

AGENDA
IRVINE RANCH WATER DISTRICT
ENGINEERING AND OPERATIONS COMMITTEE
TUESDAY, DECEMBER 10, 2019

CALL TO ORDER 7:30 a.m., IRWD Operations Center, Committee Room
3512 Michelson Drive, Irvine, California 92612

ATTENDANCE Committee Chair: Doug Reinhart _____
 Committee Member: Mary Aileen Matheis _____

<u>ALSO PRESENT</u>	Paul Cook	_____	Kevin Burton	_____	Paul Weghorst	_____
	Jose Zepeda	_____	Wendy Chambers	_____	Tom Roberts	_____
	Rich Mori	_____	Eric Akiyoshi	_____	Richard Mykitta	_____
	Kelly Lew	_____	Jim Colston	_____	Ken Pfister	_____
	Lars Oldewage	_____	Malcolm Cortez	_____	Scott Toland	_____
	John Dayer	_____	Bruce Newell	_____	_____	_____
	_____	_____	_____	_____	_____	_____

NOTICE: If you wish to address the Committee on any item, please file your name with the Committee. Forms are provided at the meeting. Remarks are limited to three minutes per speaker on each subject.

COMMUNICATIONS

1. Notes: Burton
2. Public Comments
3. Determine the need to discuss and/or take action on item(s) introduced that came to the attention of the District subsequent to the agenda being posted.
4. Determine which items may be approved without discussion.

INFORMATION

- | | |
|---|--|
| <p>5. <u>IRWD EMBEDDED ENERGY PLAN UPDATE – JOHNSON / SANCHEZ / WEGHORST</u></p> | |
|---|--|

Recommendation: Receive and file.

ACTION

- | | |
|--|--|
| <p>6. <u>FLEMING ZONE 8 TANK AND ZONE 8 TO 9 BOOSTER PUMP STATION CONSULTANT SELECTION – MOEDER / MORI / BURTON</u></p> | |
|--|--|

Recommendation: That the Board authorize the General Manager to execute a Professional Services Agreement with Tetra Tech in the amount of \$878,000 for engineering design services for the Fleming Zone 8 Tank and Zone 8 to 9 Booster Pump Station, Project 10101.

OTHER BUSINESS

7. Directors' Comments
8. Adjourn

*

Availability of agenda materials: Agenda exhibits and other writings that are disclosable public records distributed to all or a majority of the members of the above-named Committee in connection with a matter subject to discussion or consideration at an open meeting of the Committee are available for public inspection in the District's office, 15600 Sand Canyon Avenue, Irvine, California ("District Office"). If such writings are distributed to members of the Committee less than 72 hours prior to the meeting, they will be available from the District Secretary of the District Office at the same time as they are distributed to Committee Members, except that if such writings are distributed one hour prior to, or during, the meeting, they will be available at the entrance of the meeting room at the District's Operations Committee Room at 3512 Michelson, Irvine, California. The Irvine Ranch Water District's Committee Room is wheelchair accessible. If you require any special disability-related accommodations (e.g., access to an amplified sound system, etc.), please contact the District Secretary at (949) 453-5312 during business hours at least seventy-two (72) hours prior to the scheduled meeting.

December 10, 2019
Prepared by: D. Johnson
Submitted by: F. Sanchez / P. Weghorst
Approved by: Paul Cook



ENGINEERING AND OPERATIONS COMMITTEE

IRWD EMBEDDED ENERGY PLAN UPDATE

SUMMARY:

In 2015, Navigant Consulting, Inc. completed an Embedded Energy Plan for IRWD. The plan quantified energy use associated with IRWD facilities involved in the treatment, distribution, collection, use, reuse, and disposal of water and biosolids. A 2019 update to the plan is nearing completion. The updated plan refreshes the embedded energy analyses while providing IRWD the ability to develop updated pumping surcharges, target water use efficiency programs, and energy reduction measures. The update plan also enhances IRWD's role as an industry leader in water and energy efficiency. At the Committee meeting, staff will provide a presentation on the updated Embedded Energy Plan. A comparison of findings from the 2015 version and a discussion of next steps will also be provided.

BACKGROUND:

In January 2019, a Navigant was retained to update the IRWD Embedded Energy Plan. The updated plan includes of a comprehensive analysis of IRWD's water operations infrastructure and incorporates new facilities that were not contemplated in the original plan, including the MWRP Phase 2 Expansion, Baker Treatment Plant, recently constructed pump stations, and other facilities. In addition, 37 new Southern California Edison, four new Southern California Gas Company, and 24 Constellation Direct Access electricity accounts were added to the analysis. This update utilizes operational data from 2014 through 2018. The Historic Embedded Energy Analysis that comprises a significant portion of the update is provided as Exhibit "A".

Embedded Energy Plan Update Process:

Staff worked with Navigant to verify each IRWD water operations facility associated with an electric or gas account, correcting inconsistencies identified in the methodology used to produce the 2015 Plan. In addition, staff leveraged the availability of IRWD supervisory control and data acquisition data (SCADA) to determine water flow for each facility. Consideration of this data was an improvement over the 2015 Plan, which relied on numerous estimates due to limited data availability for many of IRWD's facilities from 2012 to 2014.

Navigant has completed a majority of the core tasks associated with the plan update including:

- Updating the pumping cost analysis, which was utilized to update pumping surcharges as part of the FY 2019-20 and FY 2020-21 rates and charges process;
- Updating energy use estimates associated with the IRWD facilities involved in the production, treatment and distribution of water; and
- Updating energy use estimates associated with sewage collection and treatment, as well as the distribution of recycled water and production of biosolids.

Next Steps:

Navigant is finalizing a calculation of spatial embedded energy estimates for IRWD, which will provide a weighted embedded energy value for each of the distinct geopressure zones within the IRWD service area. The data deliverables generated as part of developing the plan will enable IRWD to continue tracking the embedded energy savings associated with water conservation activities, applying for future grants and other sources of funding that focus on the water-energy nexus and reporting annual embedded energy calculations as part of IRWD's participation in the California Water-Energy Nexus Registry.

Navigant is summarizing the results of the analysis in a technical report that is expected to be available to staff for review by the end of December. At the Committee meeting, staff will provide a presentation on the updated Embedded Energy Plan. A comparison of findings from the 2015 version and a discussion of next steps will also be provided.

FISCAL IMPACTS:

None.

ENVIRONMENTAL COMPLIANCE:

This item is not a project as defined in the California Environmental Quality Act as authorized under the California Code of Regulations, Title 14, Chapter 3, Section 15378.

RECOMMENDATION:

Receive and file.

LIST OF EXHIBITS:

Exhibit "A" – Embedded Energy Plan – Task 2 Historic Embedded Energy Analysis (2019)



Embedded Energy Plan – Task 2: Historic Embedded Energy Analysis

Technical Memorandum

Prepared for:

Irvine Ranch Water District



Submitted by:

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Reference No.: 207850
October 18, 2019

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DISCLAIMER

This report was prepared by Navigant Consulting, Inc. (Navigant) for Irvine Ranch Water District. The work presented in this report represents Navigant's professional judgment based on the information available at the time this report was prepared. Navigant is not responsible for the reader's use of, or reliance upon, the report, nor any decisions based on the report. NAVIGANT MAKES NO REPRESENTATIONS OR WARRANTIES, EXPRESSED OR IMPLIED. Readers of the report are advised that they assume all liabilities incurred by them, or third parties, as a result of their reliance on the report, or the data, information, findings and opinions contained in the report.

1. INTRODUCTION

Navigant Consulting, Inc. (Navigant) was selected to update the Irvine Ranch Water District's (IRWD) 2015 Embedded Energy Plan (2015 Study).¹ The goals of this update are to provide the following benefits to IRWD:

- Demonstrate embedded energy reductions over time
- Identify the most cost-effective geographic areas for water conservation programs
- Provide information required to develop a pumping surcharge recommendation
- Position IRWD for the possibility of obtaining energy utility funding for water conservation programs
- Enhance IRWD's role as an industry leader in water conservation and energy savings

The overall project consists of seven distinct, yet interrelated tasks. These tasks are:

- Task 1: Project Management and Meetings.
- Task 2: Historic Embedded Energy Analysis Update. The Navigant team will calculate total energy use and historic embedded energy on an annual basis from 2014 to 2018 for each of IRWD's major systems.
- Task 3: Spatial Embedded Energy Estimate Update. This task will develop estimates of embedded energy in each of the 109 potable geo-pressure zones and 33 non-potable geo-pressure zones within IRWD territory. It will leverage data from Task 2 and 4.
- Task 4: Historic Water Use Analysis. This task will analyze historic potable and non-potable water use in IRWD territory on an annual basis from 2014 to 2018, as well as the associated wastewater collection.
- Task 5: Embedded Energy Tool Update. This task will provide a spreadsheet-based Embedded Energy Management tool with new data derived as part of Tasks 3 and 4.
- Task 6: Pumping Surcharge Analysis Update. The Navigant team will help IRWD assess the variation in cost of pumping to provide water to different regions throughout its service territory and develop a pumping surcharge by region.
- Task 7: Report. The Navigant team will develop a comprehensive report on the analysis conducted as part of the Embedded Energy Plan.

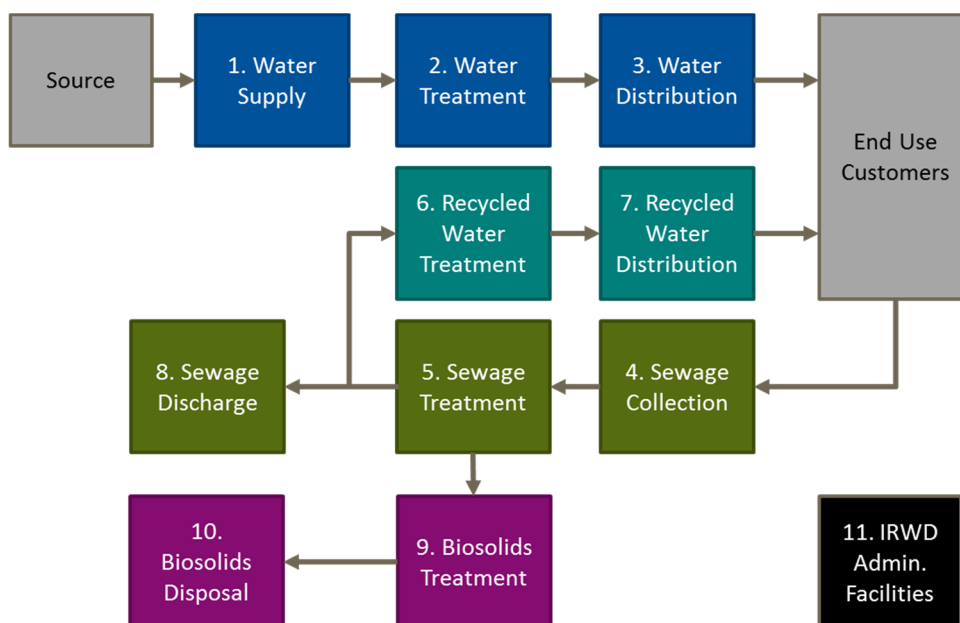
1.1 Historic Embedded Energy Estimates

This memo describes the data collection, analysis and results of Task 2: Historic Embedded Energy Estimates. In this task, the Navigant team was tasked with calculating total energy use and historic embedded energy on an annual basis for a 2014 to 2018 study period for each of IRWD's major

¹ <https://www.irwd.com/images/pdf/doing-business/energy-programs/1.%20Embedded%20Energy%20Plan%20-%20Final%20Report.pdf>

systems. The Navigant team developed embedded energy estimates for the systems numbered in Figure 1 as they are utilized by IRWD. This analysis further breaks down water supply into two subsystems: 1a – Potable Water Supply and 1b – Non-Potable Water Supply.

Figure 1: Systems

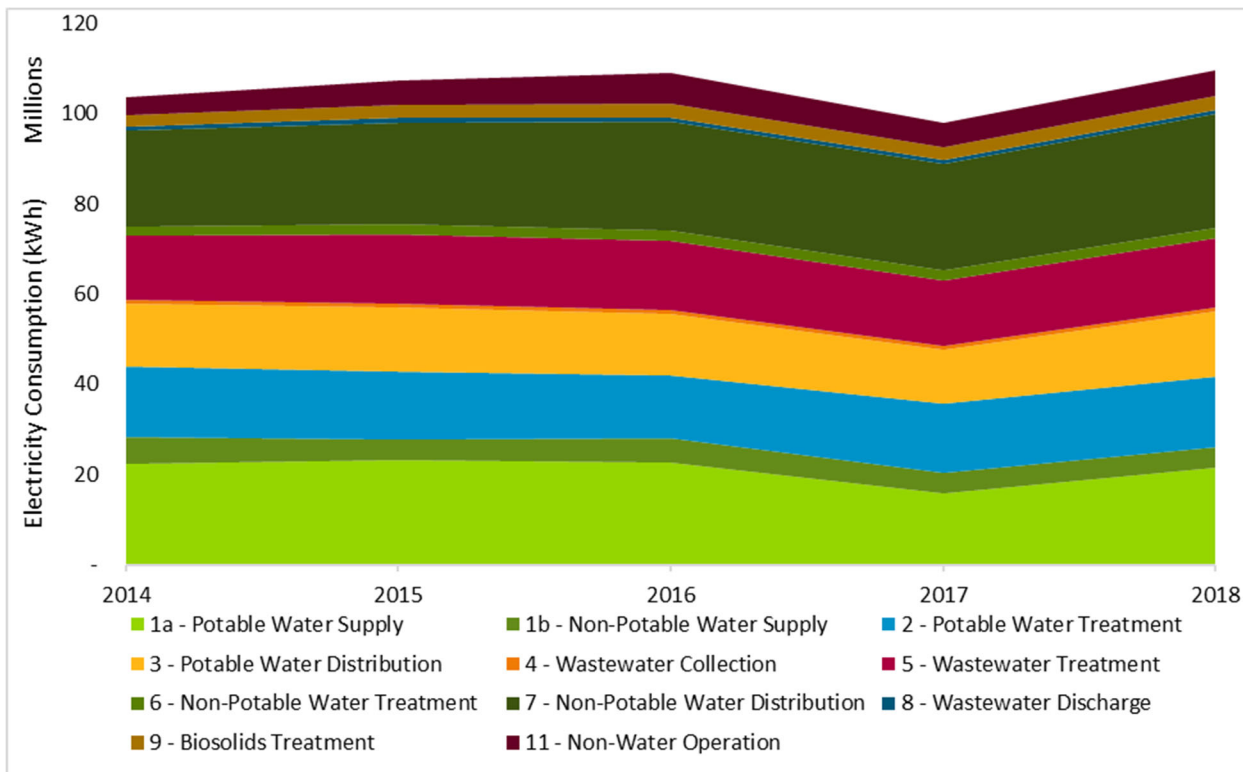


Source: Navigant analysis.

As part of this task, the Navigant team estimated the total historic energy use and average energy intensity (EI) of each major system component. Energy Intensity (EI) is defined as the average amount of energy needed to transport or treat water or sewage on a per unit basis (kilowatt hours per acre-foot of water [kWh/AF] or therms per acre-foot of water [therms/AF]). Energy intensity values provide an estimate of the energy consumption required to provide, deliver, and treat a unit of water.

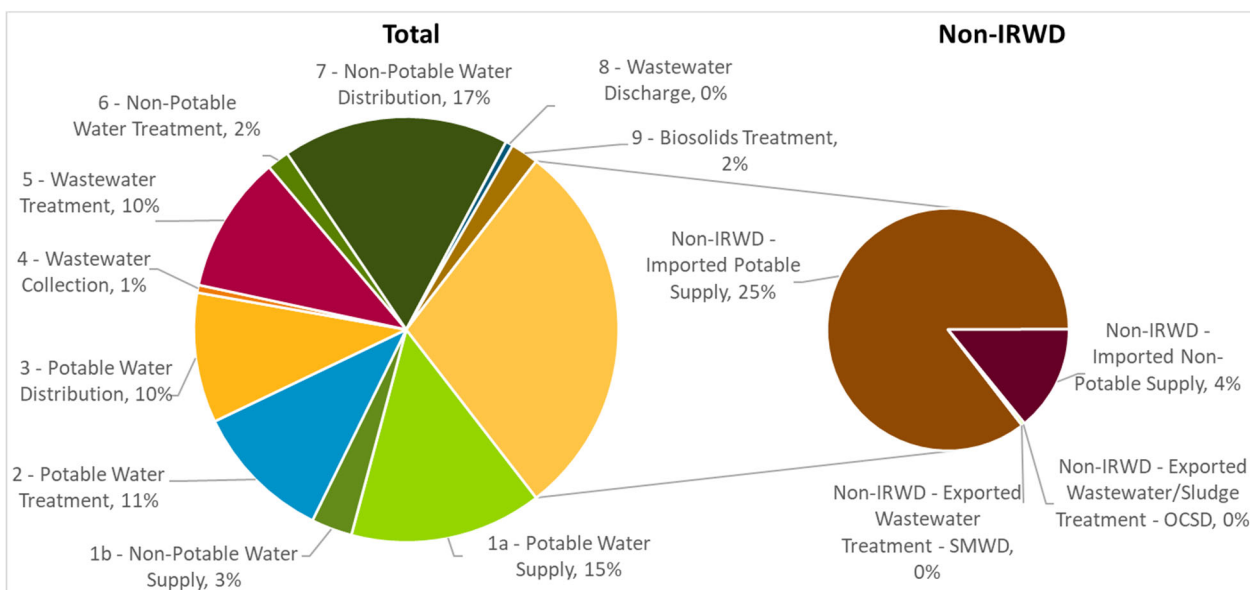
2. RESULTS

Figure 2: IRWD Electricity Use by System



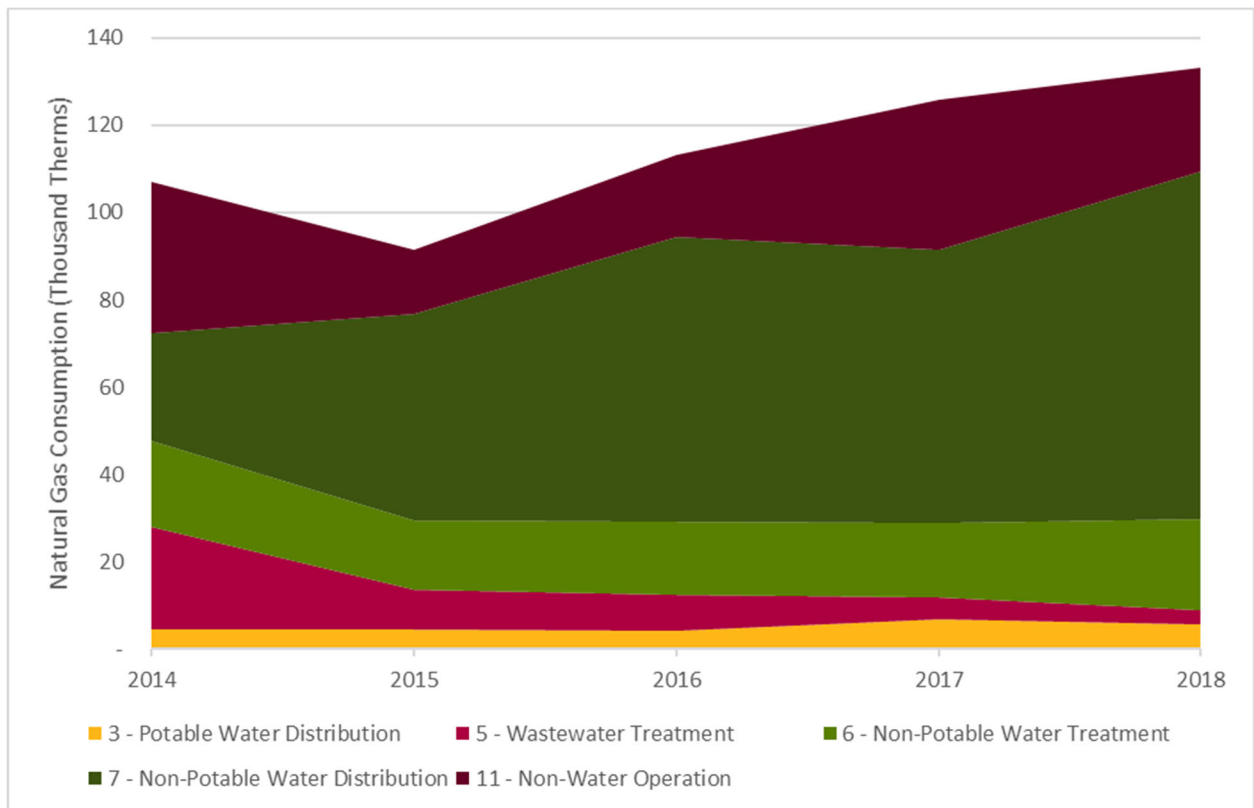
Source: Navigant analysis.

Figure 3: Distribution of 2018 Total Electricity Consumption with Non-IRWD Systems Broken Out



Source: Navigant analysis.

Figure 4: Total IRWD Natural Gas Consumption by System



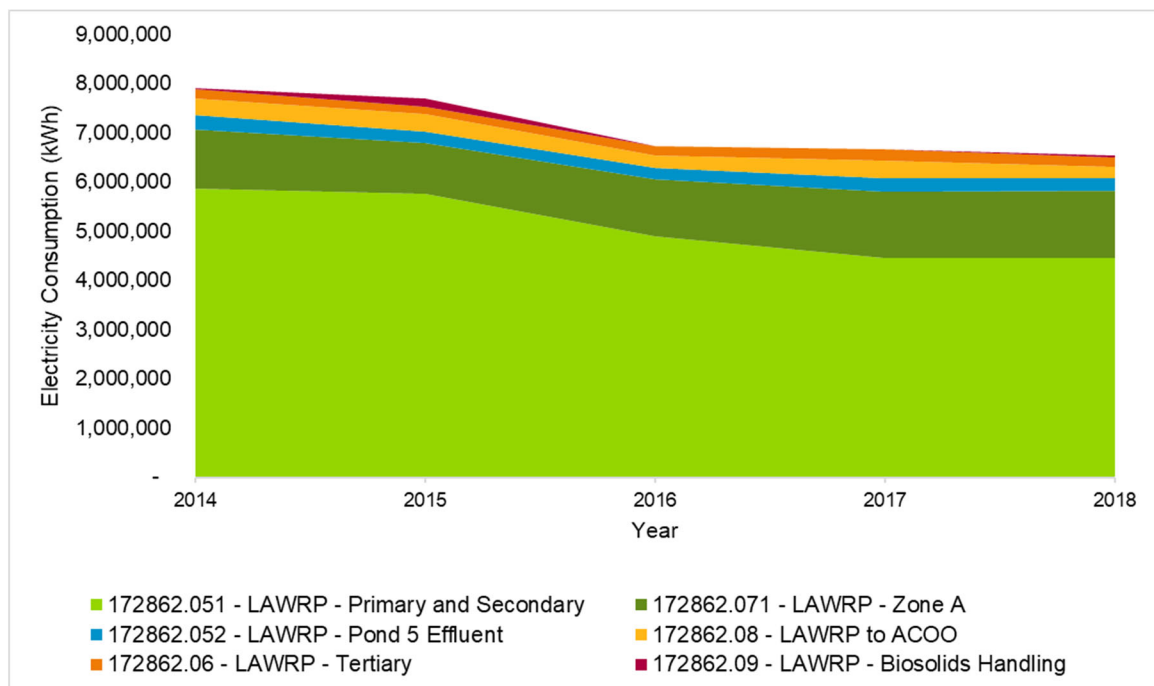
Source: Navigant analysis.

As expected, MWRP and LAWRP were two of the top energy consumers in IRWD's system. Figure 5 and Figure 6 show the electricity consumption of these facilities broken out by process. Primary and secondary treatment processes are large electricity-consuming processes at both plants, but at MWRP, recycled water pumping uses even more electricity. MWRP's recycled water pump station is by far the largest capacity station in all of IRWD's non-potable distribution system. Therefore, it consumes a significant amount of electricity.

Tertiary treatment on the other hand uses very little electricity at each facility, with only biosolids handling using less at LAWRP.² Figure 5 also illustrates that there was no tertiary treatment in 2010, and therefore no recycled water was pumped to Zone B from this process. Pumping continued to Zone A because some of the flow through this pump comes from MWRP. The submetered pump for Pond 5 Effluent came online in 2008 and was heavily utilized while tertiary treatment was down in 2010.

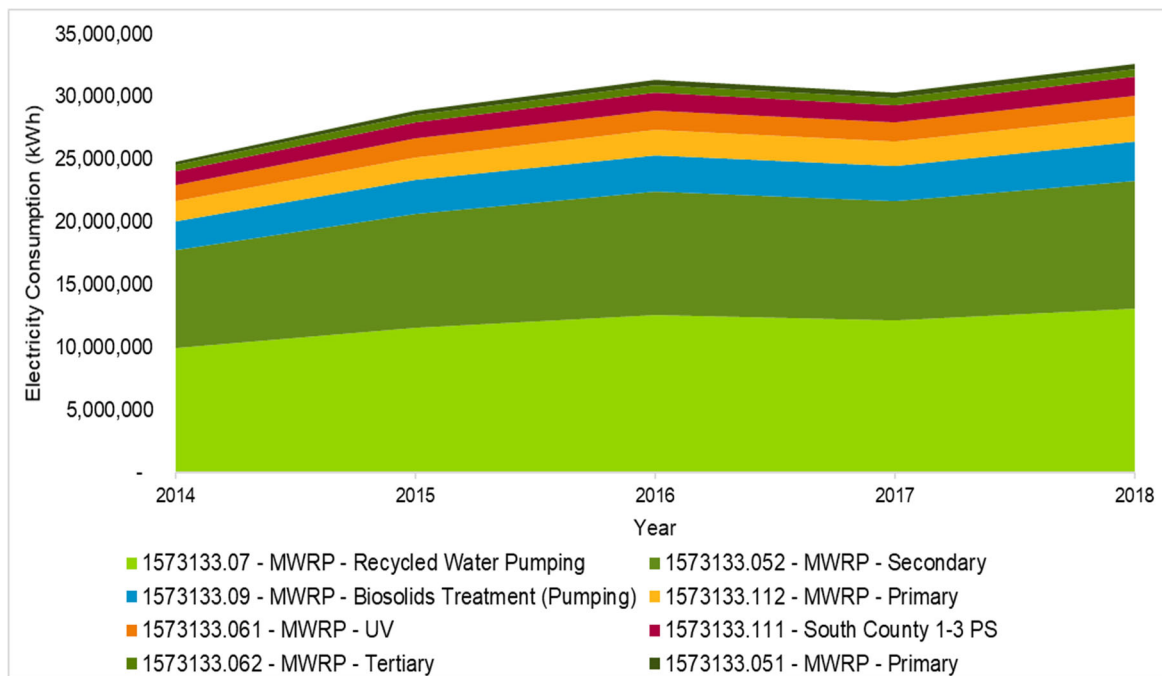
² MWRP recently installed a Membrane Bioreactor (MBR) and UV light disinfection system. Energy use for those processes is not reflected in this historic data. MBR and UV systems were not brought to full operation until 2014.

Figure 5: LAWRP Electricity Use by Process



Source: Navigant analysis.

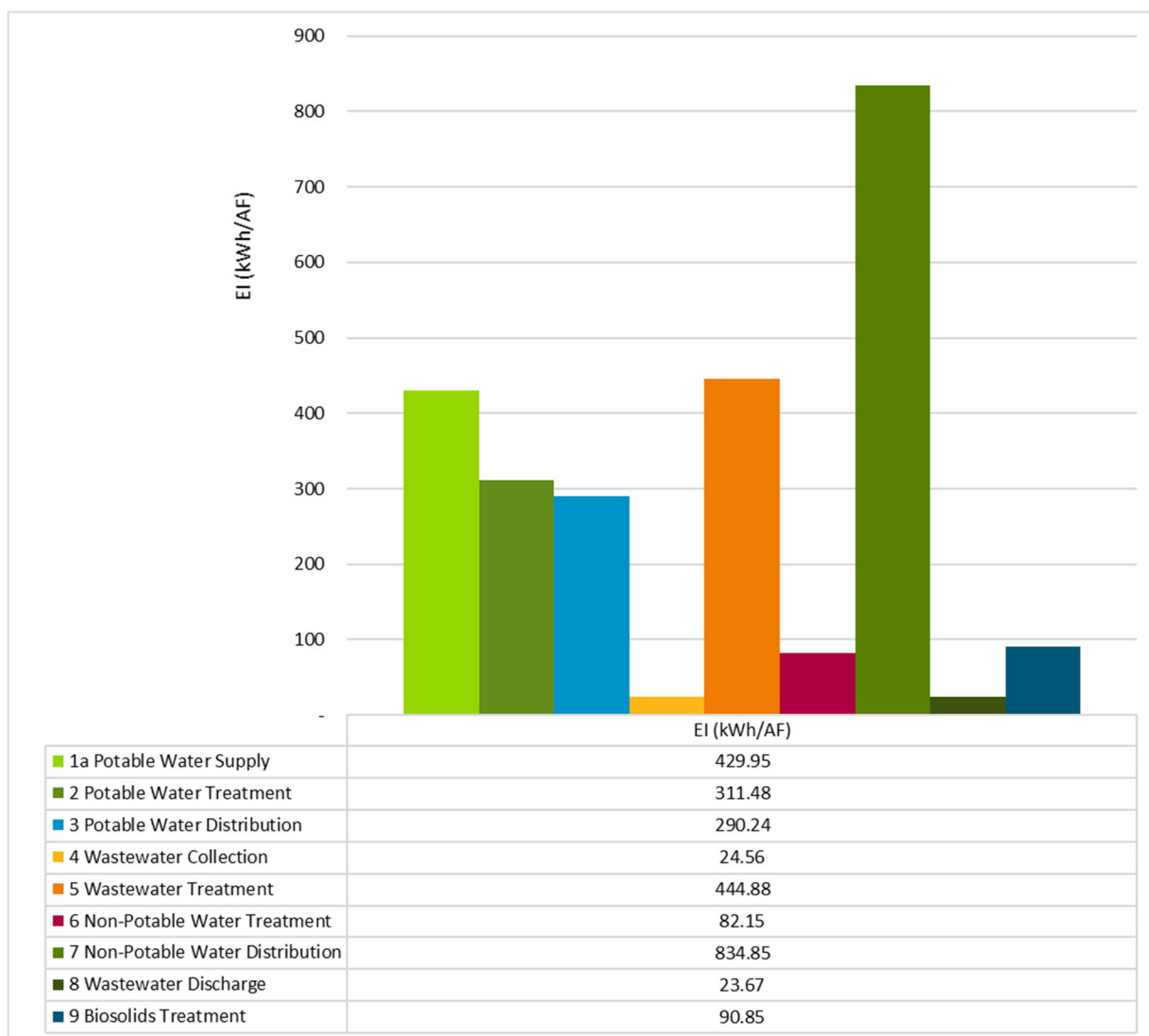
Figure 6: MWRP Electricity Use by Process



Source: Navigant analysis.

The Navigant team aggregated the energy and flow data to develop an overall energy intensity for each of IRWD's systems. The results of this can be seen in Figure 7 **Error! Reference source not found..** The results represent the average system-wide EI and are based on IRWD Only energy use in 2018. Potable water supply, potable water treatment, potable water distribution, sewage (wastewater) treatment, and non-potable water distribution are amongst the most energy intensive systems. Conversely, sewage (wastewater) collection, non-potable (recycled) water treatment, and biosolids handling are amongst the least energy intensive systems. These values will be useful if IRWD were to partner with an energy utility to develop joint customer-facing water-energy programs. The energy utilities may need the information presented in Figure 7 below to conduct analysis in the CPUC's Water-Energy Calculator.³

Figure 7: 2018 Energy Intensity of IRWD Systems



Source: Navigant analysis.

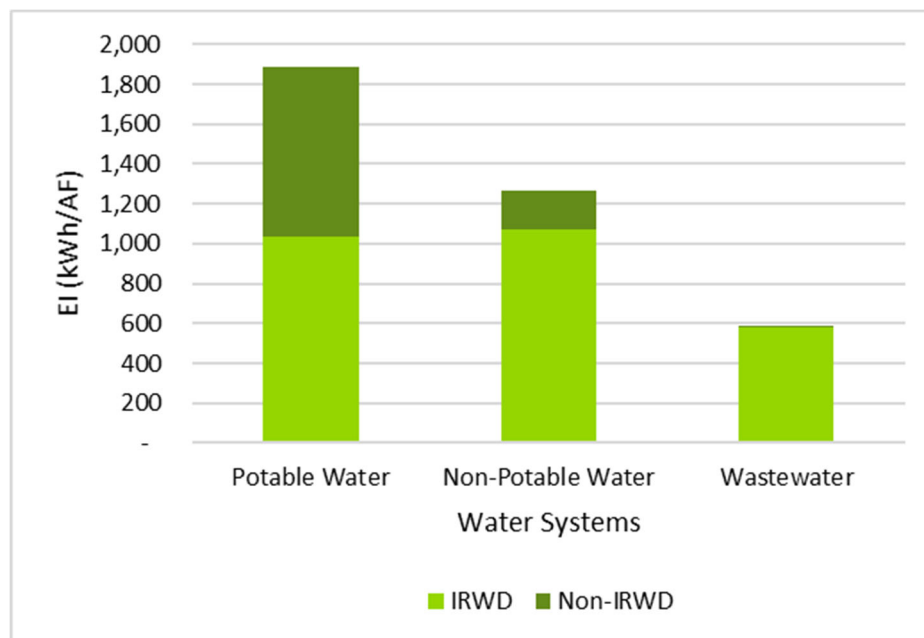
³ Additional details available at:

<http://www.cpuc.ca.gov/PUC/energy/Energy+Efficiency/Water-Energy+Nexus+Programs.htm>

Adding the Non-IRWD energy intensity from upstream (imported water) and downstream (exported sewage) systems presents the “bigger picture” of IRWD’s water-energy footprint. Figure 8 illustrates this complete view of IRWD’s water-energy footprint broken down by IRWD Only and Non-IRWD energy intensity. These values are useful for calculating the total energy savings that result from water conservation activities. Figure 8 should be interpreted as follows:

- An average of 1,890 kWh are used for every acre-foot of potable water delivered to an IRWD customer. Of that energy needed, 1,032 kWh are consumed by IRWD-owned facilities, while the remainder is consumed upstream of IRWD to import and treat that water.
- An average of 1,266 kWh are used for every acre-foot of non-potable water delivered to an IRWD customer. Of that energy needed, 1,068 kWh are consumed by IRWD-owned facilities, while the remainder is consumed upstream of IRWD to import untreated water.
- An average of 589 kWh are used to collect and treat every acre-foot of sewage from an IRWD customer. Of that energy needed, 584 kWh are consumed by IRWD-owned facilities, while the remainder are consumed downstream of IRWD to further treat sewage at OCSO or SMWD.

Figure 8: Total Energy Intensity of IRWD Water (2018)

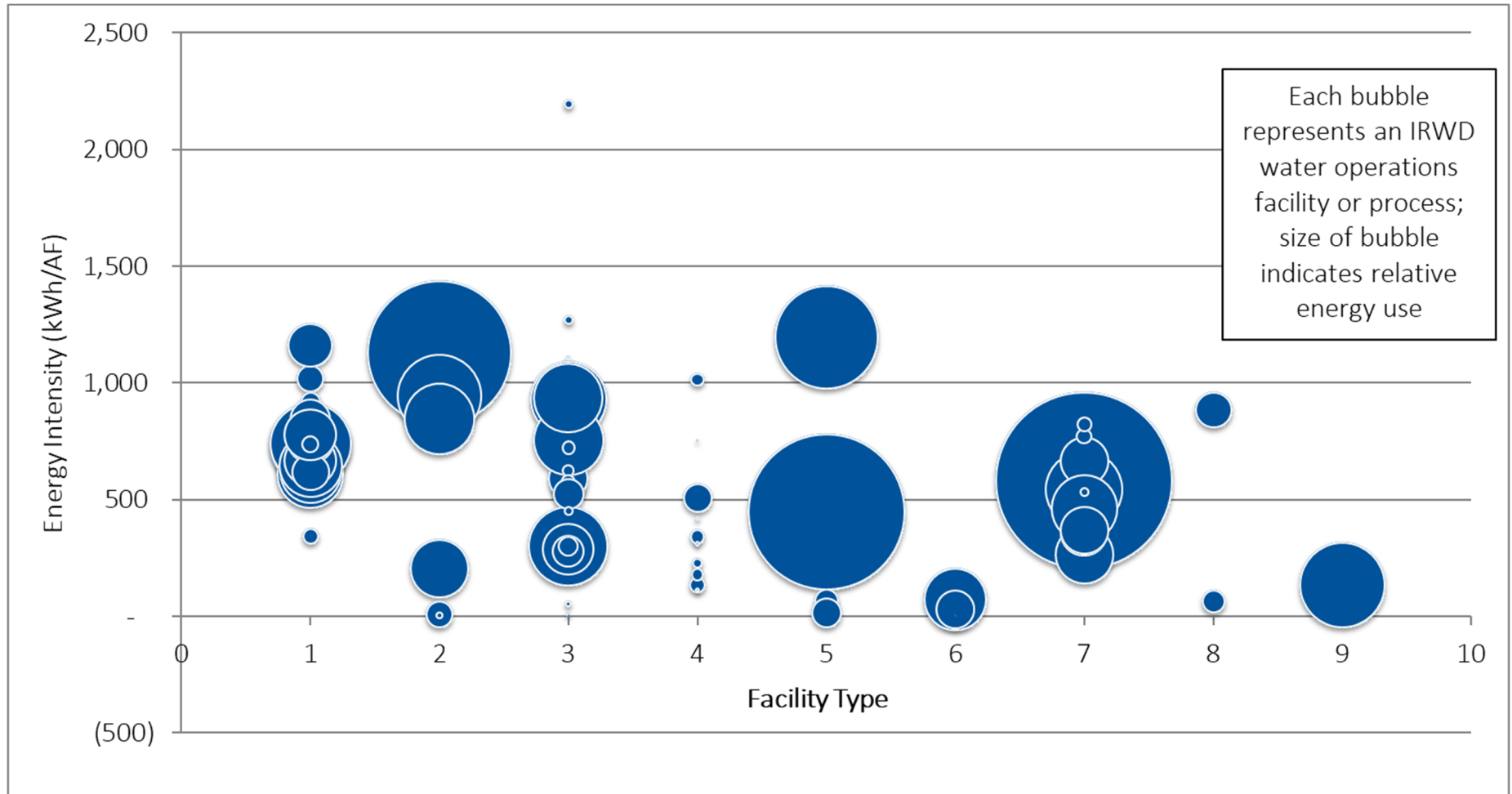


Source: Navigant analysis

The team calculated the annual energy intensity of 102 unique water operations facilities and processes throughout IRWD’s system. These are detailed in [Section 2.1](#). The Navigant team recommends using the 2018 energy intensity values as the best representation of each facility and will use this in all future analyses of this study. The results of this analysis form the backbone of data for the rest of the study. The facility energy intensity values will feed into our spatial embedded energy analysis, Embedded Energy Management Tool, and pumping surcharge analysis.

2.1 Detailed Facility Energy Intensity

Figure 9: IRWD Only Facility Energy Intensity and Energy Use Range (2018)



Source: Navigant team analysis

APPENDIX A. DETAILED RESULTS

To present a full account of the Navigant team's energy intensity analysis of water operations facilities, Table 1 has all 102 water operations facilities listed alphabetically by system. Each of the WRPs are broken out by process so that each process is listed under the appropriate system. Entries marked "N/A" represent years for which no data is available and the facility is assumed to be offline, either because it was not yet operational or because it has been decommissioned.

The Navigant team recommends using the 2018 energy intensity value as the best representation of each facility and will use this in all future analyses of this study.

Table 1: Annual Electric Energy Intensity (kWh/AF) for all IRWD Water Operations Facilities

Index	System	Electric Service Acct	Facility Name	2014	2015	2016	2017	2018
1	1a - Potable Water Supply	45013190	Baker Raw Water Plant	-	-	-	208	920
2	1a - Potable Water Supply	763215	Dyer Road Well 1	669	678	653	626	610
3	1a - Potable Water Supply	12052451	Dyer Road Well 10	705	725	740	710	740
4	1a - Potable Water Supply	1768919	Dyer Road Well 11	724	670	693	691	-
5	1a - Potable Water Supply	25359479	Dyer Road Well 12	694	653	668	669	645
6	1a - Potable Water Supply	1573123	Dyer Road Well 13	655	703	702	730	674
7	1a - Potable Water Supply	1679845	Dyer Road Well 14	744	724	731	697	668
8	1a - Potable Water Supply	2938557	Dyer Road Well 15	745	719	727	731	734
9	1a - Potable Water Supply	14570911	Dyer Road Well 16	1,505	1,641	1,534	1,015	1,019
10	1a - Potable Water Supply	13147322	Dyer Road Well 17	691	716	700	674	668
11	1a - Potable Water Supply	293611	Dyer Road Well 18	726	655	819	924	661
12	1a - Potable Water Supply	739415	Dyer Road Well 2	683	668	694	654	-
13	1a - Potable Water Supply	13147321	Dyer Road Well 3	4,341	-	-	737	699
14	1a - Potable Water Supply	771996	Dyer Road Well 4	624	650	614	611	608

Index	System	Electric Service Acct	Facility Name	2014	2015	2016	2017	2018
15	1a - Potable Water Supply	17877936	Dyer Road Well 5	832	727	728	730	817
16	1a - Potable Water Supply	8789293	Dyer Road Well 6	650	666	649	652	615
17	1a - Potable Water Supply	18288344	Dyer Road Well 7	799	960	25,119	1,048	662
18	1a - Potable Water Supply	27951627	IDP Well 76	967	898	718	834	2,631
19	1a - Potable Water Supply	27800016	IDP Well 77	794	837	751	802	789
20	1a - Potable Water Supply	38567159	Tustin Well 21	720	842	802	789	772
21	1a - Potable Water Supply	38737417	Tustin Well 22	723	695	599	598	668
22	1a - Potable Water Supply	42117084	Well 115	679	631	786	739	755
23	1b - Non-Potable Water Supply	38970394	Well 107	750	905	1,028	1,010	1,162
24	1b - Non-Potable Water Supply	28645429	Desalter Well ET-2	634	577	739	806	779
25	1b - Non-Potable Water Supply	27960967	ET-1 Well	786	776	799	805	773
26	1b - Non-Potable Water Supply	39054694	LF Well 2	654	735	761	-	739
27	1b - Non-Potable Water Supply	26238047	TIC Well 106	752	-	766	820	848
28	1b - Non-Potable Water Supply	12325164	Tustin Well 72	741	-	754	1,136	344
29	1b - Non-Potable Water Supply	28040354	Well 110	601	598	598	642	618
30	1b - Non-Potable Water Supply	8855775	Well 78	907	706	745	856	843
31	2 - Potable Water Treatment	44685928.02	Baker Water Treatment Plant	-	-	-	215	205
32	2 - Potable Water Treatment	44685928.02	Baker Water Treatment Plant - Solids	-	-	-	4	4
33	2 - Potable Water Treatment	19426944	DATS C-8 & C-9	1,143	1,130	1,107	1,010	1,130
34	2 - Potable Water Treatment	14452157	DRWF Primary Disinfection Station	11	9	9	12	10
35	2 - Potable Water Treatment	28231842	IDP Treatment Facility	995	1,009	1,073	983	945
36	2 - Potable Water Treatment	38567127	Tustin Wells 21 & 22 Treatment Facility	865	861	818	806	846
37	3 - Potable Water Distribution	28048786	SCWD Shaw Pump Station	1,101	1,268	1,250	1,285	1,270

Index	System	Electric Service Acct	Facility Name	2014	2015	2016	2017	2018
38	3 - Potable Water Distribution	1875635	Coastal Zone 6 Pump Station	536	547	532	579	556
39	3 - Potable Water Distribution	12350158.03	Coastal Zone 7 Pump Station	502	557	575	530	626
40	3 - Potable Water Distribution	22319269	Crystal Cove Zone 2-4 Pump Station	1,139	1,122	1,014	1,006	1,105
41	3 - Potable Water Distribution	1116202.031	East Irvine Zone 3 Pump Station	310	311	318	-	-
42	3 - Potable Water Distribution	1751280	East Irvine Zone 4 Pump Station	275	281	301	306	294
43	3 - Potable Water Distribution	374664	Foothill Zone 6-A Pump Station	351	357	357	372	403
44	3 - Potable Water Distribution	11625674	Foothill Zone 6 Pump Station	753	757	749	752	755
45	3 - Potable Water Distribution	43204644.03	Hidden Canyon Zone 3-4 PS	-	823	823	732	867
46	3 - Potable Water Distribution	19766582	LF Zone 2 (East) Pump Station	-	862	796	30	9
47	3 - Potable Water Distribution	44685928.03	LF Zone 2 (West) Pump Station	-	741	586	756	936
48	3 - Potable Water Distribution	3742549	OC- 63 Coastal to Zone 4 Pump Station	653	880	885	899	930
49	3 - Potable Water Distribution	28305324	PA6 Portola Springs Zone 3-4 Pump Station	105	255	265	312	280
50	3 - Potable Water Distribution	29138686.03	PA6 Portola Springs Zone 4-6 PS	475	443	455	453	453
51	3 - Potable Water Distribution	9827633	Portola Zone 8 Pump Station	550	580	793	779	590
52	3 - Potable Water Distribution	31486955	Portola Zone 9 Pump Station	229	231	232	299	299
53	3 - Potable Water Distribution	23091012	Quail Hill Zone 4 Pump Station	590	597	617	663	578
54	3 - Potable Water Distribution	28048832	SCWD Manning Pump Station	315	330	408	764	722
55	3 - Potable Water Distribution	28048804	SCWD Read Reservoir	1,786	2,136	2,138	1,691	2,194
56	3 - Potable Water Distribution	28048891	SCWD Santiago Hills Zn 5-6 PS	985	1,002	931	891	991
57	3 - Potable Water Distribution	21545086	Shady Canyon Pump Station	226	99	71	95	52
58	3 - Potable Water Distribution	1116202.032	South County 1-3 PS	297	303	288	154	300
59	3 - Potable Water Distribution	5391970	Turtle Rock Zone 3 Pump Station	346	307	281	278	287
60	3 - Potable Water Distribution	1369409	Turtle Rock Zone 4 PS	-	-	-	-	-

Index	System	Electric Service Acct	Facility Name	2014	2015	2016	2017	2018
61	3 - Potable Water Distribution	9981860	Tustin Ranch Zone 1-3 Pump Station	541	440	426	615	773
62	3 - Potable Water Distribution	23266080	Tustin Ranch Zone 3-5 Pump Station	471	453	465	542	523
63	3 - Potable Water Distribution	28049172	Williams Canyon Pump Station	1,910	2,681	2,666	2,563	2,766
64	3 - Potable Water Distribution	19766571	Zone 3 (EAST) #2 Pump Station	-	397	357	436	310
65	3 - Potable Water Distribution	19766598	Zone 3 (West) Pump Station	2	2	-	3	3
66	4 - Wastewater Collection	1573124	Bayview Lift Station	198	230	271	215	199
67	4 - Wastewater Collection	24423692	Canada Lift Station	289	347	265	244	229
68	4 - Wastewater Collection	23946411	Coastal Ridge Lift Station	1,101	1,511	874	1,122	1,016
69	4 - Wastewater Collection	19233900	Coyote Canyon Lift Station	302	395	306	331	340
70	4 - Wastewater Collection	22183490	El Morro Lift Station	616	1,111	970	861	753
71	4 - Wastewater Collection	31461823	HATS Facility	652	739	525	446	506
72	4 - Wastewater Collection	19858826	Los Trancos Low Flow Lift Station	249	247	139	130	114
73	4 - Wastewater Collection	22676102	Michelson Lift Station	119	174	166	281	181
74	4 - Wastewater Collection	19858611	Muddy Canyon Low Flow Lift Station	-	600	410	395	420
75	4 - Wastewater Collection	1573136	University Lift Station	113	115	121	153	134
76	5 - Wastewater Treatment	172862.052	LAWRP - Pond 5 Effluent	72	60	63	72	67
77	5 - Wastewater Treatment	172862.051	LAWRP - Primary and Secondary	1,462	1,515	1,353	1,190	1,195
78	5 - Wastewater Treatment	1573133.051	MWRP - Primary	14	16	17	17	17
79	5 - Wastewater Treatment	1573133.052	MWRP - Secondary	364	417	455	459	448
80	6 - Non-Potable Water Treatment	172862.06	LAWRP - Tertiary	74	69	73	74	61
81	6 - Non-Potable Water Treatment	1573133.062	MWRP - Tertiary	24	27	29	29	29
82	6 - Non-Potable Water Treatment	1573133.061	MWRP - UV	62	70	75	75	74
83	6 - Non-Potable Water Treatment	20757299	Sand Canyon CL2 Facilities	10	9	8	5	5

Index	System	Electric Service Acct	Facility Name	2014	2015	2016	2017	2018
84	7 - Non-Potable Water Distribution	8169712	Coastal G Pump Station	631	635	624	636	665
85	7 - Non-Potable Water Distribution	3180640	Coastal Zone D Pump Station	306	501	540	521	542
86	7 - Non-Potable Water Distribution	12350158.07	Coastal Zone H Pump Station	462	543	543	529	772
87	7 - Non-Potable Water Distribution	1573161	East Irvine Zone B Pump Station	393	372	409	389	426
88	7 - Non-Potable Water Distribution	43204644.07	Hidden Canyon Zone B-C PS	-	823	823	714	822
89	7 - Non-Potable Water Distribution	19774792	Lake Forest Zn E PS (LAWD Zn C)	384	474	414	384	331
90	7 - Non-Potable Water Distribution	172862.071	LAWRP - Zone A	537	550	503	501	592
91	7 - Non-Potable Water Distribution	1573133.07	MWRP - Recycled Water Pumping	485	554	595	592	583
92	7 - Non-Potable Water Distribution	21916100	Northwood Zn 75-1 A-B PS	305	306	344	326	361
93	7 - Non-Potable Water Distribution	29138686.07	PA6 Portola Springs Zone C-D PS	411	429	439	444	431
94	7 - Non-Potable Water Distribution	32373656	Portola Zone A-C	585	507	501	488	463
95	7 - Non-Potable Water Distribution	15786443	Shady Cyn Zn A-B PS	248	257	266	258	264
96	7 - Non-Potable Water Distribution	42117093	Syphon Reservoir PS	453	528	-	522	532
97	7 - Non-Potable Water Distribution	4412044	Turtle Rock Zone B Pump Station	423	485	440	418	465
98	7 - Non-Potable Water Distribution	44685928.07	Zone B Pump Station	382	383	335	436	369
99	8 - Wastewater Discharge	172862.08	LAWRP to ACOO	84	94	72	98	63
100	8 - Wastewater Discharge	27763856	Shallow Ground SGU	1,152	1,059	864	1,056	884
101	9 - Biosolids Treatment	172862.09	LAWRP - Biosolids Handling	7	40	1	1	13
102	9 - Biosolids Treatment	1573133.09	MWRP - Biosolids Treatment (Pumping)	109	126	137	138	135

Source: Navigant analysis

Table 2 shows the natural gas energy intensity of each of the water operations facilities that consume natural gas, also listed alphabetically by system.

Table 2: Annual Natural Gas Energy Intensity (therms/AF) for IRWD Natural Gas-Consuming Water Operations Facilities

Index	System	Gas Service Acct	Facility Name	2014	2015	2016	2017	2018
1	05 - Wastewater Treatment	114-226-3759	MWRP - Secondary	23,689	8,964	8,280	5,166	3,169
2	06 - Non-Potable Water Treatment	111-307-9200	MWRP - Tertiary	19,680	15,993	16,546	16,964	20,984
3	07 - Non-Potable Water Distribution	080-407-6900	Northwood Zn 75-1 A-B PS	24,446	47,234	65,141	40,308	50,431
4	07 - Non-Potable Water Distribution	085-308-3028	Zone B Pump Station	-	-	132	22,397	29,232

Source: Navigant analysis

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December 10, 2019

Prepared by: J. Moeder / R. Mori

Submitted by: K. Burton

Approved by: Paul A. Cook



ENGINEERING AND OPERATIONS COMMITTEE

FLEMING ZONE 8 TANK AND ZONE 8 TO 9 BOOSTER PUMP STATION CONSULTANT SELECTION

SUMMARY:

Staff is proceeding with the design of the enlarged Fleming Zone 8 Tank and upgraded Zone 8 to 9 Booster Pump Station as identified in the 2017 Santiago Area Distribution System Analysis. Staff recommends that the Board authorize the General Manager to execute a Professional Services Agreement in the amount of \$878,000 with Tetra Tech for engineering design services for the Fleming Zone 8 Tank and Zone 8 to 9 Booster Pump Station.

BACKGROUND:

IRWD provides potable water supply service to approximately 2,500 customers in the Santiago Area located in an unincorporated region of Orange County. The Santiago Area is east of the Eastern Transportation Corridor (SR-241), north of Lomas Ridge, and west of Portola Hills. This service area includes four distinct sub-areas including Santiago Canyon, Silverado Canyon, Williams Canyon, and Modjeska Canyon. Each canyon area contains a system of domestic water tanks and pump stations that solely relies on the existing 150,000 gallon steel Fleming Zone 8 Tank and the existing Zone 8 to 9 Booster Pump Station as the main source of supply. The facilities are located near the intersection of Santiago Canyon Road and Black Star Canyon Road as shown in Exhibit "A".

In 2017, IRWD completed the Santiago Area Distribution System Analysis, which included several recommended improvements for undersized infrastructure and requirements for additional storage in the Santiago Area. The study recommended increasing the storage capacity to 1.3 million gallons (MG) to meet the storage requirements for the area.

The project includes construction of a new 1.3 MG storage tank, a reservoir management system building with sodium hypochlorite and ammonia storage and feed systems and in "in-tank" chemical injection and mixing system, a 2,000 gallon diesel fuel storage tank, and replacement of the existing pump station, which has reached the end of its service life. The project also includes a new office space that can be used as an IRWD emergency operations center for emergencies in the canyon area, a new storage building for emergency equipment and supplies, and various site electrical, telemetry, and control improvements.

Consultant Selection:

Staff received proposals for engineering design services from Dudek, Lee & Ro, Stantec, and Tetra Tech. Each firm presented unique project approaches and creative engineering solutions for achieving the project objectives. Tetra Tech presented the most comprehensive approach to completing the project, demonstrated an outstanding understanding of the project issues,

provided an in-depth summary of how each issue will be resolved during the design, and presented conceptual facility layouts for the proposed facilities. Tetra Tech also demonstrated the most extensive, recent experience with the design and construction of prestressed concrete tanks. The consultant selection matrix is attached as Exhibit “B”, and Tetra Tech’s scope of work and fee proposal are attached as Exhibit “C”.

Staff recommends that the Board authorize the General Manager to execute a Professional Services Agreement in the amount of \$878,000 with Tetra Tech since its design approach, schedule, and staff hours are consistent with the project goals and objectives.

Schedule:

The design will be completed in accordance with the following schedule milestones:

Kick-Off Meeting	January 7, 2020
Preliminary Design Report Completion	July 2020
Final Design Completion	May 2021
Bid Opening and Notice of Award (for construction)	July 2021

FISCAL IMPACTS:

The Fleming Zone 8 Tank and Zone 8 to 9 Booster Pump Station, Project 10101, is included in the FY 2019-20 Capital Budget and will be funded through 89.5% existing customers (Improvement District 1110) and 10.5% replacement funds (Improvement District 1100). Staff may adjust the funding splits after completion of design when more detailed construction estimates are available. The existing budget is sufficient to fund the recommendation presented herein.

ENVIRONMENTAL COMPLIANCE:

This project is subject to the California Environmental Quality Act (CEQA). In conformance with the California Code of Regulations Title 14, Chapter 3, Section 15004, the appropriate environmental document will be prepared when "meaningful information" becomes available. It is expected that the preliminary analysis will lead to preparation of a Mitigated Negative Declaration for the project.

RECOMMENDATION:

That the Board authorize the General Manager to execute a Professional Services Agreement with Tetra Tech in the amount of \$878,000 for engineering design services for the Fleming Zone 8 Tank and Zone 8 to 9 Booster Pump Station, Project 10101.

LIST OF EXHIBITS:

- Exhibit “A” – Location Map
- Exhibit “B” – Consultant Selection Matrix
- Exhibit “C” – Tetra Tech Scope of Work and Fee Proposal



LOCATION MAP - FLEMING RESERVOIR AND PUMP STATION

1 inch = 100 feet

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EXHIBIT "B"

CONSULTANT SELECTION MATRIX

Fleming Tank and Pump Station Improvements										
Item	Description	Weights	Dudek		Lee & Ro		Stantec		Tetra Tech	
A	<u>TECHNICAL APPROACH</u>									
1	Project Understanding & Approach	40%	2		4		3		1	
2	Project Experience	30%	2		3		4		1	
3	Project Team	30%	2		3		4		1	
	<u>Weighted Score</u>		2.0		3.4		3.6		1.0	
	Ranking of Consultants		2		3		4		1	
B	<u>SCOPE OF WORK</u>									
TASK			Task Hours	Fee	Task Hours	Fee	Task Hours	Fee	Task Hours	Fee
1	Project Management		260	\$64,763	456	\$97,056	414	\$124,614	352	\$87,200
2	Preliminary Design		1,645	\$269,593	2,568	\$421,188	1,592	\$402,192	1,616	\$339,600
3	Final Design		2,922	\$495,066	2,638	\$459,356	2,728	\$627,567	3,174	\$451,200
	Total Engineering Services Fee		4,827	\$829,422	5,662	\$977,600	4,734	\$1,154,373	5,142	\$878,000
C	<u>OTHER</u>									
	Number of Drawings		140		107		115		138	
	Engineering Design Services Fee per Drawing		\$5,924		\$9,136		\$10,038		\$6,362	
	Sub Consultants									
	Electrical		MPA		In-house		MPA		In-house	
	Civil		In-house		In-house		In-house		In-house	
	Structural		PSE		In-house		PSE		In-house	
	Architectural		MBN Group		In-house		GPA		In-house	
	Geotech		Converse		Associated Soils Eng.		Leighton Consulting		Leighton Consulting	
	Mechanical		In-house/ATC		In-house		In-house		In-house	
	Survey		Guida Surveying		The Prizm Group		In-house		Metz Surveying	
	Surge		ZZ Technologies		NHC		NHC		Scott Foster Engineering	
	Potholing		TC Mueller		Bess Test lab		None		C-Below	
	Exceptions taken to IRWD Std. Contract		No		No		No		No	
	DIR Numbers Provided		Yes		Yes		Yes		Yes	
	Insurance (Professional & General Liability)		Yes		Yes		Yes		Yes	

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SCOPE OF WORK

Members of the Project team have performed an in-depth review of the project description and scope of work within the Request for Proposal (RFP) as well as the Exhibits provided within the RFP.

We propose to provide the following scope of work for the preliminary design, final design and construction phase services with each phase being authorized by a separate Notice-to-Proceed.

All work performed on this project will conform to IRWD standards and requirements including, but not limited to, the following: IRWD Project Manual; IRWD Construction Manual; and IRWD Electrical and Instrumentation and Control (I&C) Design Standards.

Tetra Tech will provide the following detailed scope of services:

TASK 1 – PROJECT MANAGEMENT

Tetra Tech will conduct project management activities to ensure adherence to scope, schedule, and budget; promote efficient communication between Tetra Tech, IRWD, and others as required; and implement an effective quality assurance/quality control (QA/QC) program.

- A. **Preparation of Project Status Reports.** Tetra Tech will prepare weekly and monthly status reports. Each weekly status report shall consist of a brief (one or two paragraphs) e-mail summarizing the activities completed the previous week, the activities planned for the upcoming week, and critical decisions that need to be made. Each monthly status report shall provide more detail, summarizing the work completed and reviewing work status relative to budget and schedule. The project schedule shall also be updated on a monthly basis for inclusion in the monthly status report.
- B. **Meetings and Workshops.** Tetra Tech will organize, attend, and conduct meetings and workshops as required; prepare and submit meeting agendas for IRWD review and concurrence at least five days prior to the meeting; and prepare draft and final minutes for all meetings and workshops and submit them to IRWD within one week of the meeting.

For budgeting purposes, Tetra Tech will budget for the following meetings at a minimum:

MEETING/WORKSHOP	DESCRIPTION
General project management and design development meetings	Eight (8) two-hour meetings
Site Visits	Four (4) two-hour meetings
Coordination activities with jurisdictional agencies and project stakeholders including, but not limited to, The Division of Drinking Water (DDW), Southern California Edison (SCE), Orange County Fire Authority (OCFA), and AT&T	Four (4) two-hour meetings
Reservoir Location Workshop	One (1) two-hour workshop
Site Master Plan Workshop	One (1) two-hour workshop
Preliminary Design Workshop	One (1) two-hour workshop
Present the 60% design, discuss IRWD's comments, and discuss how the outstanding items were addressed	One (1) two-hour meetings

MEETING/WORKSHOP	DESCRIPTION
Present the 90% design, discuss IRWD's comments, and discuss how the outstanding items were addressed	One (1) two-hour meetings
Present the 100% design, discuss IRWD's comments, and discuss how the outstanding items were addressed	One (1) two-hour meetings

- C. **Quality Assurance/Quality Control.** Tetra Tech will develop and implement proven QA/QC measures throughout the project to ensure ongoing and consistent quality control throughout all project phases. As part of the QA/QC measures, Tetra Tech will capture comments from review meetings and submittals and thoroughly check the work product to ensure that comments are addressed.

TASK 2 – PRELIMINARY DESIGN

Tetra Tech will perform the following subtasks as part of the preliminary design phase. The subtasks shall be documented and compiled into a Preliminary Design Report (PDR) as summarized below.

- A. **Background Information.** Tetra Tech will review existing reports, historical flow data, system process, record drawings, and other information related to the project. Tetra Tech will conduct a meeting with IRWD with a focus on multiple project phases, hydraulic considerations, site constraints, and facility considerations. Tetra Tech will also conduct one of the site visits indicated above to establish an initial site reconnaissance and understanding of existing facilities.
- B. **Utility Research.** Tetra Tech will research and identify the location of existing underground utilities and/or other physical features in the immediate vicinity of the proposed facilities and appurtenances. Information on utilities including material, size, horizontal and vertical locations shall be identified. Tetra Tech will include budget to pothole four (4) existing utilities.
- C. **Zone 8 Reservoir.** The proposed reservoir will be prestressed concrete construction. Tetra Tech will fully design and detail the reservoir and shall include all necessary plans, sections, and details in the construction plans. The preliminary design shall consider seismic requirements, performance, and ways to reduce concrete shrinkage and cracking and shall include a summary of proposed reservoir features including overflow provisions, inlet and outlet pipelines, drain pipeline, pipe sizes and routing, venting, interior column sizing and spacing, subgrade preparation, foundation and footing requirements, pipe penetrations, ladders, stairs, hatches, guardrail, reservoir sub-drain system, and any other ancillary items as necessary.

Tetra Tech will consider the existing system operation, minimum and maximum hydraulic grade lines, and sequencing of construction to maintain service to the area when determining the siting and configuration of the proposed reservoir and other onsite facilities.

Tetra Tech will evaluate the site constraints and restrictions, environmental impacts, permitting schedule, costs, construction duration, and phasing for two (2) reservoir layout alternatives. Layout Alternative 1 would be to construct the new reservoir in the undeveloped area west of the access road and protect in place the existing AT&T cell tower and electrical equipment. Layout Alternative 2 would be to construct the new reservoir in the southern half of the existing developed site and to relocate the existing AT&T cell tower and electrical equipment and existing sewage holding tank.

The work described above shall be summarized and compiled into a Technical Memorandum (TM) that clearly summarizes each of the evaluated alternatives and highlights details associated with the recommended alternative. Six copies of the draft TM and one electronic copy in PDF will be submitted for review. Upon resolution and incorporation of review comments, six copies of final TM and one electronic copy in PDF on CD will be submitted.

- D. **Reservoir Management System.** Tetra Tech will identify the optimal location for a RMS facility generally consisting of a CMU block building, chlorine residual sampling, chloramine disinfection, including storage and feed systems for sodium hypochlorite (12.5%) and aqueous ammonia (29%), and in-tank PAX mixing system and controls. Tetra Tech will be responsible for all aspects of the RMS facility design including layout, mechanical, structural, electrical, chemical storage volumes, chemical feed rates, in-tank mixer sizing, and associated reservoir penetrations and connection details. Tetra Tech will identify the requirements for and design of an automatic sprinkler system as required by OCFA.
- E. **Pump Station Building Configuration.** Tetra Tech will evaluate and develop at least three building layout alternatives for the proposed pump station. The pump station shall consist of split-face CMU block walls with a sloped or gable roof constructed of steel or other fire resistant material that complies with IRWD's fire-hardening design criteria. Each alternative building layout shall include a pump room, electrical room, office room, restroom, and diesel fuel storage room. The pump room shall be sized for three (two duty and one standby) 600 GPM vertical turbine pumps with a spare pump bay to accommodate the potential for future installation of a fourth pump. The office room shall consist of a minimum of 350 square feet (sf). The electrical room, office room, and restroom shall be provided with air conditioning. The diesel storage room shall be provided with air conditioning, if required by any jurisdictional or regulatory agencies. HVAC equipment may be located inside or outside as space permits. The pump room shall include the pumps and motors, a high pressure bypass pressure reducing valve (PRV), and a magnetic flowmeter. Any surge equipment proposed as part of Task 2.K shall be located outside, except for the air compressor, which shall be located within the pump room.
- F. **Site Master Plan.** Tetra Tech will develop an overall site master plan that provides detailed layouts for the proposed facilities and on-site pipelines, maintenance access roads and new entry point (if applicable), any needed facility relocations, which may include relocation of the existing emergency generator, and all existing facilities at the site. Site security shall be provided at the site and shall include, at a minimum, limited site lighting, a motorized entrance gate with OCFA override access, and replacement of all fencing around the perimeter of the site with barbed wire chain link fencing.

IRWD anticipates replacing the existing storage building with a new storage building that consists of a minimum of 1,000 sf. During this task, Tetra Tech will collaborate with IRWD on the space needs to fully define the storage configuration and size. Tetra Tech will also evaluate the condition of the existing storage building and determine if it can be salvaged and incorporated into the final site layout.

The sewer line from the existing restroom drains to a holding tank located on the site. Tetra Tech will evaluate the condition and adequacy of the existing sewer line and sewer holding tank to determine if the facilities can be re-used and incorporated into the new site configuration or if new facilities are required. Tetra Tech will also evaluate the feasibility of a new leach field location.

Tetra Tech has assumed that the pump station, electrical room, office and bathroom will be in one building. The RMS Facility will be in a separate building located adjacent to the proposed reservoir. The storage building and diesel fuel storage and dispensing facility will be paired together in another building

The work completed herein shall document the proposed site configuration, site constraints, potential challenges, findings, and other information that Tetra Tech finds relevant. At a minimum, Tetra Tech will develop and evaluate three (3) alternative site layouts in collaboration with IRWD once IRWD has selected the reservoir location. As part of this task, Tetra Tech will conduct a workshop with IRWD to review and evaluate the proposed layouts.

The work described above shall be summarized and compiled into a Technical Memorandum (TM) that clearly summarizes each of the evaluated alternatives and highlights details associated with the recommended alternative. Six copies of the draft TM and one electronic copy in PDF will be submitted for review. Upon resolution and incorporation of review comments, six copies of final TM and one electronic copy in PDF on CD will be submitted.

- G. **Architectural Renderings.** Tetra Tech will prepare architectural renderings of the site for the recommended site layout. The renderings will include, at a minimum, a bird's eye view of the site from each direction (i.e., north, south, east, and west) that captures the proposed reservoir, the proposed building(s), perimeter fencing, and all proposed above-grade site improvements.
- H. **Construction Phasing.** Tetra Tech will evaluate construction and siting requirements for the proposed facilities and identify which, if any, existing facilities are required to be relocated, temporarily disabled, demolished, or modified. Tetra Tech will prepare a phasing plan and recommended sequence of construction that identifies the order in which facilities will need to be relocated, temporarily disabled, demolished or modified to maintain existing services and minimize disruption to the system. The PDR shall include a discussion on construction sequencing to maintain existing services throughout construction prior to demolition of the existing facilities.
- I. **Surge Analysis.** Tetra Tech in unison with Scott Foster Engineering, Inc. will conduct a hydraulic transient analysis and provide recommendations to ensure that the proposed improvements, and other existing domestic water system facilities impacted by the improvements, are adequately protected from surge events.

The project calls for the installation of a new larger reservoir and new Fleming booster pump station (BPS) at the same location as the existing facilities. The new BPS will contain three 600 gpm pumps (two duty and one standby). The BPS will boost the flow from the new Zone 8 Reservoir (HGL = 1060 ft) into the Zone 9 distribution system (HGL = 1360 ft). The Zone 9 distribution system floats on the Williams and Shaw tanks as well as supplies flow to the Cabinland and Manning pump stations.

Based on the provided information, it is not clear if the new reservoir will be able to be bypassed and the BPS be supplied directly by the Santiago Hills PS. This potential scenario is also possible for the Shaw and Williams pump stations. For the purpose of this proposal, it will be assumed that the reservoirs at the pump stations will not be bypassed and will remain in service. This creates a hydraulic break in the system that will prevent pressure surges generated by any of these pump stations from impacting the other pump stations. Therefore, only the reservoirs will be included in the models and the pump stations will not. Note that this is not the case for Cabinland or Manning as these are hydraulically connected to the new BPS. For the purpose of this proposal, the analysis of the pressure surges generated by these two pump stations will not be included and will be modeled as constant demands in the system.

Upon the loss of power to the BPS, a pressure drop a low pressure wave will propagate out into the Zone 9 distribution system, lowering the pressure in the system piping as it travels throughout the zone. This low pressure wave could result in negative pressure conditions in the zone and possible vapor pressure

conditions. Upon reflection at the Shaw and Williams reservoirs as well as the Cabinland and Manning pump stations, a repressurization wave will propagate back towards the BPS, collapsing any vapor cavities that have formed, creating extremely high pressures in the system that could overpressurize the piping. Additionally, it may be possible to collapse the pipelines if they have insufficient collapse strength.

We have assumed that the existing hydraulic model of the Zone 9 distribution system will be provided. To perform the surge analysis, the model will need to either be provided in Bentley software format or converted to EPANET. The surge analysis will be performed using Bentley's HAMMER surge analysis software. The surge analysis will be performed for sudden loss of power and startup of the BPS under maximum and minimum (i.e., reservoir fill) flow conditions.

The following Scope of Work to perform the necessary pressure surge analyses is based on the discussion above:

1. **Information Review:** We will review information including: pump station plans, sections, pump curves, valving, operations, etc.; existing hydraulic model converted to EPANET, Zone 9 pipeline materials, diameters, and pressure classes.
2. **Model Development:** We will create a surge analysis model of the system including the upgraded pump station and the Zone 9 distribution system under maximum demand flow conditions.
3. **Analysis and Recommendations:** We will perform surge analyses simulations for sudden pump trip and pump startup of the pump station under maximum flow demand conditions assuming no surge protection for the system. Based on the results of the analyses, recommend surge protection measures to protect Zone 9 distribution system from adverse pressure surges.
4. **Draft Technical Memorandum:** We will prepare and submit a Draft Technical Memorandum summarizing the results and recommendations of the analysis. Three copies of the draft TM and one electronic copy in PDF shall be submitted for review.
5. **Final Technical Memorandum:** We will submit the Final Technical Memorandum upon receipt and incorporation of comments. Three copies of the final TM and one electronic copy in PDF on SD shall be submitted.

To perform the Scope of Work, we have assumed the following information will be provided:

1. A hydraulic model of the distribution system converted to EPANET.
2. Pump station information (plans, sections, valving, pump curves.
3. Zone 9 distribution system piping information (materials, pressure classes or maximum allowable hydraulic gradelines, etc.)

As an optional item, the analysis of the pressure surges generated by the Cabinland and Manning pump stations and the effects these surges will have on the 1360 Zone can be included as part of the above Scope of Work. The hydraulic model to be provided will need to include the distribution systems into which both of these pump stations deliver flow. Additionally, similar information as required for the Fleming station will need to be provided for these two stations.

- J. **Site Electrical Service.** The existing site electrical service, provided by SCE, consists of two separate electrical services. As part of the project, the two existing electrical services shall be removed and combined into a single new electrical service capable of supplying the entire site. Tetra Tech will evaluate the existing and proposed site electrical loads to identify the size of the needed electrical service to the site. Tetra Tech will coordinate with SCE to begin preparation of the SCE preliminary service plan and shall support SCE as needed to develop the final SCE-approved service plan during the final design phase.
- K. **Electrical and Controls.** Tetra Tech will develop electrical and controls design requirements associated with the proposed improvements. The existing generator on site, automatic transfer switch, and triple switch shall be evaluated to determine if they are appropriately sized to handle the new facility loads and can be re-used with the proposed facilities. The existing site utilizes a point-to-point T1 line for SCADA communication between the Fleming site and the Michelson Water Recycling Plant (MWRP). Telephone communication is used to communicate from the Fleming site to the other facilities in the canyons. Tetra Tech will maintain the existing T1 line for point-to-point communication between the Fleming site and MWRP. Tetra Tech will also include installation of a new minimum 50-foot antenna (from the highest finished grade elevation at the site) for radio communications with other IRWD facilities located in the canyons. Tetra Tech will also include installation of two new programmable logic controllers (PLCs), housed within two separate control panels, to provide the needed controls for the proposed facilities. As part of the construction phasing task, Tetra Tech will ensure that the existing communication and controls are maintained throughout construction.
- L. **Geotechnical Investigation.** Tetra Tech in unison with Leighton Consulting will conduct a geotechnical investigation to adequately characterize the conditions at the proposed site. The following tasks, at a minimum, shall be conducted as part of the geotechnical investigation:
1. **Background Review:** We will review available in-house geotechnical reports prepared by Leighton for adjacent sites and publicly available literature, aerial photographs, and maps relevant to the Project site. In our review, we will look for geological hazards and potential geotechnical issues that may significantly impact the proposed Project and affect our proposed field exploration and laboratory testing program.
 2. **Field Exploration:** We propose to drill, sample and log four (4) borings at the proposed site to a depth of 20 to 25-feet below existing grade or auger refusal, whichever is shallower. Prior to the field exploration, we will mark the proposed boring locations and contact Underground Service Alert (USA) for utility marking. The borings will be logged by a member of Leighton's technical staff. Representative soil samples will be collected at selected depths from the borings and transported to our laboratory for testing. The borings will be backfilled with soil cuttings and patched with cold mix asphalt where asphalt is penetrated.
 3. **Percolation Testing:** The borings will be converted to percolation test wells and insitu percolation testing will be performed in accordance with the County of Orange *Technical Guidance Document for the Preparation of Conceptual/Preliminary and/or Project Water Quality Management Plans* (December 20, 2013). A 2-inch diameter 0.020-inch PVC pipe slotted between 5 to 10 feet will be installed in each boring to measure percolation rates over the depth. The space between the test hole and the slotted pipe will be backfilled with No. 3 sand as a filter pack. The pipe will then be filled with water to saturate the soils. The percolation test will be performed by measuring the drop of water level in the pipe and the time associated with the

- change in water level. After conclusion of the percolation tests, the PVC pipe will be removed and the test hole will be backfilled with the soil cuttings.
4. **Seismic Refraction:** We will perform up to approximately three (3) seismic refraction soundings on the westerly slope to assess depths to bedrock and properties of the bedrock for rippability evaluation.
 5. **Geotechnical Laboratory Testing:** We will conduct geotechnical testing on sampled earth materials in our laboratory for soil classification and to evaluate engineering properties. This testing may include moisture content and dry density, sieve analysis, consolidation, direct shear, R-value and corrosivity (chloride and sulfate content, minimum resistivity, and pH). The testing program will depend upon the soil type encountered and samples recovered.
 6. **Geotechnical Analyses and Report Preparation:** We will review the field and laboratory data and perform engineering analysis to develop geotechnical recommendations for design and construction of the Project. We will prepare a report presenting our geotechnical findings and recommendations, which will be signed and stamped by a California Licensed Geotechnical Engineer. Our report will include a boring location map, boring logs and geotechnical testing results, and address the following:
 - **Site Conditions:** We will review and summarize surface, subsurface and groundwater conditions, and engineering properties of soils encountered during our geotechnical exploration, including presence of loose soils and/or undocumented fill that may require removal and recompaction. We will discuss excavation characteristics of encountered subsurface materials, including ease or difficulty of excavation.
 - **Geologic Hazards:** We will discuss potential geologic hazards at the Project site, including the potential for surface fault rupture, ground shaking, liquefaction, and tsunamis.
 - **Seismicity:** We will provide site-specific seismic coefficients in accordance with the 2019 California Building Code.
 - **Corrosivity:** We will characterize corrosion potential of concrete and metal in contact with onsite soils and provide recommendations if special design and measures are required.
 - **Infiltration Rates:** We will present results of the percolation testing, including soil type and infiltration rates, for design of leach fields for the new restroom.
 - **Foundation Design:** We will present geotechnical parameters for design of shallow foundation for the proposed reservoir, booster pump station, buildings, and storage tank.
 - **Lateral Earth Pressures:** We will provide recommendations for lateral earth pressures acting on retaining and subterranean walls, and frictional and passive values for the resistance of lateral pressures.
 - **Pipe Installation:** We will present recommendations for subgrade preparation, pipe bedding, materials for trench backfill, and backfill compaction.

- **Construction Considerations:** We will present guidelines for site preparation, overexcavation, fill placement, compaction requirements, temporary excavation, dewatering if groundwater is expected to be encountered in our borings, and geotechnical parameters for design of temporary shoring.

M. **Hazardous Materials Inspection and Testing.** Tetra Tech in unison with National Econ Corporation will conduct a hazardous materials inspection of the existing buildings and the existing 150,000 gallon storage reservoir to determine the potential presence of hazardous materials. Tetra Tech will a budget of \$7,500 for laboratory testing of potentially hazardous material samples. The following tasks, at a minimum, shall be conducted as part of the Hazardous Materials Inspection and Testing:

1. ***Asbestos Containing Materials***

- Asbestos inspection and bulk sampling of suspect asbestos containing materials by a state certified asbestos consultant or certified site surveillance technician, utilizing modified Asbestos Hazards Emergency Response Act (AHERA) sampling protocols.
- Analysis of bulk samples by a National Voluntary Laboratory Accreditation Program (NVLAP) accredited laboratory, utilizing Polarized Light Microscopy (PLM) up to 65 samples. Any additional samples cost \$20 per sample. (Excluding Point Count)
- Evaluation of inspection and report preparation, including remedial recommendations.

2. ***Lead/Lead-Based Paint***

- Lead-based paint inspection in accordance with modified Chapter 7 of Title X of the Housing & Community Development Act of 1992 (HUD Guidelines) 1997 Revision, of accessible spaces for lead based paint, for compliance with the EPA Lead-Based Paint Renovation, Repair & Painting (RRP) Rule by California Department of Public Health (CDPH) certified technicians.
- Identification of Lead Based Paint using X-Ray Fluorescence (XRF).
- Evaluation and report preparation including submitting Form 8552 to the CDPH.

3. ***Hazardous Raw Material Inspection***

- Inspect storage building for storage of potentially hazardous raw materials. (Di-electric fluids, paint, solvents, hydraulic oil etc.)
- Inspect gauges on water pumps and tanks for mercury - albeit in small quantities.
- Assess size and construction of sewer holding tank. (Similar to a gasoline UST Excavation and removal; may require testing of soils beneath the tank for TPH and metals.)
- Inspect Site for aboveground (pad mounted and pole mounted) transformers. Check if the transformer(s) is labeled as Non-PCBs and document the manufacturer and serial number of the transformers. (Transformer may be owned by SCE.)
- Provide recommendations for additional inspections and/or sampling.

N. **Surveying Services.** Tetra Tech in unison with Metz Surveying will perform a topographic survey of the Fleming Reservoir Site located at the Fleming Site near the intersection of Santiago Canyon Road and Black Star Canyon Road, Silverado, California. The topographic survey will collect all topographic site features as well as surface utilities within the project area extending out into the centerline of neighboring streets. We will identify or set onsite horizontal and vertical control points to assist during the construction phase of the project. A record boundary will be prepared based upon observed field monumentation and record information.

The survey will be tied horizontally to the California State Plan Coordinate system NAD83 (2017.50 Epoch) based upon observed Orange County Public Works horizontal control points. Vertically, the survey will be tied to NAVD 88 (1995 adjustment) based upon observed Orange County Public Works benchmarks.

All survey work performed by Metz Surveying will be under the direct supervision of a Professional Land Surveyor licensed in the State of California.

- O. **Permits.** Tetra Tech will make applications and secure all permits with appropriate agencies. The permit acquisition process shall be initiated as early as practical to avoid project delay. Copies of completed permits and approvals shall be inserted in the appendix of the Project Manual. IRWD will reimburse Tetra Tech for actual permit fees without surcharge. Tetra Tech will include a \$5,000 allowance within their budget for the payment of permit fees in addition to the labor effort described above. The known permits and/or coordination with other agencies that are not identified elsewhere in this RFP include:
1. **Fire Master Plan.** A Fire Master Plan will be required for the RMS facility that utilizes liquid sodium hypochlorite and aqueous ammonia. Tetra Tech will develop a Fire Master Plan for the site and shall obtain approval of the master plan from the OCFA.
 2. **Orange County Fire Authority.** In addition to the Fire Master Plan, Tetra Tech has assumed the following OCFA Guidelines will require approval for the RMS facility and Diesel Storage Tank and Dispensing facility:
 - Hazardous Materials Identification
 - Completion of the Chemical Classification Packet
 - Installation and Modification of Aboveground Equipment Components of Fuel Dispensing Operations
 3. **Construction General Permit.** IRWD anticipates that the project will require a Storm Water Pollution Prevention Program (SWPPP). Tetra Tech, who will act as the Qualified SWPPP Developer, shall determine the risk level for the project and prepare the SWPPP accordingly for inclusion in the Project Manual. It is IRWD's intent to have the Contractor act as the Qualified SWPPP Practitioner (QSP) and perform the monitoring and reporting as part of the construction contract.

Tetra Tech will prepare and submit the SWPPP for the project site to comply with the State Regional Water Quality Control Board General Permit for Construction Activities. The SWPPP will be prepared by a Qualified SWPPP Developer (QSD) and will be submitted to the IRWD for review and concurrence. Tetra Tech will assist IRWD in registering the project on the State SMARTs system and complete the Notice of Intent (NOI) for the project. It is assumed that all registration fees in excess of the \$5,000 allowance already included will be paid by IRWD.
 4. **Department of Drinking Water (DDW).** Tetra Tech will submit the reservoir plans and location of existing and proposed sewer holding tank and potential leach field to the Department of Drinking Water. Tetra Tech has assumed that a meeting with DDW will not be required or will not require Tetra Tech's attendance.
 5. **Orange County Public Works Permits.** Tetra Tech has assumed that the grading plans will need to be submitted to Orange County Public Works for review and comments.
- P. **Water Quality Management Plan Requirements.** Tetra Tech will define project features and best management practices that will mitigate the Project's impact on water quality and the environment according to the North Orange County permit from the National Pollutant Discharge Elimination System, which is under the jurisdiction of the Santa Ana Regional Water Quality Control Board. Tetra Tech will

perform a site assessment, compile site conditions, determine hydrologic conditions of concern and pollutants of concern, determine performance criteria, and provide recommendations for low impact development best management practices for treatment and capture of discharges on the site. Tetra Tech will review the proposed improvements with IRWD, determine which are suitable, and then incorporate the improvements into the project. Preparation of a complete Water Quality Management Plan is not required.

- Q. **CEQA Documentation.** IRWD will hire a CEQA consultant separate from this contract to prepare the CEQA documentation for this project. IRWD anticipates the preparation of a Mitigated Negative Declaration. Tetra Tech may need to review portions of the environmental document, prepare exhibits, attend meetings, and/or provide project specific information. Tetra Tech will include a \$5,000 budget for supporting IRWD and the environmental consultant through the CEQA documentation process.
- R. **Project Schedule.** Tetra Tech will prepare a project schedule, which shall include detailed schedules for both design and construction activities. The schedule shall include all critical factors impacting the project schedule including implementation, permitting, and coordination activities to ensure that the project is completed in accordance with the proposed schedule. The schedule shall be prepared in Microsoft Project and shall be updated monthly as described in Task 1.A.
- S. **Opinion of Probable Construction Cost.** Tetra Tech will prepare a detailed and itemized opinion of probable construction cost for the proposed facilities.
- T. **Preliminary Design Report (PDR).** The work described above shall be summarized and compiled into a PDR. At a minimum, the PDR shall summarize the results of the subtasks identified above along with additional design criteria identified by Tetra Tech during the preliminary design.

Eight (8) copies of Draft PDR and one (1) electronic copy in PDF shall be submitted for review. Upon resolution and incorporation of review comments, eight (8) copies of the final PDR and one (1) electronic copy in PDF shall be submitted.

TASK 3 – FINAL DESIGN

The final design shall result in the preparation of the Contract Documents. In the final design phase, Tetra Tech will address the items discussed hereunder.

- A. **Project Manual.** Tetra Tech will prepare a Project Manual in standard IRWD format. IRWD's front end documents shall be utilized, and Tetra Tech will assess IRWD's documents to determine any needed supplemental General/Special Provisions that should be added to comply with IRWD's General Provisions and front end requirements. The Project Manual shall describe the allowable shutdown durations and sequencing associated with any connections and tie-ins to existing IRWD facilities. The Project Manual shall also include the IRWD General Technical Specifications, modifications thereto, and any project specific technical specifications. It is incumbent upon Tetra Tech to familiarize themselves with IRWD's standards, use the standards as a starting point, and modify them as needed for the project.
- B. **Construction Plans.** Tetra Tech will prepare detailed construction drawings in the latest version of AutoCAD and using NCS V4.0 layering standards, on 22-inch x 34-inch sheets utilizing IRWD's standard border template. Separate sheets with sheet index/location map/legend, general notes, index map, construction notes, condensed profiles, phasing, and detail connections shall be included. Construction

notes shall be used (callouts on the plans are not allowed) on all construction drawings. Existing IRWD utilities shall be identified on the plan view by as-built plan set number with the pipeline material and IRWD pressure zone labeled. The index map shall include sheet legend, final alignment, valve locations, surrounding streets, and significant project site locations. Construction plans shall be prepared using the NAVD 88 and NAD 83 survey standards.

Assuming Alternative 1 (reservoir located west of the existing access road) We envision the construction drawings will consist of the following sheets:

- General Sheets (4 sheets)
- Horizontal Control Plan (2 sheets)
- Site Demolition Plan (2 sheets)
- Demolition Detail Sheet (Cross-sections and belowground assumptions)
- Overall Site Plan
- Zone 8 Reservoir Construction Grading Plan (20 scale)
- Zone 8 Reservoir Cross Sections and Site Details
- Zone 8 Reservoir and RMS Building Final Grading Plan (20 scale)
- Zone 8 Reservoir Subgrade Preparation
- Zone 8 Reservoir Final Grading and Drainage Details (2 sheets)
- Zone 8 Reservoir and RMS Perimeter Wall and Details (Fire Protection Improvements)
- Zone 8 Reservoir SWPPP/Erosion Control Plan (2 sheets)
- Zone 8 to 9 Booster Pump Station Phasing Plan
- Zone 8 to 9 Booster Pump Station and Storage Building Site Plan and Precise Grading Plan (10 scale)
- Domestic Yard Piping Plan
- Drain Yard Piping Plan
- Reservoir Subdrain Piping Plan
- Inlet/Outlet Piping Profile
- Drain/Overflow Piping Profile
- Site Details (3 sheets)
- Surface Water Treatment Details
- Connection Details
- Piping Details (2 sheets)
- Reservoir Piping Details (2 sheets)
- Reservoir Miscellaneous Appurtenances (2 sheets)
- Reservoir Access Hatches/Ladders
- Reservoir Subdrain Details and Inspection Manhole (2 sheets)
- Corrosion Protection Details
- Miscellaneous Details
- Zone 8 to 9 Booster Pump Station Plan and Sections (3 sheets)
- RMS Building Plan and Section including sprinkler system (2 sheets)
- Storage Building and Diesel Storage Tank & Dispensing Facility Plan and Section (2 sheets)
- Diesel Dispensing Facility Sections and Details
- Surge Tank Plan and Sections
- Surge Tank and Air Compressor Details
- RMS Water Sample Piping Diagram
- Mechanical Details (6 sheets)
- Mechanical Symbols and Abbreviations
- Zone 8 to 9 Booster Pump Station - Electrical Room HVAC and Piping Plan

- Zone 8 to 9 Booster Pump Station - Office HVAC and Piping Plan
- Zone 8 to 9 Booster Pump Station - HVAC Section
- Zone 8 to 9 Booster Pump Station - Mechanical Details
- Zone 8 to 9 Booster Pump Station - Mechanical Schedules
- Zone 8 to 9 Booster Pump Station - Plumbing Symbols and Abbreviations
- Zone 8 to 9 Booster Pump Station - Plumbing Drainage Plan
- Zone 8 to 9 Booster Pump Station - Plumbing Supply Plan
- Zone 8 to 9 Booster Pump Station - Plumbing Details
- Zone 8 to 9 Booster Pump Station - Plumbing Schedules
- RMS Building - Chemical Building Ventilation and Heating Plan
- RMS Building - Plumbing Drainage Plan
- RMS Building - Plumbing Supply Plan
- Storage Building Ventilation and Heating Plan
- Storage Building Plumbing Drainage Plan
- Storage Building Plumbing Supply Plan
- Diesel Storage Tank Room HVAC and Piping Plan
- General Structural Notes and Special Inspection Requirements (3 sheets)
- Typical Structural Details (2 sheets)
- Building Foundation Details
- Building Wall Details
- Building Roof Framing Details (3 sheets)
- Zone 8 Reservoir Prestressing Notes
- Zone 8 Reservoir Foundation Plan
- Zone 8 Reservoir Roof Deck Plan
- Zone 8 Reservoir Roof Deck Reinforcing Plan
- Zone 8 Reservoir Wall Section and Elevation
- Zone 8 Reservoir Full Section
- Zone 8 Reservoir Roof Deck Reinforcing Sections
- Zone 8 Reservoir Foundation Details
- Zone 8 Reservoir Wall Details (2 sheets)
- Zone 8 Reservoir Roof Deck Details (2 sheets)
- Zone 8 to 9 Booster Pump Station Foundation Plan
- Zone 8 to 9 Booster Pump Station Roof Framing Plan
- Zone 8 to 9 Booster Pump Station Exterior Elevations
- Zone 8 to 9 Booster Pump Station Sections
- Storage Building Foundation Plan
- Storage Building Roof Framing Plan
- Storage Building Exterior Elevations
- Storage Building Sections
- RMS Building Foundation Plan
- RMS Building Roof Framing Plan
- RMS Building Exterior Elevations
- RMS Building Sections
- Electrical Symbols and Abbreviations
- Electrical Site Plan
- Power Site Plan (3 sheets)
- I&C Site Plan (3 sheets)

- Grounding Plan
- Lighting Plan
- Security Plan
- Single Line Diagram
- Schematic Diagram (2 sheets)
- Equipment Elevation Plan
- Motor Control Schematics
- Panel Schedule
- Conduit and Fixture Schedule
- Electrical Details (3 sheets)
- I&C Symbols and Abbreviations
- Piping & Instrumentation Diagrams (P&ID) (2 sheets)
- PLC Panel/RTU Layout Plan (2 sheets)
- Network Topology

Total Number of Sheets: 138 sheets

- C. **Electrical/Instrumentation.** Tetra Tech will prepare an operational scheme including P&IDs, single line diagrams, control equipment list, control loop descriptions, and method of integrating the proposed facilities into IRWD's existing SCADA system. Prior to this process, Tetra Tech will meet with IRWD electrical/automation staff to incorporate IRWD's standard operations, PLC and SCADA programming, and equipment tagging requirements into the design. Tetra Tech will develop and provide the operational scheme and functional descriptions (in plain English) for IRWD review and approval.
- D. **SCE Final Service Plan.** Tetra Tech will coordinate with SCE early in the design process to obtain the Final Service Plan, which shall be inserted in the appendix of the Project Manual. This task shall include the coordination efforts necessary to communicate the project requirements, address any comments from SCE, and implement all requirements into the project design. Tetra Tech will be responsible for obtaining SCE's approval for the proposed electrical service at the site.
- E. **Project Schedule.** Tetra Tech will maintain and consistently update the project schedule, which shall include detailed schedules for both design and construction activities. The schedule shall include all critical factors impacting the project schedule including implementation, permitting, and coordination activities to ensure that the project is completed in accordance with the proposed schedule. The schedule shall be prepared in Microsoft Project.
- F. **Opinion of Probable Construction Cost.** Tetra Tech will prepare a detailed and itemized opinion of probable construction cost for the proposed facilities, which shall be updated and submitted with each of the design deliverables described below.
- G. **Design Deliverables.** Deliverables shall be made as follows:
1. **60 Percent Design Submittal.** Eight (8) 11"x17" bound copies of the 60 percent submittal and one (1) CD containing a single PDF file of the entire plan set. Show civil/site, preliminary reservoir plans and sections, mechanical, and electrical plans. Show basic mechanical equipment, structural and architectural layouts, pipeline alignments, preliminary profiles, and existing utilities at a minimum. Provide a complete table of contents for the Project Manual.

2. **90 Percent Design Submittal.** Eight (8) 11"x17" bound copies of the 90 percent submittal and one (1) CD containing a single PDF file of the entire plan set. Show concepts of each component of the design such as civil, structural, mechanical, architectural, electrical and instrumentation. Show plan, profile, connections, details, and location of appurtenances. Plan and profile drawings and mechanical details/drawings shall be developed to a high level of detail. Provide five (5) color coded copies of the 90 percent Project Manual, including all sections; contract documents, general provisions, special provisions, general requirements, technical specifications, and appendix.
 3. **100 Percent Design Submittal.** Eight (8) 11"x17" bound copies of the 100 percent submittal, one (1) CD containing AutoCAD files for the entire plan set, and one (1) CD containing a single PDF file of the entire plan set. Include complete plans and five (5) color coded copies of the Project Manual, a notebook with the design calculations (including, but not limited to, mechanical, civil, structural, electrical, pipe thickness and restraint), and one (1) CD containing all MS Word files used in the preparation of the Project Manual.
 4. **Final Design Submittal.** One (1) full size final stamped and signed reproducible plan set with mylar cover sheet and one (1) original signed reproducible Project Manual for IRWD's signatures.
- H. **Addenda Preparation and Pre-Bid Meeting.** During the bidding period, Tetra Tech will assist with providing information and clarification of bid documents to prospective bidders. Tetra Tech will include budget for the preparation of up to three (3) addenda including revisions to the design plans and specifications and assistance with addressing bidder questions. At a minimum, addenda preparation activities shall include:
1. **Plan Revisions:** Tetra Tech will budget forty (40) hours of appropriate staff time for plan revisions to the construction drawings.
 2. **Specification Revisions:** Tetra Tech will budget twenty-five (25) hours of appropriate staff time for revisions or additions to the project specifications.
 3. **Bidder Questions:** Tetra Tech will budget forty (40) hours of appropriate staff time to address and respond to bidder questions.
 4. **Pre-Bid Meeting:** Tetra Tech will attend one (1) two-hour pre-bid meeting (conducted by IRWD). This will include a site visit with potential bidding contractors.

PROJECT TEAM

The key for success on this project is the project team we have assigned and their relationship with IRWD and their previous reservoir experience. As with past assignments for IRWD, we propose to approach this assignment with a spirit of partnership with IRWD. This will enable us to combine the knowledge, ideas, and talents of IRWD's staff with our planning, design and construction experience to provide extraordinary results.

The following presentation introduces key members of our project team, all of whom have the knowledge, experience, and enthusiasm necessary to successfully complete your project. **It will be our collective goal to not only meet, but to exceed, your expectations.** The following paragraphs summarize the qualifications of our key project staff:

Project Manager: Tom Epperson, PE, will be the Project Manager and will provide the overall project direction, technical oversight, quality management, and ensure that the necessary resources are committed to Mike Tsoi in order to get the job done. Tom has over 39 years of experience and will provide his technical

expertise to assist the design team in the areas of constructability, specifications, review and as-needed project management support. Tom and Mike have been working together for 20 years on similar reservoir, pump station/wells and pipeline projects for IRWD (over 25 different projects).

Team Leader: Mike Tsoi, PE, will provide the project direction and coordination for Tetra Tech's project team and provide all day-to-day contact with IRWD staff. Mike has over 30 years of experience working on similar projects. As noted within the Project Approach Section of this Proposal, Mike has been working with Tom on over 25 projects for IRWD during the last 15 years. For the last nine years, Mr. Tsoi has been the key point of contact with IRWD on over 10 projects under the supervision and direction of Mr. Epperson, the Project Manager.

Pump Station and Site Master Plan Task Leader: Laurence Esguerra, PE, will perform the role as the Project Engineer as well as the Task Leader for the Pump Station and Site Master Plan portion of the work. Laurence has previously worked with IRWD on the following past projects: Zone 1-3 BPS; IDP Wells, Well 78, Well 107 and the IDP Conveyance Pipelines.

Reservoir and RMS Facility Task Leader: Erin Cabañero, PE, will perform the role as the Task Leader for the Reservoir and RMS Facility portion of the work. Erin has previously worked with IRWD on the following past projects: 3.7 MG Zone 1 Reservoir, Dyer Road Well Field Surge Tanks, Peters Canyon Channel Water Capture and Reuse Pipeline, Sand Canyon Grade Separation, and Well 78.

Site Work/WQMP/SWPPP Task Leader: Nate Schreiner, PE, QSD, will help coordinate permits, SWPPP and provide a technical memorandum for the Water Quality Management Plan Requirements to the IRWD. Nate has over 11 years of experience at Tetra Tech.

Building Structural Task Leader: Victor Ramirez, PE, SE, will assist our Project Manager and direct the activities of other members of the design team in the capacity of the Structural Buildings Team Leader. For the past 38 years Victor has been involved in the structural design of the majority of our water storage and pump station structures.

Reservoir Structural Task Leader: Eric Yuen, PE, SE, will assist our Project Manager and direct the activities of other members of the design team in the capacity of the Structural Reservoir Team Leader. For the past 12 years Eric has been involved in the structural design of the majority of our water storage and pump station structures as well as the 3.7 MG Zone 1 Reservoir.

Electrical Task Leader: Mazen Kassar, PE, will assist our Project Manager and direct the activities of other members of the design team in the capacity of the Electrical Task Leader. At Tetra Tech, Mazen has been responsible for the design of electrical systems for the majority of all of our water/wastewater facilities in Southern California.

Controls System Task Leader: Astrid Fleischer, PE, will assist our Project Manager and direct the activities of other members of the design team in the capacity of the Controls System Task Leader. At Tetra Tech, Astrid has been responsible for the design of SCADA improvements for the majority of all of our water/wastewater facilities in Southern California.

Luke Ramirez (PE, LEED AP, and PMP) will lead the design for the **Plumbing and HVAC** for the different buildings on the project.

Architectural Renderings: Ota Ulc created the renderings and fly-over video for the 3.7 MG Zone 1 Reservoir which is located within the City of Irvine.

Quality Assurance/Quality Control: Tetra Tech has assigned an independent QA/QC team including constructability review for the project. This team will provide independent review and input to the project team throughout the design process. They will be responsible for technical oversight as part of our team's commitment to quality assurance/quality control. **Mr. Ken Berard, PE**, will be in charge of the QA/QC team. Mr. Berard has been responsible for the design of over 20 reservoirs/tanks during the last 15 years, which are in addition to the 20 tanks that our Project Team has designed. Adding Ken to our Project Team, will bring the additional experience that was obtained from different clients within the Southern California service area. Our team will be able to gain the technical experience from these other projects, including the recent experience with NSF concrete approval during the construction of the Plant 224 Reservoirs for Suburban Water Systems.

In order to provide the full range of services required for this project, we have added several subconsultants to our project team. Tetra Tech will be responsible for coordinating and integrating the efforts of each subconsultant. They will serve IRWD as subconsultants to Tetra Tech.

Surge Analysis: *Scott Foster Engineering, Inc.*

Geotechnical Investigation: *Leighton Consulting (DIR Registration #: 1000007443)*

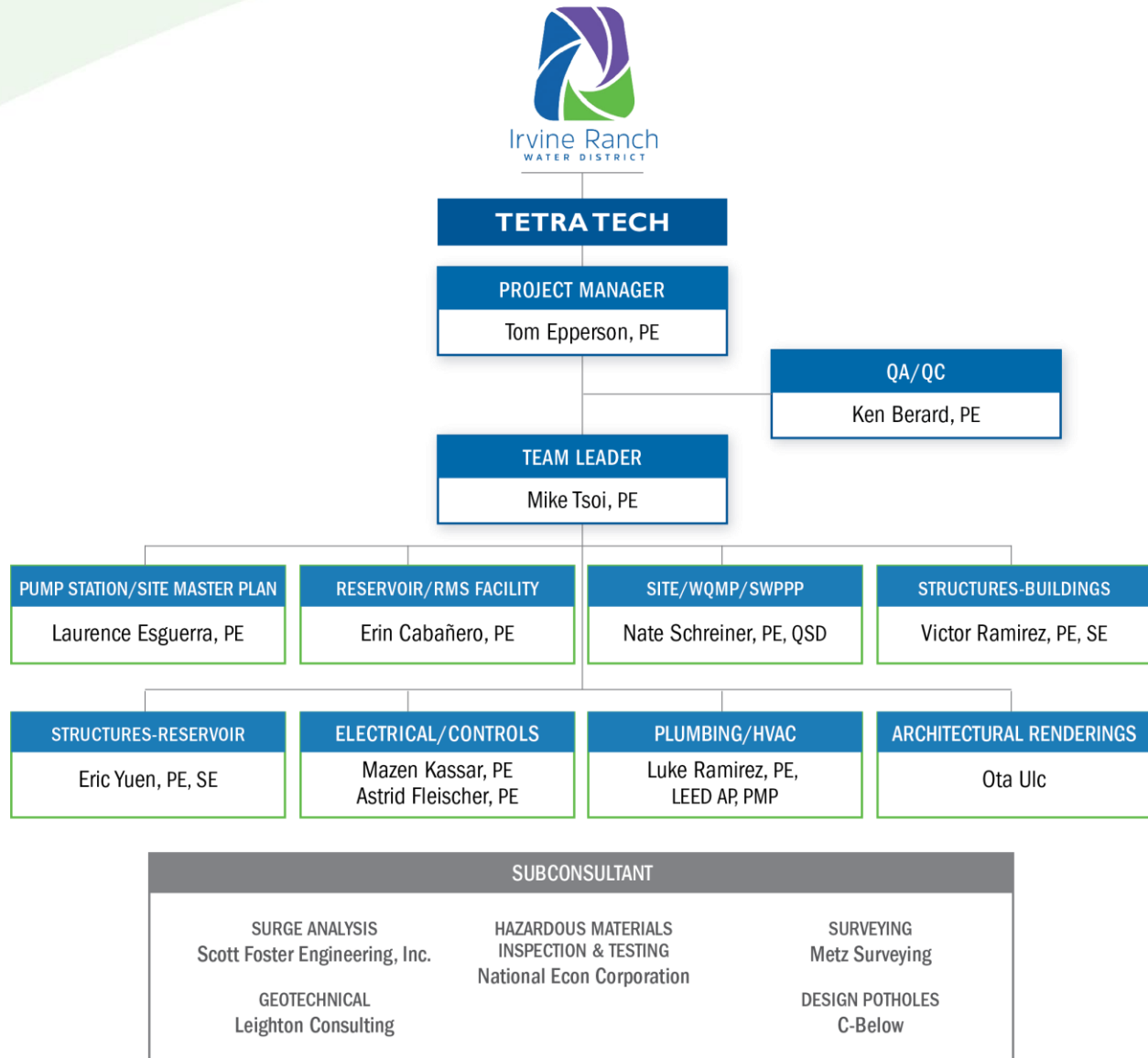
**Hazard Materials
Inspection and Testing:** *National Econ Corporation*

Surveying: *Metz Surveying (DIR Registration #: 1000045062)*

Design Potholes: *C Below*

We have included resumes in Appendix C.

P R O J E C T T E A M C H A R T



Fee Proposal
Irvine Ranch Water District
Fleming Zone 8 Reservoir and Zone 8 to 9 Booster Pump Station Project
Submitted by Tetra Tech

Fee Summary

Task Description		Sr. Project Manager	Project Manager 2	Project Manager 1	Project Engineer	Design Engineer	CADD	Word Processor	Total Hours	Fees		TOTALS
										Labor	Sub-Contractors Re-imburseables	
1	Project Management											
	Project Status Report (64/16)	16			80	4			100	\$19,000		\$19,000
	Meetings (19) and Workshops (3) (2 hr/mtg)	44	16	24	60			8	152	\$34,740	\$460	\$35,200
	Constructability Review and QA/QC	100							100	\$33,000		\$33,000
	Subtotal	160	16	24	140	4	0	8	352	\$86,740	\$460	\$87,200
2	Preliminary Design Report											
	Review background information			2	4	8			14	\$2,140		\$2,140
	Hydraulic Analysis & Pump Selection	4		8	16	32	16		76	\$11,480		\$11,480
	Utility Research			2	4	8		4	18	\$2,580	\$300	\$2,880
	Design Potholes (4 potholes)			2		4		1	7	\$1,070	\$4,600	\$5,670
	Zone 8 Reservoir Siting (Tech Memo)	4		24	40	60	40	4	172	\$25,440		\$25,440
	Reservoir Management System			2	4	8	8		22	\$2,940		\$2,940
	Pump Station Building Configuration	2		4	8	16	8		38	\$5,740		\$5,740
	Storage and Diesel Storage Building Configuration			4	8	16	8		36	\$5,080		\$5,080
	Site Master Plan (Tech Memo)	4		16	30	40	40	4	134	\$19,430		\$19,430
	Architectural Renderings (3 layouts)				8	12	16		36	\$4,480	\$7,000	\$11,480
	Construction Phasing			8	8	8	4		28	\$4,520		\$4,520
	Surge Analysis			4	8	4		1	17	\$2,830	\$16,560	\$19,390
	Site Electrical Service		8			40			48	\$7,280		\$7,280
	Electrical and Controls		24		86	150			260	\$39,930		\$39,930
	Structural Preliminary Design		24	14		36	70	4	148	\$21,440		\$21,440
	Geotechnical Investigation			2		4		1	7	\$1,070	\$37,375	\$38,445
	Hazardous Materials Inspection			2	4	8		1	15	\$2,250	\$5,530	\$7,780
	Hazardous Materials Testing								0	\$0	\$7,500	\$7,500
	Surveying Services			2	12	12	8	1	35	\$4,890	\$6,975	\$11,865
	Permits and Coordination			8	36	24	8	4	80	\$12,060		\$12,060
	Permit Fees								0	\$0	\$5,000	\$5,000
	Water Quality Management Plan Requirements/SWPPP		10	20	40	30	126		226	\$30,100		\$30,100
	CEQA Documentation Assistance			4	12	12	4	1	33	\$4,930	\$70	\$5,000
	Project Schedule			2	4	8			14	\$2,140		\$2,140
	Opinion of Probable Construction Cost	2		6	8	16			32	\$5,380		\$5,380
	Preliminary Design Report (PDR) Preparation	4		24	40	24	24	4	120	\$19,160		\$19,160
	Reproduction/ Mileage								0	\$0	\$330	\$330
	Subtotal	20	66	160	380	580	380	30	1616	\$238,360	\$91,240	\$329,600
3	Final Design											
	Project Manual	8	2	8	24			8	50	\$9,760		\$9,760
	Construction Plans									\$0		\$0
	General and Construction Notes (4 sheets)			4	12	16	30		62	\$7,940		\$7,940
	Horizontal Control Plan (2 sheets)					8	16		24	\$2,640		\$2,640
	Site Demolition Plans and Sections (3 sheets)			8	14	24	36		82	\$10,790		\$10,790
	Overall Site Plan			2	4	8	12		26	\$3,340		\$3,340
	Reservoir Construction Grading Plan	1		4	10	16	24		55	\$7,340		\$7,340
	Reservoir Cross Sections and Site Details			2	8	12	16		38	\$4,920		\$4,920
	Reservoir & RMS Building Final Grading Plan	1		2	8	16	16		43	\$5,770		\$5,770
	Reservoir Subgrade Preparation			2	4	8	16		30	\$3,740		\$3,740
	Reservoir Final Grading and Drainage Details (2 sheets)	1		4	8	16	24		53	\$7,010		\$7,010
	Reservoir and RMS Perimeter Wall and Details			2	8	8	16		34	\$4,400		\$4,400
	SWPPP/Erosion Control Plan (2 sheets)			8	24	30	16		78	\$11,220		\$11,220
	BPS Phasing Plan			4	8	16	12		40	\$5,480		\$5,480
	BPS and Storage Building Site & Grading Plan	1		2	8	16	16		43	\$5,770		\$5,770
	Yard Piping Plan and Profiles (5 shts)	1		8	16	30	60		115	\$14,630		\$14,630
	Site Details (3 sheets)	1		4	12	20	36		73	\$9,390		\$9,390
	Surface Water Treatment Details			4	8	12	12		36	\$4,960		\$4,960
	Connection Details			4	8	16	12		40	\$5,480		\$5,480
	Piping Details (2 sheets)			4	8	16	24		52	\$6,680		\$6,680
	Reservoir Piping, Appurtenances, Miscellaneous Details (5 sheets)	1		6	12	24	60		103	\$12,750		\$12,750
	Subdrain Piping Details/Inspection MH (2 sheets)	1		2	4	8	24		39	\$4,870		\$4,870
	Corrosion Protection Details			4	8	12	12		36	\$4,960		\$4,960
	Miscellaneous Details			4	6	16	8		34	\$4,750		\$4,750
	BPS Plan and Sections (3 sheets)	1		8	16	30	36		91	\$12,230		\$12,230
	RMS Plan and Section (2 sheets)	1		8	12	24	32		77	\$10,390		\$10,390
	Storage Building and Diesel Fuel Plan and Sections (2 sheets)	1		8	12	24	24		69	\$9,590		\$9,590
	Diesel Dispensing Facility Sections and Details			4	8	16	12		40	\$5,480		\$5,480
	Surge Tank Plan, Sections and Details (2 sheets)	1		4	12	24	24		65	\$8,710		\$8,710
	RMS Water Sample Piping Diagram			4	8	12	12		36	\$4,960		\$4,960
	Mechanical Details (6 sheets)			6	22	40	64		132	\$16,550		\$16,550
	HVAC and Plumbing (18 sheets)				172	237			409	\$59,190		\$59,190
	Structural Plans (34 sheets)		24	30		100	215	10	379	\$48,440		\$48,440
	Electrical Plans (21 sheets)		20			260			280	\$39,000		\$39,000
	Instrumentation Plans (6 sheets)		16		80				96	\$17,360		\$17,360
	Electrical/Instrumentation		28		84	10			122	\$22,440		\$22,440
	SCE Final Service Plan		4			40			44	\$6,240		\$6,240
	Project Schedule			2	8	8			18	\$2,800		\$2,800
	Opinion of Probable Costs	2	2	6	12	8			30	\$5,520		\$5,520
	Final Design Deliverables				8	11	15	2	36	\$4,470		\$4,470
	Agenda Preparation and Pre-Bid Meeting	8	4	8	24	8	8	4	64	\$11,680		\$11,680
	Reproduction/ Mileage								0	\$0	\$7,560	\$7,560
	Subtotal	30	100	180	700	1200	940	24	3174	\$443,640	\$7,560	\$451,200
	Total	210	182	364	1220	1784	1320	62	5142	\$ 768,740	\$ 99,260	\$ 868,000
	Optional Items											
	Surge Analysis (Cabinland & Manning Pump Stations)		4		8	4		2	18	\$3,100	\$6,900	\$10,000
	Total + Optional Items	210	186	364	1228	1788	1320	64	5160	\$ 771,840	\$ 106,160	\$ 878,000