APPENDIX A

Potable Water Demand Assumptions

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Table A-1. Projected Potable Water Demands for Planned Development Projects
(Projects shaded in yellow are assumed to develop by 2020)

Site No.	Planning Area	Name	Description	Estimated Start Year	Estimated End Year	Estimated Duration in Years	Potable Demand w/ UAFW, mgd
1	Camp Parks	Parks RFTA	Parks Reserve Forces Training Area	2015	2025	10	0.581
2	Camp Parks	Dublin Crossing	Dublin Crossing Project	2015	2020	5	0.399
3	Central Dublin	Downtown Dublin -- Retail	Downtown Dublin Specific Plan	2015	2035	20	0.162
4	Central Dublin	Downtown Dublin -- Transit	Downtown Dublin Specific Plan	2015	2035	20	0.465
5	Central Dublin	Downtown Dublin -- Village	Downtown Dublin Specific Plan	2015	2035	20	0.036
6	Central Dublin	Dublin Village	Dublin Village Historic Area Specific Plan	2015	2035	20	0.037
7	Central Dublin	Ramma Market and Cuisine	Restaurant and Market	2014	2015	1	0.001
8	Central Dublin	Sierra Business Center	Industrial Park	2016	2017	1	0.006
9	Eastern Dublin	Chevrolet Detail Area	Vehicle Wash and Detail	2016	2017	1	0.011
10	Eastern Dublin	Fallon Gateway	Retail Commercial Center	2016	2018	2	0.029
11	Eastern Dublin	Promenade	Residential	2016	2021	5	0.070
12	Eastern Dublin	East County Hall of Justice	Alameda County Courtrooms	2014	2016	2	0.016
13	Eastern Dublin	Gateway Medical Center	Medical Offices	2016	2023	7	0.008
14	Eastern Dublin	The Green	Mixed Use	2015	2020	5	0.060
15	Eastern Dublin	Grafton Plaza	Mixed Use--Townhomes	2015	2024	9	0.148
16	Central Dublin	Valley Christian Center	Sanctuary	2014	2016	2	0.001
17	Central Dublin	Valero Service Station	Mini-mart and Car Wash	2015	2016	1	0.001
18	Central Dublin	Dublin Preschool	Day Care Center	2014	2015	1	0.001
19	Central Dublin	Fountainhead Montessori	Elementary School	2014	2017	3	0.003
20	Eastern Dublin	Persimmon Place	Shopping Center	2014	2015	1	0.027
21	Central Dublin	Challenge Butter	Office Building	2015	2016	1	0.000
22	Eastern Dublin	The Groves	Townhomes	2015	2021	6	0.018
23	Eastern Dublin	Sorrento -- Ravello	Townhomes	2014	2015	1	0.018
24	Eastern Dublin	Sorrento -- Lucca	Single Family Small Lot	2014	2018	4	0.026
25	Eastern Dublin	Wallis Ranch	Mixed Residential	2015	2020	5	0.200
26	Eastern Dublin	Silvera Ranch -- Phase 3	Townhomes	2014	2017	3	0.018
27	Central Dublin	Tralee	Townhomes	2014	2015	1	0.018
28	Eastern Dublin	Moller Ranch	Residential	2015	2020	5	0.100
29	Eastern Dublin	Chateau	Single Family	2014	2019	5	0.039
30	Eastern Dublin	Dublin Station -- Esprit (E-1)	Townhomes	2014	2017	3	0.015
31	Eastern Dublin	Dublin Station -- Avalon II	Apartments	2014	2016	2	0.036
32	Eastern Dublin	Tassajara Highlands	Single Family	2015	2018	3	0.013
33	Eastern Dublin	Nielsen	Single Family	2014	2016	2	0.013
34	Eastern Dublin	Dublin Ranch North (Redgewick)	Estate Residential	2018	2019	1	0.003
35	Eastern Dublin	Jordan Ranch -- Windwood	Single Family	2014	2020	6	0.094
36	Western Dublin	Schaefer Ranch	Single Family	2014	2018	4	0.052
37	Central Dublin	Eden Housing -- Veteran's Project	Affordable Housing	2015	2018	3	0.010
38	Central Dublin	Crown Chevy	Mixed Use Building	2015	2017	2	0.048
39	Western Dublin	Schaefer Ranch GPA	Mixed Residential	2016	2030	14	0.012
40	Eastern Dublin	Positano -- The Ridge	Single Family	2014	2020	6	0.036
41	Eastern Dublin	Positano -- The Heights	Single Family	2014	2020	6	0.032
42	Eastern Dublin	Positano -- Verona Estates	Single Family	2014	2015	1	0.011
43	Eastern Dublin	Positano -- Veneto	Single Family	2014	2020	6	0.050
44	Central Dublin	Bayrock	Townhomes	2016	2017	1	0.007
45	Central Dublin	Ares/Prologis	Office Building--Residential	2017	2019	2	0.068
46	Eastern Dublin	Lazy Dog Restaurant	Restaurant	2014	2014	0	0.002
47	Eastern Dublin	Jordan Ranch -- Capri	Alley Loaded Homes	2014	2020	6	0.026
48	Eastern Dublin	Jordan Ranch -- Trio	Townhomes	2014	2020	6	0.021
49	Central Dublin	Heritage Park	Single Family Homes	2017	2019	2	0.015
50	Eastern Dublin	Jordan Ranch -- Neighborhood 6	Townhomes and Flats	2017	2022	5	0.019
51	Eastern Dublin	Dublin Station -- Site A-1	Townhomes	2016	2018	2	0.009
52	Eastern Dublin	Lennar Homes -- Sub Area 3	Mixed Residential	2015	2025	10	0.108
53	Eastern Dublin	Jordan Ranch -- Ardmore	Medium Density	2014	2020	6	0.030
54	Dougherty Valley	Gale Ranch -- Avanti	Single Family	2014	2015	1	0.016
55	Dougherty Valley	Gale Ranch -- Fiorella	Single Family	2014	2015	1	0.030
56	Dougherty Valley	Gale Ranch -- Iriana	Single Family	2014	2015	1	0.033
57	Dougherty Valley	Gale Ranch -- Avanti Heights	Single Family	2014	2016	2	0.026
58	Dougherty Valley	Gale Ranch -- Andorra	Single Family	2015	2017	2	0.024
59	Dougherty Valley	Gale Ranch -- Fiorella II	Single Family	2015	2016	1	0.010
60	Dougherty Valley	Gale Ranch -- Fiorella II (9297)	Single Family	2015	2017	2	0.024
61	Dougherty Valley	Gale Ranch -- Romana	Single Family	2015	2017	2	0.022
62	Dougherty Valley	Gale Ranch -- Posante	Single Family	2015	2017	2	0.031
63	Dougherty Valley	Gale Ranch -- Cantera	Condominiums	2016	2018	2	0.023
64	Dougherty Valley	Gale Ranch -- Amarante	Single Family	2016	2018	2	0.028
65	Dougherty Valley	Gale Ranch -- Romana II	Single Family	2017	2020	3	0.039
66	Dougherty Valley	Gale Ranch -- Tri-Plexes/C2	Townhomes	2017	2020	3	0.027
67	Dougherty Valley	Gale Ranch -- 9301	Single Family	2017	2020	3	0.044
68	Dougherty Valley	Rancho San Ramon	Community Park and Senior Center	2014	2015	1	0.005
69	Dougherty Valley	Community Center	Community Center	2015	2017	2	0.000
70	Dougherty Valley	Village Center -- North	Condominiums	2017	2020	3	0.076
71	Dougherty Valley	Village Center -- South	Commercial	2017	2020	3	0.038
72	Dougherty Valley	School/Park	School/Park	2017	2020	3	0.009
73	Eastern Dublin	Kaiser	Medical Offices	2016	2035	19	0.058
74	Eastern Dublin	DiManto	Commercial--Residential--Public	2020	2030	10	0.165
75	Eastern Dublin	Grafton Station Area A	Commerical	2020	2021	1	0.009
76	Eastern Dublin	Site 15A	Commercial	2027	2028	1	0.022
77	Eastern Dublin	Moura-Tipper	Medium Density Residential	2017	2018	1	0.017

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Table A-1. Projected Potable Water Demands for Planned Development Projects
(Projects shaded in yellow are assumed to develop by 2020)

Site No.	Planning Area	Name	Description	Estimated Start Year	Estimated End Year	Estimated Duration in Years	Potable Demand w/ UAFW, mgd
78	Eastern Dublin	Ashton at Dublin Station (A-3)	Apartments	2026	2028	2	0.027
79	Eastern Dublin	Fallon Village -- Croak	Mixed Residential--Park	2022	2032	10	0.222
80	Eastern Dublin	Fallon Village -- Chen	Mixed Use--Park	2028	2035	7	0.173
81	Eastern Dublin	Fallon Village -- Anderson	Mixed Use	2027	2035	8	0.083
82	Eastern Dublin	Fallon Village -- Righetti	Mixed Use	2025	2035	10	0.080
83	Eastern Dublin	Fallon Village -- Monte Vista	Industrial	2028	2035	7	0.009
84	Eastern Dublin	Fallon Village -- Branaugh	Mixed Use	2027	2035	8	0.056
85	Eastern Dublin	EBJ Partners L.P.	Commerical	2030	2035	5	0.002
86	Eastern Dublin	Pleasanton Ranch Investments	Commercial	2030	2035	5	0.001
87	Eastern Dublin	Dublin Station -- Site D-1	Campus Office	2030	2035	5	0.004
88	Eastern Dublin	Dublin Station -- Site D-2	Campus Office	2030	2035	5	0.018
89	Eastern Dublin	Dublin Station -- Site E-2	Campus Office	2030	2035	5	0.011
90	Eastern Dublin	East Dublin	Commerical	2030	2035	5	0.026
91	Eastern Dublin	Zimmer-Raley	Medium Densirty Residential	2030	2035	5	0.007
92	Eastern Dublin	Dublin Ranch	Rural Residential--Ag	2030	2035	5	0.001
93	Eastern Dublin	Dublin Ranch	Rural Residential--Ag	2030	2035	5	0.000
94	Eastern Dublin	Jordan--Mixed Use	Mixed Use	2020	2022	2	0.026
95	Eastern Dublin	Jordan--Park 1	Park	2015	2016	1	0.001
96	Eastern Dublin	Jordan--Park 2	Park	2020	2022	2	0.001
97	Eastern Dublin	Jordan--Residential 1	Medium Density Residential	2015	2017	2	0.031
98	Eastern Dublin	Jordan--Residential 2	Medium Density Residential	2017	2019	2	0.020
99	Eastern Dublin	Jordan--Elementary School	Elementary School	2015	2017	2	0.007
100	Eastern Dublin	Jordan--Semi-Public	Semi-Public	2020	2022	2	0.002
101	Eastern Dublin	Jordan--Residential 3	Low Density Residential	2020	2022	2	0.016
102	Eastern Dublin	Fallon Enterprises--Residential 1	Rural Residential--Ag	2030	2035	5	0.000
103	Eastern Dublin	Fallon Enterprises--Residential 2	Single Family Residential	2030	2035	5	0.041
104	Eastern Dublin	Braddock & Logan--Residential 1	Rural Residential--Ag	2030	2035	5	0.001
105	Eastern Dublin	Braddock & Logan--Residential 2	Single Family Residential	2014	2016	2	0.026
106	Eastern Dublin	Braddock & Logan--Residential 3	Single Family Residential	2014	2016	2	0.007
107	Eastern Dublin	Dublin Ranch--Commercial 1	General Commerical	2030	2035	5	0.004
108	Eastern Dublin	Dublin Ranch--Commercial 2	Neighborhood Commerical	2020	2021	1	0.007
109	Eastern Dublin	Dublin Ranch--Commercial 3	Commerical	2030	2035	5	0.004
110	Central Dublin	Central Dublin--Infill 1	Business Park, Industrial, Outdoor Storage	2030	2035	5	0.003
111	Western Dublin	Schafer Ranch--Residential 1	Estate Residential	2014	2019	5	0.000
112	Western Dublin	Schafer Ranch--Residential 2	Single Family Residential	2014	2019	5	0.051

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Table A-2. Existing Customers to be Converted to Recycled Water

Account No	Type	Customer	Area	Location	site_addr	SERV_LOC_ID
06-21-663652-000	Converted 2014	Dublin Ranch Golf	Golf Course	Golf Course Irrigation	GOLF COURSE IRRIGATION	2031
06-21-766368-000	Converted 2014	Dublin Ranch Golf	Golf Course	Golf Course Irrigation	GOLF COURSE IRRIGATION	2005
06-21-577012-000	Converted 2014	Archstone Apartments	Hacienda Drive Area	Central Parkway	SOUTHSIDE CENTRAL PARKWY IRRIG	2072
06-21-577008-000	Converted 2014	Archstone Apartments	Hacienda Drive Area	Central Parkway	SOUTHSIDE CENTRAL PARKWAY IRRIG	2071
06-21-586221-000	Converted 2014	Dublin Ranch/Shea Homes	Tassajara Road Area	5400 S.Dublin Ranch Streescapes	5400 S DUBLIN RANCH DR/IRR	2055
06-21-663474-000	Converted 2014	Dublin Ranch Owners Assoc.	Tassajara Road Area	5391 S Dublin Ranch Rd	5391 S DUBLIN RANCH IRRIG	2030
06-21-586226-000	Converted 2014	MSSH Dublin Dev/Shea Homes	Tassajara Road Area	5460 S. Dublin Ranch Dr	5460 S DUBLIN RANCH DR/IRRIG	2056
06-21-609405-000	Converted 2014	Dublin Ranch/Shea Homes	Tassajara Road Area	5613 Cedar Crest Terrace - temp irrigation	5613 CEDAR CREST TERR/TEMP IRR	2045
06-21-586218-000	Converted 2014	Dublin Ranch Owners Assoc	Tassajara Road Area	5391 S Dublin Ranch Dr. SE Side	5391 S DUB RANCH DR/SE SIDE/IR	2054
06-21-586212-000	Converted 2014	Dublin Ranch /Shea Homes	Tassajara Road Area	3900 S. Dublin Ranch	3900 S DUBLIN RANCH DR	2051
06-21-604522-000	Converted 2014	Dublin Ranch Owners Assoc.	Antone Way	3490 Antone Way soutside of Antone St. East of Grafton	3490 ANTONE WAY/IRRIG	2039
05-41-655600-001	Converted 2014	Silvera Ranch HOA	Fallon Road	6556 Fallon Road	6556 FALLON RD/IRRIG	17584
05-48-400917-001	Converted 2014	Silvera Ranch HOA	Fallon Road	SE Crnr Silvera Ranch Dr	SE CRNR SILVERA RANCH DR	16148
05-41-383110-001	Converted 2014	Silvera Ranch HOA	Fallon Road	3831 Silvera Ranch Dr.	3831 SILVERA RANCH DR/IRRIG	15864
06-21-555550-001	Converted 2014	City of Dublin	Dublin Blvd.	NW corner of Dublin Blvd & Myrtle dr	NE CNR DUBLIN BL MYRTLE IRRIG	2059
06-21-589010-000	Converted 2014	City of Dublin	Hacienda Drive Area	5990 Gleason Road	5990 GLEASON DR-CTR ISLAND/IRR	2033
06-21-589990-000	Converted 2014	City of Dublin	Hacienda Drive Area	Median north of Central Parkway	HACIENDA N CENTRAL PKWY MEDIAN	2035
05-44-404300-000	Converted 2014	City of Dublin	Tassajara Road Area	Tassajara Road medians	TASSAJARA RD MEDIAN IRRIG	3444
06-21-086952-000	Converted 2014	City of Dublin	Gleason Drive	Southside of Gleason btwn Hacienda & Madigan by pole	GLEASON RD E OF HACIENDA MEDIAN IRRIG	2216
06-21-571690-000	Converted 2014	City of Dublin	Central Parkway	Hacienda Dr. Hibernnia (Archstone has been paying for this) Street Median	SOUTHSIDE CENTRAL PKWY IRRIG	2068
06-21-571692-000	Converted 2014	City of Dublin	Gleason Drive	Southside of Gleason btwn Hacienda & Madigan by pole	SOUTHSIDE GLEASON SIDEWALK/ IRRIG	2069
03-21-702060-000	Converted 2014	City of Dublin	Dougherty Road & Amador Valley Blvd.	Irrigation	AMADOR VALLEY BLVD AND DOUGHERTY IR	5692
03-21-123870-000	Converted 2014	City of Dublin	Civic Center Police Station Irrigation	Irrigation	100 CIVIC PLAZA/IRRG	6359
03-21-123050-002	Converted 2014	6363 Clark Ave	City of Dublin Public Safety Complex	Irrigation	6363 CLARK AVE/IRRG	6356
06-21-589900-000	Converted 2014	City of Dublin	Gleason Drive	South of Gleason west of Hacienda 06-21-589900	GLEASON AT HACIENDA SIDEWALK	2034
06-21-460010-001	Converted 2014	Toyota Drive	Dublin Toyota	4321 Toyota Drive	4321 TOYOTA DR/IRRIG	2153
03-21-601000-000	Converted 2014	8262 North Lake Drive	Amador Lakes	Irrigation	8262 NORTH LAKE DR/IRRG	5773
03-21-601280-000	Converted 2014	8174 North Lake Drive	Amador Lakes	Irrigation	8174 NORTH LAKE DR/IRRG	5774
03-21-602080-000	Converted 2014	7949 S. Lake Drive	Amador Lakes	Irrigation	7949 SOUTH LAKE DR/IRRG	5749
03-21-600200-000	Converted 2014	8467 North Lake Drive	Amador Lakes	Irrigation	8467 NORTH LAKE DR/IRRIG	5768
03-21-600660-000	Converted 2014	8392 North Lake Drive	Amador Lakes	Irrigation	8392 NORTH LAKE DR/IRRG	5770
03-21-603060-000	Converted 2014	7930 S. Lake Drive	Amador Lakes	Irrigation	7930 SOUTH LAKE DR/IRRG	5755
03-21-601820-000	Converted 2014	6900 Lake Drive	Amador Lakes	irrigation	6900 LAKE DR/IRRG	5778
03-21-602620-000	Converted 2014	8098 S. Lake Drive	Amador Lakes	Irrigation	8098 SOUTH LAKE DR/IRRG	5753
06-21-459520-000	Market Study	Alameda County - Animal Shelter	Animal Shelter	4595 Gleason Dr.	4595 GLEASON DR IRRIG	2179
05-38-640900-000	Market Study	Alameda County - Santa Rita Jail	Santa Rita Jail	5325 Broder Blvd.	5325 BRODER BLVD	13177
05-38-678000-000	Market Study	Alameda County - Sheriff's Office	Adjunt to Santa Rita Jail	5325 Broder Blvd. and Arnold	5325 BRODER BLVD & ARNOLD	17094
03-21-384030-000	Market Study	Amador Apartments	Residential Apts	7571 Amador Valley Blvd.	7571 AMADOR VLY BL/IRRG	5956
03-21-386080-000	Market Study	Amador Apartments	Residential Apts	7571 Amador Valley Blvd.	7571 AMADOR VLY BL/IRRG	5936
06-21-499900-000	Market Study	California Highway Patrol	CHP Office	4999 Gleason Dr.	4999 GLEASON DR/IRRIGATION	2114
03-21-299030-001	Market Study	Church of Christ	Church	11873 Dublin Blvd.	11873 DUBLIN BLVD	6066
03-51-287733-000	Market Study	City of Dublin - Shannon Community Center	Community Center	11600 Shannon Ave.	11600 SHANNON AVE/IRRIG	18731
03-21-389040-001	Market Study	City of Dublin - Firehouse 16	City Firehouse	7494 Donohue Dr.	7494 DONOHUE DR FIREHOUSE 16/IRRIG	5941
06-21-620010-000	Market Study	City of Dublin - Firehouse 17	City Firehouse	6200 Madigan St.	6200 MADIGAN ST FIRE HSE 17 IR	2023
03-21-431570-000	Market Study	City of Dublin - Medians	San Ramon Rd. median	near San Ramon Rd. and Vomac Rd.	0 W VOMAC AND SAN RAMON IRRIG NW	5881
03-21-266020-002	Market Study	City of Dublin - Medians	Regional St. median	7222 Regional St.	7222 REGIONAL ST/IRRG	6117
03-21-448880-000	Market Study	City of Dublin - Medians	Amador Valley Blvd median	Amador Valley Blvd at Amador Plaza Rd.	AMADOR VALLEY BLVD AMADOR PLAZA RD	5838
03-21-253550-000	Market Study	City of Dublin - Medians	San Ramon Rd. median	in front of 7100 San Ramon Rd.	SAN RAMON RD IRRIG	6143
03-21-509033-000	Market Study	City of Dublin - Medians	sw crnr San Ramon Rd and Dublin Blvd	San Ramon Rd and Dublin Blvd.	SAN RAMON RD S/W CNR/DUBLIN BLVD	5780

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Table A-2. Existing Customers to be Converted to Recycled Water

Account No	Type	Customer	Area	Location	site_addr	SERV_LOC_ID
03-21-432000-000	Market Study	City of Dublin - Medians	San Ramon Rd. median	near San Ramon Rd. and Vomac Rd.	WEST VOMAC AND SAN RAMON RD IRRIG	5882
03-21-438070-000	Market Study	City of Dublin - Shannon Park	City Park (Shannon)	Shannon Park	SHANNON PARK IRRIG	5886
03-21-441290-000	Market Study	City of Dublin - Dolon Park	City Park (Dolon)	Dolon Park	DOLAN PARK ON IGLESIA/IRRIG	5867
03-21-443070-000	Market Study	City of Dublin - Mape Park	City Park (Mape)	Mape Park	MAPE PARK IRRIG	5869
03-21-760600-000	Market Study	City of Dublin - Senior Center	Community Center (Senior Center)	7600 Amador Valley Blvd.	7600 AMADOR VALLEY BLVD IRRIG	5631
03-21-283430-000	Market Study	Dublin Blvd Associates	Commercial	11555 Dublin Blvd.	11555 DUBLIN BLVD/IRRG	6093
03-21-256030-000	Market Study	Dublin Chevron	Commercial	7007 San Ramon Rd.	7007 SAN RAMON RD	6128
03-21-283520-000	Market Study	Dublin Exec Center	Commercial	11501 Dublin Blvd	11555 DUBLIN BLVD	6094
03-21-293290-000	Market Study	Dublin Historic Park	Community Park	11825 Dublin Blvd.	11825 DUBLIN BLVD/IRR/HIST PARK	20197
03-21-253000-000	Market Study	Dublin Iceland	Commercial - Ice Skating	7212 San Ramon Rd.	7212 SAN RAMON RD	6142
03-50-118250-000	Market Study	Dublin Pioneer Cemetery	Historical Cemetery	11825 Dublin Blvd.	11825 DUBLIN BLVD/IRRIG	18909
03-21-294040-000	Market Study	Dublin Pioneer Cemetery	Historical Cemetery	11825 Dublin Blvd.	11825 DUBLIN BLVD/IRRG	6059
03-21-420050-000	Market Study	Dublin Unified School District - Dublin Elementary	Elementary School	7997 Vomac Rd.	7997 VOMAC RD/IRRG	5913
03-21-440030-000	Market Study	Dublin Unified School District - Nielsen Elementary	Elementary School	7500 Amarillo Rd.	7500 AMARILLO RD	5894
05-38-634715-001	Market Study	Federal Correctional Institution	Federal Prison Complex	989 8th St.	989 8TH ST/IRRIG	16732
05-38-140332-000	Market Study	Federal Correctional Institution	Federal Prison Complex	Bldg 973, 8th St. and Keppler	BLDG 973 8TH ST KEPPLER/IRRIG	17015
06-99-035055-000	Market Study	Federal Correctional Institution	Federal Prison Complex	FCI behind Trailer Park	FCI BEHIND TRAILER PARK	1876
06-99-415241-000	Market Study	Federal Correctional Institution	Federal Prison Complex	FCI Training Center	FCI TRAINING CTR GOODFELLOW ST/IRRIG	1855
06-99-654319-000	Market Study	Federal Correctional Institution	Federal Prison Complex	FDC Loop at 8t St.	FDC LOOP AT 8TH STREET	15242
05-38-210326-001	Market Study	Federal Correctional Institution	Federal Prison Complex	FCI Park at FCI 8th St.	PARK @ FCI 8TH ST/IRRIG	16733
03-21-301070-000	Market Study	Frankie Johnnie & Luigi Too	Commercial - Restaurant	11891 Dublin Blvd.	11891 DUBLIN BLVD/IRRG	6068
03-21-298050-000	Market Study	Heritage Park Office Center	Commercial	11875 Dublin Blvd.	11875 DUBLIN BLVD/IRRG	6065
03-21-283070-000	Market Study	Hexcel Corp	Commercial	11711 Dublin Blvd.	11711 DUBLIN BLVD	6090
03-21-439050-000	Market Study	John Knox Church	Church	7421 Amarillo Rd.	7421 AMARILLO RD	5893
03-21-250060-002	Market Study	McNamara's Steak Chop House	Commercial - Restaurant	7400 San Ramon Rd.	7400 SAN RAMON RD/IRR	6137
03-21-251040-001	Market Study	Michael Perkins (Commercial)	Commercial	7370 San Ramon Rd.	7370 SAN RAMON RD	6139
03-21-249100-000	Market Study	Public Storage	Commercial - Warehouse/Storage	7420 San Ramon Rd.	7420 SAN RAMON RD/IRRG	6157
03-21-302050-001	Market Study	Shell Station	Commercial	11989 Dublin Blvd.	11989 DUBLIN BLVD	6069
03-21-437090-000	Market Study	St. Raymonds Church	Church	11555 Shannon Ave.	11555 SHANNON AVE/IRRG	5885
03-21-255500-000	Market Study	The Springs (Kildara HOA)	Housing Complex (Kildara HOA)	7310 Cronin Cir	7310 CRONIN CIR IRRG	6123
03-21-255410-000	Market Study	The Springs (Kildara HOA)	Housing Complex (Kildara HOA)	0 Amador Ct.	0 AMADOR CT END IRRIG	6122
03-21-255700-000	Market Study	The Springs (Kildara HOA)	Housing Complex (Kildara HOA)	7255 Cronin St.	7255 CRONIN ST/IRRG	6125
03-21-255230-001	Market Study	Town and Country (Chiu Family Trust)	Commercial	7214 San Ramon Rd.	7214 SAN RAMON RD/IRRG	6146
03-21-390010-000	Market Study	Whitney Investments	Commercial	7601 Amador Valley Blvd	7601 AMADOR VALLEY BLVD IRRIG	5943
03-21-976630-000	2010 Assessment	Dublin High School			8151 VILLAGE PKWY / IRRIG	19601
03-21-695020	March 10, 2015 email	Cottonwood Apts	Multi-Family	6511 COTTON WOOD CIR/IRRG	6511 COTTON WOOD CIR/IRRG	5686
03-21-701260	March 10, 2015 email	Cottonwood Apts	Multi-Family	6555 COTTON WOOD CIR/IRRG	6555 COTTON WOOD CIR/IRRG	5689
03-21-701080	March 10, 2015 email	Cottonwood Apts	Multi-Family	6552 COTTON WOOD CIR/IRRG	6552 COTTON WOOD CIR/IRRG	5688
03-21-722100	March 10, 2015 email	Parkwood Apts	Multi-Family	7327 PARKWOOD CIR/IRRG	7327 PARKWOOD CIR/IRRG	5644
03-21-720500	March 10, 2015 email	Parkwood Apts	Multi-Family	7300 PARKWOOD CIR/IRRG	7300 PARKWOOD CIR/IRRG	5668
03-21-721600	March 10, 2015 email	Parkwood Apts	Multi-Family	7325 PARKWOOD CIR/MAINT BLDG I	7325 PARKWOOD CIR/MAINT BLDG I	5643

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APPENDIX B

Summary of Changes in the Key Performance Criteria

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APPENDIX B
Changes in Key Performance Criteria

Several key water system planning and performance criteria have changed since the District's 2005 Water Master Plan to reflect recent standards and to address specific District concerns. These changed criteria are summarized in Table B-1.

Table B-1. Summary of Potable Water System Planning and Performance Criteria Changes

Criteria	2005 Water Master Plan Criteria	2015 Water System Master Plan Criteria	Reason for Change in Criteria
Pipeline Velocity in Transmission Mains	5-7 ft/s for Average Day Demand; 6-8 ft/s for Peak Hour Demand	5 ft/s	Separate, distinct velocity criteria established for transmission mains and distribution mains, with lower velocity in larger diameter transmission mains. Criteria consistent with other water agencies. For the existing water system pipelines, pipeline velocity criteria are not typically used to identify deficient facilities. However, these criteria are used for sizing new transmission and distribution system pipeline facilities.
Pipeline Velocity in Distribution Mains		8 ft/s	
Pipeline Velocity under Fire Flow Conditions	12 ft/s	10 ft/s	Reduced to 10 ft/s to be more conservative. Criteria consistent with other water agencies. For the existing water system pipelines, pipeline velocity criteria are not typically used to identify deficient facilities. However, these criteria are used for sizing new transmission and distribution system pipeline facilities.
Backup Power at Pumping Facilities	Plug-in portable generator	On-site generator for critical stations Plug-in portable generator for less critical stations	There is no regulation on the number of on-site generators and/or portable standby generators that a water utility agency should maintain. The standard practice for emergency preparedness recommends backup power at critical facilities to maintain an acceptable level of service during a power outage[1].
Storage Reservoir Level Assumed at Start of Hydraulic Evaluation for normal operating conditions	100% full	75% full	In the field, tank level fluctuates over time. The assumption of 75 percent full represents the average of the operational storage available at any given time in the District system.
Storage Reservoir Level Assumed at Start of Hydraulic Evaluation for fire flow conditions	100% full	50% full	In the field, tank level fluctuates over time. The assumption of 50 percent full represents the average of the fire storage available at any given time in the District system.

[1] "Is Your Water or Wastewater System Prepared? What You Need to Know About Generators" United States Environmental Protection Agency Mid-Atlantic, EPA 903-F-11-002, March 2011.

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APPENDIX C

Fire Code Requirements
Fire Flow Information Received from Alameda County Fire Department

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CALIFORNIA FIRE CODE – MATRIX ADOPTION TABLE
APPENDIX B – FIRE-FLOW REQUIREMENTS FOR BUILDINGS

(Matrix Adoption Tables are non-regulatory, intended only as an aid to the user.
See Chapter 1 for state agency authority and building applications.)

Adopting Agency	BSC	SFM		HCD			DSA		OSHPD				BSCC	DHS	AGR	DWR	CEC	CA	SL	SLC
		T-24	T-19*	1	2	1/AC	AC	SS	1	2	3	4								
Adopt Entire Chapter																				
Adopt Entire Chapter as amended (amended sections listed below)		X																		
Adopt only those sections that are listed below																				
[California Code of Regulations, Title 19, Division 1]																				
Chapter / Section																				
B105.2		X																		

* The *California Code of Regulations* (CCR), Title 19, Division 1 provisions that are found in the *California Fire Code* are a reprint from the current CCR, Title 19, Division 1 text for the code user's convenience only. The scope, applicability and appeals procedures of CCR, Title 19, Division 1 remain the same.

APPENDIX B
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

SECTION B101
GENERAL

B101.1 Scope. The procedure for determining fire-flow requirements for buildings or portions of buildings hereafter constructed shall be in accordance with this appendix. This appendix does not apply to structures other than buildings.

SECTION B102
DEFINITIONS

B102.1 Definitions. For the purpose of this appendix, certain terms are defined as follows:

FIRE-FLOW. The flow rate of a water supply, measured at 20 pounds per square inch (psi) (138 kPa) residual pressure, that is available for fire fighting.

FIRE-FLOW CALCULATION AREA. The floor area, in square feet (m^2), used to determine the required fire flow.

SECTION B103
MODIFICATIONS

B103.1 Decreases. The fire chief is authorized to reduce the fire-flow requirements for isolated buildings or a group of buildings in rural areas or small communities where the development of full fire-flow requirements is impractical.

B103.2 Increases. The fire chief is authorized to increase the fire-flow requirements where conditions indicate an unusual susceptibility to group fires or conflagrations. An increase shall not be more than twice that required for the building under consideration.

B103.3 Areas without water supply systems. For information regarding water supplies for fire-fighting purposes in rural and suburban areas in which adequate and reliable water supply systems do not exist, the fire code official is authorized to utilize NFPA 1142 or the *California Wildland-Urban Interface Code*.

SECTION B104
FIRE-FLOW CALCULATION AREA

B104.1 General. The fire-flow calculation area shall be the total floor area of all floor levels within the exterior walls, and under the horizontal projections of the roof of a building, except as modified in Section B104.3.

B104.2 Area separation. Portions of buildings which are separated by fire walls without openings, constructed in accordance with the *California Building Code*, are allowed to be considered as separate fire-flow calculation areas.

B104.3 Type IA and Type IB construction. The fire-flow calculation area of buildings constructed of Type IA and Type IB construction shall be the area of the three largest successive floors.

Exception: Fire-flow calculation area for open parking garages shall be determined by the area of the largest floor.

SECTION B105
FIRE-FLOW REQUIREMENTS FOR BUILDINGS

B105.1 One- and two-family dwellings. The minimum fire-flow and flow duration requirements for one- and two-family

dwellings having a fire-flow calculation area that does not exceed 3,600 square feet (344.5 m^2) shall be 1,000 gallons per minute (3785.4 L/min) for 1 hour. Fire-flow and flow duration for dwellings having a fire-flow calculation area in excess of 3,600 square feet (344.5m^2) shall not be less than that specified in Table B105.1.

Exception: A reduction in required fire-flow of 50 percent, as approved, is allowed when the building is equipped with an approved automatic sprinkler system.

B105.2 Buildings other than one- and two-family dwellings. The minimum fire-flow and flow duration for buildings other than one- and two-family dwellings shall be as specified in Table B105.1.

Exceptions:

1. A reduction in required fire-flow of up to 75 percent, as approved, is allowed when the building is provided with an approved automatic sprinkler system installed in accordance with Section 903.3.1.1 or 903.3.1.2. The resulting fire-flow shall not be less than 1,500 gallons per minute (5678 L/min) for the prescribed duration as specified in Table B105.1.
2. *[SFM] Group B, S-2 and U occupancies having a floor area not exceeding 1,000 square feet, primarily constructed of noncombustible exterior walls with wood or steel roof framing, having a Class A roof assembly, with uses limited to the following or similar uses:*
   - *2.1. California State Parks buildings of an accessory nature (restrooms).*
   - *2.2. Safety roadside rest areas, (SRRA), public restrooms.*
   - *2.3. Truck inspection facilities, (TIF), CHP office space and vehicle inspection bays.*
   - *2.4. Sand/salt storage buildings, storage of sand and salt.*

TABLE B105.1
MINIMUM REQUIRED FIRE-FLOW AND FLOW DURATION FOR BUILDINGS

FIRE-FLOW CALCULATION AREA (square feet)					FIRE-FLOW (gallons per minute)[b]	FLOW DURATION (hours)
Type IA and IB[a]	Type IIA and IIIA[a]	Type IV and V-A[a]	Type IIB and IIIB[a]	Type V-B[a]		
0-22,700	0-12,700	0-8,200	0-5,900	0-3,600	1,500	2
22,701-30,200	12,701-17,000	8,201-10,900	5,901-7,900	3,601-4,800	1,750	
30,201-38,700	17,001-21,800	10,901-12,900	7,901-9,800	4,801-6,200	2,000	
38,701-48,300	21,801-24,200	12,901-17,400	9,801-12,600	6,201-7,700	2,250	
48,301-59,000	24,201-33,200	17,401-21,300	12,601-15,400	7,701-9,400	2,500	
59,001-70,900	33,201-39,700	21,301-25,500	15,401-18,400	9,401-11,300	2,750	
70,901-83,700	39,701-47,100	25,501-30,100	18,401-21,800	11,301-13,400	3,000	3
83,701-97,700	47,101-54,900	30,101-35,200	21,801-25,900	13,401-15,600	3,250	
97,701-112,700	54,901-63,400	35,201-40,600	25,901-29,300	15,601-18,000	3,500	
112,701-128,700	63,401-72,400	40,601-46,400	29,301-33,500	18,001-20,600	3,750	
128,701-145,900	72,401-82,100	46,401-52,500	33,501-37,900	20,601-23,300	4,000	4
145,901-164,200	82,101-92,400	52,501-59,100	37,901-42,700	23,301-26,300	4,250	
164,201-183,400	92,401-103,100	59,101-66,000	42,701-47,700	26,301-29,300	4,500	
183,401-203,700	103,101-114,600	66,001-73,300	47,701-53,000	29,301-32,600	4,750	
203,701-225,200	114,601-126,700	73,301-81,100	53,001-58,600	32,601-36,000	5,000	
225,201-247,700	126,701-139,400	81,101-89,200	58,601-65,400	36,001-39,600	5,250	
247,701-271,200	139,401-152,600	89,201-97,700	65,401-70,600	39,601-43,400	5,500	
271,201-295,900	152,601-166,500	97,701-106,500	70,601-77,000	43,401-47,400	5,750	
295,901-Greater	166,501-Greater	106,501-115,800	77,001-83,700	47,401-51,500	6,000	
—	—	115,801-125,500	83,701-90,600	51,501-55,700	6,250	
—	—	125,501-135,500	90,601-97,900	55,701-60,200	6,500	
—	—	135,501-145,800	97,901-106,800	60,201-64,800	6,750	
—	—	145,801-156,700	106,801-113,200	64,801-69,600	7,000	
—	—	156,701-167,900	113,201-121,300	69,601-74,600	7,250	
—	—	167,901-179,400	121,301-129,600	74,601-79,800	7,500	
—	—	179,401-191,400	129,601-138,300	79,801-85,100	7,750	
—	—	191,401-Greater	138,301-Greater	85,101-Greater	8,000	

For SI: 1 square foot = 0.0929 m^2, 1 gallon per minute = 3.785 L/m, 1 pound per square inch = 6.895 kPa.

a. Types of construction are based on the *California Building Code*.

b. Measured at 20 psi residual pressure.

SECTION B106
REFERENCED STANDARDS

>	ICC	IWUIC—12	California Wildland-Urban Interface Code	B103.3
	NFPA	1142—12	Standard on Water Supplies for Suburban and Rural Fire Fighting	B103.3

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Table C-1. Fire Flow Requirement Received from Alameda County Fire Department

Parcel Number	Address	Owner	Land Use Type	Fire Flow Duration, hour	Fire Flow Requirement Confirmed by Alameda County Fire Department		
					Fire Flow Requirement, gpm	Up to 75% Reduction (resulting fire flow shall not be less than 1,500 gpm)	Sprinkler System, gpm
941-0022-006-00 941-0022-005-00 941-0022-004-00	7500 INSPIRATION DR	Valley Christian Center of Dublin	Church, School	4	5,500	1,500	4,000
941-1570-003-00	11555 DUBLIN BLVD	DeSilva Gates Construction	Commercial/Office	4	6,500	1,625	4,000
941-1560-009-01	11711 DUBLIN BLVD	Hexcel Corporation	Industrial Light/Manufacturing	4	4,250	1,500	4,000
985-0002-006-03	6363 TASSAJARA RD	Quarry Lane School	School	4	8,000	2,000	4,000
941-1570-004-03	11501 DUBLIN BLVD	Bicentennial Square	Commercial/Office	4	5,500	1,500	4,000
NA	11600 SHANNON AVE	Shannon Park Community Center	Community Center/ Semi-Public	3	3,750	1,500	3,000
NA	11557 SHANNON AVE	St. Raymonds School	School	3	3,750	1,500	3,000

Source: Alameda County Fire Department, July 2015.

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APPENDIX D

Evaluation of Future Storage Reservoir Locations

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APPENDIX D
Evaluation of Future Storage Reservoir Locations

As part of the Dublin San Ramon Services District (District or DSRSD) Water System Master Plan Update, District staff requested West Yost Associates (West Yost) to evaluate and perform hydraulic analyses for potential alternative locations for proposed future potable water storage reservoirs in Pressure Zones 1 and 20. A description of the evaluation findings and recommendations is provided below.

1.1 OVERVIEW

Based on recommendations made in the District's 2005 Water Master Plan, two future potable water reservoirs were recommended and are included in the District's current capital improvement program. These future potable water reservoirs are Reservoir 1C in Pressure Zone 1 and Reservoir 20B in Pressure Zone 20. Future Reservoir 1C was previously proposed to be located just north of Reservoir 1B (also referred to as the Dougherty Reservoir) with a capacity of 2.74 million gallons (MG) and future Reservoir 20B was proposed to be located adjacent to existing Reservoir 20A with a capacity of 1.52 million gallons.

For Pressure Zone 1, the District identified the following three potential storage locations:

- North of the Reservoir 1B (Dougherty Reservoir) (as previously proposed);
- At the District's existing Reservoir 10A site (using either the existing or a new Reservoir 10A); or
- At the City of Pleasanton's existing Tassajara Reservoir (which would involve the District trading the existing Reservoir 10A for the City of Pleasanton's Tassajara Reservoir)[1].

For Pressure Zone 20, the District identified the following three potential storage locations:

- Adjacent to the District's existing Reservoir 20A (as previously proposed);
- At the Moller Ranch West (Casamira Valley) Development Property in Dublin; or
- At an area southeast of Dougherty Valley, near the existing Windemere Development.

Figure 1 presents location of these potential storage reservoir sites. The following sections discuss the hydraulic evaluation for each potential storage location in Pressure Zone 1 and Pressure Zone 20.

[1] Since the completion of the storage evaluation conducted in coordination with this Water System Master Plan, the City of Pleasanton has moved forward with the conversion of the Tassajara Reservoir from a potable water reservoir to a recycled water reservoir. Therefore, this reservoir is no longer an available option for potable water storage for the District.

1.2 ANALYSIS ASSUMPTIONS

1.2.1 Demand Assumptions

All of the hydraulic model evaluations for this storage evaluation were conducted under the buildout (2035) maximum day demand condition (see Chapter 3 for additional information).

1.2.2 Zone 7 Turnout Assumptions

The hydraulic grade line of the Zone 7 turnouts assumed in the hydraulic model are listed below.

- Turnout 1 at 529 feet;
- Turnout 2 at 493 feet;
- Turnout 4 at 552 feet;
- Turnout 5 at 543 feet; and
- Turnout 6 (proposed) at 546 feet.

1.2.3 Future Potable Water Storage Requirements

As part of the 2015 Water System Master Plan work, West Yost evaluated the future storage capacity required in each of the District's pressure zones (see Chapter 6). Table 1 presents a summary of the required storage capacity in Pressure Zones 1 and 20 under the buildout demand condition.

Table 1. Summary of Required Storage Capacity under Buildout Demand Condition

Pressure Zone	Available Storage Capacity, MG	Required Storage Capacity, MG			Total Required Storage, MG	Storage Surplus (Deficit), MG
		Operational	Emergency	Fire Flow		
1	10.35[a]	3.44	6.89	1.08	11.41	(1.06)
20	3.3[b]	1.20	2.40	0.96	4.56	(1.26)

[a] Includes existing Reservoirs 1A (2 MG), 1B (2.35 MG), 10A (3 MG) and 10B (3 MG).
[b] Includes existing Reservoir 20A (3.3 MG).
MG = million gallons

As shown in Table 1, with the existing reservoirs in Pressure Zone 1, there is a storage deficit of 1.06 MG under the buildout demand condition in Pressure Zone 1. With the existing reservoir in Pressure Zone 20, there is a storage deficit of 1.26 MG under the buildout demand condition in Pressure Zone 20.

It should be noted that the District has not regularly operated the existing Reservoir 10A as its hydraulic grade line is 17.5 feet higher than the other reservoirs in Pressure Zone 1. The District had previously planned to replace existing Reservoir 10A with the previously proposed Reservoir 1C, as the existing Reservoir 10A is also quite old (constructed in the 1940s). If existing Reservoir 10A will be replaced with a new reservoir in Pressure Zone 1, the required capacity of

the new reservoir would need to be 4.1 MG (3.0 MG to replace the capacity of existing Reservoir 10A plus 1.06 MG for the Pressure Zone 1 storage deficit under the buildout demand condition).

1.3 POTENTIAL RESERVOIR SITES EVALUATED

1.3.1 Pressure Zone 1

The following describes the potential new reservoir sites evaluated in Pressure Zone 1.

1.3.1.1 Previously Proposed Reservoir 1C Site

The previously proposed Reservoir 1C site is located north of the existing Reservoir 1B (Dougherty Reservoir). Based on the required storage capacities described above, the proposed volume of the storage reservoir is 4.1 MG. The base elevation of the proposed reservoir would be 505 feet with an overflow height of 520.5 feet. This overflow height would be consistent with hydraulic grade line in the Pressure Zone 1 which is 520.5 feet.

Because this proposed site is located on an open space site, there are major pipelines that need to be installed to fill the storage reservoir and serve the Pressure Zone 1 potable water system:

- To fill Reservoir 1C, a total of 3,205 lineal feet of a new 12-inch diameter pipeline would be required to deliver water from the Zone 7 Turnout 2 through the District's Pump Station 1A. An altitude valve would be required to control the fill cycle of the storage tank and separate inlet and outlet pipelines would be required.
- To serve Pressure Zone 1 from Reservoir 1C, new 12-inch diameter pipelines are required to convey water from the storage tank to the Stagecoach Road connection and to the Shady Creek Road connection. The total pipeline length is approximately 1,913 lineal feet.

West Yost used the hydraulic model to review the hydraulic impact of the future Reservoir 1C to the Pressure Zone 1 system. Figure 2 presents the Pressure Zone 1 reservoir level trends over a 72-hour simulation period. For this hydraulic simulation, West Yost adjusted the operation of Zone 7 Turnouts 4 and 5 to be based on the Reservoir 10B level.

Figure 3A presents system pressure trends for selected nodes in Pressure Zone 1 with the future Reservoir 1C in service. The location of selected nodes are graphically presented on Figure 4. Results indicated that system pressures over a 72-hour period for Node J11247, which is located at higher topology, ranged from 41 to 48 psi.

1.3.1.2 Existing Reservoir 10A Site

The existing Reservoir 10A in Pressure Zone 1 has a volume of 3.0 MG. The existing Reservoir 10A has a hydraulic grade line of 538 feet which is 17.5 feet higher than the Pressure Zone 1 potable water system. Due to its higher hydraulic grade line compared to Pressure Zone 1, the District has not been able to optimize the operation of this reservoir. As part of this storage evaluation, West Yost reviewed and adjusted the operation of Pump Station 10A and the Pressure Regulator at existing Reservoir 10A to optimize the use of existing Reservoir 10A. The operation

of Pump Station 10A was adjusted to fill the existing Reservoir 10A based on the reservoir level. The Pressure Regulator that supplies water from existing Reservoir 10A was adjusted to operate only when Pump Station 10A was not operating.

The hydraulic model was used to review and identify if there is a hydraulic impact to the Pressure Zone 1 potable water system, and how the existing reservoirs in Pressure Zone 1 were impacted by the operation of existing Reservoir 10A. Figure 5A presents the Pressure Zone 1 reservoir level trends over a 72-hour simulation period.

Figure 3A presents system pressure trends for selected nodes in Pressure Zone 1 with existing Reservoir 10A in service. Results indicated that system pressures for Node J11247 ranged from 33 to 47 psi over the 72-hour simulation period.

It should be noted that even if operations could be adjusted to operate the existing Reservoir 10A more efficiently at its current elevation, the existing Reservoir 10A is quite old (constructed in the 1940s) and there would still be a storage deficit of 1.06 MG in Pressure Zone 1 (see Table 1). Therefore, a preferable option would be to replace existing Reservoir 10A with a new larger reservoir at the same location (new Reservoir 10A with a capacity of 4.1 MG) and constructed at a lower elevation to meet the hydraulic grade line of Pressure Zone 1.

The hydraulic model was used to review and identify if there is a hydraulic impact to the Pressure Zone 1 potable water system, and how the existing reservoirs in Pressure Zone 1 would be impacted by the operation of a new Reservoir 10A. Figure 5B presents the Pressure Zone 1 reservoir level trends over a 72-hour simulation period.

Figure 3B presents system pressure trends for selected nodes in Pressure Zone 1 with a new Reservoir 10A in service. Results indicated that system pressures for Node J11247 ranged from 37 to 45 psi over the 72-hour simulation period.

1.3.1.3 Tassajara Reservoir

The existing Tassajara Reservoir is currently owned and operated by the City of Pleasanton. It is located on North Dublin Ranch. The reservoir capacity is 8.2 MG with a hydraulic grade line of 515 feet. The hydraulic grade line of the District's Pressure Zone 1 is 520.5 feet. The Tassajara Reservoir hydraulic grade line is 5.5 feet lower than the Pressure Zone 1 hydraulic grade line. To operate the Tassajara Reservoir as a District Pressure Zone 1 facility, a pump station would be required to lift the hydraulic grade line from the reservoir into the Pressure Zone 1 service area. Another pump station would also be required to fill the tank when the tank level drops. The pump stations would be connected to the District's existing 18-inch diameter transmission main located along North Dublin Ranch.

Because of the elevation of the Tassajara Reservoir, and the need to pump from it to serve the District's Pressure Zone 1, West Yost did not model the Tassajara Reservoir for the Pressure Zone 1 storage analysis.

1.3.2 Pressure Zone 20

The following describes the potential new reservoir sites evaluated in Pressure Zone 20.

1.3.2.1 Adjacent to Existing Reservoir 20A

The District previously planned to construct the future Reservoir 20B adjacent to the existing Reservoir 20A. The existing Reservoir 20A site has space for an additional storage tank. There is an existing 16-inch diameter transmission main that could be connected to the future Reservoir 20B. The hydraulic model was adjusted to include the future Reservoir 20B at the existing Reservoir 20A site.

Figure 6 presents the simulated reservoir level trends over a 72-hour simulation period. Results indicated that the new reservoir could serve the Pressure Zone 20 demands. The reservoir level trend indicated that all reservoirs in Pressure Zone 20 could turn over within a 24-hour period. The system pressure trends for selected nodes in Pressure Zone 20 over a 72-hour period are presented on Figure 7A. System pressure over a 72-hour period for Node J201891, which is located at higher topology, ranged from 41 to 61 psi.

1.3.2.2 Moller Ranch West (Casamira Valley) Development

Due to the growth and available land in Pressure Zone 20, the District is considering to potentially locate Reservoir 20B at the planned Moller Ranch West (Casamira Valley) Development. Based on the grading map for the proposed development provided by the District[2], the open space near Parcel C on the map indicated an elevation suitable for Reservoir 20B. The hydraulic grade line for the Pressure Zone 20 is 695 feet. The base elevation required for Reservoir 20B would need to be located at 670 feet with a tank height of 25 feet. At this reservoir site, the District would be required to construct approximately 1,824 lineal feet of a new 12-inch diameter pipeline. This new main would be connected to the existing 12-inch diameter pipeline on Tassajara Road.

Because this storage site is located inside a new development area, the District will be required to coordinate with the Project Proponent to obtain the site for Reservoir 20B.

Figure 8 presents the proposed reservoir level trends over a 72-hour period. Results indicated that the new reservoir could serve the Pressure Zone 20 buildout demands. The system pressure trends for selected nodes over a 72-hour period were presented on Figure 7A. Results indicated that system pressure for Node J201891, which is located at higher topology, ranged from 42 to 61 psi.

1.3.2.3 Existing Windemere Development

Due to available land near the existing Windemere Development, the District is considering to potentially locate Reservoir 20B in this area (southeast of Dougherty Valley). The hydraulic grade line for the Pressure Zone 20 is 695 feet. The base elevation required for Reservoir 20B would need to be located at 670 feet with a tank height of 25 feet. At this reservoir site, the District would

[2] Moller Ranch-Braddock & Logan Properties – Vesting Tentative Tract Map No. 8102: Preliminary Grading Plan, October 22, 2012.

be required to construct approximately 8,674 lineal feet of a new 12-inch diameter pipeline. This new main would be connected to the existing 12-inch diameter pipeline on Tassajara Road.

Because this storage site would be located in an undeveloped parcel within Contra Costa County, the District will be required to coordinate with the property owner to obtain the site for Reservoir 20B.

Figure 9 presents the proposed reservoir level trends over a 72-hour period. Results indicated that the new reservoir could serve the Pressure Zone 20 buildout demands. The system pressure trends for selected nodes over a 72-hour period were presented on Figure 7B. Results indicated that system pressure for Node J201891, which is located at higher topology, ranged from 42 to 61 psi.

1.4 COST COMPARISON

Table 2 presents the total construction cost estimate for each of the following potential reservoir sites evaluated:

- For Pressure Zone 1:
  - — Construction of a new Reservoir 1C;
  - — Use of existing Reservoir 10A, plus construction of a new 1.06 MG reservoir at another location;
  - — Construction of a new larger reservoir at existing Reservoir 10A site (capacity of 4.1 MG); and
  - — Use of existing Tassajara Reservoir with new pumping facilities.
- For Pressure Zone 20:
  - — Construction of a new Reservoir 20B adjacent to existing Reservoir 20A;
  - — Construction of a new Reservoir 20B at Moller Ranch; and
  - — Construction of a new Reservoir 20B at Windemere.

Because the Tassajara Reservoir site has an existing storage tank, there was no new storage tank cost for this site; however, costs for pumping facilities and pipelines were estimated for this potential reservoir site. The total construction cost estimate does not include land acquisition, facility trading process cost, roadway and grading at the potential new tank sites.

Table 2. Estimated Construction Cost for Alternative Reservoir Sites[a,b,c]

	Pressure Zone 1 Sites				Pressure Zone 20 Sites		
Improvement Description	Reservoir 1C (4.1 MG)	Reservoir 10A (Existing Reservoir)[d]	Reservoir 10A (new 4.1 MG)	Tassajara Reservoir	Reservoir 20B at Reservoir 20A	Reservoir 20B at Moller Ranch	Reservoir 20B at Windemere
New Pipelines	$ 2,292,000	$ -	$ -	$ -	$ 3,885,000	$ 817,000	$ 3,885,000
New Altitude Valve	$ 457,000	$ -	$ -	$ 457,000	$ -	$ -	$ -
New Storage Tank	$ 7,436,000	$ 3,549,000	$ 7,436,000	$ -	$ 3,718,000	$ 3,718,000	$ 3,718,000
Demolition of Existing Storage Tank	$ -	$ -	$ 200,000	$ -	$ -	$ -	$ -
New Pump Station[e]	$ -	$ -	$ -	$ 2,871,000	$ -	$ -	$ -
Property Purchase						$ 150,000	$ 150,000
Total Capital Cost	$ 10,185,000	$ 3,549,000	$ 7,636,000	$ 3,328,000	$ 7,603,000	$ 4,685,000	$ 7,753,000

[a] Costs shown are based on the October 2015 SF ENR CCI of 11169.

[b] Total rounded to nearest $1000. Costs include base construction costs plus 30 percent design and construction contingency.

[c] Costs include mark-ups equal to 30 percent (Professional Services: 30 percent of construction costs).

[d] Construction cost to keep the existing Reservoir 10A in service is zero because it is an existing facility; however, a new 1.06 MG reservoir would be required.

[e] Total capital cost estimate for pump station at the Tassajara Reservoir includes a pump station with a total pumping capacity of 3.24 mgd.

1.5 STORAGE SITE EVALUATION

1.5.1 Evaluation Criteria and Scoring System

The following criteria were considered in the evaluation of the potential reservoir sites:

- Current Land Use;
- Constructability/Site Access;
- Operational Concerns;
- New Facilities Required;
- Estimated Capital Cost; and
- Environmental Concerns/Issues.

Tables 3 and 4 provide summary descriptions for each of the potential reservoir sites in Pressure Zones 1 and 20, respectively, based on the matrix evaluation criteria. For Tables 3 and 4, a color-coded scoring system was established and used to rate and compare the potential sites based on each of the evaluation criteria:

- GREEN was assigned when the proposed site had no identified issues;
- YELLOW was assigned when the proposed site had only minor identified issues; and
- RED was assigned when the proposed site had major identified issues.

1.6 CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation and rating for each of the criteria for each of the potential reservoir sites, the following reservoir sites are recommended:

- For Pressure Zone 1:
  - The existing Reservoir 10A site ranked the highest with the assumption that a new Reservoir 10A would be constructed at this location with a larger storage volume (4.1 MG) than the existing Reservoir 10A (3.0 MG) and at an elevation suitable for operation in Pressure Zone 1.
  - **Recommendation: Construct new and larger Reservoir 10A (4.1 MG) at existing Reservoir 10A site at an elevation suitable for operation in Pressure Zone 1.**
- For Pressure Zone 20:
  - The proposed site at Windemere is ranked the highest, primarily due to (1) eagle nesting concerns at the site adjacent to existing Reservoir 20A and (2) possible permitting issues at the Moller Ranch site.
  - **Recommendation: Construct new Reservoir 20B (1.3 MG) at Windemere site.**

Table 3. Matrix Evaluation for Potential Reservoir Sites in Zone 1[(a)]

	Reservoir 1C	Existing Reservoir 10A	New Reservoir 10A	Tassajara Reservoir
Current Land Use	• The General Plan land use designation for this site is Open Space. Use of this site for a new reservoir will require the site to be rezoned.	• Existing reservoir site owned by DSRSD.	• Existing reservoir site owned by DSRSD.	• Existing reservoir site owned by City of Pleasanton. District would need to negotiate with the City of Pleasanton to purchase or lease the reservoir.
Constructability/Site Access	• Site requires new road access from Dougherty Reservoir. • May require site grading. • District would need to negotiate with the property owner to purchase or lease the reservoir site.	• Existing facility with existing road.	• Existing facility with existing road.	• Existing facility with existing road.
Operational Concerns	• Storage tank would connect to the discharge side of the Pump Station 1A located on Amador Valley Boulevard. • Hydraulic results for buildout demand conditions indicate that this storage site would improve system pressure at the highest point on the Crossridge Road. The simulated system pressure was above 40 psi which meets the District's peak hour system pressure criteria. • Hydraulic results are presented on Figures 2 and 3.	• Existing Pump Station 10A would be operated to fill the reservoir from Zone 1. • Existing Pressure Regulator at the Pump Station 10A would allow the reservoir to serve Zone 1 and it would be off-line when the Pump Station 10A is operating. • Hydraulic results for buildout demand conditions indicate that the simulated system pressure at the highest point (elevation at 416 feet) on Crossridge Road was 33 psi **which does not meet the District's peak hour system pressure criteria at 40 psi**. This location has a static pressure of 45 psi, based on the Zone 1 tank overflow elevation of 520.5 feet. • Hydraulic results are presented on Figure 5A.	• Operational concerns described for the existing Reservoir 10A can be eliminated by replacing the existing Reservoir 10A with a new Reservoir 10A constructed at lower hydraulic grade line than the existing Reservoir 10A to meet the hydraulic grade line of Pressure Zone 1. • Hydraulic results for buildout demand conditions indicate that the simulated system pressure at the highest point (elevation at 416 feet) on Crossridge Road was 37 psi **which does not meet the District's peak hour system pressure criteria at 40 psi.** This location has a static pressure of 45 psi, based on the Zone 1 tank overflow elevation of 520.5 feet. • Hydraulic results are presented on Figure 5B.	• A new pump station at Tassajara Reservoir would be required to serve Zone 1. • A new altitude valve may be required to fill the reservoir when the pumps are off-line to avoid circular flow at the pump station. • **Either Pump Station 1A or Zone 7 Turnouts 1 and 4 may need to be adjusted to allow the new pump station to pump water from Tassajara Reservoir into Zone 1.**
New Facilities Required	• New pipelines (5,115 LF of 12-inch diameter). • New altitude valve. • New storage tank (4.1 MG) with on-site improvements.	• An additional 1.06 MG Reservoir would be required to meet Zone 1 storage deficit at buildout (see Table 1).	• New storage tank (4.1 MG) with on-site improvements. • Demolition of existing storage tank	• New altitude valve. • New pump station (3.24 mgd) with on-site improvements to connect into the DSRSD potable water system.
Estimated Capital Cost	• Total estimated capital cost = $10.2M (see Table 2). • Need to purchase land/lease from current property owner. Land costs are not included in the capital cost estimate.	• Total estimated capital cost = $3.5M (see Table 2). • May need to purchase land/lease from current property owner. Land costs and additional piping to site are not included in the capital cost estimate.	• Total estimated capital cost (storage and demolition) = $7.6M (see Table 2).	• Total estimated capital cost = $3.3M (see Table 2). • Need to purchase or lease Tassajara Reservoir from City of Pleasanton. • Reservoir purchase/lease cost is not included in the capital cost estimate.
Environmental Concerns/Issues	• Site would require environmental study because this site is currently designated as Open Space.	• Site may require environmental study.	• Demolition permit.	• None---this is an existing facility.

[(a)] All hydraulic evaluations assumed a new parallel 16-inch diameter pipeline along Amador Valley from Village way to Donohue Drive (approximately 1,786 lf) is constructed, and a 16-inch diameter pipeline that would replace the existing 12-inch diameter pipeline (367 lf) from the downstream of the Pump Station 1A to Iron Horse Trail is constructed.

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Table 4. Matrix Evaluation for Potential Reservoir Sites in Zone 20

	Next to Existing Reservoir 20A	At Moller Ranch West (Casamira Valley)	At area southeast of Dougherty Valley (Windemere)
Current Land Use	• Existing reservoir site is owned by DSRSD.	• Currently, this site is a vacant lot. The General Plan land use designation for this site is Rural Residential. Use of this site for a new reservoir may require the site to be re-zoned.	• Site would be on a vacant lot (not currently owned by DSRSD).
Constructability/Site Access	• Existing reservoir site with existing access road. • Space exists at the existing reservoir site for a second reservoir. • May require side berm. • Extensive site grading will be required (District estimated to be $1M).	• Site is vacant and it requires site grading. • May require cut and fill for the site. • May require partially buried tank, or side berm will be required. • District would need to negotiate with the property owner to purchase or lease the reservoir site.	• Site is vacant and it requires site grading. • May require cut and fill for the site. • May require partially buried tank, or side berm will be required. • District would need to negotiate with property owner to purchase or lease the reservoir site.
Operational Concerns	• This reservoir would connect to the existing 16-inch diameter pipeline at the existing Reservoir 20A site. • There would be no required change in the operation of the District's pump stations. • Hydraulic results for buildout demand conditions indicate that the simulated system pressure at Cantalise Drive (which is located at pressure zone break between Zone 20 and Zone 30) ranged from 38 to 59 psi over a 72-hour period. This location has an elevation of 600 feet, and a static pressure of 41 psi based on the Zone 20 tank overflow elevation of 695 feet. • Hydraulic results are presented on Figures 6 and 7A.	• This reservoir would require the construction of a new 12-inch diameter pipeline extending from the existing 12-inch diameter pipeline along Tassajara Road to the site (estimated length 1,824 LF). • There would be no required change in the operation of the District's pump stations. • Hydraulic results for buildout demand conditions indicate that the simulated system pressure at Cantalise Drive (which is located at pressure zone break between Zone 20 and Zone 30) ranged from 39 to 58 psi over a 72-hour period. • Hydraulic results are presented on Figures 7A and 8.	• This reservoir would require the construction of a new 12-inch diameter pipeline extending from the existing 12-inch diameter pipeline along Tassajara Road to the site (estimated length 8,674 LF). • There would be no required change in the operation of the District's pump stations. • Hydraulic results for buildout demand conditions indicate that the simulated system pressure at Cantalise Drive (which is located at pressure zone break between Zone 20 and Zone 30) ranged from 39 to 59 psi over a 72-hour period. • Hydraulic results are presented on Figures 7B and 9.
New Facilities Required	• New storage tank (1.26 MG) with on-site improvements.	• New storage tank (1.26 MG) with on-site improvements. • New 12-inch diameter pipeline (1,824 LF).	• New storage tank (1.26 MG) with on-site improvements. • New 12-inch diameter pipeline (8,674 LF).
Estimated Capital Cost	• Total estimated capital cost = $3.7M (see Table 2).	• Total estimated capital cost = $4.7M (see Table 2). • Cost includes purchase of land from current property owner (estimated to be $150,000).	• Total estimated capital cost = $7.7M (see Table 2). • Cost includes purchase of land from current property owner (estimated to be $150,000).
Environmental Concerns/Issues	• Site has known golden eagle nesting. The golden eagle nesting period generally ranges from January 1 to June 30, with peak activity from mid-February to April. The scheduling of the construction activities would need to be arranged to be outside of the nesting season.	• Site is currently vacant, and may require environmental study before the construction of a new storage reservoir.	• Site is currently vacant, and may require environmental study before the construction of a new storage reservoir.

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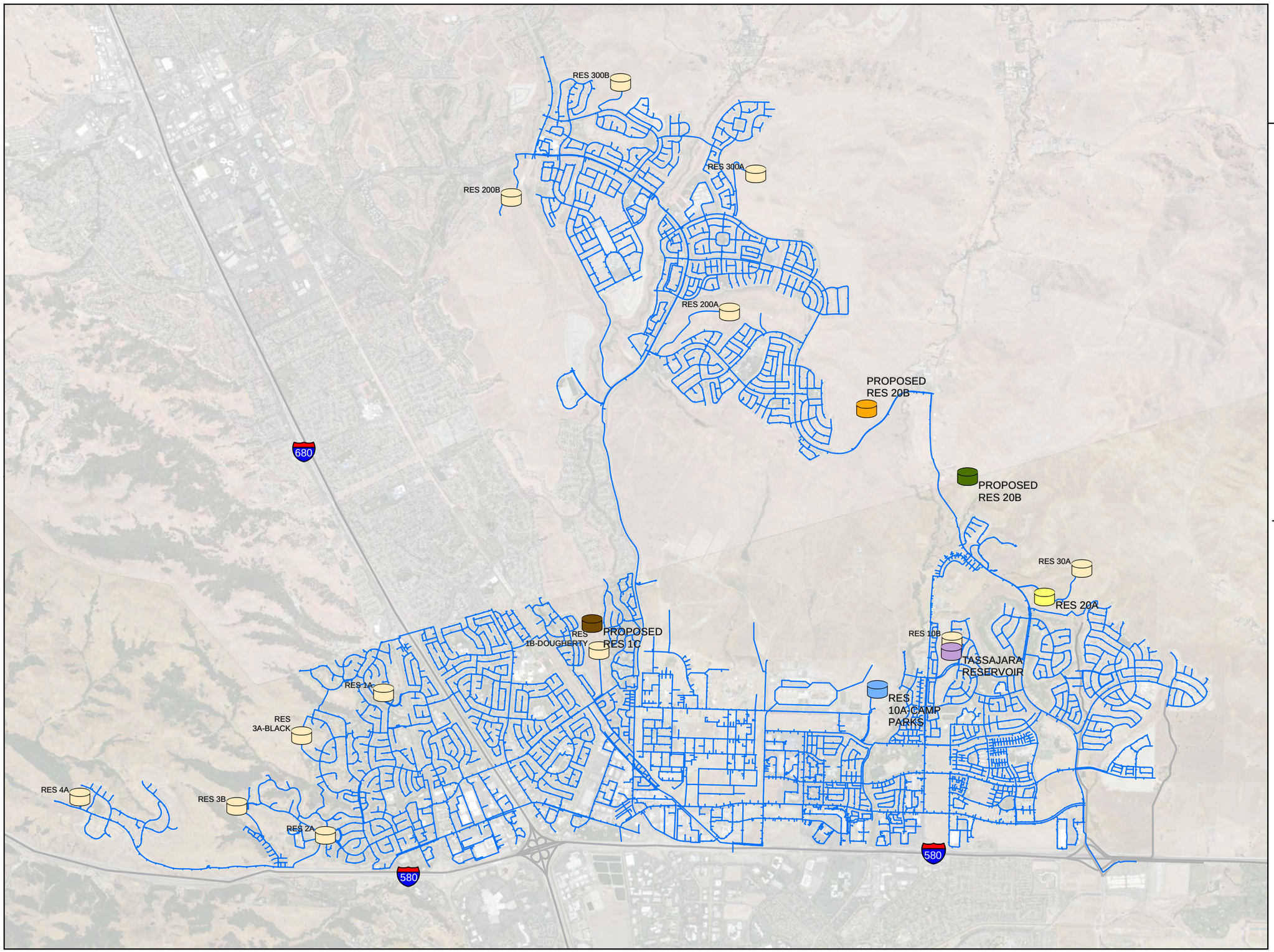
Last Saved: 3/18/2016 5:11:10 PM akwong; O:\Clients\406 DSRSD\02-14-38 Wtr Sys MP Capacity Study\GIS\Figures\StorageTM\Figure 1_Tank Location.mxd

FIGURE 1

Dublin San Ramon Services District Future Storage Tank Sites Evaluation

STORAGE SITE LOCATIONS



N

0 1,800 3,600

Scale in Feet

LEGEND

- Existing Reservoirs
- Existing Reservoir 10A
- Proposed Reservoir 20B at Reservoir 20A
- Proposed Reservoir 20B at Windemere
- Proposed Reservoir 20B at Moller Ranch
- Proposed Reservoir 1C
- City of Pleasanton Tassajara Reservoir
- Existing Pipelines

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Consulting Engineers

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Figure 2. Zone 1 Reservoir Level Trendings with Reservoir 1C

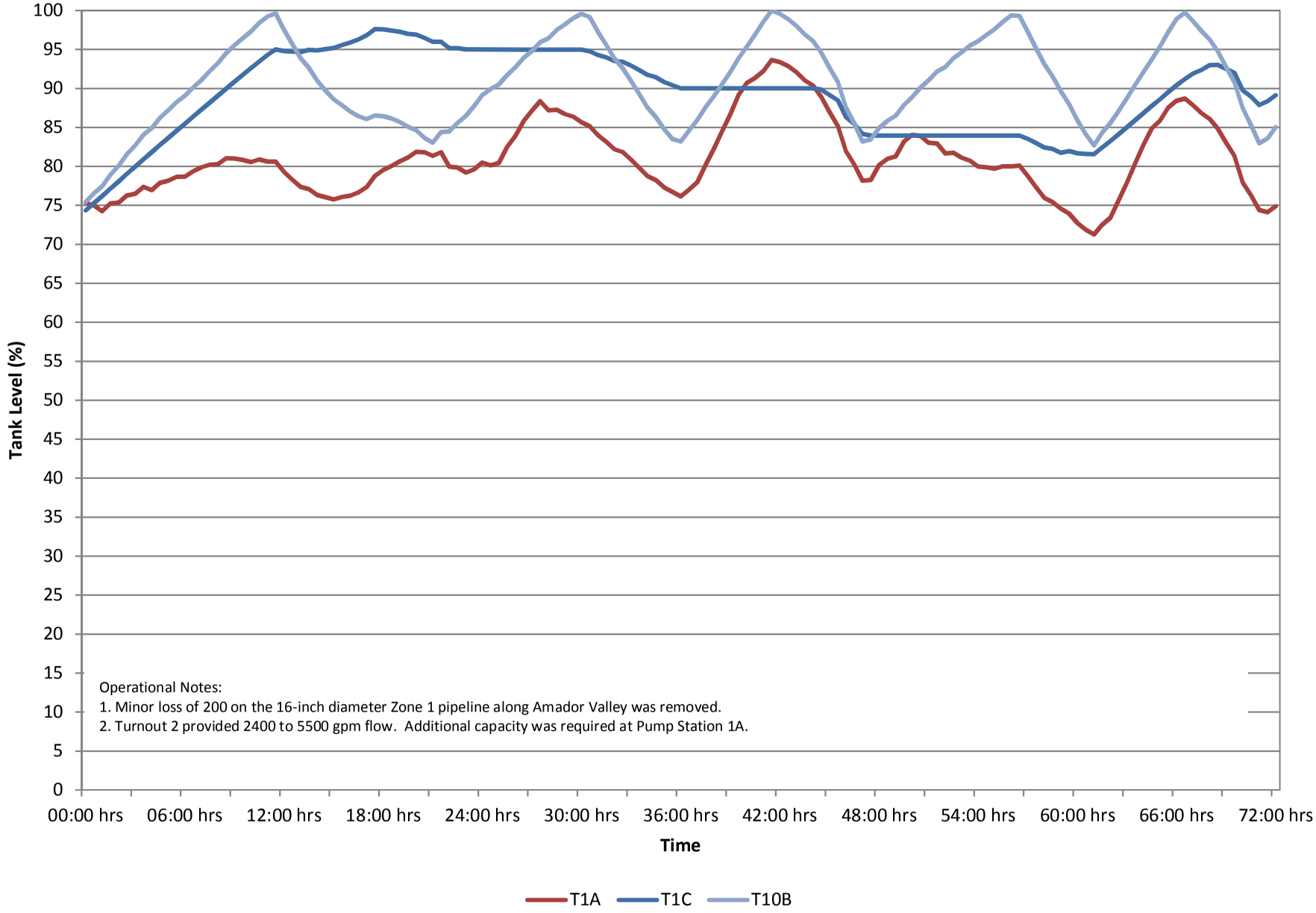

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Figure 3A. System Pressure of Selected Node in Pressure Zone 1 over 72-Hours

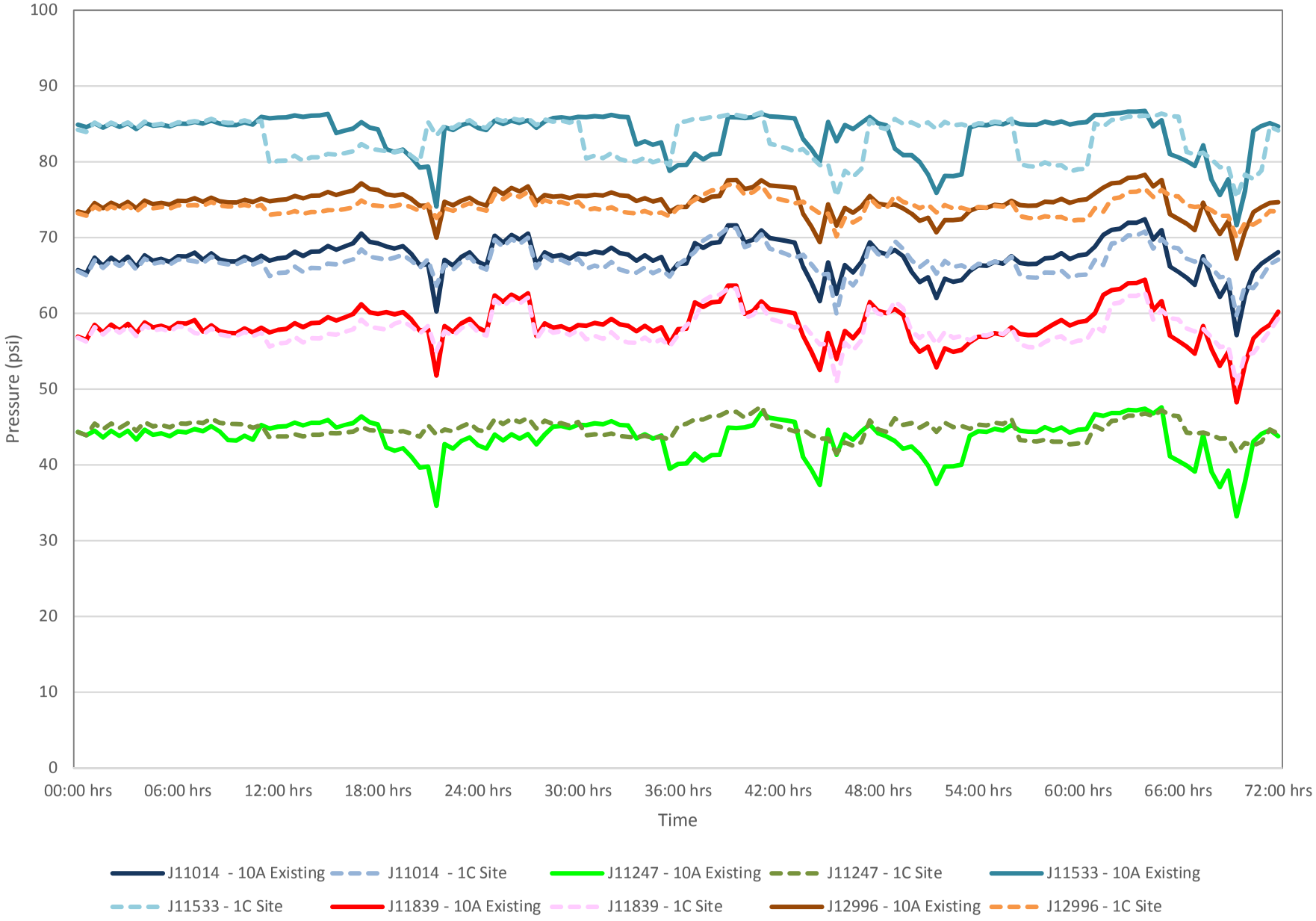

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Figure 3B. System Pressure of Selected Node in Pressure Zone 1 over 72-Hours

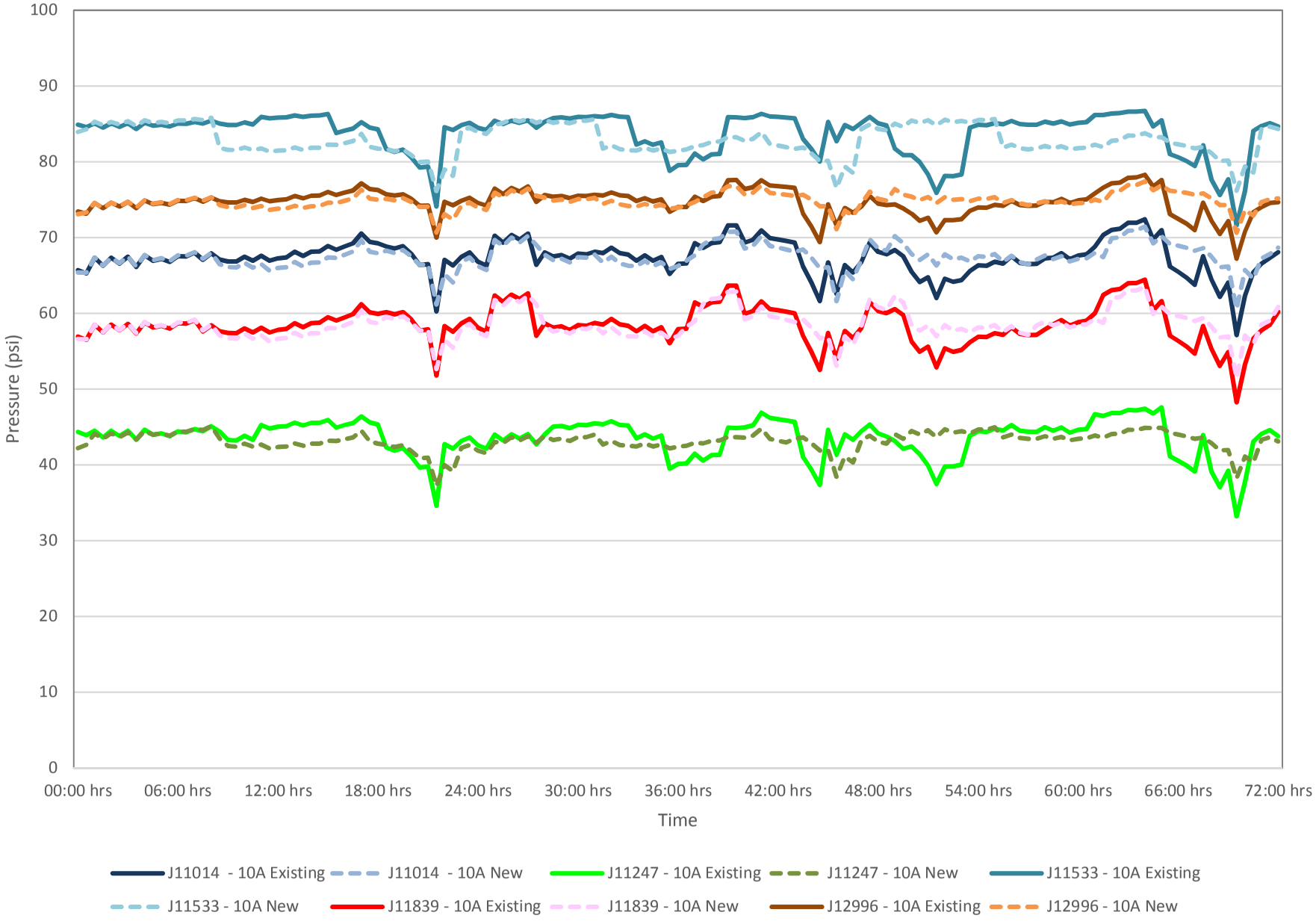

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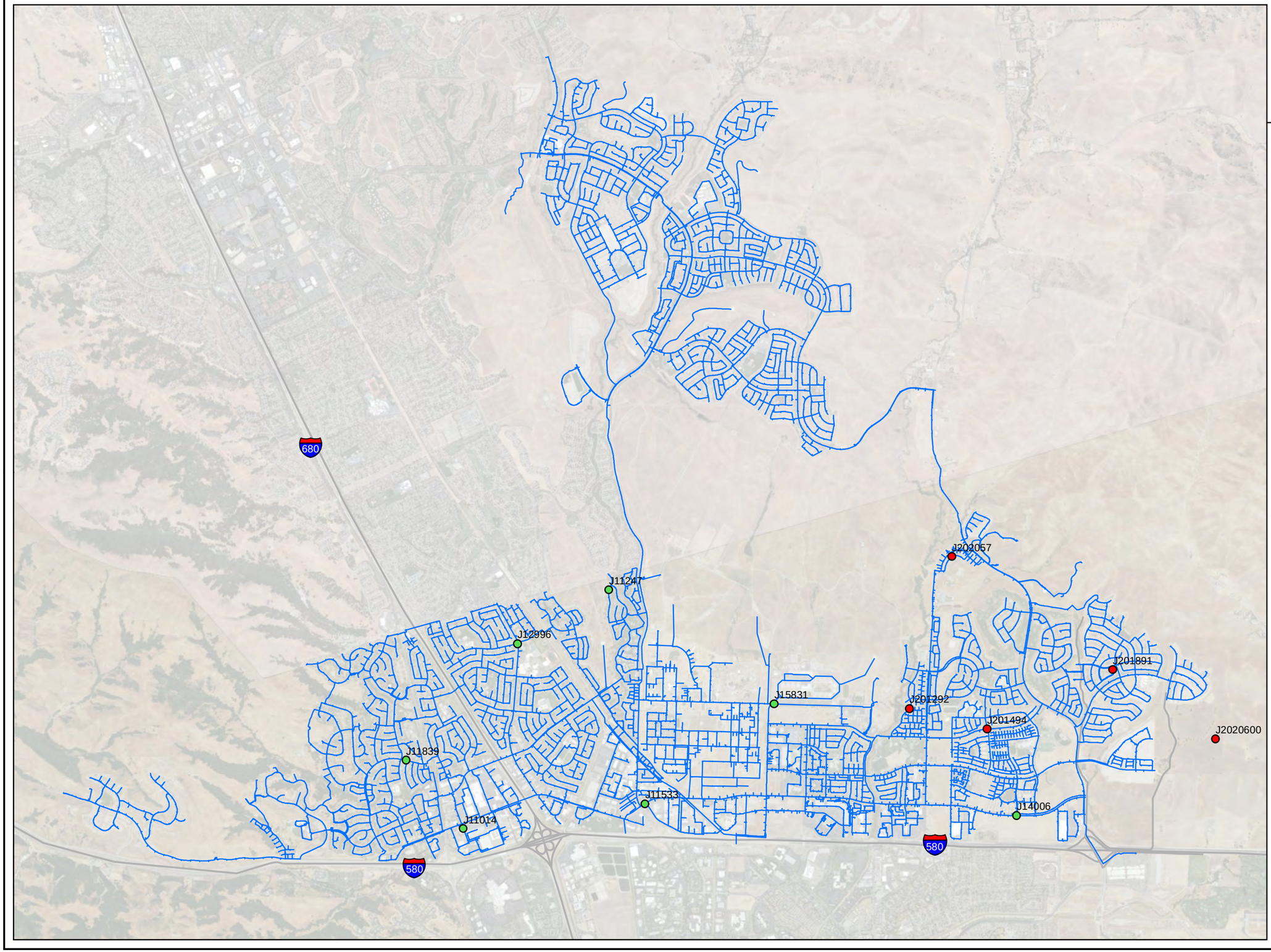
FIGURE 4

Dublin San Ramon Services District Future Storage Tank Sites Evaluation

SELECTED NODE LOCATIONS



N

0 1,800 3,600

Scale in Feet

LEGEND

- Pressure Zone 1
- Pressure Zone 20
- Existing Pipelines

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Figure 5A. Zone 1 Reservoir Level Trendings with Existing Reservoir 10A

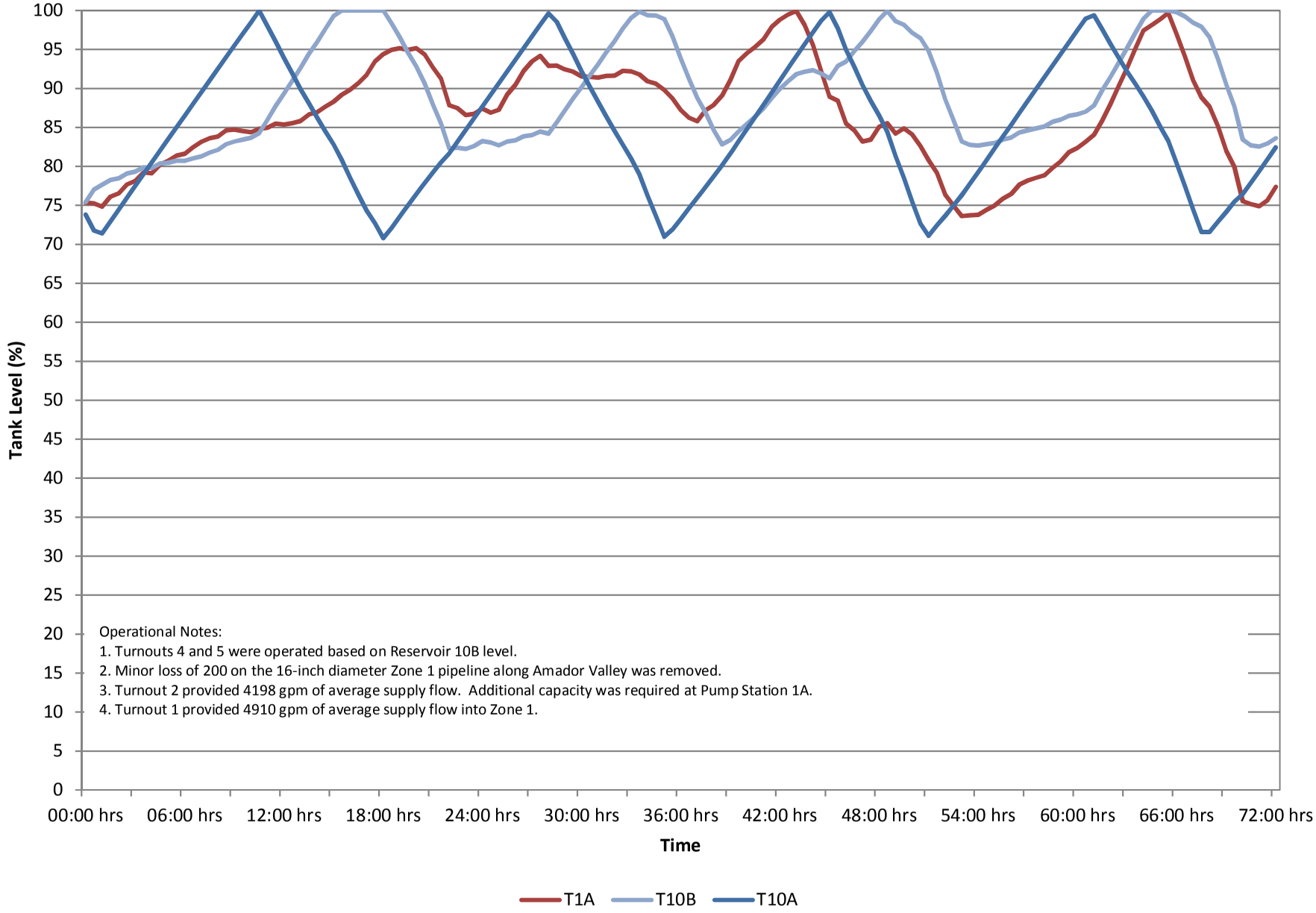

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Figure 5B. Zone 1 Reservoir Level Trendings with New Reservoir 10A

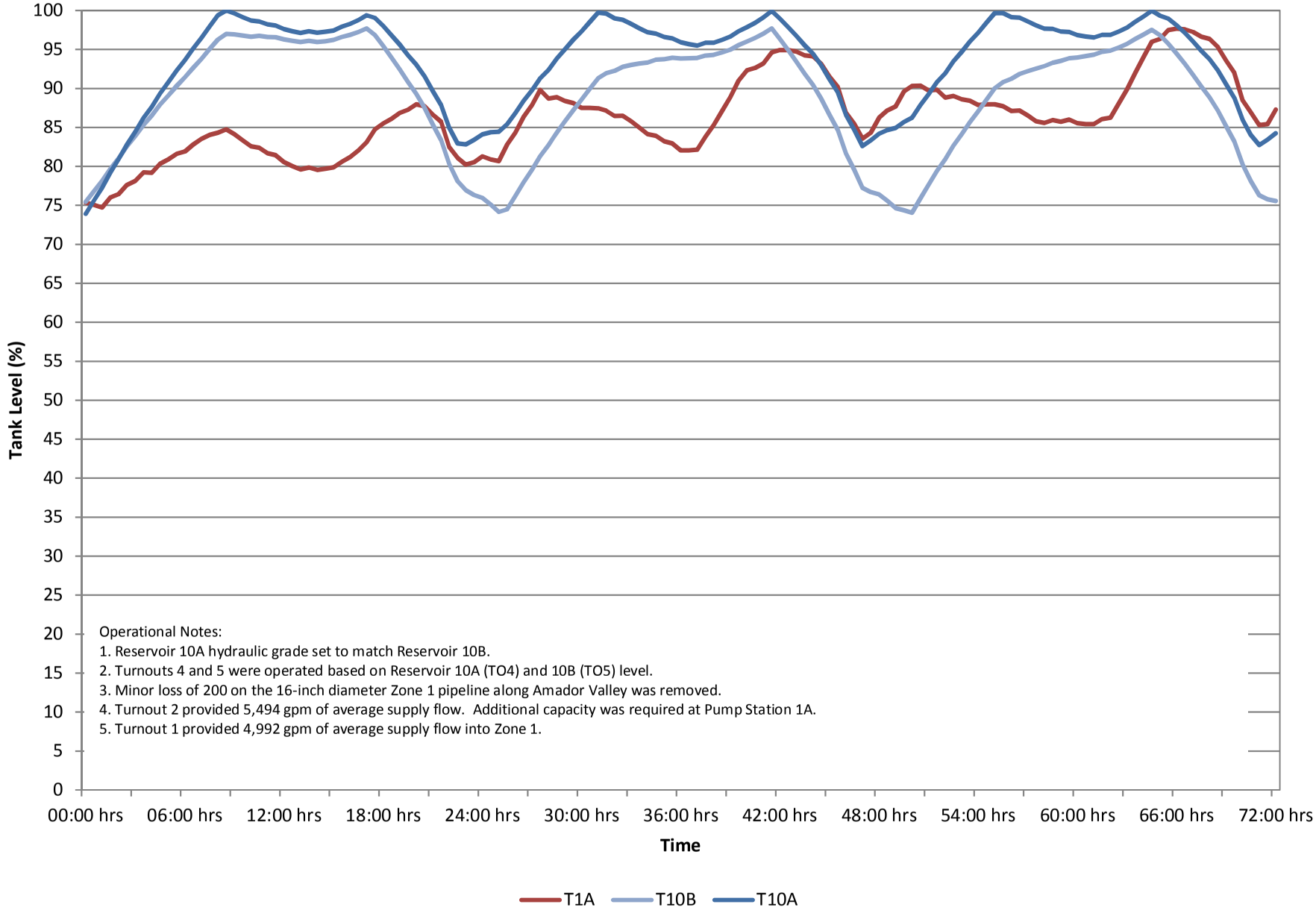

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Figure 6. Zones 20 and 30 Reservoir Level Trendings - Reservoir 20B Adjacent to Reservoir 20A

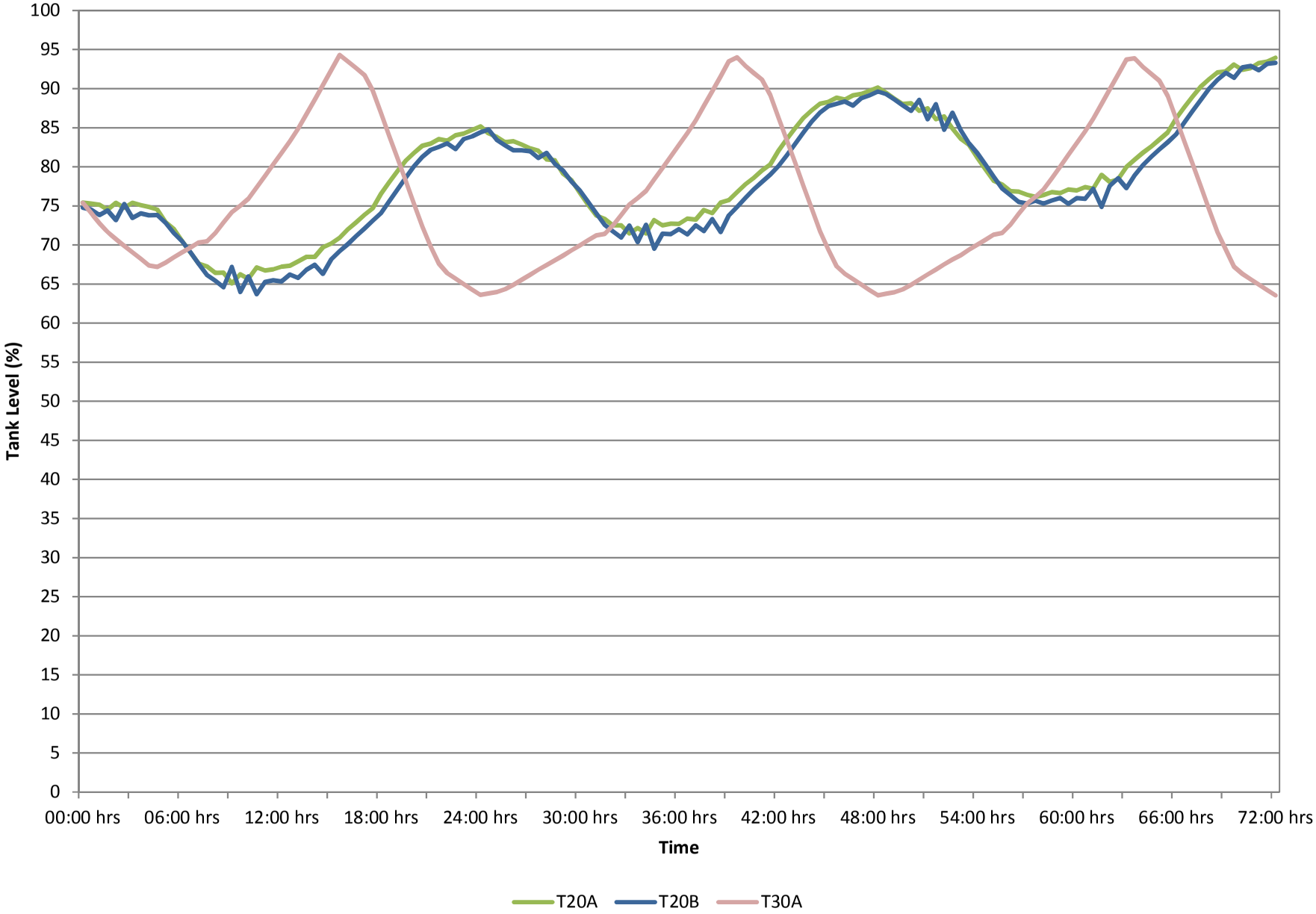

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Figure 7A. System Pressure of Selected Node in Pressure Zone 20 over 72-Hours

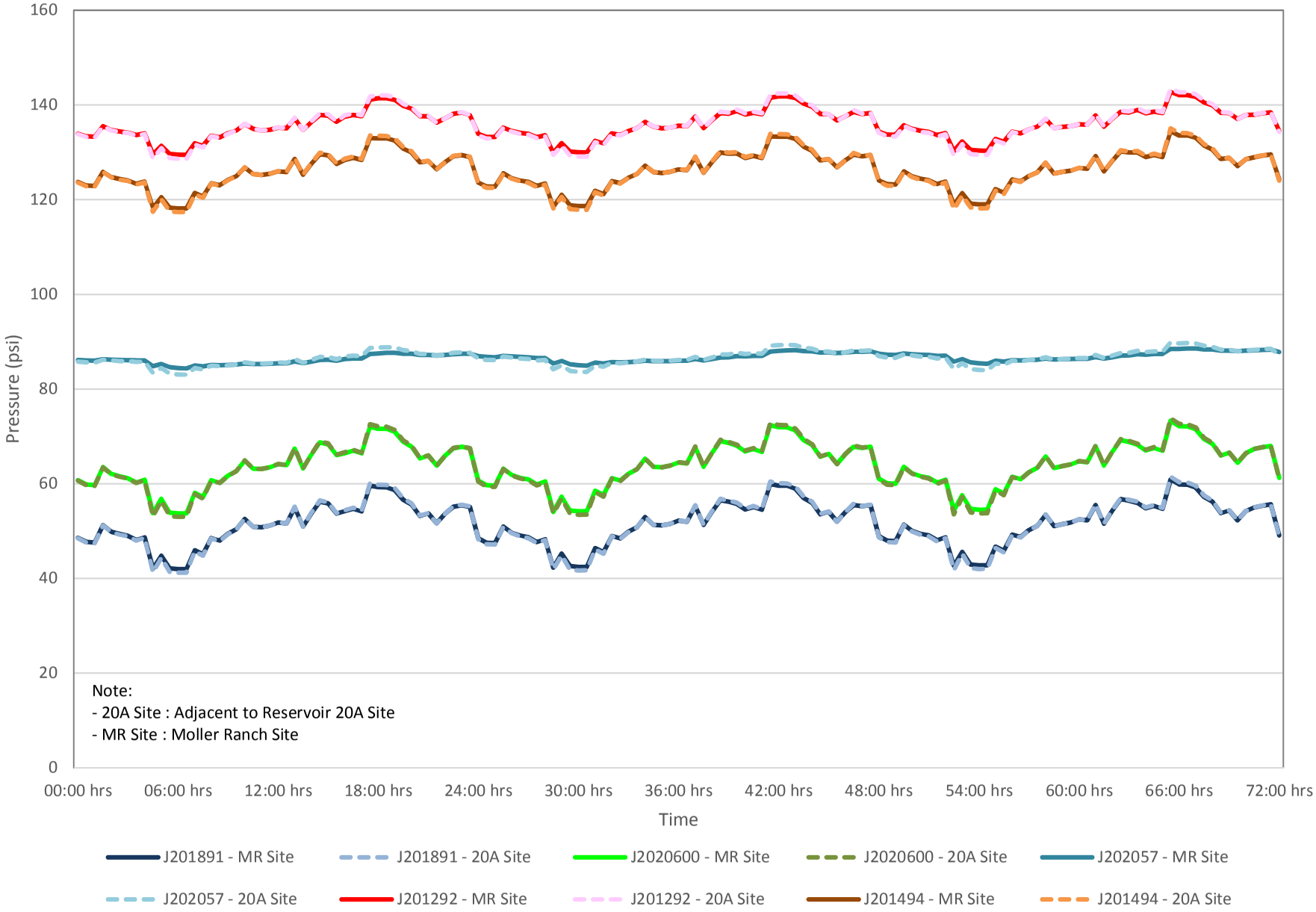

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Figure 7B. System Pressure of Selected Node in Pressure Zone 20 over 72-Hours

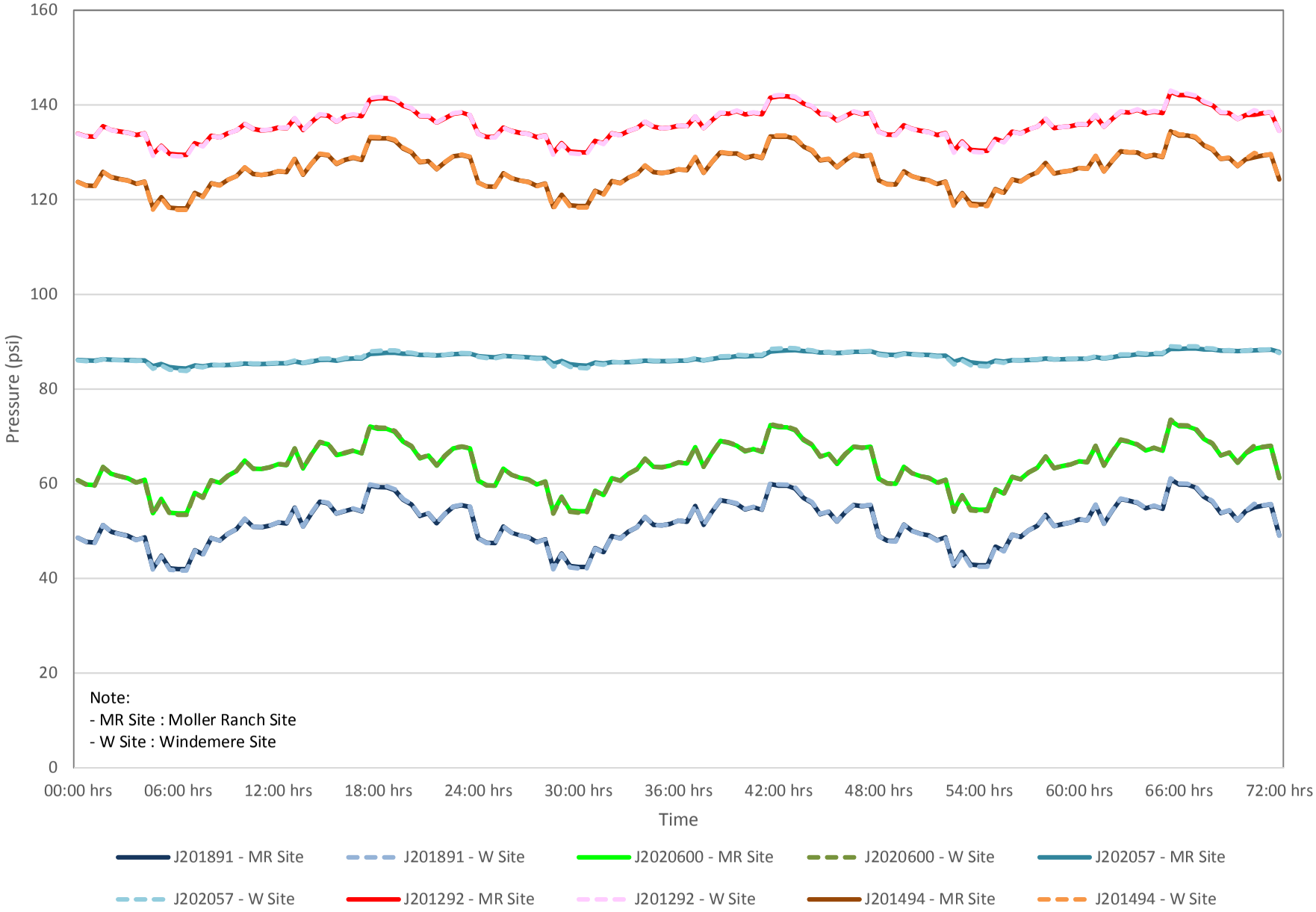

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Figure 8. Zones 20 and 30 Reservoir Level Trendings - Reservoir 20B at Moller Ranch Site

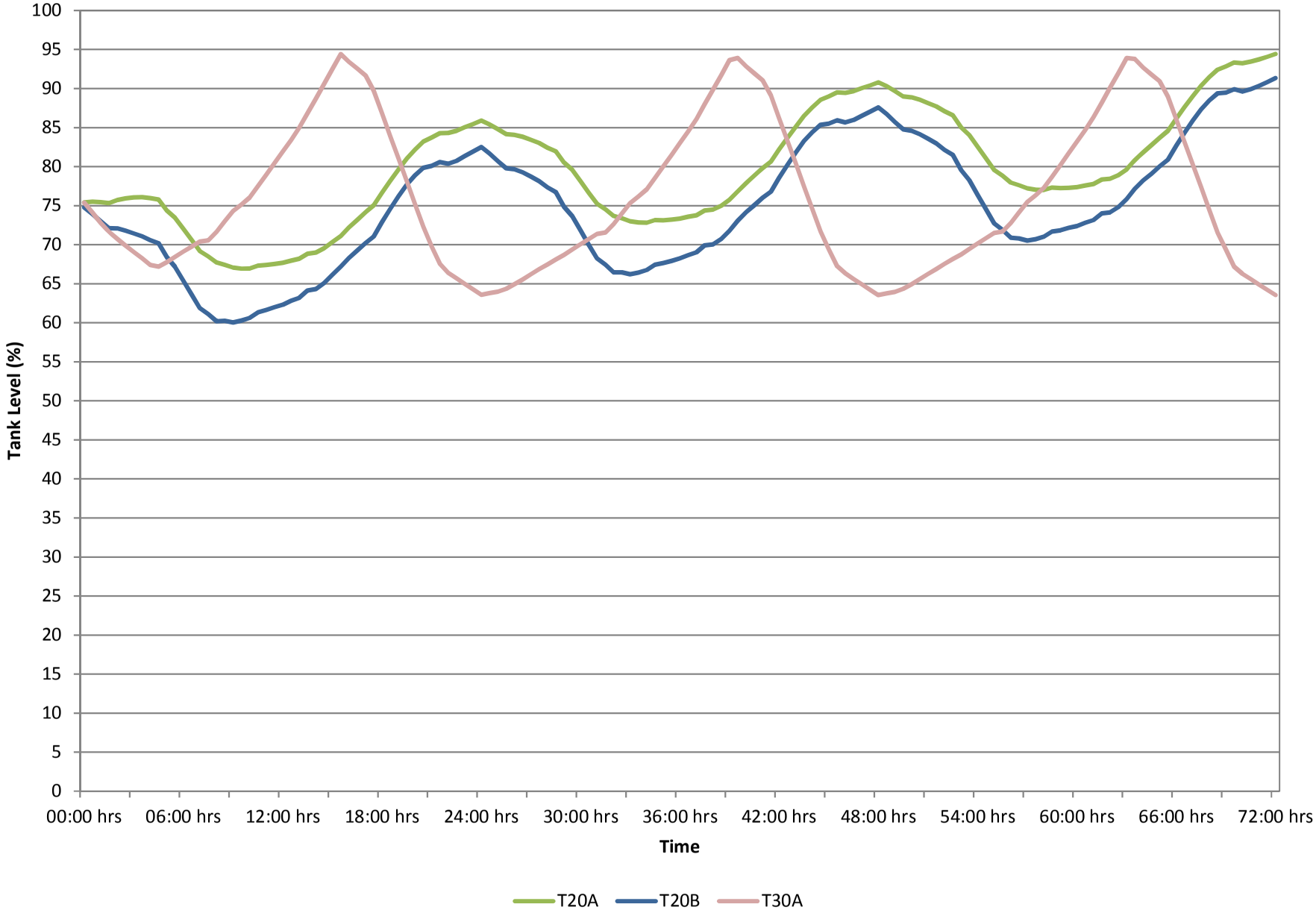

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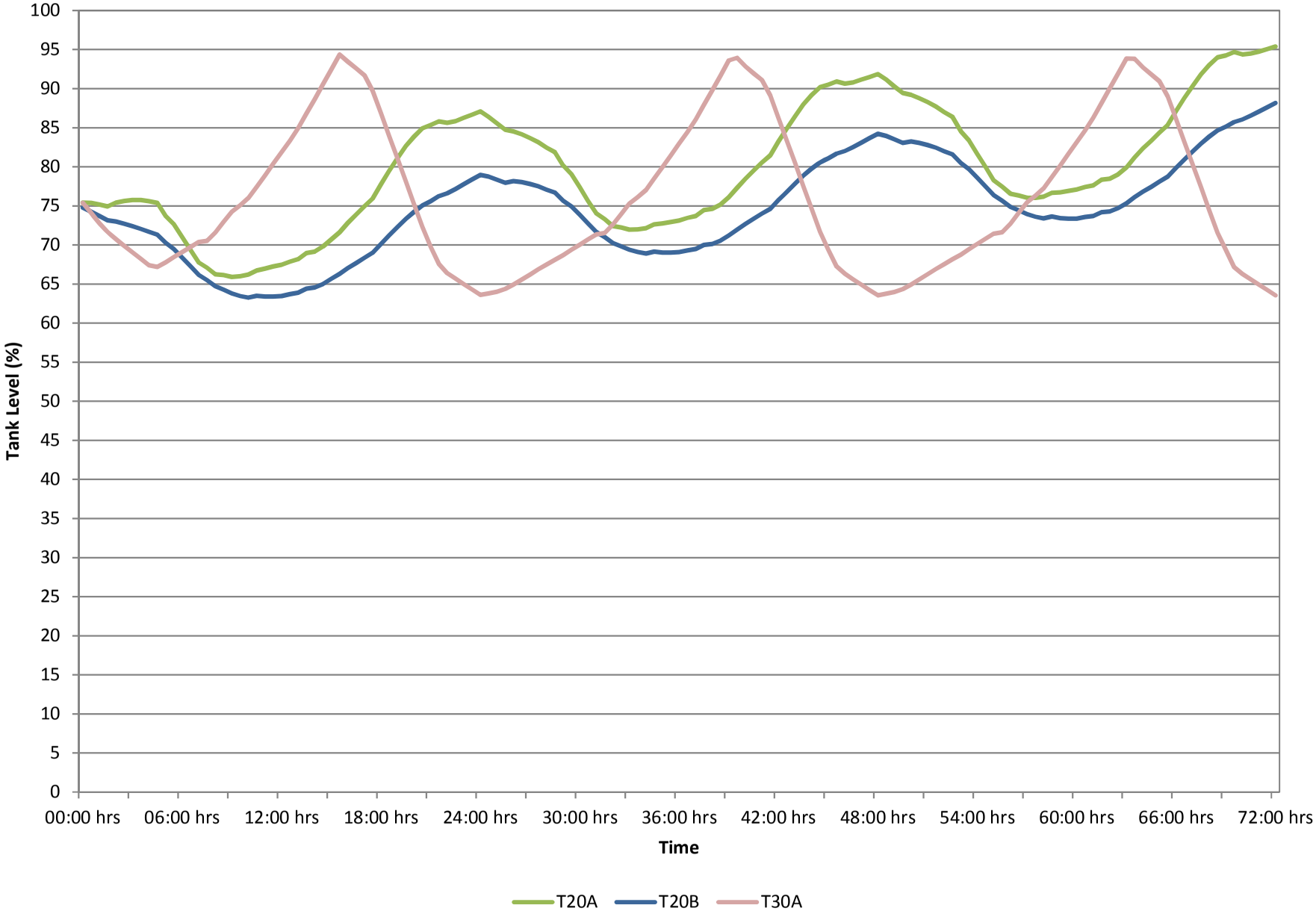
Figure 9. Zones 20 and 30 Reservoir Level Trendings - Reservoir 20B at Windemere Site



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APPENDIX E

Cost Estimating Assumptions

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1.1 OVERVIEW

This appendix provides the assumptions used by West Yost to estimate the probable construction costs for the planning and design of recommended water system facilities for the District's water system. Construction costs were developed based on a combination of data supplied by manufacturers, published industry standard cost data and curves, construction costs for similar facilities built by other public agencies, and construction costs previously estimated by West Yost for similar facilities with similar construction cost indexes.

Additionally, the costs presented in this appendix are for construction only and do not include uncertainties in estimation or unexpected construction costs (e.g., variations in final quantities) or cost estimates for land acquisition, engineering, legal costs, environmental review, soils investigation, surveying, construction management, and inspections and/or contract administration. Some of these additional cost items are referred to as contingency costs or mark-ups, and are further described in the last section of this appendix.

All estimated construction costs have been adjusted to reflect October 2015 costs at an Engineering News Record (ENR) Construction Cost Index (CCI) of 11169.31 (San Francisco Average). These construction costs are to be used for conceptual cost estimates only, and should be updated regularly. Construction costs presented in this appendix are not intended to represent the lowest prices in the industry for each type of construction; rather they are representative of average or typical construction costs. These planning level construction cost estimates have been prepared for guidance in evaluating various facility improvement options, and are intended for budgetary purposes only, within the context of this master planning effort.

The following sections of this appendix describe the assumptions used to estimate the probable construction costs for the planning and design of recommended water system facilities for the District's potable water system:

- Water System Construction Costs
- Land Acquisition Cost
- Contingency Costs and Mark-ups

1.2 WATER SYSTEM CONSTRUCTION COSTS

The following sections present the construction cost estimates used to project probable construction costs for recommended facilities in the District's water system and are categorized by improvement project type.

1.2.1 Storage Reservoirs

Table 1 summarizes the estimated construction costs for water storage reservoirs for the size range of 0.1 to 6.0 MG. These costs generally include the installation of the storage tank, site piping, earthwork, paving, instrumentation, and all related sitework. Costs do not include land acquisition. It should be noted that these costs are representative of construction conducted under normal excavation and foundation conditions, and would be significantly higher for special or difficult foundation requirements. Cost assumptions are for above grade welded steel tanks.

Table 1. Construction Costs for Welded Steel Water Storage Reservoirs[a]	
Capacity, MG	Estimated Construction Cost, million dollars
0.1	1.3
0.5	1.6
1.0	2.0
2.0	2.8
3.0	3.6
4.0	4.4
5.0	5.2
6.0	5.9

[a] Based on October 2015 ENR CCI of 11169.31 (San Francisco Average).

The demolition cost of an existing storage reservoir is estimated to be approximately $200,000. This cost is representative of demolition conducted under normal conditions and does not include costs associated with hazardous material handling (e.g., lead paint or lead based coatings).

1.2.2 Pump Stations

Pump stations will be required at reservoirs in order to lift water to the appropriate pressure zones. Estimated average construction costs for distribution pumping stations, shown in Table 2, are based on enclosed stations with architectural and landscaping treatment suitable for residential areas. It should be noted that pump station costs can vary considerably, depending on factors such as architectural design, pumping head, and pumping capacity. Therefore, these costs presented below are representative of construction conducted under common or normal conditions, and would be significantly higher for special or difficult conditions.

Pump station cost estimates include the installation of the pumps, site piping, earthwork, paving, on-site backup/standby power generator, SCADA, and all related sitework. Station designs will be based on the District's typical newer pump station configurations, which include 2 to 4 pumps installed in parallel to accommodate varying water demand conditions.

Table 2. Construction Costs for Pump Stations[a]	
Firm Capacity[b], mgd	Estimated Construction Cost, million dollars
0.5	1.3
1	1.3
2	1.5
3	1.7
8	2.5
10	2.8

[a] Based on October 2015 ENR CCI of 11169.31 (San Francisco Average).
[b] Equal to the total pumping capacity with the largest pump assumed out of service or on standby (i.e., firm capacity).

1.2.3 Pipelines

Table 3 presents unit construction costs for potable water pipelines 8 through 24-inches in diameter. These unit costs are for pipeline construction in developed areas and are representative of pipeline construction conducted under common or normal conditions, which would be significantly higher under special or difficult conditions.

The unit construction costs presented below generally include pipeline materials, trenching, placing and jointing pipe, valves, fittings, hydrants, service connections, placing imported pipe bedding, native backfill material, and asphalt pavement replacement, if required. However, the costs presented in Table 3 do not include the cost of boring and jacking pipe. Pipeline bore and jack costs are shown in Table 4 and should be added where required for this purpose. Pipeline bore and jack costs were used as representative of micro tunneling or other advanced pipeline costs.

Table 3. Unit Construction Costs for Pipelines[a,b]

Pipeline Diameter, inches	Unit Construction Cost, $/linear foot
8	200
10	235
12	265
14	300
16	335
20	400
24	465

(a) Costs based on San Francisco peninsula pipeline cost estimates, scaled up to October 2015 ENR CCI of 11169.31 (San Francisco Average).
(b) Costs based on ductile iron cement-lined pipe.

Table 4. Unit Construction Costs for Bore and Jack[a,b]

Pipeline Size	Unit Construction Cost, $/linear foot
8-inch diameter (16-inch diameter casing)	510
12-inch diameter (21-inch diameter casing)	580
16-inch diameter (24-inch diameter casing)	675
20-inch diameter (30-inch diameter casing)	830

(a) Costs based on San Francisco peninsula pipeline cost estimates, scaled up to October 2015 ENR CCI of 11169.31 (San Francisco Average).
(b) Conductor pipe is not included in cost.

1.2.4 Pressure or Flow Regulating Stations and Valves

Interconnections (i.e., pressure regulating stations or check valves) are required to provide water supply between pressure zones during peak demands and/or emergency conditions.

- Pressure Regulating Stations:
  - The construction cost for a new pressure regulating station or an existing pressure regulating station upgrade under normal conditions is estimated to be approximately $270,000.
  - The construction cost for a new pressure regulating station or an existing pressure regulating station upgrade under special or difficult conditions (e.g., construction in high traffic areas) is estimated to be approximately $340,000.
- Check Valves:
  - The construction cost for a new check valve connection is estimated to be approximately $6,000.

Construction cost estimates for a pressure regulating station include the installation of control valve(s), a concrete utility vault, access hatches, site piping, earthwork, paving, SCADA, and related sitework.

1.2.5 Backup Power Generators

On-site backup power generators are recommended at key locations to provide power to pumps so that water can be pumped into the distribution system in the event of a power outage. These generators should be sized to meet the power demands of the pumps. The construction cost for a new on-site backup power generator is estimated to be approximately $250,000. This cost is representative of construction conducted under normal conditions, and would be significantly higher for special or difficult conditions.

1.3 LAND ACQUISITION COST

Depending on a facility's location, the District may need to purchase property for the new facility. New tanks will generally be located in areas with land use designated as Open Space. Land acquisition for Open Space land use is assumed to be $25,000 per acre. The regulatory agencies for land acquisition require acquisition of a mitigation property at a ratio of 3:1. Therefore, for every acre of Open Space land acquisition requested, the District is required to purchase 3 acres to be maintained as Open Space. The total land acquisition costs do not include any contingency or mark-ups.

1.4 CONTINGENCY COSTS AND MARK-UPS

Contingency costs or mark-ups must be reviewed on a case-by-case basis because they will vary considerably with each construction project. However, to assist District staff with budgeting for recommended water system facility improvements, the following percentages were developed.

- Design and Construction Contingencies (30 percent): The construction costs presented above are representative of the construction of potable water system facilities under normal construction conditions and schedules; consequently, it is appropriate to allow for estimating and construction uncertainties unavoidably associated with the conceptual planning of projects. Factors such as unexpected construction conditions, the need for unforeseen mechanical items, and variations in design and final quantities are only a few of the items that can increase project costs.
- Professional Services (30 percent): Professional services have been divided into four categories as shown in the table below. Design services associated with new facilities include preliminary investigations and reports, right-of-way acquisition, foundation explorations, preparation of drawings and specifications for construction, surveying and staking, sampling of testing material, and start-up services. Construction management covers items such as contract management and inspection during construction. District administration, public outreach and legal covers items such as legal fees, financing expenses, and interest during construction.

Design:	10 percent
Construction Management and Inspection:	10 percent
Permitting, Regulatory and CEQA Compliance	5 percent
District Administration, Public Outreach, and Legal:	5 percent
Total:	30 percent

The total markup, including contingencies and professional services, is compounded, and amounts to 69 percent of the estimated construction cost. However, it must be noted that for smaller or more complicated projects, the design cost may increase by 10 to 20 percent of the estimated construction cost.

An example application of these standard mark-ups to a project with an assumed base construction cost of $1.0 million is shown in Table 4. As shown, the total cost of all project markups is 69 percent of the base construction cost for each construction project.

Table 4. Example Application of Mark-ups

Cost Component	Percent	Cost
Estimated Base Construction Cost[(a)]		$1,000,000
Contingencies:		
Design and Construction Contingencies	30%	$300,000
Estimated Project Cost after Design and Construction Contingencies		$1,300,000
Professional Services		
Design	10%	$130,000
Construction Management and Inspection	10%	$130,000
Permitting, Regulatory and CEQA Compliance	5%	$65,000
District Administration, Public Outreach, and Legal	5%	$65,000
Estimated Professional Services Total		$390,000
Estimated Total Project Cost		**$1,690,000**

(a) Assumed cost of an example project.

APPENDIX F

DERWA Model Update and System Evaluation

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This document is released for the purpose of information exchange review and planning only under the authority of Paul V. Friedlander, CA 55565.

This document is released for the purpose of information exchange review and planning only under the authority of Ryan F. Orgill, CA 75802.

DUBLIN SAN RAMON SERVICES DISTRICT

DERWA MODEL UPDATE AND SYSTEM EVALUATION

DRAFT
March 2016

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pw:\\Carollo/Documents\Client/CA/DSRSD/9230A00/Task 11/Deliverables\RW Evaluation

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DUBLIN SAN RAMON SERVICES DISTRICT

DERWA MODEL UPDATE AND SYSTEM EVALUATION

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1.0 INTRODUCTION

The purpose of the Dublin San Ramon Services District (DSRSD) East Bay Municipal Utility District (EBMUD) Recycled Water Authority (DERWA) Model Update and System Evaluation was to update the DERWA recycled water system hydraulic model and evaluate any infrastructure improvements needed to meet current and projected future demands.

1.1 Study Area and Background

Starting in 1995, DSRSD and EBMUD began working on the San Ramon Valley Recycled Water Project (SRVRWP), a joint project operated through DERWA to provide recycled water service to landscape irrigation customers in the San Ramon Valley and adjacent areas. The SRVRWP was specifically developed to provide recycled water that met Title 22 disinfected tertiary recycled water requirements to landscape irrigation customers of EBMUD and DSRSD, including the City of San Ramon, City of Dublin, Dougherty Valley, Town of Danville, and Town of Blackhawk areas of Alameda and Contra Costa Counties. The recycled water deliveries began in early 2006 after the completion of the first phase of the program.

The DERWA recycled water system has three components owned by three different agencies:

- DERWA owns the Pump Stations R1 (at the WWTP), R200B, and R200A, as well as reservoirs R100 and R200.
- EBMUD owns and operates the recycled water distribution pipeline system contained within its service area, and will have two pump stations and a reservoir (future facilities).
- DSRSD owns and operates the recycled water treatment facilities at its wastewater treatment plant that treat wastewater from Dublin, South San Ramon and Pleasanton, and the recycled water distribution pipeline system within its service area, along with three pump stations, R300A, R300B, and R20, and two reservoirs, R20 and R300.

The City of Pleasanton began using recycled water from the recycled water treatment facilities in 2014, and will be expanding use in the future. City of Pleasanton demands are included in the DERWA model as a point demand on the main DERWA transmission main, as described below.

1.2 Study Purpose and Report Organization

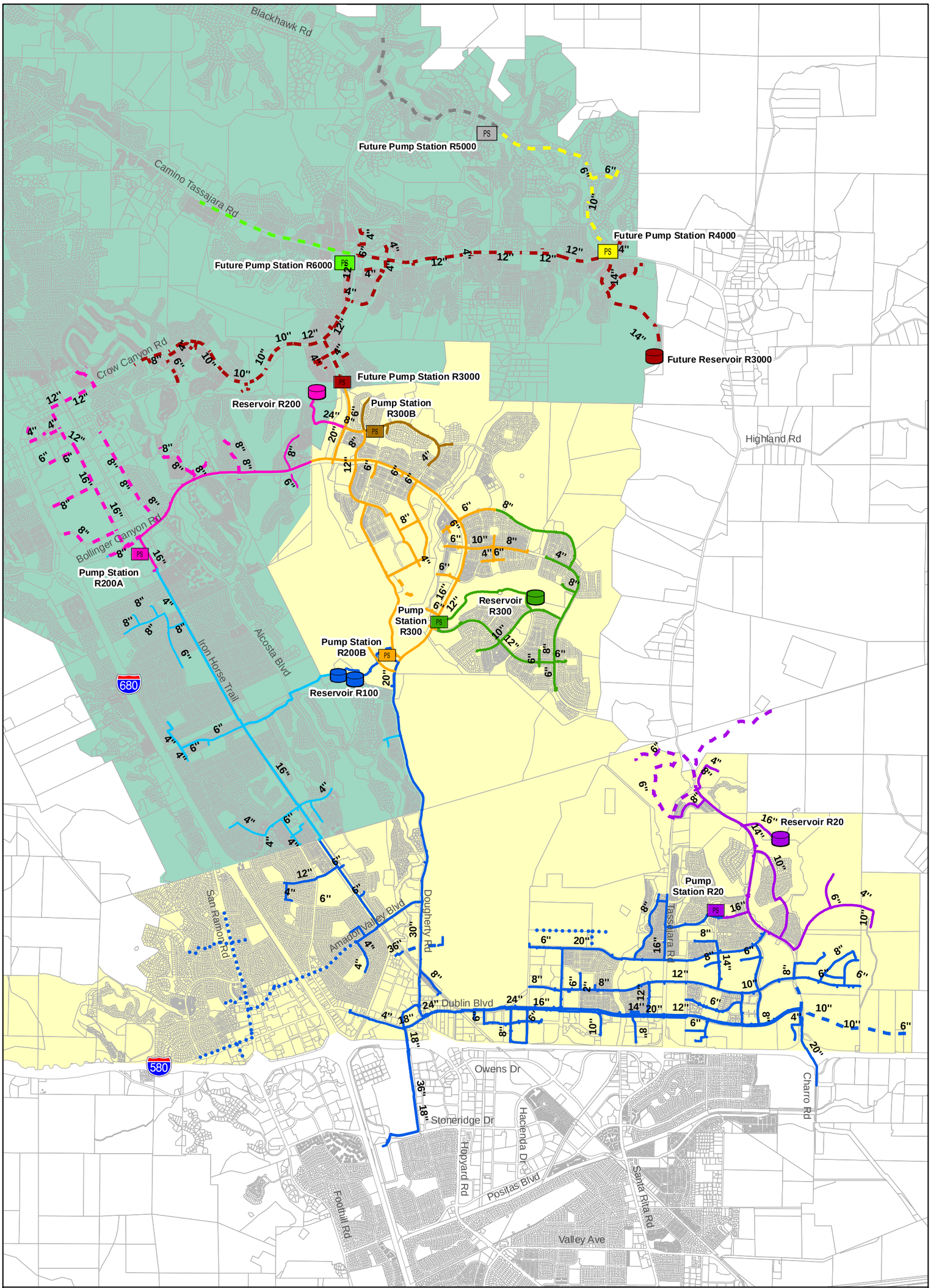
The purpose of this DERWA Model Update and System Evaluation Report is to document the work performed as part of the recycled water model update and system evaluation, and to support DSRSD's ongoing Water System Master Plan. This report is organized into the following sections:

- **Section 1: Introduction.** This section provides a description of the objectives of this study.
- **Section 2: Service Area and Water System Facilities.** This section provides a brief overview of the DERWA recycled water system service area and water system facilities.
- **Section 3: Recycled Water Demands.** This section summarizes current and projected recycled water demands, including demand projections for DSRSD, EBMUD, and City of Pleasanton customers, based on the most recent information available.
- **Section 4: Hydraulic Model Update.** This section documents the process used to update the DERWA recycled water system hydraulic model to reflect current operational conditions.
- **Section 5: System Analysis.** This section provides a description of the results of the revised system evaluation conducted as part of this project.

2.0 SERVICE AREA AND WATER SYSTEM FACILITIES

The DERWA recycled water distribution system consists of five existing pressures zones. Zone R1 is served by pump station (PS) R1, which pumps recycled water from the DSRSD Wastewater Treatment Plant (WWTP) into the recycled water distribution system. Recycled water from Zone R1 is pumped into Zones R20 and R200 and recycled water from Zone R200 is pumped again into Zones R300A and R300B.

Each pressure zone, except for Zone 300B is also served by a ground level or buried storage reservoir. Figure 1 shows the existing DERWA recycled water system. Table 1 summarizes the major features of the recycled water distribution system.



Legend

Facilities

- Pump Station
- Reservoir
- Existing Pipeline
- Future Pipeline
- Installed 2015/16

- R1 (DSRSD)
- R1 (EBMUD)
- R20 (DSRSD)
- R200 (DSRSD)
- R200 (EBMUD)
- R300A (DSRSD)
- R300B (DSRSD)
- R3000 (EBMUD)
- R4000 (EBMUD)
- R5000 (EBMUD)
- R6000 (EBMUD)

- Parcels
- EBMUD Service Area
- DSRSD Service Area

Feet
0 3,000 6,000

DERWA RECYCLED WATER SYSTEM

FIGURE 1

DERWA MODEL UPDATE AND SYSTEM EVALUATION

carollo

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Table 1 Pressure Zone Summary				
	Pump Stations		Reservoirs	
Pressure Zone	Name	Total Capacity (gpm)	Name	Volume (MG)
R1	PS R1	8,750	Res. R100	4.5
R20	PS R20A	3,440	Res. R20	1.5
R200	PS R200A PS R200B	3,900 6,000	Res. R200	4.5
R300A	PS R300A	1,250	Res. R300	0.45
R300B	PS R300B	920	--	--
Total	**--**	**--**	**--**	**10.95**

3.0 RECYCLED WATER DEMANDS

Recycled water demands vary on an annual, daily, and seasonal basis. Peaking conditions that are of particular significance to hydraulic analysis are the average day demand (ADD), maximum day demand (MDD), and peak hour demand (PHD). This section summarizes the existing and future recycled water demands, as well as the methodology used to generate these demands.

3.1 Available Data

The existing and future DERWA recycled water demands were generated using historical water meter data and projected recycled water demand information provided by DSRSD and EBMUD. Table 1 summarizes the data that was provided. DSRSD provided recent demand data for the year 2014 for both DSRSD and EBMUD accounts. 2014 was the most recent full year with available data. Monthly/bimonthly demand data were provided by account for all users.

Hourly consumption data were based on the DSRSD recycled water accounts for June 2015. Only a portion of the EBMUD accounts had hourly data available, and this hourly data was provided for the summer of 2008 only (more recent data were not available). These two sources of hourly data were used to develop hourly demand patterns, as well as peaking factors.

Table 2 Summary of Available Data

Database Name	Database Format	Data Type	Time Frame Available	No. of Meters[1]
DSRSD Bimonthly Recycled Consumption	Microsoft Excel Document	Bi-Monthly Consumption	Jan. 14 - Dec. 14	366
EBMUD 2014 Monthly Recycled Water Use	Microsoft Excel Document	Monthly Consumption	Jan. 14 - Dec. 14	46
DSRSD Hourly Recycled Consumption	Microsoft Excel Document	Hourly	June 2015	366
042008_092008_ EBMUD_AMR	Microsoft Excel Document	Hourly	April 08 - September 08	29
DSRSD RW Projections[2]	Microsoft Excel Document	Annual/Max Day	n/a	69
EBMUD Recycled Water Projections[3]	Microsoft Excel Document	Annual	n/a	100
Pleasanton Recycled Water Demand Projections	Adobe PDF Document	Annual	2015-2019	n/a

Notes:

(1) Represents the number of individual meters or accounts provided.
(2) Source: DSRSD recycled water demand projections, revised April 2015.
(3) Source: EBMUD Demand Projections Phase 1 through 6, revised 03/03/2016.

3.2 Demand Generation Methodology

The following summarizes the methodology used to develop the recycled water demands summarized in this report:

- **Average Day Demand.** The ADD is the total annual recycled water demand in a year divided by the number of days in that year. The 2014 DSRSD and EBMUD data, were used to develop the ADD for each account receiving recycled water. Future ADDs were determined based on information provided by DSRSD and EBMUD, and were added to the estimated existing demands.

- **Minimum Month Demand.** The minimum month demand (MinMD) is the average demand for the month with the lowest demand of the year, which usually occurs in the winter. Because bi-monthly data was provided, the MinMD is assumed to be roughly equal to the average demand during the lowest two month period during the year. Future MinMD estimates were developed by determining the existing MinMD to ADD ratio and applying this factor to the future ADD estimates provided by DSRSD.

- **Maximum Day Demand.** The MDD is the greatest water demand during a 24-hour period of the year. Because hourly (and hence daily) data was not available for every account (EBMUD accounts primarily), it was not possible to directly compute the existing MDD. Additionally, only one month of hourly data was available for DSRSD accounts. Therefore, to estimate the existing MDD, the MDD for all accounts with hourly data was calculated and the ratio of MDD to ADD was determined by pressure zone. DSRSD's historical production data, by pressure zone, was also used to validate the estimated MDD developed using the hourly demand data. The appropriate peaking factor was then applied to the ADD for all active accounts. Future MDD estimates were developed by applying the existing system-wide MDD to ADD ratio to the future ADD estimates provided by DSRSD or EBMUD.

- **Peak Hour Demand.** The PHD is the highest water demand during any one-hour period of the year. Hourly data was available for all DSRSD users, but there was only limited data for the EBMUD accounts. Therefore, a direct computation of the existing PHD was not possible. For this reason, the PHD for all accounts with hourly data was calculated and the ratio of PHD to ADD was determined by pressure zone. The appropriate peaking factor was then applied to the ADD for all active accounts. Future PHD estimates were developed by applying the existing system-wide PHD to ADD ratio to the future ADD estimates provided by DSRSD or EBMUD.

- **Daily Diurnal Patterns.** Hourly demand data were provided for DSRSD users for the period of June 2015, and EBMUD customers for the summer months of 2008 and in 2009 for selected customers. The hourly data were used to develop hourly diurnal patterns for each pressure zone. This was accomplished by calculating the average hourly total recycled water demands in each pressure zone. The average hourly demands were then normalized by dividing the average hourly pressure zone demands by the average daily pressure zone demands for the time period in which hourly demands were available.

3.3 Existing Recycled Water Demand Summary

Existing recycled water demand estimates, by pressure zone, are summarized in this section. The demand estimates were developed using the methodology described in Section 3.2.

3.3.1 Seasonal Demand

Recycled water use varies significantly based on the time of the year. Recycled water use is very low in the winter months and highest in the summer months. Typically, seasonal variation in water use is developed on a monthly basis. Monthly water use data, however, were not available for DSRSD accounts. Seasonal demands were therefore summarized on a bimonthly basis, as provided in Table 3.

Table 3 Seasonal Demand						
	Seasonal Demand Variation (mgd)					
Zone	Jan/Feb	Mar/Apr	May/June	July/Aug	Sep/Oct	Nov/Dec
R1	0.27	0.74	1.86	1.85	1.01	0.40
R20	0.08	0.29	0.67	0.66	0.28	0.14
R200	0.15	0.68	1.74	1.72	0.84	0.24
R300A	0.04	0.22	0.58	0.56	0.21	0.08
R300B	0.02	0.09	0.22	0.22	0.10	0.03
City of Pleasanton	0.00	0.01	0.05	0.09	0.09	0.04
Total	**0.57**	**2.03**	**5.13**	**5.10**	**2.49**	**0.92**

Notes:

(1) Source: Bimonthly metered recycled water demand data provided by DSRSD (2014) and EBMUD (2014).

3.3.2 Average Day Demand

The ADD was determined using the methodology summarized in Section 2.2. Table 4 summarizes the ADD zone by pressure zone.

Table 4 Average Day Demand Summary			
	Average Day Demand[(1)]		
Zone	(AFY)	(gpm)	(mgd)
R1	1,153	715	1.03
R20	397	243	0.35
R200	1,004	625	0.90
R300A	320	201	0.29
R300B	128	76	0.11
City of Pleasanton	52	32	0.05
Total	**3,054**	**1,892**	**2.73**

Notes:

(1) Represents year 2014 ADD. ADD was calculated from bimonthly metered recycled water demand data provided by DSRSD. EBMUD data was calculated from monthly data for the year 2014.

3.3.3 Minimum Month Demand

As noted in Section 3.2, the MinMD is assumed to be approximately equal to the recycled water demand in the lowest two-month period of the year. Based on the information provided in Table 3, the MinMD is estimated to be roughly 0.57 million gallons per day (mgd) system-wide, which equates to a MinMD to ADD ratio of approximately 0.21. The MinMD corresponds to the January/February recycled water demands. Table 5 summarizes the MinMD to ADD peaking factors, by pressure zone.

Table 5 Minimum Month Demand Summary

Zone	ADD (mgd)	MinMD[(1)] (mgd)	MinMD/ADD Ratio
R1	1.03	0.27	0.26
R20	0.35	0.08	0.23
R200	0.90	0.15	0.17
R300A	0.29	0.04	0.15
R300B	0.11	0.02	0.18
City of Pleasanton	0.05	0.00	0.00
Total	**2.73**	**0.57**	**0.21**

Notes:
(1) Based on January/February recycled water demands.

3.3.4 Maximum Day Demand

As noted in Section 3.2, it was not possible to directly compute the MDD. The MDD was therefore estimated by computing a MDD/ADD peaking factor, by pressure zone, for accounts with hourly water use data. The resulting peaking factors were then applied to all active accounts in each pressure zone, as summarized in Table 6. As shown in Table 6, the existing system-wide MDD to ADD peaking factor is estimated to be approximately 2.5.

Table 6 Maximum Day Demand Summary				
Zone	Existing ADD (mgd)	MDD/ADD[(1)] Ratio	Maximum Day Demand (mgd)	Maximum Day Demand (gpm)
R1	1.03	2.12	2.18	1,516
R20	0.35	2.91	1.02	707
R200	0.90	3.00	2.70	1,875
R300A	0.29	2.03	0.59	409
R300B	0.11	1.85	0.20	141
City of Pleasanton	0.05	2.50	0.12	81
Total	**2.73**	**2.50**	**6.81**	**4,730**

Notes:
(1) Developed from available hourly metered data.

3.3.5 Peak Hour Demand

Similar to the MDD, it was not possible to directly compute the PHD. The PHD was therefore estimated by computing a PHD/ADD peaking factor, by pressure zone, for accounts with hourly water use data. The resulting peaking factors were then applied to all active accounts in each pressure zone, as summarized in Table 7. As shown in Table 7, the existing system-wide PHD to ADD peaking factor is estimated to be approximately 7.55.

Table 7 Peak Hour Demand Summary				
Zone	Existing ADD (mgd)	PHD/ ADD[(1)] Ratio	Peak Hour Demand (mgd)	Peak Hour Demand (gpm)
R1	1.11	5.84	6.02	4,177
R20	0.35	11.17	3.91	2,715
R200	0.84	9.84	8.86	6,150
R300A	0.29	7.63	2.21	1,537
R300B	0.11	7.66	0.84	585
City of Pleasanton	0.05	2.5	0.12	81
Total	**2.73**	**7.55**	**20.58**	**14,291**

Notes:
(1) Developed from available hourly metered data. Represents year 2014 PHD.

3.3.6 Daily Diurnal Patterns

Daily diurnal patterns were developed, by pressure zone, to represent the temporal distribution of water demands throughout the day. The diurnal patterns were developed using the procedure outlined in Section 3.2. Figure 2 shows an example diurnal pattern for Zone R1. Diurnals for each pressure zone are provided in Appendix A.

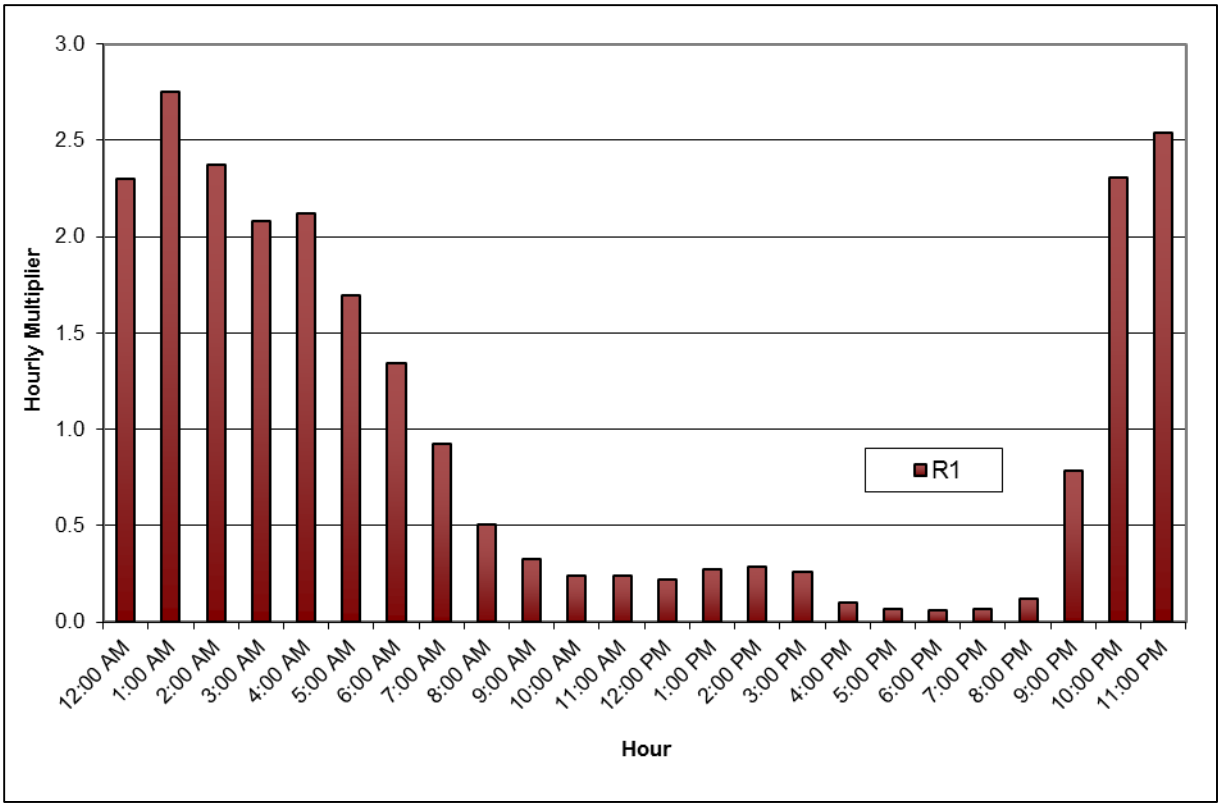


Figure 2 Pressure Zone R1 Hourly Diurnal Pattern

3.3.7 Existing Demands Summary by Agency

Table 8 summarizes the 2014 recycled water demands by agency (i.e., DSRSD, EBMUD, and the City of Pleasanton) based on the data sources listed in Table 2. DSRSD accounts for approximately 75-percent of the total system demand on an annual basis, EBMUD accounts for about 23-percent of the total system demand, and the City of Pleasanton accounts for the remaining 2-percent of the total system demand.

Table 8 Existing Demand Summary

Agency	Existing ADD			Existing MDD	
	(AFY)	(mgd)	(% of Total)	(mgd)	(% of Total)
DSRSD	2,287	2.04	75%	4.98	73%
EBMUD	715	0.64	23%	1.71	25%
City of Pleasanton	52	0.05	2%	0.12	2%
Total	**3,054**	**2.73**	**100%**	**6.81**	**100%**

Notes:

(1) Information based on the data sources listed in Table 2.
(2) DSRSD data only includes demand in the recycled water distribution system and does not include water from recycled water fill stations at the treatment plant.

3.4 Future DERWA Demand Summary

Future recycled water demand estimates are provided in this section based on the most currently available demand projections provided by DSRSD, and the EBMUD Phase 2 through 6 demand projections provided March 2016. Two demand scenarios were considered for DSRSD/EBMUD customers:

- **2020 Demand Scenario.** Includes EBMUD Phase 2 and all demand increases anticipated by DSRSD from 2015 through 2020;
- **2031 Demand Scenario.** Includes EBMUD Phases 3 through 6, and all post 2020 demand increases anticipated by DSRSD.

In addition, demand estimates from the City of Pleasanton were also considered, and are discussed in this section.

3.4.1 Projected Increase in DERWA Demand by 2020

Appendix B provides detailed estimates, by customer, for the 2020 demand scenario. Table 9 summarizes the data presented in Appendix B by pressure zone. It should be noted that all future demand estimates assume MDD and PHD demand peaking factors of 2.5 and 7.55, respectively, which correspond to the existing system-wide peaking factors.

Table 9 Projected Increase in DERWA Demand by 2020							
	Average Day Demand			Maximum Day Demand		Peak Hour Demand	
Zone	(AFY)	(gpm)	(mgd)	(gpm)	(mgd)	(gpm)	(mgd)
R1	816	506	0.73	1,265	1.82	3,821	5.50
R20	97	60	0.09	150	0.22	453	0.65
R200	1,398	867	1.25	2,168	3.12	6,546	9.43
R300A	0	0	0.00	0	0	0	0
R300B	0	0	0.00	0	0	0	0
Subtotal	**2,311**	**1,433**	**2.07**	**3,583**	**5.16**	**10,820**	**15.58**

Notes:

(1) These demand projections include EBMUD Phase 2 (Zone R200), and future DSRSD demands projected by year 2020.

(2) Demands do not include City of Pleasanton demands.

EBMUD provided future recycled water demand estimates, by customer, for their Phase 2 customers. Additionally, DSRSD provided estimates for future customers that will connect to the system in this time period. Customers to receive recycled water in this demand scenario will be located within pressure zones R1, R20, and R200, as identified in Appendix B. The locations of each future customer are shown in Appendix C for reference.

3.4.2 Projected Increase in DERWA Demand from 2020 to 2031

Appendix B provides detailed estimates, by customer, for the 2031 demand scenario. Table 10 summarizes the data presented in Appendix B by pressure zone. As previously noted, all future demand estimates assume MDD and PHD demand peaking factors of 2.5 and 7.55, respectively.

EBMUD provided future recycled water demand estimates, by customer, for their Phase 3 and Phase 4 customers. Additionally, DSRSD provided estimates for future customers that will connect to the system in this time period. Customers to receive recycled water in these demand scenario will be located in the pressure zones R1, R20, R200, as well as the future pressure zones R3000, R4000, R5000 and R6000. The locations of each future customer are shown in Appendix C for reference.

Table 10 Projected Increase in DERWA Demand from 2020 to 2031							
	Average Day Demand			Maximum Day Demand		Peak Hour Demand	
Zone	(AFY)	(gpm)	(mgd)	(gpm)	(mgd)	(gpm)	(mgd)
R1	296	184	0.26	459	0.66	1,386	2.00
R20	31	19	0.03	48	0.07	145	0.21
R200	0	0	0	0	0	0	0
R300A	0	0	0	0	0	0	0
R300B	0	0	0	0	0	0	0
R3000	695	431	0.62	1,078	1.55	3,255	4.69
R4000	355	220	0.32	550	0.79	1,661	2.39
R5000	185	115	0.17	287	0.41	866	1.25
R6000	150	93	0.13	232	0.33	702	1.01
Subtotal	**1,712**	**1,062**	**1.53**	**2,654**	**3.81**	**6,016**	**11.55**

Notes:

(1) These demand projections include EBMUD Phase 3A-3C (Zone R3000), EBMUD Phase 4 (Zone R4000), EBMUD Phase 5 (Zone R5000), EBMUD Phase 6 (Zone R6000) and the DSRSD demands projected to occur after 2020.

(2) Demands do not include City of Pleasanton demands.

3.4.3 Pleasanton Demands

The City of Pleasanton provided low range and high range demand projections, which were included in the DERWA hydraulic model at the corner of the DSRSD Dedicated Land Disposal (DLD) site adjacent to Stoneridge Drive. For the purposes of this study, the high range demand estimate of 1,640 AFY was assumed for the 2020 and 2031 demand scenarios, and a 2.5 MDD/ADD peaking factor consistent with City of Pleasanton estimates. A diurnal pattern was not applied to the City of Pleasanton demands since peak hour demands will be met from City of Pleasanton storage reservoirs and not from the DERWA system, and therefore the PHD and the MDD are the same. The estimated 2020 MDD for the City of Pleasanton is projected to be 3.7 mgd, and the 2031 MDD is projected to be 4.2 mgd.

3.5 Recycled Water Demand Summary

Table 11 summarizes the existing and future demands that were input into the hydraulic model. A map is provided in Appendix C, which identifies the locations of existing and future recycled water meter locations.

Table 11 Recycled Water Demand Summary			
	Total (mgd)		
Year	Average Day Demand	Maximum Day Demand	Peak Hour Demand
2014	2.7	6.8	20.6
2020	6.4	16.0	41.2
2031	8.2	20.4	53.3

Note:
(1) City of Pleasanton 2014 annual demand was 46,000 gallons per day.

Table 12 summarizes the existing and future demands by agency based on the data sources listed in Table 2.

Table 12 Recycled Water Demand Summary by Agency								
	DSRSD		EBMUD		City of Pleasanton		Total	
Year	ADD (mgd)	MDD (mgd)	ADD (mgd)	MDD (mgd)	ADD (mgd)	MDD (mgd)	ADD (mgd)	MDD (mgd)
2014	2.0	5.0	0.6	1.7	0.0(1)	0.1	2.7	6.8
2020	3.5	8.7	1.5	3.7	1.5	3.7	6.4	16.0
2031	3.8	9.4	2.7	6.8	1.7	4.2	8.2	20.4

Note:
(1) City of Pleasanton 2014 annual demand was 46,000 gallons per day.
(2) Information based on the data sources listed in Table 2.

4.0 HYDRAULIC MODEL UPDATE

This section summarizes the process used to update the DERWA hydraulic model to reflect current operational conditions. The model was previously calibrated as part of the Operations Plan Update project. Model calibration was not included in the scope of this study. However, the model was updated to include new facilities constructed since the last model update, and new water demands were allocated in the model.

4.1 Hydraulic Modeling Overview

The hydraulic computer model of the DERWA recycled water distribution system is an important tool for system planning and operation. The model can be used to identify deficiencies in the system, plan capital improvements, and develop operation plans.

The hydraulic model is composed of three main parts:

- The data file storing geometry for geographic location of facilities.
- The database that defines the physical system.
- A computer program "calculator" that solves a series of hydraulic equations to define the performance of the water system in terms of pressure and flow.

The geographic data file provides water system facility locations in Geographic Information System (GIS) file format. Elements used in this file to model system facilities include pipes, junction nodes (connection points for pipes and location of demands), valves, pumps, and storage reservoirs.

The database includes distribution system facility information such as facility size and geometry, operational characteristics, and production/consumption data. Facility size and geometries include length and diameter of pipe, reservoir dimensions, sizes of valves, and pump curves. Operational characteristics include parameters that control how facilities move water through the system, such as on and off settings for pumps, pressure controls, or main line valve closures. Data for production and consumption determine where the water enters and exits the distribution system.

The computer program "calculator" analyzes the hydraulic information in the database file and generates results for pressures, flow rates, and operating status. This allows the hydraulic model to be used as a tool to simulate existing and future conditions, identify system deficiencies, analyze impacts from increased demands, and determine the appropriateness of proposed improvements for the system or changes to operations.

4.2 Hydraulic Modeling Software

There are several widely used software programs that are used to model water distribution systems. Each of these programs has a variety of capabilities and features. The selection of a particular model is generally dependent upon user preference, the requirements of the particular water distribution system, and the cost associated with the software. DERWA's recycled water system model uses the $H_2OMAP^{®}$ Water hydraulic modeling software platform, developed by MWH Soft.

4.3 Modeled Facilities Update

As part of this study, Carollo obtained DSRSD's most recent GIS shapefiles of the recycled water distribution system to identify pipelines that have been constructed (added to the system) since the last model update. Carollo prepared a map comparing the previous modeled water system facilities to the current GIS database, which identified the location of these pipe segments that need to be updated or added to the model. In addition, DSRSD provided information related to future pipelines that will be added to the system. These facilities were included in the hydraulic model for the 2020 and 2031 model scenarios.

Figure 1 shows the recycled water system facilities that were included in the updated DERWA recycled water system hydraulic model.

4.4 Demand Allocation

DSRSD provided recycled water consumption data by account for the year 2014. This data was used to reallocate recycled water demands in the hydraulic model.

Using the 2014 recycled water billing data, recycled water demands were calculated for each customer within the service area. Address points for each billing record were geocoded and then linked to the nearest node in the hydraulic model. The billing record demands were then linked to the model and assigned as demands. Using this method, 100 percent of all demands were assigned to a node in the model.

4.5 Diurnal Patterns

Daily diurnal patterns were developed, by pressure zone, to represent the temporal distribution of water demands throughout the day. The diurnal patterns were developed using the procedures outlined in Section 3.3.6. These diurnal patterns were assigned in the model based on pressure zone.

4.6 Hydraulic Model Validation

As previously discussed, model recalibration was out of the scope of this study. However, after the model was updated and demands were recalibrated, the model was re-run to make sure that the model output produced reasonable results (e.g., system flows, tank levels, pressures, etc.). Once this check was performed, the model was deemed updated and ready to use for system analysis.

5.0 SYSTEM ANALYSIS

The updated DERWA recycled water system hydraulic model was used to determine if existing demands result in delivery pressure issues within the system or if the increase in recycled water demands from the future customers identified in Section 3 will result in delivery pressure issues within the system by year 2020 and 2031. The hydraulic model also includes demands for the City of Pleasanton, which were applied at the corner of the DSRSD DLD site.

The daily diurnal pattern used for future customers was based on the updated system-wide diurnal, developed as part of this study. The diurnal demand pattern represents the temporal distribution of recycled water demands throughout the day. In the hydraulic model, the diurnal demand pattern is applied to the MDD, which ultimately provides the peak hour system demands.

5.1 Analysis Criteria/Assumptions

The primary planning criteria for recycled water system is to maintain 40 pounds per square inch (psi) at all delivery locations during peak use hours. The analysis also included consideration of peak hour velocities and head losses. Desired peak hour velocities are less than 6 feet per second (ft/s), and desired peak hour head losses were under 10 feet per 1,000 feet of pipeline (ft/1,000 ft).

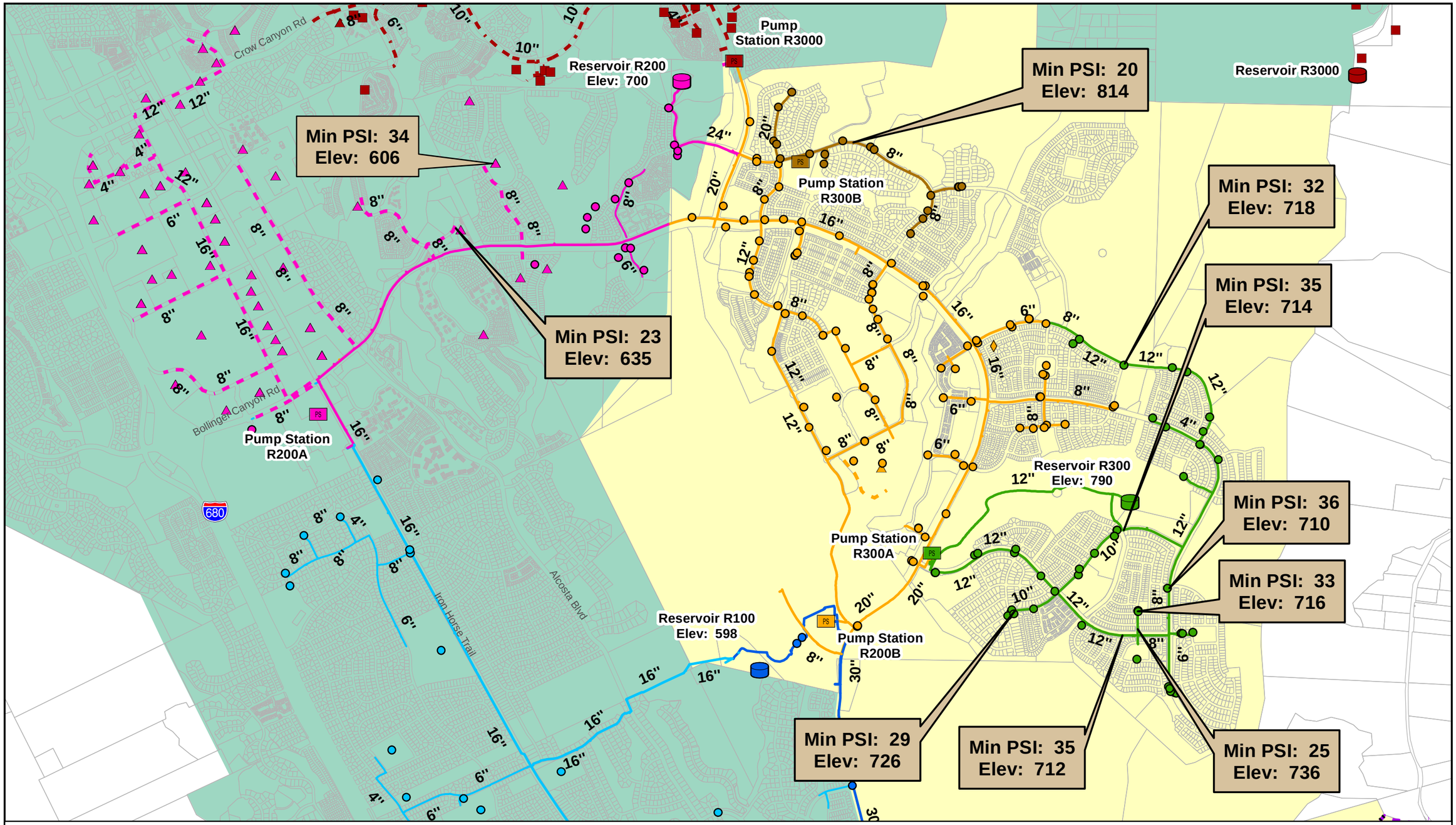
For future demand conditions, it was assumed that Pump Station R1 will be expanded, as the existing pump station does not have sufficient capacity to serve the projected recycled water demands. DSRSD is planning to upgrade the capacity of the pump station to 15.8 mgd in the near future. Once the pump station is upgraded, it should provide sufficient capacity to meet the projected recycled water demands through year 2020. By 2031, the pump station would need to be expanded to a capacity of 18.6 mgd to meet the projected 2031 MDD (with DSRSD, EBMUD, and Pleasanton demands considered).

5.2 System Analysis Results

The hydraulic model was run under year 2020 and 2031 recycled water demand conditions to identify areas of low pressure under PHD conditions. The model was also used to identify high velocity and headloss locations. In general, the hydraulic modeling analysis indicates that DSRSD should be able to serve the projected 2031 recycled water demands while meeting the established planning criteria. Notable findings from the system analysis are discussed below[1]:

- **Low Pressure Areas:** As noted in the Operations Plan Update, there are a few isolated areas in the system that experience low pressures (below 40 psi) during PHD conditions. These areas are primarily driven by the service elevation rather than system headlosses or other hydraulic restrictions. Some customers in these areas have onsite booster pump stations to increase pressures as needed. Others have not cited any low pressure issues. For this reason, no improvements are recommended to address any low pressure conditions in these areas. Figure 3 shows the locations of the low pressure conditions during the 2031 PHD condition.

[1] Note: Updated EBMUD demand projections were provided after the initial draft of the report was submitted (including two additional phases - Phase 5 and 6). At the time of this revised draft, the planned alignments for EBMUD Phase 5 and 6, as well as any updates to the Phase 2-4 alignments, were not available. Therefore, the analysis results presented in the March 2016 draft of this report are based on the previous demand estimates. Once the updated alignment information is provided by EBMUD, the analysis results will be updated to reflect the revised demand projections.



RECYCLED WATER MAIN PRESSURES UNDER 40 PSI FOR 2031 DEMAND SCENARIO

FIGURE 3

DERWA MODEL UPDATE AND SYSTEM EVALUATION

Note: 1. Some customers at high elevations in Zone R300A have small booster stations to provide additional pressure.

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- **Shaefer Ranch/Western Dublin Area:** DSRSD has projected future recycled water demands associated with this area of roughly 208 AFY, which is located outside of the current recycled water service area in Western Dublin. The estimated service elevation at Shaefer Ranch is roughly 1,000 feet at the highest point. Potable water service for this area is located within the Zone 4 pressure zone, with a maximum hydraulic grade line elevation of 1,130 feet. In order to provide recycled water service to this area, it would need to be boosted from pressure zone R1 into a new recycled water pressure zone. The approximate hydraulic grade line elevation difference between the two pressure zones would be on the order of 520 feet.

  Preliminary sizing of the infrastructure required to serve this area is shown on Figure 4, and would include the following:

  – Approximately 22,600 linear feet of 12-inch diameter main
  – A new recycled water pump station with a firm pumping capacity of approximately 480 gpm and a pump head of approximately 520 feet
  – A new 300,000 gallon storage tank in Shaefer Ranch

  A planning level cost estimate for the infrastructure listed above is provided in Appendix D. As shown in Appendix D, the capital cost for the transmission main, tank, and pump station is estimated to be approximately 15 million dollars. Based on the facilities required, the District has determined that providing recycled water service to this area would not be cost-effective given the relatively small demand.

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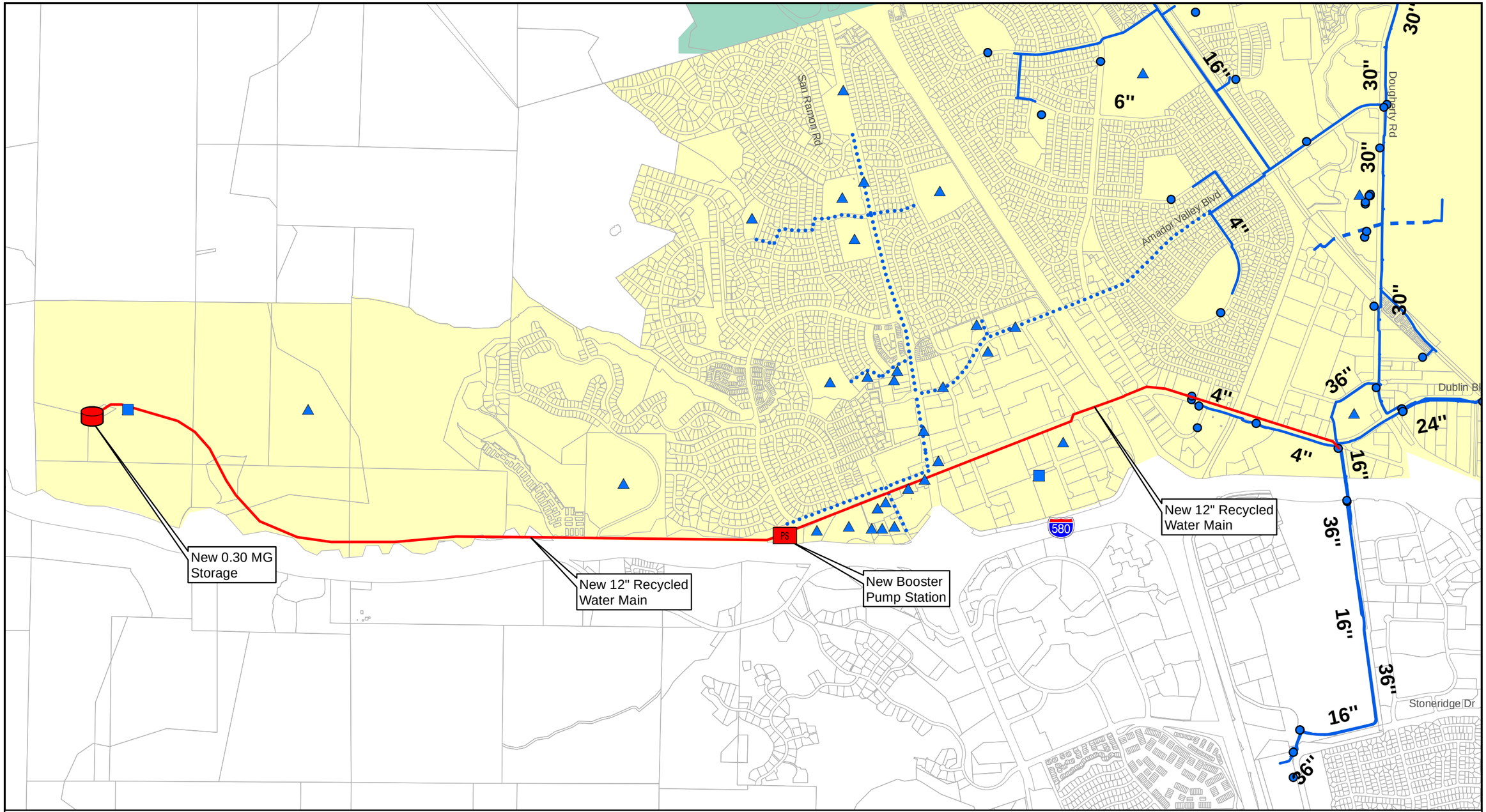

Legend

- Existing Meters
- Connected/Built Out by 2020
- Connected by 2020/ Built Out After 2020
- Connected/Built Out After 2020

Facilities

- Pump Station
- Reservoir
- Existing Pipeline
- Installed 2015/16

- R1 (DSRSD)
- R1 (EBMUD)
- R200 (DSRSD)
- R200 (EBMUD)
- R300A (DSRSD)
- R300B (DSRSD)
- R3000 (EBMUD)
- Roadways
- EBMUD Service Area
- DSRSD Service Area

Feet
0 1,500 3,000

ESTIMATED INFRASTRUCTURE REQUIRED TO SERVICE THE WESTERN DUBLIN/SCHAEFER RANCH AREA

FIGURE 4

DERWA MODEL UPDATE AND SYSTEM EVALUATION

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DUBLIN SAN RAMON SERVICES DISTRICT

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APPENDIX A – HOURLY DIURNAL PATTERNS

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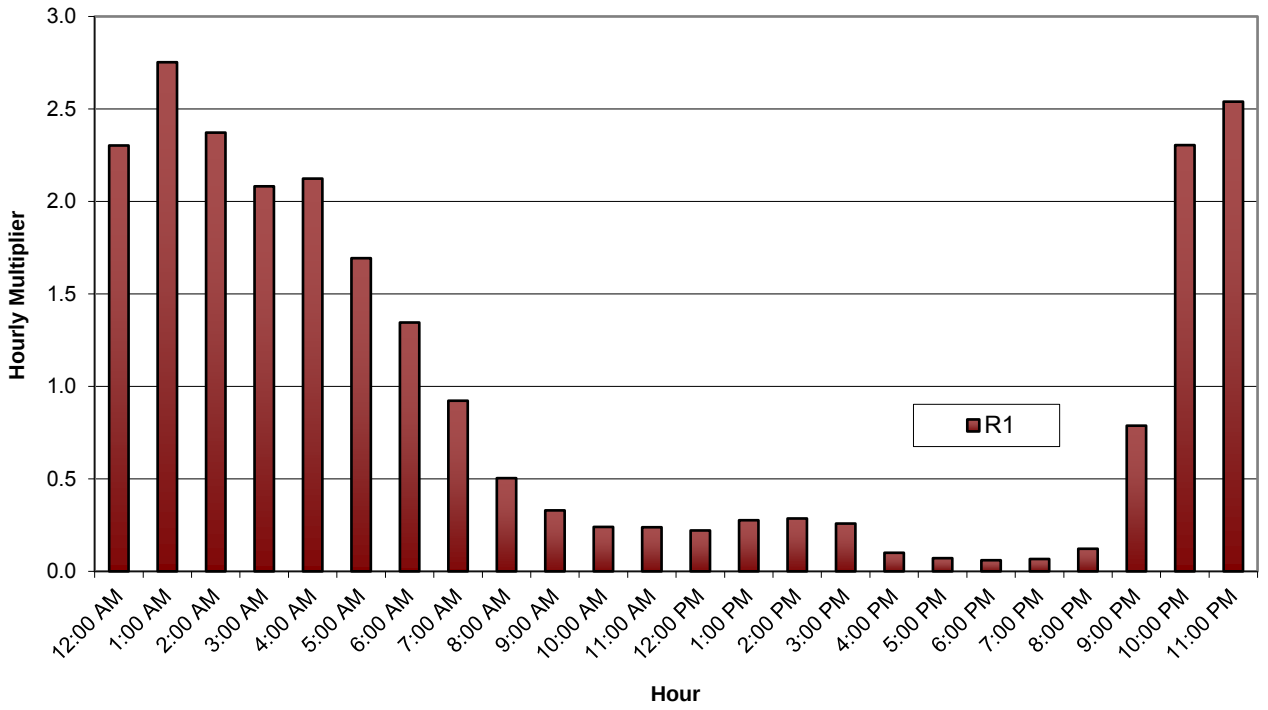
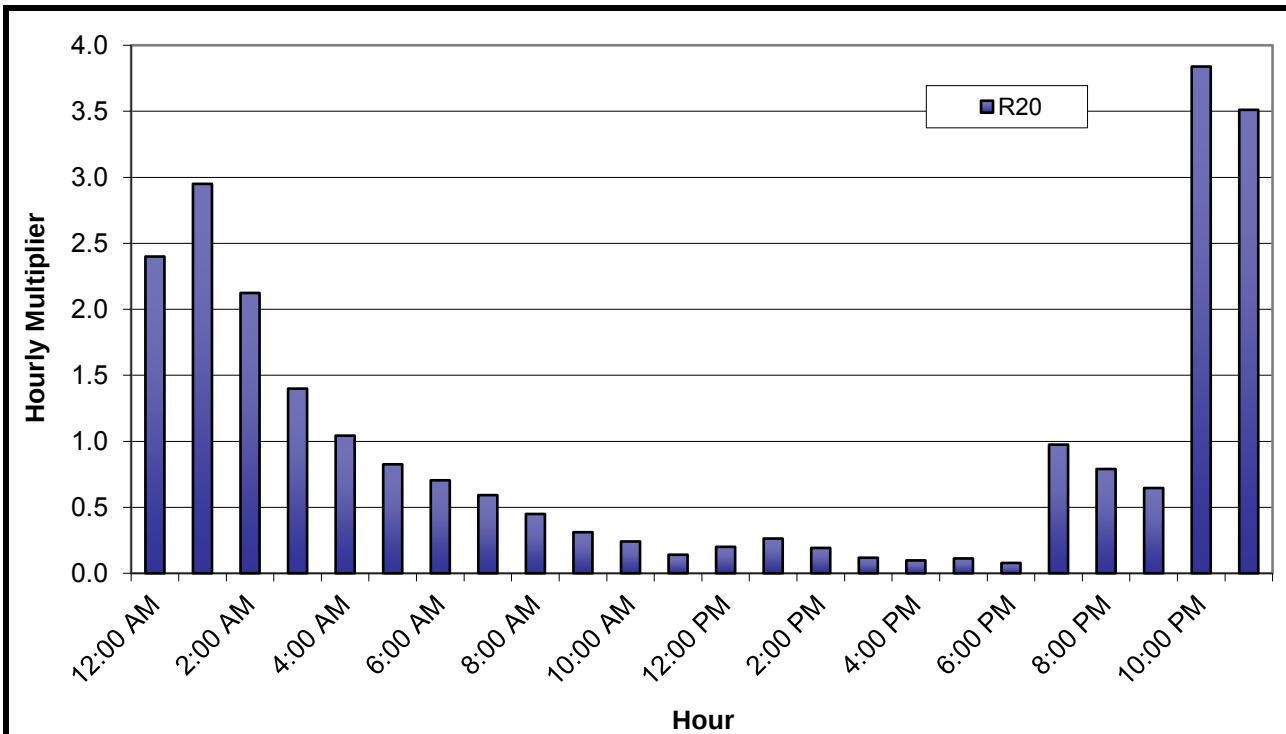


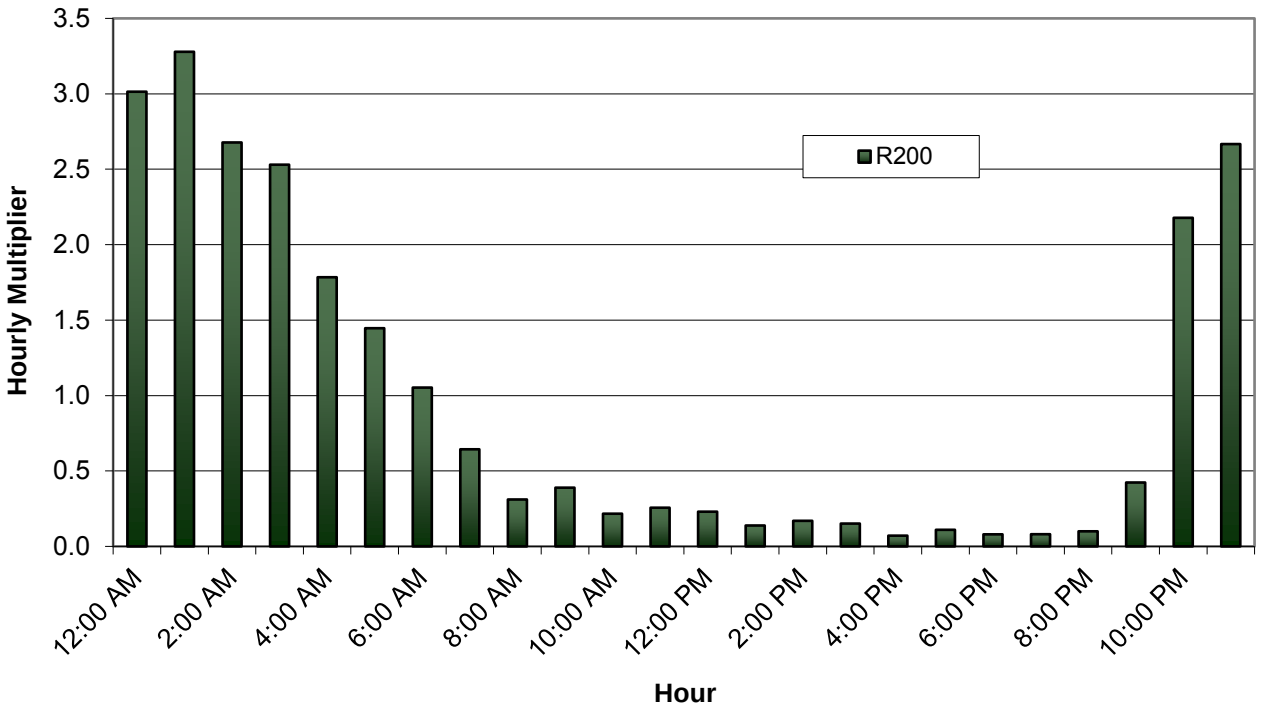
ZONE R1 DIURNAL

FIGURE A



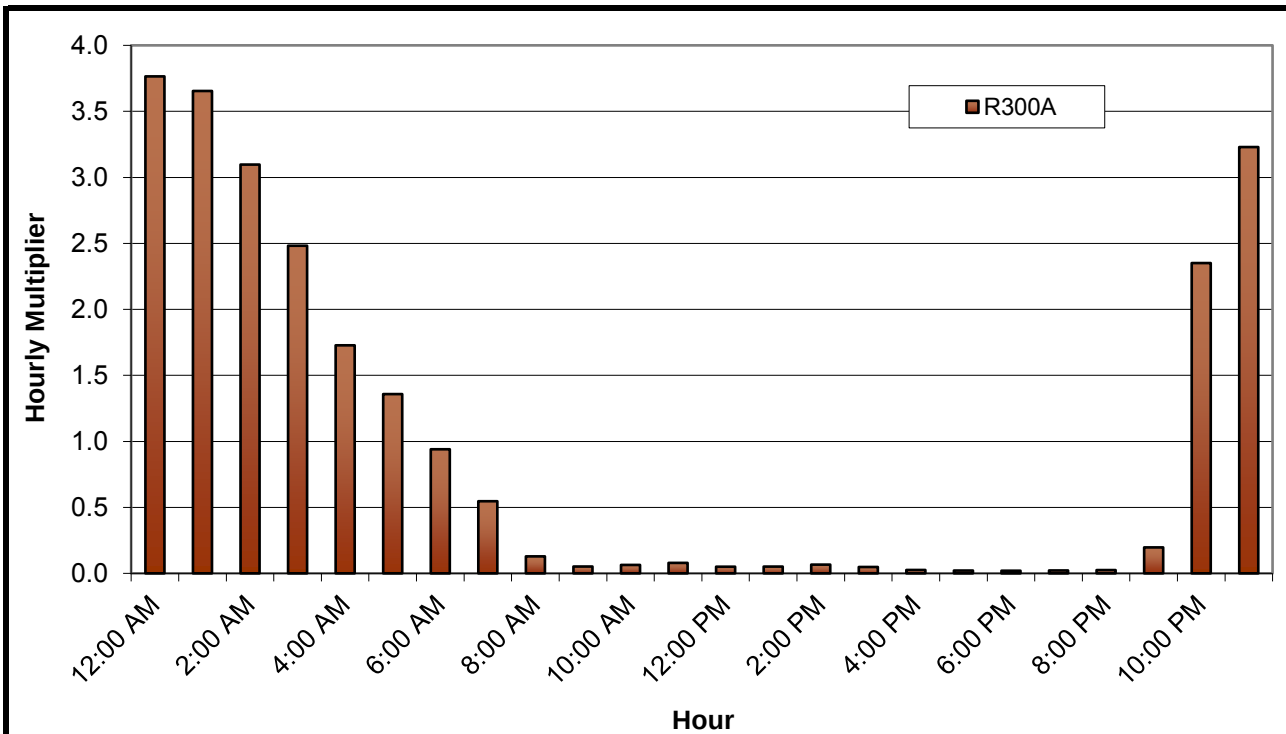
ZONE R20 DIURNAL

FIGURE B



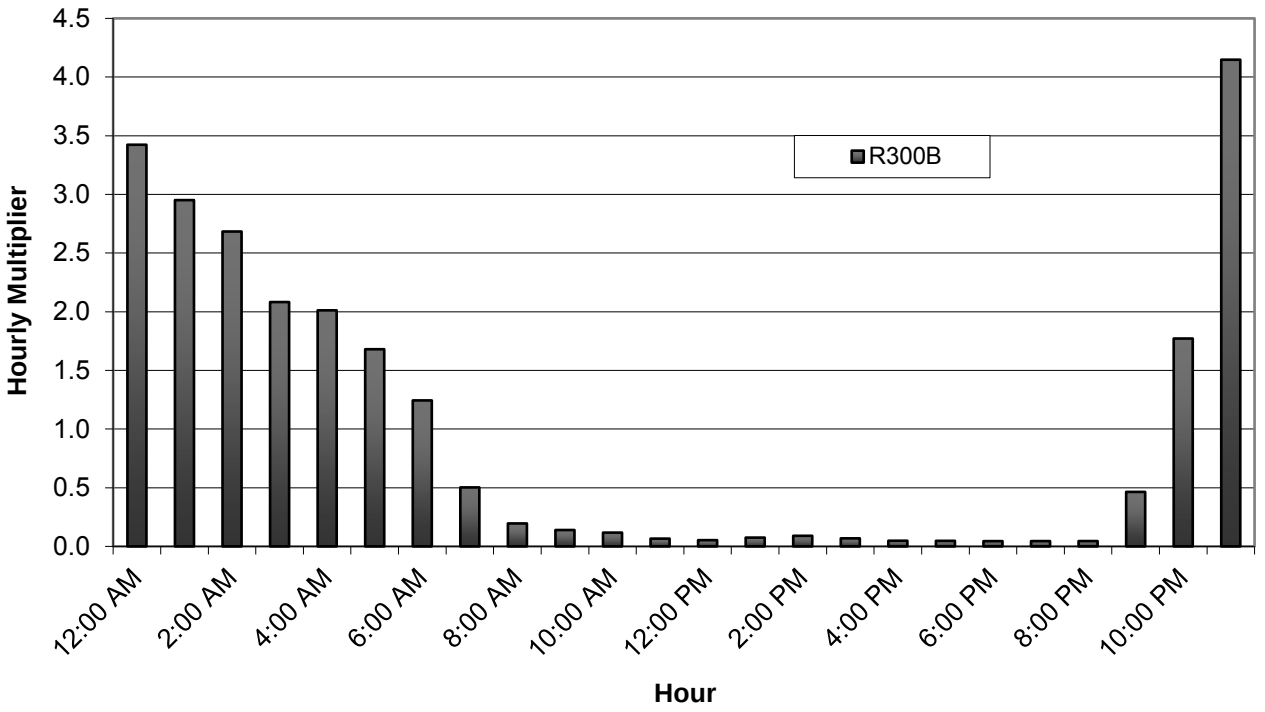
ZONE R200 DIURNAL

FIGURE C



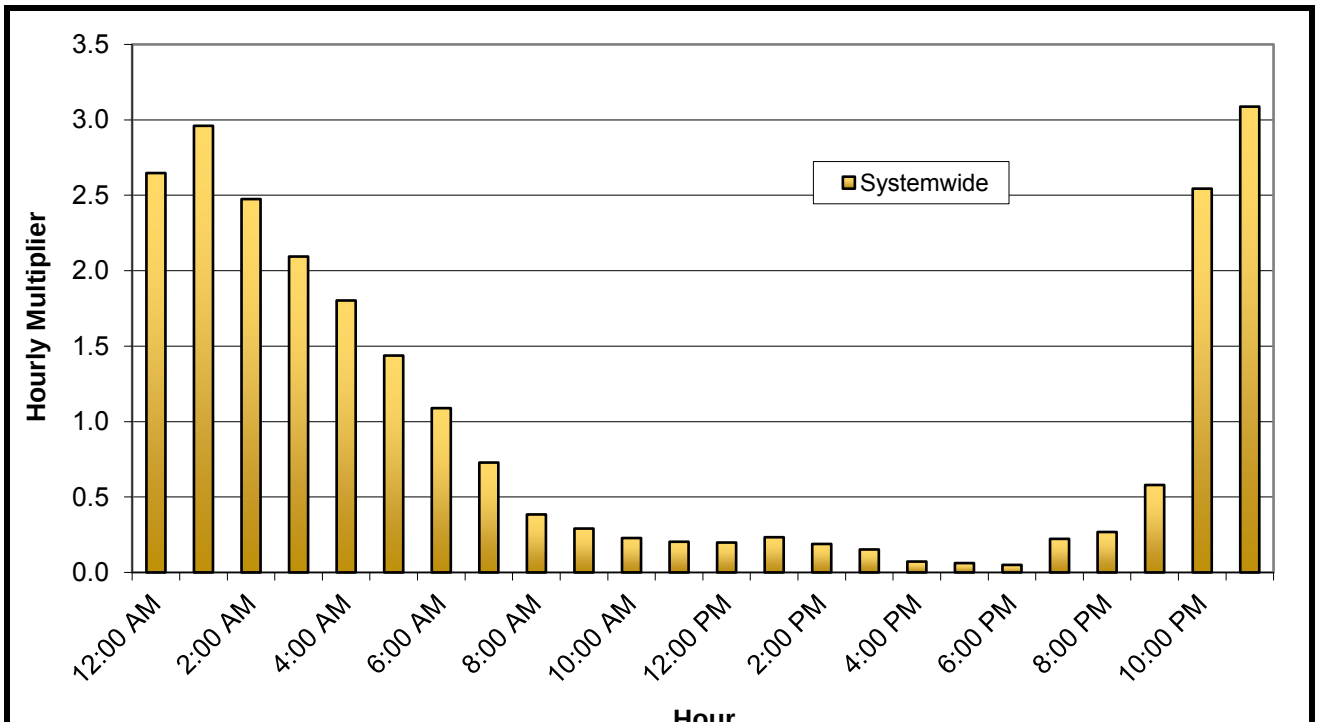
ZONE R300A DIURNAL

FIGURE D



ZONE R300B DIURNAL

FIGURE E



SYSTEMWIDE DIURNAL

FIGURE F

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APPENDIX B – FUTURE RECYCLED WATER DEMAND ESTIMATES

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Table A Additional Year 2020 Recyled Water Demands
DERWA Recycled Water Model Update
Dublin San Ramon Services District

Customer	Address	Pressure Zone	ADD (AFY)	ADD (GPM)	MDD[2] (GPM)	PHD[2] (GPM)
Central Dublin						
Tralee - Pinn Bros.	n/a	R1	2.69	1.67	4.17	12.59
Valley Christian Center	n/a	R1	1.30	0.80	2.01	6.07
Kingsmill (formerly Crown Chev)	n/a	R1	3.22	2.00	4.99	15.08
West Dublin/Pleasanton BART - Essex	n/a	R1	3.07	1.91	4.76	14.39
West Dublin/Pleasanton BART - AMB	n/a	R1	0.62	0.39	0.96	2.91
Arroyo Vista - Eden Housing	n/a	R1	0.75	0.47	1.17	3.53
Heritage Park	n/a	R1	1.96	1.22	3.04	9.18
Central Dublin RW Expansion	n/a	R1	114.81	71.18	177.95	537.41
East Dublin						
Wallis Ranch (Dublin Ranch West)	n/a	R20	24.95	15.47	38.68	116.80
Silveria - Pinn Bros. Villas and Estates	n/a	R20	0.56	0.35	0.87	2.63
Moller Ranch (Casamira Valley)	n/a	R20	22.70	14.07	35.18	106.24
Nielsen Property	n/a	R20	4.55	2.82	7.05	21.28
Raley	n/a	R1	0.31	0.19	0.48	1.44
EBRPD	n/a	R1	28.08	17.41	43.52	131.43
Alameda Cty - Green at Park Place	n/a	R1	8.08	5.01	12.53	37.83
Alameda Cty - Gateway Medical Center	n/a	R1	3.38	2.10	5.24	15.82
Alameda Cty - East County Admin Ctr	n/a	R1	11.91	7.38	18.46	55.75
Alameda Cty - in 2005 WMP Undesignated	n/a	R1	27.99	17.35	43.38	131.02
Kaiser Hospital	n/a	R1	0.17	0.11	0.27	0.80
Dimanto	n/a	R1	0.65	0.40	1.01	3.05
Vargas	n/a	R20	0.59	0.37	0.92	2.77
Fredrich	n/a	R20	2.61	1.62	4.04	12.21
Bart Transit Corridor	n/a	R1	11.08	6.87	17.17	51.86
FCI and Alameda Cty Inst RW Expansion	n/a	R1	150.10	93.06	232.64	702.57
Dublin Ranch						
Dublin Ranch Phase 1	n/a	R1	35.06	21.73	54.33	164.09
Irongate (Lennar)	n/a	R1	1.65	1.02	2.56	7.72
Grafton Plaza	n/a	R1	0.27	0.17	0.42	1.26
Grafton Station	n/a	R1	0.50	0.31	0.78	2.36
The Cottages (Area G Nbhd MH-1)	n/a	R1	1.44	0.89	2.23	6.74
Fallon Gateway	n/a	R1	1.35	0.84	2.09	6.32
Undesignated Areas	n/a	R1	0.01	0.01	0.01	0.04
Camp Parks RFTA						
Camp Parks Cantonment - Development	n/a	R1	103.55	64.20	160.49	484.68
Camp Parks - City Development	n/a	R1	23.63	14.65	36.62	110.59
Western Dublin						
Schaefer Ranch	n/a	R1	22.85	14.16	35.41	106.93
Western Dublin (RW from BoR funding)	n/a	R1	154.58	95.83	239.58	723.54
Dougherty Valley	n/a					
Shapell	n/a	R200	319.37	198.00	495.00	1494.89
Windemere	n/a	R200	226.66	140.52	351.30	1060.92
East of Fallon Road						
Fallon Village - C-1 thru E-2 (at Positano)	n/a	R20	40.83	25.31	63.28	191.12
Jordan Ranch (Mission Valley)	n/a	R1	66.34	41.13	102.83	310.54
Chen (TMI)	n/a	R1	8.61	5.34	13.34	40.29
Anderson	n/a	R1	18.36	11.38	28.45	85.93
Righetti	n/a	R1	3.10	1.92	4.81	14.53
Monte Vista Properties	n/a	R1	0.74	0.46	1.15	3.48
Branaugh	n/a	R1	4.09	2.54	6.35	19.17
EBMUD Phase 2A[1]						
Granada Sales Inc.	4000 Executive Pky	R200	10.48	6.50	16.24	49.05
Granada Sales Inc.	2503 Bishop Drive	R200	8.11	5.03	12.57	37.96
Granada Sales Inc.	3080 Executive Parkway	R200	7.83	4.85	12.14	36.65
Granada Sales Inc.	3000 Executive Pky	R200	7.07	4.38	10.96	33.09
Granada Sales Inc.	2 Annabel Lane	R200	5.38	3.34	8.34	25.18
Granada Sales Inc.	5000 Executive Pky	R200	2.77	1.72	4.29	12.97
Toyota Motor Dist Inc.	2451 Bishop Drive	R200	42.49	26.34	65.86	198.90
Valacal Company (UPS)	4500 Norris Canyon Road	R200	28.50	17.67	44.17	133.40
Crow Canyon Country Club	881 Silver Lake Dr.	R200	70.20	43.52	108.80	328.59
PG&E	3301 Crow Canyon Road	R200	47.22	29.27	73.19	221.02
SBC (former AT&T, now Sunset Development)	2600 Camino Ramon	R200	29.09	18.03	45.09	136.16
Sunset Development Co.	2603 Camino Ramon	R200	20.47	12.69	31.73	95.81
Calfront Associates	2350 Camino Ramon	R200	16.99	10.54	26.34	79.54
Granada Sales Inc.	2301 Camino Ramon	R200	16.27	10.09	25.22	76.16
Commons Office Park Assn	2228 Camino Ramon	R200	12.30	7.63	19.06	57.57
Sunset Development Co.	2420 Camino Ramon	R200	11.54	7.15	17.89	54.02
Granada Sales Inc.	2410 Camino Ramon	R200	10.29	6.38	15.95	48.16
Sunset Development Co.	2527A Camino Ramon	R200	9.48	5.88	14.69	44.37
2300CR Associates LLC	2300 Camino Ramon	R200	9.20	5.70	14.26	43.06
Granada Sales Inc.	2665 Camino Ramon	R200	8.90	5.52	13.79	41.66
Commons Office Park Assn	2256 Camino Ramon	R200	5.80	3.60	8.99	27.15
Annabel Investment Co.	2409 Camino Ramon	R200	5.07	3.14	7.86	23.73
Sunset Development Co.	2623 Camino Ramon	R200	4.34	2.69	6.73	20.31
Sunset Development Co.	2633 Camino Ramon	R200	4.25	2.63	6.59	19.89
Sunset Development Co.	2527 Camino Ramon	R200	3.67	2.28	5.69	17.18

Table A Additional Year 2020 Recyled Water Demands
DERWA Recycled Water Model Update
Dublin San Ramon Services District

Customer	Address	Pressure Zone	ADD (AFY)	ADD (GPM)	MDD[(2)] (GPM)	PHD[(2)] (GPM)
Town of Danville	2101 El Capitan Dr.	R200	3.30	2.05	5.11	15.45
Crow Canyon CC Estates	901 Silver Lake Dr.	R200	3.20	1.98	4.96	14.98
Sunset Development Co.	2453 Camino Ramon	R200	3.20	1.98	4.96	14.98
Town of Danville	2151 El Capitan Dr.	R200	2.80	1.74	4.34	13.11
City of San Ramon	3585 Crow Canyon Rd.	R200	2.40	1.49	3.72	11.23
Annabel Investment Co.	2440 Camino Ramon	R200	2.39	1.48	3.70	11.19
Sunset Development Co.	2613 Camino Ramon	R200	2.35	1.46	3.64	11.00
Annabel Investment Co.	2430 Camino Ramon	R200	1.76	1.09	2.73	8.24
City of San Ramon	3500 Crow Canyon Rd.	R200	2.05	1.27	3.18	9.60
Crow Canyon Country Club	711 Silver Lake Dr.	R200	18.93	11.74	29.34	88.61
Annabel Investment Co.	1 Annabel Lane	R200	2.03	1.26	3.15	9.50
EBMUD Phase 2B[(1)]						
Calif Kosaido Inc	7300 Bollinger Cyn. Rd.	R200	36.00	22.32	55.80	168.51
Calif Kosaido Inc (Golf Course)	7300 Bollinger Cyn. Rd.	R200	86.94	53.90	134.75	406.94
Calif Kosaido Inc. (Golf Course)	1995 Canyon Lakes Drive	R200	74.30	46.06	115.16	347.78
City of San Ramon (Central Park)	12555 Alcosta Blvd.	R200	33.90	21.02	52.54	158.68
City of San Ramon (Central Park)	12501 Alcosta Blvd.	R200	14.70	9.11	22.78	68.81
City of San Ramon (greenbelt)	7301 Bollinger Canyon Road	R200	20.55	12.74	31.85	96.19
City of San Ramon (greenbelt)	10001 Bollinger Canyon Rd.	R200	19.37	12.01	30.02	90.67
Shapell Industries of No. Calif.	3073 N Chanterella Dr.	R200	6.64	4.12	10.29	31.08
Shapell Industries of No. Calif.	90 Alisma Ct/113 S. Chanterella	R200	3.92	2.43	6.08	18.35
Shapell Industries of No. Calif. (Coyote Crossin	4348 Sweetgale Dr.	R200	55.10	34.16	85.40	257.91
Shapell Industries of No. Calif. (greenbelt)	3100 N Chanterella Dr.	R200	13.58	8.42	21.05	63.56
Shapell Industries of No. Calif. (Windy Hills Par	1236 Ustilago Drive	R200	20.30	12.59	31.46	95.02
SRVUSD - Iron Horse Middle School	12617 Alcosta Blvd.	R200	7.02	4.35	10.88	32.86
Sunset Development Co.	12677 Alcosta Blvd.	R200	18.00	11.16	27.90	84.25
2020 Demand Increase Totals						
Pressure Zone R1			**816.32**	**506.08**	**1,265.21**	**3,820.93**
Pressure Zone R20			**96.79**	**60.01**	**150.02**	**453.06**
Pressure Zone R200			**1,398.48**	**867.00**	**2,167.50**	**6,545.86**
Pressure Zone R300A			**0.00**	**0.00**	**0.00**	**0.00**
Pressure Zone R300B			**0.00**	**0.00**	**0.00**	**0.00**
Pressure Zone R3000			**0.00**	**0.00**	**0.00**	**0.00**
Pressure Zone R4000			**0.00**	**0.00**	**0.00**	**0.00**

Notes
(1) Source: "DERWA_EBMUD Demand Projections Phases 1 Through 6 rev 03-03-16.xls" file provided by EBMUD
(2) Assumes MDD/ADD and PHD/ADD peaking factors of 2.5 and 7.55, respectively.

Table B Additional Year 2031 Demands Summary
DERWA Recycled Water Model Update
Dublin San Ramon Services District

Customer	Address	Pressure Zone	ADD (AFY)	ADD (GPM)	MDD[3] (GPM)	PHD[3] (GPM)
Central Dublin						
West Dublin/Pleasanton BART - Essex	n/a	R1	0.51	0.32	0.79	2.40
East Dublin						
Moller Ranch (Casamira Valley)	n/a	R20	30.26	18.76	46.91	141.66
Alameda Cty - Green at Park Place	n/a	R1	6.06	3.76	9.39	28.37
Alameda Cty - Gateway Medical Center	n/a	R1	1.35	0.84	2.10	6.33
Alameda Cty - East County Admin Ctr	n/a	R1	2.98	1.85	4.62	13.94
Alameda Cty - in 2005 WMP Undesignated	n/a	R1	41.99	26.03	65.08	196.53
Kaiser Hospital	n/a	R1	1.71	1.06	2.65	8.01
Dimanto	n/a	R1	1.96	1.21	3.03	9.16
Fredrich	n/a	R20	0.65	0.40	1.01	3.05
Dublin Ranch						
Irongate (Lennar)	n/a	R1	1.65	1.02	2.56	7.72
Grafton Plaza	n/a	R1	0.81	0.50	1.26	3.79
Grafton Station	n/a	R1	0.00	0.00	0.00	0.00
Undesignated Areas	n/a	R1	0.02	0.01	0.03	0.08
Camp Parks RFTA						
Camp Parks - City Development	n/a	R1	19.69	12.21	30.52	92.16
Western Dublin						
Schaefer Ranch	n/a	R1	30.46	18.88	47.21	142.58
East of Fallon Road						
Croak	n/a	R1	84.74	52.53	131.33	396.63
Chen (TMI)	n/a	R1	60.25	37.35	93.38	282.01
Righetti	n/a	R1	21.73	13.47	33.69	101.73
Monte Vista Properties	n/a	R1	3.72	2.31	5.77	17.41
Branaugh	n/a	R1	16.38	10.15	25.39	76.67
EBMUD Phase 3A[2]						
Alamo Creek - A Street Medians/Greenbelts	?	R3000	4.24	2.63	6.57	19.85
Alamo Creek - Aquatic Center	?	R3000	3.02	1.87	4.68	14.14
Alamo Creek - Elementary School Playfield	?	R3000	23.02	14.27	35.68	107.75
Alamo Creek - Fire Station	?	R3000	1.34	0.83	2.08	6.27
Alamo Creek - Future Middle School Site	?	R3000	45.50	28.21	70.52	212.97
Alamo Creek - Interior Streets Park Areas	?	R3000	3.48	2.16	5.39	16.29
Alamo Creek - Medians/Greenbelts Camino Tassajara	?	R3000	3.94	2.44	6.11	18.44
Alamo Creek - Memorial Park	?	R3000	12.70	7.87	19.68	59.44
Alamo Creek - Neighborhood Parkways	?	R3000	15.52	9.62	24.05	72.64
Alamo Creek - Open Space	?	R3000	4.67	2.90	7.24	21.86
Alamo Creek - Senior Facility	?	R3000	6.92	4.29	10.73	32.39
Alamo Creek - Soccer Field (Perimeter landscaping)	?	R3000	11.79	7.31	18.27	55.19
CCC Dept Pub Works	3000 Mansfield Dr.	R3000	3.40	2.11	5.27	15.91
City of San Ramon	4361 Reedland Circle	R3000	67.10	41.60	104.00	314.08
Davidon Homes	162 Heritage Park Drive	R3000	5.29	3.28	8.20	24.76
Heritage Danville HOA	134 Heritage Park Drive	R3000	3.28	2.03	5.08	15.35
Plaza Retail Property LP	3400 Blackhawk Plaza Circle	R3000	15.73	9.75	24.38	73.63
Shapell Industries of No. Calif.	2110 Goldenrod Lane	R3000	7.67	4.76	11.89	35.90
Tassajara Creek	94 Rassani Dr	R3000	3.30	2.05	5.11	15.45
Tassajara Shopping Center	3436 Camino Tassajara	R3000	9.58	5.94	14.85	44.84
Tassajara Shopping Center Assn.	3474 Camino Tassajara	R3000	4.67	2.90	7.24	21.86
Town of Danville	1000 Tassajara Ranch Drive	R3000	18.17	11.26	28.16	85.05
Town of Danville	1001 Tassajara Ranch Drive	R3000	10.81	6.70	16.75	50.60
Town of Danville	600 Center Way	R3000	9.40	5.83	14.57	44.00
EBMUD Phase 3B[2]						
Calif Kosaido Inc.	2900 Lakemont Drive	R3000	65.96	40.89	102.23	308.74
City of San Ramon	5010 Shoreline Drive	R3000	19.89	12.33	30.83	93.10
City of San Ramon	5510 Canyon Crest Drive	R3000	15.87	9.84	24.60	74.28
City of San Ramon	3835 Crow Canyon Rd	R3000	1.60	0.99	2.48	7.49
Crow Canyon Country Club	3900 Crow Canyon Road	R3000	90.72	56.24	140.61	424.63
Essex Property Trust Inc.	155 Shoreline Circle	R3000	23.80	14.76	36.89	111.40
San Ramon Valley USD - Golden View School	5025 Canyon Crest Drive	R3000	31.64	19.62	49.04	148.10
The Lake Assn.	110 Lakeridge Lant	R3000	42.99	26.65	66.63	201.22
The Shores	2086 Shoreline Drive	R3000	17.64	10.94	27.34	82.57
The Shores	2000 Shoreline Drive	R3000	8.13	5.04	12.60	38.05
EBMUD Phase 3C[2]						
City of San Ramon	3451 Dougherty Road	R3000	17.40	10.79	26.97	81.44
City of San Ramon	3600 Dougherty Road	R3000	9.79	6.07	15.17	45.82
City of San Ramon	190 Red Willow Way	R3000	9.54	5.91	14.79	44.65
Miravilla at Gale Ranch	700 S Blackbrush Ln	R3000	14.50	8.99	22.47	67.87
Shapell Industries of No. Calif.	420 S. Clovercrest Lane	R3000	14.58	9.04	22.60	68.24
Shapell Industries of No. Calif.	300 Maverick Court	R3000	11.13	6.90	17.25	52.10
Trevari	107 Pearlgrass Ct	R3000	5.70	3.53	8.83	26.68
EBMUD Phase 4[2]						
Blackhawk Country Club	3505 Deercrest	R4000	81.79	50.71	126.77	382.83
Blackhawk Country Club**	5230 Blackhawk Drive	R4000	89.00	55.18	137.94	416.58
Blackhawk Country Club	5340 Blackhawk Drive	R4000	69.75	43.24	108.11	326.48
Blackhawk Country Club	5426 Blackhawk Drive	R4000	84.57	52.43	131.08	395.85
CCC Public Works	4101 Camino Tassajara	R4000	9.13	5.66	14.15	42.73
Country Club Improv Assoc	3855 Blackhawk Rd	R4000	9.60	5.95	14.88	44.93
Country Club Improv Assoc	4502 Kingswood Dr.	R4000	11.10	6.88	17.20	51.96
EBMUD Phase 5[2]						
Blackhawk Country Club	595 Blackhawk Club Drive	R5000	128.00	79.36	198.39	599.13
Blackhawk Country Club	3022 Deer Meadow Drive	R5000	57.00	35.34	88.34	266.80
EBMUD Phase 6[2]						
Danville West	School/Park	R6000	150.00	92.99	232.48538	702.11
2031 Demand Increase Totals						
Pressure Zone R1			**296.00**	**183.51**	**458.78**	**1,385.51**
Pressure Zone R20			**30.92**	**19.17**	**47.92**	**144.71**
Pressure Zone R200			**0.00**	**0.00**	**0.00**	**0.00**
Pressure Zone R300A			**0.00**	**0.00**	**0.00**	**0.00**
Pressure Zone R300B			**0.00**	**0.00**	**0.00**	**0.00**
Pressure Zone R3000			**695.42**	**431.13**	**1,077.83**	**3,255.06**
Pressure Zone R4000			**354.94**	**220.05**	**550.12**	**1,661.37**
Pressure Zone R5000			**185.00**	**114.69**	**286.73**	**865.93**
Pressure Zone R6000			**150.00**	**92.99**	**232.49**	**702.11**

Notes
(1) Source: 2007/2008 Irrigation Billing Records
(2) Source: "DERWA_EBMUD Demand Projections Phases 1 Through 6 rev 03-03-16.xls" file provided by EBMUD
(3) Assumes MDD/ADD and PHD/ADD peaking factors of 2.5 and 7.55, respectively.

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APPENDIX C – MAP OF EXISTING AND FUTURE RECYCLED WATER USERS

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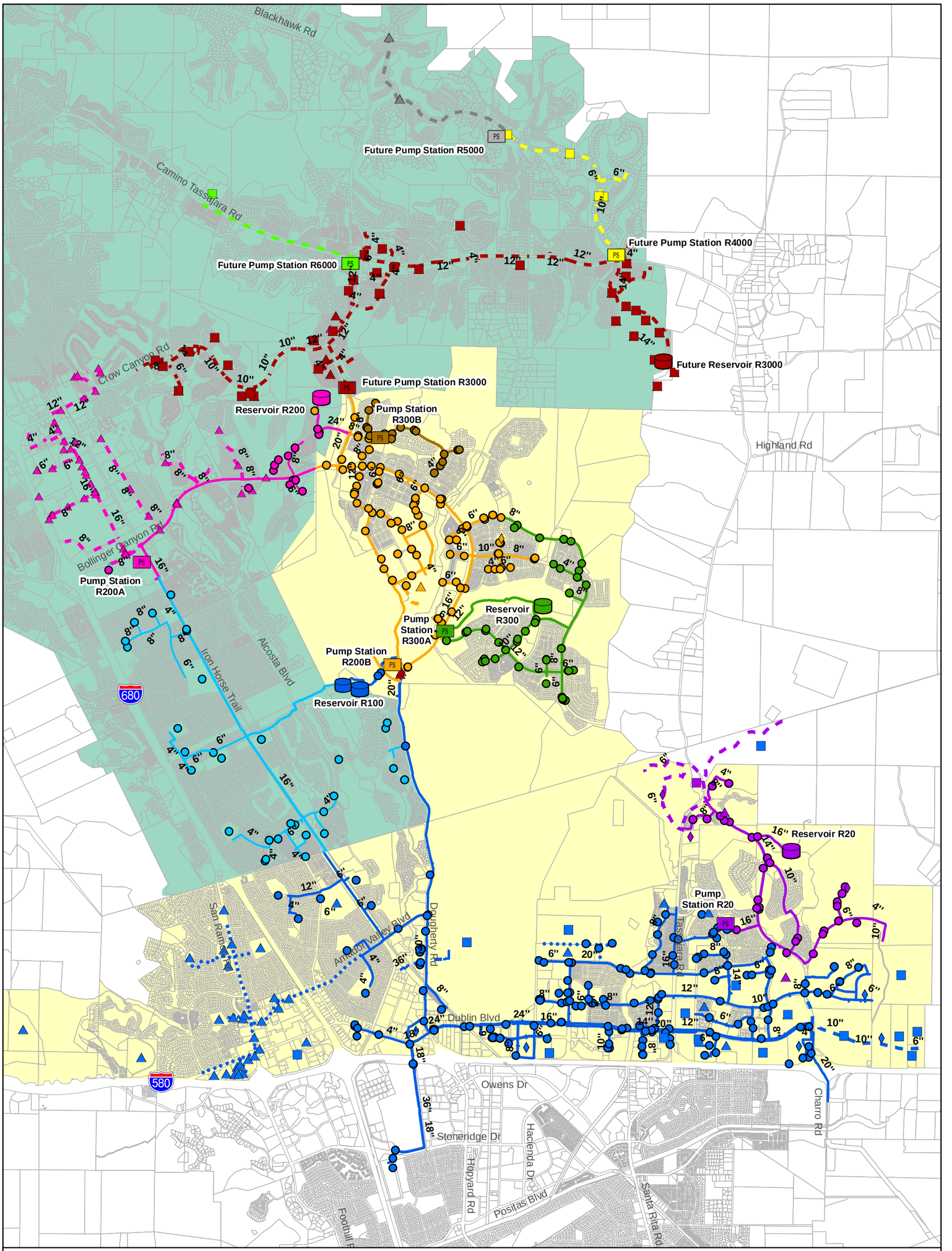

Legend

- Existing Meters
- Connected/Built Out by 2020
- Connected by 2020/Built Out After 2020
- Connected/Built Out After 2020

Facilities

- Pump Station
- Reservoir
- Existing Pipeline
- Future Pipeline
- Installed 2015/16

- R1 (DSRSD)
- R1 (EBMUD)
- R20 (DSRSD)
- R200 (DSRSD)
- R200 (EBMUD)
- R300A (DSRSD)
- R300B (DSRSD)
- R3000 (EBMUD)
- R4000 (EBMUD)
- R5000 (EBMUD)
- R6000 (EBMUD)
- Parcels
- EBMUD Service Area
- DSRSD Service Area

Feet
0 3,000 6,000

EXISTING AND FUTURE RECYCLED WATER METER LOCATIONS

APPENDIX C

DERWA MODEL UPDATE AND SYSTEM EVALUATION

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APPENDIX D – PLANNING LEVEL COSTS FOR FACILITIES TO SERVE SHAEFER RANCH AREA

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Planning Level Costs for Facilities to Serve Shaefer Ranch Area
DERWA Model Update and System Evaluation

Facility	Size	Length (ft)	Unit Cost[1] ($)	Estimated Construction Cost[1]	Design and Construction Contingency[2]	Professional Services[3]	Total Capital Cost[4]
Booster Pump Station	0.7 mgd	--	--	$ 1,300,000	$ 390,000	$ 507,000	$ 2,197,000
Storage Tank	0.30 MG	--		$ 1,450,000	$ 435,000	$ 566,000	$ 2,451,000
12" Diameter Transmission Main	12"	22,300	265	$ 5,910,000	$ 1,773,000	$ 2,305,000	$ 9,988,000
Transmission Main Crossing Under 680	12"/21"	300	580	$ 174,000	$ 52,000	$ 68,000	$ 294,000
Total				**$ 8,834,000**	**$ 2,650,000**	**$ 3,446,000**	**$ 14,930,000**

Notes:
(1) Unit costs based on DSRSD Water Master Plan unit cost estimates (provided by West Yost), and are based on and ENR CCI of 11,155 (San Francisco, July 2015)
(2) Design and construction contingency is estimated to be 30-percent of the estimated construction cost.
(3) Professional services are estimated to be 30-percent of the estimated cosntruction cost and design and construction contingency.
(4) Total capital cost is estimated to be approximately 169-percent of the estimated construction cost.

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