9	0.34	0.11	0.13
8590	8556	1631	2,383.73	12	120	-1,555.06	4.41	15.87	6.66
8594	814	8558	955.19	16	120	-1,679.97	2.68	1.81	1.89
8596	8558	805	77.07	16	120	-1,685.58	2.69	0.15	1.9
8598	8560	10056	15.44	16	120	0	0	0	0
86	1094	1090	406.6	6	120	0	0	0	0
860	536	538	1,530.78	20	120	-3,036.12	3.1	2.92	1.91
8602	8564	1441	509.88	8	120	0	0	0	0
861	1471	1470	11.67	18.1	120	0	0	0	0
862	1461	1465	38.17	4	120	0	0	0	0
863	1462	100102	27.96	4	120	0	0	0	0
864	1463	100110	26.61	4	120	-22.94	0.59	0.02	0.57
8652	1879	8568	781.14	8	130	0	0	0	0
8658	8572	8574	7.09	8	120	0	0	0	0
866	1459	1451	175.18	16	120	541.59	0.86	0.04	0.23
8660	8574	1697	23.83	8	120	86.15	0.55	0.01	0.23
8662	8576	8570	6.9	8	120	0	0	0	0
8664	8574	8578	13.05	4	120	-86.15	2.2	0.09	6.61
8666	8580	8576	11.39	4	120	-86.15	2.2	0.08	6.61
867	1458	1459	33.35	16	120	541.59	0.86	0.01	0.23
8676	8590	1110	578.07	8	120	12.74	0.08	0	0.01
868	1469	1468	16.49	10	120	0	0	0	0
8680	8592	1229	3,120.53	14	120	-1,653.56	3.45	10.99	3.52
8686	123	8598	863.6	16	120	1,643.66	2.62	1.57	1.82
869	1478	1471	505.46	18	120	541.59	0.68	0.07	0.13

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
8694	8604	66	646.77	12	120	-427.19	1.21	0.39	0.61
8696	714	8606	431.61	8	120	5.12	0.03	0	0
87	1033	1031	579.69	8	120	41.45	0.26	0.03	0.06
870	1459	1460	22.48	10	120	0	0	0	0
8708	8616	1601	1,205.31	8	120	270	1.72	2.26	1.87
871	1460	1472	112.03	8	120	0	0	0	0
8716	8618	2277	485.05	12	120	-63.89	0.18	0.01	0.02
872	1460	8564	1,768.11	8	120	0	0	0	0
8724	8622	1873	1,007.69	6	120	354.44	4.02	12.7	12.6
873	556	536	810.85	6	120	-8.63	0.1	0.01	0.01
8732	8624	2581	1,292.33	6	120	83.47	0.95	1.12	0.87
8736	8626	1738	821.77	10	120	582.36	2.38	2.16	2.62
874	535	536	520.64	20	120	-3,027.48	3.09	0.99	1.9
8742	2535	8624	32.99	6	120	84.05	0.95	0.03	0.88
8744	8628	1153	463.58	8	120	24.19	0.15	0.01	0.02
875	566	556	903.1	8	120	-2.04	0.01	0	0
8750	8630	1299	437.54	14	120	-1,307.47	2.72	1	2.28
876	744	707	1,011.07	6	120	9.78	0.11	0.02	0.02
8762	8632	1020	1,534.88	12	120	-423.34	1.2	0.92	0.6
877	1491	1522	816.97	6	120	-577.29	6.55	25.4	31.1
8772	8636	8530	1,041.23	12	120	542.61	1.54	0.99	0.95
878	1486	100114	106.57	6	120	-549.12	6.23	3.02	28.34
8782	8640	1356	475.86	8	120	3.59	0.02	0	0
8784	8642	1573	531.49	18	120	1,860.82	2.35	0.68	1.29
879	1486	1476	1,502.89	8	120	182.72	1.17	1.37	0.91
8792	8652	20011	1,292.02	20	120	2,103.33	2.15	1.25	0.97
8794	8652	20005	16.27	8	120	6.41	0.04	0	0
8796	8654	435	852.24	14	120	-648.19	1.35	0.53	0.62
88	1028	1025	279.35	6	120	42.63	0.48	0.07	0.25
880	1474	1486	695.07	10	120	-337.91	1.38	0.67	0.96
8804	8660	2169	739.98	8	120	-9.76	0.06	0	0
881	769	744	669.72	6	120	20.16	0.23	0.04	0.06
882	760	756	325.26	12	120	-754.15	2.14	0.57	1.74
883	823	815	458.9	14	120	-1,633.61	3.4	1.58	3.44
884	770	756	461.57	12	120	766.12	2.17	0.83	1.79
8842	8682	2071	860.49	20	120	0	0	0	0
885	846	824	1,000.26	10	120	-32.76	0.13	0.01	0.01
886	824	823	7.48	12	120	-1,630.52	4.63	0.05	7.27
8860	8692	1891	1,095.34	8	120	76.08	0.49	0.2	0.18
887	825	818	264.13	12	120	609.64	1.73	0.31	1.18
8870	8660	8042	4.65	8	120	0	0	0	0
8872	1920	8692	19.9	8	120	76.16	0.49	0	0.18
8874	8658	2210	5.34	8	120	-118.1	0.75	0	0.41
888	807	825	1,344.40	12	120	-977.22	2.77	3.79	2.82
8882	8702	1371	447.57	24	120	-1,914.58	1.36	0.15	0.33
8888	82	8634	4.26	14	120	-2,913.07	6.07	0.04	10.05
889	825	824	23.88	12	120	-1,597.76	4.53	0.17	7
8892	8704	100158	947.48	42	120	0	0	0	0
8894	8706	1970	933.44	16	120	-1,407.38	2.25	1.27	1.36
89	1028	1027	19.1	6	120	0	0	0	0
890	693	706	300.35	6	120	10.88	0.12	0.01	0.02
8900	8710	2280	1,118.26	8	120	-4.5	0.03	0	0
891	755	752	822.1	12	120	-721.94	2.05	1.32	1.61
8914	8714	1343	175.45	6	120	-95.78	1.09	0.2	1.12
892	1681	1640	917.79	12	120	90.37	0.26	0.03	0.03
8921	2626	2628	10	16	120	-1,800.00	2.87	0.02	2.15
893	1640	100072	22.72	8	120	0	0	0	0
894	1639	100078	56.47	4	120	-90.36	2.31	0.41	7.22
895	1638	1594	2,029.08	12	120	88.34	0.25	0.07	0.03
896	1638	1636	54.1	3	120	1.01	0.05	0	0.01
897	752	758	275.53	12	120	-727.75	2.06	0.45	1.63
898	754	755	74.75	12	120	-721.94	2.05	0.12	1.61
899	1641	1647	215.22	12	120	-1,717.24	4.87	1.72	8
9	11	15	2,618.05	8	120	-90.53	0.58	0.65	0.25
90	1030	1028	934.82	6	120	42.64	0.48	0.23	0.25
900	1648	1647	33.49	12	120	1,901.83	5.4	0.32	9.67

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
9001D	9001	10134	1	4	120	0	0	0	0
9001U	10132	9001	1	4	120	0	0	0	0
9003D	9003	10138	1	2	120	23.71	2.42	0.02	17.76
9003U	10136	9003	1	2	120	23.71	2.42	0.02	17.76
9009D	9009	8520	1	8	120	0	0	0	0
9009U	8522	9009	1	8	120	0	0	0	0
901	1647	1666	1,055.24	12	120	168.21	0.48	0.11	0.11
9011D	9011	10150	1	6	120	59.87	0.68	0	0.49
9011U	10148	9011	1	6	120	59.87	0.68	0	0.49
9013D	9013	10154	1	6	120	363.03	4.12	0.01	13.18
9013U	10152	9013	1	6	120	363.03	4.12	0.01	13.18
9015D	9015	10156	1	6	120	113.46	1.29	0	1.53
9015U	10158	9015	1	6	120	113.46	1.29	0	1.53
9017D	9017	1290	1	6	120	250.72	2.84	0.01	6.65
9017U	10160	9017	1	6	120	250.72	2.84	0.01	6.65
9019D	9019	10164	1	6	120	0	0	0	0
9019U	10162	9019	1	6	120	0	0	0	0
902	1648	1695	1,749.59	18	120	644.79	0.81	0.32	0.18
9025D	9025	1294	1	4	120	173.05	4.42	0.02	24.11
9025U	10174	9025	1	4	120	173.05	4.42	0.02	24.11
9027D	9027	10176	1	8	120	4.2	0.03	0	0
9027U	10178	9027	1	8	120	4.2	0.03	0	0
9029D	9029	10180	1	6	120	0	0	0	0
9029U	10182	9029	1	6	120	0	0	0	0
903	739	754	1,240.37	12	120	-702.78	1.99	1.9	1.53
9031D	9031	1352	1	8	120	40.83	0.26	0	0.06
9031U	10184	9031	1	8	120	40.84	0.26	0	0.06
9033D	9033	10186	1	2	120	111.04	11.34	0.31	309.63
9033U	10188	9033	1	2	120	111.04	11.34	0.31	309.63
9035D	9035	10190	1	8	120	0	0	0	0
9035U	10192	9035	1	8	120	0	0	0	0
9037D	9037	240	1	6	120	0	0	0	0
9037U	10194	9037	1	6	120	0	0	0	0
9039D	9039	237	1	3	120	311.01	14.12	0.29	289.43
9039U	10196	9039	1	3	120	311.01	14.12	0.29	289.43
904	739	728	96.22	6	120	7.03	0.08	0	0.01
9041D	9041	264	1	2	120	4.21	0.43	0	0.73
9041U	263	9041	1	2	120	4.21	0.43	0	0.73
9043D	9043	260	1	6	120	0	0	0	0
9043U	259	9043	1	6	120	0	0	0	0
9045D	9045	334	1	2	120	77.89	7.95	0.16	160.58
9045U	336	9045	1	2	120	77.89	7.95	0.16	160.58
9047D	9047	335	1	6	120	0	0	0	0
9047U	337	9047	1	6	120	0	0	0	0
9051D	9051	1365	1	12	120	0	0	0	0
9051U	10198	9051	1	12	120	0	0	0	0
9053D	9053	2445	1	24	120	0	0	0	0
9053U	10200	9053	1	24	120	0	0	0	0
9057D	9057	2365	1	16	120	747	1.19	0	0.37
9057U	10204	9057	1	16	120	747	1.19	0	0.37
9059D	9059	2075	1	27	120	0	0	0	0
9059U	10206	9059	1	27	120	0	0	0	0
906	1643	1633	329	8	120	-25.24	0.16	0.01	0.02
9061D	9061	2005	1	16	120	1,268.00	2.02	0	1.1
9061U	10208	9061	1	16	120	1,268.00	2.02	0	1.1
9063D	9063	1784	0.23	18	120	6,445.00	8.13	0	12.75
9063U	10210	9063	0.24	18	120	6,445.00	8.13	0	12.82
9065D	9065	1184	1	24	120	4,298.00	3.05	0	1.46
9065U	10212	9065	1	24	120	4,298.00	3.05	0	1.46
9067D	9067	1066	1	12	120	718	2.04	0	1.59
9067U	10214	9067	1	12	120	718	2.04	0	1.59
9069D	9069	100010	1	2	120	11.99	1.22	0.01	5
9069U	100008	9069	1	2	120	11.99	1.22	0.01	5
907	740	739	114.26	12	120	-694.03	1.97	0.17	1.49
9071D	9071	100014	1	6	120	135.32	1.54	0	2.14
9071U	100012	9071	1	6	120	135.32	1.54	0	2.08

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ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
9073D	9073	100018	1	8	120	22.2	0.14	0	0
9073U	100020	9073	1	8	120	22.2	0.14	0	0
9075D	9075	2127	1	8	120	0	0	0	0
9075U	100022	9075	1	8	120	0	0	0	0
9077D	9077	100026	1	3	120	0	0	0	0
9077U	100024	9077	1	3	120	0	0	0	0
9079D	9079	100030	1	8	120	0	0	0	0
9079U	100028	9079	1	8	120	0	0	0	0
908	1643	1649	206.18	6	120	3.38	0.04	0	0
9081D	9081	100034	1	2	120	0	0	0	0
9081U	100032	9081	1	2	120	0	0	0	0
9083D	9083	100038	1	8	120	34.26	0.22	0	0
9083U	100036	9083	1	8	120	34.26	0.22	0	0.06
9085D	9085	100042	1	8	120	0	0	0	0
9085U	100040	9085	1	8	120	0	0	0	0
9087D	9087	100046	1	2	120	12.34	1.26	0.01	5.31
9087U	100044	9087	1	2	120	12.34	1.26	0.01	5.31
9089D	9089	100048	1	6	120	0	0	0	0
9089U	100050	9089	1	6	120	0	0	0	0
909	1707	2686	763.43	18	120	12.81	0.02	0	0
9091D	9091	100052	1	2	120	14.97	1.53	0.01	7.57
9091U	100054	9091	1	2	120	14.97	1.53	0.01	7.57
9093D	9093	100058	1	10	120	864.41	3.53	0.01	5.43
9093U	100056	9093	1	10	120	864.41	3.53	0.01	5.43
9097D	9097	8572	1	8	120	0	0	0	0
9097U	8570	9097	1	8	120	0	0	0	0
9099D	9099	8578	1	2.5	120	86.15	5.63	0.07	65.25
9099U	8580	9099	1	2.5	120	86.15	5.63	0.07	65.31
91	1029	1026	804.88	8	120	45.37	0.29	0.06	0.07
910	1645	1644	35.25	6	120	0	0	0	0
9101D	9101	100074	1	8	120	0	0	0	0
9101U	100072	9101	1	8	120	0	0	0	0
9103D	9103	100078	1	4	120	90.36	2.31	0.01	7.26
9103U	100076	9103	1	4	120	90.36	2.31	0.01	7.2
9109D	9109	100090	1	2	120	68.98	7.04	0.13	128.17
9109U	100088	9109	1	2	120	68.98	7.04	0.13	128.23
911	1643	1623	1,211.69	6	120	10.05	0.11	0.02	0.02
9111D	9111	100094	1	6	120	0	0	0	0
9111U	100092	9111	1	6	120	0	0	0	0
9113D	9113	100098	1	10	120	0	0	0	0
9113U	100096	9113	1	10	120	0	0	0	0
9115D	9115	100102	1	2	120	0	0	0	0
9115U	100100	9115	1	2	120	0	0	0	0
9117D	9117	100106	1	10	120	518.65	2.12	0	2.14
9117U	100104	9117	1	10	120	518.64	2.12	0	2.08
9119D	9119	100110	1	2	120	22.94	2.34	0.02	16.69
9119U	100108	9119	1	2	120	22.94	2.34	0.02	16.72
912	1645	100140	13.33	18	120	2.22	0	0	0
9121D	9121	100114	1	6	120	549.12	6.23	0.03	28.38
9121U	100112	9121	1	6	120	549.12	6.23	0.03	28.38
9123D	9123	100116	1	8	120	0	0	0	0
9123U	100118	9123	1	8	120	0	0	0	0
9125D	9125	100120	1	4	120	799.43	20.41	0.41	409.55
9125U	100122	9125	1	4	120	799.43	20.41	0.41	409.55
9127D	9127	100126	1	4	120	0	0	0	0
9127U	1268	9127	1	4	120	0	0	0	0
9129D	9129	100128	1	2	120	0	0	0	0
9129U	1267	9129	1	2	120	0	0	0	0
913	734	740	86.66	12	120	-693.41	1.97	0.13	1.49
9139D	9139	100142	1	8	120	186.91	1.19	0	0.92
9139U	101	9139	1	8	120	186.92	1.19	0	0.98
914	666	650	229.62	6	120	16.97	0.19	0.01	0.05
9141D	9141	100144	1	2	120	224.05	22.88	1.14	1,136.35
9141U	102	9141	1	2	120	224.05	22.88	1.14	1,136.29
9143D	9143	8518	1	3	120	5.47	0.25	0	0.18
9143U	8516	9143	1	3	120	5.47	0.25	0	0.18

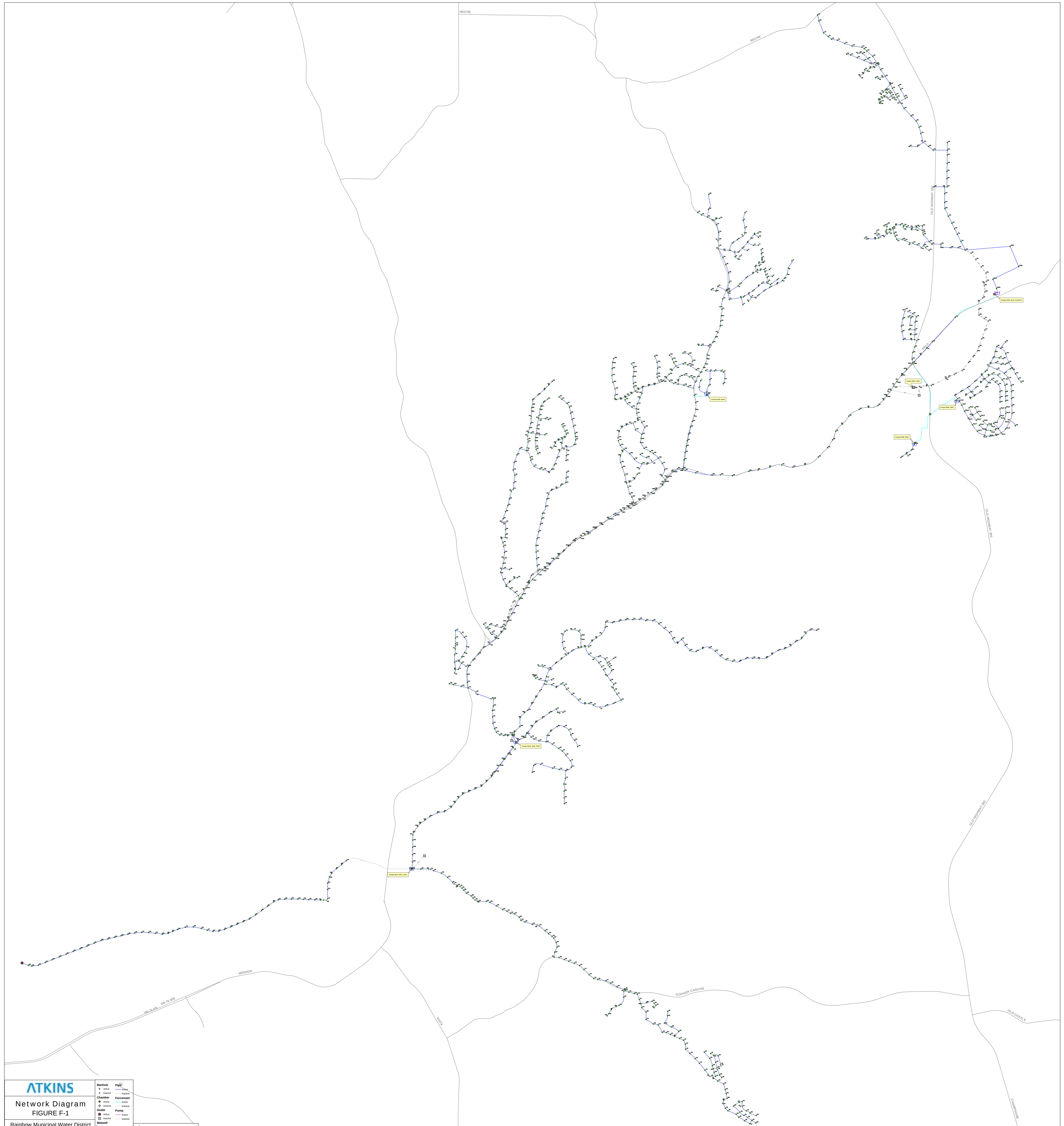
Pipe Report – Peak Hour Demand Scenario

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
9145D	9145	8512	1	8	120	0	0	0	0
9145U	105	9145	1	8	120	0	0	0	0
9147D	9147	8514	1	2.5	120	0	0	0	0
9147U	103	9147	1	2.5	120	0	0	0	0
9149D	9149	10124	1	6	120	0	0	0	0
9149U	2317	9149	1	6	120	0	0	0	0
915	1678	1664	244.81	18	120	543.36	0.69	0.03	0.13
9151D	9151	8538	1	4	120	0	0	0	0
9151U	8536	9151	1	4	120	0	0	0	0
9153D	9153	1611	1	8	120	95.56	0.61	0	0.24
9153U	8554	9153	1	8	120	95.56	0.61	0	0.24
9155D	9155	8562	1	14	120	0	0	0	0
9155U	8560	9155	1	14	120	0	0	0	0
9159D	9159	2439	1	6	150	0	0	0	0
9159U	2438	9159	1	6	150	0	0	0	0
916	1685	1678	199.66	18	120	505.51	0.64	0.02	0.12
917	1681	2432	88.27	12	120	-128.21	0.36	0.01	0.07
918	1678	1681	27.51	12	120	-37.85	0.11	0	0.01
919	666	665	304.07	6	120	6.74	0.08	0	0.01
92	1030	1029	543.73	8	120	56.42	0.36	0.06	0.1
920	734	666	1,606.51	6	120	52.11	0.59	0.58	0.36
921	1689	1685	65.54	8	120	-52.92	0.34	0.01	0.09
922	1688	1689	47.58	8	120	-32.04	0.2	0	0.04
923	508	516	1,307.98	8	120	-144.55	0.92	0.77	0.59
924	1698	1685	708.07	18	120	558.43	0.7	0.1	0.14
925	1694	1688	1,319.43	12	120	90.8	0.26	0.05	0.03
926	1689	1676	472.93	8	120	18.99	0.12	0.01	0.01
927	508	499	293.35	6	120	11.84	0.13	0.01	0.02
929	636	645	1,022.57	4	120	9.37	0.24	0.11	0.11
93	1032	1030	646.84	8	120	99.06	0.63	0.19	0.29
931	2724	1846	707.99	8	120	-127.22	0.81	0.33	0.47
933	1156	1155	410.62	8	120	-119.26	0.76	0.17	0.41
934	1169	1159	691.96	6	120	-22.5	0.26	0.05	0.08
935	1161	1152	1,162.08	6	120	198.99	2.26	5.03	4.33
936	1150	1149	406.25	8	120	11.29	0.07	0	0.01
937	1152	1151	625.54	6	120	110.11	1.25	0.9	1.45
938	15	14	615.96	12	120	-740.66	2.1	1.04	1.69
939	1115	1120	181.19	8	120	0.27	0	0	0
94	1078	1076	29.13	12	120	-530.84	1.51	0.03	0.91
940	1119	1135	657.64	8	120	16.46	0.11	0.01	0.01
941	1117	1116	109.12	8	120	104.46	0.67	0.04	0.32
942	1125	1126	203.75	8	120	30.32	0.19	0.01	0.03
943	1150	1128	924.13	6	120	92.56	1.05	0.97	1.05
944	2275	2284	1,530.39	16	120	-1,210.54	1.93	1.58	1.03
945	2494	2472	1,893.60	8	110	5.12	0.03	0	0
946	2467	2404	1,450.67	12	110	10.06	0.03	0	0
947	2468	2467	12.11	14	110	-39.89	0.08	0	0
948	2492	2468	933.88	14	110	-38.79	0.08	0	0
949	2493	2492	40.37	14	110	-38.7	0.08	0	0.01
95	1076	GOPHERCYN_TNK	11.05	16	120	-2,486.28	3.97	0.04	3.91
950	2497	2494	595.49	14	110	-31.64	0.07	0	0
951	2528	2497	1,688.98	14	110	-28.42	0.06	0	0
952	2571	2528	2,059.76	14	110	-22.67	0.05	0	0
953	2576	2571	679.25	14	110	-15.26	0.03	0	0
954	2598	2591	458.56	8	110	4.97	0.03	0	0
955	2618	1004	468.4	8	110	11.68	0.07	0	0.01
956	2403	2384	842.31	8	110	1.51	0.01	0	0
957	2588	2590	2,174.08	14	120	-10.38	0.02	0	0
958	2582	2576	715.92	14	110	-15.26	0.03	0	0
959	2599	2582	1,137.44	14	110	-12.72	0.03	0	0
96	1078	1076	10.57	16	120	-1,955.44	3.12	0.03	2.51
960	2594	2601	565.72	14	120	1.36	0	0	0
961	2572	2594	1,201.30	14	120	1.64	0	0	0
962	2560	2572	2,030.87	14	120	7.14	0.01	0	0
963	2560	2588	1,469.10	14	120	-9.99	0.02	0	0
964	1702	1716	304.15	8	120	82.09	0.52	0.06	0.21

Pipe Report – Peak Hour Demand Scenario

ID	From Node	To Node	Length (ft)	Diameter (in)	Roughness	Flow (gpm)	Velocity (ft/s)	Headloss (ft)	HL/1000 (ft/k-ft)
965	1716	1724	441.89	10	120	58.85	0.24	0.02	0.04
966	1710	1711	65.63	6	120	-130.85	1.48	0.13	1.99
967	554	539	612.42	6	120	18.61	0.21	0.03	0.05
968	1674	1669	8.06	10.1	120	1.75	0.01	0	0
969	562	554	436.13	6	120	-14.04	0.16	0.01	0.03
97	1079	1078	11.91	16	120	-2,486.28	3.97	0.05	3.91
970	26	25	71.61	8	120	1.19	0.01	0	0
971	27	26	135.14	8	120	1.19	0.01	0	0
972	20	19	155.65	12	120	0	0	0	0
973	78	71	816.73	10	120	-1,133.44	4.63	7.36	9.01
974	94	78	953.75	6	120	-3	0.03	0	0
975	47	50	297.19	4	120	3.41	0.09	0	0.02
976	46	47	156.68	4	120	9.77	0.25	0.02	0.12
977	53	51	31.24	6	120	0	0	0	0
978	53	60	1,107.21	6	120	-15.35	0.17	0.04	0.04
979	60	61	178.79	6	120	-21.81	0.25	0.01	0.07
98	1079	1073	224.09	16	120	1,026.20	1.64	0.17	0.76
980	69	68	315.45	10	120	-966.1	3.95	2.11	6.7
981	147	148	1,480.58	6	120	65.87	0.75	0.83	0.56
982	161	147	720.97	12	120	-501	1.42	0.59	0.82
983	115	99	3,612.02	10	120	-353.25	1.44	3.76	1.04
984	149	133	827.66	10	120	4.17	0.02	0	0
985	157	156	71.89	12	120	37.87	0.11	0	0.01
986	149	157	694.08	12	120	39.47	0.11	0.01	0.01
987	159	139	837.93	16	120	-164.79	0.26	0.02	0.03
988	1273	10152	1,764.02	6	120	364.92	4.14	23.46	13.3
989	1235	10148	46.63	6	120	59.87	0.68	0.02	0.47
99	1074	1079	330.13	16	120	-1,460.08	2.33	0.48	1.46
990	1249	1235	665.05	6	120	59.87	0.68	0.31	0.47
991	1247	1244	925.69	6	120	22.29	0.25	0.07	0.08
992	2441	10022	38.87	20	120	1,362.56	1.39	0.02	0.43
993	2438	2440	12.06	8	120	0	0	0	0
995	2427	2433	9.09	20	120	0	0	0	0
996	2439	2358	1,921.23	8	120	0	0	0	0
997	953	8020	1,159.11	8	120	0	0	0	0
998	949	953	901.4	8	120	19.83	0.13	0.01	0.01
999	949	2410	1,005.14	12	120	-128.07	0.36	0.07	0.07
P13	2627	419	253.28	24	120	-1,801.12	1.28	0.08	0.3

Sewer Hydraulic Model Output



ATKINS

Network Diagram

FIGURE F-1

Rainbow Municipal Water District
Master Plan Updates

PDWF – 2035 without Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D
342	-2.00%	1,576.62	1
938	0.00%	1,543.50	1
995	0.10%	1,747.29	0.81
329	0.10%	1,563.21	0.76
997	0.20%	1,666.00	0.67
998	0.20%	1,660.96	0.67
999	0.20%	1,661.26	0.67
1000	0.20%	1,662.03	0.67
1001	0.20%	1,662.29	0.67
1002	0.20%	1,663.03	0.67
1006	0.20%	1,664.21	0.67
1007	0.20%	1,664.46	0.67
1008	0.20%	1,665.45	0.67
1009	0.20%	1,665.67	0.67
1010	0.20%	1,666.68	0.67
1011	0.20%	1,667.08	0.67
1012	0.20%	1,667.72	0.67
1013	0.20%	1,668.28	0.67
1014	0.20%	1,668.91	0.67
1015	0.20%	1,669.42	0.67
1016	0.20%	1,670.06	0.67
1017	0.20%	1,670.19	0.67
1018	0.20%	1,669.82	0.67
1019	0.20%	1,669.14	0.67
1020	0.20%	1,667.79	0.67
1021	0.20%	1,666.75	0.67
341	0.20%	1,580.75	0.65
331	0.20%	1,566.56	0.64
352	0.20%	1,578.31	0.64
996	0.20%	1,665.44	0.63
336	0.20%	1,572.10	0.62
325	0.20%	1,558.78	0.61
326	0.20%	1,559.90	0.61
337	0.20%	1,570.66	0.61
332	0.20%	1,563.12	0.6
323	0.30%	1,553.20	0.59
324	0.30%	1,556.75	0.59
344	0.30%	1,575.78	0.58
343	0.30%	1,576.33	0.57
346	0.30%	1,583.29	0.57
347	0.30%	1,579.53	0.57
348	0.30%	1,578.31	0.55
349	0.30%	1,578.31	0.55
350	0.30%	1,578.31	0.55
351	0.30%	1,578.31	0.55
328	0.30%	1,563.21	0.54
330	0.30%	1,562.53	0.54
338	0.30%	1,569.59	0.54
9088	0.20%	1,564.96	0.54
9176	0.20%	1,570.27	0.54
9178	0.20%	1,568.48	0.54
345	0.40%	1,572.27	0.53
1024	0.50%	1,817.25	0.53
9164	0.20%	1,506.29	0.52
9166	0.20%	1,504.35	0.52
9168	0.20%	1,502.35	0.52

ID	Slope	Maximum Flow (gpm)	Maximum d/D
9170	0.20%	1,498.99	0.52
9172	0.20%	1,498.34	0.52
9174	0.20%	1,495.12	0.52
9180	0.20%	1,564.29	0.51
9116	0.30%	1,570.92	0.48
9118	0.30%	1,566.72	0.48
9120	0.30%	1,555.48	0.48
9126	0.30%	1,563.45	0.48
339	0.60%	1,583.49	0.47
1026	0.70%	1,760.39	0.47
9122	0.30%	1,548.72	0.47
9124	0.30%	1,548.72	0.47
9128	0.30%	1,555.89	0.47
9132	0.30%	1,546.14	0.47
9134	0.30%	1,538.79	0.47
9136	0.30%	1,534.67	0.47
9138	0.30%	1,528.48	0.47
9140	0.30%	1,527.71	0.47
9142	0.30%	1,525.27	0.47
9144	0.30%	1,519.60	0.47
9146	0.30%	1,517.57	0.47
9148	0.30%	1,509.54	0.47
9150	0.30%	1,507.28	0.47
9152	0.30%	1,501.52	0.47
9154	0.30%	1,500.52	0.47
1025	0.80%	1,759.91	0.46
9076	2.90%	1,563.87	0.46
9112	0.40%	1,582.67	0.46
9114	0.40%	1,579.04	0.46
9156	0.30%	1,496.52	0.46
9158	0.30%	1,494.80	0.46
9160	0.30%	1,493.45	0.46
9162	0.30%	1,490.30	0.46
9106	0.40%	1,535.17	0.45
9108	0.40%	1,531.66	0.45
9110	0.40%	1,528.46	0.45
327	0.80%	1,561.02	0.42
1003	0.90%	1,663.27	0.42
1004	0.90%	1,663.27	0.42
1005	0.90%	1,663.27	0.42
340	1.00%	1,581.51	0.4
742	0.20%	1,474.30	0.38
9096	0.20%	1,791.66	0.38
736	0.20%	1,429.43	0.37
754	0.30%	1,631.48	0.37
755	0.30%	1,666.44	0.37
764	0.30%	1,176.46	0.37
9092	0.20%	1,759.35	0.37
9094	0.20%	1,781.98	0.37
738	0.20%	1,441.96	0.36
744	0.30%	1,481.98	0.36
746	0.30%	1,506.64	0.36
9186	0.70%	2,126.28	0.36
739	0.30%	1,453.08	0.35
743	0.30%	1,481.98	0.35
747	0.30%	1,537.22	0.35

PDWF – 2035 without Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D
748	0.30%	1,543.19	0.35
9130	0.90%	1,551.31	0.35
741	0.30%	1,467.15	0.34
991	0.20%	2,055.26	0.34
987	0.20%	1,975.55	0.33
990	0.20%	1,975.55	0.33
9090	0.30%	1,702.16	0.33
737	0.40%	1,436.97	0.32
989	0.20%	1,830.40	0.32
745	0.50%	1,501.35	0.31
988	0.20%	1,732.24	0.31
9086	1.30%	2,105.87	0.31
740	0.50%	1,461.46	0.3
749	0.60%	1,569.97	0.3
984	0.20%	1,633.12	0.3
750	0.70%	1,587.16	0.29
751	0.70%	1,599.46	0.29
752	0.70%	1,620.57	0.29
937	0.20%	1,544.15	0.29
940	0.20%	1,543.58	0.29
941	0.20%	1,543.59	0.29
942	0.20%	1,543.63	0.29
943	0.20%	1,543.69	0.29
944	0.20%	1,543.70	0.29
945	0.20%	1,543.74	0.29
946	0.20%	1,543.80	0.29
947	0.20%	1,543.82	0.29
948	0.20%	1,543.85	0.29
949	0.20%	1,543.91	0.29
950	0.20%	1,543.92	0.29
951	0.20%	1,543.99	0.29
952	0.20%	1,544.03	0.29
953	0.20%	1,544.03	0.29
954	0.20%	1,544.10	0.29
955	0.20%	1,544.17	0.29
956	0.20%	1,544.18	0.29
957	0.20%	1,544.25	0.29
958	0.20%	1,544.30	0.29
959	0.20%	1,544.33	0.29
960	0.20%	1,544.35	0.29
961	0.20%	1,544.39	0.29
962	0.20%	1,544.46	0.29
972	0.20%	1,544.80	0.29
973	0.20%	1,544.89	0.29
974	0.20%	1,544.93	0.29
975	0.20%	1,544.94	0.29
976	0.20%	1,545.01	0.29
977	0.20%	1,545.04	0.29
978	0.20%	1,545.13	0.29
979	0.20%	1,545.16	0.29
980	0.20%	1,545.21	0.29
761	1.10%	1,174.82	0.27
762	1.00%	1,175.79	0.27
986	0.40%	1,732.24	0.27
753	1.30%	1,631.48	0.26
985	0.40%	1,661.75	0.26
763	1.60%	1,175.79	0.24
9104	3.30%	1,429.43	0.24
9100	3.10%	1,940.27	0.23
9182	1.30%	1,701.20	0.23
939	0.90%	1,543.51	0.2
963	1.00%	1,544.46	0.2
964	1.00%	1,544.48	0.2
965	1.00%	1,544.52	0.2
966	1.00%	1,544.59	0.2
967	1.00%	1,544.62	0.2
968	1.00%	1,544.62	0.2
971	0.90%	1,544.78	0.2
9098	5.90%	1,935.37	0.2
993	3.40%	2,081.38	0.17
992	4.00%	2,065.42	0.16
969	3.20%	1,544.71	0.15
970	3.20%	1,544.72	0.15
981	3.00%	1,545.13	0.15
9042	269.00%	1,746.90	0.15
982	4.40%	1,545.20	0.14
983	3.90%	1,545.23	0.14

PDWF - 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
329	0.10%	1,825.80	1	Possibly incorrect pipe invert, 0.0007 slope
342	-2.00%	1,841.73	1	Siphon
938	0.00%	1,998.37	1	Outlet
995	0.10%	1,770.60	0.82	Wet Well Inlet
331	0.20%	1,826.86	0.72	
341	0.20%	1,843.02	0.72	
352	0.20%	1,845.51	0.72	
336	0.20%	1,832.68	0.69	
325	0.20%	1,820.80	0.68	
326	0.20%	1,823.69	0.68	
337	0.20%	1,834.29	0.68	
332	0.20%	1,823.49	0.67	
1000	0.20%	1,671.90	0.67	
1001	0.20%	1,671.90	0.67	
1002	0.20%	1,671.90	0.67	
1006	0.20%	1,671.90	0.67	
1007	0.20%	1,671.90	0.67	
1008	0.20%	1,671.90	0.67	
1009	0.20%	1,671.90	0.67	
1010	0.20%	1,671.90	0.67	
1011	0.20%	1,671.90	0.67	
1012	0.20%	1,671.90	0.67	
1013	0.20%	1,671.90	0.67	
1014	0.20%	1,671.90	0.67	
1015	0.20%	1,671.90	0.67	
1016	0.20%	1,671.90	0.67	
1017	0.20%	1,671.90	0.67	
1018	0.20%	1,670.75	0.67	
1019	0.20%	1,669.51	0.67	
997	0.20%	1,677.97	0.67	
998	0.20%	1,671.90	0.67	
999	0.20%	1,671.90	0.67	
1020	0.20%	1,667.98	0.67	
1021	0.20%	1,666.84	0.67	
324	0.30%	1,819.43	0.66	
323	0.30%	1,817.53	0.65	
344	0.30%	1,838.82	0.64	
347	0.30%	1,845.91	0.64	
996	0.20%	1,677.97	0.64	
343	0.30%	1,841.57	0.63	
346	0.30%	1,848.58	0.63	
349	0.30%	1,845.51	0.61	
350	0.30%	1,845.51	0.61	
328	0.30%	1,825.80	0.6	
338	0.30%	1,831.05	0.6	
9178	0.20%	1,830.16	0.6	
348	0.30%	1,845.51	0.6	
351	0.30%	1,845.51	0.6	
330	0.30%	1,826.64	0.59	
9088	0.20%	1,829.63	0.59	
9176	0.20%	1,833.69	0.59	
345	0.40%	1,838.42	0.58	
9166	0.20%	1,774.87	0.58	
9168	0.20%	1,774.26	0.58	
9170	0.20%	1,771.29	0.58	
9172	0.20%	1,769.22	0.58	

PDWF – 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
1024	0.50%	2,090.84	0.58	
9164	0.20%	1,779.56	0.57	
9174	0.20%	1,767.19	0.57	
9180	0.20%	1,826.86	0.56	
9116	0.30%	1,828.49	0.52	
9118	0.30%	1,820.89	0.52	
9120	0.30%	1,819.06	0.52	
9122	0.30%	1,813.29	0.52	
9124	0.30%	1,813.29	0.52	
9126	0.30%	1,819.13	0.52	
9128	0.30%	1,818.65	0.52	
9132	0.30%	1,811.34	0.52	
9134	0.30%	1,805.91	0.52	
9136	0.30%	1,801.24	0.52	
9138	0.30%	1,799.16	0.52	
9140	0.30%	1,795.01	0.52	
9144	0.30%	1,792.32	0.52	
9146	0.30%	1,788.68	0.52	
9150	0.30%	1,781.68	0.52	
339	0.60%	1,845.64	0.51	
9076	2.90%	1,825.52	0.51	
9142	0.30%	1,794.68	0.51	
9148	0.30%	1,785.89	0.51	
9152	0.30%	1,780.49	0.51	
9154	0.30%	1,775.29	0.51	
9156	0.30%	1,773.46	0.51	
9158	0.30%	1,771.53	0.51	
9160	0.30%	1,768.53	0.51	
9162	0.30%	1,765.68	0.51	
1026	0.70%	2,032.39	0.51	
9106	0.40%	1,805.12	0.5	
9112	0.40%	1,832.25	0.5	
9114	0.40%	1,830.58	0.5	
1025	0.80%	2,032.19	0.5	
9108	0.40%	1,795.54	0.49	
9110	0.40%	1,795.33	0.49	
327	0.80%	1,824.25	0.46	
340	1.00%	1,843.12	0.44	
1003	0.90%	1,671.90	0.43	
1004	0.90%	1,671.90	0.43	
1005	0.90%	1,671.90	0.43	
742	0.20%	1,781.08	0.42	
736	0.20%	1,722.09	0.41	
738	0.20%	1,736.92	0.4	
744	0.30%	1,784.01	0.4	
746	0.30%	1,809.54	0.4	
754	0.30%	1,884.77	0.4	
755	0.30%	1,921.53	0.4	
9092	0.20%	1,970.10	0.4	
9096	0.20%	1,989.11	0.4	
739	0.30%	1,752.26	0.39	
743	0.30%	1,784.01	0.39	
747	0.30%	1,820.27	0.39	
9094	0.20%	1,978.99	0.39	
748	0.30%	1,830.89	0.38	
9130	0.90%	1,812.50	0.38	
741	0.30%	1,768.44	0.37	
764	0.30%	1,208.91	0.37	

PDWF – 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
9186	0.70%	2,152.89	0.37	
737	0.40%	1,734.66	0.36	
9090	0.30%	1,933.54	0.35	
740	0.50%	1,762.34	0.34	
745	0.50%	1,795.83	0.34	
937	0.20%	2,002.25	0.34	
940	0.20%	1,998.75	0.34	
941	0.20%	1,998.93	0.34	
942	0.20%	1,999.29	0.34	
943	0.20%	1,999.31	0.34	
944	0.20%	1,999.78	0.34	
945	0.20%	1,999.94	0.34	
946	0.20%	2,000.21	0.34	
947	0.20%	2,000.54	0.34	
948	0.20%	2,000.59	0.34	
949	0.20%	2,001.10	0.34	
950	0.20%	2,001.25	0.34	
951	0.20%	2,001.34	0.34	
952	0.20%	2,001.76	0.34	
953	0.20%	2,002.06	0.34	
954	0.20%	2,002.21	0.34	
955	0.20%	2,002.47	0.34	
956	0.20%	2,002.81	0.34	
957	0.20%	2,003.09	0.34	
959	0.20%	2,003.61	0.34	
960	0.20%	2,003.63	0.34	
961	0.20%	2,004.27	0.34	
972	0.20%	2,007.32	0.34	
973	0.20%	2,007.38	0.34	
974	0.20%	2,008.25	0.34	
975	0.20%	2,008.52	0.34	
977	0.20%	2,010.02	0.34	
978	0.20%	2,010.24	0.34	
979	0.20%	2,010.72	0.34	
980	0.20%	2,011.71	0.34	
984	0.20%	2,015.12	0.34	
991	0.20%	2,055.28	0.34	
749	0.60%	1,843.06	0.33	
958	0.20%	2,003.31	0.33	
962	0.20%	2,004.43	0.33	
976	0.20%	2,009.46	0.33	
987	0.20%	2,019.99	0.33	
988	0.20%	2,018.23	0.33	
989	0.20%	2,018.84	0.33	
990	0.20%	2,019.99	0.33	
750	0.70%	1,861.07	0.32	
751	0.70%	1,875.32	0.32	
752	0.70%	1,884.26	0.31	
9086	1.30%	2,090.48	0.3	
986	0.40%	2,018.23	0.29	
762	1.00%	1,208.76	0.28	
985	0.40%	2,015.46	0.28	
753	1.30%	1,884.77	0.27	
761	1.10%	1,208.71	0.27	
9104	3.30%	1,722.09	0.27	
763	1.60%	1,208.76	0.25	
9100	3.10%	2,014.19	0.24	
9182	1.30%	1,933.24	0.24	

PDWF – 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
939	0.90%	1,998.37	0.23	
971	0.90%	2,006.49	0.23	
963	1.00%	2,004.43	0.22	
964	1.00%	2,004.84	0.22	
965	1.00%	2,005.16	0.22	
966	1.00%	2,005.35	0.22	
967	1.00%	2,005.40	0.22	
968	1.00%	2,005.54	0.22	
9098	5.90%	2,013.87	0.2	
969	3.20%	2,006.27	0.17	
970	3.20%	2,006.48	0.17	
981	3.00%	2,012.42	0.17	
993	3.40%	2,081.38	0.17	
983	3.90%	2,014.54	0.16	
992	4.00%	2,065.42	0.16	
982	4.40%	2,013.10	0.15	
9042	269.00%	1,770.56	0.15	

PWWF - 2035 without Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
329	0.10%	2,182.19	1	Possibly incorrect pipe invert, 0.0007 slope
331	0.20%	2,183.72	1	Flat pipe downstream and bottleneck upstream possibly causing.
341	0.20%	2,213.62	1	Siphon
342	-2.00%	2,212.55	1	Siphon
352	0.20%	2,226.85	1	Not sure what causes
938	0.00%	2,032.96	1	Outlet
995	0.10%	1,824.66	1	Wet Well Inlet
336	0.20%	2,201.76	0.81	
337	0.20%	2,204.72	0.8	
325	0.20%	2,175.45	0.79	
326	0.20%	2,178.33	0.79	
332	0.20%	2,178.08	0.77	
324	0.30%	2,171.34	0.75	
323	0.30%	2,170.06	0.74	
344	0.30%	2,210.74	0.74	
347	0.30%	2,227.33	0.73	
343	0.30%	2,212.41	0.72	
346	0.30%	2,229.43	0.72	
349	0.30%	2,226.85	0.7	
350	0.30%	2,226.85	0.7	
348	0.30%	2,226.85	0.69	
351	0.30%	2,226.85	0.69	
328	0.30%	2,182.19	0.68	
338	0.30%	2,202.50	0.68	
997	0.20%	1,693.12	0.68	
1002	0.20%	1,683.71	0.68	
1006	0.20%	1,683.72	0.68	
1008	0.20%	1,683.73	0.68	
1010	0.20%	1,683.76	0.68	
1011	0.20%	1,683.79	0.68	
1014	0.20%	1,684.10	0.68	
330	0.30%	2,182.27	0.67	
998	0.20%	1,683.69	0.67	
999	0.20%	1,683.70	0.67	
1000	0.20%	1,683.70	0.67	
1001	0.20%	1,683.71	0.67	
1007	0.20%	1,683.72	0.67	
1009	0.20%	1,683.74	0.67	
1012	0.20%	1,683.97	0.67	
1013	0.20%	1,684.00	0.67	
1015	0.20%	1,684.11	0.67	
1016	0.20%	1,684.12	0.67	
1017	0.20%	1,684.13	0.67	
1018	0.20%	1,680.72	0.67	
1019	0.20%	1,677.06	0.67	
1020	0.20%	1,672.50	0.67	
1021	0.20%	1,669.10	0.67	
1024	0.50%	2,594.37	0.67	
9088	0.20%	2,185.40	0.67	
9176	0.20%	2,191.00	0.67	
9178	0.20%	2,185.85	0.67	
345	0.40%	2,209.90	0.66	
996	0.20%	1,693.10	0.64	
9166	0.20%	2,029.23	0.64	
9170	0.20%	2,025.40	0.64	

PWWF - 2035 without Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
9168	0.20%	2,028.54	0.63	
9172	0.20%	2,022.06	0.63	
9180	0.20%	2,182.14	0.63	
9164	0.20%	2,035.25	0.62	
9174	0.20%	2,019.61	0.62	
339	0.60%	2,215.48	0.57	
1026	0.70%	2,469.06	0.57	
1025	0.80%	2,468.79	0.56	
9076	2.90%	2,180.53	0.56	
9116	0.30%	2,071.39	0.56	
9118	0.30%	2,066.39	0.56	
9120	0.30%	2,057.34	0.56	
9122	0.30%	2,051.57	0.56	
9124	0.30%	2,051.57	0.56	
9126	0.30%	2,079.16	0.56	
9128	0.30%	2,072.18	0.56	
9132	0.30%	2,059.49	0.56	
9134	0.30%	2,059.42	0.56	
9136	0.30%	2,056.00	0.56	
9138	0.30%	2,053.58	0.56	
9140	0.30%	2,048.99	0.56	
9144	0.30%	2,041.01	0.56	
9146	0.30%	2,035.14	0.56	
9148	0.30%	2,034.21	0.56	
9150	0.30%	2,031.38	0.56	
9152	0.30%	2,027.52	0.56	
9154	0.30%	2,023.68	0.56	
9158	0.30%	2,016.02	0.56	
9142	0.30%	2,042.57	0.55	
9156	0.30%	2,016.09	0.55	
9160	0.30%	2,010.89	0.55	
9162	0.30%	2,009.44	0.55	
9112	0.40%	2,092.38	0.54	
9114	0.40%	2,077.61	0.54	
9106	0.40%	2,024.10	0.53	
9108	0.40%	2,014.48	0.53	
9110	0.40%	1,999.42	0.52	
327	0.80%	2,178.86	0.51	
340	1.00%	2,213.68	0.49	
742	0.20%	1,881.47	0.43	
1003	0.90%	1,683.72	0.43	
1004	0.90%	1,683.72	0.43	
1005	0.90%	1,683.72	0.43	
736	0.20%	1,833.03	0.42	
738	0.20%	1,851.72	0.42	
743	0.30%	1,900.97	0.41	
744	0.30%	1,900.97	0.41	
746	0.30%	1,919.42	0.41	
754	0.30%	1,984.94	0.41	
755	0.30%	1,992.82	0.41	
9130	0.90%	2,070.08	0.41	
739	0.30%	1,860.13	0.4	
747	0.30%	1,931.55	0.4	
9092	0.20%	2,013.57	0.4	
9094	0.20%	2,018.16	0.4	
9096	0.20%	2,025.09	0.4	
741	0.30%	1,878.03	0.39	
748	0.30%	1,940.81	0.39	

PWWF - 2035 without Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
737	0.40%	1,839.10	0.37	
764	0.30%	1,176.60	0.37	
9186	0.70%	2,175.13	0.37	
9090	0.30%	2,006.51	0.36	
745	0.50%	1,909.84	0.35	
740	0.50%	1,860.68	0.34	
749	0.60%	1,950.08	0.34	
937	0.20%	2,036.55	0.34	
940	0.20%	2,033.39	0.34	
941	0.20%	2,033.42	0.34	
942	0.20%	2,033.83	0.34	
943	0.20%	2,033.98	0.34	
944	0.20%	2,034.22	0.34	
945	0.20%	2,034.51	0.34	
946	0.20%	2,034.55	0.34	
947	0.20%	2,035.01	0.34	
948	0.20%	2,035.11	0.34	
949	0.20%	2,035.46	0.34	
950	0.20%	2,035.48	0.34	
951	0.20%	2,035.84	0.34	
952	0.20%	2,036.15	0.34	
953	0.20%	2,036.33	0.34	
954	0.20%	2,036.37	0.34	
955	0.20%	2,036.85	0.34	
956	0.20%	2,037.10	0.34	
957	0.20%	2,037.28	0.34	
958	0.20%	2,037.36	0.34	
959	0.20%	2,037.78	0.34	
960	0.20%	2,037.92	0.34	
961	0.20%	2,038.27	0.34	
962	0.20%	2,038.59	0.34	
972	0.20%	2,040.92	0.34	
973	0.20%	2,041.17	0.34	
974	0.20%	2,041.68	0.34	
975	0.20%	2,041.99	0.34	
976	0.20%	2,042.40	0.34	
977	0.20%	2,042.48	0.34	
978	0.20%	2,043.05	0.34	
979	0.20%	2,043.56	0.34	
980	0.20%	2,043.96	0.34	
984	0.20%	2,044.87	0.34	
988	0.20%	2,047.57	0.34	
989	0.20%	2,046.62	0.34	
990	0.20%	2,047.33	0.34	
991	0.20%	2,055.37	0.34	
750	0.70%	1,953.57	0.33	
751	0.70%	1,955.79	0.33	
987	0.20%	2,047.33	0.33	
752	0.70%	1,969.11	0.32	
9086	1.30%	2,123.77	0.31	
986	0.40%	2,047.57	0.29	
753	1.30%	1,984.94	0.28	
985	0.40%	2,045.87	0.28	
761	1.10%	1,175.87	0.27	
762	1.00%	1,176.34	0.27	
9104	3.30%	1,833.03	0.27	
9182	1.30%	2,005.44	0.25	
763	1.60%	1,176.34	0.24	

PWWF - 2035 without Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
9100	3.10%	2,106.58	0.24	
939	0.90%	2,033.11	0.23	
971	0.90%	2,040.39	0.23	
963	1.00%	2,038.59	0.22	
964	1.00%	2,038.88	0.22	
965	1.00%	2,039.06	0.22	
966	1.00%	2,039.12	0.22	
967	1.00%	2,039.36	0.22	
968	1.00%	2,039.60	0.22	
9098	5.90%	2,037.07	0.2	
969	3.20%	2,040.06	0.17	
970	3.20%	2,040.13	0.17	
981	3.00%	2,043.18	0.17	
993	3.40%	2,081.39	0.17	
982	4.40%	2,044.31	0.16	
983	3.90%	2,044.85	0.16	
992	4.00%	2,065.43	0.16	
9042	269.00%	1,824.36	0.16	

PWWF - 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
323	0.30%	2,443.39	1	Caused by downstream bottleneck
324	0.30%	2,448.13	1	Caused by downstream bottleneck
325	0.20%	2,449.34	1	Caused by downstream bottleneck
326	0.20%	2,455.87	1	Caused by downstream bottleneck
329	0.10%	2,459.10	1	Possibly incorrect pipe invert, 0.0007 slope
331	0.20%	2,463.53	1	Caused by downstream bottleneck
332	0.20%	2,460.16	1	Caused by downstream bottleneck
336	0.20%	2,457.12	1	Possible bottleneck point
337	0.20%	2,457.08	1	Possible bottleneck point
341	0.20%	2,459.93	1	Siphon
342	-2.00%	2,455.86	1	Siphon
352	0.20%	2,450.66	1	Not sure what causes
938	0.00%	1,999.59	1	Outlet
344	0.30%	2,451.09	0.82	
995	0.10%	1,770.50	0.82	
343	0.30%	2,455.47	0.79	
346	0.30%	2,457.96	0.79	
347	0.30%	2,450.99	0.79	
350	0.30%	2,450.66	0.76	
349	0.30%	2,450.66	0.75	
328	0.30%	2,459.10	0.74	
330	0.30%	2,462.59	0.74	
338	0.30%	2,451.46	0.74	
348	0.30%	2,450.66	0.74	
351	0.30%	2,450.66	0.74	
9176	0.20%	2,477.26	0.74	
9178	0.20%	2,472.47	0.74	
9088	0.20%	2,470.81	0.73	
9166	0.20%	2,424.74	0.72	
9168	0.20%	2,424.13	0.72	
9170	0.20%	2,419.79	0.72	
9172	0.20%	2,415.80	0.72	
345	0.40%	2,448.63	0.71	
9164	0.20%	2,432.63	0.71	
9174	0.20%	2,412.90	0.71	
1024	0.50%	2,693.32	0.69	
9180	0.20%	2,465.06	0.69	
997	0.20%	1,677.97	0.67	
998	0.20%	1,671.90	0.67	
999	0.20%	1,671.90	0.67	
1000	0.20%	1,671.90	0.67	
1001	0.20%	1,671.90	0.67	
1002	0.20%	1,671.90	0.67	
1006	0.20%	1,671.90	0.67	
1007	0.20%	1,671.90	0.67	
1008	0.20%	1,671.90	0.67	
1009	0.20%	1,671.90	0.67	
1010	0.20%	1,671.90	0.67	
1011	0.20%	1,671.90	0.67	
1012	0.20%	1,671.90	0.67	
1013	0.20%	1,671.90	0.67	
1014	0.20%	1,671.90	0.67	
1015	0.20%	1,671.90	0.67	
1016	0.20%	1,671.90	0.67	
1017	0.20%	1,671.90	0.67	
1018	0.20%	1,670.75	0.67	

PWWF - 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
1019	0.20%	1,669.51	0.67	
1020	0.20%	1,667.98	0.67	
1021	0.20%	1,666.84	0.67	
996	0.20%	1,677.97	0.64	
9116	0.30%	2,507.19	0.64	
9118	0.30%	2,502.93	0.64	
9120	0.30%	2,495.97	0.64	
9126	0.30%	2,497.65	0.64	
9132	0.30%	2,483.64	0.64	
9140	0.30%	2,464.61	0.64	
9122	0.30%	2,485.38	0.63	
9124	0.30%	2,485.38	0.63	
9128	0.30%	2,490.21	0.63	
9134	0.30%	2,474.27	0.63	
9136	0.30%	2,473.49	0.63	
9138	0.30%	2,465.33	0.63	
9142	0.30%	2,462.66	0.63	
9144	0.30%	2,458.28	0.63	
9146	0.30%	2,454.27	0.63	
9148	0.30%	2,449.20	0.63	
9150	0.30%	2,442.68	0.63	
9152	0.30%	2,441.67	0.63	
9154	0.30%	2,433.67	0.63	
9156	0.30%	2,432.08	0.63	
9158	0.30%	2,428.85	0.63	
9160	0.30%	2,424.34	0.62	
9162	0.30%	2,419.92	0.62	
339	0.60%	2,465.20	0.61	
9076	2.90%	2,462.38	0.61	
9112	0.40%	2,518.12	0.61	
9114	0.40%	2,513.70	0.61	
1026	0.70%	2,635.70	0.6	
9106	0.40%	2,489.14	0.6	
9108	0.40%	2,484.96	0.6	
9110	0.40%	2,478.63	0.6	
1025	0.80%	2,635.14	0.58	
327	0.80%	2,457.18	0.55	
340	1.00%	2,460.46	0.52	
742	0.20%	2,464.89	0.5	
736	0.20%	2,410.46	0.49	
738	0.20%	2,429.67	0.49	
744	0.30%	2,483.81	0.48	
746	0.30%	2,503.92	0.48	
754	0.30%	2,610.05	0.48	
755	0.30%	2,639.81	0.48	
764	0.30%	1,928.82	0.48	
743	0.30%	2,483.81	0.47	
9092	0.20%	2,699.11	0.47	
9094	0.20%	2,710.97	0.47	
9096	0.20%	2,720.42	0.47	
739	0.30%	2,440.21	0.46	
747	0.30%	2,531.10	0.46	
748	0.30%	2,534.97	0.46	
741	0.30%	2,461.89	0.45	
9130	0.90%	2,487.08	0.45	
737	0.40%	2,416.24	0.43	
1003	0.90%	1,671.90	0.43	
1004	0.90%	1,671.90	0.43	

PWWF - 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
1005	0.90%	1,671.90	0.43	
9090	0.30%	2,662.82	0.42	
9186	0.70%	2,753.93	0.42	
745	0.50%	2,500.43	0.41	
740	0.50%	2,442.91	0.4	
749	0.60%	2,559.00	0.39	
750	0.70%	2,574.68	0.38	
751	0.70%	2,586.05	0.38	
752	0.70%	2,602.70	0.37	
761	1.10%	1,925.42	0.35	
762	1.00%	1,927.60	0.35	
9086	1.30%	2,750.90	0.35	
937	0.20%	2,003.52	0.34	
940	0.20%	1,999.97	0.34	
941	0.20%	2,000.16	0.34	
942	0.20%	2,000.51	0.34	
943	0.20%	2,000.53	0.34	
944	0.20%	2,001.01	0.34	
945	0.20%	2,001.17	0.34	
946	0.20%	2,001.46	0.34	
947	0.20%	2,001.78	0.34	
948	0.20%	2,001.84	0.34	
949	0.20%	2,002.35	0.34	
950	0.20%	2,002.50	0.34	
951	0.20%	2,002.58	0.34	
952	0.20%	2,003.01	0.34	
953	0.20%	2,003.32	0.34	
954	0.20%	2,003.47	0.34	
955	0.20%	2,003.72	0.34	
956	0.20%	2,004.07	0.34	
957	0.20%	2,004.35	0.34	
959	0.20%	2,004.88	0.34	
960	0.20%	2,004.90	0.34	
961	0.20%	2,005.56	0.34	
972	0.20%	2,008.63	0.34	
973	0.20%	2,008.68	0.34	
974	0.20%	2,009.58	0.34	
975	0.20%	2,009.69	0.34	
977	0.20%	2,010.72	0.34	
978	0.20%	2,010.98	0.34	
979	0.20%	2,011.69	0.34	
980	0.20%	2,012.31	0.34	
984	0.20%	2,014.68	0.34	
991	0.20%	2,055.28	0.34	
958	0.20%	2,004.58	0.33	
962	0.20%	2,005.71	0.33	
976	0.20%	2,010.55	0.33	
987	0.20%	2,020.57	0.33	
988	0.20%	2,018.19	0.33	
989	0.20%	2,019.15	0.33	
990	0.20%	2,020.57	0.33	
753	1.30%	2,610.05	0.32	
9104	3.30%	2,410.46	0.32	
763	1.60%	1,927.60	0.31	
986	0.40%	2,018.19	0.29	
9182	1.30%	2,662.21	0.29	
985	0.40%	2,015.34	0.28	
9100	3.10%	2,750.10	0.28	

PWWF - 2035 with Meadowood

ID	Slope	Maximum Flow (gpm)	Maximum d/D	Notes
9098	5.90%	2,748.43	0.24	
939	0.90%	1,999.59	0.23	
971	0.90%	2,007.81	0.23	
963	1.00%	2,005.71	0.22	
964	1.00%	2,006.13	0.22	
965	1.00%	2,006.45	0.22	
966	1.00%	2,006.65	0.22	
967	1.00%	2,006.71	0.22	
968	1.00%	2,006.83	0.22	
969	3.20%	2,007.57	0.17	
970	3.20%	2,007.80	0.17	
981	3.00%	2,012.52	0.17	
993	3.40%	2,081.38	0.17	
983	3.90%	2,014.39	0.16	
992	4.00%	2,065.42	0.16	
982	4.40%	2,013.43	0.15	
9042	269.00%	1,770.43	0.15	

APPENDIX G

RMWD Sewer System Management Plan

RAINBOW MUNICIPAL WATER DISTRICT
Committed to Excellence

RAINBOW MUNICIPAL WATER DISTRICT

SEWER SYSTEM MANAGEMENT PLAN

REGION 9
SAN DIEGO COUNTY

Rainbow Municipal Water District
Fallbrook, California

November 2, 2015

2 Year Update

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APPENDICES

LIST OF FIGURES

LIST OF TABLES

Update Schedule

Type	Deadline	Actual Date of Update	Sections Revised	Signature
Organization, LRO, Staff	12-31-2015	May 4 ,2015	Section II Organization	RZ,BF
Legal Authority, Administrative Code	12-31-2015	October 14,2015	Section III legal Authority	RZ/SK
Operations & Maintenance update, Overflow emergency plan revised, Lift No. 2 / Specs	12-31-2015	Sept. 07,2015	Section IV Operations & Maintenance	RZ&RL
Operations & Maintenance Updated Lift Station No. 4 Spec's	12-31-2015	Sept. 07,2015	Section IV Operations & Maintenance	RZ&RL
Operations & Maintenance Revised - Private spill response binder	12-31-2015	June 08,2015	Section V Design & Performance Provision	RZ,RL
CIP,Compliance Summary	12-31-2015	October 27,2015	Section VIII System Evaluation capacity assurance	RZ,SK& RL
Measurement, Monitoring Revisions , data updates	12-31-2015	October 27,2015	Review all sections	RZ,SK
Audit Review	12-31-2015	October 27,2015	Reviewed all sections	RZ,JA, SK
Audit Review	12-31-2015	October 27,2015	MRP 2013-0058 *SSMP Completed*	RZ,JA,SK
Audit Review	12-31-2015	November 17,2015	Internal Audit Board Action approval	Board

LIST OF FREQUENT ACRONYMS

Cal EMA	California Emergency Management Agency
CI	Cast Iron
CCW	Counter Clockwise
CIP	Capital Improvement Project
CIWQS	California Integrated Water Quality System
CW	Clockwise
DEH	Department of Environmental Health
District	Rainbow Municipal Water District
EDU	Equivalent Dwelling Unit
FOG	Fat, Oils & Grease
GCDI	Grease Control Device Inspection
GPD	Gallons Per Day
HDPE	High-Density Polyethylene
HP	Horsepower
HZ	Hertz
I&I	Inflow and Infiltration
LRO	Legally Responsible Officer
MRP	Monitoring Reporting Plan
NPDES	National Pollutant Discharge Elimination System
O&M	Operations & Maintenance
PM	Preventive Maintenance
POTW	Publicly Owned Treatment Works
RCT	Regulatory Compliance Technician
SCADA	Supervisory Control & Data Acquisition
SDRWQCB	San Diego Regional Water Quality Control Board
SSMP	Sanitary Sewer Maintenance Plan
SSO	Sanitary Sewer Overflow
SWRCB	State Water Resources Control Board
TDH	Total Dynamic Head
WERP	Wastewater Emergency Response Plan

DISTRIBUTION LIST

NAME	TITLE
Board Members (5)	Board
Tom Kennedy	General Manager
Juan Atilano	Operations Manager
Sherry Kirkpatrick	Engineer Manager
Ramon Zuniga	Wastewater Superintendent
Wastewater (1)	Staff

INTRODUCTION

RAINBOW MUNICIPAL WATER DISTRICT

SEWER SYSTEM MANAGEMENT PLAN

Introduction

The Rainbow Municipal Water District (District) is a local governmental agency providing water and wastewater services to an unincorporated area of northern inland San Diego County in California. The District serves the unincorporated communities of Rainbow, Bonsall, and a portion of Fallbrook covering approximately 49,800 acres. The District is a form of government in California known as a special district and is organized under the California Water Code**.**

The District serves a relatively rural group of customers with approximately 7,800 water connections and 3,800 wastewater connections. The District straddles, in part, Interstate 15 and the San Luis Rey River. Much of the area remains in its natural state of chaparral, oak and coastal sage vegetation, characteristic of Mediterranean west coast climatic regions. Temperatures vary from a low mean daytime temperature of 69 degrees in the winter to a high mean daytime temperature of 86 degrees in the summer.

The terrain is rugged and mountainous, consisting of developed groves, with some residential areas interspersed in the more accessible valleys. The District is largely agricultural; however, it is expected to see growth in its residential customer base in the future. The area has many agricultural uses, including citrus, avocados, strawberries, tomatoes, corn, commercial nurseries and livestock.

The District owns and operates a collection system of 60 miles of gravity sewer lines and over 2.5 miles of force main along with 6 lift stations and 1 metering station. These facilities collect and convey sewage from the District's customers for final treatment and disposal at the San Luis Rey Treatment Plant operated by and located in the City of Oceanside. The District owns through contract, the capacity to convey and treat 1 ½ million gallons of sewage per day at the San Luis Rey plant.

State Water Resources Control Board Requirement

On May 2, 2006, the State Water Resources Control Board (SWRCB) enacted Order No. 2006-0003 and Amended Order No. WQ2013-0058 EXEC. (See Appendix A) entitled, "Statewide General Waste Discharge Requirements for Sanitary Sewer Systems (WDR). The WDR requires any public agency that owns or operates a sanitary sewer system more than one mile in length that conveys treated or partially treated wastewater to a Publicly Owned Treatment Works (POTW) in the State of California, to comply with the requirements of the WDR in order to reduce the number of Sewer System Overflows (SSOs).

The public agency must develop goals to properly manage, operate and maintain all parts of its wastewater collection system in order to reduce and prevent SSOs as well as to mitigate any SSOs that occur.

The District has already implemented measures to reduce SSOs, and utilizes the statewide electronic reporting system, “California Integrated Water Quality System” (CIWQS) for SSOs.

The District submitted a “Notice of Intent” for coverage under the WDR and has developed a Sewer System Management Plan (SSMP) per these requirements. The SSMP identifies how the District complies or implements the eleven mandatory elements in the WDR that will reduce SSOs. The required elements are as follows:

1. Goals
2. Organization
3. Legal Authority
4. Operation and Maintenance Program
5. Design and Performance Provisions
6. Overflow Emergency Response Plan
7. FOG Control Program
8. System Evaluation and Capacity Assurance Plan
9. Monitoring, Measurement and Program Modifications
10. SSMP Program Audits
11. Communication Program

Details of each of these elements and how they apply to the specific requirements of the WDR are contained in the following sections.

WW System Map goes here for RMWD personnel only.

MAP NOT INCLUDED (CONFIDENTIAL)

SECTION I

GOALS

SECTION I - GOALS

Regulatory Requirement

The goal of the SSMP is to provide a plan and schedule to properly mange, operate and maintain all parts of the sanitary sewer system. This will help reduce and prevent SSOs, as well as mitigate any SSOs that do occur.

Goals

The District is committed to reducing SSOs in order to decrease the risk to both human health and the environment. The number and size of SSOs generally can be reduced, if not prevented, through the application of sound and appropriate operation, maintenance and management principles.

In accordance with the WDR, the SSMP will include the applicable elements that provide proper and cost effective management, along with operation and maintenance of the collections system, while taking into consideration risk management and cost benefit analysis.

Providing safe, responsive and reliable sewer service is a key component to fulfilling the District's mission statement. *"To provide our customers reliable high quality water and sewer service at the most efficient cost"*.

In support of this mission, the District has developed the following goals for the operation and maintenance of its sewer system.

- Properly manage, operate and maintain all parts of the wastewater collection system to provide reliable and uninterrupted service at least 99% of the time.
- Maintain and complete on schedule the District's three (3) year sewer system cleaning plan. Establish and implement a Close Circuit Television (CCTV) maintenance program by contracting field services.
- Reduce inflow and infiltration in the collection system. The District's Engineering Department commissioned an Inflow and Infiltration (I&I) study for the gravity sewer system.
- Provide adequate capacity to convey peak flows.
- Minimize the frequency of SSOs to zero. Mitigate the impact of SSOs utilizing safe, practical, proven and effective methods.
- Provide Operation and Maintenance (O&M) training for all staff and standby personnel who are involved in responding to system problems and SSOs.

SECTION II

ORGANIZATION

SECTION II – ORGANIZATION

Regulatory Requirements

The name of the responsible or authorized representative having responsibility for the overall operation of the regulated facility.

Legally Responsible Official

Juan Atilano, Operations Manager is designated as the Legally Responsible Official (LRO).

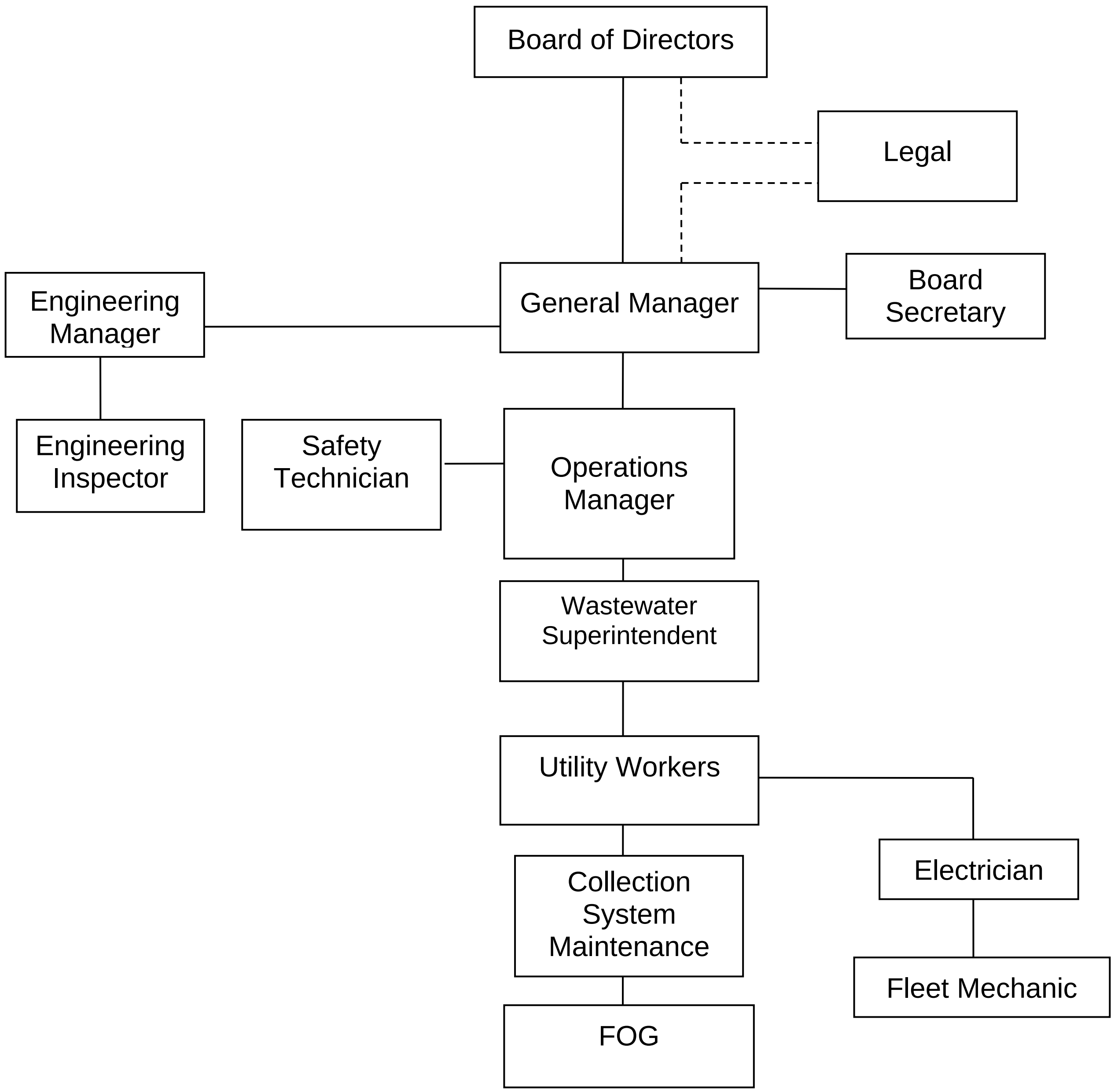
Regulatory Requirements

The names and telephone numbers for management, administrative and maintenance positions responsible for implementing specific measures in the SSMP program. The SSMP must identify lines of authority through an organization chart with a narrative explanation.

Responsible Positions

Wastewater Standby	760 525-6932
Wastewater Superintendent, Ramon Zuniga	760 525-6934
Operations Manager Juan Atilano	760 525-9460
District Engineer Sherry Kirkpatrick	760 685-7335
General Manager, Tom Kennedy	760 445-0000
District Inspector, David Hill	760 525-4175
Electrician, Ed Bradley	760 518-9753
Safety Technician, Jeff Stacy	760 518-8776
District Fleet Mechanic, Rene Del Rio	760 685-2031

An organization chart and narrative explanation of positions follows:


Board of Directors
Legal
Engineering Manager
General Manager
Board Secretary
Engineering Inspector
Safety Technician
Operations Manager
Wastewater Superintendent
Utility Workers
Electrician
Collection System Maintenance
Fleet Mechanic
FOG

Board of Directors

The District is a governmental agency, governed by a five (5) member Board of Directors. Each Director is elected by a vote of the people within one of the five Divisions of the District. Each of the elected Directors serves a four-year term. The Board of Directors set District policy.

Legal

The District's legal team advises the Board of Directors and staff on legal matters.

General Manager

The General Manager has overall responsibility for all functions of the District. The General Manager serves as Public Information Officer (PIO) and provides information and updates to the Board of Directors.

Operations Manager

The Operations Manager serves as the LRO for the Wastewater system and will establish procedures, allocate resources, delegate responsibility and authorize outside contractors to perform services. The LRO also coordinates development of the District's SSMP.

Engineering Manager

The Engineering Manager prepares wastewater system planning documents, manages capital improvement projects (CIP) and documents new and rehabilitated assets.

Engineering Inspector

The Engineering Inspector ensures that new and rehabilitated assets meet District standards, works with field crews to handle emergencies when contractors are involved and provide verbal and written reports to the District Engineer.

Safety Technician

The Regulatory Compliance Technician (RCT), under the direction of the Operations Water Manager, has responsibility for the planning and administration of the District's programs and services related to safety, security, emergency preparedness and environmental compliance functions.

Wastewater Superintendent

The Wastewater Superintendent manages and oversees all responsibilities in field operations and maintenance activities, provides relevant information to agency management, prepares and implements contingency plans, leads emergency response, investigates and reports SSOs and trains field crews. He coordinates and manages the repair, maintenance and operation of the wastewater pumping and collection system and performs research & planning. The Wastewater superintendent also assists with the development and implementation of the WDR, SSMP and is the backup L.RO official.

Utility Workers – Wastewater

Utility Worker staff performs preventative maintenance activities, mobilizes and responds to notification of stoppages and SSOs, activates sewer cleaning equipment and CCTV, sets bypass pumping equipment and portable generators as well as other equipment such as traffic control, confined space rescue, trenching and shoring.

Collection System Maintenance

- Lift Stations – Staff performs regular routine maintenance on the District's six (6) lift stations and 1 flow metering station.

- Line Cleaning – Staff performs regular maintenance on the 60 miles of gravity sewer lines.

- CCTV – Staff oversees contract video recording of the gravity sewer system.

Fats, Oils and Grease (FOG) Program

Staff oversees FOG Program for source control. / Outsource when needed.

Electrician

The Electrician provides general electrical journey level experience in wastewater applications.

Vehicle Maintenance

The Mechanic maintains wastewater vehicles and equipment.

Regulatory Requirements

The chain of communication for reporting SSOs, from receipt of a complaint or other information, including the person responsible for reporting SSOs to the State and Regional Water Board and other agencies if applicable.

Reporting Plan

The reporting plan is detailed in the notification procedures in Section VI, the Overflow Emergency Response Plan.

SECTION III

LEGAL AUTHORITY

SECTION III – LEGAL AUTHORITY

Regulatory Requirement

Each enrollee must demonstrate, through sanitary sewer system use ordinances, service agreements or other legally binding procedures, that it possesses the necessary legal authority:

- Prevent illicit discharges into its sanitary sewer system
- Require that sewers and connections be properly designed and constructed
- Ensure access for maintenance, inspection or repairs for portions of the lateral owned or maintained by the Public Agency
- Limit the discharge of fats, oils and grease and other debris that may cause blockages
- Enforce any violation of its sewer ordinance

Legal Authority – Revised under Administrative Code

The District, Administrative Sewer Policy 12-6-2011 by Ordinance possesses the necessary legal authority to prevent, require, limit and enforce specific features and operations required by the Order. A summary of the relevant sections of Administrative Code is in Table 1 and the ordinance in its entirety is in Appendix B.

Summary of Legal Authority:

TABLE 1

Legal Authority To:	12-6-2011 by Ordinance Administrative Code
Prevent Illicit discharges into the Sanitary sewer system	9.04.040 9.11.010 9.08.010
Require that sewers and connections be properly designed and constructed	9.04
Sewer and connections Limitations on sewer connections Relocating lateral sewers Illegal connections	9.04 9.08.030
Limit the discharge of fats oils and grease and other debris that may cause blockages	9.12
Enforce any violation of the Rainbow Municipal Water District ordinances	9.01.010 9.01.020 9.13.010 9.14 9.15 9.17 9.18 9.19

SECTION IV

OPERATION AND MAINTENANCE PROGRAM

SECTION IV – OPERATION AND MAINTENANCE PROGRAM

Regulatory Requirement

Maintain an up-to-date map of the sanitary sewer system showing all gravity line segments and manholes, pumping facilities, pressure pipes and valves and applicable storm water pumping facilities.

District Map

The District has an up-to-date map of the wastewater collection system. An overview copy is in the Introduction. The detailed field map book is updated electronically whenever new facilities, such as a new development, are added.

The Engineering Department is responsible for updating the map book. As discrepancies are found, Engineering is contacted by Wastewater staff for corrections.

Regulatory Requirement

Describe routine preventive operation and maintenance activities by staff and contractors, including a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance targeted at known problem areas. The Preventive Maintenance (PM) program should have a system to document scheduled and conducted activities, such as work orders.

Operation and Maintenance Program

Listed in Section II, Organization, the Wastewater Division includes a superintendent and 4 utility workers. All of the Wastewater staff are cross-trained and perform all work needed to operate and maintain the collection system.

Table 2 lists vehicles and equipment assigned to the Wastewater Division. This division also has access to a variety of construction equipment such as backhoes, dump trucks and concrete saws, etc.

Wastewater Division Equipment

TABLE 2

Unit No.	Equipment	Purpose
#60	½ Ton Pickup Truck 4.3 V6	Service Truck
#61	F- 450 Super Duty 1 ½ Ton Utility Truck	Service Truck / Confined Space
#68	2500 HD ¾ Ton	Emergency Response Vehicle
#75	Combination Sewer Truck	Line Cleaning
#116	Emergency Response Trailer	Emergency Response / Confined Space Recue Operations
#141	Portable Emergency Generator	Backup Power for Lift Stations

Table 3 shows the age of the collection system. The majority of the system is 20 to 30 years old and approximately 6% is older than 40 years.

Collection System Age:

TABLE 3

Construction Year	Age (Year)	Distribution (%)
1960-1969	>50	6.00%
1970-1979	>40	37.52%
1980-1989	>30	30.51%
1990-1999	>20	10.67%
2000-2009	<10	15.10%
2010-2019	<10	0.19%

The pipe sizes of the collection system are shown in Table 4. The majority of the system is 8" pipe.

Collection System Pipe Sizes:

TABLE 4

Diameter Size (Inches)	Length (Feet)	Length (Miles)	Distribution %
6	3,511	0.66	0.01%
8	199,703	37.82	0.65%
10	18,343	3.47	0.06%
12	43,543	8.25	0.14%
14	236	0.04	0.00%
15	25,794	4.89	0.08%
18	1539	0.29	0.01%
21	2,183	0.41	0.01%
24	11,300	2.14	0.04%

Wastewater Standby Calls:

The District responds to all customer calls 24/7 relating to wastewater issues. During the past three (3) years, the District responded to 188 after-hour customer calls or requests for information. Table 5 below signifies the breakdown per year.

TABLE 5

Year	Private Sewer Spills	RMWD Spills	Sewer Odor	Misc. Calls
2006	3	1	3	13
2007	5	2	10	86
2008	3	1	7	54
2009	1	0	15	15
2010	0	0	5	5
2011	0	0	2	6
2012	0	0	0	7
2013	0	0	0	18
2014	0	0	0	9
2015	0	0	0	6

Work is scheduled daily based on current needs. The District's work week is Monday through Thursday 9 hours work days & Friday an 8 hr workday. Unless there are emergencies, the lift stations are maintained on Mondays and Thursdays.

Lift station maintenance and repair data is summarized on spreadsheets. Daily hours for each pump station are taken from Supervisory Control and Data Acquisition Systems (SCADA) and manually entered into a spreadsheet showing the total hours pumped by each pump. All of the pump stations use constant speed, centrifugal pumps except Lift Station #6, which uses a submersible pump mounted on rails.

Characteristics of District Lift Stations:

TABLE 6

Lift Station	Number of Pumps	Capacity of Each (gpm)	Inspection Frequency	SCADA	Backup Power	Flow Meter
Lift Station 1	3	500	Bi-weekly	Yes	Yes	No
Lift Station 2	3	1,900	Bi-weekly	Yes	Yes	Yes
Lift Station 3 (B Plant)	2	320	Bi-weekly	Yes	Yes	No
Lift Station 4	2	320	Bi-weekly	Yes	Yes	No
Lift Station 5	2	805	Bi-weekly	Yes	Yes	No
Lift Station 6	2	250	Bi-weekly	Yes	Yes	No

The following sections describe the six (6) sewage lift stations and the flow metering station. The maintenance plan for the stations follows (see Table 7) on Page 25.

LIFT STATION #1

Address:	31250 Old River Road Bonsall, California 92028
Placed in Service:	1974
Station:	Smith & Loveless
Serial No.:	N/A
Coordinates:	3316.9527 / -11713.1108
Pumps:	Three (3) non clog centrifugal pumps, Model #6D, 500 GPM, 20' Total Dynamic Head (TDH), Impeller diameter 10 5/8''
Pump Rotations:	Pump #1 – Counter clockwise (CCW) / Pump #2 – CCW / Pump #3 – Clockwise (CW)
Motors:	5 HP, 870 RPM, 3 phase, 60 HZ, 230/460 volts
Standby Generator:	Generac, Model #91A021775, Serial #996436, KVA 67.5,
Fuel	Propane / 500 - gallon capacity
Duration of fuel:	3 days
Connections:	3,198 Equivalent Dwelling Units (EDUs)
Population Served:	6,414
Average Flow:	400,000 gallons per day (GPD)
Area Served:	Bonsall Elementary and Normal Sullivan Middle School, Olive Hill Estates, West Lilac, Las Casitas, San Luis Rey Downs, Villas Fore, Fairgreen Way, Ascot Park Estates, Malabar Ranch Estates, Sycamore Ranch Estates, Sweetgrass Lane, Live Oak Estates, Lake Tree Estates, River Village, Thoroughbred Lane, Lake Vista Estates, Golf Club Lane, and Lift Stations 3, 4, 5 and 6.
Force Main:	10" Cast Iron (CI)

LIFT STATION #2

Address:	30516 Old River Road Bonsall, California 92028
Placed in Service:	2011
Station:	Brand: Flygt Pump Station
Serial No.:	Model # 3202
Coordinates:	3316.0415 / -11713.9902
Pumps:	Motor type submersible, Model No. 3202, 70 Horsepower, cable length 75’, RPM 1,750, explosion proof yes, leak sensor yes. (3) New impellers 9/2015
Pump Rotations:	Pump #1 – CCW / Pump #2 – CCW / Pump #3 - CW
Motors:	70 HP, 1,750 RPM, 3phase, 60Hz, 460 volts and 615 amps, Service factor .88, mini cas Yes (3).
Standby Generator:	Cummins 175 kW Standby Generator Engine: 120/240 volts 1500 watts Fuel System: 72 hour sub base tank Direct injection: Number 2 diesel fuel, fuel filter, automatic electric fuel shutoff 2 Year Warranty 2 Year standby power warranty 5 Year basic power warranty
Fuel	Diesel 966 Gallon Capacity
Duration	72.0 hrs
Connections:	3,587 EDUs
Population Served	7,174
Average Flow:	600,000 GPD
Area Served:	Old River Road, Vista Valley Development, Little Gopher Canyon, Cal-a-Vie Spa, and Lift Stations 1, 3, 4, 5 and 6.
Force Main:	14" high-density polyethylene (HDPE)

LIFT STATION #3

Address:	3707 Old Highway 395 Fallbrook, California 92028
Placed in Service:	1964
Station:	Smith & Loveless
Serial No.:	66-2122
Coordinates:	33.19.5159 / -1179.7645
Pumps:	Two (2) non clog centrifugal pumps, Model Number 4D215TTDR8381ANL 4B2A, 320 GPM, 22’ TDH, Impeller diameter 8 1/8"
Pump Rotations:	Pump #1 – CW / Pump #2 – CCW
Motors:	5 HP, 1170 RPM, 3 phase, 60 HZ, 460 volts
Standby Generator:	Generac, Model # 92A022095, Serial # 2003351, KVA 37.5 Propane / 200-gallon capacity
Fuel	Propane 500 Gallon Capacity
Duration	5 Days operational
Connections:	593 EDUs
Population Served	1,186
Average Flow:	85,000 GPD / Revised due to drought
Area Served:	District Office, Valley Oaks Mobile Home Park, Pala Mesa Resort, Pala Mesa Fairway Villas
Force Main:	6" PVC

LIFT STATION #4

Address:	211 ½ Manzano Street Fallbrook California 92028
Placed in Service:	2012
Station:	Brand: Flygt Pump Station
Serial No.:	Model # 3127
Coordinates:	3319.1150 / -1179.7255
Pumps:	Model # Flygt NP3127.090-488 impeller Submersible, 320 GPM, 22’ TDH, Impeller Diameter 8 1/8’’ / Non Clog; (2) pumps at lift station
Pump Rotations:	Pump #1 – CW / Pump #2 – CCW
Motors:	10 HP, 1735 RPM, 3 phase, 60 HZ, 230/460 volts and 12.6 25.2 amps
Standby Generator:	Generac, Model #92A022075, Serial #2003349, KVA 75
Fuel:	Natural gas
Duration	Continuous
Connections:	187.4 EDUs
Population Served	1,186
Average Flow:	35,000 GPD
Area Served:	Rancho Monserate Mobile Home Park
Force Main:	6" PVC

LIFT STATION #5

Address:	4198 Lake Circle Drive Fallbrook California 92028
Placed in Service:	1990
Station:	Gorman Rupp
Serial No.:	89-2936
Coordinates:	33.194243 / -117.93694
Pumps:	#1, Classic T series, 6’’ x 6’’ self-priming centrifugal pump, Model No. T6A3-B, 1,765 RPM, Semi-open, type two vane impeller #2, Super T, 6’’ x 6’’ centrifugal self-priming pump, Model No. T6A3S-B, Serial No. 1436277, 1,765 RPM, Semi-open, type two vane impeller
Pump Rotations:	Pump No. 1 - CCW / Pump No. 2 - CCW
Electric Motors:	#1, 40 HP GR-28225-251, 1750 rpm, 3 phase, 60 HZ, 460 volts #2, 40 HP GR-28225-253, 1750 rpm, 3 phase, 60 HZ, 460 volts
Standby Generator:	Generac, Model #3285B1263B, Serial #AD2051935PK; KVA – 164,
Fuel:	Propane 500 / gallon capacity
Duration:	4 Days
Connections:	755 EDUs
Population Served	1, 1887
Average Flow:	145,000 GPD Due to drought
Area Served:	Serves the Rancho Viejo Development
Force Main:	10" PVC

LIFT STATION #6

Address:	3690 Sara Ann Drive Fallbrook California 92028
Placed in Service:	1988
Station:	Myers
Serial No.:	5025-029
Coordinates:	3319.4584 / -1171.15089
Pumps	Two (2) submersible, Model #4R50M4-21 6VH FL112L3XX2728, Serial #741064-A-1

Rebuilt: P1 6/2012 New impeller
Rebuilt: P1 6/2012 New impeller

Pump Rotations:	Pump No. 1 – CW / Pump No. 2 – CW
Motors:	5 HP, 1,750 RPM, 60 HZ, 230 volts and 60 amps
Standby Generator:	Onan Model #GGDB-5692340, Serial #1040697462, KVA – 20,
Fuel:	Natural Gas
Duration:	Continuous
Connections:	39 EDUs
Population Served:	78
Average Flow:	6,500 GPD
Area Served:	Fallbrook Oaks Development
Force Main:	6'' PVC

STALLION STATION

Address:	5304 North River Road Oceanside, CA 90254
Placed in Service:	2002
Specifications:	The station monitors and calculates the District's collections system flow with a Flo Far brand meter using Doppler radar technology.
Serial No.:	Flo Dar Serial #4640-0160-0902, Model #464
Coordinates:	3316.9527 / -11713.1108
Model:	#464R - S232 with 4-20 mA output; Marsh–McBirney, Inc.
Operation:	Flows are transmitted to SCADA. In the event the District loses a signal, Wastewater staff responds to the site immediately. A sampling system collects periodic samples. The system is an Issco 3700 Sampler Refrigerator.
Maintenance:	The meter is calibrated Semiannual, using the Marsh-McBirney, Inc. Flo-Tote 2000 portable handheld electromagnetic flow meter. Depth measurements are taken using a standard metal ruler; actual field flow calculations are calculated using the "Insight Flow Simulator" which is compared to actual real time field readings of the Flo Dar Meter sensor firings.

TABLE 7

LIFT STATION MAINTENANCE

Schedule	Exterior	Wet Well	Dry Well	Electrical Cabinet	Stationary Standby Generator	Force Main
LIFT STATION #1						
Bi-Weekly	Check fence, & air blower	Clean interior / Check air compressors / Check floats & wet well levels, odors	Confined space entry: check pumps,& seals, interior parts, valves / Clean all components	Review each pump's run hours	Inspect generator	N/A
Weekly	N/A	Clean debris & floats	N/A	N/A	N/A	N/A
***Semi-Weekly**	N/A	N/A	N/A	N/A	Power shutdown .15 min.	Inspect force main
Monthly	N/A	Drain bubbler line; check pressure switch settings / Perform float switch test	Exercise all valves / Flush out sump pump, activate alarm	Inspect wiring & connections / Inspect telemetry & control systems / Perform motors resistance tests	Shut down grid power & test generator startup / Service air valves	N/A
Semi-Annually	N/A	N/A	Lubricate check valves, pump bearing and fittings / Perform vibration test	N/A	N/A	N/A
Annually	N/A	N/A	Disassemble & inspect pumps; check impellor, gaskets; lubricate pump bearings, fittings	Inspect electrical components / Clean & inspect motor controls	Perform load band testing / Perform routine maintenance, oil change	N/A
LIFT STATION #2						
Bi-Weekly	Check fence, bioxide tank & air blower	Clean interior / Check / Check floats & wet well levels	Check vault valves	Review each pump's run hours	Inspect generator	N/A
Weekly	N/A	Clean debris / Check bubbler lines & floats	N/A	N/A	N/A	N/A
***Semi-Weekly**	N/A	N/A	N/A	N/A	Power shutdown .15 min.	Inspect force main
Monthly	N/A	check pressure switch settings / Perform float switch test	Exercise all valves / Flush out sump pump, activate alarm	Log soft starter reads on each pump Inspect wiring & connections / Inspect telemetry & control systems / Perform motors resistance tests	Shut down grid power & test generator startup / Transfer switch once per month 40 min. test Service air valves	N/A
Semi-Annually	N/A	N/A	Lubricate check valves, pump bearing and fittings / Perform vibration test	N/A	N/A	N/A
Annually	N/A	Pump inspections Disassemble & inspect pumps; check impellor, gaskets; lubricate pump bearings, fittings		Inspect electrical components / Clean & inspect motor controls	Perform load band testing / Perform routine maintenance, oil change	N/A
LIFT STATION #3						
Bi-Weekly	Check fence, containers & life preservers	Clean interior / Check air compressors / Check floats & wet well levels	Confined space entry: check pumps,& seals, interior parts, valves / Clean all components	Review each pump's run hours	Inspect generator	N/A
Weekly	N/A	Clean debris / Check bubbler lines & floats	N/A	N/A	N/A	N/A
***Semi-Weekly**	N/A	N/A	N/A	N/A	Power shutdown .15 min.	Inspect force main
Monthly	N/A	Drain bubbler line; check pressure switch settings / air compressor switches / Perform float switch test	Exercise all valves / Flush out sump pump, activate alarm	Inspect wiring & connections / Inspect telemetry & control systems / Perform motors resistance tests	Shut down grid power & test generator startup	N/A
Semi-Annually	N/A	N/A	Lubricate check valves, pump bearing and fittings / Perform vibration test	N/A	N/A	N/A
Annually	N/A	N/A	Disassemble & inspect pumps; check impellor, gaskets; lubricate pump bearings, fittings	Inspect electrical components / Clean & inspect motor controls	Perform load band testing / Perform routine maintenance	N/A
LIFT STATION #4						
Bi-Weekly	Check perimeter	Clean interior / Check air compressors / Check floats & wet well levels	Valves / Clean all components	Review each pump's run hours	Inspect generator	N/A
Weekly	N/A	Clean debris / Check bubbler lines & floats	N/A		N/A	N/A
***Semi-Weekly**	N/A	N/A	N/A	N/A	Power shutdown .15 min	Inspect force main
Monthly	N/A	Drain bubbler line; check pressure switch settings / air compressor switches / Perform float switch test	Exercise all valves / Flush out sump pump, activate alarm	Inspect wiring & connections / Inspect telemetry & control systems / Perform motors resistance tests	Shut down grid power & test generator startup / Service air valves	N/A
Semi-Annually	N/A	N/A	Lubricate check valves,	N/A	N/A	N/A
Annually	N/A	Disassemble & inspect pumps; check impellor, gaskets; lubricate pump bearings, fittings	N/A	Inspect electrical components / Clean & inspect motor controls	Perform load band testing / Perform routine maintenance, oil change	N/A
LIFT STATION #5						
Bi-Weekly	Check perimeter & life preservers	Clean interior / Check air compressors / Check floats & wet well levels	Confined space entry: check pumps,& seals, interior parts, valves / Clean all components	Review each pump's run hours	Inspect generator	N/A
Weekly	N/A	Clean debris / Check bubbler lines & floats	N/A	N/A	N/A	N/A
***Semi-Weekly**	N/A	N/A	N/A	N/A	Power shutdown .15 min	Inspect force main
Monthly	N/A	Drain bubbler line; check pressure switch settings / air compressor switches / Perform float switch test	Exercise all valves / Flush out sump pump, activate alarm, grease prime valve	Inspect wiring & connections / Inspect telemetry & control systems / Perform motors resistance tests	Shut down grid power & test generator startup / Service air valves	N/A
Annually	N/A	N/A	Disassemble & inspect pumps; check impellor, gaskets; lubricate pump bearings, fittings	Inspect electrical components / Clean & inspect motor controls	Perform load band testing / Perform routine maintenance, oil change	N/A
LIFT STATION #6						
Bi-Weekly	Check perimeter	Clean interior / Check air compressors / Check floats & wet well levels	Confined space entry: check pumps,& seals, interior parts, valves / Clean all components	Review each pump's run hours	Inspect generator	N/A
Weekly	N/A	Clean debris / Check bubbler lines & floats	N/A	N/A	N/A	N/A
***Semi-Weekly**	N/A	N/A	N/A	N/A	Power shutdown .15 min	Inspect force main
Monthly	N/A	Drain bubbler line; check pressure switch settings / air compressor switches / Perform float switch test	Exercise all valves / Flush out sump pump, activate alarm	Inspect wiring & connections / Inspect telemetry & control systems / Perform motors resistance tests	Shut down grid power & test generator startup / Service air valves	N/A
Semi-Annually	N/A	N/A	Lubricate check valves, pump bearing and fittings / Perform vibration test	N/A	N/A	N/A
Annually	N/A	Disassemble & inspect pumps; check impellor, gaskets; lubricate pump bearings, fittings	N/A	Inspect electrical components / Clean & inspect motor controls	Perform load band testing / Perform routine maintenance, oil change	N/A

* Note: Semi Weekly Based on all six lift stations on 15 min. Power shutdowns.

Regulatory Requirement

Develop a rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. The program should include regular visual and TV inspections of manholes and sewer pipes, and system for ranking the conditions of sewer pipes and scheduling rehabilitation. Rehabilitation and replacement should focus on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Finally, the rehabilitation and replacement plan should include a capital improvement plan that addresses proper management and protection of the infrastructure assets. The plan shall include a time schedule for implementing the short and long-term plans, plus a schedule for developing the funds needed for the capital improvement plan.

Rehabilitation and Replacement Plan

The District's collection system is cleaned every three (3) years (Table 8, pg. 27). The current cycle is from October 1, 2014 through September 30, 2017. Average monthly footage cleaned is 7,600 feet. 20–25% of the cleaned system is inspected by CCTV each year. High frequency areas are inspected per the schedule (Table 9, pg. 27). All manholes are inspected during the three-year cleaning cycle. A root control program has been initiated and may become part of the routine PM after evaluating the effectiveness of the program. The annual operating budget provides funds for repair and maintenance of the system.

The District has a three (3) year Capital Improvement Program (CIP) based on system needs. Funds are budgeted from sewer rates. Current projects included in the District's CIP are listed in Table 10 on Page 34.

Cleaning Schedule:

Total footage: 316,800 feet or 60 miles

TABLE 8

Area Covered	Feet / Month	Dates
Basin #1 Vista Valley to Lift Station #2	30,135 ft. / 4 mo.	Oct. 1, 2015 – Jan. 31,2015
Basin #11 W Lilac, Camino Del Cielo, San Luis Rey Track	26,477 ft. 3.5 mo.	Feb. 1,2015 – May 15,2015
Basin #4 Tecalote	15,997 ft. 2 mo.	May 16, 2015 – July 15,2015
Basin #6 Pala Mesa	13,110 ft. 2 mo.	July 16, 2015 – Sept. 15,2015
Basin #5 Horse Ranch Creek	15,401 ft. 2 mo.	Sept. 16, 2015 – Nov. 15,2015
Basin #7 Rancho Monserate, Lake Rancho Viejo	17,411 ft. 2.25 mo.	Nov. 16, 2015 – Jan. 23, 2016
Basin #2 Laketree, Gird to Sycamore Ranch North	24,855 ft. 3.25 mo.	Jan. 24, 2016 – April 30,2016
Basin #3 Sycamore Ranch – Gird to 76	13,640 ft. 2 mo.	May 1, 2016 – June 30,2016
Basin #8 Sycamore Ranch – Phase II & III	11,046 ft. 1.5 mo.	July 1, 2016 – Aug. 15,2016
Basin #9 Brook hills, Ramona, Sweetgrass, Thoroughbred	34,858 ft. 4.5 mo.	Aug. 15, 2016 – Dec. 31,2016
Basin #10 Hwy 76 Trunk	30,871 ft. 4 mo.	Jan.1, 2017 – Apr. 30 , 2017
Basin #12Lake Vista Estates to Lift Station #2	23,988 ft. 3 mo.	May 1, 2017 – July 31 , 2017
Basin #13 Lift Station #2 to Stallion	16,002 ft. 2 mo.	Aug. 1, 2017 – Sept. 30,2017

TABLE 9

HIGH FREQUENCY AREAS									
Location	Map Page	Roots	Grease	Low Flows	Dead-End Lines	Footage	Undersized Pipe / Problem	Problem Resolution	Time Frame
Tecolote Road	G-6 M/H 14 G-6 M/H 15	X				378'		Hydro flush	3-Month Cycle
Tecolote Road Private	G-6 M/H 44 G-6 M/H 43 G-6 M/H 06	x				303'		Hydro flush	3-Month Cycle
Daisy Lane	I-6 M/H 04 I-6 M/H 03	X				149'		Hydro flush	3-Month Cycle
Lake Vista Terrace	N-3 M/H 35 03 M/H 01	X				341'		Hydro flush	3-Month Cycle
Little Gopher Canyon	P-3 M/H 13 P-3 M/H 14	X				126'		Hydro flush	3-Month Cycle
Vista Valley	Q-4 M/H 30 Q-4 MH 31	X				211'		Hydro flush	3-Month Cycle
Lake Garden	I-5 M/H 56 I-5 M/H 55 I-5 M/H 54 I-5 M/H 53 I-5 M/H 52 I-5 M/H 51	X			X	2,722'		Hydro flush	3-Month Cycle
Circle View Drive & Golf Club Drive	N-3 M/H 43 N-3 M/H 42 N-3 M/H 41 N-3 M/H 79 N-3 M/H 88 N-3 M/H 87 N-3 M/H 86 N-3 M/H 28 N-3 M/H 83 N-3 M/H 82 N-3 M/H 81		X			2,451'		Hydro flush	3-Month Cycle

TABLE 9, Continued

Location	Map Page	Roots	Grease	Low Flows	Dead-End Lines	Footage	Undersized Pipe / Problem	Problem Resolution	Time Frame
San Luis Rey Track & Training - *Sludge*	N-4 M/H 07 N-4 M/H 06 N-4 M/H 05 N-4 M/H 04 N-4 M/H 03 N-4 M/H 02 N-4 M/H 11 N-4 M/H 01		Sludge			2092''		Hydro flush	6-Month Cycle
Del Cielo Oeste West	M-3 M/H 03 M-3 M/H 04 M-3 M/H 05 M-3 M/H 06		X			791'		Hydro flush	6-Month Cycle
Del Cielo Oeste East	M-4 M/H 02 M-4 M/H 03 M-4 M/H 01 M-3 M/H 55		X			734'			6-Month Cycle
31505 Old River Road	N-3 M/H 68 (Private sewer system @ Bonsall School District: 8'' sewer cleanout. Note: County of San Diego storm drain 167')		X			98'			6-Month Cycle
Via Altamira	I-6 M/H 70 I-6 M/H 71		X			62'			6-Month Cycle
Comfort Inn Hotel	J-6 Private Pump Station		X	X		Private			6-Month Cycle

TABLE 9, Continued

Location	Map Page	Roots	Grease	Low Flows	Dead-End Lines	Footage	Undersized Pipe / Problem	Problem Resolution	Time Frame
Villa Drive	M-3 M/H 20 M-3 M/H 19 M-3 M/H 18 M-3 M/H 17 M-3 M/H 16 M-3 M/H 11		X			1,298’		Hydro flush	6-Month Cycle
Via Larga Vista	M-4 M/H 18 M-4 M/H 16 M-4 M/H 15 M-4 M/H 12 M-4 M/H 11 M-4 M/H 06 M-4 M/H 07 M-3 M/H 05	X		X		1,311’		Hydro flush	6-Month Cycle
Camino Del Cielo	M-3 M/H 07 M-3 M/H 02 M-3 M/H 08 M-3 M/H 09 M-3 M/H 10 M-3 M/H 11 M-3 M/H 16		X			2,248’’		Hydro flush	6-Month Cycle

TABLE 9, Continued

Location	Map Page	Roots	Grease	Low Flows	Dead-End Lines	Footage	Undersized Pipe / Problem	Problem Resolution	Time Frame
Vista Valle Camino	F-5 02 F-5 01	X			X	232’			12-Month Cycle
Little Gopher Canyon	P-3 M/H 33 P-3 M/H 34	X				253’			12-Month Cycle
Pankey Ranch / Orange Grove, South Side	J-6 M/H 51 J-6 M/H 50 J-6 M/H 49 J-6 M/H 48 J-6 M/H 47 J-6 M/H 46 J-6 M/H 45 J-6 M/H 44 J-6 M/H 43 J-6 M/H 42 J-6 M/H 41 J-6 M/H 40 J-6 M/H 39 J-6 M/H 38 J-6 M/H 37 J-6 M/H 35 J-6 M/H 34 J-6 M/H 33	X				3,365’’			12-Month Cycle
Via Alta Vista	M-4 M/H 16 M-4 M/H 17	X		X		350’		Hydro flush	12-Month Cycle
Via Casitas	M-4 M/H 09 M-4 M/H 10 M-4 M/H 11 M-4 M/H 08 M-4 M/H 05 M-4 M/H 04	X	X			775’		Hydro flush	12-Month Cycle

TABLE 9, Continued

Location	Map Page	Roots	Grease	Low Flows	Dead-End Lines	Footage	Undersized Pipe / Problem	Problem Resolution	Time Frame
Horse Ranch Creek	H-6 M/H 13 H-6 M/H 14 H-6 M/H 15 H-6 M/H 16 H-6 M/H 17 H-6 M/H 18	X				1,351'		Hydro Flush	12-Month Cycle
Horse Ranch Creek	I-6 M/H 54 I-6 M/H 55 I-6 M/H 56 I-6 M/H 57 I-6 M/H 58 I-6 M/H 50 I-6 M/H 51 I-6 M/H 52 I-6 M/H 53 I-6 M/H 58 I-6 M/H 59 I-6 M/H 60 I-6 M/H 61 I-6 M/H 62 I-6 M/H 63 I-6 M/H 64	X				4,387’		Hydro Flush	12-Month Cycle

TABLE 9, Continued

Location	Map Page	Roots	Grease	Low Flows	Dead-End Lines	Footage	Undersized Pipe / Problem	Problem Resolution	Time Frame
Laketree	I-5 M/H 04 I-5 M/H 11 I-5 M/H 21 I-5 M/H 86 I-5 M/H 83	X				743’		Hydro Flush	18-Month Cycle
Westmont Lane	I-5 M/H 85 I-4 M/H 02	X				223’		Hydro Flush	18-Month Cycle
Old River Road Bonsall Center Drive - Median	N-3 M/H 05 N-3 M/H 81 N-3 M/H 84 N-3 M/H 80 N-3 M/H 85 N-3 M/H 01	X	X			1,839’		Hydro Flush	18-Month Cycle
River Village	M-3 M/H 40 M-3 M/H 41 M-3 M/H 42 M-3 M/H 43 M-3 M/H 44 M-3 M/H 45 M-3 M/H 47 M-3 M/H 48 M-3 M/H 49		X	X		1,342’		Hydro Flush / CCTV	18-Month Cycle
Thoroughbred Lane	M-3 M/H 27 M-3 M/H 28 M-3 M/H 29		X	X		583’		Hydro Flush / CCTV	18-Month Cycle

RMWD Wastewater Capital Projects: FY 2015-2016

TABLE 10

Rainbow MWD

Projected CIP **2015-2016 Budget**

A	B	C	D	E	F	G	H	I
CIP EXPENDITURES:								
	Wastewater Job Name							
	Abandon Lift Station 3B	$300,000	$0	$0	$300,000	$0	$300,000	$0
201266	Sewer Outfall Line RMWD Replacement	$13,000,000	$131,106	$69,709	$12,799,185	$1,000,000	$10,000,000	$1,799,185
201040	Lift Station #1 Replacement	$2,400,000	$22,148	$152,812	$2,225,040	$1,500,000	$725,040	$0
200768	Highway 76 Realignment-Sewer lines	$365,000	$11,985	$0	$353,015	$353,015	$0	$0
201260	Hwy 76 Realignment - Caltrans UPSIZE	$3,200,000	$0	$1,009,330	$2,190,670	$1,050,000	$100,000	$1,040,670
201571	2015 Wastewater Master Plan	$300,000	$0	$18,903	$281,097	$281,097	$0	$0
	Manhole Rehabilitation	$180,000	$0	$0	$180,000	$60,000	$60,000	$60,000
	Parking Lot Paving	$25,000	$0	$0	$25,000	$25,000	$0	$0
	Total Expenditure (Wastewater):	**$19,770,000**	**$165,239**	**$ 1,250,753**	**$18,354,007**	**$4,269,112**	**$11,185,040**	**$2,899,856**

Regulatory Requirement

Provide training on a regular basis for staff in sanitary sewer system operations and maintenance, and require contractors to be appropriately trained utilizing the District's training program.

Training Program

The District provides the following training for all staff working in the Wastewater Division. All staff participate in weekly tailgate meetings.

Safety

- Confined Space Entry
- Confined Space Rescue
- Traffic Control
- Trenching & Shoring
- Bloodborne Pathogens
- Heat Stress
- Forklift
- First Aid/CPR Training

Collection System

- Lift Station O&M
- Main Line Cleaning / CCTV – Envirosite /. Camera tool
- High PSI Equipment / Vac Con Combination Truck
- USA Locations
- Customer Service
- Wet wells /Dry wells

<u>Electrical</u>:

- Arc Flash
- Electrical Maintenance
- SCADA

<u>Regulatory</u>

- SSSMP/WDR 20006-003
- MRP Order 2013-00058
- SSOs / Emergency Response
- APCD – Air Pollution Control District San Diego
- (LPG) Pressure Vessels Unit – State of California
- NIMS / SEMS

<u>Certification</u>

- Class A Drivers
- California Water Environment Association (CWEA)
- Office of Water Programs – CIWQ's

Training records are kept by the District's Safety Section and Human Resources Department.

Regulatory Requirement

Provide equipment and replacement part inventories, including identification of critical replacement parts.

Contingency Equipment and Replacement Inventories

The District maintains a supply of equipment and replacement parts for the wastewater system. The equipment and spare parts are stored at the District's Wastewater Storage Yard and is secured by an alarm system. The inventory is listed in Table 11 on Pages 38-43.

Through the use of spare parts, backup pumps and portable generators, the District can readily deal with equipment or part failures at any of the pump stations and could handle a localized power outage if any stationary generators failed. The District can readily repair most pipeline breaks that may occur up to 12" in diameter, which covers 95% of the sewer system. In addition to spare parts on hand, the District has agreements with local vendors where parts and materials can be obtained 24 hours per day, 7 days per week.

The District also has a working relationship with local water and wastewater agencies (Fallbrook Public Utilities District, Valley Center, Vista Irrigation District, etc.) where parts and equipment can be borrowed.

Parts are replaced as they are used and the spare parts inventory is reviewed monthly by the Wastewater Superintendent.

Critical Parts Inventory:

TABLE 11

LIFT STATION #1						
Date	**Item**	**Description**	**Vendor**	**Part Number**	**On Hand**	**Required**
2015	Water Gauges	(100 inch of water gauge)	McMasters	4026K1	3	6
2015	Filter	* Parker filter elements	Applied Tech	03531100B	2	10
2015	Park bowls	* Filter Bonnet bowls	Applied Tech	03530500B	15	0
2015	Filter bonnet o rings	* Bowl - o rings	Applied Tech	027097202B	10	4
2015	Hour meters	* Cramer	Graingen	6X137	3	1
2015	Pressure switches	*Allen Bradley	Smith Loveless	4L407B	4	4
2015	Floats	*Normal open/ Normal closed	Barrett Pump	1022454	3	2
2015	3/8" Tubing	*3/8" tubing for bubblier line	Ace Hardware	048643-025639	200'	100'
2015	Pump seal kit	Repair Kit	Chesterton	669337	0	1
2015	Volute	6"	Smith Loveless	60D35	0	0
2015	Motor	5 Hp	Smith Loveless	F12271XX2644	0	0
2015	Impeller	10 5/8"	Smith Loveless	60D34-105	0	1
2015	Sump Pump	* 2" effluent pump Dayton	Grainger	3BB92	2	0
2015	Transducer	4 to 20 MA	Esterline	J000013992	1	0
2015	Compressor	1/8" Air Compressor	Grainger	5Z348	2	1
2015	Check Valve	Complete Assembly	Smith Loveless	Out on field	0	1
2015	Check Valve	Repair parts	Smith Loveless	60H15	0	0
2015	Suction elbow	Pump stand	Smith Loveless	60D35	0	0

Definitions: * Can be used with other pump stations

TABLE 11, Continued

LIFT STATION #2						
Date	**Description**	**Description**	**Vendor**	**Part Number**	**On-Hand**	**Required**
2015	Hour meters	* Cramer	Grainger	6X137	3	1
2015	Floats	*Normal open/ Normal closed	Barrett Pump	1022454	1	1
2015	3/8" Tubing	* 3/8" tubing for bubblier line	Ace Hardware	048643-025639	200'	100'
2015	Anti seize lubricant	Lubricant Chesterton 785 250 gram brush	Chesterton	82016	4	1
2015	Sump Pump	* 2" effluent pump Dayton	Grainger	3BB92	1	1
2015	Seal kit / pumps	Flygt pump seal kit per cavity tray	Flygt	829698	1 pack	1 pack
2015	Seal kit / pumps	Flygt pump seal kit per cavity tray	Flygt		1 pack	1 pack
2015	Grease tubes	High temp grease	Chevron	5214-pl	4	1

Definitions: * Can be used with other pump stations

TABLE 11, Continued

LIFT STATION #3						
Date	**Item**	**Description**	**Vendor**	**Part Number**	**On Hand**	**Required**
2015	Water Gauges	*(100 inch of water gauge)	McMasters	4026K1	3	6
2015	Filter	* Parker filter elements	Applied Tech	03531100B	4	4
2015	Park bowls	* Filter Bonnet bowls	Applied Tech	03530500B	2	1
2015	Filter bonnet o rings	* Bowl - o rings	Applied Tech	027097202B	4	4
2015	Pressure switches	*Allen Bradley	Smith Loveless	4L407B	4	4
2015	Floats	*Normal open/ Normal closed	Barrett Pump	1022454	5	5
2015	3/8" Tubing	*3/8" vinyl tubing for bubbler line	Ace Hardware	048643-025639	200'	100'
2015	Pump seal kit	Repair Kit	Chesterton	669337	0	1
2015	Motor	5 Hp 4b2A	Smith Loveless	4D215TTDR8381ANL	1	0
2015	Impeller	8" 1/8	Smith Loveless	60D34-105	0	1
2015	Motor starter	Cutler Hammer	Walters	size 1	0	1
2015	Sump Pump	* 2" EFFLUENT PUMP	Grainger	3BB92	0	1
2015	Transducer	* 4 to 20 MA	Esterline	J000013992	0	1
2015	Compressor	*1/8" Air Compressor	Grainger	5Z348	0	2
2015	Check Valve	Complete Assembly	Smith Loveless	200W0G	0	1
2015	Check Valve	Repair parts	Smith Loveless	60H15	0	1
2015	Suction elbow	6" adapter to pump frame	Smith Loveless	60D35	0	1
2015	6" knife valve	Suction or discharge	Western water works	87791	2	0
2015	6" plug valve	Suction or discharge	Western water works	0518SX	2	0

Definitions: * Can be used with other pump stations

TABLE 11, Continued

LIFT STATION #4						
Date	Item	Description	Vendor	Part Number	On Hand	Required
2015	Floats	*Normal open/ Normal closed	Barrett Pump	1022454	1	1
2015	Seal kit	Seal kit for pump cavity	Flygt	803222	1	1
2015	Grease tubes	High temp grease	Chevron	5214-PL	4	1

TABLE 11, Continued

LIFT STATION #5						
Date	**Item**	**Description**	**Vendor**	**Part Number**	**On Hand**	**Required**
2015	Suction ck valve	Ck valve rubber to hold prime	Calif. Environ. Controls	46411-064	0	1
2015	Fill cover	Secure latch to pump water fill	California Environ Controls	42111-344	1	1
2015	Set gauges	Field gauge kit 0"- 35"	Calif. Environ. Controls	GR-418213-090	0	1
2015	Floats	*Normal open/ Normal closed	Barrett Pump	1022454	3	1
2015	wear plate	24150 material code	Calif. Environ. Controls	46451-723	0	1
2015	Sensor	Flow line sensor	Calif. Environ. Controls	Model Lu20	2	1
2015	Air Valve	Suction Priming valve	Calif. Environ. Controls	GR GRP33-07B	1	1
2015	Impeller	12 3/8" diameter 11 010	Calif. Environ. Controls	10958	0	0
2015	Pump	6" Pump model T6A3B rotating unit	Calif. Environ. Controls	GR - 10956F	0	0
2015	Electric Motor	40 HP Gorman Rupp	Calif. Environ. Controls	28225-251/28225-253	1	1
2015	ck valve	Right hand side	Calif. Environ. Controls	GR-26642-068	0	0
2015	ck valve	Left hand side	Calif. Environ. Controls	GR-26642-088	0	0
2015	Spool piece	6" spool C.I.	Calif. Environ. Controls	GR-46354-556	0	1
2015	Sump Pump	* 2" effluent pump	Grainger	3BB92	0	1
2015	Transducer	4 to 20 MA	Esterline	J0000139965	0	1

Definitions: * Can be used with other pump stations

TABLE 11, Continued

LIFT STATION #6						
Date	Item	Description	Vendor	Part Number	On Hand	Required
2015	Water Gauges	(100 inch of water gauge)	McMasters	4026K1	3	0
2015	Hour meters	* Cramer	Grainger	6X137	6	1
2015	Run relay caps	Motor control set	Walters wholesale	12141A006	0	2
2015	Capacitors	START AND RUN CAPS	Grainger	ZGU15	0	3
2015	Pressure switches	*Allen Bradley	Smith Loveless	4L407B	4	4
2015	Floats	*Normal open/ Normal closed	Barrett Pump	1022454	5	3
2015	3/8" Tubing	*3/8" tubing for bubblier line	Ace Hardware	048643-025639	100'	100'
2015	Motor/ Myers	5 Hp submersible	Peninsula Pumps	FL112L3XX2728	0	1
2015	Motor starter	Cutler Hammer	Walters wholesale	SIZE 1	0	1
2015	Transducer	4 to 20 MA	Esterline	J000013992	0	1
2015	Compressor	1/8" Air Compressor	Grainger	5Z348	0	4
2015	2" air valve Apco	Apco sewage air release valve	HD Waterworks	Series -400	0	1
2015	6" Check Valve	Complete Assembly	HD Waterworks	6 x214k	0	1

Definitions: * Can be used with other pump stations

TABLE 11, Continued

Stallion Flow Meter						
Date	Item	Description	Vendor	Part Number	On Hand	Required
2015	Sample bottles	Alloquat sampling & monitoring	Issco	1 litter	24	24
2015	3/8" vinyl hose	Calibration	Issco	686700047	30'	10'
2015	flow meter	flow metering unit Flodar	Hach.marshmcbirney	4640-0160-0902	0	1

Definitions: * Can be used with other pump stations

SECTION V

DESIGN AND PERFORMANCE PROVISIONS

SECTION V – DESIGN AND PERFORMANCE PROVISIONS

Regulatory Requirement

Design and construction standards and specifications for the installation of new sanitary sewer systems, pump stations and other appurtenances; and for the rehabilitation and repair of existing sanitary sewer systems.

Design Standards

The District's "Domestic Water and Sanitary Sewer Construction Manual", December 2015 (Standards Manual). The Standards Manual is not included in this document but is readily available at the District offices. Section 1 of the Standards Manual contains general conditions for all projects and Section 1, Part 1.23 and Section 2, Part 2.03 contain requirements for sanitary sewers.

Regulatory Requirement

Procedures and standards for inspecting and testing the installation of new sewers, pumps and other appurtenances, and for rehabilitation and repair projects.

Inspecting and Testing

The District Engineer or designee will inspect all new construction activity. When a developer or contractor indicates that the construction is complete, an air test, a leakage test and an infiltration test where applicable, is performed with the District Engineer or designee onsite during the tests to observe the results. Upon completion of construction, the developer or contractor shall hire a video company approved by the District to videotape the sewer mains and then submit the video to the District for review for potential construction defects. Prior to acceptance of any sewer line, all lines shall be flushed clear using a *Wayne Ball* and mandrel tested.

SECTION VI

OVERFLOW EMERGENCY RESPONSE PLAN

SECTION VI – OVERFLOW EMERGENCY RESPONSE PLAN

Regulatory Requirement

Proper notification procedures so that the primary responders and regulatory agencies are informed of all SSOs in a timely manner.

Notification Procedures

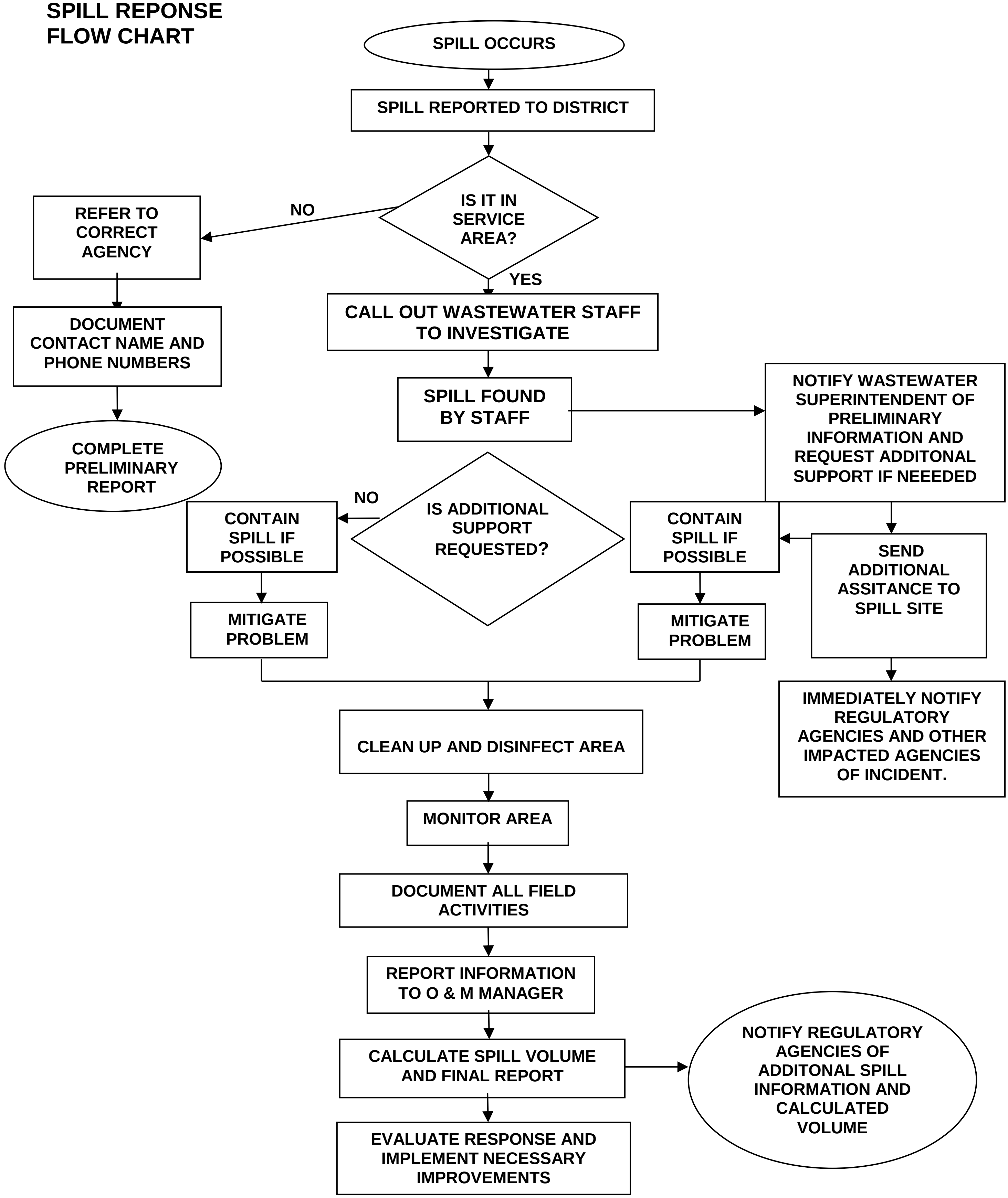
Notification of any potential SSO is received by the District Customer Service staff during regular business hours (8:00 AM – 5:00 PM) Monday – Friday. The Wastewater Superintendent is notified and responds. After regular business hours, the District's contracted answering service receives calls through the District business phone number. The Wastewater Standby person responds. Wastewater staff can also be notified by SCADA alarms and through electronic level sensors or SmartCovers.

The Wastewater Superintendent is responsible for notifying the required regulatory agencies, State Water Resources Control Board (SWRWB), San Diego Regional Water Quality Control Board (SDRWQCB), California Emergency Management Agency (Cal EMA) and County of San Diego Department of Environmental Health (DEH). The Wastewater Superintendent will also contact the Operations Water Manager, who in turn contacts the General Manager. The General Manager is responsible for notifying the Board of Directors.

The Operations Water Manager is the LRO, who certifies SSO reports that have been submitted to the CIWQS database.

A typical District spill response is described in the flow chart on the next page.

SPILL REPONSE FLOW CHART



Regulatory Requirement

A program to ensure an appropriate response to all overflows.

Response Procedures

All crews are trained for appropriate response to any potential SSO. They are trained in assessing and documenting as well as estimating the volume of an overflow. The District's Combination truck is on standby 24/7.

An important determination that must be made in the initial stages of a sewage spill is to estimate the spill volume. The volume of sewage spilled is estimated by using known methods such as the San Diego Manhole Flow Rate Chart and documenting the flow of the sewage with photographs.

Regulatory agencies must be notified as soon as reasonably possible. DEH shall be notified of a sewage spill of any size. SDRWQCB shall be notified as soon as possible, but no later than 24 hours after a spill occurs. Additionally, for spills greater than 1,000 gallons reach surface water and waters of the State, California OES must be notified within 2 hours.

<u>Lift Stations</u>

The District's lift stations employ a SCADA system, which notifies District personnel in the event of a loss of power, pump fail and high or low wet well conditions. The alarms are monitored 24 hours per day by Wastewater staff. If an alarm is received, staff visits the lift station site, assesses the problem and takes whatever action is necessary to correct the situation. At lift stations #1, #2, #3, #, 4, #5, and 6 there is an emergency plan mounted in a capsule with an estimate number & forms through rain for Rent Xylem pump rentals to bypass the sewer system and keep sewage flowing .Response time to an after-hours emergency call-out is generally one (1) hour.

<u>Stallion Flow Meter</u>

If a loss of flow occurs at Stallion flow meter, Lift Station #2 is checked by timing pumps to indicate a possible pump failure. If pumps are working, this would indicate a failure of the force main which would require investigation to determine the area of the break. Staff will check flow by lifting manhole at North River Road & Holly Lane and check flow.

Force Mains

In the event of a force main failure, the District will implement the following emergency response procedures:

- Build temporary earthwork berms or containment areas where necessary to temporarily retain any overflow that may occur so that it can be recovered and pumped back into the collection system.

- Immediately install and/or activate emergency bypass pumping/pipeline systems in order to halt sewage flow through the force main and enable repairs to be performed if necessary.

- In the event that an emergency bypass system/pipeline is not available, contact other public agencies or contract vacuum trucks or tanks to transport sewage to the nearest manhole until repairs are completed.

Line Break

In the event of a sewer line break, Wastewater staff will meet at the site in order to assess the damage and take whatever precautions are necessary to contain the spill. If outside resources are required, the District maintains an on call contractor list. Containing the spill and repairing the breakage may involve the installation of portable pumps and/or highlines or may result in having to truck the sewage to a disposal site at the City of Oceanside's treatment plant. If a spill occurred, the District will submit the required reports to the proper agencies.

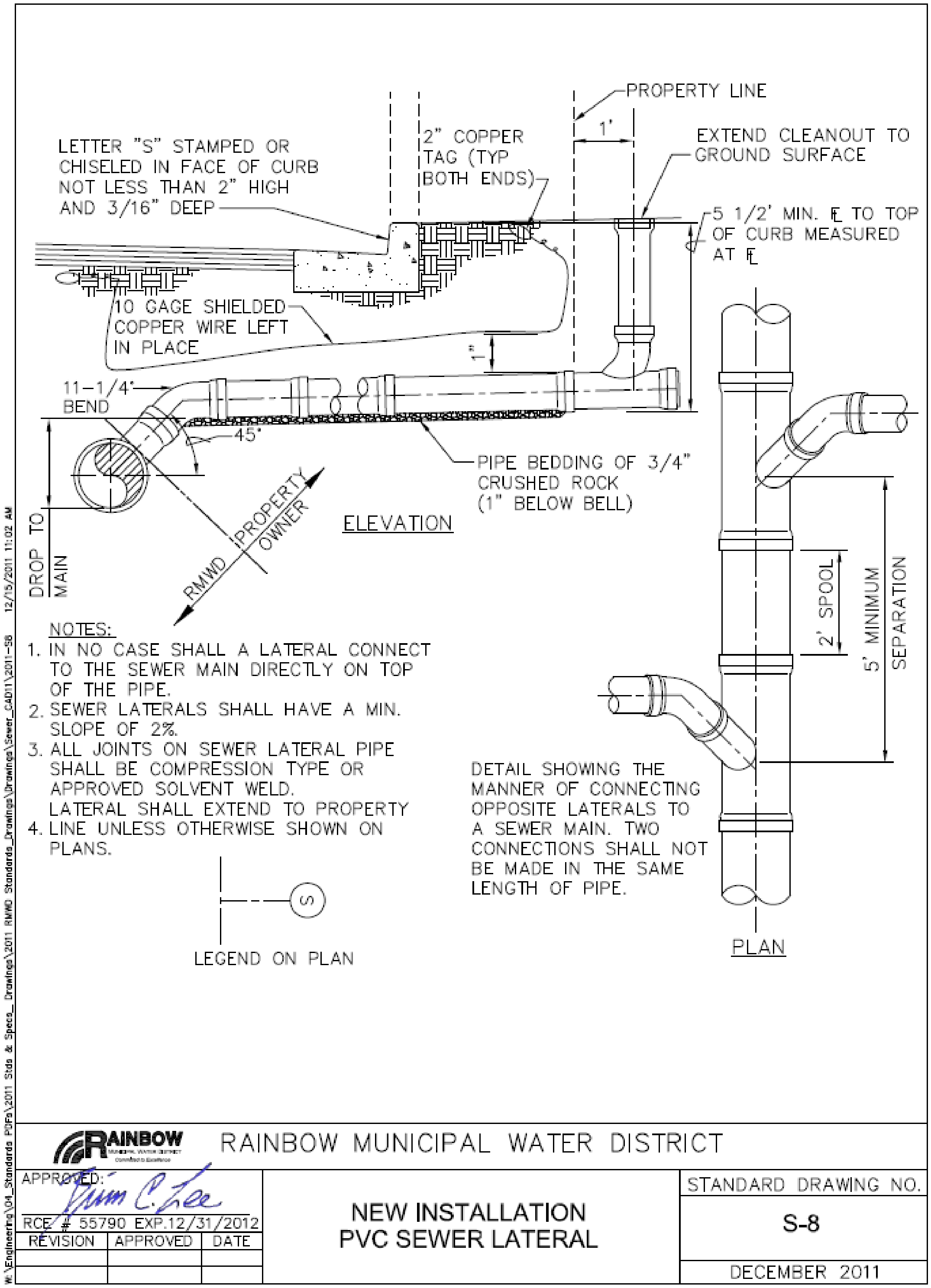
Private Sewer Back-Up

The District is not responsible for private sewer laterals; however, the District has made a commitment to assist homeowners with containing private spills to protect health and environment. Figure 2 below details owner or customer responsibility for maintenance of the sewer lateral.

Reference the wastewater contractor after Hours Emergency Contact phone list in assisting homeowners in making a decision on who they want to employ for emergency repairs.

FIGURE 2

RESPONSIBILITY FOR MAINTENANCE - PRIVATE SEWER LATERAL



Inspection

Inspection of the collection system is performed to monitor conditions, detect or correct problems which may cause sanitary hazards, identify damage to or deterioration of facilities or equipment and detect encroachment of other utilities. Most types of inspections are routine (such as checking for vandalism), while others are performed under special circumstances or on a scheduled basis.

All staff is trained to be alert to potential or actual problems while traveling throughout the District. Any activity that may threaten or endanger a District facility (above or below ground) will be brought to the attention of the Wastewater Superintendent immediately. Easements are checked for signs of erosion above and around sewer lines. Access to sewer manholes is maintained at all times and excessive odors that could indicate sewage problems are investigated. Vandalism such as forced entry, property damage, graffiti or dumping of trash, will be reported immediately.

Regulatory Requirement –Monitoring Reporting Plan

Procedures are in place to ensure prompt notification to appropriate regulatory agencies and other potentially affected entities (e.g. health agencies, Regional Water Boards, water suppliers, etc.) of all SSOs that potentially affect public health or reach waters of the State in accordance with the Monitoring Reporting Plan (MRP). All SSOs shall be reported in accordance with this MRP, the California Water Code, other State Law, and other applicable Regional Water Board WDR's or NPDES permit requirements. The SSMP should identify the officials who will receive immediate notification.

Notification of Appropriate Regulatory Agency

The first responder will determine the magnitude of the spill and take further action if necessary. The Wastewater Superintendent will be responsible for initiating the proper cleanup procedures and filing of the necessary reports with the SDRWQCB.

In compliance with California Health and Safety Code Section 5411.5, immediately reportable spills pertain to all spills to waters of the state (ocean, bay, river, dry or flowing creek or stream, etc.) and "unmitigated spills to areas with potential public contact (near homes, schools, parks, etc.)". These spills must be immediately reported to DEH, 24/7, via electronic report and a faxed copy of the SSO report.

Notify the SDRWQCB and Cal EMA as soon as possible within 2 hours from the time of knowledge of discharge. For after-hours, weekends and holidays, the following information must be left on the answering machine:

- Name and telephone number of person reporting incident
- Arrival time of operator
- Responsible Sanitary Sewer System Agency
- Estimated total of sewer overflow volume
- Location
- Potential receiving waters
- Whether or not sewer overflow is still occurring at time of report
- End of sewage spill time
- Confirmation that DEH and or Cal OES was or will be notified

Summary of MRP Order # 2013-0058 Requirements:

“Category 1” spills Discharges of untreated or partially treated wastewater of **any volume** resulting from an enrollee’s sanitary sewer system failure or flow condition that:

- Reach surface water and/or reach a drainage channel tributary to a surface water; or

- Reach a Municipal separate storm sewer system (MS4) and are not fully captured and returned to the sanitary sewer system or not otherwise captured and disposed of properly. Any volume of wastewater not recovered from the MS4 is considered to have reached surface water unless the storm drain system discharges to a dedicated storm water or ground water infiltration basin (e.g., infiltration percolation pond).

“Category 2” spills Discharges of untreated or partially treated wastewater of **1,000 gallons or greater** resulting from an enrollees sanitary sewer system failure or flow condition that do not reach surface water, a drainage channel, or MS4 unless the entire SSO discharged to the storm drain system is fully recovered and disposed of properly.

“Category 3” spills all other discharges of untreated or partially treated wastewater resulting from an enrollee’s sanitary sewer system failure or flow condition.

Private Lateral sewage discharge (PLSD) Discharges of untreated or partially treated wastewater resulting from blockages or other problems **within a privately owned sewer lateral connected to the enrollee’s sanitary sewer system or from other private sewer assets.** PLSD that the enrollee becomes aware of may be voluntarily reported to the California Integrated Water Quality System (CIWQS) Online SSO Database.

Element	Requirement	Method
Notification – See section B of MRP	Within 2 hours of becoming aware of any category 1 SSO greater than or equal to 1,000 gallons discharged to surface water or spilled in allocation where it probably will be discharged to surface water, notify the California Office of Emergency Services (CAL OES) and obtain a notification control number.	Call Cal OES AT: 1-800-852-7550

Regulatory Requirement

Procedures to ensure that appropriate staff and contract personnel are aware of and follow the Emergency Response Plan and are appropriately trained.

Staff and Contractor Training

District crews complete SSO response training periodically, including components and goals of the Wastewater Emergency Response Plan (WERP). Properly trained personnel are more capable of responding safely and effectively when an SSO occurs. The Wastewater Superintendent is responsible for testing the plan, SOPs, equipment and facilities, etc., by scheduling regular exercises to promote preparedness. Staff, other public agencies and standby contractors are trained. Contractors are required to train their employees on the District's wastewater collection system policies and procedures prior to performing work on the wastewater system. The training is recorded and filed.

The purpose of SSO training is for participants to become familiar with the conditions of an emergency, to visualize and practice response roles and to address procedural conflicts or difficulties. Benefits of training include:

- Reveals planning weaknesses
- Identifies source gaps
- Clarifies real roles and capabilities
- Improves coordination, performance and confidence; and
- Builds teamwork

Ways to test the plan will include these three (3) simulations/techniques:

- Orientation Exercise: A briefing through lecture and visuals. This is an introductory session to instruct employees on the plan and required documentation.

- Tabletop Exercise: A sewage spill event is simulated without the use of equipment or deployment of resources. The facilitator verbally explains the steps taken. Exercise effectiveness is determined by the feedback from participants and impact on revisions to plans, procedures and systems.

- Functional Full Scale Exercise: A sewage spill event is simulated with the use of equipment or deployment of resources. Controllers monitor and record actions. This type of exercise not only allows for the re-evaluation of plan objectives, but also tests equipment, responses time, training, resources and staff capabilities.

All exercises include follow up meetings to critique strengths and weaknesses and to recommend improvements.

Regulatory Requirement

Procedures to address emergency operations, such as traffic and crowd control and other necessary response activities.

Response Activities

The primary objective of the responders to a sewage spill is to protect public health. Therefore, the initial actions in any sewage spill response effort are to isolate the public from coming in contact with the sewage; this includes vehicular traffic, as well as pedestrians. The crew must establish perimeters and control zones with cones, barricades, vehicles or terrain. The District maintains appropriate traffic control devices, including barricades, lighting, sign boards and flagging. This equipment is readily available for SSO emergencies. In addition, the District has full authority and will take responsibility for implementing necessary traffic control in the event of an SSO.

Regulatory Requirement

A program to ensure that all reasonable steps are taken to contain and prevent the discharge of untreated and partially treated wastewater to waters of the United States and to minimize or correct any adverse impact on the environment resulting from the SSOs, including such accelerated or additional monitoring as may be necessary to determine the nature and impact of the discharge.

Spill Mitigation and Containment Procedure

The following actions are taken to respond to a spill originating within the District's service area. All spills require notification of the appropriate managers and supervisors. The guidelines and procedures are provided to direct actions of staff to ensure the health and safety of personnel, the public and the environment. Key response responsibilities include the following:

- Identify and assess the area and the extent of the spill.
- Quantify available resources.
- Determine the optimal use of resources.
- Initiate immediate spill containment, control and cleanup measures.

Recommend immediate and long-term abatement activities:

- Maintain liaison with responding agencies.
- Document remedial actions.
- Authorize and oversee contractor activities.

Establish Response Priorities

Containment

After the public has been isolated from the sewage spill, the crew must then proceed with containment of the spill. The crew must contain the discharged sewage to the maximum extent possible and every effort must be made to prevent the discharge of sewage into surface waters. The following procedures shall be implemented to contain the overflow:

- Sandbag or block off access to storm drains with spill containment mats.
- Divert the spill by building a small berm to change direction of flow of sewage back to the sanitary sewer and/or use combination trucks to pick up the spill.
- Divert the spill by pumping around overflow and return to the sewer.
- Retain the spill by letting it collect in a natural low area and recover the sewage with combination trucks as soon as possible.
- Dike or dam the spill by building a dirt berm to contain and collect the spill.

Control

Once the spill is contained, the responding crew can focus their attention on controlling the spill. Controlling the spill includes relieving the source of blockage in the line, repairing the broken pipe or eliminating whatever the source of the spill may be. Procedures that can be used to remedy the cause of the sewage spill include:

- Relieving the spill by mechanically or hydraulically cleaning the sewer.
- Diverting flow to another pipe using bypass transfer pumps, hoses, and combination and tanker trucks.
- Stop pumping at the lift station if the spill is in a force main.

- Start up backup/standby generator in case of a power failure.

A District crew should be able to contain most spills before proceeding with control activities. If two crews respond to the sewage spill, then efforts to contain the spill can be conducted concurrently with efforts to control the spill. However, if the spill is too large to contain given the available resources, efforts should first be focused on controlling the spill.

Cleanup

Crews shall make full effort to collect/recover as much sewage as possible and return collected sewage to the sewer system. The sewage should be directed back into the sewer manhole by gravity flow or pressurized water. When this is not possible, the combination trucks can be used to return contained sewage to the sanitary sewer.

Any sewage that is not recovered and returned to the sewer (i.e., soaks into ground), must be disinfected when required, in order to protect human health and minimize impact on the environment. DEH should be contacted to assist in coordinating the cleanup effort.

If sewage from an SSO flows into a storm drain, it is of the utmost importance to contain and recover as much as possible to prevent the sewage from entering receiving waters. When practical, sewage that enters a storm drain shall be diked and recovered at the initial entry point. If this is not practical, sewage shall be diked, contained and recovered by vacuum and/or pumps and hoses as necessary. After a sewage spill, pavement and hardscapes shall be flushed with water. Flush-water should be contained, vacuumed and returned to the sewer whenever possible. Do not remove barricades until the entire cleanup operation is complete.

Spill Monitoring – Water Quality

For a sewage spill that reaches surface water and/or closes the beaches, DEH and/or the District will provide sampling and testing for bacteriological and/or chemical analysis. Testing and sampling will continue until results for two consecutive days indicate that the waters are safe for human contact.

Posting Plan

Whenever there is a risk of contamination from a sewage spill to surface waters or an area of public contact, the District will initiate posting of the contaminated area with signs warning of the contamination. DEH will be contacted in order to determine the duration of the posting and whether or not any closure or sampling of the area will be necessary. Upon notification by DEH that the threat of contamination is over, the District will remove any posted signs.

Immediate and Long-Term Abatement Activities

Abatement activities are any steps taken to prevent the recurrence of the sewage spill. The nature of the spill determines what immediate and long-term abatement activities will occur. Short-term steps may be as simple as jetting the line to clean out grease build-up, remove grit or eliminate roots, or re-routing the flow of sewage over the course of a few days in order to repair a line.

Long-term abatement activities imply some type of preventive or corrective maintenance on the line. Preventive maintenance includes routine cleaning of grease build-up from the lines or utilizing a root cutter to routinely clear out tree roots, as well as inspection of lines with a video sewer camera. The District conducts an ongoing maintenance program involving the cleaning and inspection of the collection system and more frequent maintenance high frequency areas.

Regulatory Agency Notification Requirements:

TABLE 12

Spill Type	Spill Details	Initial Notification	External Notification	Required Agency Notifications
ALL	Sewage spills of any size within the District	Initial Notification: Wastewater Superintendent, Ramon Zuniga (Office) 760-728-1178, ext. 151; (Cell) 760-525-6934 The above personnel will contact the following: Operations Manager: Juan Atilano (Office) 760 728-1125, ext. 160 (Cell) 760-525-9460	Call person or agency responsible for area affected by sewage spill	The District Engineer or Designee, will notify the following agencies: **Cal EMA - Obtain control number, complete field spill report : 800-852-7550 / Fax 916- 845-8910** **SWRCB Executive Order requires report of discharge within 2 hours** On September 9, 2013, Order # (2006-0003 DWQ was amended) The new *MRP Order # 2013-0058* that became effective September 09, 2013 supersedes Order # 2006-0003. The Statewide General Waste Discharge Requirements for Sanitary Sewer Systems that was signed and immediately put into effect by the State Water Resources Control Board. The order requires that: "For any discharges of sewage that results in a discharge into a drainage channel or a surface water, the Discharger shall, as soon as possible, but not later than two (2) hours after becoming aware of the discharge, notify the California Emergency Management Agency (Cal EMA), the local health officer or directors of environmental health with jurisdiction over affected water bodies, and the appropriate Regional Water Quality Control Board." It also requires that: "As soon as possible, but no later than twenty-four (2) hours after becoming aware of a discharge to a drainage channel or surface water, the Discharger shall submit to the appropriate Regional Water Quality Board a certification that the California Emergency Management Agency and the local health officer or director of environmental health with jurisdiction over the affected water bodies have been notified of the discharge.”
> 1,000 Gallons	Sewage spills > 1,000 gallons within the District	“	“	In addition to the ALL Sewage Spill notifications, also notify the following: (CAL OES) Cal OES - Obtain control number, complete field spill report : 800-852-7550 / Fax 916- 845-8910 for sewer spills greater than 1,000 gallons
Impacts State Waters	Sewage spills that impacts or threatens to impact state waters	“	“	In addition to the ALL sewage spill notification , also notify the following: San Diego Branch California Department of Fish & Game: 858-467-4215 / 916-445-9338
Impacts Storm Drain System	Sewage spill that impacts the storms drain system	“	“	In addition to the ALL Sewage Spill notifications, also notify the following: San Diego County Watershed Protection Program: 858-495-5318
Impacts Drinking Water Supply	Sewage spill impacts or threatens to impact the drinking water supply	“	“	Notification of District / City Agencies / local Health Department, San Marcos Branch: 760-471-0730

SECTION VII

FOG CONTROL PROGRAM

SECTION VII – FATS, OILS & GREASE PROGRAM

Legal Requirement

Implementation of a plan and schedule for a public education outreach program that promotes proper disposal of FOG.

Public Outreach

The District has identified all food preparation and service locations within its service area. Facilities will be provided with a FOG binder consisting of an educational video, posters and other materials educating them on proper FOG disposal. These customers must undergo an annual Grease Best Management Practices (GBMP) inspection where the following are evaluated: exhaust hoods, seating capacity, menus and review of the Best Management Practices (BMP's) in the food preparation area. A Grease Control Device Inspection (GCDI) is also performed annually to ensure that interceptors are routinely serviced to minimize FOG discharges to the sewer system. Food preparation and service locations must keep annual records of interceptor maintenance. Customers with a history of contributing FOG to the sewer system are sent a letter of correction. The District maintains an active listing of all food preparation and service locations and permits are not required at this time.

Legal Requirement

A plan and schedule for the disposal of FOG generated within the sanitary sewer system service area and a list of acceptable disposal facilities.

FOG Disposal

The District contracts for and stores a grit bin at the yard. The disposal contractor disposes of the waste at an authorized site.

Legal Requirement

Legal authority to prohibit discharges to the system and identify measures to prevent SSOs and blockages caused by FOG.

Authority

The District possesses the legal authority to prohibit discharges to the system and identify measures to prevent SSOs and blockages caused by FOG through District Administrative Sewer Policy 12-6-2011 Ordinance: Quality of Sewage.

Legal Requirement

Requirements to install grease removal devices, design standards for the removal devices, maintenance requirement, BMP requirements, record keeping and reporting requirements.

Grease Removal Devices

Sewer Administrative Code 12/6/2011: Grease, Oil and Sand Interceptors, details installation, design, maintenance, record keeping and reporting requirements.

Legal Requirement

Authority to inspect grease- producing facilities, enforcement authorities, and sufficient staff to inspect and enforce the FOG ordinance.

Inspection

The District has the authority to inspect grease- producing facilities throughout its service area per Sewer Administrative Code 12/6/2011: Entry upon Private Property to Enforce Provisions. All interceptors and other grease control devices are inspected annually with more frequent inspections of those facilities experiencing inconsistent maintenance practices. The District maintains standard drawings for grease interceptors and there are several independent vendors which will collect and dispose of accumulated FOG. The District works in conjunction with contract staff to provide inspections of each grease removal device in the service area a minimum of one time per year.

Legal Requirement

Identification of sanitary sewer system sections subject to FOG blockages and establishment of a cleaning maintenance schedule for each section.

High Frequency Areas

The District has identified high frequency areas of the sewer system subject to higher levels of FOG and has developed a cleaning program for those areas. As sewer lines are cleaned, the severity of the FOG accumulation is documented in the District database system and the program is updated based on the most recent data collected by field staff.

Legal Requirement

Development and implementation of source control measures for all sources of FOG discharged to the sanitary system for each section identified.

Source Control

The District has developed and implemented source control measures for potential FOG discharged to the sewer system by implementing annual GBMP inspections.

SECTION VIII

SYSTEM EVALUATION AND CAPACITY ASSURANCE PLAN

SECTION VIII – SYSTEM EVALUATION AND CAPACITY ASSURANCE PLAN

Regulatory Requirement

Actions needed to evaluate those portions of the sanitary sewer system that are experiencing or contributing to an SSO discharge caused by hydraulic deficiency. The evaluation must provide estimates of peak flows (including flows from SSOs that escape from the system) associated with conditions similar to those causing overflow events, estimates of the capacity of key system components, hydraulic deficiencies (including components of the system with limiting capacity) and the major sources that contribute to the peak flows associated with overflow events.

Where design criteria do not exist or are deficient, undertake the evaluation identified above to establish appropriate design criteria.

The steps needed to establish a short- and long-term CIP to address identified hydraulic deficiencies, including prioritization, alternatives analysis and schedules. The CIP may include increases in pipe size, I/I reduction programs, increases and redundancy in pumping capacity, and storage facilities. The CIP shall include an implementation schedule and shall identify sources of funding. (Pg. 34)

The Enrollee shall develop a schedule of completion dates for all portions of the capital improvement program developed in (a)-(c) above. This schedule shall be reviewed and updated consistent with the SSMP review and update requirements as described in Section D.14, Monitoring, Measurement, and Program Modifications of SWRCB Order No. 2006-0003.

Compliance Summary

The District's 2006 Master Plan addresses the following:

- System Description
- System Flows
- System Evaluation
- Ultimate system Flow Projections and Analysis
- Capital Improvement Programs

SECTION IX

MONITORING, MEASUREMENT AND PROGRAM MODIFICATIONS

SECTION: IX - MONITORING, MEASUREMENT & PLAN MODIFICATIONS

Regulatory Requirement

Maintain relevant information that can be used to establish and prioritize appropriate SSMP activities.

Historical and Baseline Performance

The District maintains information relevant to the performance of the collection system in its database. The District has been reporting SSOs using the CIWQS since 2007. CIWQS data will be used as the District's historical performance data. Trend analysis will be conducted in future years as additional data becomes available.

Regulatory Requirement

Monitor the implementation and, where appropriate, measure the effectiveness of each element of the SSMP.

Performance Measures

- SSO Rate (SSOs/60 miles/year)
- Number of SSOs for each cause (roots, grease, debris, pipe failure, capacity, lift station failures, etc.)
- Average SSO volume (gallons)
- Percentage of SSOs greater than 100 gallons
- Percentage of SSOs reported as Category 1
- Percentage of sewage contained compared to total volume spilled
- Percentage of total spilled sewage discharged to surface waters

Regulatory Requirement

Assess the success of the preventative maintenance program.

Performance Monitoring and Program Changes

The District will evaluate the performance of its wastewater collection system annually using the performance measures indentified above. The District will update the data and analysis in this section at the time of the evaluation. The District may use other performance measures in its evaluation. The District will prioritize its actions and initiate changes to this SSMP and the related programs based on the results of the evaluation.

Regulatory Requirement

Update program elements, as appropriate, based on monitoring and assessments.

Program Update

Staff will review the SSMP annually and update program elements as necessary.

Regulatory Requirement

Identify and illustrate SSO trends, including frequency, location and volume.

Compliance Summary

The District tracks the location and cause of all SSOs, blockages and gravity main high frequency locations. The District maintains a log of all cleaning activity within each of its cleaning zones. Each of these basins/zones represents a separate drainage basin for the District. The District maintains records of the staff that cleaned the line, the equipment used, the size and length of the pipe, the amount of debris gathered, the manhole condition assessments on the line, and any relevant remarks observed during the cleaning. The District uses work orders to document preventative maintenance activity.

Additionally, District staff observes all gravity and force mains during routine cleaning and conducts contracted video inspections when their observations in the field warrant further investigation. The District maintains a log of the video inspections.

Condition Assessment

In the future, the District will implement the following condition assessment parameters. Each asset will be given a ranking based on the observed overall condition and defect (if any). The rankings, as well as the observed condition of each pipeline, will allow the District to identify gravity mains that are at risk of failure or prone to more frequent blockages due to pipe defects. The District will track several performance indicators, including reactionary efforts.

- Location of all overflows.
- Amount of overflow recaptured and/or released to the environment.
- Cause of the overflows as revealed through CCTV investigation / per contractor assistance.
- Average response time of staff to arrive at an overflow location.
- Volume of sewage spills per mile of sewer mains.
- Station Facility Maintenance: Percentage of planned work activities completed during the fiscal year based on standards established in the Maintenance Assessment Program.
- Sewer Main Cleaning: Percentage of planned work activities completed during the fiscal year based on standards established in the Maintenance Assessment Program.
- Record and track total mileage of gravity sewer system cleaned annually.
- Evaluation of the “high frequency areas” to evaluate whether to add or delete sections of the system from the accelerated cleaning schedule.
- Percentage of total gravity sewer system cleaned annually.
- Number of manholes inspected annually.
- Number of Interceptors inspected and/or cleaned annually.
- Percentage of wet wells cleaned annually.

It is anticipated that performance measures will be compared over time and an effort will be made towards lowering or eliminating SSOs.

SECTION X

SSMP PROGRAM AUDITS

SECTION X: PROGRAM AUDITS

Regulatory Requirement

Conduct periodic internal audits, appropriate to the size of the system and the number of SSOs. At a minimum, these audits must occur every two years and a report must be prepared and kept on file. The audit shall focus on evaluating the effectiveness of the SSMP and compliance with the SSMP requirements identified in this subsection (D.13), including identification of any deficiencies in the SSMP and steps to correct them."

Compliance Summary

The District will conduct an internal audit of the SSMP every two years, focusing on the effectiveness of the SSMP and the District's compliance with the SSMP requirements. The audit will include, but may not be limited to the following:

- State Water Resources Control Board Order No. 2006-0003 & MRP Order 2013 - 0058 Statewide General WDR for Wastewater Collection Agencies.
- Any significant changes to components of the SSMP, including but not limited to, Legal Authority, FOG Control Program, Emergency Response Plan, Overflow Emergency Response Plan, and System Evaluation & Capacity Assurance Plan.
- Any significant changes to the referenced compliance documents.
- SSMP implementation efforts over the past two years.
- A description of additions and improvements made to the sanitary sewer collections system during the past two years.
- A description of the additions and improvements planned for the upcoming two years, with an estimated schedule for implementation.
- Strategies to correct deficiencies, if indentified, will be developed by the responsible RMWD division.

The Wastewater Superintendent will document audit findings and recommend changes to the SSMP in a written report to the Operations Water Manager. These audit reports will be kept on file and made available to the public upon request. Minor changes to the SSMP, such as changes to the operation and maintenance element, will be made at the staff level. Significant changes, such as changes to legal authority, must be reviewed and approved by the Board of Directors. The latest updated/version of the SSMP will be available on the District's website: **www.rainbowmwd.com**.

SECTION XI

COMMUNICATIONS PROGRAM

SECTION XI: COMMUNICATIONS PROGRAM

Regulatory Requirement

Communicate on a regular basis with the public the development, implementation and performance of the SSMP. The communication system shall provide the public the opportunity to provide input as the program is developed and implemented. The Enrollee shall also create a plan of communication with systems that are tributary and/or satellite to the Enrollee's sanitary sewer system.

Compliance Summary

The SSMP will be posted on the District's updated website, **www.rainbowmwd.com** with instructions to the public on how to provide input on the SSMP. As input is received, staff will consider changes to the SSMP. The District is tributary to the City of Oceanside, which treats all sewage. The District has a written agreement with the City of Oceanside for wastewater flow and quality. The District regularly communicates with City of Oceanside utilities staff.

Other means of communication include the District's Communications Committee and monthly newsletter.

APPENDIX H
Detailed Capital Improvement Recommendations

Table H-1: Water System - Hydraulic Capacity Deficiency Related Improvement Projects

Project No.	Water Pressure Zone	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Project Type	Pipe Size	Quantity	Phase	Severity (3-1)	Construction Costs	
													Unit Cost	Total Cost
Hydraulic Capacity Projects														
WH1	South	Upsize 12" to 16" along Dentro de Lomas/Paseo Grande Rd	59, 30	1458, 1759	Increase system pressures, increase emergency (or permanent) pump performance	Downstream of Dentro De Lomas Emergency Pump Station	Arterial	Replacement	16-inch	2100 ft	1	2	$335	$704,000
WH2	Canonita	Upsize 6" to 10" along Wilt Road	1933, 1870, 1808	15110, 1204, 8724, 1474, 1170, 1219, 1218, 1478, 1169	Increase system pressures, improve function of Wilt & Citrus PRV into Pala Mesa Tank	Only first ~2,200 feet fails criteria	Rural	Replacement	10-inch	5200 ft	3	2	$195	$1,010,000
WH3	Morro	Remove Bottleneck, Upsize 8-inch to 12-inch on Mission Road & North River Road	8632, 71	187, 188	Reduce headlosses through bottleneck, increase flow capacity during Morro filling		State Road	Replacement	12-inch	3500 ft	3	2	$310	$1,090,000
														$2,804,000

Table H-2: Water System - Pressure Regulation Related Improvement Projects

Project No.	Water Pressure Zone	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Project Type	Size	Quantity	Phase	Severity (3-1)	Construction Costs Unit Cost	Construction Costs Total Cost
Pressure Regulation Projects														
							Rural	New	6	1	1	3	$75,000	$75,000
WP1	Pala Mesa	Install PRSs at Intersections of Knottwood Way and Staghorn Lane / Gird Road	828, 1551	201, 200, 1844, 139	Reduce local pressure, reduce risk of pipe and lateral breaks	Install two PRVs on Knottwood Way, close valves GV145 and PV231. 90 psi+ reduction possible	Rural	New	4	1	1	3	$35,000	$35,000
							Rural	New	8	1	1	3	$100,000	$100,000
WP2	Northside	Install PRSs at Brooke Hollow Rd and Ranger Road	2159, 2033	2147, 2236	Reduce local pressure to large geographical service area, reduce risk of pipe / lateral breaks	95 psi+ reduction possible	Rural	New	6	1	1	3	$75,000	$75,000
WP3	Gomez	Install PRS at Alex Road and gate valve at Jeremy Way	2210, 8660	8804, 598	Reduce extremely high (400+) local pressures, reduce risk of pipe and lateral breaks	intersection with Jeremy Way. 200 psi+ reduction possible	Rural	New	6	2	1	3	$75,000	$150,000
WP4	North	Install PRS to serve Rice Canyon Road South of Pala Mesa Heights Drive	8692	8872	Reduce extremely high (300+) local pressures, reduce risk of pipe and later breaks	Install PRV after PV23. 175 psi+ reduction possible	Rural	New	6	1	1	3	$75,000	$75,000
WP5	South	Install PRS to serve South Fork Area along Vista Valley Drive	14, 1113, 1059	7, 8, 69	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRVs at Vista Valley Drive intersections with Gopher Canyon Road and Laurel Valley Drive. Close PV35. 100 psi+ reduction possible	Arterial	New	8	2	2	2	$100,000	$200,000
WP6	Morro	Install PRS on Baja Mission Road	541, 593	272, 268	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRV at intersection of Baja Mission Rd and La Canada Road. Close GV 28. 100 psi+ reduction possible	Rural	New	6	1	2	2	$75,000	$75,000
WP7	Morro	Install PRS on Limber Pine Road	602, 599	1389, 2515	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRV on Limber Pine Road Flowerwood Lane and close valve PV127. 90 psi+ reduction possible	Rural	New	6	2	2	2	$75,000	$150,000
WP8	Morro	Install PRS Club Vista East on Lake Vista Drive	201	353	Reduce local pressure, reduce risk of pipe and lateral breaks	intersection with Club Vista Lane. 90 psi+ reduction possible	Rural	New	6	1	2	2	$75,000	$75,000
WP9	Pala Mesa	Install PRSs at Diego Estates Drive and Sarah Ann Drive	1543, 1532, 1509	1328, 385, 1317	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRVs at Gird Road intersections with Diego Estates Drive and Sarah Ann Drive. Close PV65. 130 psi+ reduction possible	_	New	6	2	2	2	$75,000	$150,000
WP10	South	Install PRS at Via Maria Elena	1228	316	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRV after GV23. 60 psi+ reduction possible	Rural	New	6	1	2	2	$75,000	$75,000
WP11	Morro	Install PRS at Intersection of Mission Road and East Vista Way	1020	10208	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRV after PV51. 140 psi+ reduction possible. Serves very small area	Rural	New	6	1	2	2	$75,000	$75,000
WP12	South	Install PRS to serve Champagne Boulevard	1106	38	Reduce local pressure, reduce risk of pipe and lateral breaks	Install PRV after PV20. 100 psi+ reduction possible. Serves very small area	Undeveloped	New	6	1	2	2	$75,000	$75,000
							Rural	New	6	1	2	2	$75,000	$75,000
WP13	Morro	Connect and Install PRS to serve Orange Hill, Estate Drive and Rio Vista Drive	609, 596, 564	2489, 496, 515	Reduce local pressure, provide redundancy and reduce risk of pipe and lateral breaks	Install PRV after PV145. Close valve GV16 and PV42. Install 1,300 ft of 8-inch pipe to connect dead ends. 100 psi+ reduction possible	Rural	New	8-inch	1300 ft	2	2	$145	$189,000
WP14	Morro	Install PRS on Thoroughbred Lane	289	1688	Reduce local pressure (~300), reduce risk of pipe and lateral breaks	Install PRV after PV4. 180 psi+ reduction possible. Serves very small area	Local	New	6	1	2	2	$75,000	$75,000
WP15	Morro	Install PRS to serve River Village	1492	10248	Reduce local pressure (250+) reduce risk of pipe and lateral breaks	Install PRV after GV19. 150 psi+ reduction possible. Serves very small area	Local	New	6	1	2	2	$75,000	$75,000
WP16	Morro	Install PRS to serve Ascot Park Area	320, 344	401, 1603	Reduce local pressure (220+) reduce risk of pipe and lateral breaks	Install PRV after PV17 and PV70. 100 psi+ reduction possible. Serves very small area. 6" pipe, cannot reduce pressure too far, FF	Local	New	6	2	2	2	$75,000	$150,000
WP17	Rainbow Heights	Install PRS at Rainbrook	2183		Reduce local pressure, reduce risk of pipe and lateral breaks		Local	New	6	1	2	2	$75,000	$75,000
														$2,024,000

Table H-3: Water System - Operations, Redundancy and Reliability Related Improvement Projects

Project No.	Water Pressure Zone	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Project Type	Size	Quantity	Phase	Severity	Construction Costs	
												(3-1)	Unit Cost	Total Cost
Operations, Redundancy and Reliability Projects														
WR1	Morro	Line NN Transmission Upgrades		1650, 1656, 1785, 278, 279, 488, 668, 774	Provide transmission flow path to allow better utilization of Dentro de Lomas PRV through new Line NN during Morro Filling		Rural	Replacement	16-inch	9000 ft	1	2	$315	$2,800,000
WR2	Vallecitos	Pump Station #3 (Vallecitos) Replacement			Improved efficiency and reliability to pressure zone	Increase discharge size from 6-inch. Provide at least 2 pumps for redundancy	--	Replacement	75 HP	600 gpm	1	3	--	$1,030,000
WR3	U-1	U-1 Transmission Pipeline Replacement to Ranchbrook Road		2048, 2372	Replace aging pipeline, fewer service outages and resources spent on repairs	Replace aging pipeline that is the sole transmission source into zone	Rural	Replacement	12-inch	3200 ft	1	2	$235	$752,000
WR4	Northside	Northside Zone Supply Redundancy. Upsize Rainbow Hills Road Pipeline to 12-inch and Install New PRS	2285, 2332	2280, 2279, 2366	Provides an emergency supply connection to service large, critical zone	Replace 6-inch pipe on Rainbow Hills Road with 12-inch. Could provide emergency service during a pump station outage. Only ~70' difference	Rural	Replacement	12-inch	2200 ft	1	3	$235	$517,000
WR5	South/Pala Mesa	Hutton Tank to Pala Mesa Zone Emergency Connection	HUTTON_TANK, 2166	10606, 10608	Provide redundant supply and increased looping for emergency support	PL along Old Highway 395 to Pala Road. Similar zone connection through the Vessels development also possible	State Road	New	16-inch	9,900	2	2	$400	$4,000,000
WR6	South	Moosa Permanent Emergency Pump Station	10039		Permanent Station to provide emergency supply to South Zone	Assumed at existing location. Additional study necessary to confirm pump flow/size	New Site	New	200 HP	2000 gpm	2	2	--	$2,500,000
							Rural	New	16-inch	3,700	2	2	$285	$1,050,000
WR12	Northside	Northside Emergency Pump Station Connection and Pipeline at Reche Road	100174, 2033, 2035	10220, 10230, 15346, 1006	Provide emergency supply to Northside zone in case of transmission failure	Upsize ex pipeline rather than providing a new parallel. Pump station similar to other emergency PSs proposed.		New	50 HP	1000 gpm	2	2	--	$980,000
WR8	Pala Mesa	76 & Gird Permanent Emergency Pump Station			Improved zone reliability during outage or transmission main break scenarios	At same site as 76 & Gird PRV Station	--	New	100 HP	2000 gpm	2	2	--	$1,600,000
WR9	South	Line P Permanent Emergency Pump Station	10035		Permanent Station to provide emergency supply to South Zone	Assumed at existing location. Additional study necessary to confirm pump flow/size	New Site	New	100 HP	2000 gpm	2	2	--	$1,600,000
WR10	South	Camino Del Rey Emergency Pump Station	1300		Permanent Station to provide emergency supply to South Zone	Assumed at existing location. Additional study necessary to confirm pump flow/size	New Site	New	100 HP	2000 gpm	2	2	--	$1,600,000
WR11	South	Dentro De Lomas Permanent Emergency Pump Station	10019		Permanent Station to provide emergency supply to South Zone	Assumed at existing location. Additional study necessary to confirm pump flow/size	New Site	New	100 HP	2000 gpm	2	2	--	$1,600,000
WR7	North	North Feeder and Rainbow Hills Water Line Replacements		2276, 2275, 15192, 475	Fewer service outages and resources spent on repairs	Replace corroded pipelines which have suffered several breaks	State Road	Replacement	30-inch 27-inch	3788 ft	2	2	$515	$2,000,000
WR13	North	Rice Canyon Tank Transmission PL to I-15/SR76 Corridor	RICECYN_TNK		Improve cycling of Rice Canyon tank and serve new development	Project will likely be developer funded	Undeveloped	New	12-inch	3000 ft	2	2	$150	$450,000
WR14	Rainbow Heights	Pump Station #1 (Rainbow Heights) Natural Gas Motor Replacements	5009, 5011, 5013, 5015 - Pumps		Improved efficiency and reliability to pressure zone	Cost provided by District, 196k, exclusive of SDG&E requirements and contingencies.	--	Replacement	250 HP	2	1	2	$150,000	$300,000
WR15	South	Loop Pipelines in Via Ararat Drive to West Lilac Road	1358, 8702	8884	Provide redundant supply and increased looping	Reliability Connection to provide additional looping for increased system pressures.	Rural	New	8-inch	615 ft	2	2	$145	$89,000
WR16	South	Loop Pipelines in Magee Lane to Disney Lane	8628, 1140	8746	Loop lines for redundancy and improved fire flow		Undeveloped	New	8-inch	300 ft	2	2	$100	$30,000
WR17	South	South Zone Water Storage Tank			Provide operational storage for increased demands and additional storage during Morro Filling and	Near Turner (South) Tank, support Turner during outages and Morro Filling	--	New	4.0 MG	1	3	2	$1.6 per gal	$6,200,000
WR18	Morro	Improve Flow Path to Morro Reservoir, Install Parallel 10-inch pipeline on Kari Lane	8632, 42		Provide additional flow path and reduced resistance during Morro filling	Parallel existing pipeline on Kari Lane	Rural	New	10-inch	2800 ft	3	1	$180	$504,000
WR19	Pala Mesa	Lake Rancho Viejo Permanent Connection	1558, 2164		Provide redundant supply to reduced zone	Not shown on Figure 7-1A	Rural	New	8-inch	150 ft	3	2	$145	$22,000
WR20	South	Integrity Court, connect dead end lines	1108, 1102		Provide redundant supply and increased looping		Rural	New	8	1000 ft	3	1	$145	$145,000
WR21	Districtwide	Water System Condition Assessment Program			Provide the District with an accounting of the characteristics of its water system	Integral part of the implementation of an Asset Management Program	--	--	--	--	1	3	--	$1,500,000
WR22	Districtwide	Pressure Reducing Station Replacement Program			Replace valves that are aging, under designed and lacking redundancy	Old and small valves and valves with no PR station should be replaced, assumed 20	--	--	--	20	1	3	$40,000	$800,000
WR23	Districtwide	Isolation Valve Installation Program			Reduce shutdowns of service to any area serving 50+ persons	Allow District to serve during isolated emergencies, assume 50 installations	--	--	--	50	1	3	$15,000	$750,000
WR24	Districtwide	Water System Billing Meter - Systemwide AMI Conversion			Replace existing meters with AMI technology	Instantaneous sales history access. Identify and control leaks and other water losses. Cost estimate provided by District staff	--	--	--	--	1	3	--	$3,000,000
WR25	Districtwide	Water System Monitoring Program			Install measuring devices to track flow balance into system and through zones	Identify and control leaks and other water losses, assume 25 installations	--	--	--	25	1	3	$35,000	$875,000
WR26	Districtwide	New District Headquarters			Construct new District Headquarters to appropriately house staff	Replace aging buildings and provide room for new staff as development occurs	--	--	--	--	2	2	--	$3,000,000
WR27	Districtwide	Install Permanent Emergency Generators at Pump Stations			Provide system reliability in cases of extended power outage	Include update of all stations to include transfer switches and soft start motors	--	--	--	7	3	2	$125,000	$875,000
														$35,987,000

Table H-4: Water System - Fire Flow Capacity Related Improvement Projects

Project No.	Water Pressure Zone	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Project Type	Size	Quantity	Phase	Severity (3-1)	Construction Costs Unit Cost	Construction Costs Total Cost
Fire Flow Projects														
FF1	Pala Mesa	Upsize 6-inch to 8-inch in Via San Alberto	1427	1398	Increase available fire flow	Available flow less than 500 gpm	Rural	Replacement	8-inch	1000 ft	1	2	$155	$155,000
FF2	Morro Tank	Upsize 4-inch and 6-inch to 8-inch and 10-inch along Sleeping Indian, Conejo and Caroline Roads	484	1405; 684, 1402, 1403, 1404, 692	Increase available fire flow	Available fire flow is less than 500 gpm	Rural	Replacement	10-inch	1300 ft	1	3	$195	$254,000
							Rural	Replacement	8-inch	2000 ft	1	3	$155	$310,000
FF3	North	Upsize 6-inch to 8-inch on Chica Road	2535	8732, 8742	Increase available fire flow	Available flow less than 600 gpm	Rural	Replacement	8-inch	1300 ft	1	3	$155	$202,000
FF4	Canonita	Upsize 4-inch to 8-inch on Lupine Lane		1171	Increase available fire flow	Available flow less than 700 gpm	Rural	Replacement	8-inch	700 ft	2	2	$155	$109,000
FF5	South	Upsize 4-inch and 6-inch to 8-inch at Mageee Lane	1132, 1133, 1140	1464, 1465, 1466, 1471	Increase available fire flow	Available flow less than 700 gpm	Rural	Replacement	8-inch	1500 ft	2	2	$155	$233,000
FF6	Northside	Upsize 4-inch on Via Chaparral	1278, 1994	10228	Increase available fire flow	Available flow less than 700 gpm	Rural	Replacement	8-inch	850 ft	2	2	$155	$132,000
														$1,395,000

Table H-5: Water System - Water Supply Related Improvement Projects

Project No.	Water Pressure Zone	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Size	Quantity	Phase	Severity (3-1)	Construction Costs	
												Unit Cost	Total Cost
Water Supply Projects													
WS1	South	Weese WTP Permanent Emergency Interconnect and Pump Station	Pump 5051		Provide permanent connection to emergency supply source to serve South zone during 2nd Aqueduct outage			50 HP	1000 gpm	1	2	--	$1,200,000
WS2	Northside	Northside Permanent FPUD Emergency Interconnection		See Figure 4-5 for connection location	Provide emergency supply to Northside zone in case of transmission failure & additional supply during 2nd Aqueduct outage			--	--	1	3	--	$150,000
WS3	Morro Tank	Morro Tank Zone Permanent FPUD Emergency Interconnection			Provide emergency supply to Morro Tank zone in case of fire as portions of the zone do not meet fire flow criteria without increased HGL			--	--	2	3	--	$150,000
													$1,500,000

Table H-6: Water System - Existing System Improvement Projects

Project No.	Water Pressure Zone	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Project Type	Pipe Size	Quantity	Phase	Construction Costs	
												Unit Cost	Total Cost
Water System Existing Improvement Projects													
WE1	Canonita	Gird to Monserate Hill Water Line		1382	Loop dead end system and shift demand off of the Canonita Zone		Rural	Replacement	12-inch	2150 ft	1	--	$950,000
WE2	South	Wrightwood to Cottontail PRS		287, 1562, 289	Replaced broken pipe. Install PRS to re-constitute previously looped system	Pipeline is complete, need to install PRS to allow connection to operate		New	8-inch	1	1	--	$100,000
WE3 200950	South	Lake Vista Estates Loop and PRS	172, 153		Improve water quality by eliminating dead ends and improve fire flow	Short segment of pipeline and PRS to connect Morro and South Zones	Rural	New	--	--	1	--	$144,000
WE4 201573	South	Tarek Terrace Water Line		2, 25	Replace old pipe to havefewer service outages and resources spent on repairs		Rural	Replacement	8-inch	500 ft	1	--	$143,000
WE5 201359	South	Rancho Amigos Pressure Station Replacement		See CIP Project Sheets	Improve maintenance access	Improve safety and lessen staff required for maintenance	Rural	Replacement	8-inch	--	1	$75,000	$75,000
													$462,000

Table H-7: Sewer System Improvement Projects

Project No.	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Size	Quantity	Phase	Severity (3-1)	Construction Costs Unit Cost	Total Cost
Sewer Projects Recommended Under All Alternatives												
S1	Plant B List Station (LS3), Forcemain and Horse Creek Sewer Abandonment			Abandon old, low, high infiltration sewer and aging LS with deficient wet well capacity	Replaced by Pankley LS and FM & Horse Creek Ridge sewer. 850 ft of FM and approx 13,650 ft of gravity sewer abandoned	--	--	--	1	3	--	$350,000
S2	Lake Garden Sewer Rehabilitation		69, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80	Reduce inflow and infiltration, thereby reducing maintenance and treatment costs	3,475 of pipe and 12 manholes to be rehabilitated	Rural	8-inch	3475 ft	1	3	$80	$280,000
						Rural	--	12	1	3	$5,250	$63,000
S3	Rancho Viejo LS (LS5) Wet Well Expansion	801, 4005		Provide 6 hours PWWF storage at Rancho Viejo LS to protect against sewer spills	New wet well should be at least 1400 gal	Existing Site	--	1400 gal	1	3	--	$150,000
S4	Almendra Court Sewer Rehabilitation, I-15 Crossing, Structural Pipe Lining	308, 926	290, 291, 292, 295	Rehabilitate freeway sewer crossing which is corroding	Provide system reliability	--	8-inch	938 ft	1	3	$80	$80,000
S5	Fallbrook Oaks LS (LS6) Rehabilitation and Forcemain Replacement	25, 4006	697	Rehabilitate existing LS and FM and extend useful life	Replace 6" forcemain with 8"	--	--	--	1	3	--	$200,000
						Local	8-inch	252 ft	1	3	$155	$39,000
S6	Replace Rancho Monserate LS Emergency Generator	803, 4004		Prevent sewage spill in the case of a power outage		Existing Site	--	1	1	3	--	$125,000
S7	Sewer System Condition Assessment Program			Provide the District with an accounting of the characteristics of its sewer system	Integral part of the implementation of an Asset Management Program	--	--	--	1	3	--	$400,000
S8	Sewer System Permanent Flow Monitoring			Allow the District to monitor and predict system flows and performance	Greater understanding of sewer generation and control of system	--	--	5	1	3	$25,000	$130,000
Sewer Projects - Baseline, District Office Plant Location												
S9	Construct 0.9 MGD Water Reclamation Plant (WRP) at District Office Location			Provide a reliable local water source and water supply offset. Provide sewer outfall within District to avoid exceeding interceptor capacity	Cost per TM #1	--	0.9 MGD	--	1	3	--	$37,000,000
S10 201040	Lift Station 1 Replacement			Replace critical station reaching useful life and wet well with deficient capacity	Cost per TM #1	Existing Site	--	700	2	3	--	$3,300,000
S11	WRP Conveyance (Pump Station and Pipeline) and Failsafe Storage (Beck Reservoir Rehab and Raw Water Connection)			Provide conveyance to storage and storage for treated wastewater	Cost per TM #1	--	0.9 MGD	--	1	--	--	$3,200,000
S12	Sewer System Rehabilitation Program			Rehabilitate and repair existing sewer trunk infrastructure	Keep aging pipes and manholes with no capacity deficiencies in good condition	State Route	12-inch 15-inch	--	1	3	--	$4,500,000
Sewer Projects - No Project Alternative												
S9A 201040	Lift Station 1 Replacement and Upgrade			Replace and expand critical station reaching useful life	Cost per TM #1	Existing Site	--	1800 gpm	1	--	--	$8,200,000
S11A	San Luis Rey Interceptor Replacement from LS 1 to LS 2			Provide adequate conveyance capacity	Cost per TM #1	State Route	18-inch	7500 ft	1	3	--	$3,000,000
S10A 201260	San Luis Rey Interceptor Replacement from Mission Road to LS 1			Provide adequate conveyance capacity	Cost per District Budget, Highway 76 Realignment - CalTrans UPSIZE	State Route	18-inch	7100 ft	1	3	--	$3,200,000
S12A 201266	Sewer Outfall Line RMWD Replacement			Provide adequate conveyance capacity	Previously recommended as a 30-inch pipe. Recommended to be reduced to 24-inches. Unit cost for previous project retained	State Route	24-inch	16000 ft	2	3	$27/in-ft	$10,400,000
S13A	Sewer Capacity Purchase			Provide conveyance and treatment capacity to District customers	recommendation of maximum ADF of 1.25 MGD and total forecasted flow of 1.39 MGD	--	--	0.14 MGD	2	3	$20 per gpd	$2,800,000

Table H-7: Sewer System Improvement Projects

Project No.	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Size	Quantity	Phase	Severity	Construction Costs	
										(3-1)	Unit Cost	Total Cost
Sewer Projects - LS 2 Plant Location (Not shown on Figure 7-2)												
S9B	Construct 1.6 MGD Water Reclamation Plant (WRP) at LS 2 Location			Provide reliable local water source & water supply offset. Provide sewer outfall within District to avoid exceeding outfall capacity	Cost per TM #1	--	0.9 MGD	--	1	3	--	$66,000,000
S10B	and Failsafe Storage (Beck Reservoir Rehab and Raw Water Connection)			Provide conveyance to storage and storage for treated wastewater	Cost per TM #1	--	0.9 MGD	--	1	--	--	$13,900,000
S11B 201040	Lift Station 1 Replacement and Upgrade			Replace and expand critical station reaching useful life	Cost per TM #1	Existing Site	--	1800 gpm	1	--	--	$8,200,000
S13B	San Luis Rey Interceptor Replacement from LS 1 to LS 2			Provide adequate conveyance capacity	Cost per TM #1	State Route	18-inch	7500 ft	1	3	--	$3,000,000
S12B 201260	San Luis Rey Interceptor Replacement from Mission Road to LS 1			Provide adequate conveyance capacity	Cost per District Budget, Highway 76 Realignment - CalTrans UPSIZE	State Route	18-inch	7100 ft	1	3	--	$3,200,000
S14B	Sewer System Rehabilitation Program			Rehabilitate and repair existing sewer trunk infrastructure	Keep aging pipes and manholes with no capacity deficiencies in good condition	State Route	15-inch	--	1	3	--	$2,400,000
Sewer Projects - Sewer Project Changes to Serve Out of District Developments (Not shown on Figure 7-2)												
S9C	San Luis Rey Interceptor Replacement from LS 1 to LS 2			Provide adequate conveyance capacity	Additional cost per VCMWD Meadowood Memo	State Route	21-inch	7500 ft	1	3	--	$280,000
S10C 201260	San Luis Rey Interceptor Replacement from Mission Road to LS 1			Provide adequate conveyance capacity	Additional cost per VCMWD Meadowood Memo	State Route	21-inch	7100 ft	1	3	--	$260,000
S11C	Lift Station 1 Replacement			Provide adequate conveyance capacity	Additional cost per VCMWD Meadowood Memo	Existing Site	--	--	1	3	--	$177,000

Baseline - District Office Plant Location	$48,000,000
No Project Alternative	$16,400,000
LS 2 Plant Location	$97,417,000

Table H-8: Recycled Water System Improvement Projects

Project No.	Description	Model Junction IDs	Model Pipe IDs	System Benefit	Notes	Street Type	Size	Quantity	Phase	Severity	Construction Costs	
										(3-1)	Unit Cost	Total Cost
Recycled Water Projects - Baseline												
RW1	Recycled Water Pump Stations			Convey flows to storage in various pressure zones	Cost per TM #1		--	0.9 MGD	1	--	--	$4,600,000
RW2	Recycled Water Storage			Provide operational storage to recycled water customers	Cost per TM #1		--	0.9 MGD	1	--	--	$3,600,000
RW3	Recycled Water Transmission and Distribution System Pipeline			Provide transmission and distribution capacity to recycled water customers	Cost per TM #1		--	0.9 MGD	1	--	--	$11,000,000
RW4	Recycled Water System Customer Retrofit Assistance			Assist customers in connecting to the recycled water system	Cost per TM #1		--	0.9 MGD	1	--	--	$1,000,000
												$20,200,000

APPENDIX I

Water and Sewer Analysis for the Meadowood Project

Atkins North America, Inc.
3570 Carmel Mountain Road, Suite 300
San Diego, California 92130

Telephone: +1.858.874.1810
Fax: +1.858.259.0741

www.atkinsglobal.com/northamerica

February 10, 2016

Mr. Tom Kennedy, General Manager
Rainbow Municipal Water District
3707 Old Highway 395
Fallbrook California 92028

Re: Water and Sewer Analysis for the Meadowood Project (Revised)

Dear Mr. Kennedy:

This analysis examines the feasibility and costs of a possible interagency service arrangement between the Valley Center Municipal Water District (VCMWD) and the Rainbow Municipal Water District (RMWD or District) for the provision of water and sewer service to the proposed Meadowood development (project). Specifically, this analysis examines a possible arrangement in which VCMWD would provide water and sewer service to the project using water and wastewater conveyance and appurtenant facilities owned and operated by RMWD, rather than through the construction of its own separate water conveyance, flow control facilities (FCFs) with San Diego County Water Authority (SDCWA), and wastewater reclamation plant. **Figure 1** illustrates the RMWD service area and planned developments, including the project, consistent with the County's General Plan.

BACKGROUND

The Meadowood development is located in the San Luis Rey River Valley area of northern San Diego County north and east of the intersection of SR-76 and Interstate 15 (I-15). The property encompasses 390 acres and is planned to consist of single-family and multi-family housing, a park, elementary school, maintained common area open space, unimproved natural open space and retained tree groves. The development area was approved by the San Diego Local Agency Formation Commission (LAFCO) to be annexed into the VCMWD service area. However, due to its proximity to other properties within the RMWD service area and lack of existing VCMWD infrastructure in the north, VCMWD and the developer are exploring receiving water and wastewater service through RMWD infrastructure with appropriate delivery and transportation costs.

RMWD is responsible for providing sewer service to 3,879 EDUs throughout its sewer service area. Meadowood is assumed at 850 EDUs, and would make-up about 22% of the RMWD sewer connections. The RMWD sewer service area is a small portion of the overall RMWD service area which encompasses over 7,800 potable water customers, with large agricultural water demands, and hence large capacity meters. Wastewater collected by RMWD is transferred to the City of Oceanside for treatment and disposal through a trunk and interceptor sewer system and primarily two existing sewer lift stations extending west along SR-76 and eventually to the RMWD boundaries along North River Road at Stallion Drive.

The Meadowood site contains no existing water distribution facilities available to serve the project. Previous investigations identified possible water sources with new FCF connections to the

SDCWA First and/or Second aqueduct[1], which run north-south in direction to the east and west of the project, or a connection to nearby existing RMWD water distribution facilities. RMWD water facilities are available near the northern, western and southern boundaries of the project and are available in multiple pressure zones, which can potentially provide the project with both redundancy and flexibility for wholesale water supply.

Similar to water, no existing wastewater facilities exist on the project site. The RMWD wastewater service area boundary directly abuts the property on the west and proposed adjacent development in RMWD will construct sewer trunk and SLS facilities to convey wastewater from the eastern side of the I-15 to the existing trunk sewer and outfall on the western side of the I-15, within SR-76. In the absence of a connection to the RMWD wastewater system, the project has planned and approved the development of a water reclamation plant within its boundaries. This plant would collect and treat all of the wastewater from the development and use the resulting plant effluent as a recycled water source for irrigation within the development.

Figure 1 depicts the water and wastewater service areas as well as the location of the Meadowood development relative to RMWD. As previously mentioned, the properties directly west of the Meadowood project site are within the RMWD service boundary and are also planned and approved for development. A new sewer lift station (SLS), the Pankey SLS, is to be constructed on the east side of the I-15 to support these developments. The Pankey SLS has been designed and is soon to be bid for construction. The final design capacity will accommodate Meadowood wet weather sewer flows so flows can be conveyed assuming RMWD moves forward with a transportation agreement with VCMWD or would be pumped directly to the projects' water reclamation plant.

Table 1 and **Figure 1** present the planned developments anticipated throughout RMWD projected to be developed by 2035, including Meadowood. This magnitude of overall growth is consistent with the latest SANDAG Series Forecast for 2035. **Table 1** presents the development, type, and proposed equivalent dwelling units (EDUs) assumed by 2035. **Figure 1** presents the location of each development.

[1] The SDCWA administrative code specifies a minimum connection size of 10 cfs, and sets minimum deliveries at 10 percent of rated capacity, which for the case of the minimum 10 cfs connection would provide for a minimum delivery order of 1.0 cfs. A new VCMWD connection serving project average project demands of approximately 1 cfs would, although oversized, be feasible in combination with operating storage provided within the project service area.

Table 1 Planned Developments (assumed 2035)

Reference Number	Proposed Development	Proposed EDUs	Development Type
1	Meadowood	850	Single Family
2	Horse Creek Ridge	751	Single Family
3	Campus Park West	538	Mixed
4	Vessels	400	Single Family
5	Polo Club	156	Single Family
6	Pala Mesa Highlands (Beazer)	130	Single Family
--	Horse Creek Ridge Business Center	100	Commercial
--	Palomar College	100	Commercial
7	Golf Green Estates	94	Single Family
8	Morris Ranch	89	Single Family
9	Leatherbury	85	Single Family
--	Bonsall Condos	76	Single Family
10	Olive Hill Estates	37	Single Family
11	Hidden Hills	53	Single Family
12	Dulan	51	Single Family
13	Lake Vista Estates	15	Single Family
14	Malabar Ranch	14	Single Family
--	Fallbrook Oaks (Cabrillo Medical)	13	Single Family
15	Silver Holdings	9	Commercial
16	Vista Valley Country Club	5	Commercial
	Total	**3,566**	

EDU = equivalent dwelling units
Note: Warner Ranch is not included in the analysis.

HYDRAULIC ANALYSIS

Hydraulic analyses of the impact of providing water and wastewater service to the Meadowood development project were conducted to determine the potential impacts on the existing and future RMWD water and wastewater systems. The Meadowood approved project EIR is used as the primary basis for the analysis of water and sewer requirements, as well as planning studies completed by Dexter Wilson Engineering.

As a part of the 2006 Water and Wastewater Master Plans, RMWD constructed computer hydraulic models for both the water and the sewer systems. The existing system models were constructed in InfoWater and InfoSewer, respectively, and were most recently updated in 2014 to primarily reflect changed demand and flow conditions. The models are currently being refined as a part of the 2016 Water and Wastewater Master Plan Updates to reflect recently constructed projects or soon to be constructed facilities. Since these hydraulic models are currently being updated, the results of the hydraulic analyses presented here are preliminary and may be subject to changes based on finalization of the 2016 Master Plan.

Both hydraulic models allow for extended period simulations which simulates an observed event with time varying flows (i.e. a two day rainstorm for the sewer system or a 24-hour maximum day demand on the water system). In 2014, the sewer model was re-calibrated and the water model updated with new demands. For the 2035 sewer analysis, the sewer model was loaded with the anticipated developments, summarized in **Table 1.**

Water System Analysis

The Meadowood development can have two water supply sources, originating from the First and Second aqueducts, respectively, to provide supply reliability during scheduled shutdowns. **Figure 2** presents the Meadowood development project area as well as the surrounding RMWD water facilities. Shown on the figure is the plan for water service which includes new connections to existing and planned RMWD water facilities and a FCF between RMWD and VCMWD to control water supply on a daily basis. At this location the VCMWD water system would be master metered, with SCADA control.

As shown on **Figure 2**, two existing RMWD supply sources have been identified as the primary sources of supply for the project; those sources are Connection #10 off of the SDCWA First Aqueduct, which is supported by the Rice Canyon Tank (4.0 MG), and Connection #7 off of the SDCWA Second Aqueduct, which is supported by the Pala Mesa Tank (6.0 MG). Existing transmission pipelines from the aqueduct connections to the tanks and into the project will be used to provide maximum day water supply to the project.

The critical hydraulic condition to be met is supplying or delivering the maximum day water demand for the project through the RMWD water system. Under this condition, and assuming VCMWD provides the proposed water storage, water system design criteria for the Meadowood project could be met including, peak hour, max day plus fire flow, and tank filling conditions. A demand of approximately 500 gallons per minute (gpm) was used as the maximum day demand for the project, based on the project's estimated average day demand of 0.38 million gallons per day (mgd) (260 gpm or 425 acre-feet per year), and a system-wide maximum-day peaking factor of 1.9.

Two of the SDCWA water supply sources, Connection #10 and Connection #7, connecting from the First and/or Second aqueduct, respectively, were considered an alternative source to supply the project. Each source was analyzed for its ability to supply the project with a maximum day constant flow and the project would be required to provide adequate storage to serve daily peaking and emergencies. **Figure 2** illustrates the existing and proposed water supply sources for the project.

RMWD's Rice Canyon Tank (4.0 MG), which lies immediately north of the project boundary and receives its supply from Connection #10, would be the required connection point for the project to the RMWD system. This tank is not currently heavily utilized and the additional demands on the tank would likely provide RMWD with positive benefits in managing water quality. If VCMWD connects directly to the RMWD system further south and east of the project boundary, RWMD may run the risk of short-circuiting the tank and creating water quality problems, with the majority of the supply serving the project coming directly from Connection #10. One alternative, if this southerly connection is preferred, would be to construct a separate outlet pipeline from the tank to the VCMWD connection location.

The Pala Mesa Tank (6.0 MG), which lies west of the project and I-15, receives its flow from Connection #7. This water source and pressure zone (897) will serve as a secondary or redundant supply for the project. Transmission mains from the Pala Mesa Tank leading to the project are 18-inch and 12-inch, and based on the InfoWater modeling analysis have adequate capacity to deliver an additional 500 gpm of supply without adversely affecting the existing zone.

The hydraulic analysis confirms that with a new 12-inch supply line from Rice Canyon Tank, completion of the Pala Mesa Tank supplied water mains across SR-76 to the project, and new

VCMWD water storage on site, RMWD can provide adequate supply and meet its water system design criteria.

It is likely feasible that RMWD could provide operating storage and fire flow to the project without significant upgrades to its existing system, which would provide the project with the possibility of reducing the amount of on-site storage that is currently required. This analysis may be further refined and investigated in the Master Plan as part of RMWD's updated water storage and supply reliability evaluations.

Sewer System Analysis

The Meadowood development has two options for transportation and disposal of wastewater generated within the project area: build a water reclamation plant on site as analyzed in the project EIR or connect to the RMWD wastewater trunk sewer system. This section analyzes the possible impacts of the project on RMWD's existing and planned wastewater infrastructure.

The addition of the project's wastewater flows into RMWD's system will impact the trunk sewer system as shown on **Figure 3**. For the analysis, sewer reaches were numbered for the purposes of segregating the impact of the project on various segments of the trunk sewer system. For the purpose of the sewer hydraulic analysis, a reach is defined as a segment of trunk sewer in which there are no variations in flow into the sewer.

The analysis of the impact of the Meadowood development on the RMWD wastewater conveyance system was performed using RMWD's InfoSewer hydraulic model which was calibrated to an extensive sewer flow meter program conducted in 2009 and updated to simulate 2035 conditions. In addition, PWWF data from a December 2010 storm event was used to develop an existing and 2035 PWWF design conditions.

Projected sewer flows of 0.28 mgd were initially reviewed from the 2009 Dexter Wilson study prepared for the developer. This flow equates to a per equivalent dwelling unit (EDU) generation rate of approximately 325 gpd per EDU based on a total of 850 EDUs currently projected by the developer. Based on discussions with VCMWD, a 200 gpd per EDU sewer generation rate was used resulting in a revised project sewer flow of 0.17 mgd (118 gpm).

All flows generated in the development area will be conveyed to the proposed Pankey SLS which is being constructed by Campus Park (Horse Creek Ridge) to serve development within the RMWD service area that is adjacent to the project area. Improvement plans for trunk sewers and the Pankey SLS have been prepared. The planned construction of the Pankey SLS will allow for the conveyance of wastewater across the I-15 from new development. Additionally, RMWD plans to divert wastewater from the existing Plant B Interceptor Sewer to the Pankey SLS and abandon this sewer. Since the project comes into the RMWD system at nearly the farthest point from the land outfall, nearly the entire sewer trunk system must be analyzed for impact of the project's flows.

Based on the 2014 calibrated sewer model, the District's system is currently at capacity under existing PWWF for several interceptor reaches. The District is moving forward with planned upgrades to alleviate the capacity concerns as identified in the previous master plan within SR-76 and North River Road, which also included upgrades to SLS No. 1. It is assumed that occupancies for the project will occur after RMWD has completed these upgrades. The sewer analysis, therefore, assumes updated 2035 peak wet weather flows plus Meadowood flows, and the 2006 Master Plan sewer improvements in place. Based on the projected flows from each anticipated development listed in **Table 1** and the existing flows, approximate flow for each reach of the sewer system was determined (**Table 2)**. Also presented in **Table 2** are the anticipated flows from Meadowood and their percent flow of each major reach. **Table 3** presents a status of each major reach of trunk sewer, and identifies the reaches planned for upgrades.

Under year 2035 PWWF conditions, the hydraulic analysis showed the project's sewer flows caused minor surcharging in sewer reaches 10 to 14 (see **Figure 3**). The volume of flow conveyed to the Pankey SLS during a PWWF event, required that the SLS operate two pumps, which increased flows through the interceptor system. Incremental upsizing of reaches 10 to 14 will alleviate the surcharging. Additional review is recommended at the Pankey SLS to ensure the wet well levels and pump flows which are simulated are consistent with the latest SLS design. In summary, the sewer model simulations confirm that under 2035 peak wet weather conditions, RMWD can convey sewer flows from the project via the Pankey SLS with an upgrade in diameter (18-inch to 21-inch) of the proposed CIP sewer reaches 10 to 14 and meet its sewer system design criteria. The analysis also assumes RMWD moves forward with the proposed CIP North River Road reach 15 (30-inch) and SLS No. 1 upgrades.

Table 2 Existing and Projected Average Annual Sewer Flow by Reach

Reach Name	Existing Flow (gpm)	Projected Flow Developed within Reach (gpm)	Cumulative Flow into Reach (gpm)	Cumulative Flow out of Reach (gpm)	Meadowood Flow in Reach (gpm)	Meadowood % of Flow in Reach (%)
Reach 1	47	47	0	47	0	0%
Reach 2	0	482	47	529	118	26%
Reach 3	91	119	529	647	118	26%
Reach 4	75	88	647	735	118	21%
Reach 5	38	38	735	773	118	18%
Reach 6	10	10	773	784	118	17%
Reach 7	12	12	784	796	118	17%
Reach 8	60	62	796	857	118	16%
Reach 9	2	2	857	859	118	15%
Reach 10	1	1	859	860	118	15%
Reach 11	10	12	860	872	118	15%
Reach 12	2	11	872	883	118	15%
Reach 13	93	168	883	1051	118	15%
Reach 14	27	73	1051	1124	118	12%
Reach 15	12	12	1124	1136	118	11%
Pankey SLS				529	118	26%
SLS #1				1051	118	12%
SLS #2				1124	118	11%

Table 3 Trunk Sewer Reach Pipeline Status

Reach Name	Affected Pipe Length (ft)	Existing Pipe Size(s) (in)	Master Plan Pipe Size(s) (in)	Proposed Pipe Size(s) (in)	Pipeline Status
Reach 1	--	--	--	--	Existing
Reach 2	--	--	--	--	To Be Built by Developer
Reach 3	2,871	21	21	21	Existing
Reach 4	12,058	24, 21, 18	24, 21, 18	24, 21, 18	Existing
Reach 5	931	12	18	18	Under Construction
Reach 6	1,708	12	18	18	Under Construction
Reach 7	5,028	12	18	18	Under Construction
Reach 8	1,332	12	18	18	Under Construction
Reach 9	1,320	12	18	18	Under Construction
Reach 10	491	12	18	**21**	Planned CIP
Reach 11	1,766	12	18	**21**	Planned CIP
Reach 12	945	12	18	**21**	Planned CIP
Reach 13	3,850	12, 15	18	**21**	Planned CIP
Reach 14	7,418	15	18	**21**	Planned CIP
Reach 15	16,003	15	30	**30**	Planned CIP

CAPACITY AND O&M CHARGE CONSIDERATIONS AND DRAFT FRAMEWORK – WATER

If supplied via RMWD facilities, the primary water supply for Meadowood would be from the northeast via RMWD's Connection #10 and the Rice Canyon Tank with a redundant supply from the southwest via the Pala Mesa Tank and recently constructed conveyance improvements associated with the neighboring Campus Park development. The proposed water supply from RMWD would provide the development with the ability to access operational and/or emergency storage as well as delivering average-day to maximum day flows. RMWD becomes a direct provider of water to VCMWD and will need to recover capital costs for the share of system capacity dedicated to the project, and associated O&M costs.

Operation and Maintenance Costs (Delivery Charges)

RMWD should recover costs for O&M as a delivery charge for use of a portion of the water system. There are number of methodologies to estimate delivery costs. The recommended delivery charge to VCMWD is based on the following assumptions:

- This O&M cost includes pipelines, tanks, pump stations, PRSs, valves and water quality sampling and is exclusive of water purchases.
- A new operating cost has been included to maintain and monitor the two new FCFs which will service the project. This maintenance and monitoring may be performed by RMWD or possibly by the SDCWA. This analysis assumes that RMWD will maintain and monitor the meters and that VCMWD will pay the RMWD approved operating costs of two 6-inch meters.
- **Table 4** includes a summary of the proposed Monthly O&M Charges per Table 6-4 of the Raftelis Financial Consultants (RFC) Potable Water Cost of Service Study, which was performed concurrently with this study. The applicable portion of the proposed charges is the Meter Component, which is proposed to be $33.44 per month for a 1" meter.

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- The delivery costs (**Table 4**) for VCMWD are estimated to be approximately $362,000 per year based on 850 units with 1-inch meters and 2 6-inch meter connections to the RMWD system.

Table 4 Water System O&M Charges

O&M Charge	Proposed Cost
Meter Component per Unit (1)	$33.44
Connection Meter Component (2)	$869.55
Estimated Annual O&M Charge (3)	**$362,000**

(1) Meter Component O&M Charge shown is for a single 1-inch meter for a single month per the RFC Potable Water Cost of Service Study. Project contains 850 1-inch meters.
(2) Meter Component O&M Charge shown is for a single 6-inch meter for a single month per the RFC Potable Water Cost of Service Study. Project contains two 6-inch meters at the connection points to RMWD.
(3) Annual cost is the cost for 850 1-inch meters and two 6-inch meters for 12 months at the proposed Meter Component of the O&M Monthly Fixed Charges in the RFC Potable Water Cost of Service Study.

Capital Costs (District Connection Fee)

RMWD should recover costs for providing water capacity to VCMWD in RMWD's existing infrastructure and future capital improvements that benefit VCMWD. As part of VCMWD, Meadowood would be constructing a retail water distribution system including tanks, pipelines and other water appurtenances. It is presumed these capital costs will be in lieu of paying any connection fees to VCMWD, since no water system exists in the area. The project is exploring a connection to the existing RMWD water system in order to receive service and it is recommended that the District's existing Capacity Fees be applied to the project. By connecting to the RMWD system, the development would be benefiting from the whole RMWD water system. The District will be updating its Capacity Fees in 2016. The amount of a full retail RMWD water capacity fee for a 1" meter is $14,422 per EDU. Should VCMWD provide, install and inspect the meters, the full retail cost would be reduced by the cost charged by Rainbow to provide or perform those items. The combined charge for a 1" meter ($225) and inspection of the installation ($1,100) is $1,325. Subtracting this cost from the full retail charge of $14,422 reduces the capacity fee to $13,097.

CAPACITY AND TRANSPORTATION CHARGE CONSIDERATIONS AND DRAFT FRAMEWORK – SEWER

The cost basis for sewer primarily includes transportation costs associated with the O&M of the RMWD trunk sewer system, including the existing and proposed sewer lift stations to convey sewer flows through RMWD. There are numerous methodologies to recover transportation costs. This study primarily bases transportation costs on a proportional share of flow through the system. In addition, cost contributions toward necessary RMWD CIP trunk sewer and lift station improvement projects required to be upsized in order to serve the project are included in addition to the District's existing system buy-in cost. VCMWD must acquire wastewater treatment and disposal capacity directly from Oceanside and therefore no costs to/from RMWD are included for acquisition of treatment plant capacity or transportation costs through Oceanside's system.

Operation and Maintenance Costs (Transportation Charges)

The recommended transportation cost is based on the following assumptions and calculations:

- A major share of the annual O&M sewer system costs, including RMWD administration costs and depreciation, allocated to the sewer account.

- This O&M cost includes trunk sewers, collection sewers, and lift stations, but is exclusive of O&M costs paid to Oceanside for treatment and disposal.
- RMWD (and Oceanside) will require metering and measurement of wastewater strength at each connection to the RMWD system as RMWD is billed for strength and flow from the City of Oceanside.
- The proposed transportation cost for VCMWD would be proportioned on a per gallon basis for the use of the sewer system that recognizes VCMWD would have very little sewer system to maintain and would be a very large user of the RMWD system. Most of RMWD O&M costs are attributed to the interceptors and lift stations, which VCMWD would access and contribute proportionally based on the amount of flow contributed to the system.
- Trunk sewer reaches 1 through 15 (**Figure 3** and **Table 3**) are the primary facilities for assigning transportation costs and includes three lift stations and force mains.
- **Table 5** presents a summary of the 2014 operating costs for the RMWD sewer system, excluding operating costs paid to Oceanside. The total annual cost, with depreciation, excluding Oceanside, is to be an estimated at $1,995,500.
- The District currently has an average sewer flow of 0.7 MGD. Therefore the unit operating costs for the RMWD system is approximately $2,851,000 per MGD. The project would add an additional 0.17 MGD at $2,851,000 per MGD (see **Table 5**).
- Based on this methodology, potential transportation costs would be on the order of magnitude of $485,000 per year, which equates to approximately $570 per year per DU.

Table 5 Sewer System Transportation Costs

Operating Expense(1)	Sewer System Cost(2)
Sewer Services(3)	$899,824
Administrative and General	$601,407
Depreciation	$494,283
Total	**$1,995,514**
FY 2013-14 Average Sewer Flow (mgd)	0.70
Cost per MGD	$2,851,000
Proposed Project Flow	0.17
Estimated Annual Transportation Charge	**$485,000**

(1) Where applicable, operating costs split between the water and sewer systems based upon the length of pipe. The water system accounts for approximately 85% of the total amount of pipe within RMWD, the sewer system the other 15%.
(2) Operating expenses based on the RMWD FY 2013-14 Report on Examination of Financial Statements, audit by Hosaka, Rotherman & Company
(3) Sewer Services cost has been reduced by $864,000, which is the approximate annual cost of transmission to and treatment by the City of Oceanside
Note: The estimated annual costs and associated information presented in this table are presented to demonstrate the proposed methodology for calculating annual O&M costs and the approximate annual cost to the project under that methodology

Capital Costs (District Connection Fee)

RMWD should recover costs for providing sewer conveyance capacity to VCMWD in RMWD's existing infrastructure and future capital improvements that benefit VCMWD. Specifically, the District's sewer policy Section 9.13.010 states:

> "…the District may establish by agreement or Resolution the fees and charges it deems appropriate that shall be imposed for providing sewer services to premises located outside the District provided, **that such fees and charges shall not be less than would apply to similar service within the District**…"

As part of VCMWD, Meadowood must construct a sewage collection system. It is presumed these capital costs will be in lieu of paying any sewer system connection fees to VCMWD, notwithstanding Oceanside treatment and disposal costs. VCMWD would acquire capacity in Oceanside's wastewater treatment, conveyance, and disposal system by paying capacity fees to Oceanside. The project is exploring a connection to the existing RMWD sewer system in order to transmit its wastewater to Oceanside and it is required that the District's existing Capacity Fees be applied to the project. The District will be updating its Capacity Fees in 2016. The current out of District connection fee for this project is the existing Capacity Fee ($18,190), less the cost of treatment and disposal at Oceanside (assumed to be $5,000 per EDU), less the cost of lateral inspection ($1,100 per EDU) and plus the expansion component ($4,300 per EDU) resulting in a total connection fee of $16,390 per EDU (see **Table 7**).

Table 6 Sewer System Expansion Projects

Project Description	Estimated Cost	Meadowood % Responsible	Proposed Cost
Planned New Construction			
CPW Sewer and Forcemain Reimbursement (1)	$1,714,096	31%	$218,000
Pankey SLS	$3,500,000	26%	$916,000
Subtotal			$1,201,000
Planned and Required Upgrades			
Reach 10-14 - Increase CIP Pipeline Size from 18" to 21" to Increase Available Capacity	$541,000	100%	$541,000
Reach 14 - Increase LS #1 Capacity	$177,000	100%	$177,000
Reach 15(2) - Planned Upgrade of Existing 15" to 30" to Provide Ultimate Capacity	$13,300,000	11%	$1,466,300
Subtotal			$728,000
Total			**$3,623,000(3)**

(1) Cost and Meadowood allocation from DR Horton Sewer Amendment, Exhibit 6
(2) Cost estimate cited from Tetra Tech Preliminary Design Report, Oct 2013
(3) Expansion component for Meadowood equals $4,300 per EDU ($3,623,000 per 850 EDUs).

Table 7 Out of District Sewer Connection Costs

Asset	Cost/EDU
Existing Capacity Fee(1)	$12,090
Expansion Costs	$4,300
Total Connection Fee	**$16,390**

(1) Excludes Investments in Sewer Rights (Oceanside treatment) and inspection cost

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District Policy Review

In order to ensure equitability for new customers when compared to existing RMWD customers and other developments in this area, the District has indicated that it must follow existing policies related to out of service fees and charges. Specifically, the District's sewer policy Section 9.13.010 states:

> "…the District may establish by agreement or Resolution the fees and charges it deems appropriate that shall be imposed for providing sewer services to premises located outside the District provided, **that such fees and charges shall not be less than would apply to similar service within the District**…"

This policy requires the District to charge the current sewer capacity fee of $17,090 per EDU for VCMWD to connect to the sewer system which would include sewer conveyance, treatment, and disposal. However, VCMWD has indicated that they will separately negotiate treatment and disposal costs with Oceanside. Therefore it appears fair and reasonable that the "buy-in" portion of the capacity/connection fee for VCMWD could be reduced appropriately for treatment and disposal and would not be construed as charging less than existing customers.

RMWD is currently in the pre-design phase for its own water reclamation facility that would treat all wastewater locally and end the arrangement with Oceanside. This project was contemplated in the agreement between VCMWD and RMWD to conduct this study. In this agreement, VCMWD agreed to send wastewater to a potential future RMWD water reclamation plant on the condition that the treatment capacity and O&M costs would not exceed those charged by Oceanside. Any out of service area agreement that may arise from this study will need to quantify with some precision what the costs for the City of Oceanside are and should the RMWD plant go forward these costs would be added back in to the capacity fee for the Meadowood project.

Although no specific water policy was found, it is likely that the District Board of Directors would apply similar guidelines and principles to the water buy-in fee component. To charge a significantly lower capacity fee for permanent out of service area connections to the RMWD system could expose RMWD to significant risk of lawsuits of equity from neighboring developments and/or the Building Industry Association. If the proposed connection were temporary a different argument could be made, however since this connection is proposed to be in perpetuity then the principle of equity would most likely be adhered to by the District Board.

Since there is no RMWD treatment portion of a water capacity fee, and since that fee is collected separately by the San Diego County Water Authority (SDCWA), the full water capacity fee, currently $13,097 per EDU (1-inch meter) could be charged to VCMWD for connecting to the RMWD water system.

It should be noted here that RMWD will be revising its capacity fees upon the completion of the 2016 Water Master Plan and these changes will likely conform to the hybrid methodology described in the Raftelis report. It is expected that the revised capacity fees should be completed in the Spring of 2016. To support the revision of Capacity Fees which will take place next year, RMWD has also initiated an Asset Valuation Study which will review and revise the value of existing assets as necessary. For these reasons, the numerical values for capacity fees outlined in this report are subject to change.

In summary, Raftelis has made recommendations for the development of updated Capacity Fees which include using the buy-in and incremental expansion methodologies. Analyses presented in previous versions of this report presented attempts to calculate an updated Capacity Fee for the Water and Sewer systems based upon information which is currently under review by the District and likely to change. For this reason, those analyses have been removed from this study in favor of enforcing the District's existing Capacity Fees until fully updated Capacity Fees have been generated by the District.

Based on the sewer policy above, the District could adopt an out of service capacity/connection charge that is equivalent to what new customers within RMWD would pay to connect to the existing systems. The capacity fees charged to VCMWD could be as follows:

- A sewer capacity fee based on the existing capacity fee ($18,190 per EDU) less the cost of treatment and disposal to Oceanside for VCMWD (assumed at $5,000 per EDU), less the cost of inspection ($1,100 per EDU) and including the cost of expansions to the system required to serve the project ($4,300 per EDU) resulting in a **sewer capacity fee charged to VCMWD of $16,390 per EDU.**
- A water capacity fee based on the existing capacity fee ($14,422 per EDU) less the cost of meter materials and installation inspection resulting in a **water capacity fee charged to VCMWD of $13,097 per EDU.**

Until the District updates its capacity fees, which is anticipated in the Spring/Summer of 2016, VCMWD could be subject to the current capacity fees for obtaining service, unless otherwise approved by the District Board.

TECHNICAL REVIEW AND RESPONSE TO COMMENTS

A preliminary analysis was prepared and submitted to RMWD on August 14, 2015 and subsequently provided to VCMWD and the Meadowood project consultant for review. These are attached as Appendix A.

SUMMARY AND CONCLUSIONS

In summary, the analysis examines the feasibility and costs of a possible interagency service arrangement between the VCMWD and RMWD for the provision of water and sewer service to the proposed Meadowood development and offers the following conclusions:

- The arrangement is feasible with various facility upgrades and connecting pipelines.
- Both the water and sewer service connections are subject to the District's existing Capacity Fees, which are scheduled to be updated in 2016.
- Preliminary transportation and delivery costs are presented to provide a fair share annual cost opinion to convey water and sewer flows through the existing RMWD systems. This analysis is subject to further refinement based on updated operating costs and review by both agencies.
- This analysis, presenting the upfront and annual costs to connect to the District's water and sewer systems, appears to be favorable to constructing a new VCMWD wastewater treatment plant at the project site and new VCMWD water supply facilities from the SDCWA aqueduct and storage facilities on the project sight.

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- The master plans will also evaluate options for RMWD wastewater reclamation and recycled water development, which may provide water management and efficiency benefits to both agencies.

We appreciate the opportunity to assist RMWD and VCMWD in the analysis and look forward to receiving your comments. Please call me at 858.514.1042 if you have any other questions.

Respectfully submitted,

Robert J. Warren, PE
Project Manager

APPENDIX A

VCMWD Comments

Comments were initially received from VCMWD at a July 30, 2015 meeting and formally provided to the District in memorandum on September 22, 2015. The comments have been reviewed and considered in this revised analysis.

Financial Peer Review

As part of the response to VCMWD, Atkins retained the services of a financial consultant (Raftelis) to provide an independent review of the proposed analysis and methodologies for the estimated water and sewer connection or capacity fee. Their primarily objective:

- Provide input and guidance on industry standard “Out of District/Service” connection fees for fair and equitable recovery of capacity costs.
- Provide response on VCMWD comments related to inclusion of depreciation in the buy-in component as well as input on a proportionate share of the water and sewer systems for the buy-in component.
- Provide an opinion on a component “buy-in” charge for District customers, although that methodology is currently not the current District wide capacity fee basis.
- Summarize independent recommendations in a memorandum.

The Memo dated October 21, 2015 by Raftelis summarizing findings and recommendations has been attached to this revised analysis. Key highlights:

- The “Hybrid Methodology” was confirmed for the capacity or connection fee charge for VCMWD for both water and sewer systems. This includes both a “buy-in” component and an expansion component.
- The “buy-in” component should include asset replacement cost less depreciation (RCLD) as this is a more reasonable and defensible approach and addresses that the system is not new and has been used by all current users.
- The “buy-in” fee should also include current reserve balances and outstanding debt for their respective systems in the calculation.
- The equivalent dwelling units (EDUs) for the water connection fee should be based on the water meter equivalency of each existing connection. Meter equivalency standards are provided by the American Water Work Association (AWWA). This analysis would provide more clarity to the definition of an EDU and would be more equitable, recognizing that existing agriculture users in the District have access to several times more capacity with larger water meters than a typical single family units
- The entire existing water and sewer systems should be considered in the analysis, not a portion of the system based on miles of pipe or number of pumps used. The premise is that new customers, especially those who are out of District, are on par with all existing customers that have benefited from the whole systems.

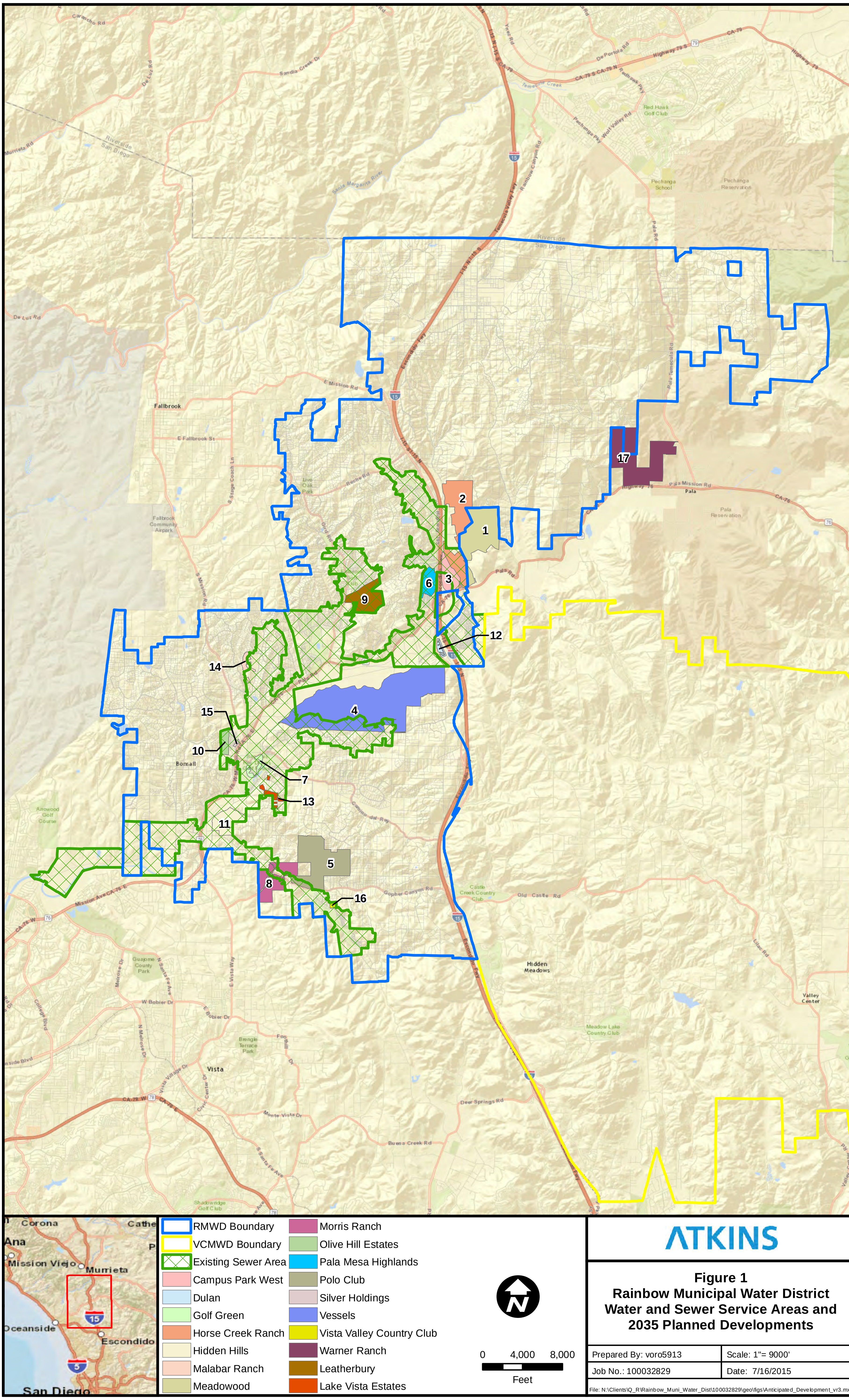
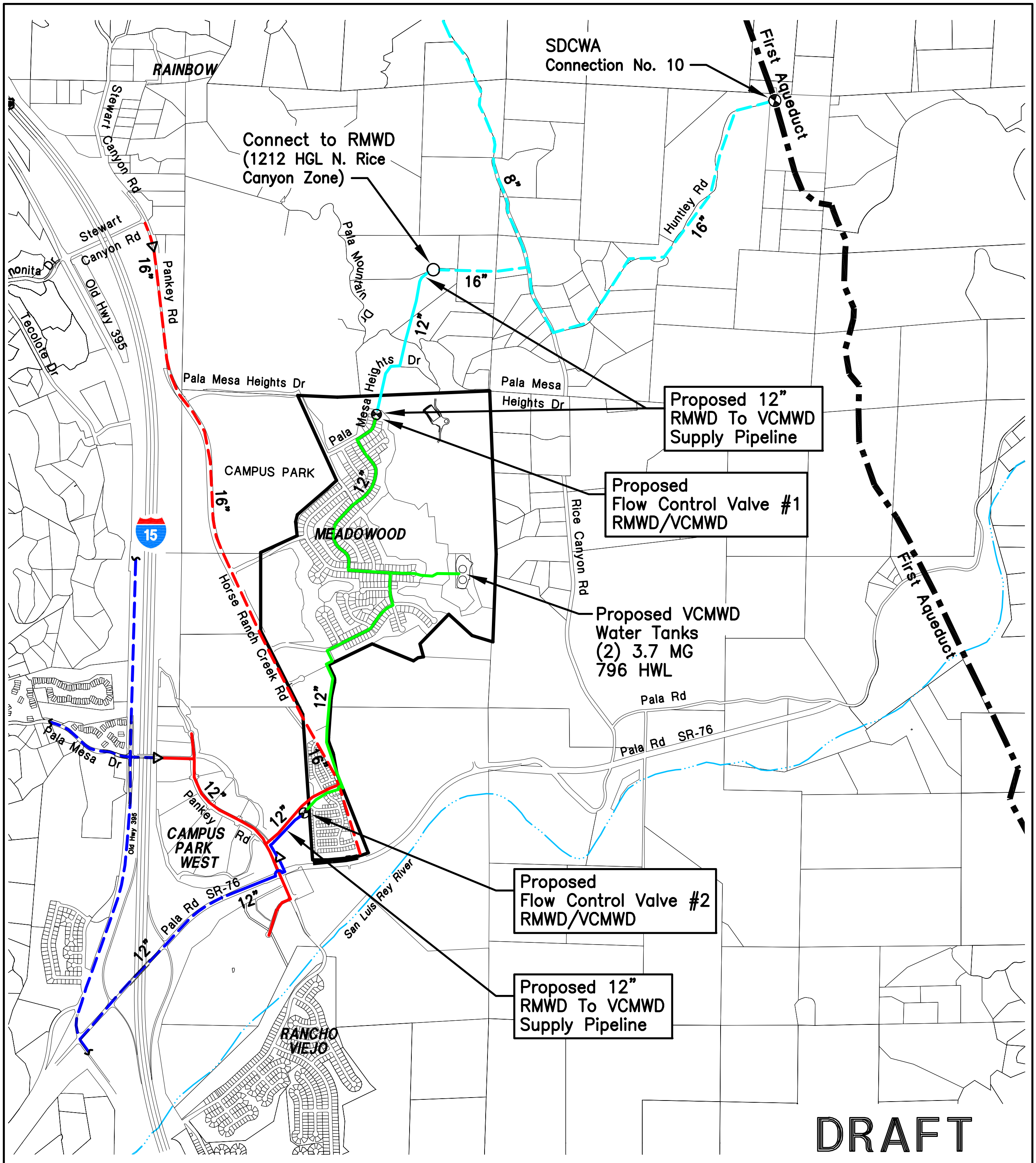
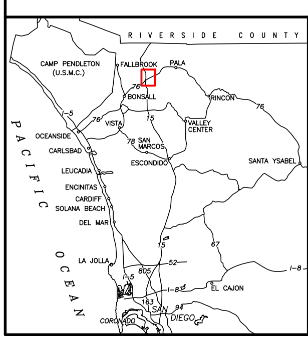


Figure 1
Rainbow Municipal Water District Water and Sewer Service Areas and 2035 Planned Developments





red dashed line	EXISTING 660 CAMPUS PARK
blue dashed line	EXISTING 897 BECK ZONE
cyan dashed line	EXISTING 1212 ZONE
red solid line	PROPOSED 660 ZONE
green solid line	PROPOSED 796 ZONE (VCMWD)
cyan solid line	PROPOSED 1212 ZONE
◁	PRS
⊗	FLOW CONTROL

N

0 2400 Feet

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Figure 2

PROPOSED
RMWD TO VCMWD
WATER SERVICE PLAN

Prepared by: leal5448	Scale: 1"=2400'
Job No.: 100032829	Date: 7/7/2015

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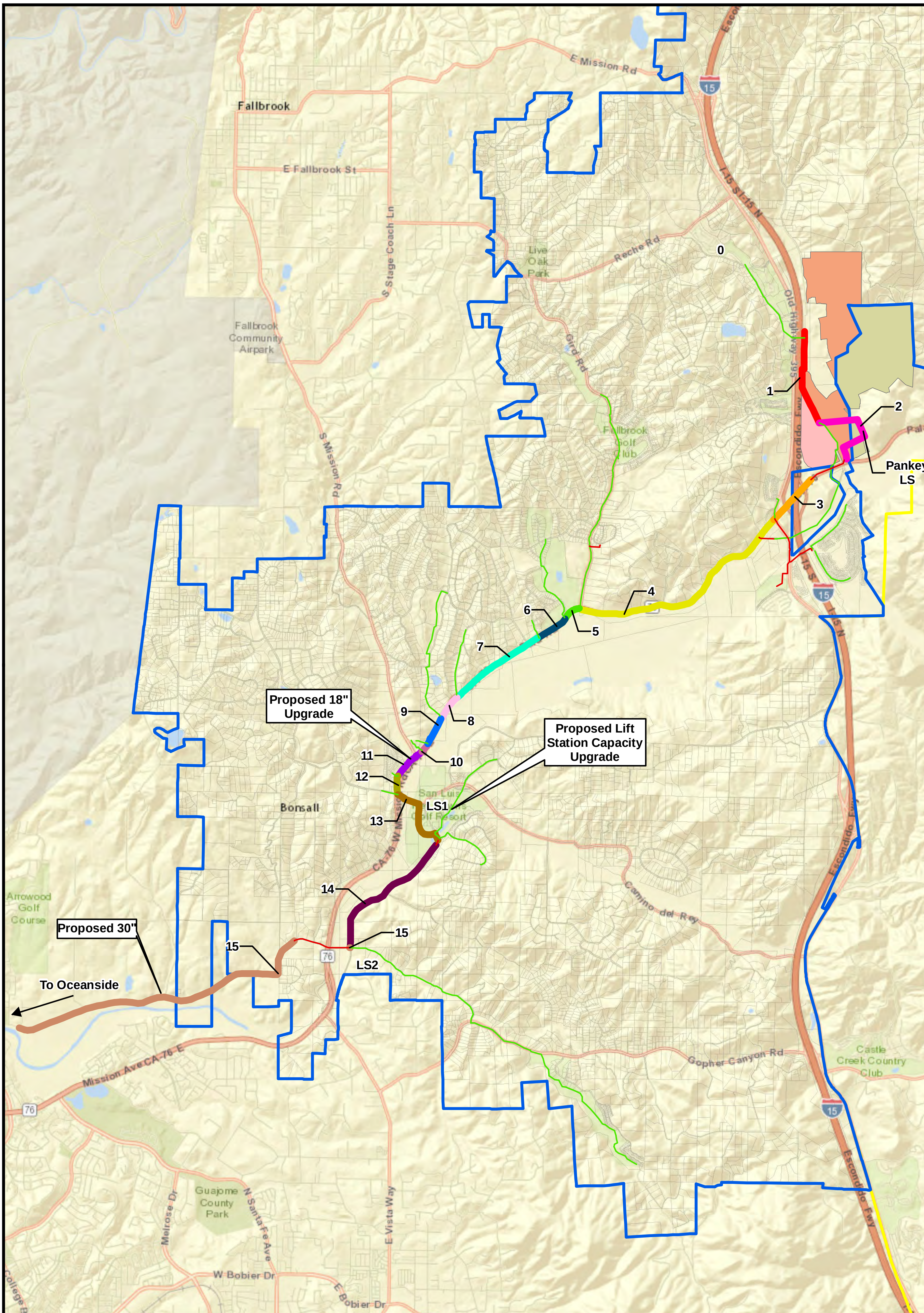

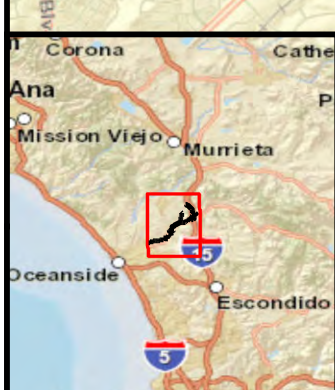

- Forcemain
- Sewer Main
- Campus Park West
- Horse Creek Ranch
- Meadowood
- RMWD Boundary
- VCMWD Boundary

Sewer Trunk Reach Number

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15

0 2,500 5,000
Feet

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Figure 3
Trunk Sewer Reaches
Rainbow Municipal Water District

Prepared By: voro5913	Scale: 1"= 5000'
Job No.: 100032829	Date: 7/16/2015

File: N:\Clients\Q_R\Rainbow_Muni_Water_Dist\100032829\geo\figs\Pipeline_Reaches_vr3.mxd