June 11, 2024

MEMO TO: BFED-21(24) File

F R O M: Yuki Lei K. Sugimura, Chair Yuki Lei K. Sugimura
Budget, Finance, and Economic Development Committee

SUBJECT: **TRANSMITTAL OF INFORMATIONAL DOCUMENT RELATING TO JOHNSON CONTROLS, INC. ENERGY PERFORMANCE CONTRACT** (BFED-21(24))

The attached informational document pertains to Item 21(24) on the Committee's agenda.

bfed:ltr:021(24)afile02:jgk

Attachment

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OFFICE OF THE
COUNTY COUNCIL

INVESTMENT GRADE AUDIT

Phase 1: Implementation Scope of Work, Planned Maintenance Services & Performance Guarantee

County of Maui
Contract No. C7619
Solicitation Document No. RFP-21-22/ESPC

VOLUME 1

Prepared for:
Office of the Mayor
c/o Alex DeRoode, Energy Commissioner
Department of Finance
County of Maui
200 South High Street
Wailuku, Maui, HI 96793

Submitted by:
Brody McMurtry
Account Executive to the County of Maui
Johnson Controls, Inc.
2065 Main St.
Suite 101
Wailuku, HI 96793

September 2022

Submitted by Department of Finance (BFED-21(22))
Received at BFED meeting on 05/29/2024

Johnson Controls

September 21, 2022

Office of the Mayor
c/o Alex DeRoode, Energy Commissioner
Department of Finance
County of Maui
200 South High Street
Wailuku, Maui, HI 96793

Dear Mr. DeRoode:

We are pleased to submit the attached Phase 1 Energy Saving Performance Contracting project across all County of Maui Departments. The $29 million project investment results in $73 million in guaranteed utility & operational savings over the 20 year term, comprised of:

1. 33% reduction of Domestic Water use across all County facilities; 1.7 billion gallons of clean, domestic water saved over the 20 year term (86 million gallons *annually*)*
2. 6% reduction of electricity use across all County facilities through implementation of energy conservation measures.
3. 2,293 Tons of Greenhouse Gas Emissions reduced *annually,* avoiding 7,146 barrels of oil.

The measures described herein are scheduled to be completed over the next 24 months, following the anticipated September 30, 2022 contract execution and Notice to Proceed.

We look forward to working with you on the development of solar + storage across the approximately 141 County sites we have identified as opportunities to add microgrid resiliency for Water Pumping, Emergency / Fire / Police Stations and Community Resiliency Hubs. Solar + storage will also add substantial electric bill savings. Phase 2 will also include additional electrification of transportation and efficiency measures, including Landfill and Waste Water improvements. Those are described herein under the “Facility Improvement Measures under Evaluation” Section.

As with proceed with the installation of Phase 1, reach out to me at any time with questions or concerns.

Brody McMurtry

Brody McMurtry
Account Executive to the County of Maui
Telephone: (808) 342-8682
Email: Brody.McMurtry@jci.com

*1.7 billion gallons comprised of 86 million gallons *annually* of clean, domestic water saved. Of this amount, 35 million gallons is from using brackish water to irrigate County Parks instead of domestic water. 51 million gallons is from reduced water use through water conservation measures across County facilities as further described in the scope.

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VOLUME 1

VOLUME 2

Executive Summary

INTRODUCTION

The County of Maui published a Request for Proposals (RFP), in accordance with Hawaii Performance Contract Statute (HRS 36-41), to procure Guaranteed Energy Savings and associated financing, per the statute. The statute requires that Guaranteed Energy Savings are greater than the amount of the associated project payments in each year of the Performance period. In the event that the contractually promised Guaranteed Savings are not provided, the selected Contractor must write a check to the County for the shortfall or the County may elect to install additional Facility Improvement Measures (FIMs) to produce the required savings, at no additional cost to the County.

After receiving and evaluating multiple competitive bids, the County of Maui selected Johnson Controls, Inc. (JCI) and awarded JCI the project as the selected Energy Services Company (ESCO).

As the ESCO for the County, JCI seeks to support each facility in energy savings initiatives and has examined many areas where further energy conservation can assist the County in meeting their objectives.

Through the continued Performance Contracting program, the County will:

- Install Facility Improvement Measures
- Address deferred maintenance
- Promote Sustainability and Fiscal Responsibility

In the attached supplemental Investment Grade Audit (IGA), JCI provides:

- FIM matrix: an overall summary of costs and benefits.
- A financial model to describe the project, including:
  - Efficiency measures paid via a Tax Exempt Lease Purchase (TELP) from a third-party finance provider, backed by Guaranteed Savings from JCI.
  - Option to add Solar PV and energy storage measures, with designated micro-grid enabled resiliency hubs, paid through a Power Purchase Agreement (PPA) from a third-party finance provider.
- Engineering, Design, and Implementation.
- Collaboration with the County for long-term service of equipment.

We look forward to building upon past successes and producing enhanced benefits for the County facilities.

LIST OF FACILITY IMPROVEMENT MEASURES

The list below is an executive summary, by Department, of the Facility Improvement Measures (FIM) included in this project. The Annual Energy Savings column is inclusive of both electricity and the water/sewer utility savings. The Simple Payback is calculated as the Implementation Cost divided by the Savings (sum of utility savings plus operational savings).

Department	Year 1 Utility Savings	Year 1 O&M Savings (*)	Year 1 Total Savings	Simple Payback (yrs)	Annual GHG Reductions (Tons CO2)
Dept of Housing and Human Concerns	$38,207	$1,092	$39,299	13.57	65.8
Dept of Parks and Recreation	$1,316,717	$252,729	$1,569,446	12.48	978.2
Dept of Prosecuting Attorney	$13,227	$383	$13,609	10.61	24.1
Dept of Public Works	$144,300	$5,556	$149,856	18.56	225.7
Dept of Water Supply	$93,989	$2,913	$96,902	10.22	154.1
Environmental Management	$135,440	$2,785	$138,225	8.51	192.0
Maui Fire & Public Safety	$162,052	$3,139	$165,191	8.79	240.6
Maui Police Department	$245,090	$5,651	$250,742	8.53	412.7
Total	**$2,149,022**	**$274,247**	**$2,423,269**	**11.89**	**2,293.1**

(*) O&M Savings are for materials or external purchases only; does not include Maui County internal employee labor savings.

Site List

The following is the list of sites that has been identified from the various electric and water bills that were provided by the County. Please note County provided MECO data contained some sites without an address, as some sites are sensitive secure areas. JCI will keep on file an address or GPS coordinates for these locations as it pertains to a potential Phase 2 project.

No.	Facility Name	Description	Address	Dept	Island
1	66 Market St Restroom	Park	66 N Market St, Wailuku, 96793	Dept of Public Works	MAUI
2	Daycare	Office Building	251 Napua St, Wailuku, 96793	Dept of Public Works	MAUI
3	State Run Old Courthouse	Office Building	628 Wharf St, Lahaina, 96761	Dept of Public Works	MAUI
4	4th Marine Division Memorial Park	Park	Mile 2, Kokomo Rd, Haiku, 96708	Dept of Parks and Recreation	MAUI
5	Alfred "Flako" Boteilho Gymnasium	Gymnasium	640 Baldwin Ave, Paia, 96779	Dept of Parks and Recreation	MAUI
6	Brooks Booster	Well/Pump		Dept of Water Supply	MAUI
7	Central Maui Regional Sports Complex	Park	S Kamehameha Ave, Kahului, HI 96732	Dept of Parks and Recreation	MAUI
8	Central Landfill	Landfill	Pulehu Rd & Hansen Rd, Puunene, 96784	Environmental Management	MAUI
9	Central Wailuku Heights Pump	Well/Pump		Dept of Water Supply	MAUI
10	Charley Young Park	Park	2200 South Kihei Road Kihei, Maui, HI 96753	Dept of Parks and Recreation	MAUI
11	Civic Center Boosters	Well/Pump		Dept of Water Supply	MAUI
12	Coach Sakamoto Pool	Aquatic/Pool	700 Halia Nakoa St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
13	Coach Shiraishi Memorial Pool	Aquatic/Pool	145 Kaulawahine St, Kahului, 96732	Dept of Parks and Recreation	MAUI
14	Cooke Memorial Pool	Aquatic/Pool	220 Kolapa Pl, Kaunakakai, 96748	Dept of Parks and Recreation	MOLOKAI
15	Country Club Pump	Well/Pump		Dept of Water Supply	MAUI
16	Credit Union Building	Office Building	1888 Wili Pa Loop, Wailuku, 96793	Dept of Water Supply	MAUI
17	David Trask Office Building	Office Building	2154 Kaohu St, Wailuku, 96793	SITE REMOVED	MAUI
18	Diamond Resort Boosters	Well/Pump		Dept of Water Supply	MAUI
19	D.T. Fleming Park	Park	Lower Honoapiilani Rd at Honoapiilani Hwy	Dept of Parks and Recreation	MAUI
20	Duke Maliu Regional Park	Park	240 W Kamehameha V Hwy, Kaunakakai, 96748	Dept of Parks and Recreation	MOLOKAI
21	Eddie Tam Memorial Center	Community Center	931 Makawao Ave, Makawao, 96768	Dept of Parks and Recreation	MAUI
22	Eluene Pl Wastewater Pumping Station	WWPS		Environmental Management	MAUI
23	Field Operations Lahaina Baseyard	Baseyard	131 Kai Ala Dr, Lahaina, HI 96761	Dept of Water Supply	MAUI
24	Fire Prevention Bureau	Office Building	313 Manea Pl, Wailuku, 96793	Maui Fire & Public Safety	MAUI
25	Forensic Facility	Office Building	1831 Wili Pa Loop, Wailuku, 96793	Maui Police Dept	MAUI
26	H.A. Baldwin Park	Park	Baldwin Park, Paia, 96779	Dept of Parks and Recreation	MAUI

No.	Facility Name	Description	Address	Dept	Island
27	Haiku Community Center	Community Center/Park	2830 Hana Hwy at Pilialoha St, Haiku, 96708	Dept of Parks and Recreation	MAUI
28	Haiku Well	Well/Pump	20°53'59.11"N - 156°19'29.10"W	Dept of Water Supply	MAUI
29	Hale Mahaulu Ewalu Senior Housing	Housing	53, 55,57, 59, 61, 63, 65 Ohia Ku St, Pukalani, 96768	Dept of Housing and Human Concerns	MAUI
30	Haleakala Acres Pumps	Well/Pump	20°46'15.63"N - 156°17'51.38"W	Dept of Water Supply	MAUI
31	Haleakala Hwy Pump	Well/Pump		Dept of Water Supply	MAUI
32	Haliimaile Park & Tennis	Gymnasium/Park	75 Makomako St, Makawao, 96768	Dept of Parks and Recreation	MAUI
33	Haliimaile Well	Well/Pump		Dept of Water Supply	MAUI
34	Hamakuapoko Well 1	Well/Pump		Dept of Water Supply	MAUI
35	Hamakuapoko Well 2	Well/Pump		Dept of Water Supply	MAUI
36	Hamoa Pump	Well/Pump		Dept of Water Supply	MAUI
37	Hana Bay Beach Park	Park	150 Keawa Pl, Hana, 96713	Dept of Parks and Recreation	MAUI
38	Hana Community Center & Ball Park	Community Center/Park	5091 Uakea Rd, Hana, 96713	Dept of Public Works	MAUI
39	Hana Fire Station	Fire Station	4655 Hana Hwy, Hana, 96713	Maui Fire & Public Safety	MAUI
40	Hana Landfill	Landfill	Waikoloa Rd, off Hana Highway (Hwy 360) Just before Hana town. Hana, 96713	Environmental Management	MAUI
41	Hana Police Station	Police Station	4611 Hana Hwy, Hana, 96713	Maui Police Department	MAUI
42	Hanakao'o Park	Park	2501 Honoapiiliani Hwy, Lahaina, 96761	Dept of Parks and Recreation	MAUI
43	Harry Fields Booster Station	Well/Pump		Dept of Water Supply	MAUI
44	Haycraft Park	Park	399 Hauoli Street, Maalaea, 96793	Dept of Parks and Recreation	MAUI
45	Helene Hall	Community Center	150 Keawa Pl, Hana, 96713	Dept of Parks and Recreation	MAUI
46	Honokowai Beach Park	Park	Lower Honoapiilani Highway, Lahaina, 96761	Dept of Parks and Recreation	MAUI
47	Honokowai Booster Pump	Well/Pump		Dept of Water Supply	MAUI
48	Honolii Park	Park	Corner of S. High & Main, Wailuku, 96793	Dept of Parks and Recreation	MAUI
49	Honukahu Well	Well/Pump		Dept of Water Supply	MAUI
50	Ho'okipa Beach Park	Park	Mile 9, Hana Hwy, Paia, 96779	Dept of Parks and Recreation	MAUI
51	Hoolehua Fire Station	Fire Station	2190 Farrington Ave, Hoolehua, 96729	Maui Fire & Public Safety	MOLOKAI
52	Huliau Housing	Housing	820 W Kaahumanu Ave, Kahului 96732	Dept of Housing and Human Concerns	Maui
53	Hyatt Wastewater Pumping Station	WWPS		Environmental Management	MAUI
54	Iao Water Treatment Plant	WTP		Dept of Water Supply	MAUI
55	Iao Well	Well/Pump		Dept of Water Supply	MAUI
56	Kaa Wastewater Pumping Station	WWPS		Environmental Management	MAUI
57	Kaanapali Wastewater Pumping Station	WWPS	Kekaa Dr	Environmental Management	MAUI
58	Kaenae Well	Well/Pump		Dept of Water Supply	MAUI
59	Kahala Well	Well/Pump		Dept of Water Supply	MAUI

No.	Facility Name	Description	Address	Dept	Island
60	Kahului Baseyard	Baseyard	2000 Maui Veterans Hwy, Puunene, HI 96784	Dept of Water Supply	MAUI
61	Kahului Community Center	Community Center	275 Uhu St, Kahului, 96732	Dept of Parks and Recreation	MAUI
62	Kahului Community Center Park	Community Center	275 Uhu St, Kahului, 96732	Dept of Parks and Recreation	MAUI
63	Kahului Fire Station	Fire Station	200 Dairy Rd, Kahului, 96732	Maui Fire & Public Safety	MAUI
64	Kahului Park	Park	5795 Hina Ave, Kahului, 96732	Dept of Parks and Recreation	MAUI
65	Kahului Park Irrigation Well	Well/Pump		Dept of Parks and Recreation	Maui
66	Kahului Wastewater Pumping Station	WWPS		Environmental Management	MAUI
67	Kahului Wastewater Reclamation Facility	WWTP	281 Amala Pl, Kahului, 96732	Environmental Management	MAUI
68	Kalae Booster	Well/Pump		Dept of Water Supply	MOLOKAI
69	Kalae Well	Well/Pump		Dept of Water Supply	MAUI
70	Kalama Irrigation Pumps	Well/Pump		Dept of Parks and Recreation	MAUI
71	Kalama Park	Park	1900 S. Kihei Rd, Kihei, 96753	Dept of Parks and Recreation	MAUI
72	Kalama Skate Park	Park	1910 S. Kihei Rd, Kihei, 96753	Dept of Parks and Recreation	MAUI
73	Kalana O Maui Building	Office Building	200 S. High St, Wailuku, 96793	Dept of Public Works	MAUI
74	Kalana Pakui	Office Building	250 S. High St, Wailuku, 96793	Dept of Public Works	MAUI
75	Kamaole I Beach Park	Park	2400 S. Kihei Rd, Kihei, 96753	Dept of Parks and Recreation	MAUI
76	Kamaole II Beach Park	Park	2550 S. Kihei Rd, Kihei, 96753	Dept of Parks and Recreation	MAUI
77	Kamaole III Beach Park	Park	2800 S. Kihei Rd, Kihei, 96753	Dept of Parks and Recreation	MAUI
78	Kamehameha Iki Park	Park	500 Front St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
79	Kamiloa Booster	Well/Pump		Dept of Water Supply	MOLOKAI
80	Kamole Water Treatment Plant	WTP		Dept of Water Supply	MAUI
81	Kanaha Beach Park	Park	Amala Pl, Kahului, 96732	Dept of Parks and Recreation	MAUI
82	Kanaha Well	Well/Pump		Dept of Water Supply	MAUI
83	Kanoa Well 1	Well/Pump		Dept of Water Supply	MAUI
84	Kanoa Well 2	Well/Pump		Dept of Water Supply	MAUI
85	Kaunakakai Ball Park	Park	Ainoa St and Ala Malama Ave, Kaunakakai, 96748	Dept of Parks and Recreation	MOLOKAI
86	Kaunakakai Fire Station	Fire Station	230 Kakalahale St, Kaunakakai, 96748	Maui Fire & Public Safety	MOLOKAI
87	Kaunakakai Tennis Courts	Park		Dept of Parks and Recreation	MOLOKAI
88	Kaunakakai Wastewater Pumping Station	WWPS		Environmental Management	MOLOKAI
89	Kaunoa Senior Services	Office Building	401 Alakapa Pl, Paia, 96779	Dept of Housing and Human Concerns	MAUI
90	Kaupakalua Well	Well/Pump		Dept of Water Supply	MAUI
91	Kawela Pump	Well/Pump		Dept of Water Supply	MOLOKAI
92	KCC Irrigation Well	Well/Pump		Dept of Parks and Recreation	MAUI

Johnson Controls

No.	Facility Name	Description	Address	Dept	Island
93	Keanae Park	Park	Keanae Rd Mile 16 Hana Highway	Dept of Parks and Recreation	MAUI
94	Kehalani Boosters	Well/Pump		Dept of Water Supply	MAUI
95	Kehalani Makai Park	Park	Ikena Avenue and Lahainaluna Road	Dept of Parks and Recreation	MAUI
96	Kehalani Mauka Park	Park	Ikena Avenue and Lahainaluna Road	Dept of Parks and Recreation	MAUI
97	Kelawea Mauka Makai Park	Park	Ikena Avenue and Lahainaluna Road	Dept of Parks and Recreation	MAUI
98	Kenolio Recreation Complex	Community Center	131 S. Kihei Rd, Kihei, 96753	Dept of Parks and Recreation	MAUI
99	Keokea Park	Community Center	218 Lower Kula Rd, Kula, 96790	Dept of Parks and Recreation	MAUI
100	Keonekai Park	Park	Keonekai St, Kihei, 96753	Dept of Parks and Recreation	MAUI
101	Keopuolani Regional Park	Park	700 Halia Nakoa St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
102	Keopuolani Skate Park	Park	700 Halia Nakoa St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
103	Kepaniwai Park	Park	870 Iao Valley Road, Wailuku, 97693	Dept of Parks and Recreation	MAUI
104	Kepaniwai Well	Well/Pump		Dept of Water Supply	MAUI
105	Kihei Aquatic Center	Aquatic/Pool	303 E. Lipoa St, Kihei, 96753	Dept of Parks and Recreation	MAUI
106	Kihei Community Center	Community Center	303 E. Lipoa St, Kihei, 96753	Dept of Parks and Recreation	MAUI
107	Kihei Elementary School	School	250 E. Lipoa St, Kihei, 96753	SITE REMOVED	MAUI
108	Kihei Fire Station	Fire Station	11 Waimahaihai St, Kihei, 96753	Maui Fire & Public Safety	MAUI
109	Kihei Police Station	Police Station	2201 Piilani Hwy, Kihei, 96753	Maui Police Department	MAUI
110	Kihei 2 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
111	Kihei 3 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
112	Kihei 4 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
113	Kihei 5 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
114	Kihei 6 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
115	Kihei 7 Wastewater Pumping Station	WWPS	2385 S Kihei Rd, Kihei PS7	Environmental Management	MAUI
116	Kihei 8 Wastewater Pumping Station	WWPS	2995 S Kihei Rd, PS8	Environmental Management	MAUI
117	Kihei 9 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
118	Kihei 10 Wastewater Pumping Station	WWPS	3850 Wailea Alanui, PS10	Environmental Management	MAUI
119	Kihei 16 Wastewater Pumping Station	WWPS	96 Makena Rd, Kihei, PS16	Environmental Management	MAUI
120	Kihei Wastewater Reclamation Facility	WWTP	480 Welakahao St, Kihei, 96753	Environmental Management	MAUI
121	Kilohana Community Center	Community Center	334-A1 Kamehameha V Hwy, Kaunakakais 96757	Dept of Parks and Recreation	MOLOKAI
122	Kilohana Park (Maui)	Park	Kilohana Dr, Kihei, 96753	Dept of Parks and Recreation	MAUI
123	Kilohana Park (Molokai)	Park	334-A1 Kamehameha V Hwy, Kaunakakais 96757	Dept of Parks and Recreation	MOLOKAI
124	Koali Boosters	Well/Pump		Dept of Water Supply	MAUI

No.	Facility Name	Description	Address	Dept	Island
125	Kokua Pool	Aquatic/Pool	275 Uhu St, Kahului, 96732	Dept of Parks and Recreation	MAUI
126	Kuau 1 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
127	Kuau 2 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
128	Kuau 3 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
129	Kuau 4 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
130	Kualapuu Park & Community Center	Community Center	1 Uwao St, Kaulapuu, 96757	Dept of Parks and Recreation	MOLOKAI
131	Kualapuu Well	Well/Pump		Dept of Water Supply	MOLOKAI
132	Kuikahi Pump	Well/Pump		Dept of Water Supply	MAUI
133	Kula Ag Pump A Station	Well/Pump		Dept of Water Supply	MAUI
134	Kula Ag Pump B Station	Well/Pump		Dept of Water Supply	MAUI
135	Kula Ag Pump C Station	Well/Pump		Dept of Water Supply	MAUI
136	Kula Community Center	Community Center	E. Lower Kula Rd, Kula, 96790	Dept of Parks and Recreation	MAUI
137	Kula Fire Station	Fire Station	50 Casala Rd, Kula, 96790	Maui Fire & Public Safety	MAUI
138	Kula Kai Booster	Well/Pump		Dept of Water Supply	MAUI
139	Kula Pump Station	Well/Pump		Dept of Water Supply	MAUI
140	Kula Water Treatment Plant	WTP		Dept of Water Supply	MAUI
141	Kupaa Well	Well/Pump		Dept of Water Supply	MAUI
142	Lahaina Aquatic Center	Aquatic/Pool	245 Shaw St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
143	Lahaina Banyan Court	Park	Front St at Canal St, Lahaina, 96761	Dept of Public Works	MAUI
144	Lahaina Baseyard	Baseyard		Dept of Public Works	MAUI
145	Lahaina Civic Center	Community Center	1840 Honoapiilani Hwy, Lahaina, 96761	Dept of Parks and Recreation	MAUI
146	Lahaina Fire Station	Fire Station	1860 Honoapiilani Hwy, Lahaina, 96761	Maui Fire & Public Safety	MAUI
147	Lahaina Gateway Center	Office Building	335 KEAWE ST, LAHAINA, 96761	SITE REMOVED	MAUI
148	Lahaina Police Station	Police Station	1850 Honoapiilani Hwy, Lahaina, 96761	Maui Police Department	MAUI
149	Lahaina Recreation Center	Park	280 Shaw St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
150	Lahaina 1 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
151	Lahaina 2 Wastewater Pumping Station	WWPS	2010 H'Piilani Hy, Lahaina	Environmental Management	MAUI
152	Lahaina 3 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
153	Lahaina 4 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
154	Lahaina 5 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
155	Lahaina 6 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
156	Lahaina 7 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
157	Lahaina Wastewater Reclamation Facility	WWTP	Lahainaluna Rd, Lahaina, 96761	Environmental Management	MAUI
158	Lahainaluna Water Treatment Plant	WTP		Dept of Water Supply	MAUI

No.	Facility Name	Description	Address	Dept	Island
159	Lanai Community Complex	Community Center	711 S. Fraser Ave, Lanai City, 96763	SITE REMOVED	LANAI
160	Lanai Baseyard	Baseyard		Dept of Public Works	LANAI
161	Lanai Fire Station	Fire Station	1345 Fraser Ave, Lanai City, 96763	Maui Fire & Public Safety	LANAI
162	Lanai Gymnasium	Gymnasium	711 S. Fraser Ave, Lanai City, 96763	Dept of Parks and Recreation	LANAI
163	Lanai Park & Tennis Courts	Park	190 Fifth St, Lanai City, 96763	Dept of Parks and Recreation	LANAI
164	Lanai Police Station	Police Station	855 Fraser Ave, Lanai City, 96763	Maui Police Department	LANAI
165	Lanai Senior Center	Senior Center	309 Seventh St, Lanai City, 96763	Dept of Housing and Human Concerns	LANAI
166	Lanai Wastewater Reclamation Facility	WWTP		Environmental Management	LANAI
167	Launiupoko Beach Park	Park	Mile 18, Kai Heleku at Honoapiilani Hwy, Lahaina, 96761	Dept of Parks and Recreation	MAUI
168	Leaisure Estate Wastewater Pumping Station	WWPS		Environmental Management	MAUI
169	Lower Kula Boosters	Well/Pump		Dept of Water Supply	MAUI
170	Lower Paia Park	Park	19 Hana Hwy, Paia, HI 96779	Dept of Parks and Recreation	MAUI
171	Mahinahina Baseyard	WTP		Dept of Water Supply	MAUI
172	Mahinahina Water Treatment Plant	WTP		Dept of Water Supply	MAUI
173	Makawao Baseyard	Baseyard		Dept of Public Works	MAUI
174	Makawao Fire Station	Fire Station	134 Makawao Ave, Makawao, 96768	Maui Fire & Public Safety	MAUI
175	Makawao Veterans Cemetery	Cemetery	3361 Baldwin Ave, Makawao, 96768	Dept of Public Works	MAUI
176	Malu Ulu Olele Park	Park	558 Front St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
177	Malu Ulu Olele Pump	Well/Pump		Dept of Water Supply	MAUI
178	Maui County Service Center	Office Building	110 Ala'ihi St, Kahalui, 96732	Dept of Public Works	Maui
179	Maui Lani Regional Park	Park	Maui Lani Parkway, Kahului, 96732	Dept of Parks and Recreation	MAUI
180	Maui Lani Well 5	Well/Pump		Dept of Water Supply	MAUI
181	Maui Lani Well 6	Well/Pump		Dept of Water Supply	MAUI
182	Maui Lani Well 7	Well/Pump		Dept of Water Supply	MAUI
183	Maui Mall	Office Building	70 E Kaahumanu Ave, Kahului, 96732	SITE REMOVED	MAUI
184	Maui Meadows Pump	Well/Pump	20°42'19.32"N - 156°26'15.16"W	Dept of Water Supply	MAUI
185	Maunaloa Community Center	Community Center	140 Maunaloa Rd, Maunaloa, 96770	Dept of Parks and Recreation	MOLOKAI
186	Mayor Hannibal Tavares Community Center	Community Center	91 Pukalani St, Pukalani, 96768	Dept of Parks and Recreation	MAUI
187	Mitchel Pauole Community Center	Community Center	90 Ainoa St, Kaunakakai, 96748	Dept of Parks and Recreation	MOLOKAI
188	Mokuhau Park	Park	Corner of Kahawai St & Nenea St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
189	Mokuhau Well	Well/Pump	20°53'17.00"N - 156°30'43.85"W	Dept of Water Supply	MAUI
190	Molokai Baseyard	Baseyard	21°05'28.3"N - 157°01'25.3"W	Dept of Public Works	MOLOKAI
191	Molokai Kuha'o Business Center	Office Building	2 Kamoi St, Suite 600, Kaunakakai, 96748	Dept of Public Works	MOLOKAI
192	Molokai Police Station	Police Station	110 Ainoa St, Kaunakakai, 96748	Maui Police Department	MOLOKAI

No.	Facility Name	Description	Address	Dept	Island
193	Molokai Wastewater Reclamation Facility	WWTP	375 Mauna Loa Hwy, Kaunakakai, HI 96748	Environmental Management	MOLOKAI
194	Nagamatsu Booster Station	Well/Pump		Dept of Water Supply	MAUI
195	Napili 1 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
196	Napili 2 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
197	Napili 3 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
198	Napili 4 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
199	Napili 5 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
200	Napili 6 Wastewater Pumping Station	WWPS		Environmental Management	MAUI
201	Napili Fire Station	Fire Station	4950 Hanawai St, Lahaina, 96761	Maui Fire & Public Safety	MAUI
202	Napili Park	Park	Honoapiilani Hwy at Maiha St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
203	Napili Rd Pump	Well/Pump		Dept of Water Supply	MAUI
204	Napili Water Treatment Plant	WTP		Dept of Water Supply	MAUI
205	Napili Well B	Well/Pump		Dept of Water Supply	MAUI
206	North Waihee Boosters	Well/Pump		Dept of Water Supply	MAUI
207	North Waihee Well	Well/Pump		Dept of Water Supply	MAUI
208	Old Courthouse Building	Office Building	150 S High St, Wailuku, 96793	Dept of Prosecuting Attorney	MAUI
209	Old Lahaina Center	Office Building	845 WAINEE ST, LAHAINA, 96761	SITE REMOVED	Maui
210	Old Lahaina Prison	Park	187 Prison St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
211	Olinda Pump	Well/Pump		Dept of Water Supply	MAUI
212	Olinda Water Treatment Plant	WTP		Dept of Water Supply	MAUI
213	Omaopio Boosters	Well/Pump		Dept of Water Supply	MAUI
214	One Alii Park	Park	Mile 3, Hwy 50, 96748	Dept of Parks and Recreation	MOLOKAI
215	Paia Community Center	Community Center	Hana Highway, Paia, 96779	Dept of Parks and Recreation	MAUI
216	Paia Fire Station	Fire Station	179 Hana Hwy, Paia, 96779	Maui Fire & Public Safety	MAUI
217	Paia Park	Park	640 Baldwin Ave, Paia, HI 96779	Dept of Parks and Recreation	MAUI
218	Paia Wastewater Pumping Station	WWPS		Environmental Management	MAUI
219	Pakele St Wastewater Pumping Station	WWPS		Dept of Public Works	MAUI
220	Papohaku Beach Park	Park	Mile 14.9 Kaluakoi Rd, Maunaloa, 96770	Dept of Parks and Recreation	MOLOKAI
221	Papohaku Park	Community Center/Park	395 Waena St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
222	Papohaku Well	Well/Pump		Dept of Water Supply	MAUI
223	Paukukalo Wastewater Pumping Station	WWPS	608 Kalakaua, Paukukalu PS	Environmental Management	MAUI
224	Paunau Park	Park	Paunau Street, Lahaina, 96761	Dept of Parks and Recreation	MAUI
225	Piiholo Water Treatment Plant	WTP		Dept of Water Supply	MAUI
226	Pi'ikea Park	Park	Liloa Dr, Kihei, 96753	Dept of Parks and Recreation	MAUI

No.	Facility Name	Description	Address	Dept	Island
227	Polehu Pump	Well/Pump		Environmental Management	MAUI
228	Pookela Well	Well/Pump		Dept of Water Supply	MAUI
229	Puamana Park	Park	272 Pualei Dr, Lahaina, 96761	Dept of Parks and Recreation	MAUI
230	Public Works DSA Office Building	Office Building	86 Kamehameha Ave, Kahului, 96732	Dept of Public Works	MAUI
231	Pukoo Fire Station	Fire Station	8735 E. Kamehameha V Hwy, Kaunakakai, 96748	Maui Fire & Public Safety	MOLOKAI
232	Pu'u Hauoli Park	Park	145 Mahalo Place, Kaunakakai, 96748	Dept of Parks and Recreation	MOLOKAI
233	Puuohala Park	Park	Puuohala Rd & Maoi St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
234	Sewer Maintenance Building	Baseyard	58 Hana Hwy, Kahului, 96732	Environmental Management	MAUI
235	Skill Village Pump	Well/Pump	20°54'6.79"N - 156°22'13.56"W	Dept of Water Supply	MAUI
236	South Maui Community Center & Park	Community Center/Park	1501 Liloa Dr, Kihei, 96753	Dept of Parks and Recreation	MAUI
237	Spreckelsville Wastewater Pumping Station	WWPS		Environmental Management	MAUI
238	Ualapue Well	Well/Pump		Dept of Water Supply	MOLOKAI
239	Ukumehame Firing Range	Park	Honoapiilani Hwy, Lahaina, 96761	Dept of Parks and Recreation	MAUI
240	Ulumalu Arena		Lower Ulumalu Road, Haiku, 96877	Dept of Parks and Recreation	MAUI
241	Upper Maui Meadows Pump	Well/Pump	3445 HOOKIPA PL, KIHEI, 96753	Dept of Water Supply	MAUI
242	Wells St Professional Center	Office Building	2145 Wells St, Wailuku, 96793	County Auditor	MAUI
243	Victims Advocate Building	Office Building	2103 Wells St, Wailuku, 96793	Dept of Prosecuting Attorney	MAUI
244	Hawaii Telecom Building	Office Building	60 S Church St, Wailuku, 96793	Dept of Public Works	MAUI
245	Sheraton Wastewater Pumping Station	WWPS		Environmental Management	MAUI
246	Upcountry Pool	Aquatic/Pool	90 Pukalani St, Pukalani, 96768	Dept of Parks and Recreation	MAUI
247	Velma McWayne Santos Community Center	Community Center	395 Waena Pl, Wailuku, 96793	Dept of Parks and Recreation	MAUI
248	Wahikuli Terrace Park	Park	Ainakea Rd at Malanai St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
249	Wahikuli Wayside Park	Park	Kaniau Road & Honoapiilani Highway, Lahaina, 96761	Dept of Parks and Recreation	MAUI
250	Waiakoa Gymnasium	Gymnasium	Lower Kula Rd and Copp Rd, Kula, 96877	Dept of Parks and Recreation	MAUI
251	Waiale Booster Station	Well/Pump		Dept of Water Supply	MAUI
252	Waiehu Kou Wastewater Pumping Station	WWPS		Environmental Management	MAUI
253	Waiale Pump	Well/Pump		Dept of Water Supply	MAUI
254	Wailea Tank Booster	Well/Pump		Dept of Water Supply	MAUI
255	Waiehu Golf Course	Golf course	200 Halewaiu Rd, Waiehu, 96793	Dept of Parks and Recreation	MAUI
256	Waiehu Terrace Park	Park	Makaala St & Alihilani St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
257	Waihee 514,515 Well	Well/Pump		Dept of Water Supply	MAUI
258	Waihee 577,578,579 Well	Well/Pump		Dept of Water Supply	MAUI
259	Waihee Beach Park	Park	Halewaiu Road, Waihee, 96793	Dept of Parks and Recreation	MAUI
260	Waikapu Community Center & Park	Community Center	22 E. Waiko Rd, Waikapu, 96793	Dept of Parks and Recreation	MAUI

No.	Facility Name	Description	Address	Dept	Island
261	Waikapu Well	Well/Pump		Dept of Water Supply	MAUI
262	Wakiu Well B	Well/Pump		Dept of Water Supply	MAUI
263	Wakiu Well C	Well/Pump		Dept of Water Supply	MAUI
264	Waikuli Terrace Park	Park	Ainakea Rd at Malanai St, Lahaina, 96761	Dept of Parks and Recreation	MAUI
265	Wailea Beach Park	Park	Between Grand Wailea and the Four Seasons Hotel, Kihei, 96753	Dept of Parks and Recreation	MAUI
266	Wailea Fire Station	Fire Station	300 Kilohana Dr, Kihei, 96753	Maui Fire & Public Safety	MAUI
267	Wailuku Baseyard	Baseyard	1827 Kaohu St, Wailuku, 96793	Dept of Public Works	MAUI
268	Wailuku Country Estates Booster 2	Well/Pump		Dept of Water Supply	MAUI
269	Wailuku Country Estates Booster 3	Well/Pump		Dept of Water Supply	MAUI
270	Wailuku Elementary School Park	Park	355 S. High St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
271	Wailuku Fire Station	Fire Station	21 Kinipopo St, Wailuki, 96793	Maui Fire & Public Safety	MAUI
272	Wailuku Police Station	Police Station	55 Mahalani St, Wailuku, 96793	Maui Police Department	MAUI
273	Wailuku Pool	Aquatic/Pool	2026 Pakahi St, Wailuku, 96793	Dept of Parks and Recreation	MAUI
274	Wailuku Well 1	Well/Pump		Dept of Water Supply	MAUI
275	Wailuku Well 2	Well/Pump		Dept of Water Supply	MAUI
276	Waiolani Mauka Park	Park	Waiolani Mauka Park/Moolu St, Waikapu, 96793	Dept of Parks and Recreation	MAUI
277	Waipuilani Park	Park	Waipuilani Rd, Kihei, 96793	Dept of Parks and Recreation	MAUI
278	Waipuka Well	Well/Pump	20°53'9.34"N - 156°39'37.37"W	Dept of Water Supply	MAUI
279	Wakea Wastewater Pumping Station	WWPS		Environmental Management	MAUI
280	War Memorial Complex	Park	700 Halia Nakoa St, Wailuku, 97693	Dept of Parks and Recreation	MAUI
281	Wells Park	Park	Well St and South Market St, Wailuku, 97693	Dept of Parks and Recreation	MAUI
282	West Maui Senior Center	Office Building	778 Pauoa Pl, Lahaina, 96761	Dept of Housing and Human Concerns	MAUI
283	Streetlights	Streetlights	Multiple locations	Dept of Public Works	LANAI
284	Tanks	Tanks	Multiple locations	Dept of Water Supply	MAUI
285	Traffic Signals	Traffic Signals	Multiple locations	Dept of Public Works	MAUI
286	Sirens	Sirens	Multiple locations	Civil Defense Agency	MAUI
287	Radio Sites	Radio	Multiple locations	Maui Police Department	MAUI
288	Ulapalakua Radio Site	Radio		Maui Police Department	MAUI
289	Kahakuloa Radio Site	Radio		Maui Police Department	MAUI

Facility Improvement Measures (FIM) Matrix

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
County Auditor	Wells St Professional Center											
SITE REMOVED	David Trask Office Building											
	Lahaina Gateway Center											
	Maui Mall											
	Old Lahaina Center											
Dept of Housing and Human Concerns	West Maui Senior Center	x	x			x				x		
	Hale Mahaulu Ewalu Senior Housing											
	Huliau Housing											
	Kaunoa Senior Services	x	x			x				x		
	Lanai Senior Center					x						
Dept of Parks and Recreation	4th Marine Division Memorial Park					x						
	Alfred "Flako" Boteilho Gymnasium	x	x									
	Central Maui Regional Sports Complex	x				x						
	Charley Young Park						x					
	Coach Sakamoto Pool	x	x			x			x			
	Coach Shiraishi Memorial Pool	x	x			x			x			
	Cooke Memorial Pool		x			x			x			
	D.T. Fleming Park					x	x					
	Duke Maliu Regional Park	x	x			x						
	Eddie Tam Memorial Center	x	x	x		x				x		
	H.A. Baldwin Park	x	x			x	x					
	Haiku Community Center			x		x						
	Haliimaile Park & Tennis		x			x						
	Hana Bay Beach Park						x					
	Hanakao'o Park	x	x			x	x					
	Haycraft Park						x					
	Helene Hall											
	Honokowai Beach Park					x	x					
	Honolii Park											

Johnson Controls

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
	Ho'okipa Beach Park	x	x			x	x					
	Kahului Community Center	x	x			x				x		
	Kahului Community Center Park					x						
	Kahului Park											
	Kahului Park Irrigation Well											
	Kalama Irrigation Pumps											
	Kalama Park	x	x			x	x					
	Kalama Skate Park											
	Kamaole I Beach Park	x	x			x	x					
	Kamaole II Beach Park	x	x			x	x					
	Kamaole III Beach Park	x	x			x	x					
	Kamehameha Iki Park						x					
	Kanaha Beach Park	x	x			x	x					
	Kaunakakai Ball Park	x	x			x		x				
	Kaunakakai Tennis Courts											
	KCC Irrigation Well											
	Keanae Park											
	Kehalani Makai Park											
	Kehalani Mauka Park					x		x				
	Kelawea Mauka Makai Park							x				
	Kenolio Recreation Complex	x	x			x						
	Keokea Park	x				x						
	Keonekai Park											
	Keopuolani Regional Park	x	x			x						
	Keopuolani Skate Park					x						
	Kepaniwai Park					x						
	Kihei Aquatic Center	x	x			x	x		x	x		
	Kihei Community Center	x	x							x	x	
	Kilohana Community Center	x	x			x						
	Kilohana Park (Maui)											
	Kilohana Park (Molokai)											
	Kokua Pool	x	x			x			x	x		

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
	Kualapuu Park & Community Center	x				x						
	Kula Community Center	x	x			x						
	Lahaina Aquatic Center	x	x			x			x			
	Lahaina Civic Center	x	x			x				x		
	Lahaina Recreation Center	x	x			x						
	Lanai Gymnasium											
	Lanai Park & Tennis Courts	x	x									
	Launiupoko Beach Park	x				x	x					
	Lower Paia Park											
	Malu Ulu Olele Park		x			x						
	Maui Lani Regional Park					x						
	Maunaloa Community Center					x						
	Mayor Hannibal Tavares Community Center	x	x	x		x				x		
	Mitchel Pauole Community Center	x	x							x		
	Mokuhau Park					x						
	Napili Park	x	x			x						
	Old Lahaina Prison					x						
	One Alii Park					x						
	Paia Community Center					x						
	Paia Park											
	Papohaku Beach Park					x	x	x				
	Papohaku Park	x	x									
	Paunau Park											
	Pi'ikea Park											
	Puamana Park											
	Pu'u Hauoli Park											
	Puuohala Park											
	South Maui Community Center & Park	x	x			x				x		
	Ukumehame Firing Range	x	x									
	Ulumalu Arena											
	Upcountry Pool	x	x			x			x			

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
	Velma McWayne Santos Community Center	x				x						
	Wahikuli Terrace Park											
	Wahikuli Wayside Park					x	x					
	Waiakoa Gymnasium	x	x			x						
	Waiehu Golf Course	x				x				x		
	Waiehu Terrace Park	x	x			x						
	Waihee Beach Park					x						
	Waikapu Community Center & Park					x						
	Waikuli Terrace Park											
	Wailea Beach Park		x			x	x	x				
	Wailuku Elementary School Park					x						
	Wailuku Pool	x	x			x			x			
	Waiolani Mauka Park											
	Waipuilani Park					x						
	War Memorial Complex	x	x		x							
	Wells Park	x	x			x						
Dept of Prosecuting Attorney	Old Courthouse Building	x	x	x		x				x		
	Victims Advocates Building					x				x		
Dept of Public Works	66 Market St. Restroom					x						
	Daycare											
	State Run Old Courthouse											
	Hana Community Center & Ball Park	x	x									
	Kalana O Maui Building	x	x	x	x	x				x		x
	Kalana Pakui	x	x	x		x				x		
	Lahaina Banyan Court					x						
	Lahaina Baseyard											
	Lanai Baseyard									x	x	
	Makawao Baseyard									x		
	Makawao Veterans Cemetery	x	x									
	Maui County Service Center											
	Molokai Baseyard					x				x		
	Molokai Kuha'o Business Center									x	x	

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
	Wailuku Baseyard	x	x			x						
	Pakele St Wastewater Pumping Station											
	Public Works DSA Office Building											
	Hawaii Telecom Building											
Dept of Water Supply	Brooks Booster											
	Central Wailuku Heights Pump											
	Civic Center Boosters											
	Country Club Pump											
	Credit Union Building											
	Diamond Resort Boosters	x	x									
	Field Operations Lahaina Baseyard											
	Haiku Well											
	Haleakala Acres Pumps											
	Haleakala Hwy Pump											
	Haliimaile Well											
	Hamakuapoko Well 1											
	Hamakuapoko Well 2	x	x									
	Hamoa Pump											
	Harry Fields Booster Station											
	Honokowai Booster Pump	x										
	Honukahu Well											
	Iao Water Treatment Plant									x		
	Iao Well	x	x									
	Kaenae Well											
	Kahala Well											
	Kahului Baseyard	x	x		x					x		
	Kalae Booster											
	Kalae Well											
	Kamiloa Booster											
	Kamole Water Treatment Plant	x	x									
	Kanaha Well											
	Kanoa Well 1	x	x									

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
	Kanoa Well 2	x	x									
	Kaupakalua Well	x	x									
	Kawela Pump											
	Kehalani Boosters	x	x									
	Kepaniwai Well											
	Koali Boosters											
	Kualapuu Well											
	Kuikahi Pump											
	Kula Ag Pump A Station											
	Kula Ag Pump B Station											
	Kula Ag Pump C Station											
	Kula Kai Booster											
	Kula Pump Station											
	Kula Water Treatment Plant	x	x									
	Kupaa Well	x	x									
	Lahainaluna Water Treatment Plant	x	x		x					x		
	Lower Kula Boosters	x	x									
	Mahinahina Baseyard	x	x									
	Mahinahina Water Treatment Plant				x					x		
	Malu Ulu Olele Pump											
	Maui Lani Well 5											
	Maui Lani Well 6											
	Maui Lani Well 7											
	Maui Meadows Pump	x	x									
	Mokuhau Well	x	x									
	Nagamatsu Booster Station											
	Napili Road Pump		x									
	Napili Water Treatment Plant											
	Napili Well B	x	x									
	North Waihee Boosters	x	x									
	North Waihee Well	x	x									

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
	Olinda Pump											
	Olinda Water Treatment Plant	x	x		x					x		
	Omaopio Boosters	x										
	Papohaku Well											
	Piiholo Water Treatment Plant				x					x		
	Pookela Well	x	x									
	Skill Village Pump											
	Ualapue Well											
	Upper Maui Meadows Pump											
	Waiale Booster Station											
	Waiale Pump											
	Waialea Tank Booster											
	Waihee 514,515 Well		x									
	Waihee 577,578,579 Well	x	x									
	Waikapu Well	x	x									
	Wakiu Well B											
	Wakiu Well C											
	Wailuku Country Estates Booster 2											
	Wailuku Country Estates Booster 3											
	Wailuku Well 1	x										
	Wailuku Well 2	x										
	Waipuka Well											
Environmental Management	Central Landfill									x		
	Eluene Pl Wastewater Pumping Station											
	Hana Landfill											
	Hyatt Wastewater Pumping Station											
	Kaa Wastewater Pumping Station											
	Kaanapali Wastewater Pumping Station											
	Kahului Wastewater Pumping Station				x							
	Kahului Wastewater Reclamation Facility	x	x		x	x				x		
	Kaunakakai Wastewater Pumping Station											

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
Environmental Management	Kihei 2 Wastewater Pumping Station											
	Kihei 3 Wastewater Pumping Station											
	Kihei 4 Wastewater Pumping Station											
	Kihei 5 Wastewater Pumping Station											
	Kihei 6 Wastewater Pumping Station											
	Kihei 7 Wastewater Pumping Station											
	Kihei 8 Wastewater Pumping Station											
	Kihei 9 Wastewater Pumping Station											
	Kihei 10 Wastewater Pumping Station											
	Kihei 16 Wastewater Pumping Station											
	Kihei Wastewater Reclamation Facility	x	x		x	x						
	Kuau 1 Wastewater Pumping Station											
	Kuau 2 Wastewater Pumping Station											
	Kuau 3 Wastewater Pumping Station											
	Kuau 4 Wastewater Pumping Station											
	Lahaina 1 Wastewater Pumping Station				x							
	Lahaina 2 Wastewater Pumping Station											
	Lahaina 3 Wastewater Pumping Station											
	Lahaina 4 Wastewater Pumping Station											
	Lahaina 5 Wastewater Pumping Station											
	Lahaina 6 Wastewater Pumping Station											
	Lahaina 7 Wastewater Pumping Station											
	Lahaina Wastewater Reclamation Facility	x	x		x	x				x		
	Lanai Wastewater Reclamation Facility									x		
	Leaisure Estate Wastewater Pumping Station											
	Molokai Wastewater Reclamation Facility											
	Napili 1 Wastewater Pumping Station											
	Napili 2 Wastewater Pumping Station											
	Napili 3 Wastewater Pumping Station											

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
Environmental Management	Napili 4 Wastewater Pumping Station											
	Napili 5 Wastewater Pumping Station											
	Napili 6 Wastewater Pumping Station											
	Paia Wastewater Pumping Station											
	Paukukalo Wastewater Pumping Station											
	Polehu Pump											
	Sewer Maintenance Building	x	x							x		
	Spreckelsville Wastewater Pumping Station											
	Sheraton Wastewater Pumping Station											
	Waiehu Kou Wastewater Pumping Station											
	Wakea Wastewater Pumping Station											
Maui Fire & Public Safety	Fire Prevention Bureau	x	x	x		x				x		
	Hana Fire Station	x	x			x				x		
	Hoolehua Fire Station	x	x							x		
	Kahului Fire Station	x	x			x				x		
	Kaunakakai Fire Station	x	x			x				x		
	Kihei Fire Station	x	x			x				x		
	Kula Fire Station	x	x			x				x	x	
	Lahaina Fire Station	x	x			x				x		
	Lanai Fire Station	x	x			x				x		
	Makawao Fire Station	x	x			x				x		
	Napili Fire Station	x	x			x				x		
	Paia Fire Station	x	x			x				x	x	
	Pukoo Fire Station											
	Wailea Fire Station	x	x			x				x		
	Wailuku Fire Station	x	x									
Maui Police Department	Forensic Facility	x	x			x				x		
	Hana Police Station	x	x			x				x		
	Kihei Police Station	x	x		x	x				x		

Johnson Controls

Department	Facility Name	FIM 1- Interior Lighting Retrofits	FIM 2 -Exterior Lighting Retrofits	FIM 3- Plug Load Controls	FIM 4- Transformers	FIM 5 - Domestic Water Fixture Retrofits	FIM 6 - Shower Tower Retrofits	FIM 7 -Irrigation Wells	FIM 8 - On-Site Sodium Hypochlorite Generation and Smart Pool Pump Controls	FIM 9- Infiltration Reduction	FIM 10 -Window Film	FIM 11 - EV and EV Charging Station(s)
Maui Police Depatment	Lahaina Police Station	x	x			x				x		
	Lanai Police Station	x	x			x				x		
	Molokai Police Station											
	Wailuku Police Station	x	x		x	x				x		
	Ulapalakua Radio Site	x	x									
	Kahakuloa Radio Site	x										

FIM 1 – Interior LED Lighting Retrofits

Existing Conditions

The existing lighting system across the City and County buildings consists of a wide variety of lighting technologies.

The following is a general overview of the most common lighting found within each building grouping. The complete lighting audit showing the exact existing quantities and types and the proposed improvements are found in Appendix 1.

Alfred "Flako" Boteilho Gymnasium

Interior – No existing fixtures are LED. Major fixture type is the 400-watt Metal Halide High Bay fixtures in the multi-purpose room. The other fixture type is the 4' fluorescent fixtures with 34-watt T12 lamps and magnetic ballasts.

Central Maui Regional Sports Complex

Interior – Of the existing fixtures 10% are already LED and will not be retrofit. Most of the interior fixtures are 4' vapor tight fluorescent fixtures with 32-watt T8 lamps and electronic ballasts.

Coach Sakamoto Pool

Interior – Of the existing fixtures 12% are already LED, however all will be retrofit to fit design strategy. Most of the interior fixtures are 4' vapor tight fluorescent fixtures with 32-watt T8 lamps and electronic ballasts and 34-watt T12 lamps and magnetic ballasts.

Coach Shiraishi Memorial Pool

Interior – No existing fixtures are LED. Most of the interior fixtures are screw-in incandescent or compact fluorescent lamps. A few 4' fluorescent fixtures with 32-watt T8 lamps and electronic ballasts and 34-watt T12 lamps and magnetic ballasts.

Cooke Memorial Pool

Interior – No Interior fixtures.

Diamond Resort Boosters

Interior – No existing fixtures are LED. Interior lighting consists of one Electrical Room with a limited number of 4' fluorescent fixtures with 34-watt T12 lamps and magnetic ballasts.

Duke Maliu Regional Park

Interior – No existing fixtures are LED. Most of the interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps and electronic ballasts and 34-watt T12 lamps and magnetic ballasts.

Eddie Tam Memorial Center

Interior – No existing fixtures are LED. Most of the interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps and electronic ballasts and 34-watt T12 lamps and magnetic ballasts. The Gym has existing 54-watt T5HO lamps and electronic ballasts. The balance of the fixtures have incandescent, halogen and high-pressure sodium fixtures.

Fire Prevention Bureau

Interior – Of the existing fixtures 33% are already LED and will not be retrofit. Most of the interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps and 28-watt T8 lamps with electronic ballasts. The 2' vanity fixtures have 14-watt T5 lamps and electronic ballasts. The balance of the fixtures have incandescent lamps.

Forensic Facility

Interior – Of the existing fixtures 10% are already LED, however only 2% will not be retrofit, the remaining 8% existing LED will be retrofit to fit design strategy. Most of the interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts. Also, the 2' vanity fixtures have 14-watt T5 lamps and electronic ballasts. The balance of the fixtures have incandescent lamps.

H.A. Baldwin Park

Interior – No existing fixtures are LED. Most of the interior fixtures are canopy fixtures with 42-watt compact fluorescent 4-pin lamps. Also, there are some 4' fluorescent fixtures with 34-watt T12 lamps and magnetic ballasts.

Haliimaile Park & Tennis

Interior – No existing fixtures are LED. The electrical room interior fixtures are 4' fluorescent fixtures with 34-watt T12 lamps and magnetic ballasts.

Hana Community Center and Ball Park

Interior – No existing fixtures are LED. The majority are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also, a small quantity of canopy fixtures contain 70-watt high pressure sodium lamps.

Hana Fire Station

Interior – Of the existing fixtures 27% are already LED, however only 8% will not be retrofit, the remaining 19% existing LED will be retrofit to fit design strategy. Most of the interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts. Also, the garage has 8' fluorescent fixtures with 59-watt T8 lamps and electronic ballasts. Also, a small quantity of 2' fluorescent fixtures with 17-watt T8 lamps and electronic ballasts.

Hana Police Station

Interior – No existing fixtures are LED. Most of the interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts. Also, a small quantity of fixtures have incandescent lamps.

Hanakao's Park

Interior – No existing fixtures are LED. The interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts in restrooms and storage.

Honokowai Booster Pump

Interior – No existing fixtures are LED. The interior fixtures are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts in the electrical room.

Ho'okipa Beach Park

Interior – Of the interior fixtures, 22% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and wall packs with 70-watt high pressure sodium lamps.

Iao Well

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kahakuloa Radio Site

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kahului Baseyard

Interior – Several Buildings. Of the existing fixtures 64% are already LED, however only 38% will not be retrofit, the remaining 26% existing LED will be retrofit to fit design strategy. Additionally, there are 4' wrap and 4’ strip fixtures with a mixture of 28-Watt T8, 32-watt T8 and 60-watt T12 lamps, and electronic ballast and magnetic ballasts.

Kahalui Community Center

Interior – Of the existing fixtures 5% are already LED, however only 3% will not be retrofit, the remaining 2% existing LED will be retrofit to fit design strategy. A mix of 4’ wrap fixtures, 4’ vapor proof fixtures and 8’ strip fixtures with fluorescent 28-watt T8, 32-watt T8, 34-watt T12 and 60-watt T12 lamps and electronic ballast/magnetic ballasts. Also, there are some 2x4 recessed troffer fixtures with 28-watt T8 lamps and electronic ballast.

Kahului Fire Station

Interior – Of the existing fixtures 11% are already LED, however only 5% will not be retrofit (mostly 2x4 LED Fixtures), the remaining 6% existing LED will be retrofit to fit design strategy. The main fixtures are 2x4, 2x2 and 1x4 recessed fixtures with some existing LED, 17-watt T8, 28-watt T8 and 32-watt T8 lamps and electronic ballasts. A mix of 4’ wrap fixtures, 4’ strip fixtures, 4’ & 8” vapor proof fixtures with existing TLED, 25-watt T8, 28-watt T8 and 32-watt lamps and electronic ballasts. Majority of bulbs are 4100K, however, some areas have 6500K. Few areas have a 2X4 acrylic LED panel. Warehouse building has High Bay fixtures, 4 lamps 32-watt T8 lamps and ballast, in addition to 6” recessed cans with 13-watt compact fluorescent 2-pin.

Kahului Wastewater Reclamation Facility

Interior – Of the existing fixtures 47% are already LED, however only 15% will not be retrofit, the remaining 32% existing LED will be retrofit to fit design strategy. Most of the interior fixtures are 4’ fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts. The garage has 8’ fluorescent fixtures with 59-watt T8 lamps and electronic ballasts. The Blower Room has high bay fixtures with eight (8) 42-watt compact fluorescent 4-pin lamps. Also, there are incandescent lamps.

Kalama Park

Interior – No existing fixtures are LED. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kalana O Maui Building

Interior – Of the existing fixtures 37% are already LED, however only 6% will not be retrofit, the remaining 31% existing LED will be retrofit to fit design strategy. Most of the interior fixtures are 2x4, 1x4 and 4’ fluorescent fixtures with 32-watt T8 lamps, 28-watt T8 lamps and 28-watt T5 lamps with electronic ballasts. The 2x2 and 2’ fluorescent fixtures have 17-watt T8 lamps, 32-watt T8 U-tube lamps, 55-watt biax lamps and 21-watt T5 lamps with electronic ballasts. Also, there are incandescent and compact fluorescent screw in lamps.

Kalana Pakui

Interior – Of the existing fixtures 28% are already LED, however only 3% will not be retrofit, the remaining 25% existing LED will be retrofit to fit design strategy. Most of the interior fixtures are 2x4, 1x4 and 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also, there are incandescent and compact fluorescent screw in lamps.

Kamaole I Beach Park

Interior – No existing fixtures are LED. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kamaole II Beach Park

Interior – No existing fixtures are LED. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kamaole III Beach Park

Interior – Of the interior fixtures, 66% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kamole Water Treatment Plant

Interior – Of the interior fixtures, 15% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also, there are 90-watt halogen lamps.

Kanaha Beach Park

Interior – Of the existing fixtures 61% are already LED, however only 38% will not be retrofit, the remaining 23% existing LED will be retrofit to fit design strategy. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. There are 8' fluorescent fixtures with 32-watt T8 lamps and 60-watt T8 lamps with electronic ballasts.

Kanoa Well I

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kanoa Well II

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kaunakakai Ball Park

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 34-watt T12 lamps with magnetic ballasts.

Kaunakakai Fire Station

Interior – Of the interior fixtures, 5% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes.

Kaunoa Senor Services – Paia

Interior – Several Buildings. Of the existing fixtures 25% are already LED, however only 7% will not be Retrofit, the remaining 18% existing LED will be retrofit to fit design strategy. Major fixture type is 4' & 8' fluorescent fixtures with 25-watt, and 32-watt T8 lamps and electronic ballast. Of these, the majority are wrap fixtures in the classrooms, offices, and kitchen areas. Another predominant type is the 2x4, 2x2, 1X4 and 4x4 recessed fixtures. Existing recessed fixtures with 25-watt T8 lamps and electronic ballast and the 2x4 fixtures in the Wellness/Activity center have four (4) 25-watt T8 lamps and electronic ballast. Existing 2x2 recessed fixtures have 15-watt TLED existing tubes.

Kaupakalua Well

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kehalani Boosters

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kenolio Recreation Complex

Interior – Of the existing fixtures 6% are already LED. The major fixture type is 1x4 surface mounted wrap fixtures with 28-watt T8 lamps and electronic ballast.

Keokea Park

Interior – Of the interior fixtures, 66% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Keopuolani Regional Park

Interior – Of the interior fixtures, 27% are already LED and will not be retrofit. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Kihei Aquatic Center

Interior – No existing fixtures are LED. A mix of 2x4 recessed fixtures, 4’ vapor proof fixtures and 4’ industrials fixtures all with 28-Watt T8, 32-watt T8 and 34-T12 lamps and electronic ballasts.

Kihei Community Center

Interior – Of the existing fixtures 5% are already LED, however only 2% will not be retrofit, the remaining 3% existing LED will be retrofit to fit design strategy. Major fixture type is 2x4, 1x4 and 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballast and LED tubes. Also fixtures with incandescent and 26-watt compact fluorescent 2-pin lamps.

Kihei Fire Station

Interior – No existing fixtures are LED. 1x4 recessed fixtures, 4’ wrap, vapor proof and industrial fixtures; 8’ industrial and strip fixtures with 28-watt T8 and 32-watt T8 lamps and electronic ballast. Many are rusted and missing several lenses. The apparatus room has 4’ and 8’ industrial fixture with 32-watt T8 lamps and electronic ballast fixtures and many are rusted due to corrosive ocean-air conditions.

Kihea Police Station

Interior – Of the existing fixtures 2% are already LED, all exit signs. The main fixtures are 2x4, 2x2 and 1x4 recessed fixtures with 28-watt T8 and 32-watt T8 lamps and electronic ballasts. A mix of 4’ and 8’wrap fixtures, strip fixtures, vapor tight fixtures with 28-watt T8 lamps and electronic ballasts. Fixtures are mostly in good condition.

Kihei Wastewater Reclamation Facility

Interior – Of the existing fixtures 40% are already LED, however only 39% will not be retrofit, the remaining 1% existing LED will be retrofit to fit design strategy. Existing LED is a mix of 2x4, 4’, 8’, and high bay fixtures already LED. Existing are mostly 2x4, 2x2 and 1x4 recessed fixtures with 28-watt T8, 32-watt T8, and 34-watt T12 lamps and electronic ballast/magnetic ballasts. Also, a mix of 4’ wrap fixtures, 4’ vapor proof fixtures and 4’ strip fixtures with 28-watt T8, 32-watt T8, 34-watt T12 and 60-watt T12 lamps and electronic ballast/magnetic ballasts. Another existing condition is the 6” recessed can with 65-watt incandescent lamps.

Kilohana Community Center

Interior – Of the interior fixtures, 21% are already LED and all will be retrofit to fit design strategy. There are 4’ fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts. Also, there are 100-watt incandescent and 13-watt compact fluorescent lamps.

Kilohana Park (Molokai)

Interior – No scope of work here.

Kokua Pool

Interior – No existing fixtures are LED. A mix of 4’ wrap fixtures, 4’ vapor proof fixtures and 4’ strip fixtures with fluorescent 28-watt T8, 32-watt T8, and 34-watt T12 lamps and electronic ballast/magnetic ballasts.

Kualapuu Park & Community Center

Interior – Of the existing fixtures 22% are already LED, however only 15% will not be retrofit, the remaining 7% existing LED will be retrofit to fit design strategy. There are 4’ fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts, and LED tubes. The multi-purpose room has existing 250-watt metal halide high bay fixtures. Also, there are two (2) 26-watt compact fluorescent 4-pin lamps in recessed fixtures.

Kula Community Center

Interior – Of the existing fixtures, 8% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. The multi-purpose room has existing 2x2 32-watt T8 U-tube lamps with electronic ballasts. Also, there are 65-watt incandescent lamps and 100-watt halogen lamps in the facility.

Kula Fire Station

Interior – No existing fixtures are LED. A mix of 2x4 and 1x4 recessed fixtures, 4' wrap fixtures and 4' industrials fixtures all with 28-Watt T8 and 32-watt lamps and electronic ballast.

Kula Pump Station

Interior – Of the interior fixtures, 100% are already LED and will not be retrofit.

Kula Water Treatment Plant

Interior – No existing fixtures are LED. However, the explosion proof fixtures in the chemical storage rooms are a No Retrofit. A mix of 4' wrap fixtures, 4' vapor proof fixtures and 4' strip fixtures with fluorescent 32-watt T8, and 34-watt T12 lamps and electronic ballast/magnetic ballasts. Additionally, there are 8' fluorescent fixtures with 60-watt T8 lamps and electronic ballasts.

Kupaa Well

Interior – No existing fixtures are LED. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Lahaina Aquatic Center

Interior – Of the existing fixtures 30% are already LED, mostly 6' recessed cans. 1x4 recessed fixtures, 4' wrap, and 4' & 8' strip fixtures with 28-watt T8, 34-watt T12, 59-watt T8 and 75-watt T12 lamps and electronic ballasts and magnetic ballasts. Several 4' wrap fixtures are missing lens, but the fixtures are in good condition. Additionally, there are canopy fixtures with 70-watt high pressure sodium lamps in the locker rooms. The existing fixtures are in mostly good condition.

Lahaina Civic Center

Interior – Of the existing fixtures 20% are already LED, however only 17% will not be retrofit, the remaining 3% existing LED will be retrofit to fit design strategy. Major fixture type is 4' & 8' fluorescent fixtures with 25-watt T8, 34-watt T12 and 75-Watt T12 lamps and electronic ballast. Most of the fixtures are strip, wrap and vapor proof fixtures in the offices, lockers, and mechanical areas. Second large count is the 2x4 recessed fixtures, mostly in the Social Hall. Existing 2x4 recessed fixtures with 28-watt T8 and 34-watt T12 lamps and electronic ballast. Additionally, there are 400-wat Metal Halide High Bay fixtures in the gymnasium.

Lahaina Fire Station

Interior – Of the existing fixtures 38% are already LED in 4' vapor tight and recessed can fixtures. A mix of 4' wrap fixtures, 4' vapor proof fixtures and 4' strip fixtures with fluorescent 28-watt T8 lamps and electronic ballasts. Also, there are 2x4 and 2x2 recessed fixtures with 28-watt T8 and 32-watt T8 lamps and electronic ballasts. Fixtures in restroom locker room are rusted and missing 1 lens. Other fixtures are in mostly good condition.

Lahaina Police Station

Interior – Of the existing fixtures 35% are already LED, however only 13% will not be retrofit (mostly LED exit signs), the remaining 22% existing LED will be retrofit to fit design strategy. The main fixtures are 2x4, 2x2 and 1x4 recessed fixtures with some existing LED, 40-watt biax lamps, 28-watt T8 and 32-watt T8 lamps and electronic ballasts. A mix of 4' wrap fixtures and 4' strip fixtures with fluorescent existing LED and 28-watt T8 lamps and electronic ballasts. The fixtures are in mostly good condition.

Lahaina Recreation Center

Interior – Of the existing fixtures 5% are already LED, exit signs only. Mostly 1x4, 2x4 recessed and 4' vapor proof fixtures with 28-Watt T8 lamps and electronic ballast. Fixtures in good condition.

Lahaina Wastewater Reclamation Facility

Interior – Of the existing fixtures, 66% are already LED, however 43% will not be retrofit, the remaining 23% existing LED will be retrofit to fit design strategy. Major fixture type is 4' & 8' fluorescent fixtures with 28-watt T8, 34-watt T12 and 75-Watt T12 lamps and electronic ballast. Many of the fixtures are strip, wrap and vapor proof fixtures in the offices, lockers, and mechanical areas. Second large count is the 2x4 recessed fixtures, mostly in the Social Hall. Existing 2x4 recessed fixtures with 28-watt T8 and 34-watt T12 lamps and electronic ballast. Additionally, there are 400-watt metal halide high bay fixtures in the gymnasium.

Lahainaluna Water Treatment Plant

Interior – Of the existing fixtures, 63% are LED already and will not be retrofit. Major fixture type is 4' fluorescent fixtures with 28-watt T8, 32-watt T8, and 34-watt T12 lamps with electronic ballast and magnetic ballasts. Additionally, there are LED high bay fixtures in the facility.

Lanai Fire Station

Interior – No existing fixtures are LED. Mostly 4' and 8' industrial and wrap fixtures with 32-watt T8, and 34-watt T12 lamps with electronic ballast and magnetic ballasts. Also, there are 13-watt compact fluorescent screw in lamps.

Lanai Park & Tennis Courts

Interior – Of the existing fixtures, 38% are already LED, however 19% will not be retrofit, the remaining 19% existing LED will be retrofit to fit design strategy. There are existing 2x4 and 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. The gym has existing LED fixtures. The balance of the miscellaneous fixtures are 20-watt and 13-watt compact fluorescent screw in lamps.

Lanai Police Station

Interior – Of the existing fixtures 3% are already LED and will not be retrofit (exit signs). There are existing 2x4, 1x4 and 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. The balance is fixtures with 26-watt compact fluorescent 4-pin lamps.

Launiupoko Beach Park

Interior – No existing fixtures are LED. Existing are 4' vapor proof fixtures with 32-watt T8 lamps and electronic ballast.

Lower Kula Boosters

Interior – No existing fixtures are LED. Existing are 4' vapor proof fixtures with 32-watt T8 lamps and electronic ballast.

Mahinahina Baseyard

Interior – Of the existing fixtures, 17% are already LED, however 16% will not be retrofit, the remaining 1% existing LED will be retrofit to fit design strategy. There are existing 2x4 and 4' vapor tight fluorescent fixtures with 34-watt T12 lamps with magnetic ballasts and LED tubes. There are existing 2x2 fluorescent fixtures with 32-watt T8 u-tube lamps and electronic ballasts.

Makawao Fire Station

Interior – No existing fixtures are LED. Mostly 4' wrap fixtures and 4' vapor proof fixtures with 28-Watt T8 and 32-watt T8 lamps and electronic ballast.

Makawao Veterans Cemetery

Interior – Of the existing fixtures, 27% are already LED and will not be retrofit. There are existing 2x4 and 4' vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. There are also 60-watt incandescent lamps and 13-watt compact fluorescent 2-pin lamps.

Malu Ulu Olele Park

Interior – No interior fixtures here.

Maui Meadows Pump

Interior – No existing fixtures are LED. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Mayor Hannibal Tavares Community Center

Interior – Of the existing fixtures, 47% are already LED. There are 2x4 recessed fixtures with 28-watt T8 lamps and electronic ballast. Also, there are 4’ strip, wrap and vapor proof fixtures with 28-Watt T8 and 34-watt T12 lamps and electronic ballasts or magnetic ballasts.

Mitchell Pauole Community Center

Interior – Of the existing fixtures, 75% are already LED, however 22% will not be retrofit, the remaining 53% existing LED will be retrofit to fit design strategy. There are existing 4’ and 8’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. There are also 60-watt incandescent and 13-watt compact fluorescent screw in lamps.

Mokuhau Well

Interior – Of the existing fixtures, 53% are already LED and will not be retrofit. There are existing 4’ and 8’ fluorescent fixtures with 32-watt T8 and 34-watt T12 lamps with electronic ballasts and magnetic ballasts. There are also 60-watt T12 lamps with magnetic ballasts.

Napili Fire Station

Interior – Of the existing fixtures 2% are already LED and will not be retrofit. The major fixture type is 1x4 surface mounted wrap fixtures with 28-watt T8 lamps and electronic ballast. The locker rooms and restroom wrap fixtures are rusted. The other fixture type is the 1x4 vapor proof fixtures in the Truck Bay with 28-watt T8 lamps and electronic ballast. Also, there are 1x4 strip fixtures with 17-watt T8, 25-watt T8, 28-watt T8, and 32-watt T8 lamps and electronic ballast.

Napili Park

Interior – No existing fixtures are LED. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Napili Rd Pump

Interior – No existing fixtures are LED. There are 8’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Napili Well B

Interior – No existing fixtures are LED. There are 4’ and 8’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

North Wailee Boosters

Interior – No existing fixtures are LED. There are 4’ wrap fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

North Wailee Well

Interior – No existing fixtures are LED. There are 2x4 and 4’ wrap fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Old Courthouse Building

Interior – Of the existing fixtures, 28% are already LED, however 26% will not be retrofit, the remaining 2% existing LED will be retrofit to fit design strategy. There are existing recessed 2x4, 1x4 and 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. The gym has existing LED fixtures. The balance of the miscellaneous fixtures are 40-watt and 60-watt incandescent lamps and two (2) 13-watt, two (2) 26-watt, two (2) 42-watt compact fluorescent 4-pin lamps. Also, there is a small amount of three (3) 36-watt biax lamps fixtures.

Olinda Water Treatment Plant

Interior – Of the existing fixtures, 16% are already LED and will not be retrofit. There are existing recessed 2x4 and 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Omaopio Boosters

Interior – Of the existing fixtures, 75% are already LED and will not be retrofit (4’ vapor tight). There is a 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballast.

Paia Fire Station

Interior – No existing fixtures are LED. The major fixture type is 1x4 surface mounted wrap fixtures with 32-watt T8 lamps and electronic ballast. The apparatus room has 4’ industrial fixture with one (1) 32-watt T8 lamps and electronic ballast and many are rusted due to ocean conditions. The original fixture was three (3) lamp and has been reduced to one (1) lamp and this could be a light level concern.

Paia Park

Interior – There is no interior fixtures at this location.

Papohaka Park

Interior – No existing fixtures are LED. There are 4’ wrap and vapor tight fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts.

Pookela Well

Interior – No existing fixtures are LED. There are 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballast.

Sewer Maintenance Building

Interior – Of the existing fixtures, 1% are already LED and will not be retrofit (2’ vanity). There are existing recessed 2x4 and 4’ wrap and vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

South Maui Community Park

Interior – No existing fixtures are LED. There are existing 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Ukumehame Firing Range

Interior – No existing fixtures are LED. There are existing 4’ wrap and industrial fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts.

Ulapalakua Radio Site

Interior – No existing fixtures are LED. There are existing 4’ wrap and vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Upcountry Pool

Interior – Of the existing fixtures, 5% are already LED and will not be retrofit. There are 4’ strip, wrap and vapor proof fixtures with 28-Watt T8 and 34-watt T12 lamps and electronic ballasts or magnetic ballasts. Also, there were 2’ and 3’ vanity fixtures with 40-watt incandescent lamps and 28-watt T8 lamps and electronic ballasts.

Velma McWayne Santos Community Center

Interior – Of the existing fixtures, 34% are already LED, mostly exit signs and drum fixtures. Balance is made up of mostly 1x4 recessed fixtures with 32-watt T8 lamps and electronic ballast. Some 4’ vapor proof fixtures with existing 28-watt T8 32-watt lamps and electronic ballasts.

Waiakoa Gymnasium

Interior – No existing fixtures are LED. There are existing 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. The gym has eight (8) 32-watt compact fluorescent 4-pin lamp high bay fixtures.

Waiehu Golf Course

Interior – Of the existing fixtures, 7% are already LED and will not be retrofit (exit sign and screw in lamps). There are existing recessed 2x4 and 4’ wrap and vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also, there are 8’ fluorescent fixtures with 59-watt T8 lamps with electronic ballasts. The garage high bay fixtures are four (4) 28-watt compact fluorescent 4-pin lamps.

Waiehu Terrace Park

Interior – Of the existing fixtures, 66% are already LED and will not be retrofit (wall-mount fixtures). There are existing 4’ strip fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Waihee 514,515 Well

Interior – Of the existing fixtures, 100% are already LED and will not be retrofit (keyless fixture).

Waihee 577,578,579 Well

Interior – Of the existing fixtures, 20% are already LED and will not be retrofit (keyless fixture). There are existing 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Waikapu Well

Interior – No existing fixtures are LED. There are existing 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Wailee Beach Park

Interior – Of the existing fixtures, 100% are already LED and will not be retrofit (flood fixture).

Wailea Fire Station

Interior – Of the existing fixtures, 4% are already LED, mostly exit signs and 2x4 recessed TLED fixtures. Balance is made up of mostly 2x4, 2x2 and 1x4 recessed fixtures with 17-watt T8, 28-watt T8 and 32-watt T8 lamps and electronic ballast. Many 6” recessed cans with 32-watt and 26-watt compact fluorescent plug in lamps and electronic ballast. Also, a mix of 4’ strip/industrial fixtures, 4’ wrap fixtures, 4’ vapor proof fixtures with existing 28-watt T8 and 32-watt lamps and electronic ballasts. The 4’ vapor proof fixtures in the tower consists of two (2) florescent 32-watt T8 lamps and electronic ballast and several are missing the lens. The apparatus room has 4’ industrial fixture with two (2) and three (3) fluorescent 32-watt T8 lamps and electronic ballast fixtures and many are rusted due to ocean conditions.

Wailuku Baseyard

Interior – Of the existing fixtures, 32% are already LED, however 15% will not be retrofit. The remaining 17% existing LED will be retrofit to fit design strategy. There are existing recessed 2x4 and 4’ and 8’ wrap and vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. Also, there are 8’ fluorescent fixtures with 59-watt T8 and 60-watt T12 lamps with electronic ballasts and magnetic ballasts. The garage high bay fixtures are six (6) 32-watt T8 lamps with electronic ballasts. Then there are some 13-watt and 23-watt compact fluorescent screw in lamps, 60-watt incandescent lamps, and 75-watt halogen lamps.

Wailuku Fire Station

Interior – Of the existing fixtures, 5% are already LED, 4’ vanity fixture and screw in LED lamps. The main fixtures are 4’ wrap and wide wrap fixtures with 28-watt T8 and 32-watt T8 lamps and electronic ballast.

Wailuku Police Station

Interior – Of the existing fixtures, 8% are already LED, however 6% will not be retrofit, the remaining 2% existing LED will be retrofit to fit design strategy. There are existing recessed 2x4, 1x4 and 4’ and 8’ industrial, wrap and vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts and LED tubes. There are canopy and ceiling mount fixtures with 150-watt high pressure sodium and metal halide lamps. There are recessed can and fixtures with 65-watt incandescent lamps and 13-watt compact fluorescent screw in lamps. Then there also are 32-watt compact fluorescent 4-pin lamps and 120-watt halogen lamps.

Wailuku Pool

Interior – Of the existing fixtures, 16% are already LED and will not be retrofit. There are existing high bay fixtures with 250-watt metal halide lamps. There are also 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. There are miscellaneous fixtures with 40-watt incandescent lamps and 13-watt compact fluorescent screw in lamps.

Wailuku Well I

Interior – Of the existing fixtures, 42% are already LED and will not be retrofit. There are 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Wailuku Well II

Interior – No existing fixtures are LED. There are 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

War Memorial Complex

Interior – Of the existing fixtures, 4% are already LED and will not be retrofit. There are 4’ wrap, industrial and vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. There are existing wall pack fixtures with 150-watt high pressure sodium lamps. Also, there are canopy and ceiling mount fixtures with 70-watt and 100-watt high pressure sodium lamp.

Wells Park

Interior – Of the existing fixtures, 86% are already LED, however 46% will not be retrofit, the remaining 40% existing LED will be retrofit to fit design strategy. There are 2x4 recessed, 4’ industrial fixtures with 32-watt T8 lamps and electronic ballast and LED tubes. There are existing wall pack fixtures with 150-watt high pressure sodium lamps. Also, there are canopy and ceiling mount fixtures with 70-watt and 100-watt high pressure sodium lamp.

West Maui Senior Center

Interior – Of the existing fixtures, 2% are already LED and will not be retrofit (exit signs). There are 2x4 recessed, 4’ industrial and wrap fixtures with 28-watt T8 lamps and electronic ballasts.

Also, there are miscellaneous fixtures with 60-watt incandescent and 120-watt halogen lamps.

FIM Description

Lighting energy efficiency upgrades provide a substantial energy benefit along with potential quality of light improvements. Facility owners realize significant operating utility savings, reduced maintenance costs, and improved overall lighting systems performance.

The existing lighting systems across Maui County consists of a wide variety of lighting technologies. The proposed solutions will result in improved efficiency. Effort has been made to standardize the installed components to reduce operational and maintenance costs over the life of the installed system. After the installation is complete, Johnson Controls will provide an attic stock of materials and as described in the planned maintenance section provide maintenance services for the lighting scope of work.

The following is a general overview of the most common lighting found within each building grouping. The complete lighting audit showing the exact existing quantities and types and the proposed improvements are found in Appendix 1-Interior Lighting Retrofits Scope of Work.

This measure will retrofit specified existing lighting fixtures with new LED lighting technology and select lighting controls in the following building groupings. Existing troffers will be replaced with new 1’x4’, 2’x2’ and

2'x4' volumetric troffer kits where applicable. Wrap and strip fixtures will be replaced with new fixtures where applicable. Areas not receiving new fixtures will be retrofitted, re-lamped, or kitted. Existing LED technologies will not be upgraded unless specified by the line by line.

- "No Retrofit" is leaving the existing fixture as-is.
- "Retrofit" is upgrading existing to fixtures with LED technology, typically involving removing existing ballasts.
- "Relamp" is installing a compatible LED lamp that uses all existing fixture components as-is.
- "Retrofit with a Kit or Reflector" is removing internal fixture components, leaving existing housing, and installing a LED kit designed for existing fixture profile. Some kits may alter finished appearance of fixture.
- "New/ Replacement Fixture" is installing a new fixture in place of the existing.
- "Remove" is removing the existing fixture and capping the junction box.
- "Misc Equipment" is battery backup lamps and drivers as required.

See quantities in the table below:

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Remove	Misc. Equipment	Total Count
Kaunoa Senior Services	41	30	58	75	152	0	0	356
Wailea Fire Station	10	47	0	135	87	0	0	279
Kihei Aquatic Center	0	42	0	26	30	0	0	98
Kihei Fire Station	0	2	9	0	28	0	0	39
Kula Fire Station	0	3	9	2	44	0	0	58
Makawao Fire Station	0	1	9	0	35	0	0	45
Paia Fire Station	0	7	6	2	64	0	0	79
Fire Prevention Bureau	32	5	4	0	56	0	0	97
Kihei Wastewater Reclamation Facility	117	47	34	175	80	0	0	453
Upcountry Pool	4	27	15	0	28	0	0	74
Mayor Hannibal Tavares Community Center	44	16	18	35	44	0	0	157
Kahului Fire Station	16	59	0	209	74	0	0	358
Wailuku Fire Station	2	1	6	0	28	0	0	37
Velma McWayne Santos Community Center	30	5	1	12	40	0	0	88
Kokua Pool	0	5	1	0	12	0	0	18
Kahului Community Center	5	17	3	32	60	0	0	117
Kahului Baseyard	2	6	8	67	104	0	0	187
Napili Fire Station	2	8	2	0	72	0	0	84
Lahaina Fire Station	39	8	2	18	35	0	0	102
Lahaina Civic Center	33	26	29	75	176	12	0	351
Lahaina Police Station	18	12	3	67	36	0	0	136
Lahaina Wastewater Reclamation Facility	95	68	0	0	56	0	0	219
Kihei Police Station	17	232	3	499	85	0	0	836
Lahaina Recreation Center	6	1	2	118	15	0	40	182

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Remove	Misc. Equipment	Total Count
Lahaina Aquatic Center	21	30	1	0	17	0	0	69
Coach Sakamoto Pool	0	28	0	1	12	0	0	41
Kenolio Recreation Complex	2	4	2	0	21	0	0	29
Eddie Tam Memorial Center	0	91	18	52	10	0	20	191
Hana Community Center & Ball Park	0	3	0	0	14	0	0	17
Hana Fire Station	4	2	0	3	39	0	0	48
Hana Police Station	0	0	4	1	33	0	0	38
Hanakao'o Park	0	1	0	0	2	0	0	3
Kahului Community Center	0	2	0	0	2	0	0	4
Kahului Wastewater Reclamation Facility	75	61	10	20	70	0	0	236
Kalama Park	0	19	0	0	14	0	0	33
Kalana O Maui Building	128	143	12	362	1,536	0	0	2,181
Kenolio Recreation Complex	0	2	0	0	10	0	0	12
Keopuolani Regional Park	20	16	0	11	28	0	0	75
Kihei Community Center	6	21	9	200	34	0	0	270
Lahaina Civic Center	0	12	0	0	0	0	0	12
Lahaina Recreation Center	4	4	0	0	2	0	0	10
Old Courthouse Building	48	31	1	71	32	0	0	183
Papohaku Park	0	13	0	0	8	0	0	21
Sewer Maintenance Building	1	52	0	20	31	0	0	104
South Maui Community Park	0	6	0	0	23	0	0	29
Wells Park	7	2	0	6	0	0	0	15
Waiehu Golf Course	28	14	0	35	47	0	0	124
Wailuku Pool	5	2	2	0	22	0	0	31
Wailuku Police Station	56	112	5	487	196	0	0	856
Forensic Facility	2	7	0	109	27	0	0	145
Kaunakakai Fire Station	10	40	0	80	44	0	8	182
Kaunakakai Ball Park	0	2	0	0	0	0	0	2
Kilohana Community Center	0	3	5	0	34	0	0	42
Mitchel Pauole Community Center	25	8	3	6	73	0	0	115
Duke Maliu Regional Park	0	5	0	0	4	0	0	9
Kilohana Park (Molokai)	0	0	0	0	0	0	0	0
Hoolehua Fire Station	2	1	0	1	24	0	0	28
Kualapuu Park & Community Center	7	7	0	10	22	0	0	46
Lanai Park & Tennis Courts	19	4	17	8	51	0	0	99
Lanai Fire Station	0	3	2	0	27	0	0	32
Lanai Police Station	5	53	2	91	6	0	0	157

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Remove	Misc. Equipment	Total Count
Launiupoko Beach Park	0	1	0	0	2	0	0	3
Makawao Veterans Cemetery	10	11	2	10	3	0	0	36
Wailuku Baseyard	47	15	13	21	202	0	18	316
West Maui Senior Center	5	11	4	155	27	0	0	202
Mahinahina Baseyard	22	80	0	24	7	0	0	133
Lahainaluna Wastewater Reclamation Facility	37	15	0	0	7	0	0	59
Wailuku Well 1	5	7	0	0	0	0	0	12
Wailuku Well 2	0	11	0	0	0	0	0	11
Waikapu Well	0	6	0	0	0	0	0	6
Napili Well B	0	3	0	0	0	0	0	3
Honokowai Booster Pump	0	2	0	0	0	0	0	2
Ukumehame Firing Range	0	7	0	0	16	0	0	23
Kula Water Treatment Plant	12	66	0	47	22	0	0	147
Olinda Water Treatment Plant	11	40	0	8	10	0	0	69
Hamakuapoko Well 2	0	3	0	0	0	0	0	3
Kaupakalua Well	0	5	0	0	0	0	0	5
Pookela Well	0	11	3	0	0	0	0	14
Lower Kula Boosters	0	3	0	0	0	0	0	3
Omaopio Boosters	5	1	0	0	0	0	0	6
Kamole Water Treatment Plant	17	27	4	4	65	0	0	117
Maui Meadows Pump	0	0	0	0	5	0	0	5
Diamond Resort Boosters	0	4	0	0	0	0	0	4
Kula Community Center	6	9	16	40	0	0	0	71
Waiakoa Gymnasium	0	2	0	0	43	0	0	45
Alfred "Flako" Boteilho Gymnasium	0	1	0	0	34	0	0	35
Kanaha Beach Park	5	4	0	1	3	0	0	13
Wahikuli Terrace Park	0	0	0	0	0	0	0	0
Keokea Park	4	2	0	0	0	0	0	6
War Memorial Complex	7	75	4	3	83	0	0	172
Kamaole I Beach Park	0	4	0	0	4	0	0	8
Kamaole II Beach Park	0	2	0	0	2	0	0	4
Kamaole III Beach Park	4	2	0	0	0	0	0	6
Waiehu Terrace Park	4	2	0	0	0	0	0	6
H.A. Baldwin Park	0	2	0	0	6	0	0	8
Ho'okipa Beach Park	2	2	0	0	5	0	0	9
Wailea Beach Park	2	0	0	0	0	0	0	2
Kalana Pakui	5	26	9	126	10	0	0	176
Napili Park	0	2	0	0	9	0	0	11

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Remove	Misc. Equipment	Total Count
Kupaa Well	0	6	0	0	0	0	0	6
Mokuhau Well	8	0	0	0	0	0	0	8
Mokuhau Well	2	7	0	2	0	0	0	11
Waihee 514,515 Well	2	0	0	0	0	0	0	2
Waikapu Well	0	6	0	0	0	0	0	6
Kanoa Well 1	0	3	0	0	0	0	0	3
Kanoa Well 2	0	12	0	0	0	0	0	12
North Waihee Boosters	0	7	0	0	0	0	0	7
North Waihee Well	0	12	0	0	0	0	0	12
Kehalani Boosters	0	6	0	0	0	0	0	6
Iao Well	0	11	0	0	0	0	0	11
Waihee 577,578,579 Well	6	24	0	0	0	0	0	30
Central Maui Regional Sports Complex	5	5	0	0	39	0	0	49
Ulapalakua Radio Site	0	11	0	0	0	0	0	11
Kahakuloa Radio Site	0	10	0	0	0	0	0	10
Coach Shiraishi Memorial Pool	0	10	11	0	0	0	0	21
TOTAL	**1,221**	**2,073**	**381**	**3,562**	**4,560**	**12**	**86**	**11,895**

Scope of Work

This section describes the contractual scope of work.

JCI shall upgrade specified existing lighting systems with newer technology energy efficient LED lighting systems.

JCI shall provide lighting retrofit work that will include all necessary labor, materials, equipment, fixture cleaning, transportation and storage for locations as identified in the detailed line by line, shown in Appendix 1 – Interior Lighting Scope of Work. Work will be performed in accordance with current applicable local, state, and federal codes and regulations promulgated at time of contract execution.

In general, unless otherwise specified in Appendix 1, the following are the significant elements of the lighting retrofit scope of work:

- 1x4, 2x2 and 2x4 Troffers
  - Troffers in existing drop ceilings shall be replaced with LED troffer kits with integrated wireless controls. Existing wall switch(es) to be replaced with wireless battery powered wall switch dimmer. Lighting will be “trimmed” or “capped” to recommended light levels as established by the Illumination Engineering Society as established in the section “Commissioning Procedure”
  - Troffers in existing hard-lid ceilings will be retrofitted with LED tubes, unless otherwise noted.
- High bay fixtures

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    - High bay fixtures shall be replaced with new LED fixtures with integrated wireless controls, unless otherwise noted. Existing wall switch(s) to be replaced with wireless battery powered wall switch. Lighting will be "trimmed" or "dimmed" to recommended light levels as established by the Illumination Engineering Society as established in the section Commissioning Procedure
- Wrap Strip, Shop and Vapor-tight Fixtures
    - Shall be replaced with new LED fixtures, unless otherwise noted.
- Fluorescent T8 lamps, in fixtures not able to be replaced, shall be retrofitted with direct-wire LED tubes (Type-B).
- Fluorescent T8 lamps, in fixtures not able to be replaced, on an existing fluorescent dimming system shall be retrofitted with LED tubes and dimmable external driver (Type-C) line voltage or 0-10V controls
- Recessed cans will be retrofitted with LED kits, unless otherwise noted.
- Fluorescent and incandescent lamps will be updated to LED in screw-based and pin-based locations, unless otherwise noted.
- General
    - Wired and/or wireless occupancy sensors will be added to select locations.
    - JCI shall provide an attic stock of 1.5% of the material. Extra stock consists of LED kits, lamps, drivers, and screw in LEDs.
    - Design illumination levels: In the absence of code-mandated lighting requirements, industry standards have been used as a guide, primarily the 10th edition Lighting Handbook from the Illuminating Engineering Society of North America (IESNA), IESNA Recommended Practice documents and IESNA Design Guides.
    - Existing lighting systems were presumed to be designed based on IESNA recommended practices. In the event current light levels are above IESNA recommendations for the space type (i.e., over-lit), light levels may be reduced. In the event light levels are below IESNA recommendations for the space type, JCI will meet or exceed current facility light levels
    - If the space is under-lit due to an inadequate spacing or quantity of fixtures from initial design, which requires adding fixtures, adding circuits, reconfiguration or new construction, this will be brought to the attention of the customer.
    - JCI will take samples of existing and post-installation illumination levels in accordance with procedures recommended by IESNA using a light meter.
    - Lamps and ballasts removed as part of the work shall be recycled and/or disposed of in compliance with applicable regulations in effect at the time of contract signing.
- The new LED lighting at the Lahaina Civic Center Gymnasium will meet the following standards in order to accommodate high profile events like the Maui Invitational Tournament.
    - The level of play for this facility is designed to IESNA Class I level of play (professional and college facilities with spectator capacity over 5000)
    - Fixtures will be replaced based upon photometric design as recommended by IES RP-6-20 Sports and Recreational Area for Class I play (See Appendix for Photometric Analysis of Lahaina Civic Center).
    - A new relay panel shall be installed with manual on/off operation. The gym will be zoned into to six pre-determined areas; two (2) 6-button switches with on/off functionality to correspond with the pre-determined zones.

<u>As Built Drawing Lighting Drawings</u>

JCI shall provide updated as-built drawings showing the upgraded lighting fixture work. Customer shall provide an electronic PDF or CAD drawing of existing reflected ceiling plan.

- Interior drawings to match 1:1 customer provided drawings
- Fixture schedule (by JCI) included on interior plans
- The drawings shall contain:
  - Identification of fixture in field with unique identification symbol
  - Fixture schedule with quantity of fixtures per drawing
  - Location of occupancy or daylight sensors, and designation of which areas are to be controlled by occupancy or daylight sensors
  - Updated drawings are to serve as a reference of upgraded illuminous technology only. No electric circuitry from the lighting electrical panels to the fixture will be designed or displayed on the JCI-furnished drawings described here.

Exclusions:

- Professional stamped Architectural or MEP engineered drawings are not included. Drawings are for design intent only. If existing building drawings are not available, JCI may not be able to create an as-built drawing of the lighting retrofit, and will furnish a detailed line-by-line inventory of the light fixtures in that building, along with a marked-up reference plan such as an existing fire escape plan with a simple mark-up of room names and numbers which will be cross-referenced to the detailed line-by-line.
- New seismic hardware. It is assumed that all existing lighting fixtures have properly installed seismic hardware that meets current code requirements. During replacement of existing fixtures, the existing seismic hardware will be reconnected to the newly installed fixtures. Correcting instances where the existing seismic hardware does not meet current code requirements is not included.
- Electrical or building permits and fees.
- Pre-Existing Conditions: Certain pre-existing conditions may be present within the County buildings that are non-compliant with applicable codes or are otherwise outside the scope of work. Regardless of whether such conditions may have been readily identifiable prior to the commitment of the work, JCI shall not be responsible for repairing such pre-existing conditions unless such is expressly provided for in the Scope of Work or an approved change order. JCI, in its reasonable, good-faith discretion, may determine whether it will bring said pre-existing conditions into compliance by agreeing to execute a change order with the County for additional compensation and, if appropriate, an extension of time to complete the work. This includes but is not limited to running new pipe and wire.
- It is assumed that each building has existing power feeds available at the fixture level to be able to provide power to each individual fixture being retrofitted. JCI is not responsible for running new power feeds or conduits
- Any auditorium or arena, house, and/or stage lighting is excluded. Due to the nature of dimming and control systems in auditorium spaces, replacement of stage and house lighting generally require upgrades to these dimming and controls systems which is excluded from this scope of work.
- Replacement, repair or upgrades to existing emergency and egress only lighting fixtures, is excluded, unless otherwise noted in Appendix 1.
- Existing task lighting and table type light fixtures unless specified in Attachment 1, room by room description of work.
- Removal or replacement of ceiling tiles unless specified in Appendix 1.
- The addition of lighting fixtures in areas with existing illumination deficiencies is not covered under this scope of work unless otherwise noted in Appendix 1. If foot-candle levels do not meet minimum standards, the customer will be notified.
- Reconfiguration of existing fixture layout unless otherwise noted in Appendix 1.

- Replacement of existing wiring and/or electrical issues in exterior fixtures.
- Any electrical wiring other than that required for the retrofit or replacement within the existing lighting fixtures, the installation of new fixtures as scheduled, the installation of occupancy sensors and other controls.
- Double or bi-level switching of in-board and out-board sockets is not included unless specified in Appendix 1.
- Repair, replacement and adjustments of existing sensors, time clocks, switches or energy management systems unless otherwise noted in Appendix 1.
- Calibration or adjustment of the lighting control devices after Customer Acceptance. If Customer Acceptance is delayed by the County, then the calibration and adjustment of lighting control devices will be deemed to be accepted and completed. JCI will set controls to the agreed upon as outlined in the section below Commissioning Procedure.
- Repair or replacement of louvers or other components unless denoted in Appendix 1.
- In areas receiving a LED tube or LED lamp upgrade repair or replacement of yellowed, cracked, damaged or missing fixture lenses, louvers, or other components.
- Replacement of defective emergency battery back-up ballast unless otherwise noted in Appendix 1.
- Unless specified in the scope of work, no provisions are made to ensure that the light levels will comply with existing surveillance camera requirements.
- Replacement of existing lighting sockets and ballast unless otherwise noted.
- Correction or repair of electrical system deficiencies or any NFPA, NEC, or Local Code deficiencies unless provided for in the scope.
- Painting, plastering or any other type of repair to existing mounting surfaces after the removal or replacement of fixtures, unless otherwise noted.

Equipment Manufacturer/Warranty

The following table summarizes our proposed major equipment components and their manufacturer warranty.

Lighting Component	Manufacturer	Warranty
LED Troffer Replacements/Retrofits	Signify, Cooper or equivalent	5 years
LED Can Light Retrofits	Signify, Green Creative or equivalent	5 years
Surface Mounted and LED Wrap Fixtures	Signify, Cooper or equivalent	5 years
Sensors	Signify, Lutron, Sensorworx or equivalent	1 years
LED T8 Lamps	Keystone, Espen, Green Creative or equivalent	5 years
Screw-in LED Lamps	Keyston, Green Creative or equivalent	3 years
Interior Sports Lighting	Linmore, Signify, Cooper or equivalent	5 years

Material Warranties - Manufacturer warranties of lamps, retrofit kits, and fixtures installed as part of the project are covered by the individual manufacturer's published documentation. Johnson Controls will furnish contact information for each manufacturer.

Energy Savings Calculations

Lighting Retrofits Energy Savings

There are savings specifically associated with the reduction in wattage due to the lighting retrofits. The equations used are shown below:

Equations for Calculating Lighting Retrofit Savings

Demand (kW)

Connected kW Savings = $\sum_u$ [(*kW/Fixture*$_{baseline}$ x *Quantity*$_{baseline}$ - *kW/Fixture*$_{post}$ x *Quantity*$_{post}$)]$_{t,u}$
Actual kW Savings = $\sum_u$ [*Connected kW Savings*$_u$ x *Coincident Factor*$_u$]$_{t,u}$

where:

kW/fixture$_{baseline}$ =	lighting baseline demand per fixture for usage group *u*
kW/fixture$_{post}$ =	lighting demand per fixture during post-installation period for usage group
Quantity$_{baseline}$ =	quantity of affected fixtures before the lighting retrofit for usage group *u*
Quantity$_{post}$ =	quantity of affected fixtures after the lighting retrofit for usage group *u*
Coincident Factor$_u$ =	Coincident Factor is a percentage multiplier to account for Demand Diversity of each specific usage group *u*..

Annual demand cost savings are determined by multiplying the kW demand savings by the corresponding facility demand rate ($/kW) times 12 months.

Energy (kWh)

kWh Savings$_{Lighting}$ = $\sum_u$ [*Connected kW Savings*$_u$ x *Burn Hours*]$_{t,u}$
where:

Connected kW Savings$_u$ =	total connected fixture demand reduction for usage group *u*
Burn Hours =	number of operating hours during the time period *t* for the usage group *u*

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

Baseline Measurements

The wattage of the existing fixtures was measured on a sample of fixtures that meet a confidence level of 80% and a precision of 20%– assuming a coefficient of variance of 0.5 –using a true RMS meter. Fixtures with similar lamps and ballasts, counts and types were grouped together with a lamp/ballast code. These values form the basis for the baseline energy consumption and will not be measured again.

Measurements were taken on a total of approximately 282 fixtures, in 21 different sites between 7/25/22 and 8/5/22. These measurements will not be taken again.

Below are the average measured pre-retrofit wattages for the various fixture types.

Fixture Description	Fixture Code	Pre-retrofit Wattage per fixture
Fluorescent, (2) 48", 25WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	2X25T8EBN	37.8
Fluorescent, (1) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	1X32T8EBN	28.2
Fluorescent, (3) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	3X32T8EBN	86.0
Fluorescent, (2) 48", 34WT12 lamps, Magnetic Ballast	2X34T12MB	66.2
Fluorescent, (2) 48", U-bend 18WT-8 lamps, LED	2X18T8U6LEDT	32.4
Metal Halide, (1) 400W lamp	1X400MH	440.0
Fluorescent, (1) 48", 34WT12 lamps, Magnetic Ballast	1X34T12MB	36.9

Fixture Description	Fixture Code	Pre-retrofit Wattage per fixture
Fluorescent, (4) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	4X32T8EBN	106.4
Fluorescent, (2) 48", U-bend 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	2X32T8U6EBN	55.6
Fluorescent, (2) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	2X32T8EBN	55.4
Fluorescent, (3) 48", 32WT-8 lamps, (2) Instant Start Ballast, NLO (0.85 < BF < 0.95)	3X32T8EBN2	81.2
Metal Halide, (1) 250W lamp	1X250MH	312.0
High Pressure Sodium, (1) 70W lamp	1X70HPS	86.3
High Pressure Sodium, (1) 150W lamp	1X150HPS	170.3
High Pressure Sodium, (1) 250W lamp	1X250HPS	269.4
Metal Halide, (1) 1000W lamp	1X1000MH	1020.1

Burn Hours

Burn hours have been estimated based on space type typical use, and from data collected during onsite surveys.

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
GENERAL	**24/7**	NIGHT LIGHT 24/7	8760	6132	30%
GENERAL	**AU**	Auditorium/Stage	2600	1820	30%
GENERAL	**BR**	Break room	3016	2111	30%
GENERAL	**BRAS**	Break room Already Sensored	2111	2111	0%
GENERAL	**BR-L**	Break room - Low hours	2600	1820	30%
GENERAL	**BRAS-L**	Break room - Low hours Already Sensored	1820	1820	0%
GENERAL	**C**	Time Clock	4368	3058	30%
GENERAL	**CELL**	Detention Cell	3640	2548	30%
GENERAL	**CF**	Cafeteria	3016	2111	30%
GENERAL	**CF-L**	Cafeteria - Low hours	2600	1820	30%
GENERAL	**CL**	Classroom	3016	2111	30%
GENERAL	**CLAS**	Classroom Already Sensored	2111	2111	0%
GENERAL	**CL-L**	Classroom - Low hours	2600	1820	30%
GENERAL	**CLAS-L**	Classroom - Low hours Already Sensored	1820	1820	0%
GENERAL	**CR**	Conference Room	3016	2111	30%
GENERAL	**CRAS**	Conference Room Already Sensored	2111	2111	0%
GENERAL	**CR-L**	Conference Room - Low hours	2600	1820	30%
GENERAL	**CRAS-L**	Conference Room - Low hours Already Sensored	1820	1820	0%
GENERAL	**CT**	Court Room/Trial Areas	3016	2111	30%
GENERAL	**E**	Exterior	4380	4380	0%
GENERAL	**E-L6**	Exterior low hours	2184	2184	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
GENERAL	**FR**	Fire Range	1250	875	30%
GENERAL	**GA**	Garage/Parking Decks	4368	3058	30%
GENERAL	**GYM**	Gymnasium	2600	1820	30%
GENERAL	**HW**	Hallway	5096	3567	30%
GENERAL	**HWAS**	Hallway Already Sensored	3567	3567	0%
GENERAL	**IT**	Server Room	3016	2111	30%
GENERAL	**IT-L**	Server Room - Low hours	2600	1820	30%
GENERAL	**KT**	Kitchen	3016	2111	30%
GENERAL	**KTAS**	Kitchen Already Sensored	2111	2111	0%
GENERAL	**KT-L**	Kitchen - Low hours	2600	1820	30%
GENERAL	**KTAS-L**	Kitchen - Low hours Already Sensored	1820	1820	0%
GENERAL	**LAB**	Laboratory	3016	2111	30%
GENERAL	**LI**	Library	3016	2111	30%
GENERAL	**LO**	Lobby/Entry Vestibule	5096	3567	30%
GENERAL	**LQ**	Living Quarters/Bunk Rooms	3016	2111	30%
GENERAL	**LR**	Locker Room	3016	2111	30%
GENERAL	**LRAS**	Locker Room Already Sensored	2111	2111	0%
GENERAL	**ME**	Mechanical/Electrical Rooms	494	346	30%
GENERAL	**MEAS**	Mechanical/Electrical Rooms Already Sensored	346	346	0%
GENERAL	**MP**	Multipurpose	2600	1820	30%
GENERAL	**N/L**	Night Light	8760	8760	0%
GENERAL	**NL**	Night Light	8760	8760	0%
GENERAL	**NO HOURS**	No Hours	0	0	30%
GENERAL	**OO**	Open Office	3016	2111	30%
GENERAL	**OOAS**	Open Office Already Sensored	2111	2111	0%
GENERAL	**OOL**	Open Office	3016	2111	30%
GENERAL	**OS**	Office Support (copy room, coffee room, etc.)	3016	2111	30%
GENERAL	**OS-L**	Office Support (copy room, coffee room, etc.) - Low hours	2600	1820	30%
GENERAL	**PO**	Private Office	3016	2111	30%
GENERAL	**POAS**	Private Office Already Sensored	2111	2111	0%
GENERAL	**PO-L**	Private Office - Low hours	2600	1820	30%
GENERAL	**POAS-L**	Private Office - Low hours Already Sensored	1820	1820	0%
GENERAL	**PR**	Patient Room	3016	2111	30%
GENERAL	**RR**	Restroom	5096	3567	30%
GENERAL	**RRAS**	Restroom Already Sensored	3567	3567	0%
GENERAL	**RR-L**	Restroom - Low hours	3016	2111	30%
GENERAL	**RRAS-L**	Restroom - Low hours Already Sensored	2111	2111	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
GENERAL	**RT**	Retail	3016	2111	30%
GENERAL	**ST**	Storage	1248	874	30%
GENERAL	**STAS**	Storage Already Sensored	874	874	0%
GENERAL	**SW**	Stairwell	8760	6132	30%
GENERAL	**TC**	Time Clock	4396	3077	30%
GENERAL	**UT**	Utility/Janitor Closets	1248	874	30%
GENERAL	**UTAS**	Utility/Janitor Closets Already Sensored	874	874	0%
GENERAL	**WH**	Warehouse	3016	2111	30%
GENERAL	**WHAS**	Warehouse Already Sensored	2111	2111	0%
GENERAL	**WR**	Work Room	3016	2111	30%
GENERAL	**WS**	Workshop	3016	2111	30%
GENERAL	**X**	Exit Signs	8760	8760	0%
COMM	**AU**	Auditorium/Stage	2600	1820	30%
COMM	**BFF**	Bathroom Fan	3380	2366	30%
COMM	**BF**	Ballfield	3380	2366	30%
COMM	**C**	Time Clock	3380	2366	30%
COMM	**CR**	Conference Room	2600	1820	30%
COMM	**E**	Exterior	4368	4368	0%
COMM	**E-L6**	Exterior low hours	2184	2184	0%
COMM	**HW**	Hallway	2600	1820	30%
COMM	**KT**	Kitchen	2600	1820	30%
COMM	**LR**	Locker Rooms	2600	1820	30%
COMM	**ME**	Mechanical/Electrical Rooms	390	273	30%
COMM	**MP**	Multipurpose	2600	1820	30%
COMM	**NL**	Night Light	8760	6132	30%
COMM	**NO HOURS**	No Hours	0	0	0%
COMM	**OO**	Open Office	2600	1820	30%
COMM	**PO**	Private Office	2600	1820	30%
COMM	**RR**	Restroom	3380	2366	30%
COMM	**ST**	Storage	1040	728	30%
COMM	**TC**	Time Clock	4368	3058	30%
COMM	**UT**	Utility/Janitor Closets	1040	728	30%
COMM	**X**	Exit Signs	8760	8760	0%
COMM-L	**AU**	Auditorium/Stage	1300	910	30%
COMM-L	**BFF**	Bathroom Fan	1560	1092	30%
COMM-L	**BF**	Ballfield	1560	1092	30%
COMM-L	**C**	Time Clock	1560	1092	30%
COMM-L	**CR**	Conference Room	1300	910	30%
COMM-L	**E**	Exterior	4368	4368	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
COMM-L	**E-L6**	Exterior low hours	2184	2184	0%
COMM-L	**E-L3**	Exterior low hours	1092	1092	0%
COMM-L	**HW**	Hallway	1300	910	30%
COMM-L	**KT**	Kitchen	1300	910	30%
COMM-L	**LR**	Locker Rooms	1300	910	30%
COMM-L	**ME**	Mechanical/Electrical Rooms	390	273	30%
COMM-L	**MP**	Multipurpose	1300	910	30%
COMM-L	**NL**	Night Light	8760	6132	30%
COMM-L	**NO HOURS**	No Hours	0	0	0%
COMM-L	**OO**	Open Office	1300	910	30%
COMM-L	**PO**	Private Office	1300	910	30%
COMM-L	**RR**	Restroom	1560	1092	30%
COMM-L	**ST**	Storage	260	182	30%
COMM-L	**TC**	Time Clock	4368	3058	30%
COMM-L	**UT**	Utility/Janitor Closets	260	182	30%
COMM-L	**X**	Exit Signs	8760	8760	0%
F-P-L	**24/7**	NIGHT LIGHT	8760	6132	30%
F-P-L	**BF**	Ballfield	2000	1400	30%
F-P-L	**BR**	Break room	1300	910	30%
F-P-L	**CF**	Cafeteria	1300	910	30%
F-P-L	**CL**	Classroom	1300	910	30%
F-P-L	**CR**	Conference Room	1300	910	30%
F-P-L	**CT**	Court Room/Trial Areas	1300	910	30%
F-P-L	**E**	Exterior	4368	4368	0%
F-P-L	**E-L6**	Exterior low hours	2184	2184	0%
F-P-L	**GA**	Garage/Parking Decks	1300	910	30%
F-P-L	**GYM**	Gymnasium	1300	910	30%
F-P-L	**HW**	Hallway	1300	910	30%
F-P-L	**KT**	Kitchen	1300	910	30%
F-P-L	**LO**	Lobby/Entry Vestibule	1300	910	30%
F-P-L	**LQ**	Living Quarters/Bunk Rooms	1300	910	30%
F-P-L	**LQAS**	Living Quarters	910	910	0%
F-P-L	**LR**	Locker Room	1300	910	30%
F-P-L	**LRAS**	Locker Room Already Sensored	910	910	0%
F-P-L	**ME**	Mechanical/Electrical Rooms	546	382	30%
F-P-L	**MEAS**	Mechanical/Electrical Rooms Already Sensored	382	382	0%
F-P-L	**MP**	Multipurpose	1300	910	30%
F-P-L	**MPAS**	Multipurpose Already Sensored	910	910	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
F-P-L	**NL**	Night Light	8760	8760	0%
F-P-L	**NO HOURS**	No Hours	0	0	0%
F-P-L	**OO**	Open Office	1300	910	30%
F-P-L	**OS**	Office Support (copy room, coffee room, etc.)	1300	910	30%
F-P-L	**PO**	Private Office	1300	910	30%
F-P-L	**POAS**	Private Office Already Sensored	1300	910	30%
F-P-L	**RR**	Restroom	1300	910	30%
F-P-L	**RRAS**	Restroom Already Sensored	910	910	0%
F-P-L	**ST**	Storage	260	182	30%
F-P-L	**STAS**	Storage Already Sensored	182	182	0%
F-P-L	**SW**	Stairwell	3120	2184	30%
F-P-L	**SWAS**	Stairwell Already Sensored	2184	2184	0%
F-P-L	**UT**	Utility/Janitor Closets	260	182	30%
F-P-L	**UTAS**	Utility/Janitor Closets Already Sensored	182	182	0%
F-P-L	**WH**	Warehouse	1300	910	30%
F-P-L	**WS**	Workshop	1300	910	30%
FIRE	**24/7**	NIGHT LIGHT	8760	6132	30%
FIRE	**BF**	Concession stands	2000	1400	30%
FIRE	**BR**	Break room	4368	3058	30%
FIRE	**CF**	Cafeteria	4368	3058	30%
FIRE	**CL**	Classroom	4368	3058	30%
FIRE	**CR**	Conference Room	4368	3058	30%
FIRE	**CT**	Court Room/Trial Areas	4368	3058	30%
FIRE	**E**	Exterior	4368	4368	0%
FIRE	**E-L6**	Exterior low hours	2184	2184	0%
FIRE	**GA**	Garage/Parking Decks	4368	3058	30%
FIRE	**GYM**	Gymnasium	4368	3058	30%
FIRE	**HW**	Hallway	4368	3058	30%
FIRE	**KT**	Kitchen	4368	3058	30%
FIRE	**LO**	Lobby/Entry Vestibule	4368	3058	30%
FIRE	**LQ**	Living Quarters/Bunk Rooms	4368	3058	30%
FIRE	**LQAS**	Living Quarters	3058	3058	0%
FIRE	**LR**	Locker Room	4368	3058	30%
FIRE	**LRAS**	Locker Room Already Sensored	3058	3058	0%
FIRE	**ME**	Mechanical/Electrical Rooms	546	382	30%
FIRE	**MEAS**	Mechanical/Electrical Rooms Already Sensored	382	382	0%
FIRE	**MP**	Multipurpose	4368	3058	30%
FIRE	**MPAS**	Multipurpose Already Sensored	3058	3058	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
FIRE	**NL**	Night Light	8760	6132	30%
FIRE	**NO HOURS**	No Hours	0	0	0%
FIRE	**OO**	Open Office	4368	3058	30%
FIRE	**OS**	Office Support (copy room, coffee room, etc.)	4368	3058	30%
FIRE	**PO**	Private Office	4368	3058	30%
FIRE	**POAS**	Private Office Already Sensored	4368	3058	30%
FIRE	**RR**	Restroom	4368	3058	30%
FIRE	**RRAS**	Restroom Already Sensored	3058	3058	0%
FIRE	**ST**	Storage	1456	1019	30%
FIRE	**STAS**	Storage Already Sensored	1019	1019	0%
FIRE	**SW**	Stairwell	8760	6132	30%
FIRE	**SWAS**	Stairwell Already Sensored	6132	6132	0%
FIRE	**UT**	Utility/Janitor Closets	1456	1019	30%
FIRE	**UTAS**	Utility/Janitor Closets Already Sensored	1019	1019	0%
FIRE	**WH**	Warehouse	4368	3058	30%
FIRE	**WS**	Workshop	4368	3058	30%
PARK	**ALL-PARK**	Overall Park hours	5460	5460	0%
PARK	**BF**	Ball Field	2600	1820	30%
PARK	**BFAS**	Ball Field Already Sensored	1820	1820	0%
PARK	**BR**	Break room	2600	1820	30%
PARK	**CR**	Conference Room	2600	1820	30%
PARK	**E**	Exterior	1456	1456	0%
PARK	**E-L2**	Exterior Low Hours	728	728	0%
PARK	**E-L1**	Exterior Low Hours	365	365	0%
PARK	**GA**	Garage/Parking Decks Already Sensored	2600	1820	30%
PARK	**GYM**	Gymnasium	2600	1820	30%
PARK	**HW**	Hallway	5096	3567	30%
PARK	**KT**	Kitchen	2600	1820	30%
PARK	**LO**	Lobby/Entry Vestibule	5096	3567	30%
PARK	**LQ**	Living Quarters/Bunk Rooms	2600	1820	30%
PARK	**LR**	Locker Room	2600	1820	30%
PARK	**ME**	Mechanical/Electrical Rooms	494	346	30%
PARK	**MEAS**	Mechanical/Electrical Rooms Already Sensored	346	346	0%
PARK	**MP**	Multipurpose	2600	1820	30%
PARK	**MPAS**	Multipurpose Already Sensored	1820	1820	0%
PARK	**NL**	Night Light	8760	6132	30%
PARK	**NO HOURS**	NO BURN HOURS	0	0	30%
PARK	**OO**	Open Office	2600	1820	30%

Johnson Controls

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
PARK	**OOAS**	Open Office Already Sensored	1820	1820	0%
PARK	**PO**	Private Office	2600	1820	30%
PARK	**POAS**	Private Office Already Sensored	1820	1820	0%
PARK	**RR**	Restroom	5096	3567	30%
PARK	**RRAS**	Restroom Already Sensored	3567	3567	0%
PARK	**ST**	Storage	1248	874	30%
PARK	**UT**	Utility/Janitor Closets	1248	874	30%
PARK	**WS**	Workshop	2600	1820	30%
PARK	**X**	Exit Signs	8760	8760	0%
PARK-L	**BF**	Ball Field	1040	728	30%
PARK-L	**BFAS**	Ball Field Already Sensored	728	728	0%
PARK-L	**BR**	Break room	1040	728	30%
PARK-L	**CR**	Conference Room	1040	728	30%
PARK-L	**E**	Exterior	1456	1456	0%
PARK-L	**E-L2**	Exterior Low Hours	728	728	0%
PARK-L	**E-L1**	Exterior Low Hours	365	365	0%
PARK-L	**GA**	Garage/Parking Decks Already Sensored	1040	728	30%
PARK-L	**GYM**	Gymnasium	1040	728	30%
PARK-L	**HW**	Hallway	1560	1092	30%
PARK-L	**KT**	Kitchen	1040	728	30%
PARK-L	**LO**	Lobby/Entry Vestibule	1560	1092	30%
PARK-L	**LQ**	Living Quarters/Bunk Rooms	1040	728	30%
PARK-L	**LR**	Locker Room	1040	728	30%
PARK-L	**ME**	Mechanical/Electrical Rooms	390	273	30%
PARK-L	**MEAS**	Mechanical/Electrical Rooms Already Sensored	273	191	30%
PARK-L	**MP**	Multipurpose	1040	728	30%
PARK-L	**MPAS**	Multipurpose Already Sensored	728	728	0%
PARK-L	**NL**	Night Light	8760	6132	30%
PARK-L	**NO HOURS**	NO BURN HOURS	0	0	30%
PARK-L	**OO**	Open Office	1040	728	30%
PARK-L	**OOAS**	Open Office Already Sensored	728	728	0%
PARK-L	**PO**	Private Office	1040	728	30%
PARK-L	**POAS**	Private Office Already Sensored	728	728	0%
PARK-L	**RR**	Restroom	1560	1092	30%
PARK-L	**RRAS**	Restroom Already Sensored	1092	1092	0%
PARK-L	**ST**	Storage	260	182	30%
PARK-L	**UT**	Utility/Janitor Closets	260	182	30%
PARK-L	**WS**	Workshop	1040	728	30%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
PARK-L	**X**	Exit Signs	8760	8760	0%
POLICE	**BR**	Break room	4368	3058	30%
POLICE	**BRAS**	Breakroom Already Sensored	3058	3058	0%
POLICE	**CELL**	Detention Cell	3640	2548	30%
POLICE	**CL**	Classroom	3640	2548	30%
POLICE	**CLAS**	Classroom Already Sensored	2548	2548	0%
POLICE	**CR**	Conference Room	4368	3058	30%
POLICE	**CRAS**	Conference Room Already Sensored	3058	3058	0%
POLICE	**E**	Exterior	4368	4368	0%
POLICE	**E-L6**	Exterior low hours	2184	2184	0%
POLICE	**GA**	Garage/Parking Decks	4368	3058	30%
POLICE	**GAAS**	Garage/Parking Decks	3058	3058	0%
POLICE	**GYM**	Gymnasium	4368	3058	30%
POLICE	**GYMAS**	Gymnasium Already Sensored	3058	3058	0%
POLICE	**HW**	Hallway	4368	3058	30%
POLICE	**HWAS**	Hallway Already Sensored	3058	3058	0%
POLICE	**IT**	Server Room	4368	3058	30%
POLICE	**ITAS**	Server Room Already Sensored	3058	3058	0%
POLICE	**KT**	Kitchen	4368	3058	30%
POLICE	**LAB**	Laboratory	4368	3058	30%
POLICE	**LI**	Library	4368	3058	30%
POLICE	**LO**	Lobby/Entry Vestibule	4368	3058	30%
POLICE	**LQ**	Living Quarters/Bunk Rooms	4368	3058	30%
POLICE	**LR**	Locker Room	4368	3058	30%
POLICE	**ME**	Mechanical/Electrical Rooms	546	382	30%
POLICE	**MEAS**	Mechanical / Electrical Already Sensored	382	382	0%
POLICE	**MP**	Multipurpose	4368	3058	30%
POLICE	**MPAS**	Multipurpose Already Sensored	3058	3058	0%
POLICE	**NL**	Night Light	8760	6132	30%
POLICE	**OO**	Open Office	4368	3058	30%
POLICE	**OOAS**	Open Office Already Sensored	3058	3058	0%
POLICE	**OOL**	Open Office	4368	3058	30%
POLICE	**OS**	Office Support (copy room, coffee room, etc.)	4368	3058	30%
POLICE	**OSAS**	Office Support Already Sensored	3058	3058	0%
POLICE	**PO**	Private Office	4368	3058	30%
POLICE	**POAS**	Private Office Already Sensored	3058	3058	0%
POLICE	**RR**	Restroom	6240	4368	30%
POLICE	**RRAS**	Restroom Already Sensored	4368	4368	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
POLICE	**ST**	Storage	1456	1019	30%
POLICE	**STAS**	Storage Already Sensored	1019	1019	0%
POLICE	**SW**	Stairwell	8760	6132	30%
POLICE	**UT**	Utility/Janitor Closets	1456	1019	30%
POLICE	**WS**	Workshop	4368	3058	30%
POLICE	**X**	Exit Signs	8760	8760	0%
POOL	**E**	Exterior	4368	4368	0%
POOL	**E-L6**	Exterior low hours	2184	2184	0%
POOL	**GYM**	Gymnasium	3016	2111	30%
POOL	**KT**	Kitchen	3016	2111	30%
POOL	**LO**	Lobby/Entry Vestibule	5096	3567	30%
POOL	**LQ**	Living Quarters/Bunk Rooms	3016	2111	30%
POOL	**LR**	Locker Room	3016	2111	30%
POOL	**ME**	Mechanical/Electrical Rooms	494	346	30%
POOL	**OO**	Open Office	3016	2111	30%
POOL	**PO**	Private Office	3016	2111	30%
POOL	**RR**	Restroom	5096	3567	30%
POOL	**ST**	Storage	1248	874	30%
POOL	**UT**	Utility/Janitor Closets	1248	874	30%
POOL	**X**	Exit Signs	8760	8760	0%
POOL-H	**E**	Exterior	4368	4368	0%
POOL-H	**E-L6**	Exterior low hours	2184	2184	0%
POOL-H	**GYM**	Gymnasium	5096	3567	30%
POOL-H	**KT**	Kitchen	5096	3567	30%
POOL-H	**LO**	Lobby/Entry Vestibule	5096	3567	30%
POOL-H	**LQ**	Living Quarters/Bunk Rooms	5096	3567	30%
POOL-H	**LR**	Locker Room	5096	3567	30%
POOL-H	**ME**	Mechanical/Electrical Rooms	2496	1747	30%
POOL-H	**OO**	Open Office	5096	3567	30%
POOL-H	**PO**	Private Office	4368	3058	30%
POOL-H	**RR**	Restroom	5096	3567	30%
POOL-H	**ST**	Storage	2496	1747	30%
POOL-H	**UT**	Utility/Janitor Closets	2496	1747	30%
POOL-H	**X**	Exit Signs	8760	8760	0%
WWT	**BR**	Break room	3016	2111	30%
WWT	**CR**	Conference Room	3016	2111	30%
WWT	**E**	Exterior	8760	8760	0%
WWT	**E-L12**	Exterior low hours	4368	4368	0%
WWT	**GA**	Garage/Parking Decks	5096	3567	30%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
WWT	**GYM**	Gymnasium	2600	1820	30%
WWT	**HW**	Hallway	5096	3567	30%
WWT	**LAB**	Laboratory	3016	2111	30%
WWT	**LO**	Lobby/Entry Vestibule	5096	3567	30%
WWT	**LR**	Locker Room	3016	2111	30%
WWT	**LRAS**	Locker room Already Sensored	2111	2111	0%
WWT	**ME**	Mechanical/Electrical Rooms	494	346	30%
WWT	**MP**	Multipurpose	2600	1820	30%
WWT	**NL**	Night Light	8760	6132	30%
WWT	**OO**	Open Office	3016	2111	30%
WWT	**PO**	Private Office	3016	2111	30%
WWT	**RR**	Restroom	5096	3567	30%
WWT	**ST**	Storage	1248	874	30%
WWT	**SW**	Stairwell	8760	6132	30%
WWT	**UT**	Utility/Janitor Closets	1248	874	30%
WWT	**WH**	Warehouse	3016	2111	30%
WWT	**WS**	Workshop	3016	2111	30%
WWT	**X**	Exit Signs	8760	8760	0%
	GA-L	Garage/Parking Decks	3713	2599	30%

Annual Lighting Runtime	Coincident Factor
Less than 100 hrs/yr	0%
Between 100 and 999 hrs/yr	50%
Between 1000 and 5999 hrs/yr	90%
6000 hrs or greater	100%
Exterior (4380 hrs/yr)	10%

The below summarizes the total Lighting Retrofits Energy Savings (for details by site refer to Appendix 11):

Table 1: FIM 1 Energy Savings Summary

Elec (kWh)	Demand (kW)	$-Elec	$-Demand	$-Total
1,291,163	378.41	$430,349.04	$60,093.78	**$490,442.82**

Lighting Controls Energy Savings

There are savings specifically associated with the reduction in lighting burn hours due to the lighting controls (occupancy sensors and/or daylighting controls) installed as part of the lighting retrofits.

The lighting system annual burn hours pre and post-retrofit vary by space type as shown below. Pre-retrofit burn hours were estimated by JCI. The percentage reduction in burn hours and the resulting post-retrofit burn hours as a result of lighting controls (occupancy sensors and/or daylight controls) are estimated when comparing various energy groups and sources, such as: Illuminating Engineering Society (VonNieda B, Maniccia D, & Tweed A. 2000. An analysis of the energy and cost savings potential of occupancy sensors for commercial lighting systems. Proceedings of the Illuminating Engineering Society Paper #43), which estimates a range of 25% to 60% savings can be achieved with occupancy sensors. JCI assumed a 30% reduction in burn hours to be derived from installation of occupancy sensors, where included (see Appendix 1).

Equations for Calculating Lighting Controls Savings

Energy (kWh)

$$kWh\ Savings_{Lighting\ controls} = \sum_u \left[kW\ Post_u \times (\text{Pre-Hours of Operation} - \text{Post-Hours of Operation}) \right]_{t,u}$$

where:	*kW Post$_u$* =	kilowatt used during the post-installation time for usage group *u* *(will be equal to pre wattage if no fixture change)*
Pre-Hours of Operation =		number of operating hours during the baseline time period *t* for the usage group *u*
Post-Hours of Operation =		reduction in run time due to lighting controls

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

Energy savings resulting from lighting controls are not cost effective to measure and verify, thus with the methodology described above, the Customer agrees that the savings generated through this reduction in lighting burn hours will be achieved. The lighting wattages will be as measured by JCI.

These savings will not be measured, and below is a table showing the total lighting controls savings:

Facility	Lighting Controls Savings (kWh/yr)	Lighting Controls Savings ($/yr)
Eddie Tam Memorial Center - Interior Lighting	852	$317.60
Fire Prevention Bureau - Interior Lighting	1,271	$415.15
Forensic Facility - Interior Lighting	3,454	$1,128.29
Hana Community Center & Ball Park - Interior Lighting	128	$41.73
Hana Fire Station - Interior Lighting	951	$354.45
Hana Police Station - Interior Lighting	309	$115.35
Hoolehua Fire Station - Interior Lighting	334	$155.77
Kahului Baseyard - Interior Lighting	5,223	$1,705.88
Kahului Community Center - Interior Lighting	1,220	$455.03
Kahului Fire Station - Interior Lighting	5,400	$1,763.77
Kahului Wastewater Reclamation Facility - Interior Lighting	2,750	$832.55
Kalana O Maui Building - Interior Lighting	24,698	$7,476.48
Kalana Pakui - Interior Lighting	2,772	$839.25
Kamole Water Treatment Plant - Interior Lighting	972	$317.38
Kanaha Beach Park - Interior Lighting	32	$11.97
Kaunakakai Fire Station - Interior Lighting	1,436	$551.14

Facility	Lighting Controls Savings (kWh/yr)	Lighting Controls Savings ($/yr)
Kaunoa Senior Services - Interior Lighting	3,972	$1,480.96
Kenolio Recreation Complex - Interior Lighting	428	$159.68
Keopuolani Regional Park - Interior Lighting	460	$171.45
Kihei Aquatic Center - Interior Lighting	818	$267.30
Kihei Community Center - Interior Lighting	2,979	$972.97
Kihei Fire Station - Interior Lighting	485	$180.99
Kihei Police Station - Interior Lighting	7,348	$2,400.03
Kihei Wastewater Reclamation Facility - Interior Lighting	3,603	$1,090.76
Kilohana Community Center - Interior Lighting	288	$134.19
Kokua Pool - Interior Lighting	193	$63.07
Kualapuu Park & Community Center - Interior Lighting	63	$29.45
Kula Community Center - Interior Lighting	421	$157.06
Kula Fire Station - Interior Lighting	866	$322.84
Kula Water Treatment Plant - Interior Lighting	1,117	$364.89
Lahaina Aquatic Center - Interior Lighting	128	$41.73
Lahaina Civic Center - Interior Lighting	13,445	$4,391.68
Lahaina Fire Station - Interior Lighting	1,671	$545.81
Lahaina Police Station - Interior Lighting	2,879	$940.44
Lahaina Recreation Center - Interior Lighting	1,240	$462.22
Lahaina Wastewater Reclamation Facility - Interior Lighting	791	$239.40
Lahainaluna Water Treatment Plant - Interior Lighting	146	$47.72
Lanai Fire Station - Interior Lighting	605	$286.82
Lanai Park & Tennis Courts - Interior Lighting	351	$166.27
Lanai Police Station - Interior Lighting	2,207	$1,002.37
Mahinahina Baseyard - Interior Lighting	675	$251.76
Makawao Fire Station - Interior Lighting	626	$233.59
Makawao Veterans Cemetery - Interior Lighting	187	$69.80
Mayor Hannibal Tavares Community Center - Interior Lighting	962	$358.59
Mitchel Pauole Community Center - Interior Lighting	1,542	$592.01
Napili Fire Station - Interior Lighting	1,398	$521.17
Old Courthouse Building - Interior Lighting	1,252	$408.90
Olinda Water Treatment Plant - Interior Lighting	384	$125.31
Paia Fire Station - Interior Lighting	1,211	$451.68
Papohaku Park - Interior Lighting	32	$10.49
Sewer Maintenance Building - Interior Lighting	615	$200.77
Ukumehame Firing Range - Interior Lighting	123	$45.81
Upcountry Pool - Interior Lighting	32	$11.97

Facility	Lighting Controls Savings (kWh/yr)	Lighting Controls Savings ($/yr)
Velma McWayne Santos Community Center - Interior Lighting	578	$215.34
Waiehu Golf Course - Interior Lighting	833	$310.47
Wailea Fire Station - Interior Lighting	2,042	$667.05
Wailuku Baseyard - Interior Lighting	3,788	$1,412.33
Wailuku Fire Station - Interior Lighting	495	$184.70
Wailuku Police Station - Interior Lighting	16,396	$4,963.22
War Memorial Complex - Interior Lighting	358	$117.07
Wells Park - Interior Lighting	84	$31.41
West Maui Senior Center - Interior Lighting	2,930	$957.10
TOTAL	**134,850**	**$44,542.41**

Lighting HVAC Energy Savings

Due to the reduction in lighting energy consumption in conditioned spaces, there will also be an associated cooling load reduction. These savings are only applied to conditioned spaces.

Rundquist method

The cooling savings are calculated using the Rundquist method, as published in the ASHRAE Journal on November 1993. The methodology and formulas used are as follows:

Equations for Calculating Lighting HVAC Savings
Energy (kWh)

Cooling Savings (only spaces that are air conditioned)

$$Clg\ kWh\ Savings = \sum_u [\ kWh\ Savings \times F_{clg} / COP_{clg}\ ]_{t,u}$$
$$Clg\ kW\ Savings = \sum_u [\ kW\ Savings / COP_{clg} \times (F_{clg} \times 12 + 2)]_{t,u}$$
$$COP_{clg} = 3.517 / kW/ton$$

where:

kWh Savings =	Kilowatt hours saved from the lighting retrofits and lighting controls
kW Savings =	Kilowatts saved from the lighting retrofits
COP_{clg} =	Average cooling COP (varies by site and HVAC system type)
F_{clg} =	Fraction lighting to cooling = 0.87 (for Miami, FL (since HI does not appear on the table for locations, this is the closest in weather that was selected)

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

Typical DX cooling equipment, which is the most prevalent in the County buildings, will have an estimated average cooling efficiency of 3.0 COP. The following table shows the cooling system efficiency estimated, and the estimated % of conditioned spaces within each facility:

Facility Name	Description	Avg cooling efficiency COP	% Bldg air conditioned	Notes
Central Landfill	Landfill	3.0	90%	
Eddie Tam Memorial Center	Community Center	3.0	30%	
Fire Prevention Bureau	Office Building	3.0	50%	
Forensic Facility	Office Building	3.0	100%	
Hana Fire Station	Fire Station	3.0	70%	
Hana Police Station	Police Station	3.0	100%	
Hoolehua Fire Station	Fire Station	3.0	50%	
Iao Water Treatment Plant	WTP	3.0	40%	
Kahului Baseyard	Baseyard	3.0	100%	
Kahului Community Center	Community Center	3.0	100%	
Kahului Fire Station	Fire Station	3.0	80%	
Kahului WRF	WWTP	3.0	100%	
Kalana O Maui Building	Office Building	3.0	100%	water cooled chiller in need of replacement
Kalana Pakui	Office Building	3.0	100%	
Kaunakakai Fire Station	Fire Station	3.0	75%	
Kaunoa Senior Services	Office Building	3.0	100%	
Kihei Aquatic Center	Aquatic/Pool	3.0	80%	
Kihei Community Center	Community Center	3.0	100%	
Kihei Fire Station	Fire Station	3.0	60%	
Kihei Police Station	Police Station	3.9	100%	chilled water/CT
Kokua Pool	Aquatic/Pool	3.0	50%	
Kula Fire Station	Fire Station	3.0	75%	
Lahaina Civic Center	Community Center	3.0	95%	Gym has AC but it is rarely used.
Lahaina Fire Station	Fire Station	3.0	80%	
Lahaina Police Station	Police Station	3.0	100%	
Lahaina WRF	WWTP	3.0	95%	
Lahainaluna WTP	WTP	3.0	50%	
Lanai Baseyard	Baseyard	3.0	40%	
Lanai Fire Station	Fire Station	3.0	50%	
Lanai Police Station	Police Station	3.0	95%	
Lanai Wastewater Reclamation Facility	WWTP	3.0	50%	
Mahinahina WTP	WTP	3.0	50%	
Makawao Baseyard	Baseyard	3.0	50%	
Makawao Fire Station	Fire Station	3.0	70%	
Maui County Service Center	Office Building	3.0	100%	
Mayor Hannibal Tavares Community Center	Community Center	3.0	50%	
Mitchel Pauole Community Center	Community Center	3.0	70%	
Molokai Baseyard	Baseyard	3.0	40%	

Facility Name	Description	Avg cooling efficiency COP	% Bldg air conditioned	Notes
Napili Fire Station	Fire Station	3.0	60%	
Old Courthouse Building	Office Building	3.0	100%	
Olinda Water Treatment Plant	WTP	3.0	50%	
Paia Fire Station	Fire Station	3.0	75%	
Piiholo Water Treatment Plant	WTP	3.0	80%	
South Maui Community Park	Community Center/Park	3.9	100%	air cooled chiller
Victims Advocate Building	Office Building	3.0	100%	
Waiehu Golf Course	Golf course	3.0	50%	
Wailea Fire Station	Fire Station	3.0	60%	
Wailuku Baseyard	Baseyard	3.0	40%	
Wailuku Fire Station	Fire Station	3.0	80%	
Wailuku Police Station	Police Station	3.5	100%	chilled water- no BAS
West Maui Senior Center	Office Building	3.0	100%	

Cooling energy savings resulting from lighting retrofits are not cost effective to measure and verify, thus with the methodology described above, the Customer agrees that the savings generated through this reduction in cooling load will be achieved. The lighting wattages will be as measured by JCI.

These savings will not be measured, and have not been quantified, but will be quantified in the future and accounted for using the methodology described above.

Commissioning Procedure

Stand Alone Occupancy Sensors

Stand-alone Occupancy Sensors (SAOS) provide cost effective occupancy control for applications not requiring network integration or more sophisticated type control.

- Hallways: Areas designated in line by lines to receive wireless SAOS shall be set to occupancy mode – auto on/auto off. The sensor will turn the lights on automatically and then off after 15 minutes of no motion detected.
- Small Spaces (Example select storage closets): Areas designated in line by lines to received wall switch dual tech SAOS. The sensor will turn the lights on automatically and then off after 15 minutes of no motion detected.
- All other areas designated in line by lines shall receive wireless sensors set to vacancy mode – manual on/auto off. The local switch will manually turn the system on and the occupancy sensor will turn off after no motion is detected for 15 minutes

Wireless Room Based “Smart” Controls

In order to increase non-guaranteed energy savings, select areas will receive room-based lighting controls, including occupancy control, dimming and high-end trim set point. This strategy involves reducing lighting based on Illuminating Engineering Society-recommended (IESNA) maintained task light levels for individual spaces rather than the originally designed maintained light levels, which in many cases is higher than needed.

The lighting can still be dimmed to implement other strategies, such as manual control and daylight harvesting, but the high-end is capped, resulting in permanent energy savings.

- Integrated Occupancy and Daylight Harvesting sensor
    - Areas indicated in in line by lines shall receive integrated wireless occupancy and daylight harvesting sensors. The local switch will manually turn the system on and the occupancy sensor will turn off after no motion is detected for 15 minutes (or noted in table below)
- Grouping and Zoning
    - Grouping or zoning of fixtures will reflect current field conditions unless instructed otherwise prior to construction by the customer. Any modification or additional scenes/zones added may require a change order.
- Dimming Control
    - As noted in the line by line, interior areas marked to receive dimmable LED technology will be equipped with the necessary control devices. Users will be able to turn fixtures on/off or raise/lower light levels from the wall control device.
    - Bi-level occupancy sensor controls will be installed on new stairwell fixtures. This will allow the fixtures to be dim at a minimum level when the space is unoccupied. When an occupant enters the space, the fixtures will return to full brightness.
- Commissioning
    - Spaces are to be commissioned as individual rooms are retrofitted, which entails the following:
        - Fixtures will be paired with the wireless switch(es).
        - High-end trim will be applied to each space to meet the IES recommended light levels
        - Fixtures will be grouped/zone similar to existing conditions.
- Sequence of Operations and High End Trim Setpoints
    - Fixtures equipped with room-based controls and integral sensors shall be set up to capture additional energy savings using a high-end trim setpoint (table below).
    - For any areas not identified (in table below) JCI will reference the Lighting Handbook 10th Edition (IESNA) for high end trim settings

Maui County Sequence of Operations and Light Level Set Points (in Footcandles) Note: applicable to areas with Smart Controls							
Area Type	**High end trim Level**	**Number of Zones**	**(Button 1 press)**	**(Button 2 press)**	**Timeout Period**	**Action on Occ Timeout**	**Daylight Harvesting**
Office conference room or other general workspaces	46FC	1	35FC	50% of Button 1	10/20 min	50% at 10 min; Off after 20 min	JCI ILI PM to review
Gym - Recreational Play	28FC	1	14FC	50% of Button 1	10/20 min	50% at 10 min; Off after 20 min	JCI ILI PM to review
Halls	10FC	1	10FC (avg at floor)	NA	10/60 min	50% at 10 min; 10% after 30 min	JCI ILI PM to review

Break Room	28FC	1	24FC	50% of Button 1	10/20 min	50% at 10 min; Off after 20 min	no
Print/Copy Room	28FC	1	24 FC	50% of Button 1	10/20 min	50% at 10 min; Off after 20 min	no
Kitchen/Food Prep	50 FC	1	40 FC	50% of Button 1	30/45 min	50% at 30 min; Off after 45 min	no
Shop (wood/Metal/Machine)	93FC	1	75 FC	50% of Button 1	30/45 min	50% at 30 min; Off after 45 min	no
Library	30FC	1	24 FC	50% of Button 1	30/45 min	50% at 30 min; Off after 45 min	no

ESCO's Training Responsibilities

Johnson Controls project manager will provide one-time, two-hour training per department for local custodial or facilities staff for basic operation with a couple demonstrations including maintenance and a short question/answer period after training. Buildings or Departments slated for training include: Police, Fire, Community Centers, Parks, Senior Center and Administration/Finance.

ESCO's Maintenance Responsibilities

JCI will perform scheduled interior inspections once every 6 months to record County location outages. The inspections will take place during County working hours.

The semi-annual inspections will take place in January and July of each year.

Frequency of visits are determined by utilizing Manufacturer L70 lamp/fixture life data, quantities of equipment installed, site burn hours, and historical knowledge of the product and historical failure rates.

Site Inspection- What to Expect

- Walkthrough with on-site representative
- Location of outage(s)
- Outage type
- Recording of materials needed to correct outage(s)
- Creation of a service ticket
- Material will be ordered, or sourced from project attic stock
- Due to exterior controls and varying burn hours, the Site rep will be asked if they are aware of any exterior outages during the interior inspection

The site representative will be contacted to schedule the repair.

Materials

JCI shall provide replacement materials which match the equipment installed during the lighting upgrade program. If materials carry a long manufacturer lead-time to procure, become unavailable, or have been upgraded by the manufacturer, like kind may be utilized.

Johnson Controls

Repairs Needed Outside of Covered Equipment

If issues arise outside of standard equipment failure, these issues can be addressed with County approval on a time and material basis. An example would be power supply and wiring issues, or product damaged outside of the intent of which the product is designed.

Warranties

Each of the product types carry manufacturer warranties for a specific amount of time. JCI will facilitate the warranties with the manufacturers. If necessary JCI will return failed product to the manufacturer to receive the appropriate replacement.

When product warranties end, JCI will continue to include the cost of the material under the yearly submitted price for the planned service agreement.

Wall Switches with wireless dimming

- Each wall switch has a CR2032 disc battery, and the switch+battery is warranted from the manufacturer for 5 years
- JCI will replace the CR2032 batteries with a new battery every 5 years during the inspection service in that year, total of 4 times throughout the 20 year Planned Service Agreement term
- If, during an interim period between these 5-Year scheduled battery replacement intervals, a battery fails, JCI will replace the battery during one of the scheduled inspection services, which will occur every 6 months

Program Efficiencies

It is the intent of JCI to provide the County with a custom maintenance program. Through detailed inspections and on-site communication, we can schedule repairs to provide the least amount of disruption to the workplace. The program is designed to limit the amount of time the County spends managing their lighting maintenance needs.

Customer's Maintenance Responsibilities

It is the responsibility of the Customer (Site rep) to provide known interior failure information during the interior lighting inspections.

It is the responsibility of the customer to perform all repairs that are outside of the scope of work. Electrical repairs, Infrastructure repairs, and repairs of equipment not installed by JCI.

Operation and Maintenance (O&M) Cost Savings Calculations

Operation and Maintenance Cost avoidance achieved by reduced lighting material replacement resulting from installation of longer life LED technology. This is calculated on a room-by-room basis according to the run time of the room space and the service life of the LED retrofit proposed compared to the existing lighting technology installed.
For calculating materials savings, the cost and manufacturer's lifetime of each lamp, and LED in the project is used and averaged over the contract term. The average lamp life for different types of lamps are shown below:

Lamp	Lamp Wattage or Type	Average Lamp Life (Hrs)
Incandescent	100W	5,000
	150W	750
	40W / 50W / 60W	1,500

	65W	1,125
HID	1000W MH	12,000
	100W MH	20,000
	150W MH	15,000
	175W MH / 250W MH	10,000
	400W MH	20,000
	70W HPS	24,000
T8 Fluorescent	4' 25W	32,000
	4' 32W / 2' 17W	24,000
	3' 25W	36,000
	8' 59W	15,000
T12 Fluorescent	2' 20W	10,000
	3' 30W	18,000
	4' 34W	20,000
	60W	12,000
LED lamps	PAR20/ PAR38/ MR16/ screw in	25,000
	Retrofit plug in	30,000
	Tube / Pin-based lamps / HID replacement lamps / recessed can kits / canopy	50,000
	Wall pack	75,000
	Flood / area light / high bay	100,000

The following are the formulas used to quantify the O&M Savings:

Lamp Unit Cost per Hour = Average Lamp Cost ÷ Average Lamp Life .

Ballast Unit Cost per Hour = Average Ballast Cost ÷ Average Ballast Life.

Existing Annual Lamp Material Cost = Existing Burn Hours × Quantity of Lamps × Lamp Unit Cost per Hour .

Existing Annual Ballast Material Cost = Existing Burn Hours × Quantity of Ballasts × Ballast Unit Cost per Hour.

Proposed Annual Lamp Material Cost = Existing Burn Hours × Quantity of Lamps × Lamp Unit Cost per Hour.

Proposed Annual Ballast Material Cost = Existing Burn Hours × Quantity of Ballasts × Ballast Unit Cost per Hour.

Proposed Annual Material Cost = Proposed Burn Hours × ((Quantity of Lamps × Lamp Unit Cost per Hour) + (Quantity of Ballasts × Ballast Unit Cost per Hour)).

Annualized Project Term Material Savings = ((Project Term × (Existing Annual Lamp Material Cost + Existing Annual Ballast Material Cost)) - ((Project Term - Proposed Lamp Warranty Period) × Proposed Annual Lamp Material Cost) + ((Project Term - Proposed Ballast Warranty Period) × Proposed Annual Ballast Material Cost))) ÷ Project Term.

The lighting material savings calculation was performed on the entire inventory of lighting fixtures.

Applying both the current cost and expected useful life, operational cost savings (material only) are calculated, and the results are shown in the table below:

Facility	Annual Avg O&M Material Savings
Alfred "Flako" Boteilho Gymnasium - Interior Lighting	$51.42
Central Maui Regional Sports Complex - Interior Lighting	$48.29
Coach Sakamoto Pool - Interior Lighting	$36.04
Coach Shiraishi Memorial Pool - Interior Lighting	$20.53
Diamond Resort Boosters - Interior Lighting	$1.11
Duke Maliu Regional Park - Interior Lighting	$11.10
Eddie Tam Memorial Center - Interior Lighting	$266.53
Fire Prevention Bureau - Interior Lighting	$118.25
Forensic Facility - Interior Lighting	$420.83
H.A. Baldwin Park - Interior Lighting	$20.59
Hamakuapoko Well 2 - Interior Lighting	$0.68
Hana Community Center & Ball Park - Interior Lighting	$23.75
Hana Fire Station - Interior Lighting	$112.49
Hana Police Station - Interior Lighting	$23.01
Hanakao'o Park - Interior Lighting	$4.36
Honokowai Booster Pump - Interior Lighting	$0.33
Ho'okipa Beach Park - Interior Lighting	$25.00
Hoolehua Fire Station - Interior Lighting	$90.49
Iao Well - Interior Lighting	$1.83
Kahului Baseyard - Interior Lighting	$910.93
Kahului Community Center - Interior Lighting	$165.76
Kahului Fire Station - Interior Lighting	$630.27
Kahului Wastewater Reclamation Facility - Interior Lighting	$445.19
Kalama Park - Interior Lighting	$36.24
Kalana O Maui Building - Interior Lighting	$3,881.34
Kalana Pakui - Interior Lighting	$497.85
Kamaole I Beach Park - Interior Lighting	$9.56
Kamaole II Beach Park - Interior Lighting	$10.96
Kamaole III Beach Park - Interior Lighting	$3.68
Kamole Water Treatment Plant - Interior Lighting	$125.63
Kanaha Beach Park - Interior Lighting	$19.17
Kanoa Well 1 - Interior Lighting	$0.52
Kanoa Well 2 - Interior Lighting	$2.05
Kaunakakai Ball Park - Interior Lighting	$1.40
Kaunakakai Fire Station - Interior Lighting	$288.29
Kaunoa Senior Services - Interior Lighting	$575.74
Kaupakalua Well - Interior Lighting	$1.34
Kehalani Boosters - Interior Lighting	$1.00

Facility	Annual Avg O&M Material Savings
Kenolio Recreation Complex - Interior Lighting	$57.20
Keokea Park - Interior Lighting	$0.84
Keopuolani Regional Park - Interior Lighting	$58.22
Kihei Aquatic Center - Interior Lighting	$165.67
Kihei Community Center - Interior Lighting	$310.25
Kihei Fire Station - Interior Lighting	$71.70
Kihei Police Station - Interior Lighting	$1,676.33
Kihei Wastewater Reclamation Facility - Interior Lighting	$759.01
Kilohana Community Center - Interior Lighting	$28.15
Kilohana Park (Molokai) - Interior Lighting	$0.00
Kokua Pool - Interior Lighting	$26.32
Kualapuu Park & Community Center - Interior Lighting	$59.09
Kula Community Center - Interior Lighting	$107.08
Kula Fire Station - Interior Lighting	$104.50
Kula Water Treatment Plant - Interior Lighting	$211.77
Kupaa Well - Interior Lighting	$1.05
Lahaina Aquatic Center - Interior Lighting	$57.34
Lahaina Civic Center - Interior Lighting	$843.99
Lahaina Fire Station - Interior Lighting	$134.68
Lahaina Police Station - Interior Lighting	$493.38
Lahaina Recreation Center - Interior Lighting	$203.69
Lahaina Wastewater Reclamation Facility - Interior Lighting	$348.60
Lahainaluna Water Treatment Plant - Interior Lighting	$18.11
Lanai Fire Station - Interior Lighting	$109.20
Lanai Park & Tennis Courts - Interior Lighting	$38.17
Lanai Police Station - Interior Lighting	$253.02
Launiupoko Beach Park - Interior Lighting	$4.36
Lower Kula Boosters - Interior Lighting	$0.50
Mahinahina Baseyard - Interior Lighting	$206.57
Makawao Fire Station - Interior Lighting	$93.02
Makawao Veterans Cemetery - Interior Lighting	$27.38
Maui Meadows Pump - Interior Lighting	$25.10
Mayor Hannibal Tavares Community Center - Interior Lighting	$233.89
Mitchel Pauole Community Center - Interior Lighting	$102.88
Mokuhau Well - Interior Lighting	$5.00
Napili Fire Station - Interior Lighting	$148.97
Napili Park - Interior Lighting	$16.80
Napili Well B - Interior Lighting	$1.09
North Waihee Boosters - Interior Lighting	$1.16

Facility	Annual Avg O&M Material Savings
North Waihee Well - Interior Lighting	$2.50
Old Courthouse Building - Interior Lighting	$345.08
Olinda Water Treatment Plant - Interior Lighting	$39.83
Omaopio Boosters - Interior Lighting	$0.17
Paia Fire Station - Interior Lighting	$137.27
Papohaku Park - Interior Lighting	$25.00
Pookela Well - Interior Lighting	$2.53
Sewer Maintenance Building - Interior Lighting	$110.84
South Maui Community Center & Park - Interior Lighting	$37.23
Ukumehame Firing Range - Interior Lighting	$10.86
Upcountry Pool - Interior Lighting	$80.29
Velma McWayne Santos Community Center - Interior Lighting	$60.61
Wahikuli Terrace Park - Interior Lighting	$0.00
Waiakoa Gymnasium - Interior Lighting	$47.37
Waiehu Golf Course - Interior Lighting	$428.97
Waiehu Terrace Park - Interior Lighting	$0.84
Waihee 514,515 Well - Interior Lighting	$0.00
Waihee 577,578,579 Well - Interior Lighting	$3.99
Waikapu Well - Interior Lighting	$2.00
Wailea Beach Park - Interior Lighting	$0.00
Wailea Fire Station - Interior Lighting	$546.47
Wailuku Baseyard - Interior Lighting	$527.84
Wailuku Fire Station - Interior Lighting	$72.59
Wailuku Police Station - Interior Lighting	$1,452.95
Wailuku Pool - Interior Lighting	$112.26
Wailuku Well 1 - Interior Lighting	$1.16
Wailuku Well 2 - Interior Lighting	$1.83
War Memorial Complex - Interior Lighting	$209.92
Wells Park - Interior Lighting	$5.18
West Maui Senior Center - Interior Lighting	$270.62
Ulapalakua Radio Site - Interior Lighting	$1.83
Kahakuloa Radio Site - Interior Lighting	$1.66
Total	**$20,427**

Operational cost avoidance material savings are non-measured and will be considered as being achieved upon the County acceptance of the completed project. No labor savings have been calculated or included herein.

Facility Support Required and Customer's Responsibilities:

Transitions will be performed in a manner to minimize downtime. Johnson Controls will work directly with the County to determine interim occupant interaction and notification requirements during the lighting retrofits.

Facility must provide complete, legible, and up-to-date digital electrical drawings in CAD or PDF format for every building proposed in JCI scope of work. Failure to provide these in a timely manner prior to the start of construction will relieve JCI of the obligation to provide updated drawings depicting the lighting retrofit work at project closeout.

FIM 2 – Exterior LED Lighting Retrofits

Existing Conditions

Alfred "Flako" Boteilho Gymnasium

Exterior – Of the existing fixtures 7% are already LED and will not be retrofit. Most exterior lighting consists of wall packs with a mix of 70-watt high pressure sodium and two (2) 18-watt compact fluorescent 4-pin lamps and electronic ballast.

Central Maui Regional Sports Complex

Exterior Building, Walkway & Roadway – All are already LED fixtures, 100% and will not be retrofit.

Coach Sakamoto Pool

Exterior Building and Poles – All are already LED fixtures (100%) and will not be retrofit.

Coach Shiraishi Memorial Pool

Exterior Building and Poles – Of the existing building mounted fixtures 71% are already LED and will not be retrofit. The other fixtures left are also building mounted wall packs with two (2) 13-watt pin lamps or no lamps.

Cooke Memorial Pool

Exterior Building and Poles – Of the existing pole fixtures 17% are already LED and will not be retrofit and the balance of the Pole fixtures are 400-watt Metal Halide fixtures. Of the building mount fixtures, they are a combo of wall pack (1) 32-watt compact fluorescent 4-pin lamps and electronic ballast and flood fixtures with 90-watt incandescent par-28 lamps. The open-air building of locker and restrooms is mostly 4' fluorescent fixtures with 32-watt T8 lamps and electronic ballasts.

Diamond Resort Boosters

Exterior Building – No existing fixtures are LED. Only (1) jar fixture with 15-watt compact fluorescent lamp.

Duke Maliu Regional Park

Exterior Parking Lot Poles – Of the existing pole fixtures 77% are already LED and will not be retrofit and the balance of the Pole fixtures are 100-watt high pressure sodium fixtures.

Exterior Buildings & Building Mount - Of the building mount fixtures, 36% are already LED and will not be retrofit. The balance is a mix of canopy, wall, and flood fixtures with two (2) 60-watt incandescent lamps, 100-watt, and 150-watt high pressure sodium fixtures. Of the open-air buildings around the ball fields (concession & dugouts) none are existing LED. They are mostly 4' fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts.

Eddie Tam Memorial Center

Exterior Parking Lot Poles – Of the existing pole fixtures 100% are already LED and will not be retrofit.

Exterior Buildings & Building Mount - Of the building mount fixtures, 65% are already LED and will not be retrofit. The balance is a mix of canopy, wall, and flood fixtures with 50-watt metal halide, 70-watt high pressure sodium and 150-watt metal halide fixtures.

Fire Prevention Bureau

Exterior Building Mount - No existing fixtures are LED. The existing are wall pack 150-watt high pressure sodium fixtures.

Forensic Facility

Exterior Building Mount - Of the existing fixtures 66% are already LED and will not be retrofit. The balance of the fixtures are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

H.A. Baldwin Park

Exterior - Of the existing fixtures 6% are already LED and will not be retrofit. Most of the exterior are picnic area 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also, there are restroom fixtures with 42-watt compact fluorescent 4-pin lamps.

Haliimaile Park & Tennis

Exterior – Of the existing fixtures 57% are already LED and will be no retrofit. Most of the exterior are wall pack 70-watt high pressure sodium and 4’ fluorescent vapor tight fixtures with 34-watt T12 lamp and magnetic ballasts.

Hana Community Center and Ball Park

Exterior Building Mount - Of the building mount fixtures, 14% are already LED and will not be retrofit. The balance is a mix of canopy and wall pack/mount fixtures with 70-watt and 150-watt high pressure sodium fixtures.

Hana Fire Station

Exterior Building Mount - Of the building mount fixtures, 68% are already LED and will not be retrofit. The balance is a mix of flood fixtures with 500-watt quartz lamps and 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps and electronic ballasts.

Hana Police Station

Exterior - Of the exterior fixtures, 20% are already LED and will not be retrofit. The balance is a mix of pole shoe box fixtures with 250-watt high pressure sodium fixtures and wall pack fixtures with 70-watt high pressure sodium fixtures.

Hanakao’s Park

Exterior - No existing fixtures are LED. The existing fixtures are exterior fixture is a wall pack fixtures with 70-watt high pressure sodium fixtures.

Honokowai Booster Pump

Exterior - All the exterior fixtures are already LED and will not be retrofit.

Ho’okipa Beach Park

Exterior - Of the exterior fixtures, 6% are already LED and will not be retrofit. The balance are wall packs and canopy fixtures with 70-watt high pressure sodium lamps.

Iao Well

Exterior - No existing fixtures are LED. The exterior wall-mount fixtures are 2-lamp 13-watt compact fluorescent 2-pin lamps.

Kahakuloa Radio Site

Exterior - All the exterior fixtures are already LED and will not be retrofit.

Kahului Base-yard

Exterior – Of the existing fixtures 22% are already LED, wall packs, flood, and pole fixtures. There are additional wall packs with 70-watt high pressure sodium lamps and flood fixtures with 250-watt metal halide, compact fluorescent, and halogen lamps existing. Also, some existing 8’ strip fixtures with 32-watt T8 lamps and electronic ballast.

Kahalui Community Center

Exterior – Of the existing fixtures 41% are already LED, in flood and cylinder fixtures. Other cylinder and flood lights with 60 watts incandescent and 75 watts halogen. Wall packs with 150-watt metal halide and high-pressure sodium lamps.

Kahului Fire Station

Exterior – Of the existing fixtures 63% are already LED, mostly flood, pole shoe box and wall pack LED fixtures in good condition. Balance is made up of mostly 10” recessed can with 60-watt incandescent lamps, wall packs with 13-watt PL 2-pin lamps, flood fixtures 400-watt metal halide and 4’ vapor proof with 32-watt T8 lamp and ballast. Also, there is one pole shoe box existing 250-watt metal halide. Fixtures in good condition.

Kahului Wastewater Reclamation Facility

Exterior - Of the exterior fixtures, 51% are already LED and will not be retrofit. The majority are recessed cans with 20-watt compact fluorescent lamps. Also 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also wall pack fixtures with 70-watt and 250-watt metal halide, and 150-watt high pressure sodium. Another scope is the pole shoe box fixtures with two (2) 250-watt high pressure sodium lamps. Last, we also found wall-mount 32-watt compact fluorescent 4-pin lamps.

Kalama Park

Exterior - Of the exterior fixtures, 61% are already LED and will not be retrofit. The majority are wall pack fixtures with 70-watt high pressure sodium, 100-watt metal halide and two (2) 26-watt compact fluorescent 4-pin lamps. Also 4’ vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Another scope is the pole shoe box with two (2) 250-watt metal halide fixtures. Last, we found one (1) cobra head pole with 400-watt metal halide lamps by Tennis Court parking.

Kalana O Maui Building

Exterior - Of the exterior fixtures, 19% are already LED and will not be retrofit. The majority are drum fixtures with 60-watt incandescent lamps, 13-watt, and 20-watt compact fluorescent screw in lamps. Also recessed cans with 20-watt compact fluorescent lamps. The wall pack fixtures have 250-watt high pressure sodium. Another scope is the pole shoe box parking fixture with four (4) 150-watt high pressure sodium lamps. Last, we also found many additional 60-watt incandescent lamps, 13-watt, and 20-watt compact fluorescent screw in lamps.

Kalana Pakui

Exterior - No existing fixtures are LED. There are existing parking lot shoe box pole fixture with four (4) 150-watt high pressure sodium lamps. Also, there are existing walkway lantern pole fixtures with 150-watt high pressure sodium lamps. Last, we also found 18-watt and 20-watt compact fluorescent screw in lamps.

Kamaole I Beach Park

Exterior – No existing fixtures are LED. There are wall packs with 70-watt high pressure sodium lamps.

Kamaole II Beach Park.

Exterior – No existing fixtures are LED. There are wall packs with 70-watt high pressure sodium lamps.

Kamaole III Beach Park

Exterior – Of the exterior fixtures, 86% are already LED and will not be retrofit. There are wall packs with 70-watt high pressure sodium lamps.

Kamole Water Treatment Plant

Exterior – Of the exterior fixtures, 86% are already LED and will not be retrofit. There are wall packs with 70-watt and 150-watt high pressure sodium lamps.

There are flood fixtures with 50-watt and 100-watt high pressure sodium lamps and 50-watt halogen lamps.

Kanaha Beach Park

Exterior – Of the exterior fixtures, 60% are already LED (wall packs) and will not be retrofit. There are 150-watt metal halide cobra head pole fixtures. Also 120-watt halogen flood fixtures.

Kanoa Well I

Exterior – No existing fixtures are LED. There are wall packs with 250-watt high pressure sodium lamps.

Kanoa Well II

Exterior – No existing fixtures are LED. There are wall packs with 250-watt high pressure sodium lamps.

Kaunakakai Ball Park

Exterior – Of the exterior fixtures, 25% are already LED (flood) and will not be retrofit. The exterior fixtures in restrooms and dugout are 4' vapor tight fluorescent fixtures with 32-watt T8 lamps and 34-watt T12 lamps with electronic ballasts and magnetic ballasts.

Kaunakakai Fire Station

Exterior – Of the exterior fixtures, 37% are already LED (flood & wall-mount) and will not be retrofit. The exterior wall pack fixtures are 70-watt high pressure sodium. The exterior parking lot fixtures are 150-watt high pressure sodium shoe box pole fixtures.

Kaunoa Senor Services – Paia

Exterior – Of the existing fixtures 51% are already LED and will not be retrofit. Most flood lights are LED fixtures in good condition. Building poles are also LED and in good condition. Included in the scope are the parking poles that are 250-watt metal halide. Activity center wall packs have 2-lamp incandescent existing.

Kaupakalua Well

Exterior – No existing fixtures are LED. There are wall packs with 32-watt compact fluorescent 4-pin lamps.

Kehalani Boosters

Exterior – No existing fixtures are LED. There are wall packs with two (2) 13-watt compact fluorescent 2-pin lamps.

Kenolio Recreation Complex

Exterior – No existing fixtures are LED. The major fixture type is decorative fixture with 13-watt PL lamps and electronic ballast.

Keokea Park

Exterior – All existing fixtures are LED, 100%.

Keopuolani Regional Park

Exterior – Of the exterior fixtures, 81% are already LED and will not be retrofit. There are 4' fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. The exterior wall-mount fixtures are 13-watt, 18-watt, and 32-watt compact fluorescent 4-pin lamp fixtures. The exterior parking lot fixtures are 150-watt high pressure sodium shoe box pole fixtures. Last, the existing wall pack fixtures are 70-watt and 150-watt high pressure sodium fixtures.

Kihei Aquatic Center

Exterior – Of the existing fixtures 61% are already LED and will not be retrofit. Walkway, parking lot and three pool poles have already converted to LED. Existing wall packs are 50-watt metal halide and canopy fixtures are 100-watt high pressure sodium.

Kihei Community Center

Exterior – No existing fixtures are LED. The recessed and cylinder fixtures have 26-watt compact fluorescent 2-pin lamps.

Kihei Fire Station

Exterior – Of the existing fixtures 47% are already LED, majority being flood wall-mounts. The existing one (1) Pole shoe box fixture (250-watt metal halide) is in poor condition. The balance of the existing fixtures is 6’ recessed cans with 13-watt compact fluorescent 2-pin lamps and electronic ballast and 4’ & 8’ fluorescent fixtures with 28-watt T8 lamps and electronic ballast.

Kihea Police Station

Exterior – No existing fixtures are LED. Most exterior fixtures are wall packs with 150-watt high pressure sodium and 70-watt high pressure sodium fixtures. Also, we have 6’ recessed cans with 26-watt compact fluorescent 4-pin lamps and electronic ballasts. Next are shoe box and Pole spider top fixtures with 250-watt high pressure sodium lamps. All in good condition.

Kihei Wastewater Reclamation Facility

Exterior – Of the existing fixtures 54% are already LED, in flood and wall pack fixtures in good condition. There is building mounted wall packs and flood fixtures that are 70-watt, 50-watt, 100-watt and 90-watt halogen lamps. Also a few 4’ vapor proof fixture under canopy is 28-watt T8 lamp and ballast.

Kilohana Community Center

Exterior – Of the exterior fixtures, 16% are already LED and will not be retrofit. There are 4’ fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. The exterior wall-mount fixtures are 60-watt incandescent lamp fixtures. The exterior parking lot fixtures are 100-watt high pressure sodium shoe box pole fixtures.

Kilohana Park (Molokai)

Exterior – No scope of work here.

Kokua Pool

Exterior – Of the existing fixtures 40% are already LED, in pole flood fixtures in good condition. There is a wall pack that is 175-watt metal halide. Also a few 4’ vapor proof fixtures under the canopy that are 32-watt T8 lamps and ballast.

Kualapuu Park & Community Center

Exterior – Of the existing pole parking fixtures 100% are already LED and will not be retrofit.

Kula Community Center

Exterior – Of the existing fixtures 55% are already LED and will not be retrofit (wall packs). The remaining fixtures are recessed can with 50-watt halogen lamps.

Kula Fire Station

Exterior – Most wall-mounted fixtures and pole shoe box fixtures with corn cob LED lamps (47%) but the jelly jars fixtures have 40-watt incandescent lamps existing.

Kula Pump Station

Exterior – Of the exterior fixtures, 100% are already LED and will not be retrofit.

Kula Water Treatment Plant

Exterior – No existing exterior fixtures are LED. There majority of the fixtures are recessed canopy fixtures with 18-watt compact fluorescent 4-pin lamps. There are exterior shoe box pole fixtures with 70-watt high pressure sodium lamps. Additionally, there are wall pack and canopy fixtures with 70-watt high pressure sodium lamps and 18-watt compact fluorescent 4-pin lamps.

Kupaa Well

Exterior – No existing fixtures are LED. There are wall packs with 250-watt high pressure sodium fixtures.

Lahaina Aquatic Center

Exterior – Of the existing fixtures 41% are already LED, in wall pack fixtures in good condition. The remaining are 1x4 recessed fixtures with 28-watt T8 lamps and electronic ballast.

Lahaina Civic Center

Exterior – Of the existing fixtures, 46% are already LED. Mainly all Pole fixtures and bollards are LED fixtures and in good condition. The remaining canopy fixtures are 175-watt metal halide fixtures and recessed cans with incandescent bulbs. All in good condition.

Lahaina Fire Station

Exterior – Of the existing fixtures 55% are already LED, in flood, wall pack and pole spider top fixtures in good condition. There are wall pack with 100-watt high pressure sodium lamps and 14-watt PL 2-pin lamps. All in good condition.

Lahaina Police Station

Exterior – Of the existing fixtures 29% are already LED, in pole spider top fixtures in good condition. There are existing decorative fixtures with 100-watt high pressure sodium lamps. All in good condition.

Lahaina Recreation Center

Exterior – No existing fixtures are LED. There is existing recessed cans and wall packs with 26-watt compact fluorescent 4-pin lamps and electronic ballast. Fixtures in good condition.

Lahaina Wastewater Reclamation Facility

Exterior – Of the existing fixtures, 72% are already LED. Mainly flood, wall packs and shoe box fixtures. The remaining wall pack fixtures are 70-watt high pressure sodium, flood fixtures are 150-watt high pressure sodium flood and 300-watt halogen fixtures.

Lahainaluna Water Treatment Plant

Exterior – Of the existing fixtures, 46% are already LED and will not be retrofit (wall packs). The flood fixtures are 400-watt high pressure sodium.

Lanai Fire Station

Exterior – No existing fixtures are LED. There are 250-watt and 70-watt high pressure sodium wall pack fixtures. Also, some 4’ vapor proof fixtures with 34-watt T12 lamps and magnetic ballast.

Lanai Park & Tennis Courts

Exterior – Of the existing fixtures 55% are already LED and will not be retrofit (wall packs). The main fixtures are wall-mount fixtures are 20-watt and 13-watt compact fluorescent screw in lamps and 70-watt high pressure sodium. There are also some existing 4’ vapor tight and strip fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Lanai Police Station

Exterior – No existing fixtures are LED. There are existing 200-watt high pressure sodium wall pack fixtures. The driveway shoe box pole fixtures have 200-watt high pressure sodium fixtures. Also, there are 70-watt high pressure sodium recessed fixtures. Last there are 4’ vapor proof fixtures with 32-watt T8 lamps and electronic ballast.

Launiupoko Beach Park

Exterior – No exterior fixtures at this.

Lower Kulo Boosters

Exterior – No exterior fixtures are LED. Existing wall pack fixtures are two (2) 13-watt compact fluorescent 2-pin lamps.

Mahinahina Baseyard

Exterior – Of the existing fixtures 92% are already LED and will not be retrofit (wall packs & shoe box fixtures). There are some existing 4’ vapor tight fluorescent fixtures with 34-watt T12 lamps with magnetic ballasts.

Makawao Fire Station

Exterior – Of the existing fixtures 30% are already LED (wall-mount) and will not be retrofit. There is one (1) existing 150-watt metal halide flood fixture. Also, there are multiple screw in incandescent fixtures and some 4’ vapor proof 28-watt T8 lamps and electronic ballast.

Makawao Veterans Cemetery

Exterior – Of the existing fixtures, 88% are already LED, however 44% will not be retrofit, the remaining 44% existing LED will be retrofit to fit design strategy. There are existing LED wall packs will be replaced due to condition. Also, the existing canopy fixtures with two (2) 23-watt compact fluorescent 4-pin lamps.

Malu Ulu Olele Park

Exterior – No exterior fixtures are LED. Existing pole flood fixtures at Basketball court with two (2) 400-watt metal halide fixtures on each pole.

Maui Meadows Pump

Exterior – No existing fixtures are LED. There are floor fixtures with 32-watt compact fluorescent 4-pin lamps.

Mayor Hannibal Tavares Community Center

Exterior – Of the existing fixtures 67% are already LED, canopy fixtures. Additionally, there are 6’ recessed cans with 13-watt compact fluorescent 2-pin lamps and electronic ballast.

Mitchell Pauole Community Center

Exterior – Of the existing fixtures 75% are already LED and will not be retrofit (recessed cans). There are some existing 4’ wrap fluorescent fixtures with 32-watt T8 lamps with electronic ballasts.

Mokuhau Well

Exterior – Of the existing fixtures 50% are already LED and will not be retrofit (wall-mount). There are a mix of 250-watt high pressure sodium and 100-watt metal halide fixtures in flood, wall pack and pole lantern fixtures.

Napili Fire Station

Exterior – Of the existing fixtures, 88% are already LED. Mainly all shoe box, wall packs and flood fixtures. The remaining 1x4 strip fixtures are 28-watt T8 lamps and electronic ballast. All in good condition.

Napili Park

Exterior – No existing fixtures are LED. There are wall pack fixtures with 70-watt high pressure sodium lamps.

Napili Rd Pump

Exterior – Of the existing fixtures 50% are already LED and will not be retrofit (flood). There are flood fixtures with 42-watt compact fluorescent 4-pin lamps.

Napili Well B

Exterior – No existing fixtures are LED. There are 150-watt high pressure sodium high bay fixtures and wall pack fixtures with 42-watt compact fluorescent 4-pin lamps.

North Wailee Boosters

Exterior – No existing fixtures are LED. There are 150-watt high pressure sodium pole lantern fixtures and wall pack fixtures with 100-watt high pressure sodium lamps.

North Wailee Well

Exterior – No existing fixtures are LED. There are two (2) 120-watt halogen flood fixtures and wall pack fixtures with 100-watt high pressure sodium lamps.

Old Courthouse Building

Exterior – No existing fixtures are LED. The main fixtures are building mount drum fixtures with 60-watt and 100-watt incandescent lamps. The other fixture is a pole globe fixture with 150-watt high pressure sodium lamps.

Olinda Water Treatment Plant

Exterior – No existing fixtures are LED. There are existing wall pack fixtures with 70-watt high pressure sodium lamps. Also, there are existing 4' and 8' vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Last there is a spider top pole fixture with 150-watt high pressure sodium lamps.

Omaopio Boosters Exterior – Of the existing fixtures 100% are already LED and will not be retrofit (pole shoe box).

Paia Fire Station

Exterior – All building mounted fixtures are LED. The two (2) poles on the street each have three (3) 25-watt incandescent lamps. The fuel tank pole is a shoebox with 150-watt metal halide lamp.

Paia Park

Exterior – Of the existing fixtures 100% are already LED and will not be retrofit (pole cobra head in walkway).

Papohaka Park

Exterior – Of the existing fixtures 96% are already LED and will not be retrofit (pole shoe box & drum fixtures). There is a wall-mount fixtures with 32-watt compact fluorescent 4-pin lamps.

Pookela Well

Exterior – No existing fixtures are LED. There are wall-mount fixtures with two (2) 13-watt compact fluorescent 2-pin lamps.

Sewer Maintenance Building

Exterior – No existing fixtures are LED. There are existing 4' vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Also, there are recessed square fixtures with 100-watt incandescent lamps. Last there is flood fixtures with 250-watt and 400-watt high pressure sodium lamps.

South Maui Community Park

Exterior – Of the existing fixtures 46% are already LED and will not be retrofit (Pole Shoe Box). There are existing pole shoe box fixtures with 150-watt high pressure sodium lamps. There are also existing 4' vapor tight fluorescent fixtures with 32-watt T8 lamps with electronic ballasts. Last there is canopy fixtures with 70-watt high pressure sodium lamps.

Ukumehame Firing Range

Exterior – No existing fixtures are LED. There are existing flood fixtures with 400-watt and 1000-watt metal halide lamps and 150-watt high pressure sodium lamps. There are also existing 4' wrap and vapor tight fluorescent fixtures with 32-watt T8 and 34-watt T12 lamps with electronic and magnetic ballasts.

Ulapalakua Radio Site

Exterior – No existing fixtures are LED. There are existing wall-mount fixtures with 32-watt compact fluorescent 4-pin lamps.

Upcountry Pool

Exterior – Of the existing fixtures 45% are already LED, pole shoe box and wall sconce fixtures. Additionally, there are pole shoe box fixtures with 100-watt metal halide lamps and 70-watt high pressure sodium lamps.

Waiakoa Gymnasium

Exterior – No existing fixtures are LED. There are existing flood fixtures with 150-watt high pressure sodium lamps. There are existing wall pack fixtures with 18-watt compact fluorescent 4-pin lamps.

Waiehu Golf Course

Exterior – Of the existing fixtures 29% are already LED and will not be retrofit (pole cobra head and wall-mount fixtures). There are existing wall pack fixtures with 70-watt high pressure sodium lamps.

Waiehu Terrace Park

Exterior – Of the existing fixtures 63% are already LED and will not be retrofit (pole shoe box fixtures). There are existing wall pack and canopy fixtures with 20-watt compact fluorescent screw in lamps.

Waihee 514,515 Well

Exterior – No existing fixtures are LED. There are existing flood fixtures with two (2) 20-watt compact fluorescent screw in lamps.

Waihee 577,578,579 Well

Exterior – No existing fixtures are LED. There are existing pole shoe box fixtures with 100-watt high pressure sodium lamps. There are existing wall-mount fixtures with two (2) 32-watt compact fluorescent 4-pin lamps. There are existing flood fixtures with 120-watt halogen lamps.

Waikapu Well

Exterior – No existing fixtures are LED. There are existing shoe box fixtures with 150-watt and 175-watt metal halide lamps. There are existing wall pack fixtures with 42-watt compact fluorescent 4-pin lamps.

Wailee Beach Park

Exterior – No existing fixtures are LED. There are existing shoe box fixtures with 100-watt and 250-watt high pressure sodium lamps. There are existing bollards with 100-watt high pressure sodium lamps.

Wailea Fire Station

Exterior – Of the existing fixtures 92% are already LED, in flood, wall pack and pole shoe box top fixtures in good condition. Only a few flood fixtures with 50-watt halogen lamps existing. All fixtures are in good condition.

Wailuku Baseyard

Exterior – Of the existing fixtures, 65% are already LED, however 62% will not be retrofit, the remaining 3% existing LED will be retrofit to fit design strategy. There are existing wall pack fixtures with 70-watt and 150-watt high pressure sodium lamps, along with 300-watt halogen lamps. There are 8’ strip fixtures with 59-watt T8 lamps with electronic ballasts.

Wailuku Fire Station

Exterior – Of the existing fixtures 83% are already LED, in pole flood and flood fixtures in good condition. Balance of the fixtures are wall packs with 13-watt PL 2-pin lamps in good condition.

Wailuku Police Station

Exterior – Of the existing fixtures, 13% are already LED and will not be retrofit. There are existing shoe box, canopy, wall-mount, recessed and bollard fixtures with 70-watt, 100-watt, and 150-watt high pressure sodium lamps.

Wailuku Pool

Exterior – Of the existing fixtures, 38% are already LED and will not be retrofit. The main fixtures are under canopy 4’ vapor tight fixtures with 32-watt T8 lamps and electronic ballast.

Wailuku Well I

Exterior – Of the existing fixtures 100% are already LED and will not be retrofit (pole flood fixtures).

Wailuku Well II

Exterior – Of the existing fixtures 100% are already LED and will not be retrofit (pole flood fixtures).

War Memorial Complex

Exterior – Interior – Of the existing fixtures, 41% are already LED, however 40% will not be retrofit, the remaining 1% existing LED will be retrofit to fit design strategy. There are existing wall pack fixtures with 70-watt, 100-watt, and 150-watt high pressure sodium lamps. There are shoe box fixtures with 150-watt high pressure sodium lamps and 250-watt metal halide lamps. There are 2x4 recessed, 4' vapor tight fixtures with 32-watt T8 lamps and electronic ballast.

Wells Park

Exterior – Of the existing fixtures, 90% are already LED and will not be retrofit (cobra head, wall-mount and 4' wraps). There are existing pole top fixtures with 150-watt high pressure sodium lamps.

West Maui Senior Center

Exterior – Of the existing fixtures, 84% are already LED and will not be retrofit (recessed cans, exits and post top pole). There are existing wall pack fixtures with 70-watt metal halide lamps.

Existing Deficiencies

Many fire stations and police stations have existing vapor tight fixtures that are rusted, either from missing lenses or wet conditions in the location.

Kahalui Community Center has two (2) trailers not in service.

Kalana O Maui Building has older exterior fixtures with paint flaking.

Mala Ulu Ole Park has not been used in a long time from the auditors observed condition.

Alfred "Flake" Gymnasium exterior has fixtures with broken lenses.

FIM Description

Lighting energy efficiency upgrades provide a substantial energy benefit along with potential quality of light improvements. Facility owners realize significant operating utility savings, reduced maintenance costs, and improved overall lighting systems performance.

The existing lighting systems across Maui County consists of a wide variety of lighting technologies. The proposed solutions will result in improved efficiency. Effort has been made to standardize the installed components to reduce operational and maintenance costs over the life of the installed system. After the installation is complete, Johnson Controls will provide an attic stock of materials, as described below, for the County to utilize for replacement and general maintenance.

The following is a general overview of the most common lighting found within each building grouping. The complete lighting audit showing the exact existing quantities and types and the proposed improvements are found in Appendix 2.

This measure will retrofit specified existing lighting fixtures with new LED lighting technology. Existing LED technologies will not be upgraded unless specified by the line by line.

- "No Retrofit" is leaving the existing fixture as-is.
- "Retrofit" is upgrading existing to fixtures with LED technology, typically involving removing existing ballasts.
- "Relamp" is installing a compatible LED lamp that uses all existing fixture components as-is.
- "Retrofit with a Kit or Reflector" is removing internal fixture components, leaving existing housing, and installing a LED kit designed for existing fixture profile. Some kits may alter finished appearance of fixture.
- "New/ Replacement Fixture" is installing a new fixture in place of the existing.

See quantities in the table below:

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Total Count
Wailea Fire Station	24	0	2	0	0	26
Kihei Aquatic Center	47	0	8	0	21	76
Kihei Fire Station	7	0	1	4	3	15
Kula Fire Station	10	0	11	0	0	21
Makawao Fire Station	5	0	1	3	4	13
Paia Fire Station	13	0	1	0	1	15
Fire Prevention Bureau	0	0	0	0	8	8
Kihei Wastewater Reclamation Facility	61	9	8	0	34	112
Upcountry Pool	15	7	2	0	9	33
Mayor Hannibal Tavares Community Center	27	0	0	13	0	40
Kahului Fire Station	41	0	2	8	14	65
Wailuku Fire Station	15	0	1	0	2	18
Kokua Pool	2	0	0	0	3	5
Kahului Community Center	16	0	13	0	10	39
Kahului Baseyard	8	0	4	0	24	36
Kaunoa Senior Services	42	0	24	7	7	80
Napili Fire Station	15	0	0	0	2	17
Lahaina Fire Station	10	0	2	0	6	18
Lahaina Civic Center	41	1	27	5	21	95
Lahaina Police Station	4	0	0	0	9	13
Lahaina Wastewater Reclamation Facility	81	0	11	0	21	113
Kihei Police Station	0	0	0	17	57	74
Lahaina Recreation Center	0	15	0	16	0	31
Lahaina Aquatic Center	17	12	0	0	0	29
Coach Sakamoto Pool	31	4	4	0	0	39
Kenolio Recreation Complex	0	10	0	0	1	11
Keopuolani Regional Park	224	1	2	0	49	276
Eddie Tam Memorial Center	45	0	0	0	16	61
Hana Community Center & Ball Park	1	0	0	0	6	7

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Total Count
Hana Fire Station	15	0	0	0	7	22
Hana Police Station	1	0	1	0	3	5
Hanakao'o Park	0	0	0	0	1	1
Kahului Community Center	31	0	0	0	0	31
Kahului Wastewater Reclamation Facility	40	6	13	0	20	79
Kalama Park	66	5	2	0	37	110
Kalana O Maui Building	11	4	23	0	20	58
Kenolio Recreation Complex	13	9	7	0	4	33
Kihei Community Center	0	14	0	22	0	36
Lahaina Aquatic Center	16	0	0	0	10	26
Lahaina Civic Center	1	0	0	0	11	12
Lahaina Recreation Center	42	1	0	0	46	89
Old Courthouse Building	0	0	0	0	9	9
Papohaku Park	25	1	0	0	0	26
Sewer Maintenance Building	0	0	8	0	12	20
South Maui Community Park	56	0	0	0	65	121
Wells Park	28	1	0	0	2	31
Waiehu Golf Course	1	0	0	0	0	1
Wailuku Pool	12	0	0	0	20	32
Wailuku Police Station	11	17	1	0	54	83
Forensic Facility	12	0	1	0	5	18
Kaunakakai Fire Station	7	0	0	0	12	19
Kaunakakai Ball Park	1	0	0	0	3	4
Kilohana Community Center	3	0	4	0	12	19
Mitchel Pauole Community Center	40	0	0	0	13	53
Duke Maliu Regional Park	11	0	3	0	19	33
Cooke Memorial Pool	2	13	2	0	21	38
Hoolehua Fire Station	0	0	1	0	5	6
Kualapuu Park & Community Center	20	0	0	0	0	20
Lanai Park & Tennis Courts	11	0	15	0	10	36
Lanai Fire Station	0	1	0	0	10	11
Lanai Police Station	0	0	0	3	24	27
Makawao Veterans Cemetery	7	0	0	0	9	16
Wailuku Baseyard	36	0	1	7	14	58
West Maui Senior Center	71	0	6	0	8	85
Mahinahina Baseyard	24	0	0	0	2	26
Lahainaluna Wastewater Reclamation Facility	7	0	0	0	8	15
Wailuku Well 1	3	0	0	0	0	3
Wailuku Well 2	2	0	0	0	0	2
Waikapu Well	0	0	0	0	3	3

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Total Count
Napili Well B	0	0	1	0	6	7
Napili Rd Pump	2	1	0	0	2	5
Honokowai Booster Pump	1	0	0	0	0	1
Ukumehame Firing Range	0	0	5	0	18	23
Kula Water Treatment Plant	0	0	0	24	31	55
Olinda Water Treatment Plant	0	0	0	0	20	20
Hamakuapoko Well 2	4	1	1	0	1	7
Kaupakalua Well	0	0	0	0	6	6
Pookela Well	0	0	1	0	4	5
Lower Kula Boosters	0	0	0	0	2	2
Kamole Water Treatment Plant	5	0	4	0	6	15
Kula Pump Station	8	0	0	0	0	8
Maui Meadows Pump	0	3	0	0	0	3
Diamond Resort Boosters	0	0	1	0	0	1
Kula Community Center	15	0	0	12	0	27
Waiakoa Gymnasium	0	0	0	0	10	10
Alfred "Flako" Boteilho Gymnasium	1	0	0	0	12	13
Kanaha Beach Park	1	0	0	0	3	4
Kanaha Beach Park	5	0	1	0	0	6
Wahikuli Terrace Park	0	0	0	0	0	0
Paia Park	1	0	0	0	0	1
Keokea Park	2	0	0	0	0	2
Haliimaile Park & Tennis	4	0	0	0	12	16
War Memorial Complex	74	0	28	9	74	185
Kamaole I Beach Park	0	0	0	0	1	1
Kamaole II Beach Park	0	0	0	0	1	1
Kamaole III Beach Park	6	0	0	0	1	7
Malu Ulu Olele Park	0	0	0	0	2	2
Waiehu Terrace Park	5	0	0	0	3	8
Velma McWayne Santos Community Center	29	0	0	0	0	29
H.A. Baldwin Park	1	0	0	0	15	16
Ho'okipa Beach Park	1	0	0	0	16	17
Wailea Beach Park	0	2	0	0	13	15
Kalana Pakui	0	8	4	3	2	17
Napili Park	0	2	0	0	6	8
Kupaa Well	0	0	0	0	1	1
Mokuhau Well	5	0	0	0	0	5
Mokuhau Well	0	1	0	0	4	5
Waihee 514,515 Well	0	0	1	0	0	1
Waikapu Well	0	0	0	0	1	1

Site/Building Name	No Retrofit	Retrofit	Relamp	Retrofit with a Kit or Reflector	New/ Replacement Fixture	Total Count
Kanoa Well 1	0	0	0	0	1	1
Kanoa Well 2	0	0	0	0	1	1
North Waihee Boosters	0	1	0	0	3	4
North Waihee Well	0	0	2	0	3	5
Kehalani Boosters	0	0	0	0	2	2
Iao Well	0	0	0	0	4	4
Waihee 577,578,579 Well	0	0	1	0	7	8
Central Maui Regional Sports Complex	139	0	0	0	0	139
Ulapalakua Radio Site	0	0	0	0	8	8
Kahakuloa Radio Site	2	0	0	0	0	2
Coach Shiraishi Memorial Pool	10	0	0	0	3	13
TOTAL	**1,749**	**150**	**262**	**153**	**1,132**	**3,446**

Scope of Work

This section describes the contractual scope of work.

JCI shall upgrade specified existing lighting systems with newer technology energy efficient LED lighting systems.

JCI shall provide lighting retrofit work that will include all necessary labor, materials, equipment, fixture cleaning, transportation and storage for locations as identified in the detailed line by line, shown in Appendix 2 – Exterior Lighting Scope of Work. Work will be performed in accordance with current applicable local, state, and federal codes and regulations promulgated at the date of this document submission.

In general, unless otherwise specified in Appendix 2, the following are the significant elements of the lighting retrofit scope of work:

- Wrap, Strip, Shop and Vapor-tight fixtures shall be replaced with new LED fixtures, unless otherwise noted.
- Fluorescent T8 lamps, in fixtures not able to be replaced, shall be retrofitted with direct-wire LED tubes (Type-B).
- Recessed cans will be retrofitted with LED kits, unless otherwise noted.
- Fluorescent and incandescent lamps will be updated to LED in screw-based and pin-based locations, unless otherwise noted.
- Canopy and garage fixtures will be replaced with new LED fixtures, unless otherwise noted
- Exterior wall and pole mounted fixtures will be replaced with new LED fixtures, unless otherwise noted
- Exterior fixtures including, but not limited to, bollards, step lights, and in-grade floods, and other fixtures in hard façade/concrete shall be retrofitted with appropriate LED lamps, unless otherwise noted.
- Where applicable, exterior fixtures shall be installed with protective coatings recommended by the manufacturers for the coastal/island environment.
- General

- JCI shall provide an attic stock of 1.5% of the material. Extra stock consists of LED kits, lamps, drivers, and screw in LEDs only.
- Design illumination levels: In the absence of code-mandated lighting requirements, industry standards have been used as a guide, primarily the most recent edition of the Illuminating Engineering Society of North America (IESNA), IESNA Recommended Practice documents and IESNA Design Guides.
- Existing lighting systems were presumed to be designed based on IESNA recommended practices. In the event current light levels are above IESNA recommendations for the space type (i.e., over-lit), light levels may be reduced. In the event light levels are below IESNA recommendations for the space type, JCI will meet or exceed current light levels
- If the space is under-lit due to an inadequate spacing or quantity of fixtures from initial design, which requires adding fixtures, adding circuits, reconfiguration or new construction, this will be brought to the attention of the customer.
- JCI will take samples of existing and post-installation illumination levels in accordance with procedures recommended by IESNA using a light meter.

As Built Drawing Lighting Drawings

JCI shall provide as-built drawings showing the upgraded lighting fixture work. Customer must provide an electronic PDF or CAD drawing of existing reflected floor plan and circuitry. JCI will not be responsible for drafting drawings if none currently exist.

Exterior Lighting plans: Exterior drawings to match 1:1 customer provided exterior drawings

Fixture schedule (by JCI) included on exterior plans

The drawings shall contain:

- Identification of customer provided electrical panelboards on plans
- Fixture schedule with quantity of fixtures per drawing
- Updated drawings are to serve as a reference of upgraded illuminous technology only. No electric circuitry from the lighting electrical panels to the fixture will be designed or displayed on the JCI-furnished drawings described here.

Exclusions:

- Professional stamped Architectural or MEP engineered drawings are not included. Drawings are for design intent only. Drafting of new drawings to produce the as-built drawings if customer cannot provide any existing drawings.
- New seismic hardware. It is assumed that all existing lighting fixtures have properly installed seismic hardware that meets current code requirements. During replacement of existing fixtures, the existing seismic hardware will be reconnected to the newly installed fixtures. Correcting instances where the existing seismic hardware does not meet current code requirements is not included.
- Electrical permits and fees.
- Pre-Existing Conditions: Certain pre-existing conditions may be present within the County buildings that are non-compliant with applicable codes or are otherwise outside the scope of work. Regardless of whether such conditions may have been readily identifiable prior to the commitment of the work, JCI shall not be responsible for repairing such pre-existing

conditions unless such is expressly provided for in the Scope of Work or an approved change order. JCI, in its reasonable good-faith discretion, may determine whether it will bring said pre-existing conditions into compliance by agreeing to execute a change order with the County for additional compensation and, if appropriate, an extension of time to complete the work. This includes but is not limited to running new pipe and wire.

- It is assumed that each building has existing power feeds available at the fixture level to be able to provide power to each individual fixture being retrofitted. JCI is not responsible for running new power feeds or conduits
- Replacement, repair or upgrades to existing emergency and egress only lighting fixtures, is excluded, unless otherwise noted in Appendix 2.
- Replacement or repair of concrete pole footings or rusted bolts on footings. Existing light poles will be re-used. Repair of wiring to poles, if required, is not included.
- Lighting Poles will be checked for contact voltage. If any hazardous voltage is noted, work on that pole will be stopped and the customer and/or the utility company be notified immediately to correct the fault before any work will be performed.
- The addition of lighting fixtures in areas with existing illumination deficiencies is not covered under this scope of work unless otherwise noted in Appendix 2. If foot-candle levels do not meet minimum standards, the customer will be notified.
- Adding a new light pole, with a new fixture and lighting circuit, is excluded.
- Reconfiguration of existing fixture layout unless otherwise noted in Appendix 2.
- Replacement of existing wiring and/or electrical issues in exterior fixtures.
- Any electrical wiring other than that required for the retrofit or replacement within the existing lighting fixtures, the installation of new fixtures as scheduled, the installation of occupancy sensors and other controls.
- Repair, replacement and adjustments of existing sensors, time clocks, switches or energy management systems unless otherwise noted in Appendix 2.
- Repair or replacement of louvers or other components unless denoted in Appendix 2.
- In areas receiving a LED tube or LED lamp upgrade repair or replacement of yellowed, cracked, damaged or missing fixture lenses, louvers, or other components.
- Replacement of defective emergency battery back-up ballast unless otherwise noted in Appendix 2.
- Unless specified in the scope of work, no previsions are made to ensure that the light levels will comply with existing surveillance camera requirements.
- Replacement of existing lighting sockets and ballast unless otherwise noted.
- Correction or repair of electrical system deficiencies or any NFPA, NEC, or Local Code deficiencies unless provided for in the scope.
- Painting, plastering or any other type of repair to existing mounting surfaces after the removal or replacement of fixtures, unless otherwise noted.

Equipment Manufacturer / Warranty

The following table summarizes our proposed major equipment components and their manufacturer warranty.

Lighting Component	Manufacturer	Warranty
Building Attached Area Lighting	Signify, Cooper or equivalent	5 years
LED Pole Head Fixture	Signify, Cooper or equivalent	5 years
LED T8 Lamps	Keystone, Espen, Green Creative or equivalent	5 years
Screw-in LED Lamps	Keystone, Green Creative or equivalent	3 years

- Material Warranties - Manufacturer warranties of lamps, retrofit kits, and fixtures installed as part of the project are covered by the individual manufacturer's published documentation. Johnson Controls will furnish contact information for each manufacturer.

Energy Savings Calculations

Lighting Retrofits Energy Savings

There are savings specifically associated with the reduction in wattage due to the lighting retrofits. The equations used are shown below:

Equations for Calculating Lighting Retrofit Savings

Demand (kW)

$$\text{Connected kW Savings} = \sum_u [(\text{kW/Fixture}_{baseline} \times \text{Quantity}_{baseline} - \text{kW/Fixture}_{post} \times \text{Quantity}_{post})]_{t,u}$$
$$\text{Actual kW Savings} = \sum_u [\text{Connected kW Savings}_u \times \text{Coincident Factor}_u]_{t,u}$$

where:

$\text{kW/fixture}_{baseline}$ =	lighting baseline demand per fixture for usage group *u*
kW/fixture_{post} =	lighting demand per fixture during post-installation period for usage group
$\text{Quantity}_{baseline}$ =	quantity of affected fixtures before the lighting retrofit for usage group *u*
Quantity_{post} =	quantity of affected fixtures after the lighting retrofit for usage group *u*
$\text{Coincident Factor}_u$ =	Coincident Factor is a percentage multiplier to account for Demand Diversity of each specific usage group *u*.

Annual demand cost savings have been ignored, assuming that the demand reduction from exterior lighting happens normally at night. However, in facilities where it is the exterior lighting that sets the monthly demand, then savings will be determined by multiplying the kW demand savings by the corresponding facility demand rate ($/kW) times 12.

Energy (kWh)

$$\text{kWh Savings}_{Lighting} = \sum_u [\text{Connected kW Savings}_u \times \text{Burn Hours}]_{t,u}$$

where:

$\text{Connected kW Savings}_u$ =	total connected fixture demand reduction for usage group *u*
Burn Hours =	number of operating hours during the time period *t* for the usage group *u*

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

Baseline Measurements

The wattage of the existing fixtures was measured on a sample of fixtures that meet a confidence level of 80% and a precision of 20%– assuming a coefficient of variance of 0.5 –using a true RMS meter. Fixtures with similar lamps and ballasts, counts and types were grouped together with a lamp/ballast code. These values form the basis for the baseline energy consumption and will not be measured again.

Measurements were taken on a total of approximately 282 fixtures, in 21 different sites between 7/25/22 and 8/5/22. These measurements will not be taken again.

Below are the measured pre-retrofit per fixture wattages.

Fixture Description	Fixture Code	Pre-retrofit Wattage per fixture
Fluorescent, (2) 48", 25WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	2X25T8EBN	37.8
Fluorescent, (1) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	1X32T8EBN	28.2
Fluorescent, (3) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	3X32T8EBN	86.0
Fluorescent, (2) 48", 34WT12 lamps, Magnetic Ballast	2X34T12MB	66.2
Metal Halide, (1) 400W lamp	1X400MH	440.0
Fluorescent, (1) 48", 34WT12 lamps, Magnetic Ballast	1X34T12MB	36.9
Fluorescent, (4) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	4X32T8EBN	106.4
Fluorescent, (2) 48", 32WT-8 lamps, Instant Start Ballast, NLO (0.85 < BF < 0.95)	2X32T8EBN	55.4
Fluorescent, (3) 48", 32WT-8 lamps, (2) Instant Start Ballast, NLO (0.85 < BF < 0.95)	3X32T8EBN2	81.2
Metal Halide, (1) 250W lamp	1X250MH	312.0
High Pressure Sodium, (1) 70W lamp	1X70HPS	86.3
High Pressure Sodium, (1) 150W lamp	1X150HPS	170.3
High Pressure Sodium, (1) 250W lamp	1X250HPS	269.4
Metal Halide, (1) 1000W lamp	1X1000MH	1020.1
Metal Halide, (1) 1500W lamp	1X1500MH	1511.5

Burn Hours

Burn hours have been estimated based on space type typical use, and from data collected during onsite surveys.

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
PARK	BF	Ball Field Surrounding Areas	2600	1820	30%
PARK-L	BF	Ball Field Surrounding Areas Low Hours	1040	1040	0%
PARK	X	Exit Sign	8760	8760	0%
COMM	E	Exterior 1	4368	4368	0%
PARK	E	Exterior 2	1456	1456	0%
WWT	E	Exterior 3	8760	8760	0%
COMM-L	E-L3	Exterior low hours 1	1092	1092	0%
FIRE	E-L6	Exterior low hours 2	2184	2184	0%
F-P-L	E-L3	Exterior low hours 3	1082	1082	0%
PARK-L	E-L1	Exterior low hours 4	365	365	0%
	E-L2	Exterior low hours 5	728	728	0%
WWT	E-L12	Exterior low hours 6	4368	4368	0%
	GA	Garage/Parking Decks	4368	4368	0%
	GA-L	Garage/Parking Decks Low	3713	3713	0%
POOL	LR	Locker Room	3016	3016	0%

Master Schedule Name Per Building List	Area Specific or Hrs Type Custom Codes	Description	Existing Burn Hours Assigned	Proposed Controlled Burn Hours	% Hours Reduction
POOL	ME	Mechanical/Electrical Rooms	494	494	0%
POOL	OO	Open Office	3016	3016	0%
PARK	ALL-PARK	Overall Park hours	5460	5460	0%
PARK	ST	Storage	1248	1248	0%
POOL	UT	Utility/Janitor Closets	1248	1248	0%
PARK	WS	Workshop	2600	2600	0%

The below summarizes the total Lighting Retrofits Energy Savings (for details by site refer to Appendix 11):

Table 2: FIM 2 Energy Savings Summary

Elec (kWh)	Demand (kW)	$-Elec	$-Demand	**$-Total**
514,894	-	$173,811.91	$0.00	**$173,811.91**

Commissioning Procedure

Since there are no controls being included for exterior lighting, there are no commissioning procedures required.

ESCO's Training Responsibilities

Since there are no controls being included for exterior lighting, there is no special training being provided or included.

ESCO's Maintenance Responsibilities

JCI will request exterior outage information from the site representative during the interior inspections.

The semi-annual inspections will take place in January and July of each year during the interior inspections.

Frequency of visits are determined by utilizing Manufacturer L70 lamp/fixture life data, quantities of equipment installed, site burn hours, and historical knowledge of the product and historical failure rates.

If Maui County enacts a new outdoor lighting ordinance, JCI shall, at its discretion, either adjust the price or inclusions of the Annual Lighting Maintenance Services to account for the increased cost of compliance to any new ordinance, or discontinue the Lighting Maintenance Service, whereby maintenance responsibility for outdoor lighting would revert back to the County.

Site Inspection- What to Expect

- Communication with Site rep to determine exterior outages.
- Location of outage(s)
- Outage type
- Recording of materials needed to correct outage(s)
- Height of equipment
- Creation of a service ticket
- Material will be ordered, or sourced from project attic stock

- Due to exterior controls and varying burn hours, the Site rep will be asked if they are aware of any exterior outages during the interior inspection.

Repair will be completed by a Lighting Technician after parts are received.

Materials

JCI shall provide replacement materials that match the equipment installed during the lighting upgrade program. If materials carry a long manufacturer lead-time to procure, become unavailable, or have been upgraded by the manufacturer, like kind may be utilized.

Repairs Needed Outside of Covered Equipment

If issues arise outside of standard equipment failure, these issues can be addressed with County approval on a time and material basis. An example would be power supply and wiring issues, or product damaged outside of the intent of which the product is designed.

Warranties

Each of the product types carry manufacturer warranties for a specific amount of time. JCI will facilitate the warranties with the manufacturers. If necessary, JCI will return failed product to the manufacturer to receive the appropriate replacement.

When product warranties end, JCI will continue to include the cost of the material under the yearly submitted price.

Program Efficiencies

It is the intent of JCI to provide the County with an efficient, comprehensive maintenance program. Through detailed inspections we can schedule repairs to provide the least amount of disruption to the workplace. The program is designed to limit the amount of time the County spends managing their lighting maintenance needs.

Customer's Maintenance Responsibilities

It is the responsibility of the Customer (Site rep) to provide exterior failure information during the interior lighting inspections.

It is the responsibility of the customer to perform all repairs that are outside of the scope of work. Electrical repairs, Infrastructure repairs, and repairs of equipment not installed by JCI.

Operation and Maintenance (O&M) Cost Savings Calculations

Operation and Maintenance Cost avoidance achieved by reduced lighting material replacement resulting from installation of longer life LED technology. This is calculated on a room-by-room basis according to the run time of the room space and the service life of the LED retrofit proposed compared to the existing lighting technology installed.

For calculating materials savings, the cost and manufacturer's lifetime of each lamp, and LED in the project is used and averaged over the contract term. The average lamp life for different types of lamps are shown below:

Lamp	Lamp Wattage or Type	Average Lamp Life (Hrs)
Incandescent	100W	5,000
	150W	750
	40W / 50W / 60W	1,500
	65W	1,125
HID	1000W MH	12,000
	100W MH	20,000
	150W MH	15,000
	175W MH / 250W MH	10,000
	400W MH	20,000
	70W HPS	24,000
T8 Fluorescent	4' 25W	32,000
	4' 32W / 2' 17W	24,000
	3' 25W	36,000
	8' 59W	15,000
T12 Fluorescent	2' 20W	10,000
	3' 30W	18,000
	4' 34W	20,000
	60W	12,000
LED lamps	PAR20/ PAR38/ MR16/ screw in	25,000
	Retrofit plug in	30,000
	Tube / Pin-based lamps / HID replacement lamps / recessed can kits / canopy	50,000
	Wall pack	75,000
	Flood / area light / high bay	100,000

The following are the formulas used to quantify the O&M Savings:

Lamp Unit Cost per Hour = Average Lamp Cost ÷ Average Lamp Life.

Ballast Unit Cost per Hour = Average Ballast Cost ÷ Average Ballast Life.

Existing Annual Lamp Material Cost = Existing Burn Hours × Quantity of Lamps × Lamp Unit Cost per Hour.
Existing Annual Ballast Material Cost = Existing Burn Hours × Quantity of Ballasts × Ballast Unit Cost per Hour.

Proposed Annual Lamp Material Cost = Existing Burn Hours × Quantity of Lamps × Lamp Unit Cost per Hour.

Proposed Annual Ballast Material Cost = Existing Burn Hours × Quantity of Ballasts × Ballast Unit Cost per Hour.

Proposed Annual Material Cost = Proposed Burn Hours × ((Quantity of Lamps × Lamp Unit Cost per Hour) + (Quantity of Ballasts × Ballast Unit Cost per Hour)).

Annualized Project Term Material Savings = ((Project Term × (Existing Annual Lamp Material Cost + Existing

Annual Ballast Material Cost)) - ((Project Term - Proposed Lamp Warranty Period) × Proposed Annual Lamp Material Cost) + ((Project Term - Proposed Ballast Warranty Period) × Proposed Annual Ballast Material Cost))) ÷ Project Term.
The lighting material savings calculation was performed on the entire inventory of lighting fixtures.

Applying both the current cost and expected useful life, operational cost savings (material only) are calculated and the results are shown in the table below:

Facility	Annual O&M Material Savings
Alfred "Flako" Boteilho Gymnasium - Exterior Lighting	$23.32
Central Maui Regional Sports Complex - Exterior Lighting	$0.00
Coach Sakamoto Pool - Exterior Lighting	$9.42
Coach Shiraishi Memorial Pool - Exterior Lighting	$0.00
Cooke Memorial Pool - Exterior Lighting	$116.21
Diamond Resort Boosters - Exterior Lighting	$1.16
Duke Maliu Regional Park - Exterior Lighting	$39.25
Eddie Tam Memorial Center - Exterior Lighting	$111.68
Fire Prevention Bureau - Exterior Lighting	$43.44
Forensic Facility - Exterior Lighting	$9.77
H.A. Baldwin Park - Exterior Lighting	$11.21
Haliimaile Park & Tennis - Exterior Lighting	$15.11
Hamakuapoko Well 2 - Exterior Lighting	$4.26
Hana Community Center & Ball Park - Exterior Lighting	$26.12
Hana Fire Station - Exterior Lighting	$4.44
Hana Police Station - Exterior Lighting	$10.50
Hanakao'o Park - Exterior Lighting	$1.38
Honokowai Booster Pump - Exterior Lighting	$0.00
Ho'okipa Beach Park - Exterior Lighting	$22.30
Hoolehua Fire Station - Exterior Lighting	$19.06
Iao Well - Exterior Lighting	$15.35
Kahului Baseyard - Exterior Lighting	$99.55
Kahului Community Center - Exterior Lighting	$69.80
Kahului Fire Station - Exterior Lighting	$61.07
Kahului Wastewater Reclamation Facility - Exterior Lighting	$280.82
Kalama Park - Exterior Lighting	$113.14
Kalana O Maui Building - Exterior Lighting	$111.10
Kalana Pakui - Exterior Lighting	$100.04
Kamaole I Beach Park - Exterior Lighting	$1.38
Kamaole II Beach Park - Exterior Lighting	$2.11
Kamaole III Beach Park - Exterior Lighting	$5.18
Kamole Water Treatment Plant - Exterior Lighting	$87.01
Kanaha Beach Park - Exterior Lighting	$7.23

Facility	Annual O&M Material Savings
Kanoa Well 1 - Exterior Lighting	$15.62
Kanoa Well 2 - Exterior Lighting	$15.62
Kaunakakai Ball Park - Exterior Lighting	$3.15
Kaunakakai Fire Station - Exterior Lighting	$53.51
Kaunoa Senior Services - Exterior Lighting	$134.45
Kaupakalua Well - Exterior Lighting	$30.12
Kehalani Boosters - Exterior Lighting	$7.67
Kenolio Recreation Complex - Exterior Lighting	$31.73
Keokea Park - Exterior Lighting	$0.00
Keopuolani Regional Park - Exterior Lighting	$58.98
Kihei Aquatic Center - Exterior Lighting	$157.38
Kihei Community Center - Exterior Lighting	$38.06
Kihei Fire Station - Exterior Lighting	$23.60
Kihei Police Station - Exterior Lighting	$494.27
Kihei Wastewater Reclamation Facility - Exterior Lighting	$494.72
Kilohana Community Center - Exterior Lighting	$8.45
Kokua Pool - Exterior Lighting	$9.28
Kualapuu Park & Community Center - Exterior Lighting	$0.00
Kula Community Center - Exterior Lighting	$30.51
Kula Fire Station - Exterior Lighting	$18.58
Kula Pump Station - Exterior Lighting	$0.00
Kula Water Treatment Plant - Exterior Lighting	$359.28
Kupaa Well - Exterior Lighting	$15.62
Lahaina Aquatic Center - Exterior Lighting	$74.71
Lahaina Civic Center - Exterior Lighting	$161.12
Lahaina Fire Station - Exterior Lighting	$19.06
Lahaina Police Station - Exterior Lighting	$33.99
Lahaina Recreation Center - Exterior Lighting	$109.02
Lahaina Wastewater Reclamation Facility - Exterior Lighting	$201.84
Lahainaluna Water Treatment Plant - Exterior Lighting	$126.00
Lanai Fire Station - Exterior Lighting	$53.62
Lanai Park & Tennis Courts - Exterior Lighting	$7.43
Lanai Police Station - Exterior Lighting	$91.20
Lower Kula Boosters - Exterior Lighting	$7.67
Mahinahina Baseyard - Exterior Lighting	$5.34
Makawao Fire Station - Exterior Lighting	$15.41
Makawao Veterans Cemetery - Exterior Lighting	$10.37
Malu Ulu Olele Park - Exterior Lighting	$8.11
Maui Meadows Pump - Exterior Lighting	$0.50
Mayor Hannibal Tavares Community Center - Exterior Lighting	$30.13

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Facility	Annual O&M Material Savings
Mitchel Pauole Community Center - Exterior Lighting	$21.96
Mokuhau Well - Exterior Lighting	$70.16
Napili Fire Station - Exterior Lighting	$3.86
Napili Park - Exterior Lighting	$9.12
Napili Road Pump - Exterior Lighting	$9.85
Napili Well B - Exterior Lighting	$54.02
North Waihee Boosters - Exterior Lighting	$32.81
North Waihee Well - Exterior Lighting	$39.31
Old Courthouse Building - Exterior Lighting	$19.36
Olinda Water Treatment Plant - Exterior Lighting	$151.95
Paia Fire Station - Exterior Lighting	$12.00
Paia Park - Exterior Lighting	$0.00
Papohaku Park - Exterior Lighting	$0.75
Pookela Well - Exterior Lighting	$19.32
Sewer Maintenance Building - Exterior Lighting	$10.92
South Maui Community Center & Park - Exterior Lighting	$97.91
Ukumehame Firing Range - Exterior Lighting	$28.92
Upcountry Pool - Exterior Lighting	$115.35
Velma McWayne Santos Community Center - Exterior Lighting	$0.00
Wahikuli Terrace Park - Exterior Lighting	$0.00
Waiakoa Gymnasium - Exterior Lighting	$10.88
Waiehu Golf Course - Exterior Lighting	$0.00
Waiehu Terrace Park - Exterior Lighting	$1.42
Waihee 514,515 Well - Exterior Lighting	-$1.72
Waihee 577,578,579 Well - Exterior Lighting	$0.00
Waikapu Well - Exterior Lighting	$37.67
Wailea Beach Park - Exterior Lighting	$10.50
Wailea Fire Station - Exterior Lighting	$3.87
Wailuku Baseyard - Exterior Lighting	$85.33
Wailuku Fire Station - Exterior Lighting	-$0.08
Wailuku Police Station - Exterior Lighting	$419.53
Wailuku Pool - Exterior Lighting	$33.78
Wailuku Well 1 - Exterior Lighting	$0.00
Wailuku Well 2 - Exterior Lighting	$0.00
War Memorial Complex - Exterior Lighting	$92.53
Wells Park - Exterior Lighting	$5.29
West Maui Senior Center - Exterior Lighting	$59.15
Ulapalakua Radio Site - Exterior Lighting	$0.00
Kahakuloa Radio Site - Exterior Lighting	$0.00
TOTAL	**$5,834**

Facility Support Required and Customer’s Responsibilities:

Transitions will be performed in a manner to minimize downtime. Johnson Controls will work directly with the County to determine interim occupant interaction and notification requirements during the lighting retrofits.

Facility must provide complete, legible, and up-to-date digital electrical drawings in CAD or PDF format for every building proposed in JCI scope of work. Failure to provide these in a timely manner prior to the start of construction will relieve JCI of the obligation to provide updated drawings depicting the lighting retrofit work at project closeout.

FIM 3 – Plug Load Controls

Existing Conditions

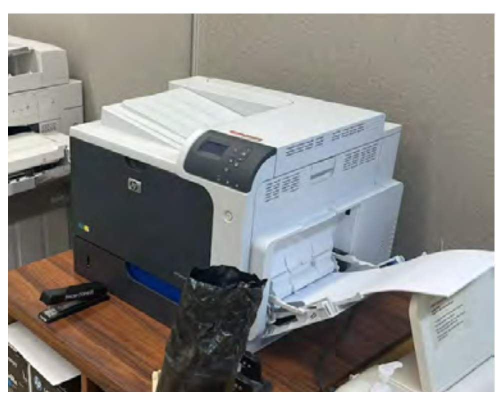
Most office buildings in the County, like other local government or State buildings, will have a certain amount of plug loads (printers, vending machines, etc.) that typically will remain plugged in to an outlet 24 hours per day, 7 days per week. These plug loads still draw power even when nobody is in the building, even when they are in the "standby/off" mode.

Johnson Controls selected buildings for site surveys using the following criteria: 1) only occupied during normal office hours, 2) areas with a high degree of probability of having those typical plug load devices, and 3) have good Wi-Fi coverage. The following table shows the quantities of the plug loads that have been identified as candidates for plug load controls.

Site	Projector	Medium Printer	Window A/C Unit	Large Copy Machine	Air Cleaner	Hot/Cold Water Dispenser	Large Coffeemaker	TV/Monitor	Snack Vending Machine	TOTAL
Old Courthouse	0	16	0	5	8	0	0	0	0	**29**
Kalana O Maui	1	74	0	26	36	12	1	20	1	**171**
Kalana Pakui	0	8	0	1	5	0	0	2	0	**16**
Fire Prevention Bureau	1	6	0	2	0	0	1	5	0	**15**
Eddie Tam Memorial Center	0	4	2	1	0	1	0	0	0	**8**
Haiku Community Center	0	1	0	0	0	1	0	1	0	**3**
Mayor Hannibal Tavares Community Center	0	6	0	0	0	0	0	0	0	**6**
TOTAL	**2**	**115**	**2**	**35**	**49**	**14**	**2**	**28**	**1**	**248**

Like any other electronic device, printers will use a certain amount of power even in the "off" position. Even though there is a large number of various types identified in the audit, only some will be controlled. Below are pictures of typical medium sized printers:

Kalana O Maui 5th floor



Mayor Hannibal Tavares Community Center

Below is a typical window A/C unit that can be easily controlled and completely powered off during unoccupied hours.

Eddie Tam Memorial Center – District Office

Below is a picture of an air purifier that is typically left running 24/7. This equipment is a very good candidate for plug load controls, which will power off the air purifier during unoccupied hours, and only run the machine when the occupants are in the buildings.

Below are pictures of typical projectors and TV/monitors that draw some power when in their “Sleep” or “off” state. These also can be powered off during unoccupied periods:

Projector Kalana O Maui

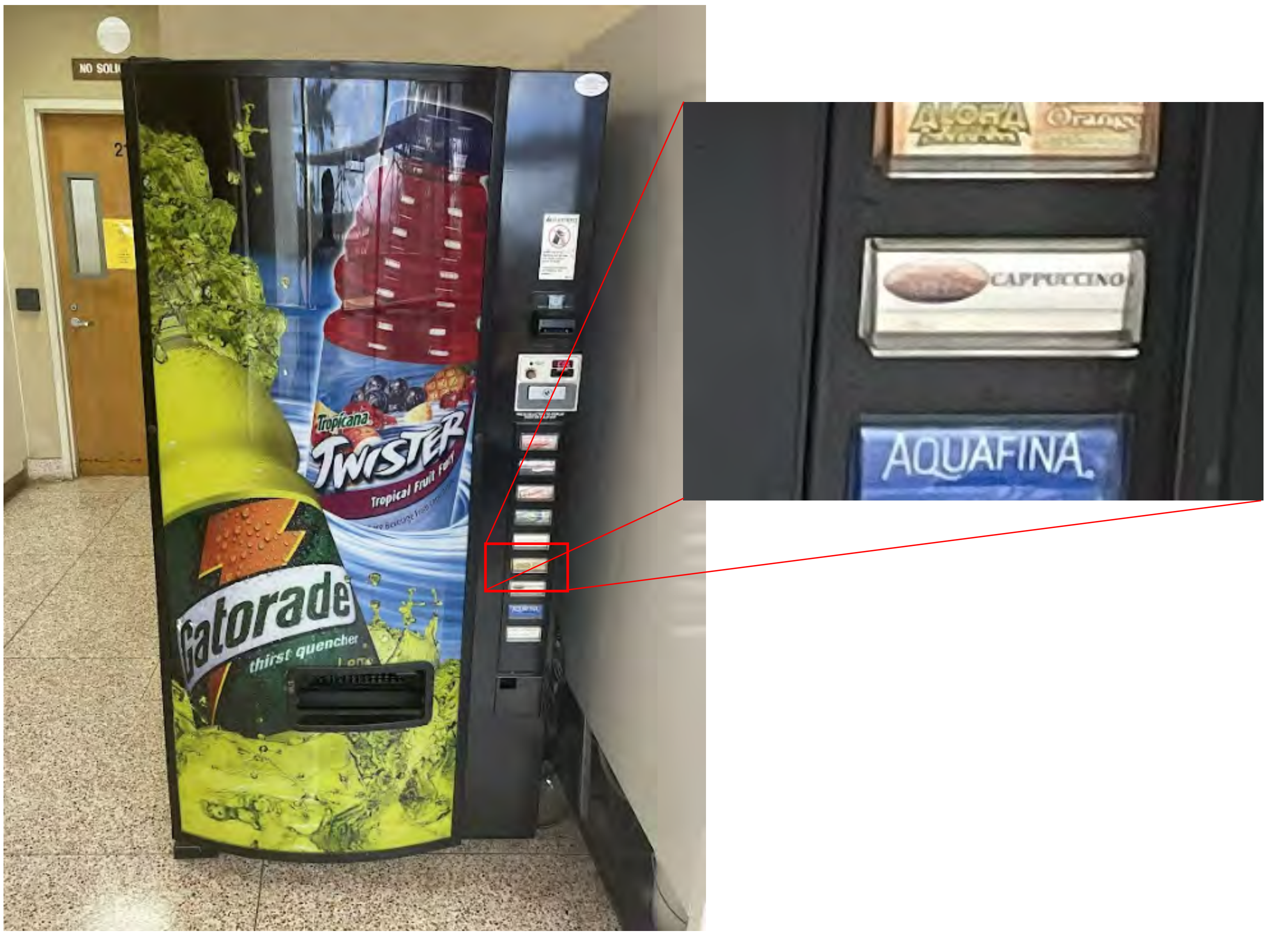
TV/Monitors on the 1st floor of Kalana O Maui

Finally, non-perishable (non-refrigerated) snack machines like the one pictured below are candidates for occupancy control:

Snack Vending Machine in 2nd floor of Kalana O Maui

Existing Deficiencies

Cold vending machines are typically very good candidates for plug load controls as they normally draw a lot of power even when idle and can be turned off during unoccupied hours without the risk of damaging the product. However, in this case, the existing machines seem to have dairy-based products that should not be allowed to get warm. Thus, these cold vending machines have not been included in this analysis.



Cold Drink Vending Machine on 2nd floor or Kalana O Maui

Large copy machines, like the one pictured below, are very common in office buildings, and these machines also draw a fair amount of power when they are idle or in their “sleep” model. For this reason, copy machines are typically very good candidates for plug load controls and have them powered off during unoccupied hours. However, it is very common for these copy machines to not be owned by the County and instead be leased from manufacturers like Xerox, and it is not uncommon for the manufacturers to not allow the machines to be without power. Therefore, to avoid potential issues with copy machine manufacturers, these have not been included in this analysis.

Old Courthouse

FIM Description

The proposed solution will allow for control of specified plug loads amongst the County buildings. The solution is comprised of a hardware component and a software component, both of which will communicate via an existing WIFI network.

The hardware component consists of smart plug load controllers that use the existing WIFI network to communicate with the software. These controllers are plugged into the outlet that the device is currently using and then the device will plug into the controller. There are various plug load controllers depending on the type of plug load being controlled (*Smart Plugs* series are used for devices such as projectors, printers, copiers, vending machines, coffee makers, monitors, TVs, etc. while *Inline* series are sometimes used for devices such as PTAC air conditioning units, electric hot water heaters, kitchen/bathroom exhaust fans, etc.).

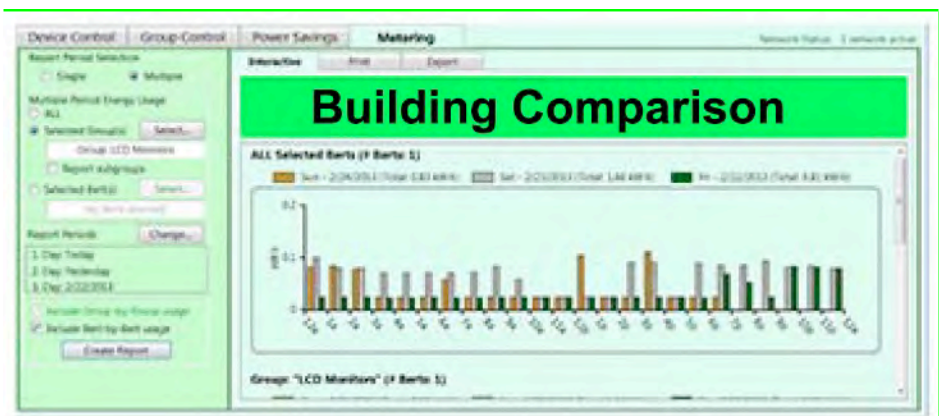
The controllers will have a Power Button that will allow the device user to restore the power and override the schedule for a few hours if they happen to be in the building during the unoccupied hours set in the schedule.

BERT 110X (plugin series)

BERT 120 IR (inline series)

Johnson Controls

The software component is installed into an existing Windows server within the customer's IT network that allows the user to create various schedules (on/off times and days) for all the different plug load controllers. Controllers can be grouped by device, building, or group of buildings so that a specific time/day when the power will be restored to the controller is specified. The software provides the ability to monitor plug loads real-time, run historical reports on their plug load energy usage, and, *most importantly,* generate savings by applying custom schedules from a centralized location that will turn off the power to the devices when the building is unoccupied (e.g., nights).



The devices that are going to be controlled all draw a certain degree of energy while in their "standby" or "sleep-mode" state, and the proposed solution will eliminate these parasitic loads. The energy savings generated by this solution come from the elimination of these parasitic loads when the buildings are unoccupied.

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Scope of Work

This section describes the contractual scope of work.

- Provide and install (194) Bert plug load controllers, model 110X, or equivalent, in projectors, indoor snack machines, window A/C units, medium size printers, coffee makers, TVs and monitors, air purifiers, and hot/cold water dispensers according to the table below. These are to be installed in areas/rooms that are not occupied 24/7. JCI's contractual scope of work below lists fewer devices for plug load applications than were surveyed. The reason for this, in our experience, is that some of the devices surveyed for plug load controllers will not be feasible due to a County occupant getting an exemption from the plug load device. JCI is aware of this potential issue based on our experience, and is contractually proposing the installation of the following devices to ensure that the guaranteed savings estimates can be realistically met. If the County does approve the installation of more plug load controllers, we can include those in subsequent IGA phases.

Building	**Projector**	**Medium Printer**	**Window A/C Unit**	**Large Copy Machine**	**Air Cleaner**	**Hot/Cold Water Dispenser**	**Large Coffeemaker**	**TV/Monitor**	**Snack Vending Machine**	**TOTAL**
Old Courthouse	0	13	0	0	8	0	0	0	0	**21**
Kalana O Maui	1	59	0	0	36	12	1	20	1	**130**
Kalana Pakui	0	8	0	0	5	0	0	2	0	**15**
Fire Prevention Bureau	1	6	0	0	0	0	1	5	0	**13**
Eddie Tam Memorial Center	0	4	2	0	0	1	0	0	0	**7**
Haiku Community Center	0	1	0	0	0	1	0	1	0	**3**
Mayor Hannibal Tavares Community Center	0	5	0	0	0	0	0	0	0	**5**
TOTAL	**2**	**96**	**2**	**0**	**49**	**14**	**2**	**28**	**1**	**194**

- Units will be installed using tamper proof screws to prevent unwanted removal of the units.
- Units will have remote connectivity via the Customer's Wi-Fi network.
- Provide programming one time of the units using the Bert network software to schedule the plug loads off during unoccupied periods. Units will be furnished with an onboard bypass switch to allow users to override the Bert unit if needed.
- Verify installed controls are communicating with the software application.
- Provide Submittals, including End User Instructions, contact information for technical support, links for operating instructions, and warranty information.

Exclusions:

- BACnet connectivity, configuration and integration to Metasys is not included.
- Repair or replacement of defective plug load devices or electrical outlets. JCI will identify the location of defective equipment and notify the Customer.
- Repair or upgrades required due to bringing adjacent electrical and mechanical systems up to code.
- Software is to be installed on an existing server and a new server is not included.
- Permits, fees or processes required by local or oversight jurisdiction and/or utilities.

- Large Copy machines have been excluded in case they are not owned by the County but leased from the manufacturers.
- Cold vending machines have been excluded because they contain dairy based products that should not be unrefrigerated for long periods of time.

Equipment Manufacturer/Warranty

The plug load controllers are manufactured by BERT. All Bert products include a one-year limited hardware and software warranty. The hardware and software warranty is one year from the date of purchase.

Energy Savings Calculations

There are savings associated with the reduction in hours when the plug loads are drawing power in their “standby/off” mode due to the plug load controls. The equations used are shown below:

Equations for Calculating Plug Load Controls Savings

The annual kWh savings will be calculated according to the following formulas:

kWh savings = $W_{standby}$ x Qty x [Annual Hours $Off_{(post\text{-}retrofit)}$ – Annual Hours $Off_{(pre\text{-}retrofit)}$] / 1000

Where:

$W_{standby}$ = the average power draw in standby/off mode for a plug load,
Annual Hours OFF = the annual hours when the plug load has no power at the outlet, and thus no standby power is drawn.

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

The plug load devices audited are left plugged and powered even in their “standby” or “off” position 24/7. Their annual hours with power available (“Annual Hours ON”) are 8,760, which means that annual hours when power is turned off at the outlet (“Annual Hours OFF”) is zero.

The buildings typically follow normal office hours, which means that the plug loads can be scheduled off through the plug load controller during unoccupied hours (6pm to 6am Mon-Fri and 24 hrs. Sat-Sun). This represents 261 working days per year (not including holidays) x 12 hours/day = 3,132 hours per year when the plug loads will have available power (“Annual Hours ON”), and 8,760 – 3,132 = 5,628 hours per year when they will be scheduled Off (“Annual Hours OFF”).

Device Type:	Annual Hours Using Standby Power			
	Hours ON BASELINE	Hours OFF BASELINE	Hours ON PROPOSED	Hours OFF PROPOSED
Projector	8,760	0	3,132	5,628
Medium Printer	8,760	0	3,132	5,628
Window A/C Unit	8,760	0	3,132	5,628
Air Cleaner	8,760	0	3,132	5,628
Hot/Cold Water Dispenser	8,760	0	3,132	5,628
Large Coffeemaker	8,760	0	3,132	5,628
Snack Vending Machine	8,760	0	3,132	5,628
TV/Monitor	8,760	0	3,132	5,628

The Standby Watts are as specified in the table below (these wattages apply during the Hours Off Proposed described above):

Device Type:	**Standby Watts**
Projector	8
Medium Printer	15
Window A/C Unit	8
Air Cleaner	75.6
Hot/Cold Water Dispenser	61
Large Coffeemaker	56
Snack Vending Machine	40
TV/Monitor	6

The below summarizes the total Plug Load Controls Energy Savings (for details by site refer to Appendix 11):

Table 3: FIM 3 Energy Savings Summary

Elec (kWh)	Demand (kW)	$-Elec	$-Demand	**$-Total**
33,739	-	$10,449.32		**$10,449.32**

Commissioning Procedure

All BERT devices are preprogrammed with the Wi-Fi credentials and shipped to the site. Each BERT device is installed, and the location, device, and MAC address are recorded in the cloud-based installation program. Installers attach stickers to each device controlled by a BERT and leave copies of the user instructions.
The BERT Support team has real-time access to this data and verifies that the newly installed BERT appears in the software and names the BERT based on the building, location, and device type. Once the on/off hours are provided all the BERT devices are scheduled by building or device.

ESCO's Training Responsibilities

One (1) hour training on programming and operation of the Bert plug load controls is included for Facilities and IT staff. The training covers naming, grouping, scheduling, and reporting based on the following agenda:

- Device Control Tab
  - Naming Berts & discussing naming convention
  - Searching for Bert using search function
  - *Turning Berts ON and OFF from within the software (in the event power is restored after a power outage)*
  - Switch between debug mode & power mode states (last communication date & time or real-time wattage info)
  - Q&A session
- Group Control Tab
  - Creating Bert groups and grouping Berts by school or device type
  - Creating, applying, and enabling/disabling a schedule to a BERT. Viewing applied schedule to individual Bert
  - Checking schedules & Berts by group(s)

        - Discuss how to use the override button on top of Bert
        - Q&A session

- Monitoring Tab
    - Running a single detailed communication Bert report in Monitoring tab to determine when a Bert is turning off and on for troubleshooting purposes
    - Q&A session

- Metering Tab
    - Discuss uses of metering reports
    - Run a single metering report for a single or group of Berts and export the data to the desktop.
    - Run a multiple metering report comparing baseline & scheduled data periods (if applicable)
    - Q&A session

- Miscellaneous
    - Running a Bert export report to have a printout of communicating & non-communicating Berts
    - Final Q&A session at end of training

ESCO's Maintenance Responsibilities

Software Maintenance includes software updates and telephone or email Technical Support during normal business hours. This is included for the first three (3) years as part of the installation, and then for every year after that it is included with the annual M&V Planned Service Agreement.

Facility Support Required and Customer's Maintenance Responsibilities:

No building power interruptions are anticipated with the implementation of this FIM. End users will need to be trained by the County on the use of these devices so they understand that they can override the device by pressing a button on the device itself.

The BERT process is turnkey- we program, install, verify communication, and schedule all the Berts. As long as they're not moved, there shouldn't be any maintenance required. The County will be responsible for ensuring the devices are utilized and if new equipment is installed, they will be responsible for moving the controller to the new devices. Similarly, the County will be responsible for updating programmed schedules on an as needed basis and replacing units if they fail. The County must be willing to provide VPN login access during installation.

Operation and Maintenance (O&M) Cost Savings Calculations

There are no O&M Savings associated with this FIM.

FIM 4 - Transformer Replacements

Existing Conditions

Electrical power is delivered to buildings through distribution lines at high voltages. At the building level, end use power-consuming devices, such as lighting, computers, and HVAC equipment, are not rated for this high voltage power – they require much lower voltages. In order to provide this lower voltage, multiple “voltage step down” points are required inside each building. The devices that provide this step down are called transformers.

Transformers are comprised of two major components: a core and windings – the core is made of steel and the windings are made of aluminum or copper. In the process of converting power from one voltage to another, some of the energy is lost through heat. We expect power to be on at the receptacles throughout our buildings, so transformers must remain “ON” at all times, therefore incurring losses/energy cost 24 hours a day.

Johnson Controls did site surveys of buildings with 277/480 Volt electrical service or above (data provided by HECO), as these are the most likely buildings for having step down transformers to 120 Volts. Buildings with 120/240 Volt electrical service will not typically have any transformers.

The table below shows the transformer sizes and the respective quantities of all the transformers that were surveyed:

	Transformer size (kVA)											Total Qty
Site	**14**	**15**	**25**	**30**	**37.5**	**45**	**50**	**63**	**75**	**112.5**	**225**	
Kahului Baseyard						1			1			2
Kahului Pump Station				1								1
Kahului WRF		2	1	3		2	1					9
Kalana O Maui						1					2	3
Kihei Police Station		1									1	2
Kihei WRF				1	1	2			4	1		9
Lahaina WRF	2	2				3		2	2			11
Lahaina-1 Pump Station									1			1
Lahainaluna WTP						2			1			3
Mahinahina WTP	1				3					1		5
Napili WTP		1										1
Olinda WTP				2								2
Piiholo WTP						2						2
Wailuku Police Station				2		5						7
War Memorial									1			1
Grand Total	**3**	**6**	**1**	**9**	**4**	**18**	**1**	**2**	**10**	**2**	**3**	**59**

Most of the existing transformers that were identified during the site surveys are either original to the building, or not efficient. The age and condition of existing distribution transformers must be taken into account when considering them for replacements. However, transformers do not contain moving parts therefore a life expectancy of 20 to 30 years or more is not unrealistic. Thus, it is very likely that all of these transformers are original to the buildings.

Prior to 2007, there were no minimum efficiency requirements for transformers, and because transformer purchases are predominately based on low first cost, manufacturers lowered product efficiency in order to lower their first cost (lower efficiency = higher operating cost).

Additionally, older transformers were designed and installed long before modern electronic equipment – a load profile that can more than double transformer losses according to a 1996 DOE Study. The result is high embedded cost on every electricity bill since the transformers were installed decades ago. In general, transformer efficiency does not change with age. Transformers that operate at an unusually low load factor, or building schedules that have the transformers operating at low load factors for extended periods of time, will have poor pre-efficiencies. Transformer efficiency drops quickly below a load factor of 30 percent.

Typical Thermal Loss on Inefficient Transformer

Existing Deficiencies

The following are potential code issues and general comments about some of the transformers identified in the survey. In general, transformers that have code issues that cannot be addressed or transformers that are 2016 or newer (high efficiency) will not be replaced.

Kahului Baseyard

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56217	Telemetry Bldg ER	Indoor	Floor	UPS system 7" in front left of Xfmer.	The replacement will be the 150c temp rise special. The minimum enclosure will prevent the adjacent electrical switch from being blocked.

Kahului Pump Station

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56262	Gen Rm	Indoor	Stand	<42" Front Work Space	The Unistrut stand is not wide enough to accommodate the replacement.

Kahului Wastewater Reclamation Facility

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56233	Ops Bldg ER	Indoor	Wall	No Grounding Visible	The existing transformer is encapsulated. Include bracket. The replacement will need to be lowered to account for the increased height in a tight area.
56234	Ops Bldg ER	Indoor	Floor	Xfmer in front of Main Power Panel	The existing transformer is non-ventilated. The existing transformer is on two Unistrut bars on the floor. The height of the replacement could interfere with the adjacent electrical panel. The movement of door to the electrical panel will be unaffected.
56236	Dewatering Bldg by Exit Door	Indoor	Wall	No Grounding Visible	The existing transformer is encapsulated. Include bracket.
56237	Dewatering Bldg, Upstairs	Indoor	Floor	No Grounding Visible	The existing transformer is accessed by tall stairs.
56238	Digested Sludge Shed	Indoor	Floor	No Grounding Visible	The existing transformer is a Delta-Hi Leg DOE 2016. The existing transformer is under an electrical panel causing a potential code violation. **REMOVED FROM SCOPE**
56239	RAS Pipe Gallery	Indoor	Wall		The existing transformer is a DOE 2016. The stand is close to ceiling lighting. **REMOVED FROM SCOPE**
56241	Head Works MCC	Indoor	Stand		The existing transformer manufacture year is 2018. there are no other efficiency information. Assumed to be a DOE 2016. **REMOVED FROM SCOPE**

Kalana O Maui

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56243	Basement MER	Indoor	Floor		The existing transformer is a DOE 2016. **REMOVED FROM SCOPE**
56244	Basement MER	Indoor	Floor	38” Front Clearance	The existing transformer is a DOE 2016. **REMOVED FROM SCOPE**

Kihei Police Station

TAG	Building Name	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56223	Kihei Police Station	Gen Rm	Indoor	Wall	No Grounding Visible	The existing transformer is a TP-1. Include bracket. The existing transformer is attached to a wall that has the insulation removed in the location of the electrical equipment including the transformer.

Kihei Wastewater Reclamation Facility

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56229	UV Bldg Outside	Outdoor	Pad		The nameplate is unreadable. The kVA size and winding configuration is assumed.

Lahaina Wastewater Reclamation Facility

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56246	HMI Rm / Solids MCC	Indoor	Pad		The existing transformer is a DOE 2016. **REMOVED FROM SCOPE**
56247	Dewatering Bldg, Solids Office	Indoor	Wall	Conduit 4” in front of Xfmer	The replacement will not fit in the location of the existing transformer. **REMOVED FROM SCOPE**
56248	Blower MCC	Indoor	Hung	Space constraints	The trapeze is not wide enough to accommodate the replacement. The existing transformer is under an electrical panel.
56249	85 MCC	Indoor	Floor	No Grounding Visible	The existing transformer is a drive isolation unit located in a switchgear. The replacement will need a UL inspection. **REMOVED FROM SCOPE**
56250	85 MCC	Indoor	Floor	No Grounding Visible	The existing transformer is a drive isolation unit located in a switchgear. The replacement will need a UL inspection. **REMOVED FROM SCOPE**
56276	85 MCC	Indoor	Floor	No Grounding Visible	The existing transformer is a drive isolation unit located in a switchgear. The replacement will need a UL inspection **REMOVED FROM SCOPE**.
56277	85 MCC	Indoor	Floor	No Grounding Visible	The existing transformer is a drive isolation unit located in a switchgear. The replacement will need a UL inspection. **REMOVED FROM SCOPE**
56278	85 MCC	Indoor	Floor	No Grounding Visible	The existing transformer is a drive isolation unit located in a switchgear. The replacement will need a UL inspection. **REMOVED FROM SCOPE**
56279	85 MCC	Indoor	Wall	2” Front Clearance	The existing transformer is on a stand and only four inches away from a large pipe and is under an electrical panel. The replacement will fit. The installation will be challenging.
56280	85 MCC	Indoor	Wall	4” Front Clearance	The existing transformer is on a stand and only four inches away from a large pipe and is under an electrical panel. The replacement will fit. The installation will be challenging.

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Mahinahina Water Treatment Plant

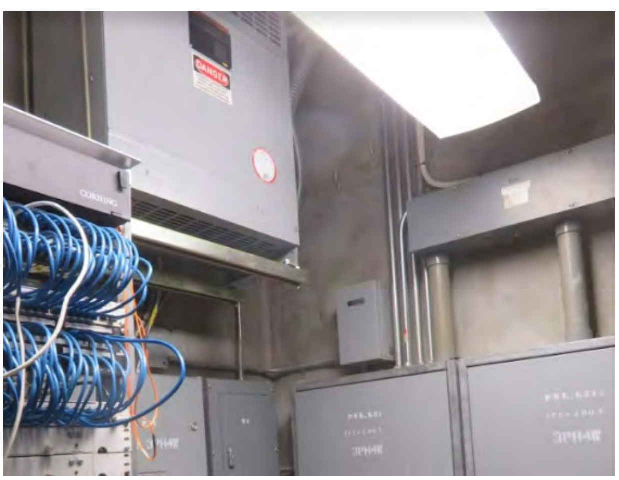
TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56281	MER	Indoor	Pad	No Grounding Visible	The existing transformer is a drive isolation unit. The replacement will be the T115 with an electrostatic shield.
56282	MER	Indoor	Wall	<42" Front Work Space, No Grounding Visible	The existing transformer is above an electrical panel. The reduction in height of the replacement may allow the ceiling tiles to be put back in place. They had to be removed to accommodate the height of the existing transformer.
56283	MER	Indoor	Wall	<42" Front Work Space, No Grounding Visible	The existing transformer is above an electrical panel. The reduction in height of the replacement may allow the ceiling tiles to be put back in place. They had to be removed to accommodate the height of the existing transformer.

Napili Water Treatment Plant

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56261	Main Elect Rm	Indoor	Pad		The existing transformer is inside a switchgear. A UL inspection will be needed if it is added in the scope. **REMOVED FROM SCOPE**

Wailuku Police Station

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56251	2nd Flr ER	Indoor	Hung	<42" Front Work Space	The replacement will be the 150c temp rise special. The trapeze is close to ceiling lighting. The minimum enclosure should accommodate the width of the trapeze. The area is very tight with the ceiling lighting being close to the front of the transformer and two electrical panel below it.
56252	Radio Room	Indoor	Hung	<42" Front Work Space	The trapeze is close to ceiling lighting.
56253	Ground Flr ER	Indoor	Hung	<42" Front Work Space	The replacement will be the 150c temp rise special. The trapeze is close to ceiling lighting.
56254	Ground Flr ER	Indoor	Hung	<42" Front Work Space	The replacement will be the 150c temp rise special. The trapeze is close to ceiling lighting. The minimum enclosure should accommodate the width of the trapeze. The area is very tight with the ceiling lighting being close to the front of the transformer and two electrical panel below it.
56255	Ground Flr Storage Rm	Indoor	Hung	<42" Front Work Space	The replacement will be the 150c temp rise special. The trapeze is close to ceiling lighting. The minimum enclosure should accommodate the width of the trapeze. The existing transformer has an electrical panel below it.
56256	Motor pool Storage Rm	Indoor	Hung	<42" Front Work Space	The replacement will be the 150c temp rise special. The trapeze is close to ceiling lighting. The minimum enclosure should accommodate the width of the trapeze. The area is very tight with the ceiling lighting being close to the front of the transformer and two electrical panel below it.
56257	Main Elect Rm	Indoor	Hung		The trapeze is above two electrical panels.



Piiholo Water Treatment Plant

TAG	Location ID / Room #	Indoor / Outdoor	Mounting	Potential Code Issue Details	Comment
56218	MER	Indoor	Wall		The existing transformer is close to an above electrical pipe. The stand is four feet from the ceiling and above an electrical panel. The area is tight and the installation could be challenging.
56219	MER	Indoor	Wall	<42" Front Work Space	The existing transformer is close to an above electrical pipe. The stand is four feet from the ceiling and above an electrical panel. The area is tight and the installation could be challenging.

FIM Description

The proposed solution is to replace the existing dry type building distribution transformers (like for like nominal kVA capacity) with DOE-2016 efficiency transformers of the same configuration (i.e. 3-phase, delta-wye). No transformers will be relocated, resized, nor will changes be made to the building electrical design. By replacing the old transformers with new transformers, the same amount of electricity can be delivered to the building with lower losses thereby reducing overall energy costs.

The existing dry-type transformers will be removed and replaced with Powersmiths E-Saver ultra-low loss, dry-type transformers, or equivalent. The retrofit transformer will minimize installation cost by taking into account existing site conditions such as transformer footprint and pad dimensions, clearances to walls and other adjacent equipment, conduit entry points, and access (delivery to and from dock). While replacement transformers will not be exact dimensional matches for existing transformers, design of the replacement transformers will minimize installation conflicts and the need to splice conductors or add conduit.

Transformers that were surveyed that were newer (high efficiency), had code issues as discussed above, and/or had no direct/easy replacement (because of configuration or dimensions), will not be replaced.

The following table shows the quantities and sizes of the dry-type transformers that are good candidates for replacements, and are included in JCI's Scope of Work:

Site	Transformer size (kVA)											Total Qty
	14	**15**	**25**	**30**	**37.5**	**45**	**50**	**63**	**75**	**112.5**	**225**	
Kahului Baseyard						1			1			2
Kahului Pump Station				1								1
Kahului WRF		1	1	1		2	1					6
Kalana O Maui						1						1
Kihei Police Station		1									1	2
Kihei WRF				1	1	2			4	1		9
Lahaina WRF		1				2			1			4
Lahaina-1 Pump Station									1			1
Lahainaluna WTP						2			1			3
Mahinahina WTP	1				3					1		5
Olinda WTP				2								2
Piiholo WTP						2						2
Wailuku Police Station				2		5						7
War Memorial									1			1
Grand Total	**1**	**3**	**1**	**7**	**4**	**17**	**1**	**0**	**9**	**2**	**1**	**46**

Scope of Work

This section describes the contractual scope of work.

1. Check for damage and loose connections. The as-found position of the circuit breakers shall be written down prior to equipment being shut down.
2. Phase rotation of individual transformers will be checked before any equipment will be shut down and rechecked before transformer will be powered up.
3. Once power is shut down, the existing transformer shall be removed and disposed of and the new transformer set plumb and level.
4. Provide and install forty-six (46) Powersmiths transformers, or equivalent, as shown on table below (see Appendix for more details), to replace existing transformers. New transformers shall be a dry-type isolation unit with a common-core, 200% rated neutral, built to NEMA ST-20, UL1561 and other applicable ANSI and IEEE standards, and be UL listed. Transformer shall also meet or exceed EPAct 2005/NEMA TP1/C802.s and U.S. DOE 2016 Efficiency requirements. Transformer shall come with a NEMA 1 ventilated drip-proof indoor enclosure made of heavy gauge steel finished with epoxy powder coating.
5. Provide necessary rigging, tools, equipment, and materials (e.g. conduit, conductors, racking, hangers, wall-mounts, concrete pads) necessary for completion of the work.
6. Adjust transformer secondary voltages to provide the required voltage at the loads.
7. Existing wires and circuit breakers will remain in place and will be reused with the new transformers.
8. New transformers will use the existing mounts and brackets as well as having the same lug configuration as the existing transformers. This will ensure the existing electrical wires will correctly connect to the new transformer.
9. Transformers with clearance code violations will be moved as needed to have the proper clearance.
10. Transformers that are found with no grounding will be grounded as needed.
11. Identified deficiencies will be corrected for replaced transformers

Johnson Controls

No	TAG	Building Name	Location ID / Room #	Existing				Proposed	
				Manufacturer	Model #	Volts/Phase	kVA	Model	kVA
1	56216	Kahului Baseyard	Telemetry Bldg ER	Hevi-Duty	T2HB75	480 - 208/120 3Ph	75	E-Saver-80R	75
2	56217	Kahului Baseyard	Telemetry Bldg ER	Hevi-Duty	T2HB45	480 - 208/120 3Ph	45	E-Saver-2016	45
3	56262	Kahului Pump Station	Gen Rm	Eaton	V48M28B30LS42	480 - 208/120 3Ph	30	E-Saver-80R	30
4	56233	Kahului WWTP	Ops Bldg ER	West	T-6E980	480 - 208/120 3Ph	15	E-Saver-80R	15
5	56234	Kahului WWTP	Ops Bldg ER	C-H	S48M11S25N	480 - 240 x 120 1Ph	25	E-Saver-80R	25
6	56235	Kahului WWTP	Ops Bldg ER	West	V48M28B50R	480 - 208/120 3Ph	50	E-Saver-2016	50
7	56236	Kahului WWTP	Dewatering Bldg by Exit Door	West	6E4397	480 - 208/120 3Ph	30	E-Saver-80R	30
8	56237	Kahului WWTP	Dewatering Bldg, Upstairs	Hevi-Duty	ET2H25S	480 - 208/120 3Ph	45	E-Saver-80R	45
9	56240	Kahului WWTP	Blower Bldg Inside AHU Rm	C-H	V48M28F45CU	480 - 208/120 3Ph	45	E-Saver-80R	45
10	56242	Kalana O Maui Bldg	Basement MER	Hevi-Duty	T2H45 SER C	480 - 208/120 3Ph	45	E-Saver-80R	45
11	56222	Kihei Police Station	MER	Eaton	V48M28T22EEUS	480 - 208/120 3Ph	225	E-Saver-80R	225
12	56223	Kihei Police Station	Gen Rm	Eaton	V48G28T15EEUS	480 - 208/120 3Ph	15	E-Saver-80R	15
13	56224	Kihei WWTP	Maint Shop	SQD	75T3H	480 - 208/120 3Ph	75	E-Saver-80R	75
14	56225	Kihei WWTP	Dewatering Bldg ER	SQD	45T3B	480 - 208/120 3Ph	45	E-Saver-80R	45
15	56226	Kihei WWTP	Outside Office Trailers	West	T87F05325	480 - 208/120 3Ph	112.5	E-Saver-80R	113
16	56227	Kihei WWTP	Outside Office Trailers	Hevi-Duty	T2H75	480 - 208/120 3Ph	75	E-Saver-80R	75
17	56228	Kihei WWTP	UV Bldg ER	West	V48M28E30B	480 - 208/120 3Ph	30	E-Saver-80R	30
18	56229	Kihei WWTP	UV Bldg Outside		Unk	480 - 208/120 3Ph	75*	E-Saver-80R	75
19	56230	Kihei WWTP	Blower Bldg by Electrician's	SQD	45T3H	480 - 208/120 3Ph	45	E-Saver-80R	45
20	56231	Kihei WWTP	Ops/Control Bldg	ITE	1F1Y037	480 - 208/120 3Ph	37.5	E-Saver-80R	38
21	56232	Kihei WWTP	Elect Shop Weight Rm	SQD	75T3H	480 - 208/120 3Ph	75	E-Saver-80R	75
22	56245	Lahaina WWTP	Ops Bldg MCC (White Box)	West	V48M28F75R	480 - 208/120 3Ph	75	E-Saver-80R	75
23	56248	Lahaina WWTP	Blower MCC	West	V48M28F45R	480 - 208/120 3Ph	45	E-Saver-80R	45
24	56279	Lahaina WWTP	85 MCC	C-H	CX5-453-415	480 - 208/120 3Ph	45	E-Saver-80R	45
25	56280	Lahaina WWTP	85 MCC	C-H	CX5-153-415F	480 - 208/120 3Ph	15	E-Saver-80R	15
26	56263	Lahaina-1 Pump Station	MER	Siemens	3F3Y075BLN3TP1	480 - 208/120 3Ph	75	E-Saver-80R	75

No	TAG	Building Name	Location ID / Room #	Existing				Proposed	
				Manufacturer	Model #	Volts/Phase	kVA	Model	kVA
27	56258	Lahainaluna WTP	Main Elect Rm	Hevi-Duty	T2H75S	480 - 208/120 3Ph	75	E-Saver-80R	75
28	56259	Lahainaluna WTP	Outside Filtration Rm	Eaton	V48M28T45EE	480 - 208/120 3Ph	45	E-Saver-80R	45
29	56260	Lahainaluna WTP	Outside Pre-Sed Bldg	Eaton	V48M28T45EE	480 - 208/120 3Ph	45	E-Saver-80R	45
30	56281	Mahainahaina WTP	MER	West	D04025	460 - 460/266 3Ph	14	E-Saver-80R T115	14
31	56282	Mahainahaina WTP	MER	West	T48M11F37CU	480 - 240 x 120 1Ph	37.5	E-Saver-80R	38
32	56283	Mahainahaina WTP	MER	West	T48M11F37CU	480 - 240 x 120 1Ph	37.5	E-Saver-80R	38
33	56284	Mahainahaina WTP	Blower Rm	C-H	T37050	480 - 240 x 120 1Ph	37.5	E-Saver-80R	38
34	56285	Mahainahaina WTP	Outside by Solar Panels	Eaton	V48M28T12EE	480 - 208/120 3Ph	112.5	E-Saver-80R	113
35	56220	Olinda WTP	MER	GE	9T23B3872	480 - 208/120 3Ph	30	E-Saver-80R	30
36	56221	Olinda WTP	Elect Rm by Gen	Challenger	302-415B-MOD.5	480 - 208/120 3Ph	30	E-Saver-80R	30
37	56218	Piihold WTP	MER	West	V48M28B45R	480 - 208/120 3Ph	45	E-Saver-80R	45
38	56219	Piihold WTP	MER	West	V48M28B45R	480 - 208/120 3Ph	45	E-Saver-80R	45
39	56251	Wailuku Police Station	2nd Flr ER	Federal Pacific	50344-M	480 - 208/120 3Ph	45	E-Saver-2016	45
40	56252	Wailuku Police Station	Radio Room	Federal Pacific	50342-M	480 - 208/120 3Ph	30	E-Saver-80R	30
41	56253	Wailuku Police Station	Ground Flr ER	Federal Pacific	50344-M	480 - 208/120 3Ph	45	E-Saver-2016	45
42	56254	Wailuku Police Station	Ground Flr ER	Federal Pacific	50344-M	480 - 208/120 3Ph	45	E-Saver-2016	45
43	56255	Wailuku Police Station	Ground Flr Storage Rm	Federal Pacific	50344-M	480 - 208/120 3Ph	45	E-Saver-2016	45
44	56256	Wailuku Police Station	Motor pool Storage Rm	Federal Pacific	50344-M	480 - 208/120 3Ph	45	E-Saver-2016	45
45	56257	Wailuku Police Station	Main Elect Rm	Federal Pacific	50342-M	480 - 208/120 3Ph	30	E-Saver-80R	30
46	56215	War Memorial	ER by Gum Heater Rm	Sorgel	None	208 - 480/277 3Ph	75	E-Saver-80R	75

* The nameplate on this transformer was unreadable. The kVA size and winding configuration is assumed. This will be verified before ordering.

Exclusions:

- Repair or replacement of defective electrical equipment and the electrical distribution system, not explicitly included in this scope, including existing wiring where the new transformers will be connected to.
- Bringing existing equipment or facilities to current code.
- Engineering services, studies, and analysis associated with any exclusions or work clearly outside of the scope definition.
- Resolution of existing design, service, and or distribution conditions known or unknown.

- Permits, fees, or processes required by local or oversight jurisdiction and/or utilities or permits and upgrades triggered by other upgrade and renovation projects.
- Temporary power during transformer installation is not included.
- Delivery of any 'As-Built' drawings, layouts or engineered design drawings.

Equipment Manufacturer/Warranty

Proposed transformers are as manufactured by Powersmiths, Model E-Saver-80R, Model E-Saver 80R T115, Model E-Saver 2016, or equivalent.

Powersmiths offers a 32-year pro-rated limited product warranty from the date of factory shipping. Pro-rating is based upon the price paid on the original invoice.

Powersmiths' liability is expressly limited to the repair or replacement of defective product at the discretion of Powersmiths. Powersmiths' entire liability shall be limited to at a maximum the purchase price of the product, and in no way shall be liable for any consequential damages. Powersmiths shall have no liability for damage resulting from external event, accident, improper application, installation, operation or repair. This limited warranty is in lieu of all other warranties.

There is also a Performance Guarantee offered by Powersmiths:

EFFICIENCY & LOSSES: Powersmiths guarantees that ALL units meet or exceed the performance levels listed in the table below for the full duration of the 32-year warranty period.

kVA	DOE 2016 reference efficiency (35% LOADING)	ESAVER-81R Efficiency (35%)	ESAVER-80-R Efficiency (35%)	Maximum Allowable No Load Losses (W)
15	97.89%	98.25%	97.89%	49
30	98.23%	98.55%	98.23%	66
37.5	98.32%	98.62%	98.32%	83
45	98.40%	98.69%	98.40%	92
50	98.43%	98.71%	98.43%	105
75	98.60%	98.80%	98.60%	132
112.5	98.74%	98.93%	98.74%	194
150	98.83%	98.98%	98.83%	232
220	98.94%	99.10%	98.94%	319
225	98.94%	99.11%	98.94%	321
300	99.02%	99.14%	99.02%	388
330	99.04%	99.16%	99.04%	464
500	99.14%	99.24%	99.14%	613
750	99.23%	99.32%	99.23%	879

NOTES: EFFICIENCY AND TEST REFERENCE: U.S. Dept. of Energy 10CFR Part 431, Sub-part K
Efficiencies at other than standard kVAs are interpolated per DOE protocol.
This table applies to 3-phase, low-voltage, dry-type transformers.

Energy Savings Calculations

Transformer Retrofits Energy Savings

There are savings specifically associated with the reduction in wattage due to the transformer replacements. The equations used are shown below:

Equations for Calculating Transformer Retrofit Savings

The annual kWh savings will be calculated according to the following formulas:

$$Xmr\ Losses\ Normal\ kW = (No\ Load\ loss\ kW\ \ +\%Load\ Normal^2\ x\ (Full\ Load\ Loss\ kW - No\ Load\ Loss\ kW)$$

$$Xmr\ Losses\ Out\ kW = (No\ Load\ loss\ kW\ \ +\%Load\ Out^2\ x\ (Full\ Load\ Loss\ kW - No\ Load\ Loss\ kW)$$

kWh normal savings = [Xmr Losses Normal $kW_{(pre)}$ – Xmr Losses Normal $kW_{(post)}$] x Daily Hours of Operation x Days of Operation per Year

kWh out savings = [Xmr Losses Out $kW_{(pre)}$ – Xmr Losses Out $kW_{(post)}$] x (24 - Daily Hours of Operation) x Days of Operation per Year

Total kWh savings = kWh normal savings + kWh out savings

Where:

% Load Normal:	Typical % Load on transformer during normal operating hours (See Transformer Loading Table below)
% Load Out:	Typical % Load on transformer outside of normal operating hours (See Transformer Loading Table below)
Full Load Loss:	Full load losses on transformer (see Load Losses Table below)
No Load Loss:	No load losses on transformer (see Load Losses Table below)
Xmr losses Normal kW:	Transformer kW losses during Normal Operation hours
Xmr losses Out kW:	Transformer kW losses outside of Normal Operation hours
Daily Hrs Operation:	estimated normal daily hours of operation; this variable will not be measured (see Operating Hours Table below).
Days of Operation:	estimated days of operation per year; this variable will not be measured (see Operating Hours Table below).

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

The below summarizes the total Transformer Retrofits Energy Savings (for details by site refer to Appendix 11):

Table 4: FIM 4 Energy Savings Summary

Elec (kWh)	Demand (kW)	$-Elec	$-Demand	**$-Total**
160,512	219.95	$50,077.63	$53,698.36	**$103,776.00**

Transformer Loading Table

kVA	% Load Normal	% Load Out
10	13.0%	4.0%
15	13.0%	4.0%
20	14.5%	5.0%
25	9.8%	5.0%
30	9.2%	5.8%
37.5	4.3%	1.0%
45	9.1%	5.0%
50	8.6%	4.0%
63	10.2%	5.0%
75	7.9%	4.3%
100	28.8%	10.0%
112.5	8.8%	5.1%
150	8.2%	4.7%
167	10.5%	5.0%
200	7.9%	4.0%
225	7.5%	4.5%

Operating Hours Table

Site	Daily Hours Transformer Loaded	Days of Operation in Loaded Conditions
Kahului Baseyard	12	255
Kahului Pump Station	16	365
Kahului WRF	16	365
Kalana O Maui	8	255
Kihei Police Station	16	365
Kihei WRF	16	365
Lahaina WRF	16	365
Lahaina-1 Pump Station	16	365
Lahainaluna WTP	16	365
Mahinahina WTP	16	365
Olinda WTP	16	365
Piiholo WTP	16	365
Wailuku Police Station	16	365
War Memorial	8	255

Load Losses Tables

Baseline		
kVA	No Load Losses (W)	Full Load Losses (W)
10	261	1072
15	315	1182
20	451	1275
25	398	1369
30	468	1462
37.5	550	1832
45	642	2202
50	567	2393
63	1553	2889
75	868	3347
100	782	3963
112.5	1200	4271
125	1306	4695
150	1518	5544
167	1472	6121
200	1671	7240
225	1870	8088

E-Saver-80R Aluminum, K-7, 130C Rise		
kVA	No Load Losses (W)	Full Load Losses (W)
10	34	434
15	35	775
20	48	1157
25	57	674
30	57	1332
37.5	65	1025
45	78	1725
50	79	1309
63	100	2130
75	111	2537
100	125	2227
112.5	165	3231
125	186	3470
150	203	3945
167	167	4010
200	288	4462
225	319	4317

E-Saver-80R T115 Aluminum, K-7, 115C Rise		
kVA	No Load Losses (W)	Full Load Losses (W)
10	34	434
15	35	740
20	43	917
25	57	698
30	57.5	1270
37.5	65	981
45	78	1697
50	69	1392
63	106	1811
75	112	2459
100	120	2206
112.5	165	3231
125	193	2907
150	203	3833
167	230	3903
200	282	4038
225	322	4141

E-Saver 2016 Special Copper, K-1, 150C Rise, MIN Case		
kVA	No Load Losses (W)	Full Load Losses (W)
45	101	1401

TP-1 Losses		
kVA	No Load Losses (W)	Full Load Losses (W)
15	167	890
30	257	1347
45	306	1979
75	441	2906
225	979	6357

DOE 2016 (Estimated)		
kVA	No Load Losses (W)	Full Load Losses (W)
15	54	290
30	84	439
45	100	645
75	144	947
225	319	2072

Commissioning Procedure

Not applicable. No commissioning procedure is required for this FIM.

ESCO's Training Responsibilities

Not applicable. No training is required for this FIM.

ESCO's Maintenance Responsibilities

No maintenance services are included for the new transformers.

Customer's Maintenance Responsibilities

Customer is responsible for properly maintaining and performing appropriate preventative maintenance on the new transformers installed, in accordance with manufacturers' standards and specifications.

Facility Support Required and Customer's Responsibilities:

The installation of the new transformers will require system shutdowns. All work shall be coordinated and scheduled with the site in order to minimize the effect on day-to-day operations. All preparation work shall be done prior to shut down to minimize the time the system is down.

Operation and Maintenance (O&M) Cost Savings Calculations

There are no O&M Savings associated with this FIM.

FIM 5 – Domestic Water Plumbing Fixture Upgrades

Existing Conditions

Various different types of existing domestic water plumbing fixtures were audited during the site visits, as well as their existing flow or flush rates. This includes toilets, urinals, faucets, and showers.

There are 1.28 gallons per flush (GPF), 1.6 GPF and 3.5 GPF toilets. Some are floor mounted and others are wall-mounted. Some are tank-type while others have flush valves.

There are 0.125 GPF, 0.5 GPF, 1.0 GPF, and 1.5 GPF urinals. There are also some waterless urinals.

There are showers that are 1.5 GPM and 2.5 GPM. And finally there are faucets that are 0.5 GPM, 1.0 GPM, 2.2 GPM, and 2.5 GPM.




These are all design flows, not actual. The table below shows the quantities for each of those fixture types and design flows audited.

Table of Quantities of Domestic Plumbing Fixtures

	FAUCET				SHOWER		TANK TYPE TOILET			FLUSH VALVE TOILET			URINAL				Waterless		
Design Flow (GPM/GPF) →	**0.5**	**1**	**2.2**	**2.5**	**1.5**	**2.5**	**1.28**	**1.6**	**3.5**	**1.28**	**1.6**	**3.5**	**0.125**	**0.5**	**1**	**1.5**	**0**	**0.5**	**Total**
4th Marine Division Memorial Park			4				3		2		1				1	1			**12**
66 Market Street			3								3				1				**7**
Central Landfill			4			1		3							2		1		**11**
Central Maui Regional Sports Complex			24							36			12						**72**
Coach Sakamoto Pool			12			5				8	5			2	1				**33**
Coach Shiraishi Pool			4			8		5								2			**19**
Cooke Memorial Pool			6			8					5				2				**21**
D.T. Fleming Park			4								5				1				**10**
Duke Maliu Regional Park			3								5				1				**9**
Eddie Tam Memorial Center			10	1		12		2			9	3			6	1			**44**
Fire Prevention Bureau			6	1		2		6							1				**16**
Forensic Facility			4					3			1								**8**
H.A. Baldwin Park			2								6				2				**10**
Haiku Community Center			8						7						3				**18**
Haliimaile Park & Tennis			10	2		7		2	2		3	7		1	1	1			**36**
Hana Fire Station			4			3		4							1				**12**
Hana Police Station			2			2					3				1				**8**
Hanakao'o Park			4								4			2					**10**
Honokowai Beach Park			3		4					6					1				**14**
Ho'okipa Beach Park			5	1			8								2				**16**
Hoolehua Fire station			2			2			2										**6**
Iao Water Treatment Plant	1					1		1							1				**4**
Kahului Baseyard			7				2	3			3				3				**18**
Kahului Community Center			5								8				1	1			**15**
Kahului Community Center Park			2								2				1				**5**
Kahului Fire Station			20			19	1				14					8			**62**
Kahului Park			10				1	2	3						2				**18**
Kahului Wastewater			4			2					3					2			**11**

	FAUCET				SHOWER		TANK TYPE TOILET			FLUSH VALVE TOILET			URINAL				Waterless		
Design Flow (GPM/GPF) →	**0.5**	**1**	**2.2**	**2.5**	**1.5**	**2.5**	**1.28**	**1.6**	**3.5**	**1.28**	**1.6**	**3.5**	**0.125**	**0.5**	**1**	**1.5**	**0**	**0.5**	**Total**
Reclamation Facility																			
Kalama Park			4							4	1				1				**10**
Kalama Skate Park			4								5				1				**10**
Kalana O Maui			44			4				51		2		17					**118**
Kalana Pakui			6					7							3				**16**
Kamaole I Beach Park			4						7						1				**12**
Kamaole II Beach Park			2						3						1				**6**
Kamaole III Beach Park			2								5				2				**9**
Kanaha Beach Park			6								5			2					**13**
Kaunakakai Fire			4			5					6				3				**18**
Kaunoa Senior Services			12	1				5			9				3				**30**
Keanae Park			3					6							2				**11**
Kehalani Mauka Park			2							3					1				**6**
Kenolio Recreation Center			9			4					5								**18**
KeoKea Park			4				5							1					**10**
Keopuolani Regional Park			15								16				5				**36**
Keopuolani Skate Park			4								5				1				**10**
Kepaniwai Park			12								16			4	1				**33**
Kihei Aquatic Center			9			8					8				2				**27**
Kihei Fire Station			3			2					2					1			**8**
Kihei Police Station			26			19				22	17		10						**94**
Kihei Wastewater Reclamation Plant			19		4	2		2	8		1					4			**40**
Kilohano Community Center			2								2				1				**5**
Kokua Pool			2			2		5									1		**10**
Kualapua Park			2					4								2			**8**
Kualapuu Park			6					5			4				1	2			**18**
Kuha'o Business Center			1					1											**2**
Kula Community Center			6								6			2					**14**
Kula Fire Station			4			3		4							1				**12**
Lahaina Aquatics			7			16					9					2			**34**
Lahaina Banyan Court Park			8								15							2	**25**

	FAUCET				SHOWER		TANK TYPE TOILET			FLUSH VALVE TOILET			URINAL				Waterless		
Design Flow (GPM/GPF) →	**0.5**	**1**	**2.2**	**2.5**	**1.5**	**2.5**	**1.28**	**1.6**	**3.5**	**1.28**	**1.6**	**3.5**	**0.125**	**0.5**	**1**	**1.5**	**0**	**0.5**	**Total**
Lahaina Civic Center	12		7			16					28				10				**73**
Lahaina Fire Station			5			5		5							3				**18**
Lahaina Police			2			4		2			2	3			3				**16**
Lahaina Rec. Center Park			2								5				1				**8**
Lahaina Wastewater Reclamation Facility			4			5		1			2	1			2	1			**16**
Lahainaluna WTP			1			1		1											**3**
Lanai Baseyard			13					11			1				3				**28**
Lanai Fire Station			3			2		3											**8**
Lanai Park and Tennis			4					1			2	1			2				**10**
Lanai Police			8			3					11				2	1			**25**
Lanai Senior Center	5					1		5							1				**12**
Lanai WTP			1			2		1								1			**5**
Launiupoko Beach Park			4							4	2				1				**11**
Lower Paia Park			2								3				1				**6**
Mahinahina WTP			2			2					2				1				**7**
Makawao Cemetery			3				3								1				**7**
Makawao Fire Station			3			4		3							1				**11**
Malu Ulu Olele Park											1								**1**
Maui County Service Center		14	7							19	1		2		2				**45**
Maui Lani Regional Park			2								6				2				**10**
Maui Senior Center			12			2					12				4				**30**
Maunaloa Community Center			2								2				1				**5**
Mayor Hannibal Tavares Community Center			15								17				5				**37**
Mitchell Pauole Community Center			13			1				6	7	4		2	3				**36**
Mokuhau Park			2					2					1						**5**
Molokai Baseyard			1					1											**2**
Napili Fire Station			4			4			4						1				**13**
Napili Park			4							6						1			**11**
Old Courthouse Building			4								6				2				**12**

	FAUCET				SHOWER		TANK TYPE TOILET			FLUSH VALVE TOILET			URINAL				Waterless		
Design Flow (GPM/GPF) →	**0.5**	**1**	**2.2**	**2.5**	**1.5**	**2.5**	**1.28**	**1.6**	**3.5**	**1.28**	**1.6**	**3.5**	**0.125**	**0.5**	**1**	**1.5**	**0**	**0.5**	**Total**
Old Lahaina Prison			1						1								2		**4**
Olinda Water Treatment			1					1											**2**
One Ali'I Park			5			12					5			2					**24**
Paia Community Center			8	1				7				2			2				**20**
Paia Fire Station			4			4		4						1					**13**
Papohaku Beach Park			4								2				2				**8**
Papohaku Park			14								14				4				**32**
Piiholo WTP			2			2		2							1				**7**
Sewer Maintenance Building			6			2			4						2				**14**
South Maui Community Center		18									35				4				**57**
South Maui Community Park			4								12				4				**20**
Upcountry Pool			10			8					8				2				**28**
Velma McWayne Community Center			14					9			2			3					**28**
Victims Advocate Building			2					2											**4**
Wahikuli Wayside Park			7								11			2	1				**21**
Waiakoa Gymnasium			1	1		1		1			2				1				**7**
Waiehu Golf Course			16		2			8			12				5				**43**
Waiehu Terrace Park			4							2	3				1				**10**
Waihee Beach Park			2						4						1				**7**
Waikapu Community Center Park			2							3					1				**6**
Wailea Beach Park			1								3				1				**5**
Wailea Fire Station			14		1	11					13				1	8			**48**
Wailuku Baseyard			12			5		10			2				3				**32**
Wailuku Elementary School Park			4					5							1				**10**
Wailuku Police Station			34			16					33	10			18				**111**
Waipuilani Park			2								3				1				**6**
Waiuku Pool			1			2			1										**4**
Wells Park			6								7				1				**14**
Grand Total	**18**	**32**	**714**	**8**	**11**	**252**	**23**	**155**	**48**	**170**	**494**	**33**	**25**	**41**	**174**	**39**	**4**	**2**	**2244**

Existing Deficiencies

Existing water closets and urinals use older non-chloramine resistant diaphragm valves. These diaphragms and components deteriorate over time due to the flexing of the rubber and chloramines in the water treatment process. The older 1.28 and 1.6 Gallon per flush “designed” water closet valves have partially degraded diaphragms creating additional flush volumes exceeding 20% inclusive of occasional “run on” issues. Existing 1.28 GPF fixtures should be recommissioned with a new synthetic flush valve and 1.6 gallon per flush fixtures should be retrofit to low flow using newer chloramine resistant synthetic diaphragm valves and respective low flow china as necessary.

FIM Description

Water usage has become a focal point of concern in recent years due to increasing unit costs for water and sewer service. A potential for savings exists through the implementation of water conservation facility improvement measures throughout a customer’s facilities. This water conservation measure installs new low-volume domestic plumbing fixtures, replacing existing high volume domestic plumbing fixtures (toilets, urinals, flush valves, faucets, showerheads, aerators).

Retrofit or replacement of domestic plumbing fixtures with modern, EPA WaterSense labeled, high efficiency fixtures can often result in the largest water savings opportunity within a facility. Faucet and showerhead retrofits will also yield thermal energy savings due to a reduction in the volume of hot water consumed.

TOILETS

High efficiency toilets (HET) are available in a wide variety of fixture types and configurations. Commercial flush-valve UHETs are designed at 1.28 gallons per flush (gpf), which is a >20% reduction from their 1.6 gpf low-flow predecessors, and a >60% reduction from older high flow toilets. Tank-type HETs are available from 0.8 to 1.28 gpf; and can utilize pressure vessel or canister flush technologies for improved performance over the traditional flapper assemblies, which helps reduce leaks, clogs, and fixture maintenance (yielding an average annual direct O&M savings of $2.00 per fixture).

> **Tank Style Water Closets:** Tank style water closets utilize a tank fill valve on top of the bowl which uses gravity to drain large volumes of water into the bowl during evacuation. Pressure assisted tank valves use domestic water pressure to pressurize the tank water allowing for more forceful evacuations with less water volume.
>
> **Flush Valve Water Closets**: Most commercial facilities utilize flush valve water closets. Flush valves are designed to release precise volumes of water when activated. High efficiency flush valve and china combinations can enable a facility to greatly reduce its water consumption by reducing flush valve flow rates and the amount of water required for evacuation.

URINALS

Flush valves will typically contain diaphragms. These diaphragms and components deteriorate over time due to the flexing of the rubber and chloramines in the water treatment process. Urinal valves over 5 years in age have partially degraded diaphragms creating an average of 10% to 15% additional water per flush for those fixtures. The fixtures will be retrofit to low flow using newer chloramine resistant synthetic diaphragm valves and all fixtures should be change to ultra-low flow standards Existing 1/8 GPF urinal china will not be changed

High efficiency urinals (HEU) are available in a variety of different flush rates ranging from 0.125 gpf (pint-flush) up to 0.5 gpf, resulting in as much as a 90% reduction in consumption from typical existing fixtures. Waterless urinals are available that can virtually eliminate urinal water use, but due to extensive maintenance and potentially damaging effect to a facility's sewer plumbing infrastructure, they are not typically recommended

<u>Flush Valves</u>– Although proper fixtures are required to fully achieve water consumption savings and the desired performance of HE fixtures, the savings is achieved at the flush valve. We recommend installing Zurn or Sloan Synthetic diaphragm valves in replacement of existing valves.

BATHROOM FAUCETS/AERATORS

Most faucets utilize aerators to restrict the volume of water at the mouth of a faucet and to generate a more comfortable flow. High efficiency aerators can greatly reduce flow rates from faucets and create a comfortable flow for handwashing and cleaning. Restricting faucet flow rates enables a facility to conserve water and reduce energy usage associated with heating water. Faucets can typically be retrofit with high efficiency flow restriction devices (aerated or laminar flow). High efficiency flow restrictors are available in a range of flows from 0.35 gpm up to 1.5 gpm. Faucets incapable of simple retrofit may warrant replacement with a modern threaded faucet in order to achieve reduced flow. It should be noted, commercial deep well kitchen sinks, janitor slop sinks, and others that are primarily used for filling a fixed volume are not candidates for flow restriction.

SHOWERHEADS

High efficiency showerheads are available with a range of flow rates from 1.25 gpm up to 2.0 gpm. It is important to understand that the lowest flow showerhead is not always the best recommendation. Selecting showerheads that provide maximum water efficiency without sacrificing end-user satisfaction is key. HE showerheads are available in a variety of different configurations including traditional post-mounted, handheld shower wands, and a variety of different institutional wall-mounted or nozzle configurations. High efficiency pressure compensating showerheads can greatly reduce shower flow rates and create a comfortable flow. Restricting shower flow rates enables a facility to conserve water and reduce energy usage associated with heating water.

NOTE: All beach parks experience excessive wear to plumbing fixtures, so it is recommended to use stainless steel plumbing fixtures where possible at those locations. This will be stainless in lieu of porcelain for flush valve toilets, urinals and lavatories.

A summary of the proposed scope of work showing the quantities and types of retrofits for each facility is in the table below.

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
4Th Marine Memorial Park							1	2	3	3				1			1			2			
66 Market Street				1	2					3		3		1			1			3			
Central Maui Landfill (*)								3	3	3				2			2			4		1	
Central Maui Regional Sports Complex												36								24			
Coach Sakamoto Pool				2	3					5		13		3			3			12	3	2	
Coach Shiraishi Pool							5		5	5				2			2			4	8		
Cooke Memorial Pool				3	2					5		5		2			2			6	6	2	
Dt Fleming Park						5						5			1		1	4	4				
Duke Regional Park				4	1					5		5	1				1			3			
Eddie Tam Memorial Center				6	6			2	2	14		12		7			7			10		2	10
Fire Prevention Bureau							1	5	6	6				1			1			6	2		
Forensic Facility					1		2	1	3	4		1								4			
H A Baldwin						6						6			2		2	2	2				
Haiku Community Center							4	3	7	7				3			3			8			
Halimaale Park And Tennis				6	4			4	4	14		10								10			7
Hana Fire Station								4	4	4				1			1			4	2	1	
Hana Policestation					2					2		2		1			1			2	1	1	
Hanakao'O Park			4									4						4	4				
Hannibal Tavres				11	6					17		17		5			5			14			

Johnson Controls

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
4th Marine Division Memorial Park						6						6			1		1			3			
66 Market Street							6	2	8	8					2		2			5			
Central Landfill (*)								2	2	2										2		2	
Central Maui Regional Sports Complex								1	1	1				1			1					1	
Coach Sakamoto Pool				5	9			1	1	15	1	14		8			8			20	17	2	
Coach Shiraishi Pool				2	1			5	5	8		3		3			3			7			
Cooke Memorial Pool				3	5					8		8		1		1	1	2		3			
D.T. Fleming Park					2					2		2		1			1			2			
Duke Maliu Regional Park							1	5	6	6				2			2			10			
Eddie Tam Memorial Center		1		1	1					3	2	3		2			2			4		2	
Fire Prevention Bureau						9					5	9			2		2	8	8				
Forensic Facility				2						2		53								44	4		
H.A. Baldwin Park							4	3	7	7				2		1	2			6			
Haiku Community Center							5	2	7	7					1		1	4	4				
Haliimaile Park & Tennis							1	2	3	3					1		1	2	2				
Hana Fire Station						5					5	5			2		2	2	2				
Hana Police Station						5						5			2		2	6	6				
Hanakao'o Park				1	5					6		6		3			3			4		5	
Mayor Hannibal Tavares Community Center				5	4		1	4	5	14	2	9		3			3			12			

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
Honokowai Beach Park							3	1	4	4			2				2			2			
Ho'okipa Beach Park							3	3	6	6				2			2			3			
Hoolehua Fire station (*)												3		1			1			2			
Iao WTP (*)				3	2					5	5	5								9	4		
Kahului Fire Station							3	2	5	5										4			
Kahului Baseyard (*)		16								16		16		5			5	1		14			
Kahului Community Center	2	3								5		5		1			1			4			
Kahului Community Center Park				12	4					16	12	16		1			1			12			
Kahului Park (*)					1					1		1								1			
Kahului Wastewater Reclamation Facility				5	2					7		7		2			2			8	3	2	3
Kalama Park				1	1					2	2	2		1			1	1		2	2		
Kalana O Maui					4					4		32		10			10			26	14	5	
Kalana Pakui					1		1	8	9	10	1	1		4			4			19	2		
Kamaole I Beach Park				1	1					2		2	1				1			2			
Kamaole II Beach Park							3	2	5	5										2	2		
Kamaole III Beach Park				1	3		4	1	5	9		4	3				3			6			
Kanaha Beach Park		6								6		6		1			1			6			
Kaunakakai Fire								4	4	4						1				4	3		

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
Kaunoa Senior Services							1	1	2	2				1			1			2		2	
Kaunakakai Ball Field				7	2					9		9				2				7	16		
Keanae Park (*)		15								15	15	15								8			
Kehalani Mauka Park				17	11					28		28		10			10	2		5	8		8
Kenolio Recreation Center								5	5	5			3				3			5	3	2	
KeoKea Park					3			2	2	5		3	3				3			2	1	3	
Keopuolani Regional Park				3	2					5	3	5		1			1			2			
Keopuolani Skate Park					3		1	1	2	5		3		2			2			5	6		
Kepaniwai Park					1		10		10	11		1		3			3			12			
Kihei Community Center (*)								3	3	3										3	1	1	
Kihei Aquatic Center		8								8		8		3			3			8	1	2	
Kihei Fire Station								2	2	2				1			1			2	1	1	
Kihei Police Station							2	3	5	5				1			1					1	
Kihei Wastewater Reclamation Plant				2	1		1		1	4		3		2			2			4			
Kilohano Community Center						2					2	6			1		1	4	4				
Kokua Pool						3						3			1		1	2	2				
Kualapuu Park		2								2		2		1			1			2	2		
Kula Community Center												3		1			1			3			

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
Kula Fire Station							1	2	3	3				1			1			3	3	1	
Kula/Piiholo WTP (*)		1								1	1	1								1			
Lahaina Aquatic Center												20		2			2			21			
Lahaina Banyan Court Park				4	2					6		6		2			2			2			
Lahaina Civic Center				1	1					2		2	1				1			2			
Lahaina Fire Station			2	4	5					9		15		3			3			12	1		
Lahaina Police							2		2	2										2			
Lahaina Rec. Center Park							1		1	1										1			
Lahaina Wastewater Reclamation Facility							1		1	1										1			
Lanai Baseyard (*)							3	1	4	4				1			1			4	4		
Lanai Fire Station												6		1			1			4			
Lanai Police				2	4					6		6		2			2			4			
Lanai WTP (*)								1	1	1	1									1			
Lanai Senior Center								1	1	1										1			
Lanai Park and Tennis(*)						5					5	5						5	5		12		
Launiupoko Beach Park					2		4	3	7	9		2		2			2			8			
Lower Paia Park (*)							3	1	4	4										4	4		
Mahinahina WTP (*)				6	8					14		14		4			4			14			
Makawao Cemetery (*)						2						2			2		2	4	4				

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
Makawao Fire Station							1	3	4	4				2			2			6		2	
Malu Ulu Olele Park				23	12					35	35	35		4			4			18			
Maui County Service Center (*)				8	4					12	6	12		4			4			4			
Maui Lani Regional Park				4	4					8		8		2			2			10			
Maunaloa Community Center					2		7	2	9	11		2								14			
Mitchell Pauole Community Center (*)								2	2	2										2			
Mokuhau Park						11						11			1		1	7	7				
Molokai Baseyard				1	1			1	1	3		2	1				1			1			
Molokai Kuha'O Business Center (*)				12			6	2	8	20		12		5			5			16			
Napili Fire Station	2	3								5		5		1			1			4			
Napili Park								3	3	3					1		1	2	2				
Old Courthouse Building												2		1			1			2			
Old Lahaina Prison						3					3	3			1		1	2	2				
Olinda WTP (*)				8	5					13	13	13		9			9			14	10	2	
One Ali'I Park					2		3	7	10	12		2		3			3			12	4	1	
Paia Community Center							3	2	5	5				1			1			4			
Paia Fire Station		20		1	1					22		34								34	16		
Papohaku Park (*)						3					3	3			1		1	2	2				
Papohaku Beach Park								1	1	1										1	2		

	WATER CLOSETS												URINALS					FAUCETS			SHOWERHEADS		
	WALL-MOUNT			FLOOR MOUNT			TANK STYLE			TOILET SEATS		FLUSH VALVES	URINALS			FLUSH VALVES		FAUCETS and Flow Restrictors			SHOWERHEADS, MANIFODS AND INSERT ADAPTERS		
Facility	1.28 GPF Wall-mount Fixture Rear Spud Bowl	1.28 GPF Wall-mount Fixture Top Spud Bowl	WM TS Stainless Steel	1.28 GPF Floor Mounted Standard Fixture	1.28 GPF ADA Compliant Floor Mounted Bowl	FM Rear Discharge Stainless Steel	1.0 GPF Tank Type Bowl	1.0 GPF ADA Compliant Tank Type Bowl	1.0 GPF Pressure Assisted Tank	Elongated Bowl Plastic Toilet Seat	Extra Vacuum Breaker	1.28 GPF Water Closet Valve	1/8 GPF Wall-mounted Urinal China Rear Spud	1/8 GPF Wall-mounted Urinal China Top Spud	Stainless Steel Wall-mounted Urinal	0.5 GPF Urinal Flush Valve	1/8 GPF Urinal Valve	0.5 GPM Single Handle Basin Cock Faucet	Metcraft Stainless Lavatory	0.5 GPM Vandal Proof Aerator	1.5 GPM Chrome Residential Showerhead	1.5 GPM Handheld Chrome Residential Showerhead	Inline Flow Restrictor - Shower
Sewer Maintenance Building (*)				5	2					7		7		1			1			6			
South Maui Community Center				10	2					12		12		4			4			12		2	
Total	**4**	**75**	**6**	**193**	**153**	**65**	**98**	**121**	**219**	**644**	**122**	**673**	**15**	**164**	**22**	**5**	**201**	**66**	**60**	**679**	**168**	**48**	**28**

NOTE:

Facilities with an (*) will not be included in the scope of work, as there were no water bills provided by the County. These sites can be included in future phases, once the water baseline is established from utility bills.

Scope of Work

This section describes the contractual scope of work.

JCI shall provide domestic water fixture retrofit work that will include all necessary labor, materials, equipment, transportation, and storage for locations as identified in the detailed line by line, shown in Appendix 3 – Domestic Water Fixtures Scope of Work. Work will be performed in accordance with current applicable local, state, and federal codes and regulations promulgated at time of contract execution. A 2% attic stock of the predominant fixture types will be provided to the County upon the completion of the installation.

- Fixture recommendations included in the proposed scope of work are done so on a "like-for-like" basis in effort to minimize infrastructure modification.
- Provide and install new domestic water fixtures as described below:

1. Water Closets:

Tank type toilet bowl and seat

- (80) 1.0 GPF Pressure Assist Tank Style Toilet
- (95) 1.0 GPF Pressure Assist ADA Tank Style Toilet

Water Closet China

- (179) High Efficiency Floor Mount Top Spud Toilet (1.28 GPF)
- (136) High Efficiency Floor Mount ADA Top Spud Toilet (1.28 GPF)
- (4) High Efficiency Wall-mount Rear Spud Toilet (1.28 GPF)
- (73) High Efficiency Wall-mount Top Spud Toilet (1.28 GPF)

Stainless Steller Security Fixtures

- (4) High Efficiency Wall-mount Top Spud Stainless Steel Toilet (1.28 GPF)
- (62) High Efficiency Floor Mount Top Spud Stainless Steel Toilet (1.28 GPF)

Water Valve

- (608) High Efficiency 1.28 GPF Synthetic Diaphragm Valve

Water Closet Seat

- (567) Elongated, standard white, open front toilet seat less cover with stainless steel check hinge

2. Urinals:

Urinal China

- (15) 1/8 GPF to 0.5 GPF Ultra Low Flow Urinal China Rear Spud
- (134) 1/8 GPF to 0.5 GPF Ultra Low Flow Urinal China Top Spud
- (21) 1/8 GPF to 0.5 GPF Low Flow Stainless Steel Urinal

Urinal Valve

- (5) High Efficiency 0.5 GPF Synthetic Diaphragm Valve
- (170) High Efficiency 1/8 GPF Synthetic Diaphragm Valve

3. Bathroom Faucets / Aerators:

- (572) Neoperl 0.5 GPM Vandal proof aerator for bathroom faucet, or equivalent
- (64) New Single Handle Basin Cock Faucets
- (58) Metcraft Stainless Steel Lavatory, or equivalent

4. Showerheads:

- (164) BriCor Eco-Fit 1.5 GPM Low Flow Pressure Compensating Showerhead, or equivalent
- (39) BriCor B150 1.5 GPM Low Flow Pressure Compensating Handheld Showerhead, or equivalent
- (28) 1.5 GPM In-Line Flow Restrictor or Acorn Shower Insert Moderator, or equivalent

Exclusions:

- Replacement of shutoff or isolation valves or repair main water valves that do not close completely or that will not fully reopen.
- Correction of existing water hammer or pipe support deficiencies, unless it was observed during the building audits and accounted for in the Scope of Work.
- Repair of previously deteriorated plumbing not associated with the work defined in this scope.
- Repair or replace corroded wall-hung toilet/urinal drainpipes or carriers, unless specified in the table above.
- Any and all ADA bathroom partitions, grab bars, extensions, sink faucet actuators, piping insulation, or other ADA requirements are hereby excluded from this proposal. JCI does not take responsibility for any existing or future ADA compliance issues and if required to modify bathrooms or fixtures to meet an ADA code this will be completed for an additional cost.
- Installation of booster pumps or pressure reducing valves, in case the building water pressure is outside the range of 25 to 85 psi
- Painting, tile work, and wall repair outside of footprint related patching. Pre-existing damage to walls or flooring will be brought to the attention of customer.
- Replacement of failed existing angle stop valves.
- Replacement of batteries in touchless fixture actuators or motion controllers.
- Permits, fees, or processes required by local or oversight jurisdiction and/or utilities or permits and upgrades triggered by other upgrade and renovation projects.

Equipment Manufacturer

The following are the list of manufacturers and their warranties:

Product	Manufacturer	Warranty (yrs)
China products	Zurn / Kohler	5
Faucets	Zurn / Delta	5
Showerheads	Acorn / BriCor	3
Various	Sloan / Zurn	5
Stainless Lavatory	Metcraft Stainless	5

Warranty does not cover damage by misuse, abuse, tampering or “acts of nature” outside our control.

Energy Savings Calculations

The savings will be calculated according to the following formulas:

Domestic Fixture Water/Sewer Savings

There are water and sewer savings specifically associated with the reduction in water use or water flow per fixture for domestic water fixture retrofits. The equations used are shown below:

Equations for Calculating Water/Sewer Savings for Domestic Water Fixtures

Water Savings $= \sum_{type}$ *[(Usage Rate*$_{baseline}$ *- Usage Rate*$_{post}$*) x AAUF*$_{type}$ *x Quantity*$_{type}$*] / 1000*

AAUF $= \sum_{population\ group}$ *[(Male Daily Use*$_{population\ group}$ *x Number Males*$_{population\ group}$ *+ Female Daily Use*$_{population\ group}$ *x Number Females* $_{population\ group}$*)] x Avg Days per Year Occupied*

where:

Water Savings = water savings realized in kilogallons (kGal). These savings will result in water and sewer dollars saved.

Usage Rate$_{baseline}$ = baseline fixture use rate in gpm (showers/faucets), or gpf (urinals/toilets)

Usage Rate$_{post}$ = post installation fixture use rate in gpm (showers/faucets), or gpf (urinals/toilets)

AAUF = average annual use or flushes per fixture; faucets or showers in minutes per year, toilets or urinals in flushes per year =average people using x minutes/day (faucets/showers) or flushes/day (toilets/urinals) x days/year

Quantity = quantity of affected fixtures

Annual water and sewer cost savings are determined by multiplying the water kgal savings by the corresponding facility water and sewer rate ($/kgal).

The assumed Daily Use data for each fixture type and population group is in the table below:

Population Group	Gender	WATER CLOSET USE daily per person (flush)	URINAL USE daily per person (flush)	FAUCET USE daily per person (min)	SHOWER USE daily per person (min)
<2 hr Visitors	Male	0.35	0.15	0.06	0.05
	Female	0.50		0.06	0.05
<4 hr Visitors	Male	0.5	0.3	0.08	0.1
	Female	0.8		0.09	0.1
8 hr Regulars/Staff	Male	2.0	1.0	0.33	0.1
	Female	3.0		0.33	0.1
Emergency Services Staff	Male	2.0	1.0	0.6	8.2
	Female	3.0		0.8	8.2

The Population data (Number of Male/Female occupants) for each facility is in the table below, as estimated by Johnson Controls (water balance calculations are performed for each facility to compare calculated water use to the actual water consumption baseline from the utility bills), as well as the Average Days per Year each facility is occupied. It is estimated that 50% of the population is male and 50% is female

Site	<2Hr Visitors	<4Hrs Visitors	8hr Staff	Emergency Services Staff	Occupied Days
4Th Marine Memorial Park	1000	1000	2	0	365
66 Market Street	200	200	2	0	365
Central Maui Landfill	1	1	5	0	365
Central Maui Regional Sports Complex	75	75	8	0	365
Charley Young Park	5	5	0	0	365
Coach Sakamoto Pool	250	250	5	0	365
Coach Shiraaishi Pool	25	25	5	0	365

Site	<2Hr Visitors	<4Hrs Visitors	8hr Staff	Emergency Services Staff	Occupied Days
Cooke Memorial Pool	25	25	5	0	365
Dt Fleming Park	110	110	2	0	365
Duke Regional Park	250	250	6	0	365
Eddie Tam Memorial Center	50	50	8	0	365
Fire Prevention Bureau	10	1	25	0	365
Forensic Facility	4	0	4	0	365
H A Baldwin	150	160	0	0	365
Haiku Community Center	30	15	6	0	365
Halimaale Park And Tennis	25	25	5	0	365
Hana Bay Beach Park	500	200	2	0	365
Hana Fire Station	1	1	0	11	365
Hana Policestation	1	1	22	0	365
Hanakao'O Park	1000	1000	2	0	365
Hannibal Tavres	25	25	10	0	365
Haycraft Park	1000	1000	2	0	365
Honokowai Beach Park	300	300	2	0	365
Hookipa Beach Park	488	488	2	0	365
Hoolehua Fire Station	1	1	0	10	365
Iao Valley Wtp	1	1	4	0	365
Kahalui Fire Station	2	2	0	50	365
Kahului Baseyard	1	1	30	0	365
Kahului Community Center	2	2	10	0	365
Kahului Community Center Park	10	250	15	0	365
Kahului Park	4	250	2	0	365
Kahului Wastewater Treatment	3	160	10	0	365
Kalama Park	500	500	2	0	365
Kalana O Maui	3	3	250	0	251
Kalana Pukai	3	3	20	0	253
Kamaole 1 Beach Park	163	163	2	0	365
Kamaole 2 Beach Park	163	163	2	0	365
Kamaole 3 Beach Park	163	163	2	0	365
Kamehameha Iki Park	100	50	2	0	365
Kanaha Beach Park	1000	1000	2	0	365
Kaunakakai Fire	1	1	0	12	365
Kaunoa Senior Service	10	10	20	0	256
Kaunakakai Ball Field	125	125	2	0	365
Keanae Park	250	250	2	0	365
Kehalani Mauka Park	250	250	2	0	365
Kenolio Rec. Center	18	18	25	0	365

Site	<2Hr Visitors	<4Hrs Visitors	8hr Staff	Emergency Services Staff	Occupied Days
Keokea Park	25	25	2	0	365
Keopuolani Regional Park	1000	1000	2	0	365
Keopuolani Skate Park	50	50	2	0	365
Kepaniwai Park	750	750	2	0	365
Kihei Community Center	75	75	8	0	365
Kihei Aquatic Center	250	250	5	0	365
Kihei Fire Station	1	1	0	9	365
Kihei Police Station	95	10	8	0	365
Kihei Wastewater Reclamation WWTP	1	1	5	0	365
Kilohano Community Center	10	10	8	0	365
Kokua Pool	300	250	8	0	365
Kualapuu Park	300	275	2	0	365
Kuha'O Business Center	1	1	2	0	308
Kula Community Center	10	10	10	0	365
Kula Fire Station	1	1	0	12	365
Kula/Piiholo Water Treatment Plant	1	1	5	0	365
Lahaina Aquatics	250	250	10	0	365
Lahaina Banyan Court Park	1250	1250	2	0	365
Lahaina Civic Center	125	125	5	1571	365
Lahaina Fire Station	1	1	0	35	365
Lahaina Police	18	5	5	0	365
Lahaina Rec. Center Park	13	13	10	0	365
Lahaina Waste Water	1	1	4	0	365
Lanai Baseyard	1	1	8	0	365
Lanai Fire Station	1	1	0	13	365
Lanai Police	12	2	4	0	365
Lanai Wtp	1	1	5	0	365
Lanai Senior Center	15	5	5	0	261
Lania Park And Tennis	13	13	2	0	365
Launiupoko Beach Park	1000	1000	2	0	365
Lower Paia Park	275	275	2	0	365
Mahinahina Wtp	1	1	6	0	365
Makawao Cemetery	20	5	8	0	365
Makawao Fire Station	1	1	0	6	365
Malu Ulu Olele Park	25	25	2	0	365
Maui County Service Center	150	20	25	0	261
Maui Lani Regional Park	70	70	2	0	365
Maunaloa Community Center	13	13	6	0	365
Mitch Pauole	163	163	100	0	365

Site	<2Hr Visitors	<4Hrs Visitors	8hr Staff	Emergency Services Staff	Occupied Days
Mokuhau Park	50	50	2	0	365
Molokai Baseyard	1	1	6	0	365
Molokai Kuha'O Business Center	1	1	2	0	294
Napili Fire Station	1	1	0	8	365
Napili Park	20	20	2	0	365
Old Court House	40	10	40	0	257
Old Lahaina Prison	275	20	2	0	365
Olinda Water Treatment	1	1	4	0	365
One Ali'I Park	1	1	1	0	365
Paia Community Center	50	50	10	0	365
Paia Fire Station	1	1	0	13	365
Papohaku Park	100	100	2	0	365
Papohaku Beach Park	850	850	2	0	365
Sewer Maintenance Baseyard	1	1	6	0	276
South Maui Community Center	50	100	10	0	365
South Maui Community Park	25	25	2	0	365
Upcountry Pool	100	100	10	0	365
Velma McWayne	15	15	5	0	365
Victims Advocate Building	1	1	8	0	282
Wahikuli Wayside Park	1000	1000	2	0	365
Waiakoa Gym	0	0	1	0	365
Waiehu Golf Course	250	300	24	0	365
Waiehu Terrace Park	50	50	2	0	365
Waihee Beach Park	20	20	2	0	365
Waikapu Community Center Park	25	25	2	0	365
Wailea Beach Park	1000	1000	2	0	365
Wailea Fire Station	1	1	0	19	365
Wailuku Baseyard	60	0	8	0	365
Wailuku Elementary School Park	50	50	2	0	365
Wailuku Police Station	100	50	8	0	365
Waipuilani Park	50	50	2	0	365
Wailuku Pool	100	50	6	0	365
Well Park	50	50	2	0	365
West Maui Senior Center	10	10	10	10	261

Baseline Measurements

The following table represents the pre-retrofit (existing) flowrates that form the basis for the baseline water consumption. These values were measured between 7/18/22 and 7/22/22 and will not be measured again.

The measurements were taken by measuring a volume of water (in Ounces) over a 3 second period. Thus, the flowrate in GPM is calculated as:

$$GPM = \frac{Ounces\ x\ \frac{1\ gal}{128\ oz}}{3\ \mathrm{sec}\ x\ \frac{1\ min}{60\ sec}} = 0.15625\ x\ Ounces\ measured$$

Flush Valves were measured with the one of following options:

Option 1: Trap of Water Closet is blocked with a 2" trap plug/ball. Contents of the bowl are emptied and dump until clear. Flush Valve is actuated and contents of bowl our vacuumed out and poured into a measured bucket. This process requires a buckethead shop vacuum and electric cord.

Option 2: The vacuum breaker tube is removed from the valve. The valve is repositioned directly vertical (if the valve is spun out and flushed, it will gush huge amounts of water). Try to leave the actual vacuum breaker in.

The measurements are averaged, and the average value is used to determine the water savings. Below is a summary of the results obtained:

Water Closets (1.6 GPF)		Water Closets (1.28 GPF)	
Current Toilet Design:	1.6 GPF	**Current Toilet Design:**	1.28 GPF
M&V Flush Volume Test:	2.26 GPF	**M&V Flush Volume Test**:	1.95 GPF
Proposed New Flow:	1.1 GPF	**Proposed New Flow:**	1.1 GPF

Tank Type Toilets	
Current Toilet Design:	1.6 GPF
M&V Flush Volume Test:	1.66 GPF
Proposed New Flow:	1.0 GPF (Pressure Assisted)

Urinals (1.0 GPF)		Urinal (1.5 GPF)	
Current Urinal Design:	1.0 GPF	**Current Urinal Design:**	1.5 GPF
M&V Flush Volume Test:	1.53 GPF	**M&V Flush Volume Test**:	1.74 GPF
Proposed New Flow:	0.125 GPF	**Proposed New Flow:**	0.125 GPF

Domestic Showers		Faucets (2.2 GPM)	
Current Shower Design:	2.5 GPM	**Current Faucet Design:**	2.2 GPM
M&V Volume Test:	4.32 GPM	**M&V Volume Test**:	3.49 GPM
Proposed New Flow:	1.5 GPM	**Proposed New Flow:**	0.5 GPM

The following tables show all the measurements taken by location.

TOILETS CATEGORY 1: 1.28 GPF Toilet Flush Valve

	Site Name	Location	Measured Flush Rate (GPF)
1	Honokowai Beach Park	Men’s	2.5
2	Honokowai Beach Park	Men’s	2.8
3	Waiehu Terrace Park	Men’s	2.5
4	Waiehu Terrace Park	Women’s	2
5	Waikapu Comm. Cent. Park	Men’s	1.2
6	Waikapu Comm. Cent. Park	Women’s	1.2
7	Waikapu Comm. Cent. Park	Women’s	1.2
8	Kalama Park	Men’s	1.5
9	Kalama Park	Men’s	1.8
10	Kalama Park	Women’s	3
11	Kalama Park	Women’s	2.3
12	Kalama Park	Women’s	1.5
13	Laniupoko Beach Park	Men’s	2
14	Laniupoko Beach Park	Men’s	2.4
15	Laniupoko Beach Park	Women’s	1.8
16	Napili Park	Women’s	2
17	Napili Park	Women’s	1.5
	Average Measurement		**1.95**

TOILETS CATEGORY 2: 1.6 GPF Toilet Flush Valve

	SIte Name	Location	Measured Flush Rate (GPF)
1	Kahului Fire Station	Men’s 2nd fl	2
2	Kahului Fire Station	Men’s 2nd fl	2.5
3	Hanakaoo Beach Park	Men’s	1.7
4	Hanakaoo Beach Park	Women’s	1.6
5	Hanakaoo Beach Park	Women’s	1.6
6	Lahaina Rec. Center	Men’s	2
7	Lahaina Rec. Center	Men’s	1.8
8	Lahaina Rec. Center	Women’s	4.5
9	Lahaina Rec. Center	Women’s	2.2
10	Lahaina Rec. Center	Women’s	1.8
11	Maui Lani Regional Park	Men’s	4
12	Maui Lani Regional Park	Men’s	1.8
13	Maui Lani Regional Park	Women’s	1.6
14	Maui Lani Regional Park	Women’s	1.8
15	Waiehu Terrace Park	Men’s	2
16	Waiehu Terrace Park	Women’s	3.2
17	Waiehu Terrace Park	Women’s	2.4
	Average Measurement		**2.26**

TOILETS CATEGORY 3: 1.6 GPF Toilet TANK Type

	SIte Name	Location	Measured Flush Rate (GPF)
1	Napili Fire Station	Unisex	1.5
2	Napili Fire Station	Unisex	1.2
3	Napili Fire Station	Captain's	1.5
4	Napili Fire Station	Unisex	1.8
5	Kamaole Beach 1	Men's	1.8
6	Kamaole Beach 1	Women's	1.5
7	Kamaole Beach 1	Women's	1.8
8	Kamaole Beach 2	Men's	1.9
9	Kamaole Beach 2	Men's	1.5
10	Kamaole Beach 2	Men's	1.5
11	Kamaole Beach 2	Women's	1.5
12	Kamaole Beach 2	Women's	1.6
13	Kihei WRF	Men's	2
14	Kihei WRF	Men's	1.9
15	Kihei WRF	Unisex	1.8
16	Kihei Comm. Comp.	Men's	2
17	Kihei Comm. Comp.	Women's	1.5
	Average Measurement		**1.66**

URINALS CATEGORY 1: 1.5 GPF Urinal Flush Valve

	Site Name	Location	Measured Flush Rate (GPF)
1	Kahului Fire Station	Men's 2nd fl	1.5
2	Wailea Beach Park	Men's	1.7
3	Napili Park	Men's	2
4	Kihei Fire Station	Unisex	2
5	Kahului Wastewater	Men's	1.8
6	Kahului Wastewater	Men's	1.5
7	4th Marine Division Park	Men's	1.9
8	Kahului Fire Station	Men's 2nd fl	2
9	Kahului Fire Station	Men's 2nd fl	1.6
10	Kahului Fire Station	Captain's	1.5
11	Kahului Fire Station	2nd fl right	1.6
12	Kahului Fire Station	2nd fl right	1.8
Average Measurement			**1.74**

URINAL CATEGORY 2: 1.0 GPF Urinal Flush Valve

	Site Name	Location	Measured `Flush Rate (GPF)
1	Lahaina Rec. Center	Men's	0.5
2	Maui Lani Regional Park	Men's	2
3	Maui Lani Regional Park	Men's	1.8
4	Waiehu Terrace Park	Men's	1.5
5	Waikapu Comm. Cent. Park	Men's	0.6
6	Kalama Park	Men's	1.6
7	Laniupoko Beach Park	Men's	1.5
8	Napili Fire Station	Unisex	1.8
9	Kihei WRF	Men's	1.8
10	Kihei WRF	Mechanic Shop	1.5
11	Kihei WRF	Men's	2
12	Kihei WRF	Men's	2
13	Kihei WRF	Men's	1.8
14	Kihei Comm. Comp.	Men's	1.5
15	Kihei Comm. Comp.	Men's	1.4
16	Kihei Pals	Men's	1.2
17	Keopuolani Regional Park	Men's	1.5
	Average Measurement		**1.53**

FAUCET CATEGORY 1: 2.2 GPM Faucets

	Site Name	Location	Fl Oz Measured	Flush / Flow Rate (GPM)
1	Napili Park	Men's	20	3.125
2	Napili Park	Men's	16	2.5
3	Napili Park	Women's	16	2.5
4	Napili Park	Women's	20	3.125
5	Wahikuli Wayside Park	Men's	20	3.125
6	Wahikuli Wayside Park	Women's	20	3.125
7	Kahului Fire Station	Men's 2nd fl	14	2.1875
8	Kahului Fire Station	Men's 2nd fl	30	4.6875
9	Honokowai Beach Park	Men's	30	4.6875
10	Honokowai Beach Park	Women's	18	2.8125
11	Honokowai Beach Park	Women's	24	3.75
12	Hanakaoo Beach Park	Women's	20	3.125
13	Hanakaoo Beach Park	Women's	22	3.4375
14	Hanakaoo Beach Park	Men's	30	4.6875
15	Lahaina Rec. Center	Men's	30	4.6875
16	Lahaina Rec. Center	Women's	26	4.0625
17	Maui Lani Regional Park	Men's	24	3.75
	Average Measurement			**3.49**

DOMESTIC INDOOR SHOWERHEADS CATEGORY 1: 2.5 GPM Showerhead

	Site Name	Location	Fl Oz Measured	Flush / Flow Rate (GPM)
1	Kahului Fire Station	Men's 2nd fl	20	3.125
2	Kahului Fire Station	Men's 2nd fl	24	3.75
3	Napili Fire Station	Unisex	32	5
4	Napili Fire Station	Unisex	30	4.6875
5	Napili Fire Station	Unisex	18	2.8125
6	Napili Fire Station	Captain's	16	2.5
7	Kihei Wastewater Reclamation	Men's	32	5
8	Kihei Wastewater Reclamation	Men's	18	2.8125
9	Kihei Wastewater Reclamation	Men's	48	7.5
10	Kihei Wastewater Reclamation	Men's	52	8.125
11	Kihei Community Comp.	Men's	32	5
12	Kihei Community Comp.	Men's	22	3.4375
13	Kihei Community Comp.	Women's	18	2.8125
14	Kihei Community Comp.	Women's	36	5.625
15	Kihei Fire Station	Unisex	16	2.5
16	Kihei Fire Station	Unisex	24	3.75
17	Sewer Maintenance Baseyard	Unisex	32	5
	Average Measurement			**4.32**

The below summarizes the total Domestic Fixtures Water/Sewer Savings (for details by site refer to Appendix 11):

Table 5: FIM 5 Water/Sewer Savings Summary

Water (kgal)	Sewer (kgal)	$-Water	$-Sewer	$-Total
14,667.99	14,667.99	$81,252.51	$54,463.00	**$135,715.51**

Hot Water Heating Energy Savings

Due to the reduction in domestic water use in showers and sinks, there will also be an associated reduction in hot water use and heating fuel/energy savings. These savings are only applied to fixtures that use hot water, and only in facilities that tend to use hot water (fire/police stations, aquatic centers).

A FIM to convert existing water heaters to Heat Pumps was not pursued due to existence of either Solar Thermal water heating, or point of use instant hot water heaters.

Hot Water Heating Fuel Project Benefits

Energy Project Benefits =

$$\text{Water savings} \times (Temp_{hot} - Temp_{cold}) \times \text{Specific Heat} \times 1{,}000 / (3413 \times \text{Efficiency})$$

where:

Energy Project Benefits =	Fuel savings realized in kWh
WaterProject Benefits$_{f-sh}$ =	water savings for faucets and showers in kGal
Temp$_{hot}$ =	average water temperature = 85°F (faucets), 106°F (showers)
Temp$_{cold}$ =	average cold water temperature = 75°F (for Maui, HI)
Specific Heat =	8.34 Btu / (kgal) (°F) for water
Efficiency =	Water heater efficiency expressed as a fraction = 98% for electric DHW heaters

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

Electric DHW heaters are assumed to have an efficiency of 98%.

The hot water savings associated with the domestic water fixture retrofits will not be measured, and below is a table showing the results:

Facility	Dom Water Heating Savings (kWh/yr)	Dom Water Heating Savings ($/yr)
Coach Sakamoto Pool - Domestic Water Fixture Retrofits	3,882.52	$1,268.15
Coach Shiraishi Memorial Pool - Domestic Water Fixture Retrofits	332.05	$108.46
Cooke Memorial Pool - Domestic Water Fixture Retrofits	332.05	$127.47
Hana Fire Station - Domestic Water Fixture Retrofits	3,977.68	$1,483.20
Hana Police Station - Domestic Water Fixture Retrofits	232.09	$86.54
Kahului Fire Station - Domestic Water Fixture Retrofits	18,077.61	$5,904.69
Kaunakakai Fire Station - Domestic Water Fixture Retrofits	4,297.68	$1,649.91
Kihei Aquatic Center - Domestic Water Fixture Retrofits	3,882.52	$1,268.15
Kihei Fire Station - Domestic Water Fixture Retrofits	4,013.32	$1,496.49
Kihei Police Station - Domestic Water Fixture Retrofits	901.01	$294.30
Kokua Pool - Domestic Water Fixture Retrofits	2,860.46	$934.31
Kula Fire Station - Domestic Water Fixture Retrofits	5,521.73	$2,058.95
Lahaina Aquatic Center - Domestic Water Fixture Retrofits	2,673.96	$873.40
Lahaina Civic Center - Domestic Water Fixture Retrofits	45,468.04	$14,851.22
Lahaina Fire Station - Domestic Water Fixture Retrofits	24,098.40	$7,871.26
Lahaina Police Station - Domestic Water Fixture Retrofits	187.95	$61.39
Lanai Fire Station - Domestic Water Fixture Retrofits	5,981.45	$2,833.76
Lanai Police Station - Domestic Water Fixture Retrofits	125.68	$57.09
Lanai Senior Center - Domestic Water Fixture Retrofits	36.10	$17.10
Makawao Fire Station - Domestic Water Fixture Retrofits	2,763.38	$1,030.41
Paia Fire Station - Domestic Water Fixture Retrofits	4,655.40	$1,735.91
Upcountry Pool - Domestic Water Fixture Retrofits	1,166.56	$434.99
Wailea Fire Station - Domestic Water Fixture Retrofits	6,282.10	$2,051.92
Wailuku Police Station - Domestic Water Fixture Retrofits	850.59	$257.48
Wailuku Pool - Domestic Water Fixture Retrofits	818.26	$267.27
Total	**143,418.58**	**$49,023.81**

Commissioning Procedure

Installation is to be completed per manufacturer specifications

ESCO's Training Responsibilities

Standard Operations and Maintenance Overview of all standard plumbing material will be provided.

ESCO's Maintenance Responsibilities

No maintenance services are included.

Customer's Maintenance Responsibilities

Customer is responsible for properly maintaining and performing appropriate preventative maintenance on the new domestic water fixtures installed, in accordance with manufacturers' standards and specifications.

Operation and Maintenance (O&M) Cost Savings Calculations

No O&M Savings have been included for this FIM. However, it is generally accepted that there will be some amount of O&M savings in the repairs/replacements of flush valves and other similar components being replaced.

Facility Support Required and Customer's Responsibilities:

It is intended that existing angle stop valves are re-used in the implementation of this scope of work. If failed stop valves are encountered, isolated or full building water shutdowns may be required. These will be coordinated in advance with facility personnel. Facility personnel will provide signage to block off restroom while JCI is working, if the work is done during occupied hours.

The new touchless flush valves and water fixtures that JCI is installing will be battery operated. Customer will furnish the maintenance, and replacement of the batteries after the initial 1-year construction warranty.

FIM 6 – Shower Tower Retrofits

Existing Conditions

The majority of beach parks have multiple shower towers for beach visitors. The population is comprised of older manual shower towers with copper lines connected to manual ball valves with 1-4 heads. Other beach parks have 2-4 nozzle older push button shower towers.

Location	QTY	TYPE
Charley Young	1	Manual
DT Fleming Park	1	Push Button
H A Baldwin	1	Push Button
Hana Bay Beach Park	5	Manual
Hanakao'o Park	2	Manual
Haycraft Park	1	Push Button
Honokowai Beach Park	1	Push Button
Hookipa Beach Park	1	Push Button
Hookipa Beach Park	1	Manual
Kalama Park	2	Manual
Kamaole I Beach Park	1	Push Button
Kamaole II Beach Park	1	Push Button
Kamaole III Beach Park	3	Push Button
Kamehameha Iki Park	1	Push Button
Kanaha Beach Park	5	Manual
Kihei Aquatic Center	3	Push Button
Launiupoko Beach Park	1	Push Button
Lower Paia Park	1	Push Button
Papohaku Beach Park	1	Manual
Papohaku Beach Park	2	Manual - Copper Shower Repipe
Wahikuli Wayside Park	3	Manual
Wailea Beach Park	1	Push Button
TOTAL	**39**	

Existing Deficiencies

High volume of water is utilized on beach shower towers daily. Older manual shower towers with copper lines are manually operated by ball valves with 1-4 heads so have exposed hose bibs at ground level. These manual shower towers operate at more than 16 gallons per minutes per head.

Push Button shower towers models are older style with 2-4 nozzles that measure 5-6 gallons per minute per head.

FIM Description

We estimate an excess of 35% of water usage coming from beach shower tower usage. Combined with vandalism and excessive usage from both visitors and non- beach users after hours, we recommend the replacement with new low flow (2.5 gpm) shower towers.

All beach parks experience excessive vandalism to plumbing fixtures so we will recommend special order vandal proof institutional grade shower towers with pressure compensating spray nozzles.

Outdoor Shower Plumbing Fixtures

- Commercial Grade, Vandal Resistant Outdoor Shower
- Custom Built – 4 Station Minimum
- Constructed of high-grade polymer.
- Tough, non-porous plastic won't rust or corrode.
- Round portions of the column are rough textured to discourage carving and engraving.
- Anchor hole areas are recessed below the top of the mounting flange to help keep mounting hardware away from bare feet.
- Impact resistant to minus 40 degrees F.
- UV stabilized, molded in colors won't fade.
- Colors molded through the entire shell. Nicks and scratches don't show when they occur. Undesirable cuts, engraving, etc., can be heat blended away with careful use of butane torch.
- 2.5 Gallon per minute maximum flow per nozzle
- ADA Compliant

The Lower Paia Park water meter provided by the County shows that there is no consumption, so, it is assumed that this shower is not used, and thus is not recommended for replacement.

Scope of Work

This section describes the contractual scope of work.

Johnson Controls shall provide domestic water fixture retrofit work that will include all necessary labor, materials, equipment, transportation, and storage for locations as identified in the table below. Work will be performed in accordance with current applicable local, state, and federal codes and regulations promulgated at time of contract execution.

- Provide and install thirty-six (36) Willoughby, or equivalent vandal proof shower towers with 2.5 gpm spray nozzles, in the locations shown in the table below.
- Repipe copper lines in two (2) inside-the-restroom showers at Papohaku Beach Park. The existing shower is a copper line with an attached copper 90° elbow as a shower. This will be re-piped to accommodate a standard 2.5 gpm showerhead with no tempering valve.
- Fixture recommendations included in the proposed scope of work are done so on a “like-for-like” basis in effort to minimize infrastructure modification.
- New Shower Towers will be installed in the same location of the pre-existing unit
- Concrete pad replacement (limited to four square feet per tower location)
- Properly disposal of replaced material and equipment

Location	QTY	TYPE	Work Description
Charley Young	1	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
DT Fleming Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
H A Baldwin	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Hana Bay Beach Park	5	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Hanakao'o Park	2	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Haycraft Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Honokowai Beach Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Hookipa Beach Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Hookipa Beach Park	1	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kalama Park	2	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kamaole I Beach Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kamaole II Beach Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kamaole III Beach Park	3	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kamehameha Iki Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kanaha Beach Park	5	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Kihei Aquatic Center	3	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Launiupoko Beach Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Papohaku Beach Park	1	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Papohaku Beach Park	2	Manual - Copper Shower Repipe	Repipe copper to accommodate a standard 2.5 gpm showerhead with no tempering valve.
Wahikuli Wayside Park	3	Manual	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
Wailea Beach Park	1	Push Button	Willoughby or Equal Vandal Proof Shower Tower with 2.5 GPM Spray Nozzles
TOTAL	**38**		

Exclusions:

- Shower Tower has one supply line and is not equipped with temperature mixing valves. Tempered water is excluded.
- Permitting for this new work is excluded, since it is considered a replacement of a currently permitted fixture.

Equipment Manufacturer/Warranty

The following are the list of manufacturers and their warranties:

Product	Manufacturer	Warranty (yrs)
Shower Tower	Willoughby	3

Warranty does not cover damage by misuse, abuse, tampering or “acts of nature” outside our control.

Energy/Water Savings Calculations

The savings will be calculated according to the following formulas:

Shower Tower Water/Sewer Savings

There are water and sewer savings specifically associated with the reduction in water use or water flow per fixture for domestic water fixture retrofits. The equations used are shown below:

Equations for Calculating Water/Sewer Savings for Domestic Water Fixtures

$$\textit{Water Savings} = [\,(\textit{Usage Rate}_{baseline} - \textit{Usage Rate}_{post}) \times AAUF \times \textit{Quantity}] / 1000$$

$$AAUF = \textit{Number of Users} \times \textit{Avg Days per Year} \times \textit{Shower Use (min/use)}$$

where:

Water Savings =	water savings realized in kilogallons (kGal). These savings will result in water and sewer dollars saved.
$\textit{Usage Rate}_{baseline}$ =	baseline fixture use rate in gpm (showers),
$\textit{Usage Rate}_{post}$ =	post installation fixture use rate in gpm (showers),
AAUF =	average annual use for showers in minutes per year = Number of people using x minutes/day (showers)
Quantity =	quantity of affected fixtures

The number of people using the showers are estimated according to the annual water baseline provided by the County for each park.

Annual water and sewer cost savings are determined by multiplying the water kgal savings by the corresponding facility water and sewer rate ($/kgal).

The assumed Daily Use data is in the table below:

Location	QTY	TYPE	Days per Year	Number of Users	Shower Use (min)	AAUF
Charley Young	1	Manual	365	16.9	2.00	12,337
DT Fleming Park	1	Push Button	365	85	2.00	62,050
H A Baldwin	1	Push Button	365	116	2.00	84,680
Hana Bay Beach Park	5	Manual	365	6.5	2.00	4,745
Hanakao'o Park	2	Manual	365	228	2.00	166,440
Haycraft Park	1	Push Button	365	104	2.00	75,920
Honokowai Beach Park	1	Push Button	365	212	2.00	154,760
Hookipa Beach Park	1	Push Button	365	87	2.00	63,510
Hookipa Beach Park	1	Manual	365	78	2.00	56,940
Kalama Park	2	Manual	365	360	2.00	262,800
Kamaole I Beach Park	1	Push Button	365	190	2.00	138,700
Kamaole II Beach Park	1	Push Button	365	295	2.00	215,350
Kamaole III Beach Park	3	Push Button	365	270	2.00	197,100
Kamehameha Iki Park	1	Push Button	365	155	2.00	113,150
Kanaha Beach Park	5	Manual	365	55	2.00	40,150
Kihei Aquatic Center	3	Push Button	365	1925	2.00	1,405,250
Launiupoko Beach Park	1	Push Button	365	210	2.00	153,300
			365	60	2.00	43,800
Papohaku Beach Park	1	Manual	365	30	2.00	21,900
Papohaku Beach Park	2	Manual - Copper Shower Repipe	365	100	5.00	182,500
Wahikuli Wayside Park	3	Manual	365	650	2.00	474,500
Wailea Beach Park	1	Push Button	365	16.9	2.00	12,337
TOTAL	**38**					

Baseline Measurements

The following table represents the pre-retrofit (existing) flowrates that form the basis for the baseline water consumption. These values were measured between 7/18/22 and 7/22/22 and will not be measured again.

The measurements were taken by measuring a volume of water (in Ounces) over a 3 second period. Thus, the flowrate in GPM is calculated as:

$$GPM = \frac{Ounces\ x\ \frac{1\ gal}{128\ oz}}{3\ \text{sec}\ x\ \frac{1\ min}{60\ sec}} = 0.15625\ x\ Ounces\ measured$$

The measurements are averaged, and the average value is used to determine the water savings. Below are the results obtained:

Manual Shower Towers

Measurement No.	Site Name	Location	Ounces Measured	Flow Rate Per Head (gpm)
1	Wahikuli wayside park	outside	98	15.3125
2	Wahikuli wayside park	outside	90	14.0625
3	Wahikuli wayside park	outside	112	17.5
4	Charley Young Park	outside	110	17.1875
5	Hanakao'o Park	outside	122	19.0625
6	Hanakao'o Park	outside	120	18.75
7	Kalama Park	outside	112	17.5
8	Kalama Park	outside	98	15.3125
9	Kalama Park	outside	110	17.1875
10	Hana Bay Beach Park	outside	114	17.8125
11	Hana Bay Beach Park	outside	112	17.5
12	Hana Bay Beach Park	outside	122	19.0625
13	Kanaha Beach Park	outside	96	15
14	Kanaha Beach Park	outside	100	15.625
15	Kanaha Beach Park	outside	112	17.5
16	Kanaha Beach Park	outside	80	12.5
17	Papohaku Beach	outside	114	17.8125
	Average Usage			**16.75**

Push Button Shower Towers

Measurement No.	Site Name	Location	Ounces Measured	Flow Rate Per Head (gpm)
1	Kihei Aquatic Center	outside	34	5.31
2	Kihei Aquatic Center	outside	36	5.63
3	Kamaole III Beach Park	outside	44	6.88
4	Honokowai Beach Park	outside	32	5.00
5	Honokowai Beach Park	outside	36	5.63
6	Honokowai Beach Park	outside	30	4.69
7	Hanakao'o Beach Park	outside	32	5.00
8	Hanakao'o Beach Park	outside	32	5.00
9	Hanakao'o Beach Park	outside	30	4.69
10	Wailea Beach Park	outside	32	5.00
11	Wailea Beach Park	outside	48	7.50
12	Wailea Beach Park	outside	38	5.94
13	Kamehameha Iki Park	outside	44	6.88
14	Kanaha Beach Park	outside	48	7.50
15	Kanaha Beach Park	outside	48	7.50
16	Kanaha Beach Park	outside	46	7.19
17	Laniupoko Beach Park	outside	56	8.75
	Average Usage			**6.12**

Johnson Controls

The below summarizes the total Shower Towers Water/Sewer Savings (for details by site refer to Appendix 11):

Table 6: FIM 6 Water/Sewer Savings Summary

Water (kgal)	Sewer (kgal)	$-Water	$-Sewer (*)	$-Total
37,473.52	37,473.52	$220,719.46	$75,106.05	**$295,825.51**

(*) Some sites do not have sewer charges.

Commissioning Procedure

Installation to be completed per manufacturer specifications.

ESCO's Training Responsibilities

Standard Operations and Maintenance Overview of all standard plumbing material will be provided.

ESCO's Maintenance Responsibilities

No maintenance services are included.

Customer's Maintenance Responsibilities

Customer is responsible for properly maintaining and performing appropriate preventative maintenance on the shower towers installed, in accordance with manufacturers' standards and specifications.

Operation and Maintenance (O&M) Cost Savings Calculations

No O&M Savings have been included for this FIM.

Facility Support Required and Customer's Responsibilities:

The installation of the new shower towers will require system shutdowns. All work shall be coordinated and scheduled with the site in order to minimize the effect on day-to-day operations. All preparation work shall be done prior to shut down to minimize the time the system is down.

FIM 7 – Irrigation Wells

Existing Conditions

Parks and Recreation locations listed on the following pages are currently using potable domestic water for irrigation and are being billed by the Department of Water Supply for domestic water use. Irrigated areas at these locations include trees, shrubs, sport fields and open grass fields.

All these sites, except for Kelawea Mauka Makai Park, are also paying sewer charges for total water consumption and do not have a second meter recording water use just for irrigation.

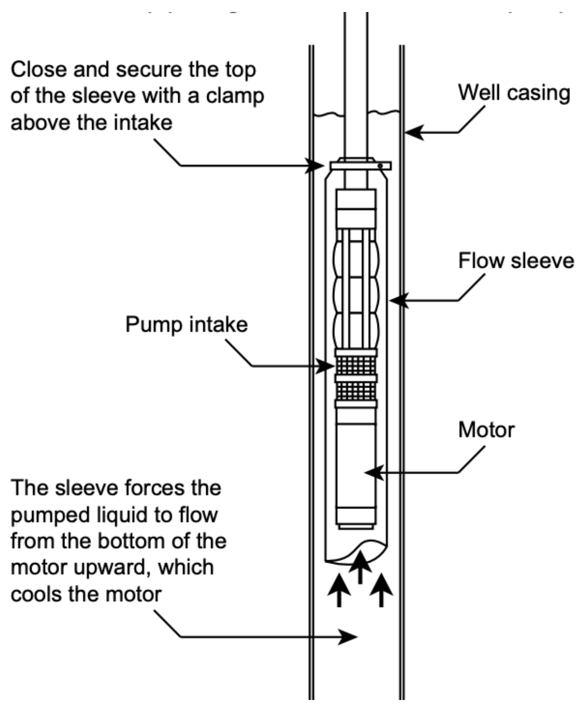
Existing Deficiencies

Sewer charges represent over 50% of the water bill. Sewer water is hardly ever measured, and in most Water Supply Districts, is assumed to equal 100% of domestic water use. When water does not go down the drain the consumer pays too much in sewer charges.

With current drought restrictions on the island, watering with domestic sources is limited. These locations represent significant irrigation usage and should be irrigated using non-potable sources.

FIM Description

Replace potable water used for irrigation with non-potable well water for locations with significant irrigation usage. Construct a new irrigation well and pump on site to provide the non-portable water and cease using domestic water for irrigation. Below is a schematic of a typical submersible pump and well:



Annual water savings equal the amount of baseline potable water that is no longer needed for irrigation.

Scope of Work

This section describes the contractual scope of work.

General:

1. Prepare and submit well construction permits, pump installation permits, electrical permits, and if required, civil permits for each site location and irrigation well.
2. Mobilization and demobilization of all required drill rigs, machinery, vehicles, supplies, materials, and tooling to job site for both well crews and civil crews for site location.
3. For both locations on Moloka'i, inter-island shipment costs for drill rigs, machinery, tooling, materials, supplies, crew housing and travel expenses are included.
4. Scope includes preparation of well pads, discharge pits or containment areas as needed across well sites.
5. Drilling of wells to be by either hammer bit or mud drilling in areas where sand is prevalent.
6. Furnish and install solid and louvered well casing.
7. Welding of well casing joints as needed during installation.
8. Installation of cement baskets.
9. Installation of tremie pipe to allow for the placement of large gravel, pea gravel, and sand while well annulus grout plug is installed.
10. Placement of grout in remaining annular space to begin above the louvered casing and extend the full length of casing up to surface grade.
11. Installation of standard sized concrete well pad.
12. At Kehalani Mauka and Wailuku Elementary Well where a pressure tank is provided, the well pad will include extra square footage to support the pressure tanks.
13. Separate mobilization and demobilization of pump installation rig and equipment to each site.
14. Installation of submersible pumps, motors, drop pipes, check valves, submersible flat jacketed cable, well discharge head, flow meters and splicing of both cables above and below grade to form permanent connections. The flow meter is a standard potable water meter, with manual read.
15. Furnish and install well control panels, with on/off switch, connection to pressure tanks as required to supply adequate pressure for irrigation lines.
16. Existing irrigation controls shall be re-programmed and standardized to a three-hour period on days watering is performed. Amount of watering (gallons) will not be changed.
17. Connections, piping, and labor to connect well discharge head with existing main irrigation lines in parallel with domestic water supply.
18. Existing domestic water connection shall remain. An isolation valve and back-flow preventor shall be installed so domestic supply can serve as a backup irrigation supply only when required.
19. Trenching and installation of said lines are not to exceed 100 LF of trenching per project, except for the Kaunakakai Ball park which is to be limited to 3 separate piping/trenching runs not to exceed 50 LF per run.
20. Electrical Power for new well pumps will be pulled from the existing restroom structure or other nearby electricity source.
21. Pump enclosure is to be designed to enclose and protect well system controls at each site. An 8'x8' pump enclosure is included.
22. Waterproof above and below ground wire splice connections.
23. As required by DLNR standards, perform an 8-hour Step Draw down test, as well as a 48-hour constant rate pump test.
24. Includes in house chloride testing per well and the submittal of all required DLNR testing documentation and reports for each individual project (one time).

Site Specific:

Kelawea Mauka Makai Park - Water Well Proposal Based on 160 GPM @ 322' TDH

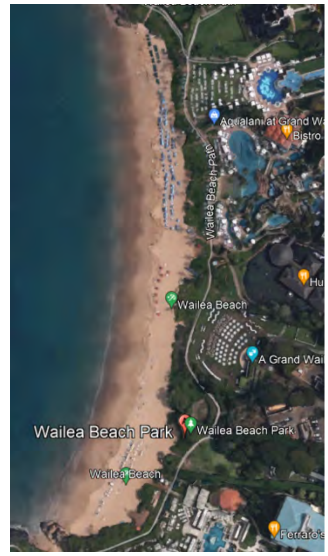
1. **Well Drilling:** Includes mobilization/demobilization of all heavy equipment, well drilling, data log, furnish and install 8" solid steel casing up to 240 linear feet (LF), 8" louvered casing up to 20LF, 2 cement baskets, installation, and removal of tremie pipe, purchase and placement of concrete grout, video recording of open and cased hole, 5'x5'x1' concrete slab and submittal of all DLNR required testing reports and documentation.
2. **160 GPM Pump to produce 28,800 gallons available for irrigation per day:** Immobilization/demobilization of pump rig, purchase, shipping, and installation of a 160 GPM submersible pump with ductile iron bowl assembly, submersible motor, galvanized treaded and coupled drop pipe with couplings, flat jacketed submersible cable, one check valve, fabricated steel discharge elbow with discharge flange, sanitary well head, flow meter and submittal of all DLNR required testing reports and documentation.
3. **Tie in from well to irrigation:** Up to 100LF of trenching, piping, and connections to connect well discharge head to feed existing irrigation water supply line.

Kehalani Mauka & Wailuku Elementary Well - Water Well Proposal Based on 281 GPM @ 531' TDH

1. **Well Drilling**: Includes mobilization/demobilization of all heavy equipment, well drilling, data log, furnish and install 8" solid steel casing up to 450LF, 8" louvered casing up to 20LF, 2 cement baskets, installation, and removal of tremie pipe, purchase and placement of concrete grout, video recording of open and cased hole, 5'x5'x1' concrete slab and submittal of all DLNR required testing reports and documentation.
2. **281 GPM Pump to produce 50,580 gallons available for irrigation per day**: Includes mobilization/demobilization of pump rig, purchase, shipping, and installation of a 281 GPM submersible pump with ductile iron bowl assembly, submersible motor, galvanized T/C drop pipe with couplings, flat jacketed submersible cable, one check valve, fabricated steel discharge elbow with discharge flange, sanitary well head, flow meter and submittal of all DLNR required testing reports and documentation.
3. **Water Storage Tank**: Purchase and installation of one water storage tank. Size will be determined during engineering. Size is dependent upon system operating pressure verified during design phase. Water Storage Tank is to be located and buried in the toe of the slope below the well to give it the ability to gravity feed Wailuku Elementary Park. After further investigation, if burying the tank is not feasible, landscaping around the tank will be provided for aesthetic purposes.
4. **Tie in from well to irrigation**: Up to 100LF of trenching, piping, and connections to connect well discharge head to feed existing irrigation water supply line.

Johnson Controls

Wailea Beach Park - Water Well Proposal Based on 117 GPM @ 139' TDH



1. **Well Drilling**: Includes mobilization/demobilization of all heavy equipment, mud well drilling, data log, furnish and install 8" solid steel casing up to 40LF, 8" louvered casing up to 10LF, 2 cement baskets, installation, and removal of tremie pipe, purchase and placement of concrete grout, video recording of open and cased hole, 5'x5'x1' concrete slab and submittal of all DLNR required testing reports and documentation.
2. **117 GPM Pump to produce 21,060 gallons available for irrigation per day**: Includes mobilization/demobilization of pump rig, purchase, shipping, and installation of a 117 GPM submersible pump with ductile iron bowl assembly, submersible motor, galvanized T/C drop pipe with couplings, flat jacketed submersible cable, one check valve, fabricated steel discharge elbow with discharge flange, sanitary well head, flow meter and submittal of all DLNR required testing reports and documentation.
3. **Tie in from well to irrigation**: Up to 100LF of trenching, piping, and connections to connect well discharge head to feed existing irrigation water supply line.

Kaunakakai Ball Park and Mitch Pauole Complex - Water Well Proposal Based on 135 GPM @ 91' TDH

1. **Well Drilling:** Includes mobilization/demobilization of all heavy equipment, mud well drilling, data log, furnish and install 8" solid steel casing up to 20LF, 8" louvered casing up to 10LF, 2 cement baskets, installation, and removal of tremie pipe, purchase and placement of concrete grout, video recording of open and cased hole, 5'x5'x1' concrete slab and submittal of all DLNR required testing reports and documentation.
2. **135 GPM Pump to produce 24,300 gallons available for irrigation per day:** Includes mobilization/demobilization of pump rig, purchase, shipping, and installation of a 113GPM submersible pump with ductile iron bowl assembly, submersible motor, galvanized T/C drop pipe with couplings, flat jacketed submersible cable, one check valve, fabricated steel discharge elbow with discharge flange, sanitary well head, flow meter and submittal of all DLNR required testing reports and documentation.
3. **Mobilization/Demobilization to Molokai:** Includes mobilization and demobilization to Molokai, lodging, per diem, and travel expenses.

Papohaku Beach Park - Water Well Proposal Based on 56 GPM @ 86' TDH

1. **Well Drilling:** Includes mobilization/demobilization of all heavy equipment, mud well drilling, data log, furnish and install 8" solid steel casing up to 15LF, 8" louvered casing up to 10LF, 2 cement baskets, installation, and removal of tremie pipe, purchase and placement of concrete grout, video recording of open and cased hole, 5'x5'x1' concrete slab and submittal of all DLNR required testing reports and documentation.
2. **56 GPM Pump to produce 10,800 gallons available for irrigation per day:** Includes mobilization/demobilization of pump rig, purchase, shipping, and installation of a 32GPM submersible pump with ductile iron bowl assembly, submersible motor, galvanized T/C drop pipe with couplings, flat jacketed submersible cable, one check valve, fabricated steel discharge elbow with discharge flange, sanitary well head, flow meter and submittal of all DLNR required testing reports and documentation.
3. **Tie in from well to irrigation:** Up to 100LF of trenching, piping, and connections to connect well discharge head to feed existing irrigation water supply line.

Exclusions:

- Existing irrigation system and controls shall be re-used
- Water connection for drilling provided by owner to within 50' of drill site
- Water volume for drilling provided by owner
- Excludes storage tank unless specified
- Excludes VFD for submersible pumps.
- Excludes tree trimming or tree removal.

Equipment Manufacturer / Warranty

The basis of design is Grundfos submersible pumps (SP): Model numbers SP 150S – 230S

Grundfos SP are submersible borehole pumps, designed for pumping groundwater. Grundfos SP are all stainless-steel pumps suitable for boreholes in sizes ranging from 4" over 6" and 8" to 10". The motor sizes for the pumps are available in 0.37-250 kW.

All installed equipment and workmanship will be warranted for a period of one year after customer acceptance. All parts, labor, and costs will be covered by Johnson Controls during this period.

Energy/Water Savings Calculations

Irrigation Well Water/Sewer Savings

$$Estimated\ Annual\ \ Savings\ (\$) = WFI_{Pre}\ (kGal) * Utility\ Rate_{Water} - Parasitic\ Electricity\ Use$$

$$Annual\ \ Savings\ (\$) = WFI_{Post}\ (kGal) * Utility\ Rate_{Water} - Parasitic\ Electricity\ Use$$

$WFI_{Pre}\ (kGal)$= Water For Irrigation - Water calculated after allocations to domestic water usage for bathroom fixtures and shower towers.

$$WFI_{Pre}\ (Kgal) = \ Annual\ Baseline\ kGal\ *\ Allocated\ Water\ \%$$

$$WFI_{Post}\ (kGal) = annual\ kGal\ pumped\ from\ water\ mete$$

Where:

$Annual\ Baseline\ kGal$ = Totalized gallons of water from last 12 months of water bills for facility/location

$Allocated\ Water\ \%$ = Estimated percentage of water used for irrigation. Based on field audits and information from County Employees

The below summarizes the total Irrigation Wells Water/Sewer Savings (for details by site refer to Appendix 11):

Table 7: FIM 7 Water/Sewer Savings Summary

Water (kgal)	Sewer (kgal)	$-Water	$-Sewer (*)	$-Total
37,473.52	37,473.52	$220,719.46	$75,106.05	**$295,825.51**

Irrigation Well Energy Penalty

$$Parasitic\ Electricity\ Use = Pump\ Usage\ (kW) * Annual\ Pump\ Operating\ Hours * Electricity\ Rate\ (\frac{\$}{kWh})$$

$$Annual\ Pump\ Operating\ Hours = Hours_{Day} * Days_{Week} * 52$$

1. Pumps will be standardized to run 3 hours per day when irrigating
2. $Days_{Week}$ obtained from field audit by location

Where:

$$Pump\ Usage(kW) = \frac{P_{TDH} * Volumetric\ Flow\ Rate * 0.746}{3960 * Pump\ Efficiency * Rated\ Motor\ Efficiency}$$

Where:

$$P_{TDH} = Pump\ Total\ Dynamic\ Head_{feet} = Depth\ of\ Well + 10\% + Irrigation\ System\ Operating\ Pressure$$

3. *Irrigation System Operating Pressure is 30 PSI = 69.3 Feet of Head*
4. *Depth of Well = Location Elevation to sea level*
5. *Pump Efficiency = 80%*
6. *Rated Motor Efficiency = 91.7%*
7. *HP to kW conversion = 0.746*
8. $Head_{feet} * GPM\ to\ Horsepower\ (HP)\ unit\ conversion = \frac{1}{3960}$

Where:

$$Volumetric\ Flo\ Rate_{GPM} = \frac{Gallons_{Day}}{180}$$

9. Irrigate for 3 hours per day *(3 hours * 60 minutes per hour)*

$$Gallons_{Day} \quad = \frac{WFI(kGal) * 1000\left(\frac{gal}{kGal}\right)}{Watering\ Days\ a\ Year}$$

10. $WFI(kGal) = baseline\ water\ used\ for\ irrigation\ (see\ above)$
11. $Watering\ Days\ a\ Year = Days_{Week} * 52\ weeks/year$

The parasitic electric penalty will not be measured, and the table below provides baseline information, field audit values, and results from the equations above:

References for Formulas	Kelawea Mauka Makai Park	Wailuku Elementary Park and Kehalani Mauka Park	Wailea Beach Park	Kaunakakai Ball Park and Mitch Pauole Complex	Papohaku Beach Park	Totals
Annual Baseline Water Use (kGal)	6,008	16,722	8,920	7,383	3,648	42,681
Allocated Water %	100%	94%	49%	86%	72%	
Irrigation Days / Week	4	6	4	5	5	
Water for Irrigation (WFI (kGAL))	6,008	15,799	4,383	6,315	2,643	35,148
Watering Days / Yr	208	312	208	260	260	
Gallons/Day	28,883	50,638	21,071	24,289	10,167	135,048
Volumetric Flow Rate (GPM)	160.5	281.3	117.1	134.9	56.5	
Pump Total Dynamic Head (Ft)	322.3	531.3	139.3	91.3	86.3	
Pump Usage (kW)	13.3	38.4	4.2	3.2	1.3	
Parasitic Electricity use (kWh)	8,287	35,926	2,613	2,468	976	50,270
Uncertainty Factor add 20% on kWh	9,945	43,111	3,136	2,961	1,172	60,324
Annual WFI savings ($)	$ 29,873	$ 168,537	$ 46,753	$ 67,366	$ 13,360	325,889
Parasitic Electricity Penalty ($)	$ 3,248	$ 16,075	$ 1,169	$ 1,380	$ 546	22,419
Total Annual Dollars Saved	**$ 33,122**	**$ 184,612**	**$ 47,922**	**$ 68,746**	**$ 13,906**	**$ 348,308**
Total Annual Gallons Saved						**35,148,084**

$$Remaining\ Domestic\ Water\ use\ (kGal) = \ Annual\ Baseline\ kGal\ * (1 - \ Allocated\ Water\ \%)$$

$$Annual\ Utility\ bill\ _{Post}(kGal) - WFI_{Post}\ (kGal) \leq Remaining\ Domestic\ Water\ use\ (kGal)$$

When the above condition is true, water produced from the irrigation well mets or exceeds savings expectation. This situation may occur when irrigation has been reduced during the year do to drought restrictions or changes implemented by the County.

Commissioning Procedure

Well pump and controls shall be installed per manufacturer specification.

Well testing shall be conducted in accordance with the Department of Land and Natural Resources Commission on Water Resource Management's (The Commission) "Hawaii Well Construction & Pump Installation Standard".

1. Step-Drawdown Test (Well Efficiency Test)
2. Constant-Rate Tests (Aquifer Test)

Length of test time, frequency of measurements, and accuracy of measurements shall be as required by the standard.

Pumping Test Records and Reports shall be submitted to the Commission

ESCO's Training Responsibilities

On-site training will be conducted upon completion of work. Training will be coordinated with Parks and Recreation.

ESCO's Maintenance Responsibilities

No maintenance services are included with this FIM.

Customer's Maintenance Responsibilities

The County will be responsible for properly maintaining and performing appropriate preventative maintenance on the new wells, in accordance with manufacturers' standards and specifications. JCI does not know exactly how much it will cost every year for the County to maintain the irrigation wells after installation is finished and the County accepts this work as complete. If the County would like estimates for approximately how much it might take, then JCI can work with the County to furnish that data. If the County would like estimates for approximately how much it might take, then JCI can work with the County to furnish that data. JCI will provide a firm, fixed price proposal for well maintenance services as part of its Phase 2 proposal to the County.

See below for more details:

Preventive Maintenance:

1. Follow all manufacturer's instructions on operation and maintenance for the pump and any additional appurtenances installed.
2. Check for any changes from as-built documentation. Report any changes to DLNR.
3. Visually observe pumped water output, looking for variations in volume, turbidity, color, and sand content.
4. Also monitor pump for any unusual noise, vibrations, or increased temperature.
5. Check concrete pad and any visible grout seals for cracking or settlement.
6. Check condition and security of well cap, air vent and power line.
7. Test water quality at regular intervals, depending on the local water quality and intended use of the water.
8. If the well flows at the surface, check shut-off valves. Exercise valves quarterly so that they remain functional. Monitor the ground surface in vicinity of well for wet spots or seeps. Check flow rate periodically. Keep well shut off when not being used to maintain pressure and conserve resources.

Maintenance Schedule:

Year 5 Scheduled Maintenance per well:

- Remove and Replace: Wire, Submersible Motor, Pump, Wire Splice, Column Pipe, Check Valves, Tanks, Gauges, Well Seal, and small Miscellaneous items (Tape, Banding, Pipe Dope).

Year 10 Scheduled Maintenance per well:

- Remove and Replace: Wire, Submersible Motor, Pump, Wire Splice, Column Pipe, Check Valves, Tanks, Gauges, Well Seal, and small Miscellaneous items (Tape, Banding, Pipe Dope).
- Inspection of casing with water well camera and replacement of well control panel.

Year 15 Scheduled Maintenance per well:

- Remove and Replace: Wire, Submersible Motor, Pump, Wire Splice, Column Pipe, Check Valves, Tanks, Gauges, Well Seal, and small Miscellaneous items (Tape, Banding, Pipe Dope).

Year 20 Scheduled Maintenance per well:

- Remove and Replace: Wire, Submersible Motor, Pump, Wire Splice, Column Pipe, Check Valves, Tanks, Gauges, Well Seal, and small Miscellaneous items (Tape, Banding, Pipe Dope).
- Inspection of casing with water well camera and replacement of well control panel.

Operation and Maintenance (O&M) Cost Savings Calculations

No O&M savings are being recognized with this FIM.

Facility Support Required and Customer's Responsibilities:

Parks and Recreations must approve the final well location. Parks and Recreation shall provide a source of water during the well drilling.

FIM 8 - On-Site Hypochlorite Generation and Smart Pool Pump Controls

Existing Conditions

The County of Maui owns and operates eight swimming pools: Coach Soichi Sakamoto Pool, Cooke Memorial Pool, Coach Spencer Shiraishi Memorial Pool, Upcountry Pool, Kokua, Kihei Aquatic Center, New Wailuku Pool, Lahaina Aquatic Center. All pools are heavily used by the public. The pools are used for recreation, competition, wellness and therapy, and instructional purposes.

The pools require mechanical equipment for filtration and chemicals for water treatment. There are a variety of mechanical systems designs for the different pools. Whereas all pools currently purchase, store, and disperse chlorine into the pools as chemical water treatment. The head lifeguard at each location is primarily responsible for water treatment. Most sites are manually treated. There is some lack of consistent water treatment between locations due to the manual control performed by different people.

Coach Sakamoto Pool:

Mechanical

- Lap pool pump is in fair condition and running at constant speed
- Other pumping systems are in fair/good condition
- Pump influent piping is in poor condition
- Piping between pool pump and filter is undersized

Water Treatment

- Water treatment is performed manually by the head lifeguard
- Muriatic Acid and CO_2 are used to adjust pool pH
- Calcium Hypochlorite is used in the form of ACCU-TAB for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market
    - This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life, and storage.
    - Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Coach Spencer Shiraishi Memorial Aquatics:

Mechanical

- Lap pool pumps are in fair condition and running at constant speed
- Other pumping systems are in fair/good condition.
- Pumps are located above water level
    - Difficult to start pump, requires manual aid to prime with water
    - Promotes air infiltration leading to pump cavitation and increased impeller wear

Water Treatment

- Water treatment is performed manually by the head lifeguard

- This pool was converted to a saline pool. Salt is used to maintain water quality for this pool.
- Muriatic Acid and CO_2 are used to adjust pool pH

Cooke Memorial Aquatics (Molokai):

Mechanical

- Lap and pumps are in fair condition and running at constant speed
- Other pumping systems are in fair/good condition
- Pumps are located above water level

Water Treatment

- Water treatment is performed manually by the head lifeguard
- Muriatic Acid and CO_2 are used to adjust pool pH
- Combination of Trichlorisocyanuric acid and Calcium Hypochlorite are used for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market
    - This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life and storage.
    - Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Kokua Pool:

Mechanical

- Lap pool pumps are in fair condition and running at constant speed
- Other pumping systems are in fair/good condition
- Lap pool filtration systems are in fair/good condition
    - Pool filtration uses multiple; five (5) pumps and five (5) filters
    - Residential grade UV light on each filtration system

Water Treatment

- There is one controller for water chemical and heating
- Muriatic Acid and CO_2 are used to adjust pool pH
- Calcium Hypochlorite is used in the form of ACCU-TAB for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market.
    - This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life and storage.
    - Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Kihei Aquatic Center:

Mechanical

- Lap and Training pool pumps are in fair condition and running at constant speed
- Pumping systems are in fair/good condition.

Water Treatment

- Water treatment is a combination of manual and automated:
    - pH is controlled using CO_2 and is automated
    - Cal Hypo feed is manually adjusted by head lifeguard
- Muriatic Acid and CO_2 are used to adjust pool pH
- Calcium Hypochlorite is used in the form of ACCU-TAB for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market.
    - This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life and storage.
    - Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Lahaina Aquatic Center:

Mechanical

- Lap and Keiki pool pumps are in fair condition and running at constant speed
- Pumping systems are in fair/good condition
- Pool surge tank is in poor condition throughout

Water Treatment

- Water treatment for the Lap Pool is automated
- Water treatment for the Keiki Pool is performed manually by the head lifeguard
- Muriatic Acid and CO_2 are used to adjust pool pH
- Calcium Hypochlorite is used in the form of ACCU-TAB for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market.
    - This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life and storage.
    - Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Upcountry Pool:

Mechanical

- Lap, Teaching, and Keiki pool pumps are in fair condition and running at constant speed
- Pumping systems are in fair/good condition
- Lap pool filter is underperforming, hard to operate and maintain
- There is a lack of surge capacity

Water Treatment

- Water treatment for the Lap Pool is automated
- Water treatment for the Teaching and Keiki Pools are adjusted manually by the head lifeguard
- Muriatic Acid and CO_2 are used to adjust pool pH
- Calcium Hypochlorite is used in the form of ACCU-TAB for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market.

- This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life and storage.
- Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Wailuku Aquatics:

Mechanical

- Lap pool pumps are in fair condition and running at constant speed
- Pumping systems are in fair/good condition.
- Recirculation piping is configured in a way that makes operation difficult.
- Pool filtration uses two (2) pumps and two (2) filters

Water Treatment

- Water treatment is performed manually by the head lifeguard
- Muriatic Acid and CO_2 are used to adjust pool pH
- Calcium Hypochlorite is used in the form of ACCU-TAB for disinfection
    - Calcium Hypochlorite is 35% calcium / 65% chlorine and is the most expensive chlorine on the market.
    - This type of chlorine is extremely corrosive and hazardous due to additives. The additives are required for shelf life and storage.
    - Pool chemicals are stored in confined locations with the pool equipment. There is limited air flow in the equipment rooms and it is difficult to unload the chemicals for storage.

Table of Existing Conditions:

Building Number	Building Name	Current System Type	Chlorine Type	Acid Type	Supplemental
1	Kihei Pool	ACCUTAB	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
2	Upcountry Pool	ACCUTAB	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
3	Lahaina Pool	ACCUTAB	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
4	Sakamoto Pool	ACCUTAB	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
5	Kokua Pool	ACCUTAB	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
6	New Wailuku Pool	ACCUTAB	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
7	Cooke Memorial Pool	TRICHLORISOCYANURIC ACID dry 3" wrapped tablets, 50 pound containers / Cal Hypo	Calcium Hypochlorite - PPG N200 Tabs	Muriatic Acid / CO2	Sodium Hypo / Reagent
8	Coach Spencer Shiraishi Memorial Pool	Chlorking SM - Saline System	SALT	Muriatic Acid / CO2	Sodium Hypo / Reagent

Existing Deficiencies

Existing deficiencies in the pool systems were identified and summarized below.

Coach Sakamoto Pool

The surge tank's auto fill and modulation valve were in fair condition but appeared to be out of adjustment.

The existing piping is too small for the required flow. This requires high pump pressure to force the needed amount of flow through smaller pipes. The high pump pressure uses more energy, and risks PVC piping rupture. It is recommended to replace the recirculation piping with the correct size.

Coach Shiraishi Memorial Pool

The existing piping configuration causes air infiltration into the pipe. This air travels along with the water to the pump which is causing operational and maintenance issues. According to pool maintenance personnel the pump at this site wears quickly and has problems at start up. These issues are to be expected when air is in the pipe. The recommended resolution is to reconfigure the equipment room piping.

Cooke Memorial Pool

The surge tank auto fill and modulation valve are in poor condition.

The existing pumps are located above the proper water level of the surge tank. The surge tank is kept overly full to make the water level above the pumps. Keeping the surge tank over design reduces its ability to take in surge water from the pool. This causes the pool to overflow and wastes water. It's recommended to reconfigure the pump influent and surge tank piping.

Kokua Pool

The filtration system for Kokua has five (5) filtration systems in parallel. This configuration is a maintenance issue because there are five (5) pumps to be maintained. The header is not properly sized for the layout of the pumps. These issues result in the inability of the pumps to operate at the correct flow rates. It is recommended to reconfigure the pump influent piping and replace the five (5) separate pumps with a single pump sized for the pool.

Kihei Aquatic Center

The surge tank's auto fill and modulation valve were in fair condition but appeared to be out of adjustment.

There are multiple areas where the existing concrete is damaged or deteriorating.

Lahaina Aquatic Center

The existing strainers are not rated for the required flow rate. The original 10" strainer was replaced with an 8" strainer. The undersized strainer causes lower flow rate and higher energy usage. It is recommended to install strainers of the proper size.

The surge tank water proofing layer has failed due to corrosion. The pipe, fittings, valves, modulator, and autofill, located within the surge tank are heavily corroded. The surge tank needs to be repaired and the corroded equipment replaced.

Upcountry Pool

According to pool maintenance staff frequent repairs are needed to the existing vacuum sand filter system. Cloudy pool water was observed during the on-site investigation, indicating the filter system is not operating properly.

There is not enough surge capacity. Due to insufficient surge capacity a choice must be made to either fill pool to proper level resulting in waste water that overflows during a surge, or the pool can be underfilled to prevent overflowing. Underfilling the pool prevents the skimming filtration system from working correctly.

It is recommended to convert the existing vacuum sand filter system into additional surge capacity and install a new regenerative media filtration system for the Lap Pool.

Wailuku Pool

Similar to Coach Spencer Shiraishi Memorial Aquatics, the existing piping configuration includes a vertical section that allows air infiltration into the pipe. This air travels along with the water to the pump which is causing operational and maintenance issues.

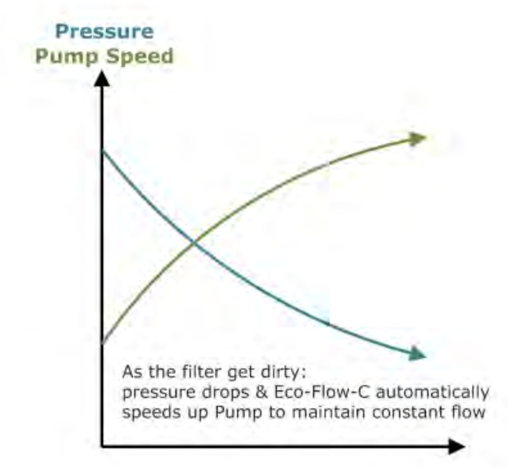
Also, the existing pumps have a class B wire insulation rating. This rating is not sufficient for use with Variable Frequency Drives (VFDs).

It's recommended to reconfigure the equipment room piping and replace the existing pumps with one (1) pump that is rated for use with a VFD.

FIM Description

The proposed improvements include: install Smart Pump control systems with integration to Aquatic Systems, install On-Site Hypochlorite Generation (OSHG), install water chemistry controllers, and repair some of the noted deficiencies with the existing pool systems.

The Smart Pump control system with integration to aquatic systems provides a system level control. This will simplify operations and save energy. Flow measuring devices will be installed and integrated into the control system. Knowing the flow is a critical aspect of maintaining efficient and effective pool filtration. The Smart Pump control system will use the flow rate to automatically adjust the speed of the pump to maintain the desired flow. The pump speed needed will change with the filter condition. Energy savings is achieved by matching the pump performance to the filter load as it dynamically changes during the filter cycle.



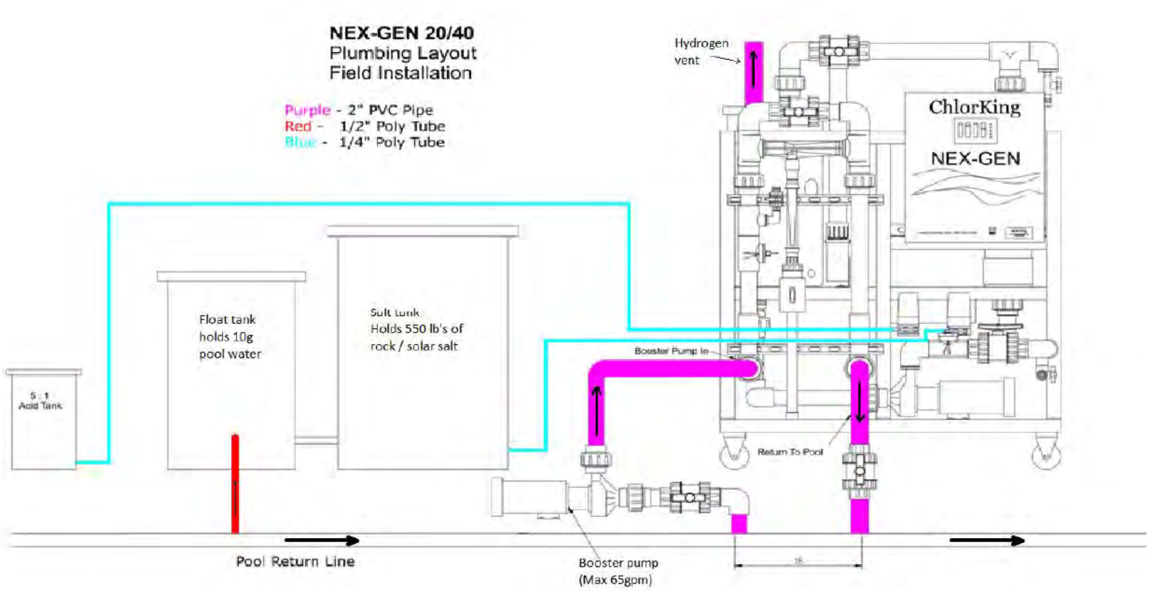
On-Site Sodium Hypochlorite Generation replaces the existing method of buying and storing chlorine for water treatment. The hypochlorite needed for pool water treatment is produced on-site and the need to purchase and store expensive chlorine is eliminated.

Sodium hypochlorite generators produce pool chlorination chemicals from the electrochemical reaction between salt, water, and electricity. On-site production of chlorine as a solution of sodium hypochlorite alleviates the risks to public health and safety relating to the storage and transportation of hazardous acid and concentrated chlorine solutions. The only raw material, salt, is an inert, safe compound that is stored in a feeder on-site and used as required by the chlorine generator.

On-site generation systems create a pH neutral chlorine. The pH neutral chlorine from OSHG reduces the need for chemicals such as CO2 / Muriatic/ Sulfuric Acids by 50% that are required to control pH in traditional chlorination systems.

Traditional chlorination systems introduce high levels of Calcium into the pool water. The amount of Calcium and other minerals is measured as Total Dissolved Solids (TDS). High TDS requires dilution with makeup water to keep it below the required amount. OSHG greatly reduces the TDS in pool water and need for dilution.

The system uses the pool water (not make-up water) to determine how much sodium hypochlorite to add. This results in a more precise control of the pool chorine levels. By using pool water directly there is residual sodium already in the water. Thus, if the pool isn't drained, less salt will be required each year.



Water chemistry controllers will automate water treatment for the pools. The controllers will monitor and control the pool pH and Free Available Chlorine (FAC). Pool chemistry controllers will provide consistency across locations by automating a task that is currently manually performed by different people.

Scope of Work

This section describes the contractual scope of work.

Kihei Aquatic Center

1. Provide and replace pumps. Reuse existing recirculation piping.
    - (2) 30hp Herborner centrifugal pool pumps at Lap Pool
    - (1) 15hp Herborner centrifugal pool pump at Training Pool
    - (1) 5hp Herborner centrifugal pool pump at Keiki Pool
    - (1) 15hp Herborner centrifugal pool pump at Keiki Pool water feature
2. Provide and install new ECO-FLOW-C VFD
    - (1) at Keiki Pool
    - (1) at Keiki Pool water feature
3. Provide and install new flow meters
    - (1) at Lap Pool
    - (1) at Training Pool
    - (1) at Keiki Pool (not the water feature)
4. Smart Controls for Lap Pool, Training Pool, & Keiki Pool
    - Provide and install control wiring to pump, flow meter, heater, and pool filter control.
    - Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
5. On-Site Hypochlorite Generation
    - Provide and install two (2) ChlorKing NEXGEN 100-SMR system to serve the Lap Pool, Training Pool, and Keiki Pool
    - Provide and install one (1) ChlorKIng CHLORVS Multi-Feed system for the Training Pool and Keiki Pool.
6. Water Chemistry Control

- Provide and install three (3) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate. One water chemistry controller for each pool

7. Electrical
   - Install conduit and new junction boxes as needed for the new devices listed above.
   - Install two (2) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
   - Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
8. Piping
   - Install new piping as needed for new devices listed above.
   - Any required new piping will be above ground and located within the equipment room.
   - SCH.80 pipe and fittings will be used.
   - Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
   - Provide and install tubing and fittings as needed for chemistry controllers

Lahaina Aquatic Center

1. Provide and replace pumps.
   a. (2) 40hp Herborner centrifugal pool pumps at Lap Pool
   b. Provide and replace two (2) existing 8" pump strainers with two (2) 10" pump strainers at Lap Pool
   c. (1) 3hp Intelliflow centrifugal pool pump at Keiki Pool
   d. Reuse existing recirculation piping.
2. Provide and install new one (1) flow meter at Lap Pool
3. Smart Controls for Lap Pool
   a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
   b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
4. On-Site Hypochlorite Generation
   a. Provide and install one (1) ChlorKing NEXGEN 100-SMR system and one (1) ChlorKing NEXGEN 50-SMR at the Lap Pool.
   b. Provide and install one (1) ChlorKing CHLOR 3.0 MSM system at the Keiki Pool.
5. Water Chemistry Control
   a. Provide and install two (2) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate. One water chemistry controller for each pool.
6. Surge Tank
   a. Provide and replace surge tank components including pipe, fittings, valves, modulator, valve extensions, and autofill.
   b. Repair and restore damaged concrete. (Repair and/or restoration of reinforcement is excluded.)
   c. Coat surge tank interior with cementitious water proofer.
7. Electrical
   a. Install conduit and new junction boxes as needed for the new devices listed above.
   b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
   c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
8. Piping
   a. Install new piping as needed for new devices listed above.
   b. Any new piping will be above ground and located within the equipment room.
   c. SCH.80 pipe and fittings will be used.

   d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
   e. Provide and install tubing and fittings as needed for chemistry controllers

Upcountry Aquatic Center

1. Provide and replace pumps. Reuse existing recirculation piping.
   a. (1) 30hp PACO vertical centrifugal pool pump at Lap Pool
   b. (1) 5hp Pentair centrifugal pool pump at Training Pool
   c. (1) 2hp Pentair centrifugal pool pump at Keiki Pool
2. Provide and install new ECO-FLOW-C VFD
   a. (1) at Lap Pool
   b. (1) at Training Pool
   c. (1) at Keiki Pool
3. Provide and install new flow meters
   a. (1) at Lap Pool
   b. (1) at Training Pool
   c. (1) at Keiki Pool
4. Smart Controls for Lap Pool, Training Pool, & Keiki Pool
   a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
   b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
5. On-Site Hypochlorite Generation
   a. Provide and install one (1) ChlorKing NEXGEN 100-SMR system and one (1) ChlorKing NEXGEN 50-SMR at the Lap Pool.
   b. Provide and install one (1) ChlorKing CHLORVS Multi-Feed system at the Training and Keiki Pool.
6. Water Chemistry Control
   a. Provide and install three (3) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate. One water chemistry controller for each pool.
7. Convert existing vacuum sand filtration at Lap Pool to additional surge capacity
   a. Remove filter media and components from the existing vacuum sand filter tank
   b. Extend existing piping from the converted tank to lower pool equipment room
   c. Install new one (1) regenerative media filtration system
   d. Add piping between new filtration system and converted tank
   e. Connect new filtration system to filter influent, effluent, and backwash piping
   f. Provide and install new media catchment system including waste pump and DE/Perlite catchment canisters.
8. Electrical
   a. Install conduit and new junction boxes as needed for the new devices listed above.
   b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
   c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
9. Piping
   a. Install new piping as needed for new devices listed above.
   b. New piping will be above ground and located within the equipment room.
   c. SCH.80 pipe and fittings will be used.
   d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
   e. Provide and install tubing and fittings as needed for chemistry controllers.

Sakamoto Memorial Swimming Pool

1. Provide and replace pump.

   a. (1) 30hp Herborner centrifugal pool pump at Lap Pool
   b. Replace recirculation piping
2. Provide and install new ECO-FLOW-C VFD at Lap Pool
3. Provide and install new flow meter at Lap Pool
4. Smart Controls for Lap Pool
   a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
   b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
5. On-Site Hypochlorite Generation
   a. Provide and install one (1) ChlorKing NEXGEN 100-SMR system and one (1) ChlorKing NEXGEN 50-SMR at the Lap Pool.
6. Water Chemistry Control
   a. Provide and install one (1) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate.
7. Electrical
   a. Install conduit and new junction boxes as needed for the new devices listed above.
   b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
   c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
8. Piping
   a. Install new piping as needed for new devices listed above.
   b. New piping will be above ground and located within the equipment room.
   c. SCH.80 pipe and fittings will be used.
   d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
   e. Provide and install tubing and fittings as needed for chemistry controllers.

Shiriashi Memorial Swimming Pool

1. Provide and replace pump.
   a. (1) 10hp Herborner centrifugal pool pump at Lap Pool
   b. Replace pump strainer
   c. Replace and reconfigure pump influent piping
2. Provide and install new ECO-FLOW-C VFD at Lap Pool
3. Provide and install new flow meter at Lap Pool
4. Smart Controls for Lap Pool
   a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
   b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
5. On-Site Hypochlorite Generation
   a. Provide and install one (1) ChlorKing NEXGEN 40-SMR at the Lap Pool
6. Water Chemistry Control
   a. Provide and install one (1) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate.
7. Electrical
   a. Install conduit and new junction boxes as needed for the new devices listed above.
   b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
   c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
8. Piping
   a. Install new piping as needed for new devices listed above.
   b. New piping will be above ground and located within the equipment room.

c. SCH.80 pipe and fittings will be used.
d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
e. Provide and install tubing and fittings as needed for chemistry controllers

Cooke Memorial Swimming Pool

1. Provide and replace pump.
    a. (2) 5hp Pentair self-priming centrifugal pool pumps at Lap Pool
    b. Replace and reconfigure pump influent piping
2. Provide and install new flow meter at Lap Pool
3. Smart Controls for Lap Pool
    a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
    b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
4. On-Site Hypochlorite Generation
    a. Provide and install one (1) ChlorKing NEXGEN 80-SMR at the Lap Pool
5. Water Chemistry Control
    a. Provide and install one (1) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate.
6. Electrical
    a. Install conduit and new junction boxes as needed for the new devices listed above.
    b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
    c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
7. Piping
    a. Install new piping as needed for new devices listed above.
    b. New piping will be above ground and located within the equipment room.
    c. SCH.80 pipe and fittings will be used.
    d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
    e. Provide and install tubing and fittings as needed for chemistry controllers

Kokua Swimming Pool

1. Provide and replace pumps
    a. Remove (5) existing pumps and replace with one (1) 15hp Pentair centrifugal pool pump at Lap Pool
    b. Remove existing UV light systems
    c. Replace and reconfigure pump influent piping to reconfigure to a single pump system
2. Provide and install new ECO-FLOW-C VFD at Lap Pool
3. Provide and install new flow meter at Lap Pool
4. Smart Controls for Lap Pool
    a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
    b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
5. On-Site Hypochlorite Generation
    a. Provide and install one (1) ChlorKing NEXGEN 50-SMR at the Lap Pool
6. Water Chemistry Control
    a. Provide and install one (1) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate.
7. Electrical
    a. Install conduit and new junction boxes as needed for the new devices listed above.
    b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.

   c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
8. Piping
   a. Install new piping as needed for new devices listed above.
   b. New piping will be above ground and located within the equipment room.
   c. SCH.80 pipe and fittings will be used.
   d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
   e. Provide and install tubing and fittings as needed for chemistry controllers

Wailuku Swimming Pool

1. Provide and replace pumps
   a. Remove two (2) existing pumps and replace with one (1) 5hp Pentair centrifugal pool pump at Lap Pool
   b. Remove existing UV light systems
   c. Replace and reconfigure pump influent piping to reconfigure to a single pump system
2. Provide and install new ECO-FLOW-C VFD at Lap Pool
3. Provide and install new flow meter at Lap Pool
4. Smart Controls for Lap Pool
   a. Provide and install control wiring to pump, flow meter, heater, and pool filter control.
   b. Connect devices to ECO-FLOW-C VFD and configure for variable speed pumping operation.
5. On-Site Hypochlorite Generation
   a. Provide and install one (1) ChlorKing NEXGEN 10-SMR at the Lap Pool
6. Water Chemistry Control
   a. Provide and install one (1) ProMinent DCM water chemistry controllers with pH, free chlorine (PPM) and temperature sensors, Ethernet, and assembled flow switch, mounted on a PVC backplate.
7. Electrical
   a. Install conduit and new junction boxes as needed for the new devices listed above.
   b. Install one (1) 208V, 100A single phase circuits from existing sub panel for ChlorKing NEXGEN equipment.
   c. Install 120V, 1A GFCI circuit single phase circuit from existing sub panel for Water Chemistry Controller.
8. Piping
   a. Install new piping as needed for new devices listed above.
   b. New piping will be above ground and located within the equipment room.
   c. SCH.80 pipe and fittings will be used.
   d. Pipe hangers, inserts, and supports, shall conform to MSS SP-58 and MSS SP-69.
   e. Provide and install tubing and fittings as needed for chemistry controllers

Equipment Manufacturer / Warranty

The following are the list of manufacturers and their warranties:

Product	Manufacturer	Warranty (yrs)
NEX-GENpH onsite chlorine generator	ChlorKing	3
ECO-FLOW-C	H2Flow Controls	3
Aquafy Regenerative Filters	Aquafy	3

Warranty does not cover damage by misuse, abuse, tampering or “acts of nature” outside our control.

Energy Savings Calculations

OSHG Water/Sewer Savings

OSHG reduces the amount of make-up water needed to dilute TDS in pools. The post-retrofit reduction is because Calcium Hypochlorite is 35% calcium by weight and will no longer be added to the pool water.

The Water/Sewer Savings are calculated with the following methodology and assumptions:

$$kGal_{Savings} = \text{Pool Volume} / 1000\ (Gal/kGal) \times \text{Dilution} \times 12\ (months/year)$$
$$Water_{Savings} = kGal_{Savings} \times \text{Water Rate}$$
$$Sewer_{Savings} = kGal_{Savings} \times \text{Sewer Rate}$$

Where:

Pool Volume = *Total volume of the pool (Gal)*

Dilution = *Percent of pool volume needed to be replaced monthly to keep calcium below 500 ppm = 13.7%*

$Water_{Rate}$ = *Marginal water rate ($/kGal)*

$Sewer_{Rate}$ = *Sewer rate ($/kGal) = $6.7/kgal (where applicable)*

And:

$$\text{Dilution} = \text{Max Calcium} / [\text{Max Calcium} + (CalHypo_{Daily\ Addition} \times Calcium_{CalHypo}) \times 30\ day/month]$$

Max Calcium = *500 (ppm)*

$CalHypo_{DailyAddition}$ = *Daily chemical addition to pool = 8 (ppm)*

$Calcium_{CalHypo}$ = *Calcium by weight of Calcium Hypochlorite = 35%*

Dilution = *13.7%*

The water/sewer savings associated with the OSGH will not be measured, and below is a table showing the total water/sewer savings:

Facility	Pool Volume (Gal)	$kGal_{Savings}$ (kGal/Yr)	$Water_{Rate}$ ($/kGal)	$Sewer_{Rate}$ ($/kGal)	$Water_{Savings}$ ($/yr)	$Sewer_{Savings}$ ($/yr)	Total Savings ($/yr)
Coach Sakamoto Pool	410,670	675	$5.85	$0.00	$3,950	$0	$3,950
Cooke Memorial Pool	270,000	444	$3.90	$0.00	$1,731	$0	$1,731
Kokua Pool	190,000	312	$5.85	$6.70	$1,827	$2,093	$3,920
Kihei Aquatic Center	1,057,500	1,739	$5.85	$6.70	$10,170	$11,648	$21,819
Lahaina Aquatic Center	522,300	859	$5.85	$6.70	$5,023	$5,753	$10,776
Upcountry Pool	453,588	746	$5.85	$0.00	$4,362	$0	$4,362
Wailuku Pool	40,000	66	$5.85	$0.00	$385	$0	$385
TOTAL	**2,944,058**	**4,840**			**$27,449**	**$19,494**	**$46,943**

OSHG Electric Penalty

OSHG will increase the electric usage at the pool facilities. This increase is because the chemical is being produced on-site by new equipment that uses electricity. The energy of the new equipment is partially offset by the removal of the existing Chloride Pump.

First calculate the post-retrofit penalty for new electrical usage by the OSHG equipment:

$$OSHG_{Elec} = Volt_{OSHG} \times Amp_{OSHG} / 1000(W/kW) \times Hour_{OSHG} \times Days\ of\ Operation$$

And:

$$Hour_{OSHG} = FAC\ Use / OSHG_{Capacity} \times 24\ (hr/day)$$

Where:

$$Volts_{OSHG} = \text{Voltage of OSHG Equipment} = 208V$$
$$Days\ of\ Operation = \text{Days of Operation per year} = 365$$

The electric penalty associated with the OSGH will not be measured, and below is a table showing the assumptions and results:

Facility	$OSHG_{Capacity}$ (lb/day)	Amp_{OSHG} (A)	FAC Use (lb/day)	$Hour_{OSHG}$ (hr/day)	$OSHG_{Elec}$ (kWh/Yr)	Elec Rate ($/kWh)	Penalty ($/yr)
Coach Sakamoto Pool	180	88	17.55	2.34	15,633	0.32663	**$5,106**
Cooke Memorial Pool	24	24	11.7	11.7	21,318	0.383907	**$8,184**
Kokua Pool	60	30	8.45	3.38	7,698	0.32663	**$2,514**
Kihei Aquatic Center	240	116	46.15	4.62	40,643	0.32663	**$13,275**
Lahaina Aquatic Center	180	88	22.75	3.03	20,266	0.32663	**$6,619**
Upcountry Pool	180	88	17.55	2.34	15,633	0.372881	**$5,829**
Wailuku Pool	12	6	2.6	5.2	2,369	0.32663	**$774**
Total	**876**	**440**	**126.75**	**32.61**	**123,560**		**$42,302**

Chloride Pump Savings

Below are the savings generated by the removal of the chloride pump:

$$Chloride\ Pump_{Elec} = Volt_{ChlorPump} \times Amp_{ChlorPump} / 1000(W/kW) \times Hour_{ChlorPump} \times Days\ of\ Operation \times Quantity$$

Where:

$$Volt_{ChlorPump} = 120\ (V)$$
$$Amp_{ChlorPump} = 5\ (A)\ \text{(Estimated size of chloride pump)}$$
$$Hour_{ChlorPump} = 8\ (hr/day)$$
$$Days\ of\ Operation = 365\ (day/year)$$
$${}^*Quantity = 7$$

**No Chloride Pump at Coach Shiraishi Memorial Pool*

The electric savings associated with the removal of the chloride pumps will not be measured. Below are the results.

$$Chloride\ Pump_{Elec} = 12,264\ (kWh/yr)$$

Facility	Chloride $Pump_{Elec}$ (kWh/Yr)	Elec Rate ($/kWh)	Chloride Pump Savings ($/yr)
Coach Sakamoto Pool	1,752	0.32663	**$572**
Cooke Memorial Pool	1,752	0.383907	**$673**
Kokua Pool	1,752	0.32663	**$572**
Kihei Aquatic Center	1,752	0.32663	**$572**
Lahaina Aquatic Center	1,752	0.32663	**$572**
Upcountry Pool	1,752	0.372881	**$653**
Wailuku Pool	1,752	0.32663	**$572**
Total	**12,264**		**$4,187**

Smart Pool Pump Control Electric Savings

The Smart Pump control systems will reduce the electric usage at the pool facilities. The savings will come from reducing pump energy by varying the speed needed to maintain desired flow.

Next determine the Pool Pump baseline electricity use (kWh):

$$Pool\ Pump_{Pre} = (Flow \times Head) / (3{,}960 \times Motor_{Eff} \times Pump_{Eff}) \times .746\ (kW/hp) \times Days\ of\ Operation \times Hour_{On} \times Qty$$

Where:

Flow = *Nameplate (gpm)*
Head = *Nameplate (Ft)*
Conversion Factor *3,960*
$Motor_{Eff}$ = *Motor Efficiency (%)*
$Pump_{Eff}$ = *Pump Efficiency (%)*
Days of Operation = *Days of operation per year = 365 day/year*
$Hour_{On}$ = *Hours of operation per day = 24hr/day*
Qty = *Number of identical pumps*

Facility	Location	Pump Flow (gpm)	Pump Head (ft)	Motor Efficiency (%)	Pump Efficiency (%)	Qty	Pool $Pump_{Pre}$ (kWh/yr)
Coach Sakamoto Pool	Lap Pool	1,300	65	92.40%	92.40%	1	163,328
Coach Siraishi Pool	Lap Pool	405	60	87.50%	87.50%	1	52,377
Cooke Memorial Pool	Lap Pool	200	80	87.50%	87.50%	2	68,973
Kokua Pool	Lap Pool	106	50	87.00%	87.00%	4	46,222
Kokua Pool	Lap Pool	106	60	87.00%	87.00%	1	13,866
Kihei Aquatic Center	Lap Pool	1,200	60	91.00%	91.00%	2	286,964
Kihei Aquatic Center	Training Pool	500	60	92.40%	92.40%	1	57,986
Kihei Aquatic Center	Keiki Pool	200	60	85.50%	85.50%	1	27,089
Kihei Aquatic Center	Keiki Feature	500	50	88.50%	88.50%	1	15,363
Lahaina Aquatic Center	Lap Pool	1,428	70	94.50%	94.50%	2	369,437
Lahaina Aquatic Center	Keiki Pool	135	60	91.00%	91.00%	1	16,142

Facility	Location	Pump Flow (gpm)	Pump Head (ft)	Motor Efficiency (%)	Pump Efficiency (%)	Qty	Pool $Pump_{Pre}$ (kWh/yr)
Upcountry Pool	Lap Pool	1,142	50	89.50%	89.50%	1	117,635
Upcountry Pool	Teaching Pool	180	70	89.00%	89.00%	1	26,251
Upcountry Pool	Keiki Pool	110	60	89.00%	89.00%	1	13,750
Wailuku Pool	Lap Pool	95	60	87.00%	87.00%	2	24,855
Total							**1,300,238**

The Pool Pump Post electrical usage is calculated as:

$$\text{Pool Pump}_{Post} = \text{Days of Operation} \times [(\text{Pump kW}_{Occ} \times \text{Hour}_{Occ}) + (\text{Pump kW}_{Unocc} \times \text{Hour}_{Unocc})]$$

Where:

Days of Operation, Occupied hours, and Unoccupied hours will not be measured and the following table of values is used.

Days of Operation = *Days of Operation per year = 365 (day/yr)*
Hour_{Occ} = *Occupied Hours per day = 7 (hr/day)*
Hour_{Unocc} = *Unoccupied Hours per day = 17 (hr/day)*

The Pool pump savings are simply calculated as:

$$\text{Pool Pump}_{Savings} = \text{Pool Pump}_{Pre} - \text{Pool Pump}_{Post}$$

Johnson Controls

Commissioning Procedure

The following is the commissioning procedure that will be followed for the pool equipment that will be installed:

Pre-functional Checklists and Startup Procedures

A Pre-Functional Inspection Checklist is completed for the mechanical equipment being commissioned. The checklist captures equipment nameplate and characteristics data and confirms the as-built status of the equipment or system. The checklists ensure that the systems are complete and operational and document the installation of components and completion of systems.

The checklists are developed from manufacturer’s data, drawings, and specifications to include the required installation, checkout, and start up procedures.

Development of Functional Test and Verification Procedures

Functional performance testing verifies the intended operation of individual components and system interactions under various conditions and modes of operation. The systems are run through all the sequences of operation and the response of components is verified. Testing proceeds from components to subsystems to systems, and finally to interlocks and connections between systems. Functional performance tests will be performed so that the complete sequence of operations is included. Documentation, including an updated points list, control sequences, and setpoints will be obtained.

Execution of Functional Testing Procedures

A functional tests of equipment will be performed. Owner operations and/or maintenance staff may also be present to assist in system observations.

Any deficiencies found from functional performance testing will be documented in a Deficiency Report. The report will include all details of the components or systems found to be non-compliant with the parameters of the design documents. The deficiency report will become part of the punch list. The report will detail the adjustments or alterations required to correct the system operation and identify the responsible party. The deficiency report will be continuously updated.

Short-Term Diagnostic Monitoring

On some equipment, short-term diagnostic testing, using data acquisition equipment or automation system trends to record system operation over a two-to-three-week period, may be used to investigate the dynamic interactions between components in the system.

The monitoring occurs after occupancy to evaluate the systems’ performance under natural occupancy and ambient load conditions. The objectives of the monitoring are to evaluate scheduling, the interaction between water chemistry, quality, and the effectiveness of the system in meeting the comfort requirements of the occupants.

Operations and Maintenance Manuals

The operation and maintenance manuals prepared by the contractors for the owner’s maintenance personnel are reviewed for completeness. Johnson Controls will submit O&M manuals at the earliest possible date. Materials may be added, or requested, to stress and enhance the importance of system interactions, troubleshooting, and long-term preventative maintenance and operation. A database of preventative maintenance information may also be created from the materials in the O&M manuals.

Commissioning Report

A final Commissioning Report will be compiled which summarizes the tasks, findings, and documentation of the commissioning process. The report will address the actual performance of the systems in reference to the design documents. Test reports by various sub-contractors, manufacturers and controlling authorities will be incorporated into the final report as well. The commissioning report includes:

- An evaluation of the operating condition of the systems at the time of functional test completion,
- Deficiencies that were discovered and the measures taken to correct them,
- Functional test procedures and results,
- Reports that document all commissioning field activities as they progressed, and
- A description and estimated schedule of required deferred testing.

ESCO's Training Responsibilities

Effective maintenance personnel training is critical to the long-term performance of the new equipment. Johnson Controls will organize training sessions by identifying the appropriate staff for each session and creating an overall training plan.

For each training session, provide a detailed agenda will be provided for each piece of equipment or system for which training is required. The agenda describes the training scope, duration, and methods, along with the name and qualifications of the trainers. Johnson Controls will develop a plan for including in training session contractors / trainers from different disciplines, when appropriate. The trainer documents each training session (duration, general subjects covered, and attendees). We encourage the County Staff to spend time with our installers as the project is in its final stages of completion. This will allow them to be present for issues and problem-solving activities which are a great way to learn.

A 4-hour owner's training on the use and operation of the system is included for each individual aquatic center.

ESCO's Maintenance Responsibilities

The tables below show the equipment that will be maintained by Johnson Controls:

No.	Facility	Proposed Generator	Chemistry Controller	Aquatic VFD
1	Kihei Pool	NEXGEN 200 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
2	Upcountry Pool	NEXGEN 150 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
3	Lahaina Aquatic Center	NEXGEN 150 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
4	Coach Sakamoto Pool	NEXGEN 150 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
5	Kokua Pool	NEXGEN 50 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
6	Wailuku Pool	NEXGEN 10 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive

No.	Facility	Proposed Generator	Chemistry Controller	Aquatic VFD
7	Cooke Memorial Pool	NEXGEN 80 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
8	Coach Spencer Shiraishi Memorial Pool	NEXGEN 40 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive

Aquatics Equipment

Chlorking Nexgen Equipment

QTY	MODEL
1	NEXGEN 40-R
5	NEXGEN 50-SMR
1	NEXGEN 10-R
1	NEXGEN 80-R
5	NEXGEN 100-SMR

Scope of Maintenance Services

Part #	Description	Qty.
ESTK25.0SMNEX	Replace cell stacks if needed	As Needed typically Year 3
PBAC2400NEXGEN	Replace one power supply if needed	As Needed typically Year 4
SU192RPNEXGEN	Replace one reverse polarity box if needed	As Needed typically Year 3
P6E6G-208-L	Replace booster pump if needed	As Needed typically Year 3
KITBEIN75110NEXGEN	Replace toroidal sensor if needed	As Needed typically Year 3
CKPH	Replace pH module if needed	As Needed typically Year 5
2680A	Replace Ball valve float assy. If needed	As Needed typically Year 4
2081	Replace Mazzi injector if needed	As Needed typically Year 4
DP10	Replace Mag pump wet end if needed	As Needed typically Year 3
150107215	Replace Actuated valve if needed	As Needed typically Year 4
PUMPFT5240	Replace Acid wash pump if needed	As Needed typically Year 3
17.101.983	Replace Flow meter if needed	As Needed typically Year 3
KITBLOWERXGEN24VDC	Replace Blower	Annually
KITAIRFLOWSENSORYR3T	Replace air flow sensor	Annually
FSKHARWIL2MSCNOT	Replace water flow sensor	Annually
KITFLOATSWITCH	Replace Acid empty switch	Annually
PHXT	Replace pH probe	Annually
20157	Replace Strainer	Annually
MCCP202 X1 MCCP205 X2	Replace Stenner pump hoses	Annually
ST114	Replace Strainer for salt feeder	Annually
MCDBINJ	Replace Injector fitting for salt	Annually
GEN	System Check	Quarterly
ProMinent	Monitor and Verification Chemistry Controller Programming	Quarterly

PMF-54-1200-FRP	Regenerative Filter - Less Media changes	Quarterly
SPCC	Monitor and Verification Smart Controller Programming	Quarterly

Notes:

1. Components above are replaced at no cost to the owner (unless components are damaged by forces out of our control per list of exclusions below).
2. The above table reflects the anticipated component replacement schedule for a NEXGEN system. Both components and labor required to install the component will be provided.
3. Inventory of replacement components will be held at a facility in Hawaii for expedited replacement as necessary.
4. Sensors and components shown with annual replacement in table above is a proactive approach to reduce downtime.
5. Each site (system) will be visited minimum two (2) times per month
6. Prominent Controller maintenance will only cover a quarterly monitoring and verification of the defined parameters established by the energy program. This will be a verification quarterly and reprogramming only if, the programming has been changed from the recorded contract set points.
7. SPCS and Traditional VFD maintenance will only cover a quarterly monitoring and verification of the defined parameters established by the energy program. This will be a verification quarterly and reprogramming only, if the programming has been changed from the recorded contract set points.
8. System checks will follow the NEXGEN summer startup Checklist
9. System checks will follow the NEXGEN maintenance task sheet
10. Regenerative Filtration maintenance only applies to Pukalani/Upcountry Pool

Customer's Maintenance Responsibilities

Customer is responsible for properly maintaining and performing appropriate preventative maintenance on any pool equipment not included in the ESCO Provided Maintenance above, in accordance with manufacturers' standards and specifications. In addition, Customer is responsible for operating the pools, which includes items such as daily checks of the chlorine levels and pool temperature.

Customer is also responsible for the filter media change in any filters installed by Johnson Controls.

Operation and Maintenance (O&M) Cost Savings Calculations

The production of chlorination chemicals on-site will impact each facility's O&M costs, Water/Sewer costs, and Electricity costs. Calculations for each of these are shown below.

OSHG main method for achieving savings is through reducing O&M costs by replacing more expensive purchased chemicals with less expensive salt. O&M savings are also reduced by the elimination of an existing chlorine pump that no longer needs to be maintained.

There are no OSHG O&M savings for Coach Shirashi Memorial Pool. Its baseline condition is a saline pool and there will not be OSHG savings.

O&M Savings:

The O&M Savings are calculated with the following methodology and assumptions:

First determine O&M Baseline:

$$O\&M_{Baseline} = \textit{Chloride}_{Pre} + pH_{Pre} + \textit{Chloride Pump}_{Maint}$$

$$\textit{Chloride}_{Pre} = \textit{Calcium Hypochlorite Use} \times \textit{Calcium Hypochlorite Cost} \times \textit{Days of Operation}$$

$$pH_{Pre} = \textit{Calcium Hypochlorite Use} \times \textit{pH Cost} \times \textit{pH Control}_{CalHypo} \times \textit{Days of Operation}$$

Where:

Calcium Hypochlorite Use	=	*Chemical usage (lb/day)*
Calcium Hypochlorite Cost	=	*Current cost of chlorine per pound of calcium hypochlorite = 3.88 \$/lb (*) for all pools, except Cooke Memorial, which is \$2.66/lb*
Days of Operation	=	*Number of days of use per year = 365 day/year*
pH Cost	=	*Cost of pH control (blended cost of acid and CO2) =\$12.49 /lb*
pH Control$_{CalHypo}$	=	*Lbs of pH chemical needed per lb of Calcium Hypochlorite used = 10%*
Chloride Pump$_{Maint}$	=	*Estimated annual Maintenance Cost for the chloride pump = \$500/yr*

Assumptions and results:

(*)cost based on a quote obtained by JCI from PICS, Inc, on Aug 22, 2022 for Accu-TAB. The total quote was for $5,124.00 plus $205 shipping to a Johnson Controls Kahului Port, plus $251.10 for taxes ($5,124+$205+$251.1=$5,580.10), for 1 pallet of (24) 60# Accu-TABs = $5,580.10/ 24 units / 60lbs/unit = **$3.88/lb**

Copy of Accu-TABs material quote:

PICS **POOL BUILDERS**
Pool, Spa, & Water Feature Construction
P.O. Box 1101 • Lihue, HI 96766
T (808) 241-1313 • F (808) 245-3989
E sales@picsllc.com • www.picsinc.net

ACCU-TAB PROPOSAL

Date: August 22, 2022

Attn: Blaine Banks
Johnson Controls
blaine.r.banks@jci.com

Item	Description	Cost
SCOPE OF WORK –		
	ACCU-TAB, 60# - 1 bucket (23 buckets or less) @ \$ 240.00	
	ACCU-TAB, 60# - 1 Pallet (24 per pallet) 24 @ \$ 213.50	\$ 5,124.00
	Strapping, Labeling, Trucking, Delivery from PICS warehouse to YB delivery only, COD to Johnson Controls at Kahului Port	\$ 205.00
	Tax	\$ 251.10
	TOTAL	**\$ 5,580.10**

Next determine O&M Post-retrofit:

$$O\&M_{Post} = Chloride_{Post} + pH_{Post}$$
$$Chloride_{Post} = Salt\ Use \times Salt\ Cost \times Days\ of\ Operation$$
$$pH_{Post} = FAC\ Use \times pH\ Cost \times pH\ Control_{FAC} \times Days\ of\ Operation$$

And:

$$FAC\ Use = Calcium\ Hypochlorite\ Use \times Chloride_{CalHypo}$$
$$Salt\ Use = FAC\ Use / Chloride_{Salt}$$

Where:

Salt Use = Salt usage (lb/day)
Salt Cost = Salt cost = $0.5/lb
Days of Operation = Number of days of use per year = 365 day/year
FAC Use = Free Available Chlorine usage (lb/day)
pH Cost = Cost of pH control (blended cost of acid and CO2) =$12.49 /lb
$pH\ Control_{FAC}$ = Lbs of pH chemical needed per lb of FAC used = 7.7%
Calcium Hypochlorite Use = Chemical usage (lb/day)
$Chloride_{CalHypo}$ = Chloride by weight of Calcium Hypochlorite = 65%
$Chloride_{Salt}$ = Chloride by weight of Salt = 33.3%

The total O&M savings is the difference between baseline and post-retrofit values:

$$O\&M_{Savings} = O\&M_{Baseline} - O\&M_{Post}$$

Facility	Pre-Retrofit				Post-Retrofit						Savings
	Calcium Hypo-chlorite Use (lb/day)	$Chloride_{Pre}$ ($/yr)	$pH\ Control_{Pre}$ ($/yr)	$O\&M_{Baseline}$ ($/yr)	Calcium Hypo-chlorite Use (lb/day)	FAC required (lb/day)	Salt Use (lb/day)	$Chloride_{Post}$ ($/yr)	pH_{Post} ($/yr)	$O\&M_{Post}$ ($/yr)	$O\&M_{Savings}$ ($/yr)
Coach Sakamoto Pool	27	$38,237	$12,309	**$51,046**	0	17.55	52.7	$9,609	$6,154	**$15,763**	**$35,283**
Cooke Memorial Pool	18	$17,452	$8,206	**$26,158**	0	11.7	35.1	$6,406	$4,103	**$10,509**	**$15,649**
Kokua Pool	13	$18,411	$5,926	**$24,837**	0	8.45	25.3	$4,626	$2,963	**$7,589**	**$17,248**
Kihei Aquatic Center	71	$100,550	$32,368	**$133,418**	0	46.15	138.4	$25,267	$16,184	**$41,451**	**$91,967**
Lahaina Aquatic Center	35	$49,567	$15,956	**$66,023**	0	22.75	68.3	$12,456	$7,978	**$20,434**	**$45,589**
Upcountry Pool	27	$38,237	$12,309	**$51,046**	0	17.55	52.7	$9,609	$6,154	**$15,763**	**$35,283**
Wailuku Pool	4	$5,665	$1,824	**$7,988.80**	0	2.6	7.8	$1,424	$912	**$2,336**	**$5,653**
TOTAL	**195**	**$268,119**	**$88,898**	**$360,517**	**0**	**126.75**	**380.3**	**$69,397**	**$44,448**	**$113,845**	**$246,672**

The salt usage required decreases by half each year until it reaches a minimum (these values are estimated). The annual salt usage is shown below as a percentage of the first year usage. The minimum on Years 5-20 is due to the continuous use of makeup water due to filter back washing.

	Year 1	Year 2	Year 3	Year 4	Year 5-20
Salt Usage relative to Year 1	100%	50%	25%	13%	6%

The table below shows the annual O&M Savings associated with the On-Site Hypochlorite Generation, including the decreasing amount of salt purchases over the first 5 years (plus the annual escalation for O&M Expenses).

Year	O&M Baseline	Salt Cost Post	pH Control Post	O&M Post	O&M Savings
1	$360,517	$69,397	$44,448	$113,845	$246,672
2	$378,543	$36,433	$46,670	$83,104	$295,439
3	$397,470	$19,128	$49,004	$68,131	$329,339
4	$417,344	$10,042	$51,454	$61,496	$355,848
5	$438,211	$5,272	$54,027	$59,299	$378,912
6	$460,122	$5,536	$56,728	$62,264	$397,858
7	$483,128	$5,812	$59,565	$65,377	$417,751
8	$507,284	$6,103	$62,543	$68,646	$438,638
9	$532,648	$6,408	$65,670	$72,078	$460,570
10	$559,281	$6,729	$68,953	$75,682	$483,599
11	$587,245	$7,065	$72,401	$79,466	$507,779
12	$616,607	$7,418	$76,021	$83,439	$533,167
13	$647,437	$7,789	$79,822	$87,611	$559,826
14	$679,809	$8,179	$83,813	$91,992	$587,817
15	$713,800	$8,588	$88,004	$96,592	$617,208
16	$749,490	$9,017	$92,404	$101,421	$648,068
17	$786,964	$9,468	$97,024	$106,492	$680,472
18	$826,312	$9,941	$101,876	$111,817	$714,495
19	$867,628	$10,438	$106,969	$117,408	$750,220
20	$911,009	$10,960	$112,318	$123,278	$787,731
Total	**$11,920,848**	**$259,723**	**$1,469,716**	**$1,729,438**	**$10,191,410**

Facility Support Required and Customer's Responsibilities:

Customer will be required to conduct standard pool operation maintenance inclusive of supplying the required Salt to the system and required CO2 or Acid. Standard pool operating chemicals for day to day use outside of chlorine and pH control are still required. Upon execution of maintenance agreement, those items covered by this agreement would be detailed in that agreement for the base scope.

Johnson Controls

FIM 9 – Infiltration Reduction

Existing Conditions

Building energy loss occurs when unwanted air movement migrates through open paths in the building's exterior envelope allowing outside ambient air to mix with inside conditioned air. The air leaving a building through these paths is exfiltration and entering the building is infiltration. Wind pressure and building temperature differences cause pressure and temperature gradients that push air through the open paths. This measure is to "seal" or block the identified paths to prevent building infiltration or exfiltration which will result in energy savings.

Existing Deficiencies

Exterior Doors

A total of 383 exterior door locations were identified in the project that could benefit from the addition of weather stripping and closure adjustments. Photos show some of the worst conditions. Note that daylight is visible around the doors. Sealing these openings will reduce the air leakage through these doors.

Interior Doors

For the project, 68 interior door locations were identified that could benefit from the addition of weather stripping and closure adjustments. Interior Doors proposed are at the boundaries of conditioned space and non-conditioned space. For example, interior doors between office spaces that have air-conditioning and maintenance bays that are not.

Window Air Conditioner

A total of 83 window air conditioners can benefit from additional weatherstripping around the perimeter.

Pipe Penetrations

Only 2 pipe penetrations have been identified with significant leakage between interior space and the exterior.

Roof/Wall Joints

The roof-wall intersection is regularly an area that allows unwanted air leakage through the building shell. Exterior flashing and finish details at this area are not constructed to stop air leakage (exterior flashings are for water control, not air control); unsealed exterior flashing details combine with interior gaps in the framing between the roof and wall assembly to allow infiltration/ exfiltration.

Where the building roof and vertical walls are joined, 718 linear feet can benefit from the installation of foam to seal the joints and reduce infiltration.

Window perimeters

There are cracks and holes found at the window systems. These gaps allow air to find its way into the wall and window frame cavities or directly from outside to inside resulting in unwanted energy losses.

The photo here is an example of a poor window seal.

Caulking will benefit 124 linear feet of window perimeters.

FIM Description

Existing holes in the building envelope allow unconditioned outdoor air to enter the building or conditioned air to escape and represents an additional load on the air-conditioning system. Consequently, infiltration can cause unwanted air-movement.

While buildings are never air-tight, and ventilation is a requirement in maintaining healthy buildings, there are specific areas of leakage that can be addressed and reduced or eliminated to save energy. Johnson Controls conducted audits for several facilities, identified multiple opportunities to reduce infiltration and measured the area that can be affected through weatherization to estimated energy savings.

Scope of Work

This section describes the contractual scope of work.

- Item #1. Exterior Door Weather Stripping – install heavy duty weather stripping with aluminum carrier and strip of Q-lon (formed and angled sponge wrapped in vinyl). Apply to the door frames, secure with screws, and caulk for added durability and air sealing through the carrier. Install door bottom sweep with double fin film seal between a set of brushes and embedded in a heavy aluminum carrier. Install sweep typically under the kick plate of the door, and secure in the same method as the rest of the door seal.
- Item #2. Interior Door Weather Stripping – install heavy duty weather stripping with aluminum carrier and strip of Q-lon (formed and angled sponge wrapped in vinyl). Apply to the door frames, secure with screws, and caulk for added durability and air sealing through the carrier. Install door bottom sweep with double fin film seal between a set of brushes and embedded in a heavy aluminum carrier. Install sweep typically under the kick plate of the door, and secure in the same method as the rest of the door seal.

- Item #3. Window Air Conditioner Weather Stripping on 4 sides – install heavy-duty aluminum carrier with oversized vinyl insert gasket at the top and clip-lock gasket material at the sides. Install aluminum carrier on bottom with an oversized U-style gasket
- Item #4. Pipe Penetration sealed with 1- or 2-part foam – seal exterior pipe penetrations with 1 or 2-part foam, depending on the type of joint being sealed and its visibility to the public eye.
- Item #5. Roof/Wall Joint to be sealed with 1- or 2-part foam
- Item#6. Seal windows around perimeter with caulk
- Clean up of job-related debris daily. Clean up and store tools and other equipment daily and remove after successful installation and operational checkout.
- Provide submittals, product data, and warranty information.

See the table provided in the “Energy Savings Calculation” section below for counts and locations of weatherization items to be installed.

Exclusions:

1. Repair or replacement of existing doors, windows, and hatches is excluded in this scope of work other than as described in scope is excluded. If any doors, windows, or hatches are found to be inoperable or broken, JCI will report the deficiency to the Customer for repair or replacement prior to JCI retrofitting the seals.
2. Repair or installation of any structural systems.
3. Fire stopping, smoke sealing, closure and other hardware adjustments, paid escorts/access, incidental work, rotted substrate, inoperable hardware, broken parts or members, missing window gaskets or parts, spline ceilings, exterior scaffolding or swing stages, hard ceilings, touch up painting, cutting, and patching.
4. Repair or upgrades required necessary to rectify existing code violations, including ADA and egress.
5. Repair, installation or replacement of brick or other masonry materials.
6. Repair or replacement of any windows, including any existing damaged frames or cracked glass. If any glass or frames are found to be damaged, JCI will report the deficiency to the Customer for repair or replacement prior to JCI installing the new window film.
7. Repair or upgrades to existing building HVAC system and indoor air quality issues.
8. Engineering services, studies and analysis associated with any deficiencies of the existing HVAC systems.
9. Removal of any “non-fixed” (unattached) furniture, fixtures and window treatments and save for re-installation once window film has been installed.

Equipment Manufacturer / Warranty

The table below provides the selected material as the basis of design:

Material Type	Manufacturer Information		
	Material Description	Part Number	Mfg. Name
Caulk (clear)	Siliconized Clear Acrylic Latex Caulk	Tower Airtite® 07873	Tower Sealants, LLC.
One-Part Foam	One part Foam, 10#	VT-10	RHH Products ®
One-Part Foam	One part Foam, Black	4004529813	Convenience Products ®
Two-Part Foam	VERSI-FOAM System 50 ASTM E-84 Class 1 Component A & B	CLS061NP	RHH Products ®
Weather Stripping (Door)	Extruded AL Soft Foam Qlon seal (Brown and/or Mil)	Mill 17045 RevA-Brown 17045-ANO-303AE	Building Envelope Solutions - Qlon
Door Sweep	Brush Door Sweep with film insert BS-196-58-AL (Brown and/or Mil)	Mill 17046 Brown 17046 -ANO-303AE	Building Envelope Solutions - Sweeps
Silicone Fin Smoke Seal	Silicone Smoke Fin Seal	5040B	National Guard Products ®
Fin Seal - Door	T-slot weather stripping	3550.036 (.270)	VISCO Q-Lon ®
Q-Lon Foam Seal Thick-V	Small door and window seal (self adhesive)	3540.20	VISCO Q-Lon ®
Window Air Conditioner Cover	Insulated window AC cover	N/A	NEW SUPER COVER™

All installed materials and workmanship will be warranted for a period of one year after customer acceptance. All parts, labor, and costs will be covered by Johnson Controls during this period.

Additional extended warranties from the material manufacturers used on the project will be passed through to the County.

Energy Savings Calculations

Cooling savings achieved from reducing infiltration through weatherization is determined through measured air leakage area and a series of calculations using local weather data.

First, the volumetric rate of air allowed to enter the facility is calculated. Leakage airflow [ft^3/min] is determined from the air leakage area and the wind pressure factor using the equations below:

$$P_t\ [Pa] = (½ \times \varrho\ [kg/m^3] \times (V_t\ [mph] \times 1{,}609.344\ [m/mi] / 3600\ [sec/hr]\ )^2)$$

$$\text{Leakage airflow [lt/sec]} = \textstyle\sum_t [\ P_t\ [Pa] \times A\ [m^2] \times K\ ]_t$$

$$\text{Leakage airflow } [ft^3/min] = \text{Leakage airflow [lt/sec]} \times 2.1188$$

Cooling Energy Savings is calculated as follows:

Clg Energy Savings [Btu] = $\sum_t$[Leakage [ft^3/min] x CDD_t [°F-day] x ϱ [lb/ft^3] x Cp [Btu/lb/°F] x 60 [min/hr] x 24 [hr/day] x $\%AC_t$ $]_t$

Cooling Energy Savings is converted to electricity savings using the standard conversion value (Btu/kWh) and the coefficient of performance for the facility cooling equipment.

$$Cooling\ Savings\ [kWh]\ = \frac{Clg\ Energy\ Savings\ [Btu]}{COP_{clg}\ x\ 3{,}412\ [Btu/kWh]}$$

where:

V_t =	Average monthly wind speed, obtained from NOAA 30-yr weather data for Kahului, HI. See weather data in table below for monthly average wind speed values used.
ϱ =	Density of Air for Kahului, HI = 0.0749 lb/ft3, 1.199 kg/M3 at 70 Degrees
P_t =	Monthly wind pressure factor calculated using the monthly wind speed.
K =	Building factor determining building style, ranging from 100-150. Low K is an efficient building envelope with central mass and high K is open space with many wings. See table below for values used in each site.
A =	Air leakage area calculated as linear feet being sealed times Gap width. See table below for values used in each site.
Leakage	= Leakage airflow because of the pressure differences caused by wind, stack effect, etc.
CDD_t =	Monthly Cooling Degree Days. Estimated for Maui, Hawaii with a balance temperature of 72°F.
Cp =	Specific heat of air = 0.243 Btu/lb/°F
$\%AC_t$ =	% of building that is air conditioned each month. See table below for values used.
COP_{clg} =	Average cooling COP = 3.0

The table below provides details by location for values used in the above equations in addition to count of specific scope items (i.e., Item #1, Exterior Doors) at those locations.

Facility Name	Building K	Total Area (sqft)	% Air Conditioned	(Qty) Ext Doors	(Qty) Interior Doors	(Qty) Window AC Units	(Qty) Pipe Penetrations	(LF) Roof/Wall Joints	(LF) Seal Windows	Adjusted Savings - uncertainty (kWh)	Annual Savings ($)
Kahului Community Center	95	0.48	100%	5		3				682	$254.14
Kokua Pool	95	0.16	50%	1		1				113	$36.90
Kahului Fire Station	120	1.76	80%	11	11	2	2			7,822	$2554.88
Kahului Wastewater Reclamation Facility	100	3.08	100%	3	3			315		4,500	$1362.08
Kihei Community Center	130	4.9	100%	47						8,877	$2899.35
Kihei Aquatic Center	120	1.72	80%	11						2,329	$760.86
Kihei Fire Station	100	0.64	60%	3	3	12				563	$210.12
Kihei Police Station	95	2.19	95%	21						2,956	$965.47
Lahaina Civic Center	140	3.36	85%	32					2	5,437	$1775.86
Lahaina Police Station	100	3.1	100%	4		2		262	24	14,894	$4864.76
Lahaina Fire Station	120	0.45	100%	1	3				8	756	$246.92
Eddie Tam Memorial Center	130	0.64	30%	4		3				346	$128.87
Napili Fire Station	100	0.59	60%	4	2	2				517	$192.64
South Maui Community Center & Park	140	2.71	100%	26						5,159	$1561.55
Wailea Fire Station	120	0.83	60%	3	5					847	$276.68
Wailuku Police Station	100	0.65	85%	5					6	1,783	$539.76
West Maui Senior Center	100	1.35	90%	13						1,783	$582.41
Fire Prevention Bureau	100	0.94	50%	9						686	$224.00
Forensic Facility	100	0.9	100%	6		5				1,314	$429.34
Central Landfill	120	0.78	90%	5						1,191	$389.08
Mayor Hannibal Tavares Community Center	100	0.42	50%	4						305	$113.65
Hoolehua Fire Station	120	0.75	50%	3	2	2			7	637	$297.02
Sewer Maintenance Building	95	0.79	70%	5	3				1	783	$255.76
Kalana O Maui Building	95	1.04	100%	10						1,482	$448.50
Old Courthouse Building	129	1.59	95%	5					42	2,557	$835.07
Kalana Pakui	100	1.46	100%	15						2,134	$645.86
Kaunakakai Fire Station	130	1.15	75%	8	6	2				1,565	$600.90
Kaunoa Senior Services	100	4.26	100%	29		21				6,226	$2321.38
Makawao Baseyard	100	0.32	50%	1	1	2				232	$86.66
Kula Fire Station	130	0.51	70%	1	3				1	687	$256.16
Molokai Kuha'o Business Center	100	0.21	100%	2						305	$142.08
Lahaina Wastewater Reclamation Facility	120	0.82	95%	5					8	1,324	$400.91
Lahainaluna Water Treatment Plant	120	0.69	50%	4		1			3	587	$191.84
Lanai Baseyard	100	0.96	40%	6		3				565	$267.51
Lanai Fire station	120	0.34	50%	2		3				288	$136.38
Lanai Police Station	100	0.69	95%	6					10	963	$437.33
Lanai Baseyard	130	0.33	30%	2		2				180	$85.23
Lanai Wastewater Reclamation Facility	95	0.17	50%	1		1				118	$55.72
Piiholo Water Treatment Plant	100	0.94	80%	9						1,097	$358.41
Olinda Water Treatment Plant	110	0.32	50%	1	1	1				256	$83.71
Makawao Fire Station	100	0.63	70%	3	3					640	$238.67
Mitchel Pauole Community Center	100	1.97	70%	17	3	5				2,020	$775.60
Molokai Baseyard	130	0.51	40%	2		1				366	$170.79
Paia Fire Station	120	0.52	75%	3	2					662	$246.76
Victims Advocate Building	100	0.31	100%	3						457	$149.34
Waiehu Golf Course	110	0.31	50%	2	1					249	$92.67
Hana Fire Station	100	0.68	70%	3	3				2	696	$259.56
Hana Police Station	95	1.22	90%	3		3		142		1,557	$580.51
Kahului Baseyard	120	4.53	100%	6	4	6			10	7,677	$2507.38
Mahinahina Water Treatment Plant	110	0.52	50%	4	1					414	$135.29
Iao Water Treatment Plant	130	0.83	40%	4	2					604	$197.40
Totals										100,185.72	$33,630

Calculated savings have been decreased by 20% to account for uncertainties.

The table below provides the monthly weather data for Kahului Airport and some calculated values that are consistent for all facilities affected by this FIM.

	Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec
Average Wind (MPH	9.40	10.10	11.20	11.60	11.50	12.60	13.10	12.80	11.20	10.40	10.50	10.10
CDD	527.0	476.0	567.3	588.0	657.2	705.0	768.8	799.8	765.0	750.2	651.0	582.8
Wind (L/S) Calculated	4.20	4.52	5.01	5.19	5.14	5.63	5.86	5.72	5.01	4.65	4.69	4.52
Pd (Pa) Calculated	10.59	12.22	15.03	16.12	15.84	19.02	20.56	19.63	15.03	12.96	13.21	12.22

Commissioning Procedure

Manufacturer's installation procedures will be followed. Strictly following the manufacturer-provided procedures avoids compromising the warranty. Post-install visual inspections will be coordinated with the County. No other commissioning is required.

ESCO's Training Responsibilities

Not applicable. No training is required for this FIM.

ESCO's Maintenance Responsibilities

Not applicable. There are no maintenance requirements for this FIM.

Customer's Maintenance Responsibilities

Replacing damaged or worn out weather stripping installed by Johnson Controls throughout the Guarantee Term.

Operation and Maintenance (O&M) Cost Savings Calculations

Not applicable. No O&M savings are being claimed from the implementation of this FIM.

Facility Support Required and Customer's Responsibilities:

- Customer support will be required to ensure access to the facility.
- Customer will provide escorts where required. Johnson Controls will coordinate access for specific areas one week in advance by providing weekly work schedules.
- Customer and Johnson Controls will coordinate efforts to accommodate reasonable variations in daily work schedules.
- Customer is responsible for the identification and abatement or removal of hazardous materials, as required, to implement this FIM, repair or replacement of malfunctioning equipment that may affect FIM performance, and reparation of existing building code compliance issues, including Egress and Americans with Disabilities Act compliance issues. Johnson Controls reserves the right to request that Customer test materials suspected of containing hazardous materials prior to proceeding with work.

FIM 10 – Window Film

Existing Conditions

Solar radiation can penetrate through windows causing unwanted heat gain in a building, along with glare and uncomfortable hot spots. Applying a solar film to the windows can mitigate these issues and reduce the cooling load of a building. Hot sunny days often correspond to the peak cooling demand times; therefore, solar film can also significantly reduce electric demand charges.

Johnson Controls identified County buildings with a significant number of windows that are exposed to direct sunlight along with being air conditioned.

Existing Deficiencies

We identified 223 windows consisting of clear single-pane and double-pane for all building orientations (North, South, East, West) where solar gains are contributing to increased cooling loads and energy waste.

The table below provides a breakdown of window quantities and total window square footage affected by this FIM by location.

	Window Quantities					
Facility	East	North	South	West	Total Qty	Window Sq-Ft
Kihei Community Center	13	50	54	19	136	1,927
Kula Fire Station	4	16	2	6	28	241
Kuoha Business		1		12	13	43
Lanai Baseyard	6				6	48
Paia Fire Station	16	12	12		40	276
Grand Total	**39**	**79**	**68**	**37**	**223**	**2,535**

See the table in Energy Savings Calculation below for additional information on the type of windows, orientation, type, and square footage by location.

The photo at left depicts “skylight” windows that will receive window film at Kihei Community Center.

Johnson Controls

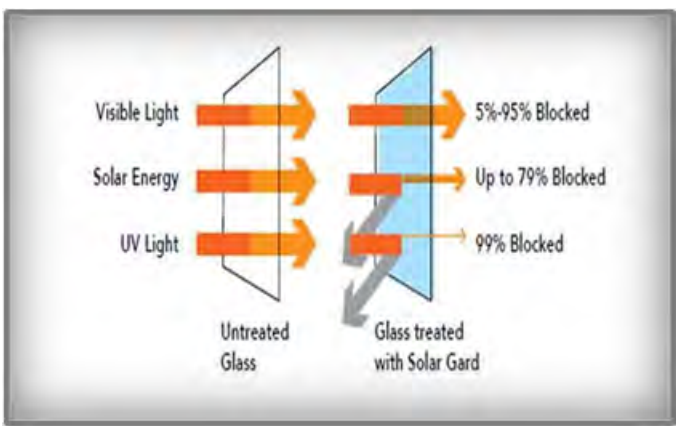
Double Pane Window – Kula

Southern Exposure – Paia Fire station

FIM Description

There are a variety of different films that can be applied to most windows. They vary in reflectivity and visible light transmittance. Typically, the darker the film, the more solar heat gain reduction and the better the savings. Alternatively, some films are quite clear, and they can be applied without altering the look of the windows. Most films are installed on the inside of the window, and do not affect the warranty of the window and avoid weathering issues.

The figure below schematically represents the benefits of window film:



Johnson Controls has experience installing window film for several customers in Hawaii. From that experience, we have seen great results with ceramic-based and hybrid window films, with slight tints to reduce UV and heat gain without darkening the windows any noticeable amount.

The scope of work for this FIM includes materials and labor for the installation of new window film to the interior glass of certain areas and buildings to reject and reflect a portion of the solar radiation and reduce the cooling load of the spaces. These spaces either have window film that has failed or nothing at all.

Scope of Work

This section describes the contractual scope of work.

The scope of work for this FIM is to furnish and install window film per the Visual Inspection Standards for Window Film by the Window Film Association (IWFA).

1. **Removal and Demolition:** Remove any existing window film and prepare glass surface as required for new film installation. Normal measures will be included to protect any items exposed that can't be removed from the installation process. Installers will use drapes, drop clothes and plastic covers to provide protection to exposed and non-removable items. Window gaskets will remain in place as a normal part of the installation process.
2. **Clean Window Surface:** Clean the interior window surface per the window film manufacturer's instructions.
3. **Window Film Preparation**: Measure, cut and ready the window film for application.
4. **Release Liner Removal**: Prepare and remove the release liner as applicable ensuring no contamination adheres to the surface and apply solution to the surface for proper installation.
5. **Window Film Application**: Apply film to glass and slide to approximately 1/16 inch from one edge of the window. Remove large wrinkles or bubbles as required. Apply solution to the surface of the film and squeegee the surface as required to remove excess solution from under the films surface.
6. **Window Film Splicing**: Film splicing will be kept to a minimum, and when inevitable due to large dimensions Film splices will be done as much as possible on out of reach places for building occupants.
7. **Trim**: Properly trim excess film from surface.
8. **Final Squeegee:** Wet surface with solution and perform final squeegee.
9. **Window Film Inspection:** Following the Adhesive Cure Time, installed Window Film will be inspected by installing contractor for acceptability (typically within one day of installation). Inspections will be performed during periods of Natural Daylight with emphasis on the items:

- Dirt Particles
- Hair and Fibers
- Adhesive Gels
- Fingerprints
- Air Bubbles
- Water Haze
- Scores and Scratches
- Film Distortion
- Creases
- Edge Lift
- Nicks and Tears
- Proper Tint

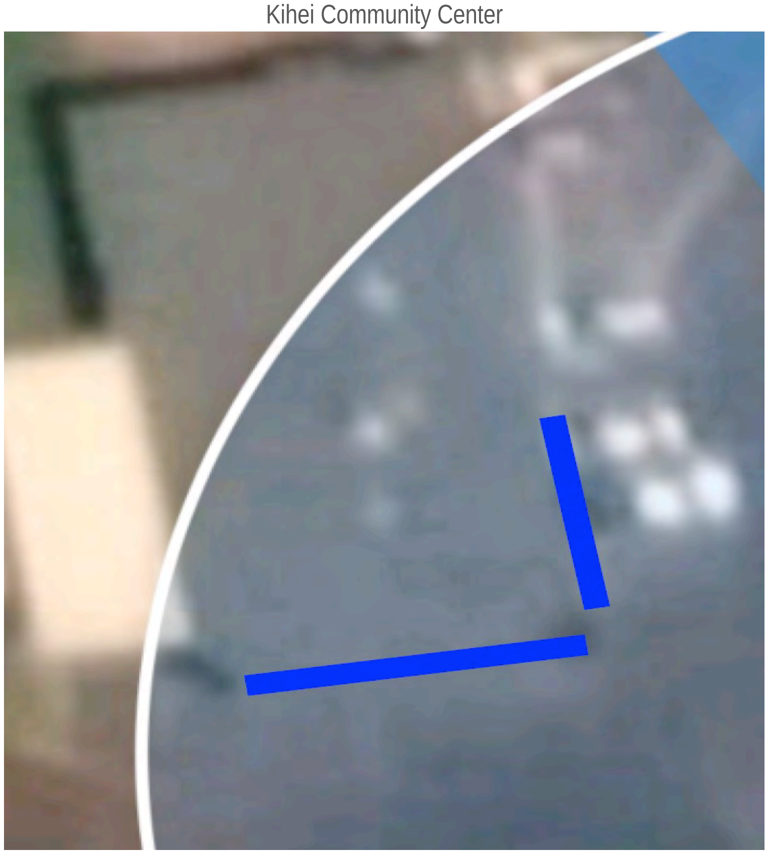
10. **Window Film Installation:** Provide and install non-metallic window film on the interior surface of the glass, suitable for a high salt marine environment, with a maximum Visible Light Transmittance of 40%, and 99% of UV rejection.

The table below provides location and quantities of windows that will receive the film:

Building	Glass Type	Direction	Window Qty	Window Sq-Ft
Totals			**223**	**2,535**
Kihei Community Center	Double Pane - Clear	North	10	227
Kihei Community Center	Double Pane - Clear	North	12	178
Kihei Community Center	Double Pane - Clear	North	10	117
Kihei Community Center	Double Pane - Clear	North	12	120
Kihei Community Center	Double Pane - Clear	North	6	79
Kihei Community Center	Double Pane - Clear	South	9	204
Kihei Community Center	Double Pane - Clear	South	12	178
Kihei Community Center	Double Pane - Clear	South	9	105
Kihei Community Center	Double Pane - Clear	South	16	160
Kihei Community Center	Double Pane - Clear	South	8	106
Kihei Community Center	Double Pane - Clear	East	2	63
Kihei Community Center	Double Pane - Clear	East	7	99
Kihei Community Center	Double Pane - Clear	East	4	53
Kihei Community Center	Double Pane - Clear	West	2	14
Kihei Community Center	Double Pane - Clear	West	10	132
Kihei Community Center	Double Pane - Clear	West	7	93
Kuoha Business	Double Pane - Clear	West	3	29
Kuoha Business	Double Pane - Clear	West	9	4
Kuoha Business	Double Pane - Clear	North	1	10
Lanai Baseyard	Single Pane - Clear	East	6	48
Paia Fire Station	Double Pane - Clear	North	12	83
Paia Fire Station	Double Pane - Clear	East	16	110
Paia Fire Station	Double Pane - Clear	South	12	83
Kula Fire Station	Single Pane - Clear	North	4	51
Kula Fire Station	Single Pane - Clear	North	2	17
Kula Fire Station	Single Pane - Clear	North	4	16
Kula Fire Station	Single Pane - Clear	North	2	13
Kula Fire Station	Single Pane - Clear	North	2	24
Kula Fire Station	Single Pane - Clear	North	2	25
Kula Fire Station	Single Pane - Clear	South	2	8
Kula Fire Station	Single Pane - Clear	West	4	50
Kula Fire Station	Single Pane - Clear	West	2	18
Kula Fire Station	Single Pane - Clear	East	2	4
Kula Fire Station	Double Pane - Clear	East	1	6
Kula Fire Station	Single Pane - Clear	East	1	11

The bird’s eye view of the locations shows the windows and orientation that will be receiving window film:

Kihei Community Center



Kuhoa Business

Lanai Baseyard

Kula Fire Station

Exclusions:

1. Repair or replacement of existing windows is excluded in this scope of work. If any windows are found to be broken, Johnson Controls will report the deficiency to the County for repair or replacement prior to Johnson Controls installing the window film.
2. Modifications required to due to existing code violations, including but not limited to the Americans with Disabilities Act (ADA) and egress, are the responsibility of the customer.
3. Repair or installation of windows or doors is not included.
4. Repair or installation of any structural systems is not included.
5. Repair or adjustment of any springs or opening mechanisms is not included.

6. Moving of all office furniture and moveable objects including curtains and blinds away from windows to be modified is not included.
7. Permits, fees, or processes required by local or oversight jurisdiction and/or utilities or permits and upgrades triggered by other upgrade and renovation projects.
8. Delivery of any 'As-Built' drawings, layouts, or engineered design drawings.

Equipment Manufacturer / Warranty

The table below provides the selected material as the basis of design:

Material Type	Manufacturer Information		
	Material Description	Part Number	Mfg. Name
Window Film	Solar Control Window Film (Reflective Series)	R20 SR CDF (Silver)	Llumar ®

Installed materials and workmanship will be warranted for a period of one year after customer acceptance. All parts, labor, and costs will be covered by Johnson Controls during this period.

Energy Savings Calculations

Window Film Retrofit Energy Savings

Electrical savings are generated through a reduction in cooling load due to the reduction in solar heat gain through windows because of the installation of window film. The solar heat gains from windows savings are directly proportional to the glass areas where window film is installed.

Equations for Calculating Window Film Savings

$$kWh_{Savings} = \frac{(1 - Shading\ Coeff) * Window\ Area * Annual\ Insolation * \left(SHGC_{pre} - SHGC_{post}\right) / \frac{ft2}{m2}}{COP}$$

Where:

1. $kWh_{Savings}$ = Annual power savings from the implementation of window film
2. $Shading\ Coeff$ = Shading Coefficient for existing glass without window film as published by ASHRAE
3. $Window\ Area$ = Measured area of window in square feet
4. $Annual\ Insolation$ = Annual Insolation (kWh/m^2) - sun exposure as determined from NREL TMY3 weather data
5. $SHGC_{pre}$ = Solar Heat Gain Coefficient for existing window before installation (*pre*)
6. $SHGC_{post}$ = Solar Heat Gain Coefficient for window with the window film (*post*)
7. $\frac{ft2}{m2}$ = unit conversion = 10.7584
8. COP = Coefficient of performance for air conditioning equipment

Annual energy cost savings are determined by multiplying the kWh energy savings by the corresponding facility energy rate ($/kWh).

The table below provides the audited values for input into the savings calculations for the buildings where this FIM is being applied. There is a line-item calculation for each window type, orientation, and varying shading coefficients at the facility.

Building	COP	Glass Type	Direction	Insolation (kwh/m^2)	Window Qty	Window Sq-Ft	Shading Coefficent	SHGC - Pre	SHGC - Post
Totals					**223**	**2,535**			
Kihei Community Center	3	Double Pane - Clear	North	515	10	227	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	North	515	12	178	0.10	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	North	515	10	117	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	North	515	12	120	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	North	515	6	79	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	South	1,339	9	204	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	South	1,339	12	178	0.10	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	South	1,339	9	105	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	South	1,339	16	160	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	South	1,339	8	106	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	East	1,030	2	63	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	East	1,030	7	99	0.45	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	East	1,030	4	53	0.45	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	West	1,030	2	14	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	West	1,030	10	132	0.75	0.76	0.20
Kihei Community Center	3	Double Pane - Clear	West	1,030	7	93	0.75	0.76	0.20
Kuoha Business	3	Double Pane - Clear	West	1,030	3	29	0.10	0.76	0.20
Kuoha Business	3	Double Pane - Clear	West	1,030	9	4	0.10	0.76	0.20
Kuoha Business	3	Double Pane - Clear	North	515	1	10	0.10	0.76	0.20
Lanai Baseyard	3	Single Pane - Clear	East	1,030	6	48	0.15	0.86	0.20
Paia Fire Station	3	Double Pane - Clear	North	515	12	83	0.05	0.76	0.20
Paia Fire Station	3	Double Pane - Clear	East	1,030	16	110	0.05	0.76	0.20
Paia Fire Station	3	Double Pane - Clear	South	1,339	12	83	0.05	0.76	0.20
Kula Fire Station	3	Single Pane - Clear	North	515	4	51	0.05	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	North	515	2	17	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	North	515	4	16	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	North	515	2	13	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	North	515	2	24	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	North	515	2	25	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	South	1,339	2	8	0.20	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	West	1,030	4	50	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	West	1,030	2	18	0.10	0.86	0.20
Kula Fire Station	3	Single Pane - Clear	East	1,030	2	4	0.20	0.86	0.20
Kula Fire Station	3	Double Pane - Clear	East	1,030	1	6	0.55	0.76	0.20
Kula Fire Station	3	Single Pane - Clear	East	1,030	1	11	0.30	0.86	0.20

The below summarizes the total Window Film Energy Savings (for details by site refer to Appendix 11):

Table 8: FIM 10 Energy Savings Summary

Elec (kWh)	Demand (kW)	$-Elec	$-Demand	$-Total
20,469	0.00	$7,074.45	$0.00	**$7,074.45**

Commissioning Procedure

Not applicable. No commissioning procedures are required for this FIM.

ESCO's Training Responsibilities

Not applicable. No training is required for this FIM.

ESCO's Maintenance Responsibilities

There are no maintenance requirements for the window film.

Customer's Maintenance Responsibilities

Window Film is considered maintenance free. However, the following restrictions apply to cleaning:

1. Do not use abrasive cleaners, industrial strength glass cleaners, or cleaning tools that may scratch the film.
2. Avoid using cleaning products containing ammonia. A simple solution of soap and water work well.
3. Do not apply tape or other adhesives as this will tear the film. Do not lean objects against windows.

Operation and Maintenance (O&M) Cost Savings Calculations

No O&M savings are being recognized with this FIM.

Facility Support Required and Customer's Responsibilities:

The facility will need to provide a clearance of 3 feet in front of the glass for access (wherever possible), of any movable furniture, window treatments, etc. that might prevent the installation of the window film.

FIM 11 – EV and EV Charging Station

Existing Conditions

Kalana O Maui Building

The County government office building in Wailuku is a multi-story, multi-department site, with parking spaces for several County vehicles. There are existing public-facing EV Chargers in the front parking lot. There are not currently any dedicated County fleet vehicle EV Charging Stations at this site.

Existing Deficiencies

Kalana O Maui Building

There were no existing deficiencies noted at this time.

FIM Description

This FIM entails the installation of a new EV charging station at the County's government offices at the Kalana O Maui Building, and the furnishing of one or more Electric Vehicles. The proposed electric vehicles will be furnished by Johnson Controls to the County of Maui as part of the installation cost of this ESPC project. The County will be the title owner of this vehicle, since it is being procured through the TELP financing of this Phase 1 project.

Scope of Work

There is an allowance of $248,000 towards EV Charging Stations and Electric Vehicle(s). The allowance is cost only, with no mark-up or overhead included. Customer will select equipment based on best interests of the County. JCI is providing this FIM to demonstrate the potential for additional electric vehicles and electric vehicle charging infrastructure, as described in FIM 15 below under "Facility Improvement Measures Under Evaluation" Section.

Equipment Manufacturer / Warranty

The vehicle equipment warranty, and EV Charger warranty will be passed directly to the County.

Energy Savings Calculations

There are no energy savings associated with this FIM.

Commissioning Procedure

Charging station shall be installed and commissioned per the manufacturer's procedures and specifications. No other commissioning is required.

ESCO's Training Responsibilities

There is no training included with this FIM.

ESCO's Maintenance Responsibilities

There is no maintenance included with this FIM.

Customer's Maintenance Responsibilities

Customer shall be responsible for all maintenance of the vehicle and the charging station according to the manufacturer's specifications.

Operation and Maintenance (O&M) Cost Savings Calculations

There is no O&M cost saving associated with this FIM.

Facility Support Required and Customer's Responsibilities:

Customer support will be required to ensure access to the facility.

Clarifications to All Scope Items

1. Neither party will be responsible to the other for damages, loss, injury, or delay caused by Force Majeure Events. If a party is delayed in achieving one or more of its schedule milestones set forth in the Agreement due to a Force Majeure Event, the affected party will be entitled to extend the relevant completion date by the magnitude of the Force Majeure Event and an equitable adjustment in price, scope and payment terms, and the Assured Performance Guarantee shall be made. “Force Majeure Events” are conditions that are beyond the reasonable control and without the intentional misconduct or negligence of a party, either foreseeable or unforeseeable, including, without limitation, severe weather, flooding, seismic disturbances, acts of God, acts or omissions of government agencies, condemnation, strikes, labor disputes, epidemics, pandemics, disease, quarantines or other public health risks and/or responses, fires, explosions or other casualties, thefts, vandalism, riots or war, acts of terrorism, electrical power outages, interruptions or degradations in telecommunications, computer, or electronic communications systems, changes in Laws, data breach, cyber-attacks, ransomware, or unavailability, delayed delivery or an increase of 5% or more in cost of any parts, materials or supplies to be used in the project between date of contract and date of installation, or during the term of the Planned Service Agreement.

2. Additionally, there may be federal 179D tax incentives for energy efficiency associated with this project. These tax incentives would available for federal tax paying entities, and if the entity doing the project does not pay federal income taxes, then the tax incentive may be assignable to the installation contractor, Johnson Controls. In the case that the 179D or similar tax incentives are available, the Customer agrees to assign those tax incentives to Johnson Controls.

3. In the case that there is a Change Order to the scope of work, regardless of the impact to the installation price of the project, a Change Order to the scope of work may require a commensurate adjustment to the Assured Performance Guarantee.

4. Customer shall supply JCI with any information in its possession relating to the presence of hazardous materials if their presence may affect JCI’s performance of the Work during the construction period or the Planned Service Agreement period. It is JCI’s policy to seek certification for facilities constructed prior to 1982 that no asbestos containing materials are present, and Customer shall at its own cost and expense provide such certification for buildings it owns or aid JCI in obtaining such certification from facility owners in the case of buildings that Customer does not own, if JCI will undertake Work in the facility that could disturb such asbestos containing materials. If Customer becomes aware of or suspects the presence of Hazardous Materials that may interfere with Work, it will immediately provide notice to JCI. Upon such notice, or if JCI becomes aware of or suspects the presence of Hazardous Materials that may interfere with Work, JCI shall promptly stop the Work in the affected area. As between Customer and JCI, Customer shall be responsible at its sole expense for removing and disposing of Hazardous Materials from its facilities and the remediation of any areas impacted by the release of Hazardous Materials in conformance with all applicable Laws and addressing the impact of its disturbance before JCI continues with its Work.

5. Use, implementation, and deployment of software and hosted software products proprietary to JCI (“Software”) offered under this Agreement shall be subject to, and governed by, JCI’s standard terms for such Software and Software related professional services in effect from time to time at https://www.johnsoncontrols.com/techterms (collectively, the “Software Terms”). Applicable Software Terms are incorporated herein by this reference. Other than the right to use the Software as set forth in the Software Terms, JCI and its licensors reserve all right, title, and interest (including all intellectual property rights) in and to the Software and improvements to the Software. The Software that is licensed hereunder is licensed subject to the Software Terms and not sold. If there is a conflict between the other terms herein and the Software Terms, the Software Terms shall take precedence and govern with respect to rights and responsibilities relating to the Software, its implementation and deployment and any improvements thereto.

Facility Improvement Measure(s) Under Evaluation

The following measures are still under evaluation for implementation in future phases as more engineering, data and analysis is required for them:

FIM 12	Energy/Water Tracking Tool
FIM 13	Sports Lighting Retrofits & Controls
FIM 14	Streetlights Retrofits & Controls, & Traffic Signals
FIM 15	Additional EVs & EV Chargers
FIM 16	Wastewater Treatment Plants Improvements
FIM 17	Landfill Gas
FIM 18	Resiliency Centers
FIM 19	HVAC Upgrades (Kalana O Maui, Kihei CC, Lahaina CC)
FIM 20	Solar PV and Energy Storage
FIM 21	Genset Block Heater Replacement
FIM 22	Ice Machine Heat Exchanger Installation
FIM 23	Propane to Heat Pump Pool Heater Conversion
FIM 24	PC Power Management
FIM 25	Pool Filtration Upgrades

FIM 12 – Energy/Water Tracking Tool

Existing Conditions

The County of Maui currently relies on printed utility bills, manually created excel workbooks, and the accounts payable system to track the energy use (electricity, water, and propane). Bill payment responsibility is distributed among the various Departments with no centralized storage, capture, or visibility to the other departments and Mayor's office.

Existing Deficiencies

The County of Maui is in the process of developing a comprehensive Joint Climate Action and Resilience Plan establishing a strategy for addressing climate change in Maui County. Plan shall identify targeted policies, programs, and projects that will mitigate the County's contribution to climate change, reduce greenhouse gas (GHG) emissions and prepare Maui for the unavoidable impacts of climate change.

This plan is not anticipated to be completed until December 2022. Tracking energy savings and the reduction in GHG emissions will be important to any plan put forth.

FIM Description

Johnson Controls proposes to implement components of the "Energy Action Tracking Tool" as outlined and described in the County's Request for Proposal. Specifically, this FIM addresses:

- Monthly and annual reporting of utility consumption and comparison to baseline usage.
- Data archiving and ability to download data, summaries, reports, and dashboards
- Track climate action progress towards goals
- Comparison of selectable year to selectable baseline year

Johnson Controls will accomplish this through the OpenBlue Enterprise Manager.

OpenBlue Enterprise Manager (OBEM) is a comprehensive suite of subscription-based application modules. It is intent that OBEM shall serve as the platform to build the "energy action tracking tool" with additional modules, apps, and services to be added on in later phases. Johnson Controls reserves the right to adjust pricing up or down based upon additional selected services not listed below.

For this project, Johnson Controls will implement OpenBlue Enterprise Manager (base platform) with Utility Bill Manager and Net Zero Advisor modules per the narrative below. Scope includes implementation labor, software, and an annually renewable subscription. Subscription pricing has been included in the project cash flow and paid for from energy savings.

Utility Bill Manager

The Utility Bill Manager (UBM) module will include utility spend and usage data for 617 separate MECO utility bills, 165 County of Maui water bills. With utility spend and usage data, users can access the invoice details. There will be a hyperlink in the bill period of the account section which when clicked will give the user the related invoice details. Users can also view the bills available directly from utility provider.

Further, the Utility Bill Managers module adds the capability to make available utility spend and usage data inside the broader Enterprise Manager and other modules. Users can manage Reports, Utility Bill Usage and

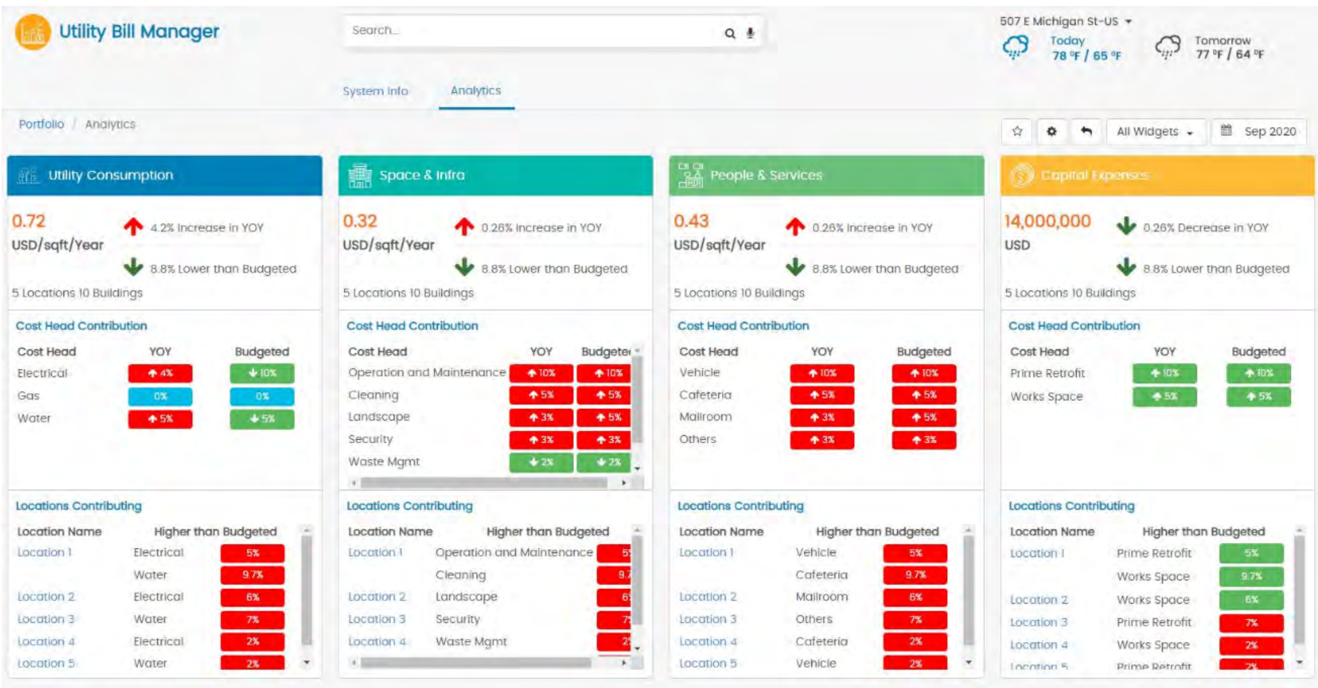
Cost Report, Utility Bill Gap Report, Utility Bill Detail Report, Utility Bill Comparison Report by Cost, Utility Bill Comparison Report by Consumption.

UBM imports utility bills from the utility providers, analyzes the utility bills for anomalies, and creates reports on the utility consumption and cost of consumption, for the billing period. This is accomplished through an automatic feed from the utility provider.

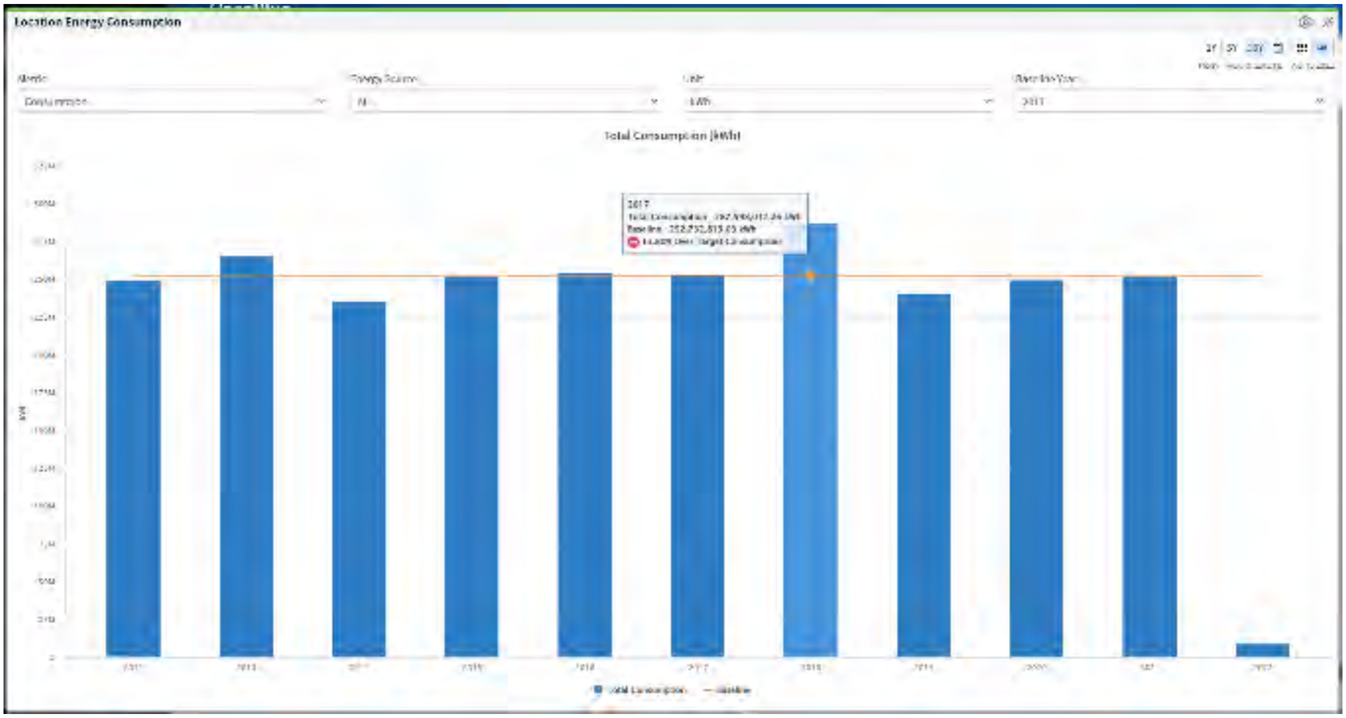
The utility data aggregator has access to the monthly utility bills from MECO and the Department of Water Supply. Johnson Controls will work with the County to setup the template and complete required forms to provide account details and login credentials to automatically allow direct access to utility information.

UBM also allows manual entry of utility information. This is applicable for bulk or infrequent purchases such as propane use and providers who do not utilize the data aggregator service. See the scope of work below for what has been included for manual entries.

In subsequent phases, Johnson Controls will work with a third-party supplier, introduce the data aggregator, and persuade the suppliers to join. Johnson Controls is not guaranteeing any future participation of these suppliers.



Example Data Screen from Utility Bill Manager



Example Data Screen from Utility Bill Manager

Net Zero Advisor

Net Zero Advisor simplifies tracking and reporting for Overall Compliance, Greenhouse Gas Emissions, and Energy Monitoring. Net Zero Advisor provides Emissions Summaries, Emission Trends and Goals as well as Portfolio Performance.

Emission numbers are provided “at a glance” displaying Total GHG emissions, total emission reduction for a calendar year based on energy conservation, energy credits and carbon offsets. A display of net emissions help track progress toward net zero goals.

Dashboards are provided to display both scope emissions from internal (Scope 1) and external/purchased sources (Scope 2). Annual emission factors are maintained and updated using a standard template.

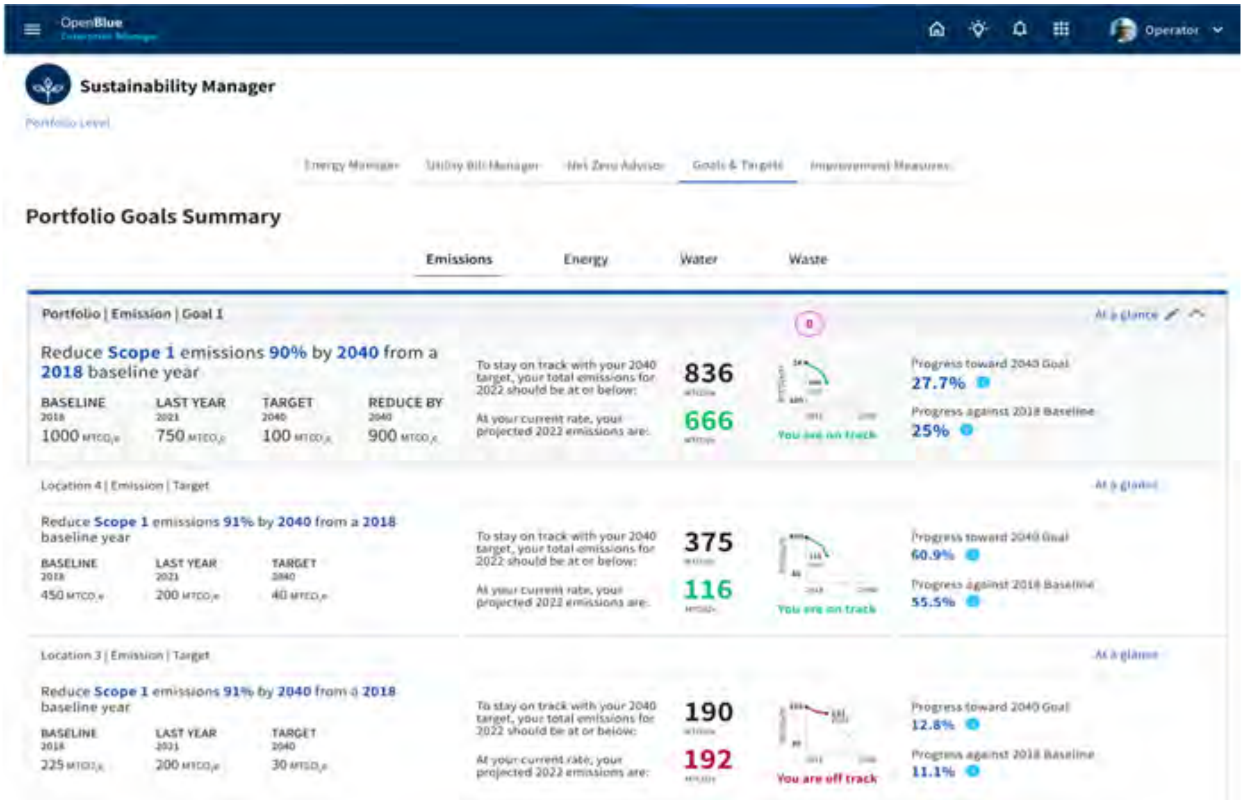
Scope 1 emissions:
Scope 1 covers emissions from sources that an organization owns or controls directly – for example from burning fuel in a fleet of vehicles (if they’re not electrically-powered).

Scope 2 emissions:
Scope 2 are emissions that an organization causes indirectly when the energy it purchases and uses is produced. For example, for electric fleet vehicles, the emissions from the generation of the electricity they're powered by would fall into this category.

Carbon emissions over time can be displayed by scope or source to help determine efforts to further reduce carbon emissions and understand source trends. GHG emissions are displayed by type/source displayed in metric tons of carbon dioxide (MTCO2e) and consumption in million British thermal units (MMBtu).

Net Zero Advisor’s Goals and Targets feature streamlines performance tracking. Portfolio level strategic goals can be defined for both energy and emission objectives. Performance metrics track progress against defined

County goals. Goals are established using a guided workflow and all targets can be viewed from a single dashboard.



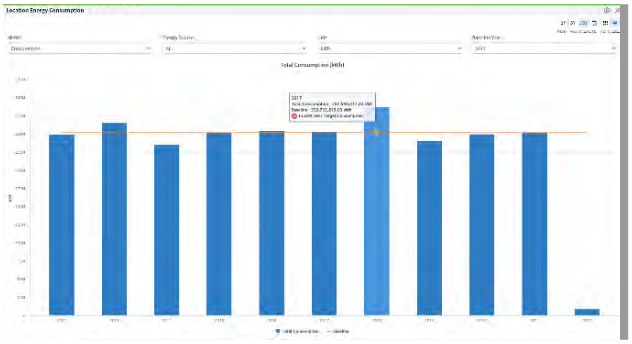
Example Portfolio Goals Summary from Utility Bill Manager

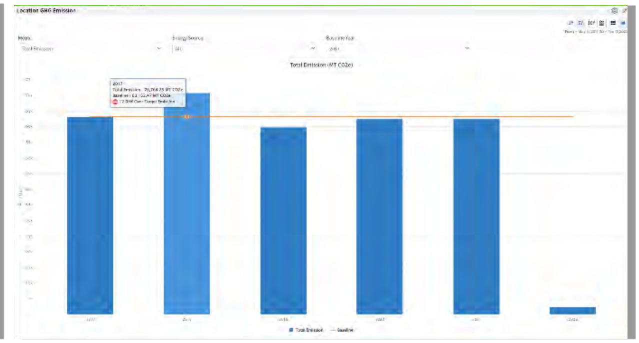
In conjunction with Utility Bill Manager, utility data from connected locations are gathered by OpenBlue Enterprise Manager and displayed. Dropdown options allow for analysis of various metrics and data sources and can be viewed in units such as kWh, kBTU, MMBTU and other units to better calculate energy use intensity and consumption by degree days in an easily to view format.

Energy Consumption and GHG Emissions

Energy consumption and GHG Emissions are based on the utility bills for connected locations across the enterprise.

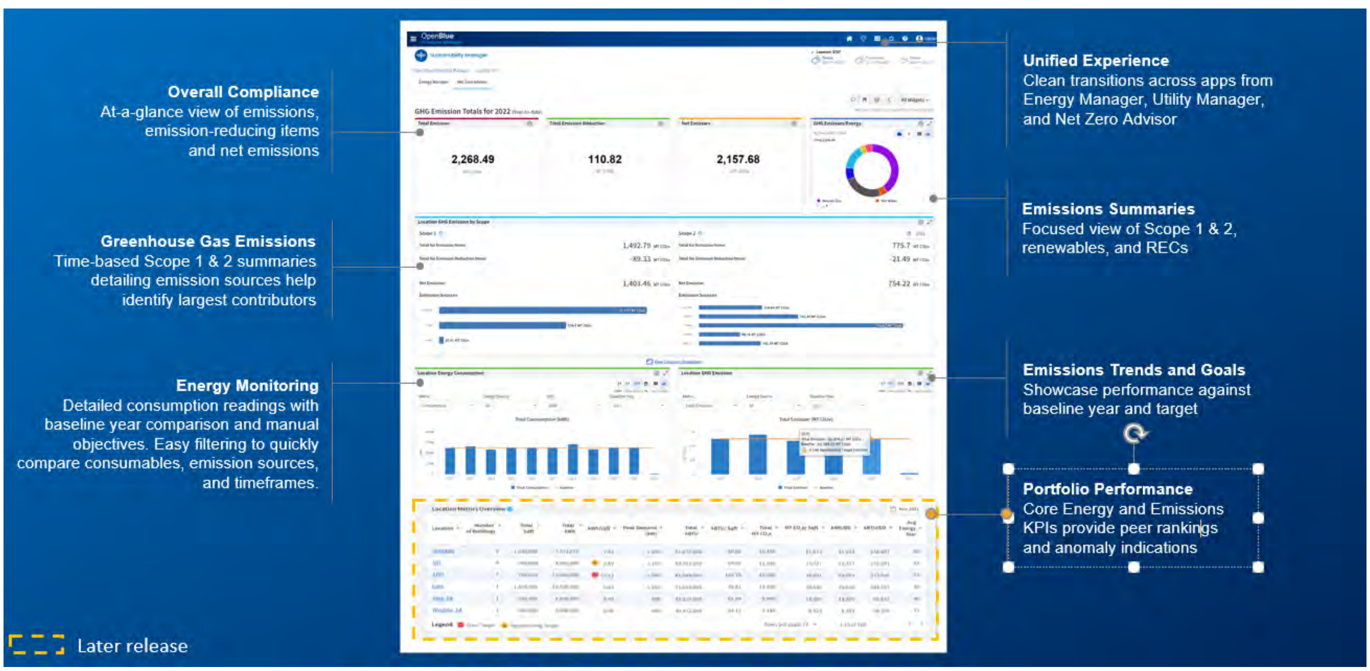
For the Energy consumption widget, drop down menus make it easy to switch between consumption, EUI, or By Degree days to analyze energy consumption over time. For the GHG Emissions widget, drop down menus include Total Emissions or Emissions Intensity summaries to help track metric patterns. Energy Sources can be filtered to isolate use, or all a commodity can be shown. Lastly, each widget includes a selectable baseline year to compare consumption of emissions against the starting year.



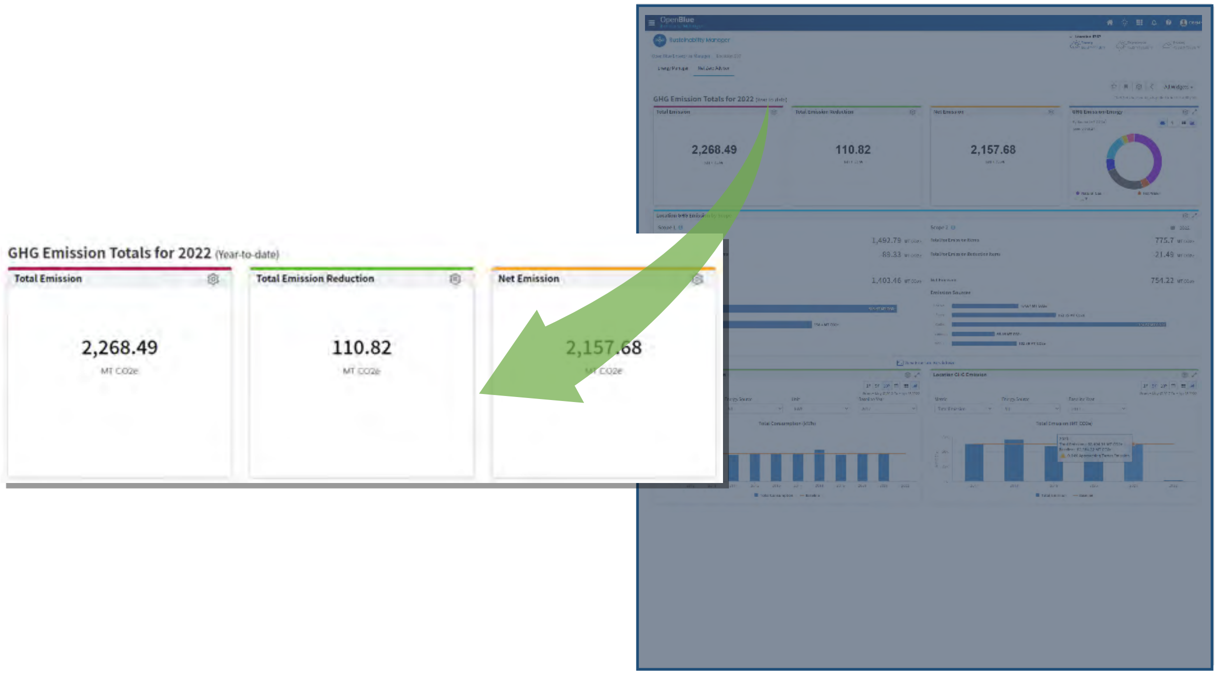


By continuously gathering Utility provider data or manual data uploads via templates, OBEM will monitor the emission of each building, region/location, and portfolio. This can quickly highlight when excess emissions are being produced by a facility.

The sample dashboard below shows the total GHG emissions and trends for a location. It provides comparison of GHG scopes 1 & 2, energy sources, reduction amounts, and emission patterns over time.



Net Zero Advisor – summarized dashboard



Emission at a Glance

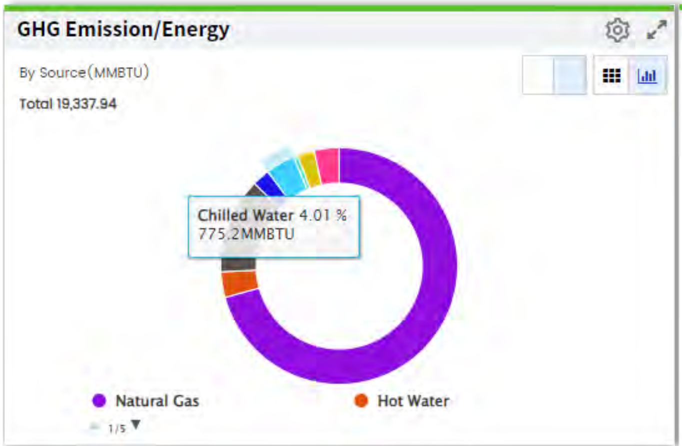
The Net Zero Advisor allows users to analyze emission and energy consumption against a selectable baseline year. Trend graphs allow the sustainability or energy manager to analyze the performance over time and easily identify areas of drift.

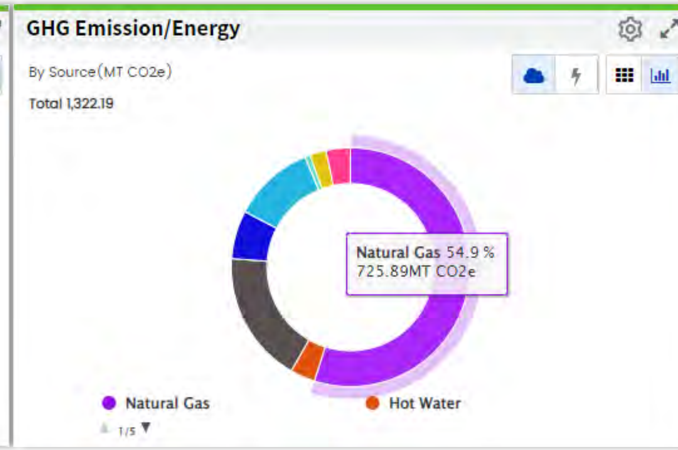
In situations where the GHG emissions are difficult to understand across the portfolio, OBEM's Net Zero Advisor will capture each facility's emission footprint to help paint a clear picture of the County's GHG status. Total GHG emissions for current year, including Scope 1 and Scope 2 emissions are summarized at each level of the operations. Net emissions help you track progress toward sustainability objectives.

The information captured year to date highlights the total emission using manual enter annual emission factors, total reduction items like REC and Carbon offsets, and the Net Emission Amount. By knowing this information, Facility and Sustainability Managers can grasp their total GHG Emission to date. In addition, the Net Zero Advisor capabilities include:

GHG Emission/Energy:

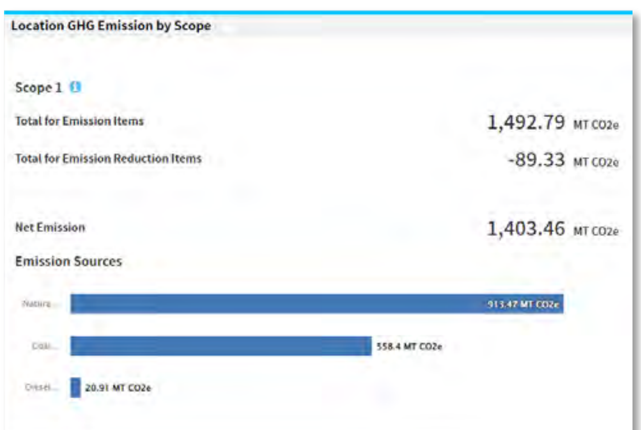
View GHG emission by commodity or by energy consumption. The chart shows the values for the year to date, which you can view in a tabular and graphical forms. View energy consumption for all commodities in Million British Thermal Unit (MMBtu) or GHG carbon emission in MTCO2e broken down by each commodity.

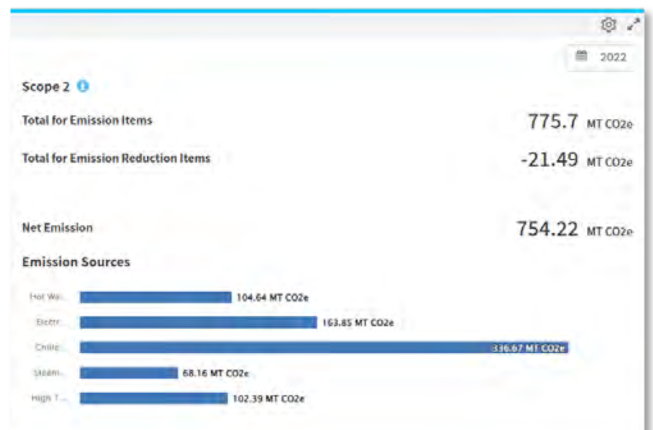




GHG Emission Breakdown by Scope (1&2)

Scope 1 GHG emission dashboard shows the total emission from scope 1 sources. View the total emission, total emission reducing items and net emission for scope 1. View classification of scope 1 emissions based on the individual emission sources.

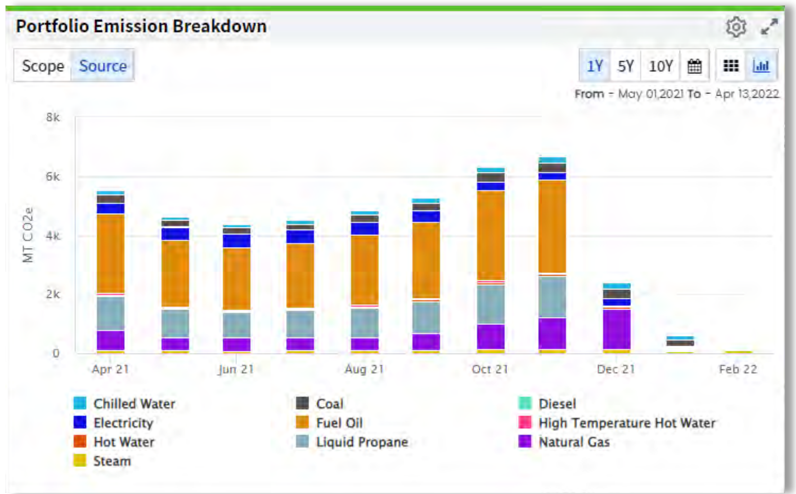




Scope 2 GHG emission dashboard shows the total emission from scope 2 sources. Dashboard shows the total emission for Scope 2, total emission reducing items and net Scope 2 emission. View classification of Scope 2 emission based on the individual emission sources.

Emission Breakdown Over Time

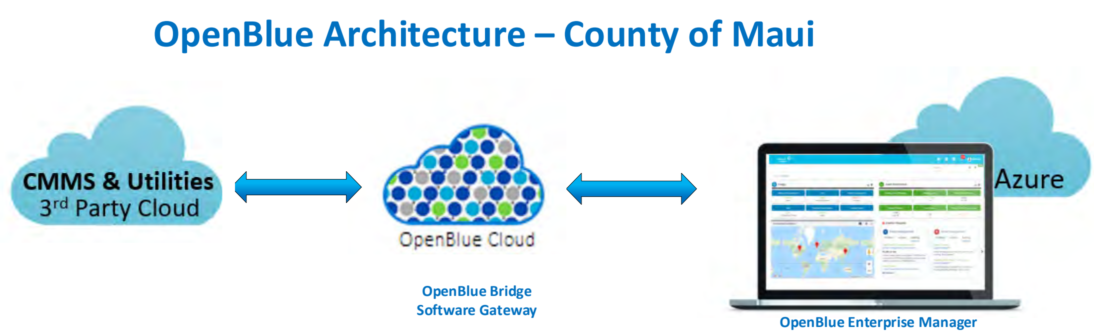
View Emission Breakdown to view a detailed breakdown of historical emissions for 1, 5, or 10 years or a custom date range. The widget helps to determine where to focus efforts to further reduce carbon emissions and understand source trends contributions. Sources can be selected to view the details of yearly emission broken down based on commodities like electricity, natural gas, and fuel oil.



Scope of Work

For the next phase of this project, Johnson Controls will work with the County to better define which features and options, if any, would be included in the installation scope of work for this FIM. The following section describes one potential option for the final scope of work.

Johnson Controls would work with third party utilities to import utility data into OpenBlue.



Proposed OpenBlue Architecture

OpenBlue Enterprise Manager Implementation

This project will implement two applications (NZA & UBM) in a single instance of OpenBlue Enterprise Manager (OBEM).

Activation:

This FIM will setup the County of Maui on the Johnson Controls' OpenBlue Enterprise Manager (OBEM) software one time. Johnson Controls will program and configure an OBEM installation utilizing a Cloud Based Server.

The OBEM Performance license has been sized to include 782 utility meters.

Urjanet Utility Data	Accounts
Connected Electric Utility Meters - MECO	617
Connected Water Utility Meters through CoM	165

Johnson Controls shall work with County of Maui to ensure Johnson Controls has access and permission to access and import utility bill information successfully into OBEM. The table above identifies the number of accounts that will be accessed by the third-party aggregator with monthly utility data imported into OBEM.

This information will dictate the meter and points to be configured into the Enterprise Manager software.

- Meter information is provided from the utilities through a JCI third-party data collection partner. Meter data and intervals is limited by the utilities. JCI is not responsible to correct or be accountable for any lost data if the utilities change their reporting format or discontinues providing requested data.
- JCI will enter data on behalf of the County for up to 5 yrs. Funding for manual data entry has been included for up to five years. If the utility is not able to provide data via automated interface by the end of the 5th year, JCI will train the County one time on how to upload the information. County also has the option at the end of year five to have JCI continue the service on their behalf. If requested, JCI will provide a change order proposal (based on the service(s) requested) to the County.
- The continued access to the OBEM product is subject to receipt of payment for the annual subscription services consistent with the payment terms of this contract.
- All meters in scope of work can be accessed by JCI's third-party data collector partner through the utility companies. The County shall provide JCI access and all needed permissions to access (on the County's behalf) and receive data as needed from all utilities.

Solution Design and Engineering:

Johnson Controls shall provide a detailed engineering document (Solution Design and Engineering Document) of what is included and excluded in the utility data set and the implementation schedule of OBEM.

Johnson Controls shall provide County of Maui with the OBEM Solution Design and Engineering Document. Prior to execution, Johnson Controls shall verify and get acceptance of the solution document from County of Maui. Formal customer acceptance process shall be identified and agreed to by the County of Maui.

Provisioning and Configuration:

Johnson Controls shall provide licenses for all features purchased as part of this proposal.

Exclusions:

- Access (Internet connection) to the OpenBlue Cloud Server by County users to be provided by the County of Maui.
- The scope of work and core OBEM functionality described within this FIM shall govern this project. Anything not covered herein, shall be subject to a change order.
- Any complete system wide validation/testing as required by specifications or local codes unless specifically defined above.

- The following costs are not anticipated, but are specifically excluded if encountered:
    - Shipping and transportation costs.
    - Permits, inspection fees, freight charges.
    - Travel and expenses.
- Repair of infrastructure or data sources like fault meters, sensors, and data APIs.

Equipment Manufacturer / Warranty

OBEM is a Software as a Service (SaaS) cloud-based solution using Amazon Azure servers. There is no equipment or warranty offered.

Energy Savings Calculations

There are no energy savings associated with this FIM.

Commissioning Procedure

Data Stabilization:

Johnson Controls shall establish data reliability, data availability, check telemetry, as well as validate custom and global rules with Customer.

Validation and Signoff:

Johnson Controls shall validate that all delivery obligations as per the OBEM Solution Design and Engineering Document are demonstrated to Customer. Johnson Controls shall update OBEM Solution Design and Engineering Document for As-Built records, if required.

ESCO's Training Responsibilities

Johnson Controls shall provide end user training on OBEM software for six (6), 4-hour training sessions to be delivered via Microsoft Teams.

- 1st phase 'Immersive training on how the tools works.
- 2nd phase go back to the County after 6-8 months to conduct a refresher training / advanced features.
- Johnson Controls shall provide Maui County with the OBEM User Guide and the Customer Adoption Handbook.

Johnson Controls shall provide elevated support for a period of two weeks immediately following implementation completion, including up to 48 hours of engagement via Microsoft TEAMS to address and resolve issues identified as part of the UAT (User Acceptance Testing).

ESCO's Maintenance Responsibilities

There is no physical maintenance, per se, required with this FIM. However, there are ongoing software subscription fees starting in Year 6, for the County to continue to use all of the features of this system. Those annual fees are described in the section, "Compensation to ESCO."

Customer’s Maintenance Responsibilities

There is no Customer maintenance required with this FIM, in terms of this being a software-based system.

Operation and Maintenance (O&M) Cost Savings Calculations

There is no O&M cost saving associated with this FIM.

Facility Support Required and Customer’s Responsibilities:

County will provide the completed (developed jointly with Johnson Controls) OBEM Data Request Form with the final scope of meters, equipment, and points for the software commissioning.

FIM 13 – LED Sports Lighting Retrofits

Existing Conditions

The existing sports lights, currently, varies by location. Some sites have existing 1000- or 1500-watt metal halide, while other areas already have existing LED (Hana Community Center & Ball Park, Kanaha Beach Park, Waikapu Community Center & Park, Puuohala Park, Central Maui Regional Sports Complex).

FIM Description

The proposed recommendations would include new LED fixtures with either a one-for-one fixture replacement (compared to the existing design) or a reduced number of fixture heads. The existing cross arms would be replaced for each pole. In addition, an advanced control system would be installed. This would allow for fixture groupings, various scene control and remote access. Sites with existing LED will remain as-is.

The table below shows the quantities of fixtures audited. The burn hours of the sports lights vary greatly by park and sports activity. In some cases, it is up to the users to push a button and turn the lights on (e.g. tennis courts). In general, these burn hours are low and the payback for retrofitting these sports lights can be long. Thus, this will be further evaluated in conjunction with the Parks Dept.

Site/Building Name	No Retrofit	New/ Replacement Fixture	Misc. Equipment	Total Count
Lahaina Recreation Center	8	10	16	**34**
Kilohana Park	0	3	0	**3**
Kahului Community Center	0	8	14	**22**
Lahaina Aquatic Center	0	11	17	**28**
Kaunakakai Ball Park	0	12	16	**28**
Wells Park	0	14	18	**32**
Papohaku Park	0	13	19	**32**
Kalama Park	13	14	29	**56**
Duke Maliu Regional Park	0	14	20	**34**
South Maui Community Park	0	16	23	**39**
Eddie Tam Memorial Center	0	28	34	**62**
Keopuolani Regional Park	0	52	16	**68**
Lahaina Civic Center	0	20	22	**42**
Cooke Memorial Pool	0	5	10	**15**
Haliimaile Park & Tennis	0	2	8	**10**
War Memorial Complex	6	31	39	**76**
Waiehu Terrace Park	0	2	8	**10**
Lanai Park & Tennis Courts	0	22	28	**50**
TOTALS	**27**	**277**	**337**	**641**

Johnson Controls

FIM 14 – Streetlighting LED Retrofits

Existing Conditions

The County of Maui has approximately 5,000 HID street lights. Currently, the County has the LED replacements for these lights in-house along with a controls system by Landis+Gyr.

Site/Building Name	No Retrofit	New/ Replacement Fixture	Total Count
Maui Street Lighting	62	4,344	4,406
Molokai Street Lighting	0	418	418
Lanai Street Lighting	0	130	130

The County appears to be currently under contract with HECO to install the new LED streetlights, therefore, Johnson Controls did not pursue further this FIM. However, if the County desires, Johnson Controls can include this in a future phase. The County may also wish to pursue conversion of Traffic Signals to LED technology for Traffic Lights that are not converted.

FIM 15 – Additional EVs and EV Chargers

Existing Conditions

The Maui County vehicle fleet is exclusively reliant on fossil fuels. The fleet information provided by the county included 482 vehicles ranging from compact sedans to public buses. Of these 480 were Internal Combustion Engine (ICE) vehicles and two were identified as using alternate fuels (they were listed as hybrid).

The vehicle fleet is distributed island wide. The fleet is not localized to specific motor pool parking lots. There are large variations between locations in how many fleet vehicles are parked overnight.

FIM Description

There is a great opportunity to replace the fleet ICE vehicles with alternative fuel vehicles. The implementation of the vehicle replacement can be phased in over time. Similar vehicles with commercially available technologies is the best place to begin. This puts focus on passenger Electric Vehicles (EVs) such as sedans, and SUVs. Certainly, other vehicle type will have commercially available options in the near future.

The major difference in how the EVs are operated as opposed to the current ICE fleet is how and where they are charged. Initially, the project will focus on installing level 2 charging stations for fleet parking. Some vehicles weekly mileage is low enough that access to standard wall socket for level 1 charging is sufficient. In the future, level 3 quick charging stations may be installed at strategic locations.

There are six locations identified with high amounts of fleet vehicle parking. Site visits have been conducted at these locations with an electrical engineering consultant. The initial site audit was to identify source for electrical power and if new electrical service would be required. The six sites audited for fleet charging stations were:

- Kaunoa Senior Center – 401 Alakapa Place, Paia
- Maui County Service Center – Alaihhi Street, Kahului
- Dept of Water Supply Baseyard – 614 Palapala Drive, Kahului
- Dept of Public Works Baseyard – 1827 Kaohu Street, Wailuku
- War Memorial Complex – 700 Halia Nakoa Street, Wailuku
- Dept of Wastewater Baseyard 480 E. Welakahao Street, Kihei

The county vehicles stationed at the Kihei Wastewater Baseyard were found to be heavy duty and used to transport tools and equipment. It is unlikely that this site would be pursued in the first tranche of fleet charging sites.

The Kalana O Maui is the next candidate site for audit, and has not been completed at time of this report.

We will work with the County in subsequent IGA and ESPC installation phases to include EV Charging stations for a portion, or the entirety of the County of Maui's vehicle fleet. This may include more than just passenger vehicles, and could include all vehicles.

Findings from the electrical engineering audit report of county fleet vehicle charging sites:

1/8

ECM Inc. *Electrical Engineering Consultants*

130 N. Market Street • Wailuku HI 96793-1716 • 808.242.8070 • Fax: 808.244.9539 • Email: ecm@ecm-maui.com

Maui County EV Charging Stations

Preliminary Engineering Report - Electrical
August 11, 2022

Kaunoa Senior Center – 401 Alakapa Place, Paia

Proposed number of charging stations: 14 Dual-type Charging Stations

Load: 86.8kVA, 241A at 3-phase 208Y/120V

Probable charging station location: The desired location is a parking area already designated for the County vehicles. It is located along the north side of the property near an existing PV canopy installation.

Provision for electrical: To provide for the proposed electrical load, the most likely approach would be to obtain new 3-phase, 208Y/120V HECO service that will terminate on a service wall near the charging area. The utility tie-in would be from existing poles/lines along Alakapa Place. An overhead electrical line extension would be the most likely scenario with a new transformer pole. From this pole, any combination of overhead electrical lines and poles with risers to underground lines can be utilized to get to the new service wall. The service wall would support a HECO CT-type service since the new load is over the capacity for a meter/main type of service setup. The service wall would could also support an exterior rated electrical panel for distribution to the charging stations.

2/8

Alternative considerations: The idea of providing individual branch or feeder circuits to the EV charging location from the existing meters/panels on the site was deemed less feasible due to the number of charging stations, capacity of existing panels, and costs associated with the trenching and wiring requirements across the distances estimated.

Maui County Service Center – Alaihi Street, Kahului

Proposed number of charging stations: 18 Dual-type Charging Stations

Load: 111.6kVA, 310A at 3-phase 208Y/120V

Probable charging station location: The desired location is in an existing gravel parking area designated for the County vehicles. It is located along the north side of the property.

3/8

Provision for electrical: To provide for the proposed electrical load, the most likely approach would be to obtain new 3-phase, 208Y/120V HECO service that will terminate on a service wall near the charging area. The utility tie-in would be from an existing stub from a HECO handhole that contains the underground utilities along Alaihi Street. A new 3-phase, 208Y/120V pad-mounted transformer would need to be installed. The service wall would support a HECO CT-type service since the new load is over the capacity for a meter/main type of service setup. The service wall would could also support an exterior electrical panel for distribution to the charging stations.

Alternative considerations: There were some discussions of consolidating the existing two services that feed the Maui County Service Center with a new exterior rated switchgear. The advantage would be mainly to tie-in a single PV system in the future that can provide an offset for a larger total load including that of the EV chargers. However, the new service would still need to be upgraded to accommodate the new EV charging load, and further provisions would be required to convert the existing 3-phase 480Y/277V voltage to the 3-phase 208Y/120V needed by the charging stations.

4/8

Department of Water Supply Baseyard – 614 Palapala Drive, Kahului

Proposed number of charging stations: 5 Dual-type Charging Stations

Load: 31kVA, 37A at 3-phase 480Y/277V

Probable charging station location: The desired location is in a small existing parking area designated for the County vehicles. It is located along the East side of the property near the front gate of the facility adjacent to Palapala Drive.

Provision for electrical: To provide for the proposed electrical load, the most likely approach would be to obtain power from an existing 3-phase, 480Y/277V electrical panel in the electrical room in the nearby building. A transformer would be required to convert the 3-phase 480Y/277V voltage to the 3-phase 208Y/120V needed by the charging stations. It would probably be an exterior rated type mounted on an adjacent wall to the charging area since available space in the existing electrical room is limited. An exterior rated electrical panel for distribution to the charging stations would also be required.

5/8

Alternative considerations: The assumption is that the added load can be accommodated by the existing 3-phase, 480Y/277V electrical panel. Otherwise, a new HECO service will be required. Under that scenario, either the existing splice can would need to be tapped or a feed to the nearby HECO pad-mounted transformer will be required. The HECO service could be a meter/main type of service setup based on the load required for the added charging stations.

<u>Department of Public Works Baseyard – 1827 Kaohu Street, Wailuku</u>

Proposed number of charging stations: 6 Dual-type Charging Stations

Load: 37.2kVA, 103A at 3-phase 208Y/120V

6/8

Probable charging station location: There were no conclusive singular area where all of the chargers would be located. The most likely result would be individual chargers located at various buildings throughout the site.

Provision for electrical: To provide for the proposed electrical load, the most likely approach would be to obtain power from existing 3-phase, 208Y/120V electrical panels or 1-phase, 120/240V electrical panels in the buildings nearby the particular EV charger location. Each charging station will draw 30A at 208V (6.2kVA) or 240V (7.2kVA) so the necessary branch circuit accommodations will need to be provided.

Alternative considerations: The assumption is that each panel that feeds the EV charger at the nearby building has enough capacity. If needed, there are nearby existing overhead electrical utility lines and transformers that are already on the site which can provide some upgrade options if necessary.

7/8

War Memorial Gym Complex – 700 Halia Nakoa Street, Wailuku

Proposed number of charging stations: 12 Dual-type Charging Stations

Load: 74.4kVA, 207A at 3-phase 208Y/120V

Probable charging station location: The desired location is in an existing parking area already designated for the County vehicles. It is located along the north of the existing pool just south of the existing tennis courts.

Provision for electrical: To provide for the proposed electrical load, the most likely approach would be to obtain new 3-phase, 208Y/120V HECO service that will terminate on an existing service wall of the gym where other existing meters are currently located. Coordination is required with HECO to tie-in to the secondary side of their existing pad-mounted transformer. HECO CT-type service is required since the new load is over the capacity for a meter/main type of service setup.

8/8

Alternative considerations: There is a current renovation project for the War Memorial Gym that would affect this installation since other work is planned for that area. The electrical service that will be tied in and the wall of the building where the new meter would be mounted might be altered before or after this work, depending on the timing of each project. If the renovation project is constructed first, it's possible that the EV charging station loads can be accommodated by the new electrical equipment of that project. That would be a much better option. Otherwise, it could be potentially costly to undo the efforts of the EV charging station project.

<u>Department of Wastewater Baseyard – 480 E. Welakahao Street, Kihei</u>

Proposed number of charging stations: various

Load: 6.2 kVA, 30A at 1-phase, 208V for each charging station

Probable charging station location: There were no conclusive singular area where all of the chargers would be located. It was determined that this site would not contain enough EVs where a charging area would be viable.

Provision for electrical: If there were a need to provide for any individual charger, the most likely approach would be to obtain power from existing 3-phase, 208Y/120V electrical panels in the building nearby the particular EV charger. The assumption is that each panel that feeds the EV charger at the nearby building has enough capacity to provide for the new load.

Alternative considerations: If there was a future possibility for a small central charging location, there would be a possibility near the southeast corner of the property where an existing motor control center can be tapped into for power. A transformer will be required to convert the 3-phase, 480Y/277V voltage to the 3-phase 208Y/120V needed by the charging stations. That would probably an exterior rated type unless available space can be made in the electrical room.

In addition to the fleet charging stations, JCI has begun preliminary investigation into public charging stations for county facilities. So far, 108 County parking lots have been reviewed. At least nineteen (19) are believed to be impacted by HRS 291-71, which states: "Places of public accommodation with at least one hundred parking spaces available for use by the general public shall have at least one parking space equipped with an electric vehicle charging system."

The list below is an analysis of the Island of Maui sites with public parking spaces. The quantity of parking spaces has been collected or estimated, and has not been verified with the permitting or zoning department to verify the counts. There are some sites, such as the Maui Mall, in which the County leases a space, but whether or not this HRS applies to the parking lot owner or the tenant is yet to be determined. For now, we assume that an instance such as the Maui Mall will be excluded from the County's requirement for public facing EV Chargers, unless directed to assume otherwise.

When taking into account the quantity of public-facing EV Chargers which are already installed, or are in process of being installed under a separate County contract between the County of Maui and OATI, there are at least thirty-two (32) additional EV Chargers which need to be installed in County parking spaces. In the subsequent phases of this IGA and in subsequent phases of installation, JCI will work with the County to include the installation of these chargers for HRS 291-71 compliance, as long as there is a commensurate level of savings in the cash flow.

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Kalana O Maui Building, Wailuku Courthouse and Public Works - Development Services Administration Complex	150, 200 and 250 S. High Street, Wailuku, HI 96793	220	2	(1) Level 2 dual-port	Installed
Ho'okele, County of Maui Service Center	110 'Ala'ihi Street, Kahului HI 96732	225	2	(1) Level 2 dual-port	Installed
Haiku Community Center	Pilialoha St, Haiku, HI 96708	100	2	(1) Level 2 dual-port	Installed
Lahaina Civic Center	1840 Honoapiilani Hwy, Lahaina, HI 96761	100	2	(1) Level 2 dual-port	under contract
Papohaku Park	395 Waena Place, Wailuku, HI 96793	150	2	(1) Level 2 dual-port	under contract
Eddie Tam Memorial Center	931 Makawao Ave, Makawao, HI 96768	75	2	(1) Level 2 dual-port	under contract
Lahaina Aquatic Center	245 Shaw St, Lahaina, HI 96761	100	3	(1) Level 3 single port (1) Level 2 dual-port	HECO Level 3 EVSE (installed) Level 2 under contract
Paia Community Center	252 Hana Hwy, Paia, HI 96779	35	2	(1) Level 2 dual-port	under contract
Kihei Aquatic Center	303 E Lipoa St, Kihei, HI 96753	150	2	(1) Level 2 dual-port	under contract
Kula Community Center	Kula, HI 96790	75	2	(1) Level 2 dual-port	under contract
Hannibal Tavares Community Center	91 Pukalani St, Makawao, HI 96768	75	2	(1) Level 2 dual-port	under contract
Cooke Memorial Pool	220 Kolapa Pl, Kaunakakai, HI 96748	65	2	(1) Level 2 dual-port	under contract

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Hana Community Ctr and Ball Park	5091 Uakea Rd, Hana, HI 96713	TBD	2	(1) Level 2 dual-port	under contract
COM Fire Prevention Bureau	313 Manea Pl, Wailuku, HI 96793	30			Limited Public Parking
COM Office Bldg	2136 Kaohu St, Wailuku, HI 96793	32			
County of Maui Offices	2145 Wells St, Wailuku, HI 96793	125	1		COM offices including Abandoned Vehicle Office
County of Maui Offices	2145 Kaohu St, Wailuku, HI 96793	104	1		Including COM Offices, CDBG Program and Conference Rooms
Public Works, DSA Electrical Permit & Inspection Office	86 W Kamehameha Ave, Kahului, HI 96732	55			
Central Maui Regional Sports Complex	S. Kamehameha Ave, Kahului, HI 96732	656	6		
Coach Spencer Shiraishi Memorial Pool	145 Kaulawahine St, Kahului, HI 96732	15			
Ho'aloha Park	1 E. Kaahumanu Ave, Kahului, HI 96732	50			additional parking for ~ 150 vehicles in open area
Kahului Community Center & Kokua Pool	275 Uhu Street, Kahului, HI 96732	155	1		
Kahului Community Center Park	399 Onehee Ave, Kahului HI 96732	70			Exact address TBD
Kahului Park	410 Hina Ave, Kahului, HI 96732	0	-	-	No Public Parking
Kamalii Park	59 E. Aiai St, Kahului, HI 96732	0	-	-	No Public Parking
Kanaha Beach Park	Amala Pl, Kahului, HI 96732	250	2		
Kokua Pool	275 Uhu St. Kahului, HI 96732				adjacent to Kahului Com Ctr
Lihikai Park	Maalo St. & S. Papa, Kahului, HI 96732	25			Parking on extended driveway, no lot
Maui Lani Regional Park	Maui Lani Pkwy, Kahului, HI 96732	30			
Maui Park	473 Molokai Hema, Kahului,HI 96732	65			
Pomaikai Park	Pona Way, Kahului, HI 96732	0	-	-	No Public Parking
County Complex & Sakamoto Pool	1580 W Kaahumanu Ave, Wailuku, HI 96793	262	2		County Parks Offices + public use
Honolii Park	S. High & Main, Wailuku, HI 96793	0	-	-	No Public Parking
Kehalani Mauka Park	Kehalani St, Wailuku, HI 96793	35			
Keopuolani park - lower	Keopuolani Parkway, Wailuku, HI 96793	240			

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Keopuolani park - upper	Keopuolani Parkway, Wailuku, HI 96793	210	2		
Keopuolani Regional Park	700 Halia Nakoa St, Wailuku, HI 97693	N/A			included w/ Sakamoto Pool (above)
Kepaniwai Park	870 Iao Valley Rd, Wailuku, HI 97693	35			
Leisure Estates Park	Lower Waiehu Rd, Waiehu, HI 96793	150	1		Estimate - No Striping
Maui Botanical Gardens	150 Kanoloa Ave, Wailuku, HI 97693	0	-	-	Uses War Memorial Complex Parking
Mokuhau Park	Kahawai St & Nenea St, Wailuku, 96793	0	-	-	No Public Parking
Puuohala Park	Puuohala Rd. & Maoi St, Wailuku, HI 96793	0	-	-	No Public Parking
Richard Pablo Caldito Sr. Park	Halewaiu Rd at Kahekili Hwy, Waihee, HI 96793	0	-	-	No Public Parking - street only
Velma McWayne Santos Community Ctr.	395 Waena Pl, Wailuku, HI 96793	95			
Waiale Park	Waiale Rd. Wailuku, HI 96793	-	-	-	Permanently Closed
Waiehu Beach Park	Halewaiu Rd, Waihee, HI 96793	-	-	-	Share Parking w/Leisure Estates Park
Waiehu Municipal Golf Course	200 Halewaiu Rd, Wailuku 96793	100	1		
Waiehu Terrace Park	608 Alihilani St, Wailuku, HI 96793	0	-	-	No Public Parking - street only
Waihee Beach Park	200 Halewaiu Rd, Wailuku, HI 96793	15			Small Lot - Remote Beach Parking
Waikapu Community Center & Park	22 E. Waiko Rd, Waikapu, HI 96793	10			
Wailuku Gymnasium & Pool	Market & Wells St, Wailuku, HI 96793	35			Small Facility - Civic Center
Wailuku Heights Park	655 Alu Rd, Wailuku, HI 96793	0	-	-	No Public Parking
Wailuku Park	Malako at Koeli St, Wailuku, HI 96793	50			Estimate - No Striping
War Memorial Complex	700 Halia Nakoa St, Wailuku, HI 97693	588	5		
Wells Community Complex	Wells at S. Market St, Wailuku, HI 97693	56			Tennis and Basketball Courts
Wells Park - Converted to Parking	Wells St. Wailuku, HI 97693	225	2		Parking Lot
Boteilho Gymnasium and Paia Park	640 Baldwin Ave, Paia, HI 96779	100	1		
H.A. Baldwin Park	Hana Hwy, Paia, HI 96779	200	2		areas with paved parking only
Ho'okipa Beach Park	Mile # 9, Hana Hwy, Paia, HI 96779	100	1		areas with paved parking only
Kaunoa Senior Services (Paia)	401 Alakapa Pl, Paia, HI 96779	104	1		Includes count for 40 Fleet vehicles, secure parking

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Kuau Beach Park	Hana Hwy, Paia, HI 96779	30			beach parking - paved lot
Lower Paia Park	19 Hana Hwy, Paia, HI 96779	60			paved parking only - no striping
Rainbow Park	Baldwin Ave, Paia, HI 96779	0	-	-	No Public Parking
Fourth Marine Division Memorial Park	Mile 2, Kokomo Rd, Haiku, HI 96708	70			Estimate - No Striping
Haliimaile Park and Tennis	Makomako St, Makawao, HI 96768	0	-	-	No Public Parking - street only
Harold W Rice Memorial Park	5700 Kula Hwy, Kula, HI 96790	10			small remote park
Keokea Park	218 Lower Kula Rd, Kula HI 96790	0	-	-	No Public Parking - street only
Kula Ball Field	Kula Hwy at Calasa, Kula, HI 96790	30			Adjacent Kula Fire Station
Sun Yet Sen Park	Mile 19, Ulupalakua Rd, Kula, HI 96790	10			small remote park
Tom Morrow Equestrian Center	Kapii Pl, Haiku, HI 96877	0	-	-	No Parking Lot - grass only
Ulumalu Arena	240 Ulumalu Rd, Haiku, HI 96708	0	-	-	No Parking Lot - grass only
Upcountry Pool	90 Pukalani St, Pukalani, HI 96768	55			
Waiakoa Gymnasium	4600 Lower Kula Rd, Kula, HI 96790	0	-	-	No Public Parking - street only
Charley Young / Cove Beach Park	2200 S Kihei Rd, Kihei, HI 96753	40			beach parking - restroom facilities only
Hale Piilani Park	Kaihoi St. & Kaiolohia St, Kihei, HI 96753	12			remote park location
Kalama Park - Beach Park	S Kihei Rd, Kihei, HI 96753	110	1		areas with paved striped parking only
Kalama Park - Skate Park	1900 S Kihei Rd, Kihei, HI 96753	40			areas with paved parking only
Kalepolepo Park	S Kihei Rd & Kaonoulu St, Kihei, HI 96753	15			areas with paved striped parking only
Kamaole I	2400 South Kihei Rd, Kihei, HI 96753	22			
Kamaole II	2550 South Kihei Rd, Kihei, HI 96753	0			No Public Parking - street only
Kamaole II	South Kihei Rd, Kihei, HI 96753	100	1		areas with paved striped parking
Keawakapu I Park	South Kihei Rd, Kihei, HI 96753	30			beach parking - restroom facilities only
Keawakapu II Park	South Kihei Rd, Kihei, HI 96753	0	-	-	No Public Parking - street only
Kenolio Recreation Complex	131 S. Kihei Rd. Kihei, HI 96753	75			
Keonekai Park	170 Keonekai St, Kihei, HI 96753	0	-	-	No Public Parking - street only
Kihei Warf - upper & lower	2800 South Kihei Rd, Kihei, HI 96753	125	1		

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Kilohana Bech Parking	South Kihei Rd, Kihei, HI 96753	50			Beach parking
Mai Poina Park / Maipoina Beach Park	S Kihei Rd at Ohukai Rd, Kihei, HI 96753	0	-	-	street parking - restroom facilities only
Palauea Beach	Makena Rd, Wailea-Makena HI 96753	0	-	-	No Public Parking
Piikea Park	Liloa St, Kihei, HI 96753	0	-	-	No Public Parking - street only
Ulua Beach Park	Ulua Beach Rd, Kihei, HI 96753	75			beach parking - restroom facilities only
Wailea Beach	Wailea Aluni Dr, Kihei, HI 96753	50			Remote Beach Parking Lot
Waipuilani Park	Waipuilani Rd, Kihei, HI 96793	20			
D.T. Fleming Park	Lower Honoapiilani Rd, Lahaina, HI 96761	75			
Hanakaoo Park	Honoapiilani Highway, Lahaina, HI 96761	45			facility public parking
Honokowai Park	Lower Honoapiilani Hwy, Lahaina, HI 96761	35			
Kamehameha Iki	500 Front St., Lahaina, HI 96761	0	-	-	open areas - unknown if COM property
Kaunoa Senior Services & COM Offices (Lahaina)	788 Pauoa St, Lahaina, HI 96761	45			COM Combined use facility
Kelawea Mauka Makai Park	Ikena Avenue/Lahainaluna Rd, Lahaina, HI 96761	10			
Lahaina Banyan Court	Front St at Canal St, Lahaina, HI 96761	0			No Public Parking
Launiupoko Beach Park	Mile 18, Honoapiilani Hwy, Lahaina, HI 96761	45			
Malu Ulu Olele Park	555 Front St, Lahaina, HI 96761	90			combined: paved/unpaved - striped/nonstriped
MaluUluOlele Park	Front St, Lahaina, HI 96761	70			Count for Striped Stalls (other random parking on site)
Nakalele Lighthouse	Mile 38, Honoapiilani Highway	N/A			available parking unknown
Napili Park	Honoapiilani Hwy at Maiha St, Lahaina, HI 96761	35			
Papalaua Wayside Park	Mile 11, Honoapiilani Highway - Road to Lahaina	0	-	-	sand beach parking - Temp Restroom facilities only
Paunau Park	Paunau St, Lahaina, HI 96761	0	-	-	No Public Parking
Pohaku Park	Lower Honopiilani Rd, Lahaina, HI 96761	0	-	-	open area parking - no striping

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Ukumehame Firing Range	Honoapiilani Hwy, Lahaina, HI 96761	30			side-by-side parking, no striping
Ukumehame Park	Honoapiilani Hwy, Lahaina, HI 96761	30			beachside parking
Wahikuli Terrace Park	Ainakea Rd at Malanai St, Lahaina, HI 96761	0	-	-	No Public Parking - street only
Wahikuli Wayside Park	Honoapiilani Hwy, Lahaina, HI 96761	15			
Waine'e Park Recreation Center	245 Shaw St, Lahaina, HI 96761	-	-	-	See above - Lahaina Aquatic Center
County Public Works Office	Hana Hwy & Uakea Rd, Hana, HI 96713	15			Small COM Office - Combined Use Space
Hana Bay Beach Park	150 Keawa Pl, Hana, HI 96713	20			Beach parking
Hana Landfill - Refuse & Recycling Center	Waikoloa Rd, Hana, HI 96713	0	-	-	No Public Parking
Helene Hall	150 Keawa Pl, Hana, HI 96713	0	-	-	No Public Parking
Honomanu Park	Mile 14 Hana Hwy, Hana, HI 96713	0	-	-	Beach parking - open areas on sand
Kipahulu Point Light Station	Mile 44 Hana Hwy, Hana,HI 96713	0	-	-	No Public Parking
Keanae Park	Hana Hwy, Keanae HI 96713	25			remote open area, oceanside parking
Paanimai Park	Mile 36 Hana Hwy, Hana, HI 96713	0	-	-	No Public Parking

For HRS 291-71 compliance on Molokai, the County will be required to install a minimum of one (1) single EV Charging device at each of the following sites:

- Duke Maliu Regional Park, 240 W. Kamehameha Hwy, Kaunakakai, HI 96748
- Molokai Park, 72 Alahula St, Kaunakakai, HI 96748

See the chart below for a more complete analysis of the County-owned parking spaces on Molokai, as related to EV Chargers, either existing or proposed.

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Cooke Memorial Pool	220 Kolapa Pl, Kaunakakai, HI 96748	60	2		Under contract with OATI
Molokai Park	72 Alahula St, Kaunakakai, HI 96748	120	1		
One Alii Park	Mile 3, HWY 450, Molokai, HI 96748	0	-	-	No Public Parking - small remote park
Duke Maliu Regional Park	240 W. Kamehameha hwy, Kaunakakai, HI 96748	105	1		Baseball and Basketball

Site Location	Address	Parking Spaces (Total)	QTY of Parking Spaces with EV Charger	Existing Public-Facing EV Chargers	Comments
Halawa Park	Mile 28 Route 450 Halawa, HI 96748	0	-	-	No Public Parking - small remote park
Kakahai'a Park	Mile 5.5, Kamehameha V Hwy, Kaunakakai, HI 96748	0	-	-	No Public Parking - roadside beach park
Kaunakakai Ball Park	Ainoa St. at Ala Malama Ave.Kaunakakai, HI 96748	0	-	-	No Public Parking - Street parking only
Kaunakakai Lighthouse/Malama Park	25 Hihio Pl, Kaunakakai, HI 96748	0	-	-	No paved parking - dirt roadside only
Kilohana Community Ctr	334-A1 Kamehameha V Highway, Kaunakakai, HI 96757	0	-	-	No Public Parking - Street parking only
Kualapuu Park & Comm Ctr	1 Uwao St, Kaulapuu, Molokai, HI 96757	45			Count for paved, striped parking
Lanikeha Community Center	2200 Farrington Ave, Ho'olehua, HI 96729	35			Count for paved, striped parking
Maunaloa Community Center	140 Maunaloa, Maunaloa, HI 96770	12			Small paved parking lot
Maunaloa Park	250 Maunaloa Road, Maunaloa, HI 96770	0	-	-	No paved parking - dirt roadside only
Mitchell Pauole Center & Skate Park	90 Ainoa St, Kaunakakai, HI 96748	55			COM mixed use - Com Ctr, DMV, Police, etc
Papohaku Beach Park, West End	West End Mile 14.9 Kaluakoi Rd, Maunaloa, HI 96770	25			Count for paved, striped parking
Puu Hauole Park	150 Mahalo Pl at Maoi Loop, Kaunakakai, HI 96748	0	-	-	No Public Parking - Street parking only

On Lanai, all parking for County of Maui sites is in a privately owned parking lot (84 parking spaces, leased by County of Maui), on streets, roads, or dirt areas adjacent to facilities. Based on this analysis, there are no County sites on Lanai that require publicly available EV Chargers to achieve HRS 291-71 compliance.

FIM 16 – Wastewater Treatment Plant Improvements

FIM 16A – On-Site Hypochlorite Generation at Kahului WWRF, Alternative Algae Control Solutions at Kihei and Lahaina WWRFs

Existing Conditions

Of the County's major wastewater facilities, disinfection is a challenge at each for different reasons. The ultraviolet disinfection (UV) system at the Lahaina facility is expensive to maintain, and improvements are in progress to provide more consistent flowrates that better suit the UV system. At the Kihei WWRF, UV is also used, but chlorine is used as a disinfectant to control algae. The Kahului WWRF facility is the only facility that uses liquid chlorine as the primary disinfection agent.

Liquid chlorine is a considerable expense for the County, and its cost has recently gone up considerably.

FIM Description

This measure is focused on reducing the cost of chemicals and improving resiliency by using on-site generation to produce liquid chlorine for disinfection at Kahului. On-site hypochlorite generation applies electricity to a salt solution to generate hypochlorite. As one manufacturer notes,

> "Incoming water first goes through a softener, then splits into two lines. One line goes to the electrolytic cell, where electricity is applied to the brine solution, and the other goes to a brine storage tank. Near-saturated brine is injected into the softened water that is going to the electrolytic cell. A current is passed through the electrolytic cell, producing sodium hypochlorite, which is stored in another tank, then metered into the water moving through the treatment process. Hydrogen gas is a natural byproduct of the electrolytic process and must be removed from the cell and storage tank." [UGSI]

On-site hypochlorite generation is safer and less expensive than the County's current practice of receiving delivered liquid chlorine. This reduces the exposure of operators to hazardous chemicals. Furthermore, on-site generation delivers a consistent strength solution, reducing the need to adjust dosing rates based on degradation.

On-site hypochlorite generation requires fewer deliveries and therefore less truck traffic. It also enables storage larger quantities of disinfection materials, making the Kahului WWRF more robust to treat flows through the challenges of natural disaster or emergency situations.

Typically, on-site generation costs 50-70% less than purchasing liquid sodium hypochlorite for disinfection.

An additional component of this FIM is pilot testing for peracetic acid (PAA) as an alternative to liquid chlorine for algae control at the Kihei and Lahaina facilities. PAA shares many of the benefits of on-site generation in that it is less hazardous to work with, requires lower volume and therefore fewer deliveries, and has a substantial cost savings. PAA also reduces the presence of disinfection by-products, which the County has struggled with at more than one facility. Site-specific pilot testing to view efficacy of PAA as an algaecide are recommended and, if effective, conversion to PAA for cost savings.

Scope of Work

The on-site generation system will require installation of the on-site hypochlorite generation systems. Depending on the equipment or manufacturer selected, this can require as few as 3 units. One would be required to operate to treat current flows, or two would be required to treat design average flows. One unit would be standby.

The system requires dosing pumps and water softening. Therefore, these additional components will be included in the scope of work if not available on-site currently. While the hypochlorite generation systems do not require full enclosures, a canopy roof is recommended to reduce exposure to the elements. The scope of work would evaluate whether there is an existing location that can house this equipment, or whether a new concrete pad would be required for this equipment. Given the location of the Kahului WWRF, this would likely require design for tsunami conditions or on an elevated pad to avoid flooding of the equipment. Electrical appurtenances, including sufficient service to accommodate (likely 130 A running) would also be included in this scope of work.

Parkson MidSeries Sodium Hypochlorite System.

Equipment Manufacturer

Equipment manufacturers and their associated warranties will be developed and communicated in a subsequent phase of this FIM. The manufacturers that will be considered are Parkson MidSeries, UGSI Microchlor, or equal.

Energy Savings Calculations

This FIM will not result in energy savings but rather an increase in energy cost as the chemical production is internalized. However, the system will result in significant cost savings. The savings will be calculated as shown below in the “Operation and Maintenance (O&M) Cost Savings Calculations” section. The increase in power consumption is estimated and outlined below.

Baseline Energy Consumption: *minimal (chemical feed pumps)*
Baseline Energy Costs: *minimal*

Proposed Energy Cost:
Power: 2.0 – 3.5 kwh / lb Free Available Chlorine depending on system output concentration
At current flowrates (baseline) of 387 ppd chlorine required, this equates to 282,500 – 494,400 kWh/year
Proposed Future Costs: $84,748 - $148,309 depending on system output concentration (assumes $0.30/kWh)

Savings = Baseline Costs – Proposed Future Costs = ($84,748) – ($148,309)
Negative savings reflect an additional cost

Johnson Controls

Commissioning Procedure

Liquid hypochlorite will continue to be delivered and utilized throughout the construction and until startup and training have occurred. At the point that the construction of these improvements are complete, the liquid sodium hypochlorite systems will be abandoned in place, unless otherwise requested by the County.

Environmental Impact

The environmental impact of this project is strongly positive. From reduced vehicular traffic and reduced potential for hazardous material exposures and spills, the environmental benefits of this FIM outweigh the increase in energy consumption.

Training Required

Startup and training will be provided by the equipment manufacturers in order to ensure the County's employees are adequately prepared to operate and maintain the system.

Operation and Maintenance (O&M) Cost Savings Calculations

This FIM will result in significant cost savings as calculated herein. The cost savings reflect the conversion from purchased liquid sodium hypochlorite to on-site generation, which requires salt, water, and electricity, which has been accounted for above.

The calculation for savings will be as follows:

Baseline Consumption: 5.8 MGD at 8 mg/L does rate = 387 lbs/day
At 12% solution, this equates to 387 gal/day
Baseline Costs: $7 per gallon = $987,933 per year
(Approximate – to be validated by chemical consumption records) at current average flow of 5.8 MGD and dosing 8 mg/L (387 ppd overall)

Proposed Operating Cost:
Salt: 2.5 – 4.0 lb / lb Free Available Chlorine depending on system output concentration
At current flowrates (baseline) of 387 ppd chlorine required, this equates to 970 – 1,550 ppd of salt

Water: 1.5 – 6.5 gpm, or $4,000 - $16,500 per year (at $5.85 per kgal)

Proposed Future Costs:
Salt: $61,000 - $98,000 depending on system output concentration
(assumes $0.18/lb salt, conservative)

Water: $4,000 - $16,500 depending on system output concentration

Total: $81,000 - $103,500 per year

O&M Savings = Baseline Costs – Proposed Future Costs = $884,400 - $906,900 per year

FIM 16B – Solar-Driven Process Improvements at Lanai WWRF

Existing Conditions

In May 2022, Brown & Caldwell issued a Technical Memorandum outlining the improvements required at the Lanai WWRF to come into compliance with current treatment limits and potentially allow for expanding in the future. That report, titled "County of Maui Wastewater Reclamation Division Lanai Pond Improvements" identified that the facultative lagoons have been overloaded and not operating appropriately. Several improvements are required to improve process performance. However, the Lanai site has inadequate power serving the site and inadequate power available to expand capacity.

FIM Description

This FIM includes process improvements to provide aeration and control short-circuiting within the Lanai WWRF's treatment lagoons. The FIM also includes a photovoltaic system with battery storage to supply sufficient power to fuel the proposed process improvements.

Scope of Work

The proposed scope of work includes conversion to partial-mixed aeration pond technology, powered by a stationery solar array. This would include high-speed floating aerators, modular insulating floating covers, floating baffle curtains, electrical improvements (transformer pad, MCC, and associated duct banks and wiring), pond dredging, and all supporting mechanical and electrical work. The solar improvements include solar array, battery system, a microgrid supporting a 200hp continuous load, 225kW prime-rated diesel generator, and all supporting equipment and appurtenances. An aerial projection for the array installation is shown in the figure below.

Lanai WWRF Site Layout (Blue bars show potential location of solar array)

Equipment Manufacturer

Equipment manufacturers and their associated warranties will be developed and communicated in a subsequent phase of this FIM. Probable equipment manufacturers to be evaluated will include Aqua-Aerobics, Aerator Products, Europlec/Aeromix Systems, Inc, or equal.

Energy Savings Calculations

The process improvements will add connected load which will be fully supported by solar. No net impact is expected to the energy use, and therefore there are no energy savings or costs expected.

Commissioning Procedure

The existing treatment facilities will remain online to the extent possible throughout construction. Johnson Controls will work with Plant Operators to develop an installation procedure that allows for adequate treatment during construction. More detailed commissioning procedures will be developed in a subsequent phase of this FIM.

Environmental Impact

The County is challenged with providing sufficient treatment for its current flows. This combined process-solar solution provides improved water treatment that improves the environmental impact of the WWRF. More detailed environmental impacts will be calculated and communicated in the next phase of this FIM, and will focus on the County's preferred option(s).

Training Required

Startup and training will be provided by the equipment manufacturers in order to ensure the County's employees are adequately prepared to operate and maintain the system.

FIM 16C – Sludge Solar Drying at Kihei and Kahului WWRFs

Existing Conditions

The County of Maui produces sludge from its three WWRFs on the island of Maui – Kihei, Lahaina, and Kahului. At the Kihei and Kahului WWRFs, the sludge is treated aerobically but does not meet full standards for aerobic digestion or Class B equivalents. The sludge from the Lahaina WWRF is pressed without digestion and sent out for disposal. The sludge produced at each site is summarized below:

The dewatered sludge recorded reflects the solids concentration after centrifuge or other treatment and ranges from approximately 13 – 15%. The remaining weight hauled is water weight, ultimately meaning that the County pays for 85% water to be hauled and disposed-of at the landfill.

The County pays more than $80 per wet ton for hauling and disposal of sludge to the Central Maui Landfill. Class B disposal options, while not specifically disallowed in the State of Hawaii, are not available. There is no Class B land application currently.

FIM Description

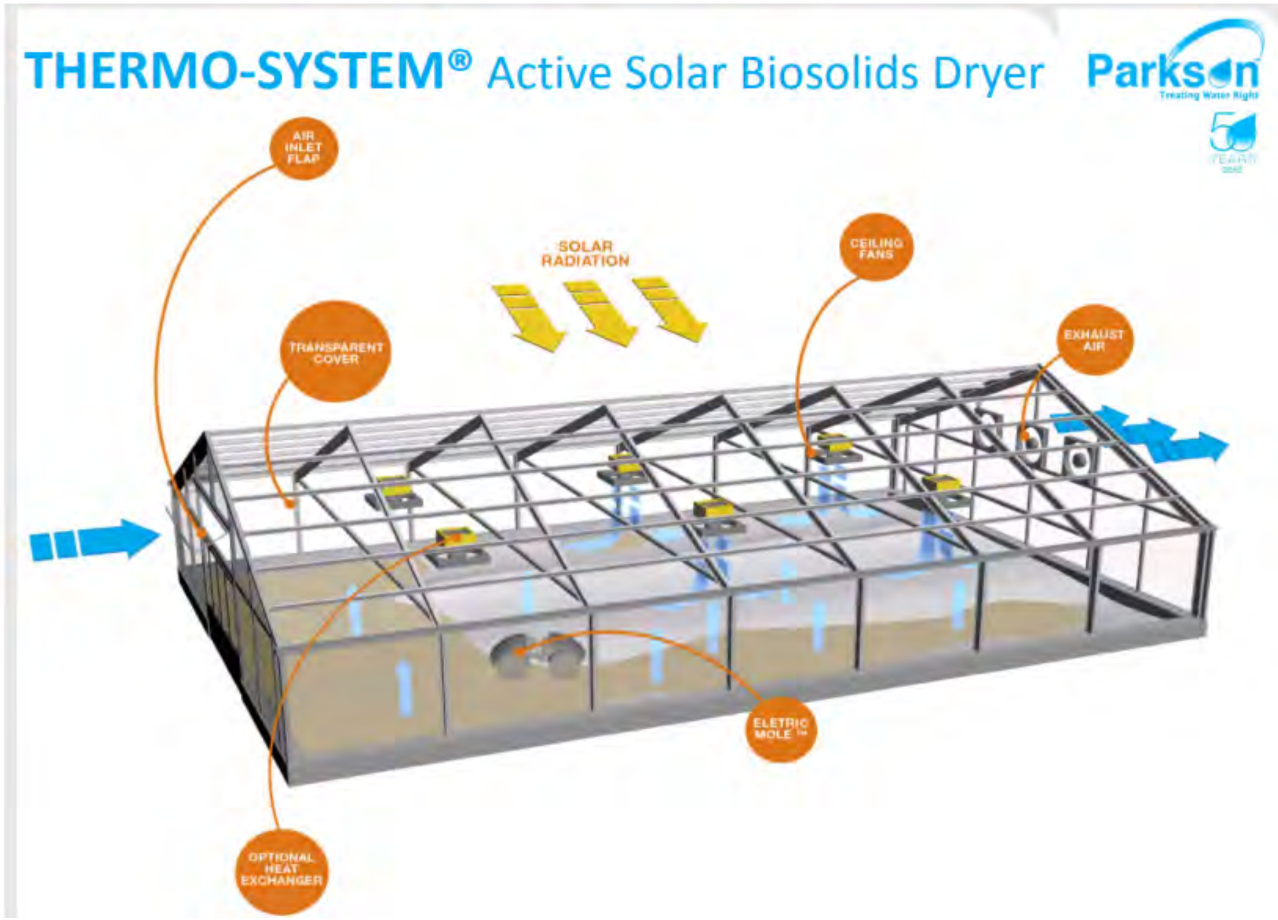
To reduce the cost of solids hauling and disposal, solar sludge drying is recommended, which will increase the solids concentration in the sludge to 70-90%. This evaluation uses 75% as the basis for calculations. The associated reduction in hauling and disposal volumes would equate to approximately 80% reduction in the hauled volume at each or all sites applied.

While the Lahaina WWRF generates the highest volume of sludge, it also lacks sludge treatment. The sludge handling causes odor issues. While odors can be managed to some extent, we recommend pursuing solar sludge drying at Kihei and Kahului WWRFs instead. The produced biosolids are Class A, allowing the County to maximize disposal options. This evaluation considers that the dried solid will still be sent to landfill. However, incorporation into composting systems to provide better closed-loop nutrients on the island is likely.

Sludge Hauled per Year	Kihei (Wet Tons)	Lahaina (Wet Tons)	Kahului (Wet Tons)
CY17	7,648	8,690	7,608
CY18	7,643	8,881	7,738
CY19	8,130	8,528	7,543
CY20	4,158	4,793	7,780
CY21	6,522	7,882	8,578
CY22	3,789	4,101	4,180
AVERAGE	**6,315**	**7,146**	**7,238**

Scope of Work

This improvement includes construction of solar sludge drying equipment. Different manufactures offer different options; however, solar sludge drying systems often resemble greenhouses, with sludge turning equipment and airflow intrinsic to encourage treatment. An example of a solar dryer system is shown below. A single unit is recommended, no redundancy. The scope of work would evaluate the optimal location on site and would require a new concrete pad to support the system. Given the location of the Kahului WWRF, this would likely require design for tsunami conditions or on an elevated pad to avoid flooding of the equipment. Electrical appurtenances would also be included in this scope of work.



Equipment Manufacturer

Equipment manufacturers and their associated warranties will be developed and communicated in a subsequent phase of this FIM. The manufacturers that will be considered are Parkson Thermo-System, Huber Solar Active Dryer, or equal.

Energy Savings Calculations

This FIM will not result in energy savings. However, the system will result in significant cost savings, which will be calculated as shown below in the "Operation and Maintenance (O&M) Cost Savings Calculations" section. The increase in power consumption is estimated and outlined below.

Baseline Energy Consumption: *minimal*
Baseline Energy Costs: *minimal*

Proposed Energy Cost:
Power: 35 kWh per ton water evaporated = 198,000 kWh/year
Proposed Future Costs: approximately $59,200 (assumes $0.30/kWh)
Savings = Baseline Costs – Proposed Future Costs = *minimal* – ($59,200) = -$59,200
Negative savings reflect an additional cost

Commissioning Procedure

The current sludge handling practices will continue throughout the construction and until startup and training have occurred. At the point that the construction of these improvements are complete, the dewatered sludge will be transferred to the solar sludge dryers. More of the commissioning details will be provided at a subsequent phase of development.

Environmental Impact

The environmental impact of this project is strongly positive, considering reduced vehicular traffic and reduced volume of sludge sent to the landfill. Since this sludge drying system utilizes solar energy, the drying process consumes minimal fossil fuel energy. Furthermore, the product biosolids will be Class A, opening the door to opportunities to provide beneficial reuse of the biosolids and improve nutrient retention within the County.


Dry, homogeneous Class A biosolids

Training Required

Startup and training will be provided by the equipment manufacturers in order to ensure the County's employees are adequately prepared to operate and maintain the system.

Operation and Maintenance (O&M) Cost Savings Calculations

This FIM will result in significant cost savings as calculated herein. The cost savings reflect the reduced volume of sludge hauled and therefore the reduction in cost of hauling and disposal. The O&M savings calculations do not consider a reduction in the disposal rate, which will improve the economics further.

Solar drying systems require very little operator attention. Therefore, a minimal 100 hours of operator labor are included in this analysis.

The calculation for savings will be as follows:

Baseline Solids Hauling + Disposal Costs are based on the sludge production records in the table below.

Sludge Production Records from 1/1/2018 through 6/28/2022

	Kihei	Lahaina	Kahului	Total
Sludge Produced	18.9	21.4	21.8	62.1
Dewatered Sludge Solids Concentration	13.6%	13% *estimated*	15.0%	13.9%
Cost per Year, Hauling + Disposal ($89/wet ton)	$ 612,992	$ 696,154	$ 708,721	$2,017,867

Baseline Costs: $2,017,867 per year

Proposed Operating Cost: assuming 75% solids in the finished product

Facility	Kihei WWRF	Lahaina WWRF	Kahului WWRF	Total	Units
Sludge Produced	18.9	21.4	21.8	62.1	tons/d
Dewatered Thickness	13.60%	13%	15.0%	13.9%	
Solar Drying - Total In	37,740	42,860	43,634	124,234	wet lbs/d
Dried Solids Thickness	75%	75%	75%	75%	
Drying - Total Volume Out	3.42	3.71	4.36	11.50	tons/d
Cost per Year, Hauling + Disposal ($89/wet ton)	$ 111,156	$ 120,667	$ 141,744	$ 373,567	

O&M Savings = Baseline Costs – Proposed Future Costs

Facility	Kihei WWRF	Lahaina WWRF	Kahului WWRF	Total
Savings, per Year	$ 501,836	$ 575,487	$ 566,977	$1,644,300

FIM 16D – Primary Treatment + Anaerobic Digestion, Kahului WWRF

Existing Conditions

The County's primary wastewater facilities consume an immense amount of electrical energy, using the bacteria intrinsic in wastewater to treat sewage and sludge aerobically. Rather than consume energy in putting air into the system, primary treatment and anaerobic digestion can provide the potential to extract the chemical energy in wastewater to offset the WWRFs' energy demand.

The sludge generated at the County's primary wastewater facilities is treated aerobically, if at all, in order to reduce volatile solids and the volume of sludge produced, and to reduce vector attraction. Aerobic digestion supplies compressed oxygen to feed the bacteria present in wastewater sludge. The sludge metabolize the volatile solids, providing a level of treatment.

The County's primary WWRFs manage sludge variously:

1. Kihei WWRF - aerobic treatment, but insufficient for complete aerobic digestion. Sludge is dewatered through centrifuges.
2. Kahului WWRF - aerobic treatment, but insufficient for complete aerobic digestion. Sludge is dewatered through centrifuges.
3. Lahaina WWRF - Sludge is dewatered through centrifuges. Aerobic treatment is not provided.

The solutions for primary treatment and anaerobic digestion can be applied at each site individually or as a regional solution.

The Kahului WWRF has particular challenges that lend themselves to this solution. The site struggles with organic capacity, which limits both current operations and future growth. In addition, the site serves significant industrial and commercial areas and already struggles with fats, oils, and grease (FOG). By implementing a direct high-strength waste receiving station, the operation and maintenance challenges that the plant staff currently faces would be reduced. Kahului WWRF is also located in a relatively central location, allowing for the potential for future expansion and simplifying the options available for biogas utilization or biosolids offtake.

FIM Description

In many municipalities, water and wastewater treatment consumes as much as 30-40% of the total energy consumed, thus making them in most cases the dominant energy consumer. Maui County has an opportunity to save energy, generate revenues, and reduce costs in meaningful ways by tackling one of its largest energy demands and opportunity centers - Wastewater Reclamation Facility (WRF) energy use. This improvement is recommended for the Kahului WWRF with eventual expansion to accommodate flows and loadings from other WWRFs or third-party haulers.

The major improvement measures that are associated with this project are summarized below.

- Construction of Primary Treatment: Energy used at the WRF comes primarily from secondary treatment aeration. The Kahului WWRF service area is also challenged with capacity issues, as population grows on the island. Primary treatment solves both issues by reducing average aeration demand by as much as 35% - diverting organic load from the aeration tanks while also freeing up this organic capacity for future connections or community growth. This is estimated to make the existing 250hp blowers the appropriate size, reducing the need for the 400hp blowers to operate, *as is proposed by others.*

- Constructing anaerobic digesters with heating, mixing, pumping, and gas capture and collection. Anaerobic digestion reduces the sludge produced and reduces vector attraction in the produced sludge. The digesters will be sized for the design average flow of the facility.

- FOG Diversion & Receiving Station: The difference between rated and actual flows also opens the door for opportunities through organic waste receiving. In particular, since the Kahului WWRF struggles with septage and FOGs influent to the WWRF, a FOG Diversion Station would alleviate collection system challenges and allow the County to extract resources, rather than throw resources into, its FOG loadings. FOG Diversion also allows the County to boost the production of digester gas (a.k.a. biogas) and potentially generate revenues from new waste streams.

- Class A Biosolids Program: Solar Sludge Drying is outlined in FIM 16C. This improvement can either stand alone, as shown in that description, or be incorporated into the digestion improvements. The digestion improvements reduce sludge volume produced, which would yield a smaller unit. However, the improvements can be made in conjunction or one after the other.

- Biogas-to-Energy: capture the biogas produced from the digestion of sludge and hauled organic wastes. Clean and compress the gas for use in a 250kW engine generator.

These improvements will provide resilience against climate change and emergency situations, open the door for continued growth and expansion by making available additional treatment capacity, and significantly reduce operating costs.

Scope of Work

The major improvement measures that are associated with this project are summarized below. This preliminary evaluation does not have available sufficient information to clarify more details on scope at this point, but the opportunity to impact growth potential, energy, and costs warrants further evaluation.

Construct Primary Treatment

Conventional primary treatment consists of rectangular or round primary clarifiers. While this technology has stood the test of time, it requires significant site footprint, produces odors and O&M required around scum removal, and offers limited ability to automate and optimize. Alternatively, treatment solutions like primary filtration or Salsnes filters have been the alternative of choice for facilities that have the ability to plan around an energy future.

There appears to be sufficient head available at the head of the Kahului WWRF to avoid necessary construction of additional pumping stations. However, construction of primary treatment still requires significant construction, including, potentially, primary treatment and primary sludge thickening equipment, enclosure to house the equipment, and associated civil, mechanical, and electrical improvements.

Construct Anaerobic Digesters

Anaerobic digestion treats sludge from the primary and secondary treatment processes in the absence of oxygen. The outputs of the process are a lower quantity of sludge (volatile solids are reduced by ~67%) and biogas. At the Kahului WWRF design loading, three anaerobic digesters (approximately 465,000 gallons each) would be constructed to provide adequate treatment capacity for future needs. The digesters would be equipped with mixing, heating, covers, and gas safety equipment. This is significant infrastructure construction project and would provide equipment that has, generally, a 30-40 year lifetime. While the WWRF site is fairly built-out, this improvement can either be considered on-site or at a nearby location.

FOG Diversion & Receiving Station

This improvement considers FOG diversion and potential high-strength waste receiving as a controllable revenue-generation mechanism. This improvement would shift the operations from the challenges of managing FOG in the collection system and into the head of the plant – to generating energy and improving handling. Technically speaking, this improvement measure requires construction of a covered waste receiving station with mixing, pumping, and odor control. This team has experience with the design of waste receiving stations and knows the importance of bar screens, glass-lined pipes, and storage to ensure stable loading rates.

Class A Biosolids Program

Refer to FIM-16C. If pursued as part of this comprehensive FIM, the solar dryer would need to process less, reducing the footprint required and associated capital costs.

Biogas-to-Energy

Anaerobic digestion will not only reduce the energy consumed in treatment and reduce solids produced, but it will also generate a value-added renewable fuel source in the form of biogas. While there are many technologies that can be used to recover the energy content in digester gas, we propose construction of a digester gas-driven engine generator with corresponding digester gas treatment. Gas treatment will remove contaminants (e.g. hydrogen sulfide, siloxanes, moisture, and particulates) that are harmful to the engine-generator equipment, and the CHP system will convert the treated gas into electrical energy. In addition to the environmental benefits of offsetting carbon consumption, a biogas-to-energy system can reduce the need for emergency generator capacity and improve resilience during emergency situations.

Anaerobic digestion of municipal sludge from the Kahului WWRF and FOGs is expected to produce 105,000 cubic feet per day (cfd) of biogas based on approximate current influent loadings. **This gas production support a 250 kW$_e$ gas engine, which would offset energy consumption by nearly $600,000 per year.** The system can also produce thermal energy, but the equipment becomes more complicated and benefits are limited for the County.

Equipment Manufacturer

This solution is a composite of several pieces of major equipment, including tanks, covers, mixers, heat exchangers, gas capture and collection equipment, gas safety equipment, pumps, and engine generators. Equipment manufacturers and their associated warranties will be developed and communicated in a subsequent phase of this FIM.

Energy Savings Calculations

Energy savings will be calculated and communicated in the next phase of this FIM, and will focus on the County's preferred option(s). Broadly, while there are ancillary connected loads associated with the recommended treatment equipment, the aeration energy will reduce by as much as 35-40%, and the system will generate as much as 250 kW in electrical power to offset operations.

FIM 16E – Activated Sludge Aeration Improvements, Kihei WWRF

Existing Conditions

The Kihei WWRF operates conventional activated sludge and aerobic digestion, using two sets of blowers. The activated sludge aeration improvements are outlined here, and the aerobic digestion aeration improvements in the following section.

For activated sludge systems, aeration can be as much as 30-50% of the treatment plant process energy use. Three main components of the aeration system dictate its energy performance – blowers, diffusers, and controls. The Kihei WRF can benefit from optimization mostly, as many of the equipment components are already in place, if not fully integrated.

1. High-efficiency blowers alone can reduce aeration energy by as much as 20%. This energy savings is manifested by quieter equipment, more comfortable room temperatures, and less vibration. While the Kihei WWRF has high-efficiency blowers (Howden Turblex blowers), the installation and integration is incomplete.

2. A focus on diffusers can further reduce energy consumption; however, diffuser replacements are often a longer payback item. The Kihei WWRF has fine-bubble diffusers, which are high performing technology, so diffuser replacement is not recommended.

3. Controls can impact the energy footprint and also improve operations by providing better controllability and adaptation to changing conditions. A simple dissolved oxygen-based control system can be highly effective, and more advanced control strategies can build on D.O. signals to avoid washout and anticipate higher aeration demands.

FIM Description

The activated sludge aeration system is currently consuming more energy than required due to several factors that include incomplete installation of blower equipment and lack of controls. Improvements can be made to significantly reduce energy consumption and provide reliable process performance and stability of the activated sludge aeration system at the Kihei WWRF.

Scope of Work

The major improvement measures that are associated with this project are summarized below. These improvements build on high-efficiency equipment that already exists and thereby optimizes the benefit. They include:

- Reinstate full capacity operation of the 250 hp and 400 hp Turblex blowers, including factory assistance.
- Aeration controls that adjust blower output based on dissolved oxygen (D.O.) and other valid process variables such as ammonia, as the County prefers.
- Additional controls and appurtenances including airflow meters and air control valves.

Equipment Manufacturer

The major equipment is largely installed, and this FIM requires instead integration and installation. The factory recommended improvements will be pursued along with integration from capable providers.

Energy Savings Calculations

The energy savings from this improvement are outlined in a previous report by HDR (“Kihei WWRF Aeration Preliminary Engineering Report”) and indicate annual energy savings of as much as $120,000 - $200,000. This will be validated during development of this improvement.

Commissioning Procedure

The recommended improvements may require downtime as piping tie-ins are performed and as the control system updates are executed. To the extent possible, the current aeration operations will continue throughout the construction and until startup and training have occurred. More of the commissioning details will be provided at a subsequent phase of development.

Environmental Impact

The environmental impact of this project is positive, reducing energy consumption and the associated greenhouse gas impacts with minimal to no additional impacts. A lower connected load also improves the ability of backup generators to operate during outage conditions.

Training Required

Startup and training will be provided by the equipment manufacturers in order to ensure the County’s employees are adequately prepared to operate and maintain the system.

Operation and Maintenance (O&M) Cost Savings Calculations

Operation of the improvements will result in a minimal but positive savings. This is due to lower operational time required for monitoring and adjusting airflow conditions. The blower O&M is similar to existing conditions, for no net impact. More detailed O&M cost savings will be calculated and communicated in the next phase of this FIM.

FIM 16F – Aerobic Digester Aeration Improvements, Kihei WWRF

Existing Conditions

The Kihei WWRF operates conventional activated sludge and aerobic digestion, using two sets of blowers. The activated sludge aeration improvements are outlined here, and the aerobic digestion aeration improvements in the following section.

As with the activated sludge aeration system, major components include blowers, diffusers and controls. The Kihei aerobic digesters rely on a separate set of blowers than the activated sludge system. Because of the variable liquid level often found in aerobic digesters, positive displacement (PD) blowers are often more appropriate. The Kihei aerobic digester blowers are multi-stage Hoffman blowers, and previous reports recommended evaluating the allowable extended equipment life. For aerobic digesters, coarse bubble diffusers are common, and these are found at the Kihei WWRF aerobic digesters. Controls are largely manual.

FIM Description

This improvement is intended to reduce aeration energy associated with the aerobic digestion process. Therefore, it considers improvements to the main aeration components: blowers, diffusers, and controls.

While this improvement reduces energy consumption, it may be inadequate to provide sufficient air transfer to substantially improve digester performance.

Scope of Work

The major improvement measures that are associated with this project are summarized below.

1. Install new rotary screw PD blowers with sound enclosures and variable frequency drives (VFDs), to provide efficient operations at all points on the operational range.
2. Upgrade aeration controls to operate on timer or based on ammonia for alkalinity recovery.
3. Diffuser replacement should be evaluated based on existing conditions to determine if more efficient diffusers are available.
4. The improvements may also include additional controls and appurtenances including airflow meters and air control valves.

Equipment Manufacturer

This solution considers blowers and diffusers. Blower manufacturers that will be considered include Atlas Copco, Aerzen, or equal. Diffuser manufacturers that will be considered include: Sanitaire, Parkson, or equal. Equipment manufacturers and their associated warranties will be developed and communicated in a subsequent phase of this FIM. This major control improvements in this FIM require integration from capable providers.

Energy Savings Calculations

The energy savings from this improvement are expected to support the improvements and will be validated during development of this improvement.

Commissioning Procedure

The recommended improvements may require downtime as piping tie-ins are performed and as the control system updates are executed. To the extent possible, the current aeration operations will continue throughout the construction and until startup and training have occurred. More of the commissioning details will be provided at a subsequent phase of development.

Environmental Impact

The environmental impact of this project is positive, reducing energy consumption and the associated greenhouse gas impacts with minimal to no additional impacts. A lower connected load also improves the ability of backup generators to operate during outage conditions.

Training Required

Startup and training will be provided by the equipment manufacturers in order to ensure the County's employees are adequately prepared to operate and maintain the system.

Operation and Maintenance (O&M) Cost Savings Calculations

Operation of the improvements will result in a minimal but positive savings. This is due to lower operational time required for monitoring and adjusting airflow conditions. The blower O&M is similar to existing conditions, for no net impact. More detailed O&M cost savings will be calculated and communicated in the next phase of this FIM.

Johnson Controls

FIM 16G – Pump Station Improvements

Existing Conditions

The County owns and operates dozens of lift stations, ranging from small to very large. This improvement replaces existing pumps and pumping systems with more efficient pumps, controls, and associated equipment.

FIM Description

Lift station pumps are an important component of the wastewater collection system. Often the controls dictate the run hours or speed of the pumps needed. Also, many lift station pumps are sized for full capacity and operate at much lower flowrates. Addition of jockey pumps or replacement of pumps with equipment that is efficient both at peak and at typical flowrates is recommended.

Scope of Work

The major improvement measures associated with this project include pump replacement and/or installation of jockey pumps for high efficiency at typical operating points, controls, and all associated mechanical and electrical work. While several sites will be evaluated, the improvements will likely include larger pump stations like Wailuku Pump Station and Lahaina Lift Station.

Equipment Manufacturer

Equipment manufacturers and their associated warranties will be developed and communicated in a subsequent phase of this FIM.

Energy Savings Calculations

Energy savings will be calculated and communicated in the next phase of this FIM, and will focus on the County's preferred option(s). However, the primary impact of this improvement is to reduce operations and maintenance costs.

Commissioning Procedure

The existing treatment facilities will remain online to the extent possible throughout construction. Johnson Controls will work with Plant Operators to develop an installation procedure that allows for adequate conveyance during construction. More detailed commissioning procedures will be developed in a subsequent phase of this FIM.

Training Required

Startup and training will be provided by the equipment manufacturers in order to ensure the County's employees are adequately prepared to operate and maintain the system.

Operation and Maintenance (O&M) Cost Savings Calculations

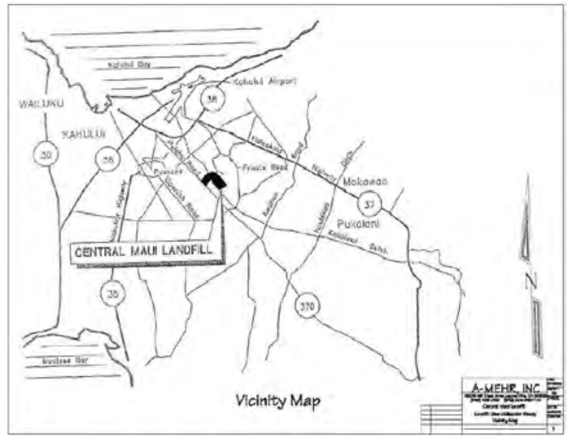
O&M cost savings will be calculated and communicated in the next phase of this FIM, and will focus on the County's preferred option(s). The savings may also consider reduction in operations and labor associated with clogging, if clog reduction is expected.

FIM 17 – Landfill Gas

Existing Conditions

The Central Maui Landfill (CML) is located off Puhelo Road as shown in Exhibit CBS-1. The County has owned and operated the CML since 1987 and the County is currently landfilling in across several different active phases of the CML. There exists only one other municipal solid waste (MSW) landfill on Maui, the Hana Landfill, which is owned and operated by the County and takes in approximately four tons per day of MSW. It is located approximately 50 miles away from the CML. The CML is open six days per week from 6:00 a.m. to 3:00 p.m., Monday through Saturday, and currently accepts approximately 450 tons per day (TPD) of MSW.

Exhibit CBS-1. Vicinity Map



While the County does not control where commercial haulers dispose of the waste they collect, the County operates the only MSW landfills on Maui. The County collects and hauls the residential MSW, which represents approximately 40 percent of the total MSW disposed of at the landfill. In addition to the MSW, three other waste streams are processed at the CML. Municipal wastewater sludge (biosolids) is hauled to the CML from each of the three County wastewater treatment facilities on the island. In total, wastewater sludge comprises on average approximately 60 TPD (22,000 wet tons/year) and consists of roughly 15 percent cake solids. Green waste totals on average approximately 45 TPD. Green waste was used in static piles with the biosolids by a composting contractor operating on CML lands; due to frequent fires, that operation ceased and both biosolids and green waste are landfilled. Fats, oils, and grease (FOG) pumped out of commercial grease traps are processed by a contractor operating on CML lands to produce biodiesel.

Existing Deficiencies

The CML, like all other MSW landfills, generates landfill gas (LFG) as a result of the anaerobic (without air) decomposition of organic material contained within the landfill. LFG typically consists of approximately 50% methane and 50% carbon dioxide and has a higher heating value (HHV) of approximately 500 BTU per standard cubic foot (BTU/SCF). The actual composition and energy content vary depending on how the gas collection system is operated, characteristics of the waste (e.g., composition and age of the refuse) and a number of environmental factors (e.g., the presence of oxygen in the landfill, moisture content, and temperature).

Exhibit CBS-2. Maui Central Landfill

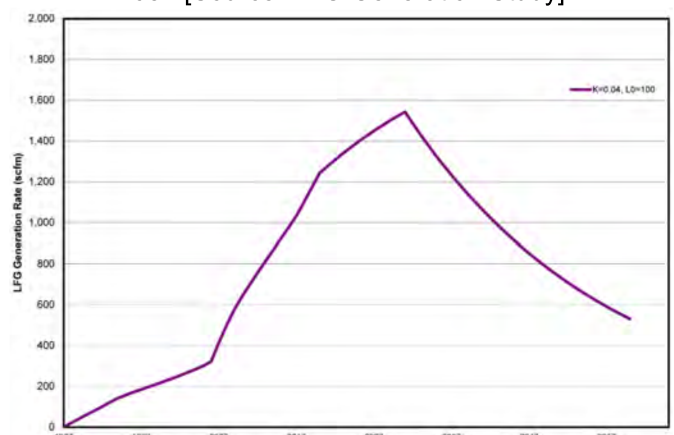
In order to manage the release of LFG to the atmosphere, prevent off-site migration of LFG, and comply with State of Hawaii and federal regulations, CML has installed a gas collection and control system (GCCS). The system, consisting of a series of wells and collection pipes, blowers and a flare, is designed to manage LFG from closed, currently operating, and future disposal areas at CML. Exhibit CBS-2 depicts a Google Earth image of the CML with the location of the GCCS identified by the red arrow. Exhibit CBS-3 is a close-up of the Google Earth image.

Exhibit CBS-3. Landfill Gas Flare System

In January 2010, A-Mehr of Laguna Hills, CA submitted the Final Landfill Gas Utilization Study and Conceptual Design to the County. The County constructed GCCS expansion improvements in approximately 2011, 2015, and 2021. Currently the County is designing a new blower and flare station to replace the current blower and flare station. The new blower and flare station is being designed to allow the outlet LFG from the blowers to be directed to a future LFG upgrading project or the flare. The new LFG flare is currently planned to have dual zone burners to allow for increased turndown on the LFG flare.

Since 2011, the County has sought offers from the private sector to implement LFG upgrading and monetization projects, including an unsuccessful effort for an integrated waste management plant which was to be developed under contract by Anaergia, Inc. On August 8, 2022, the County issued RFP No. 22-23, P-47 for Development of a Landfill Gas Utilization Project at the Central Maui Landfill. For the purposes of responding to the RFP, the County directed proponents to assume LFG flow rates of 1,100 and 1,600 standard cubic feet per minute (scfm) at 42 to 55 percent (50 percent methane).

Exhibit CBS-4. Estimated LFG Production through 2057 [Source: LFG Generation Study]



In January 2021, Tetra Tech, Inc. prepared a LFG generation summary for the County. Exhibit CBS-4 depicts a graph of the modeling results. If the County continues to landfill MSW and other wastes, including biosolids and green waste, at the CML, modeling predicts that there will be significant amount of LFG (up to 1,500 scfm) which will need on-going management. This includes closed areas of the landfill, existing cells], and new cells to be developed and operated as part of future phases.

Under even the best of circumstances and with effective operation of the GCCS, the County may be emitting methane, a potent greenhouse gas, into the atmosphere. The continue flaring of LFG emits carbon dioxide into the atmosphere, further contributing to global warming. **Optimization of the GCCS will reduce uncontrolled methane releases to the atmosphere. Coupled with a biogas upgrading system and JCI's monetization strategy, the County will reduce lifecycle greenhouse gas emissions and generate revenue from the sale of biogas-derived energy products created as part of this FIM.**

FIM Description

The County has a massive resource recovery opportunity at the CML. As noted in the A-Mehr report, hundreds of LFG beneficial use projects in the United States utilize LFG as fuel in a variety of ways, including:

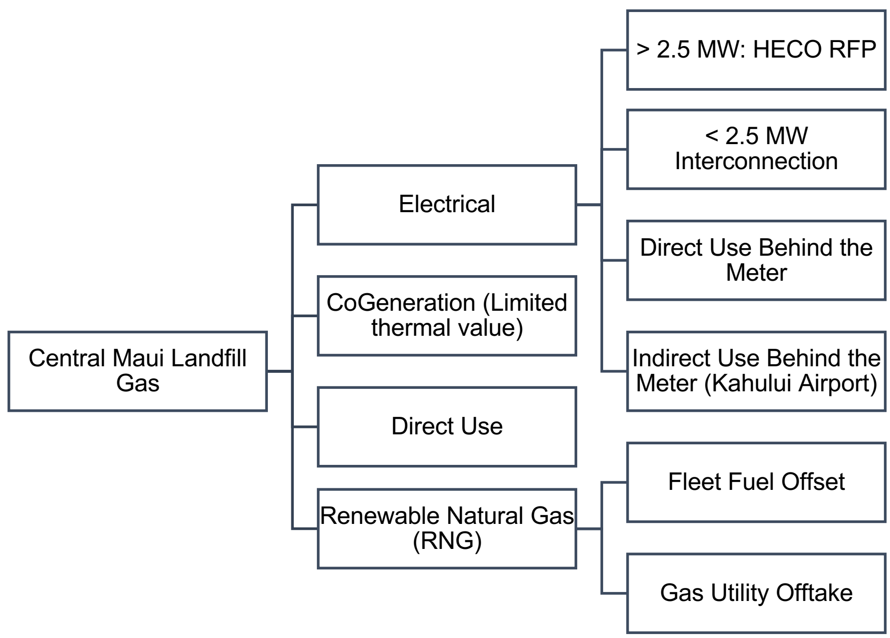
- **Electrical generation**, using LFG to fuel combustion engines, gas turbines, and fuel cells, which may be connected to the local utility grid or placed in service for behind-the-meter supply of energy to displace grid power;

- **Cogeneration**, combining the production of thermal and electrical energy, typically in a Combined Heat and Power plant which produces electricity and recovers the associated heat release for beneficial reuse. Because of the specific conditions present on the County (e.g., limited thermal demand for heating or wastewater process needs, high operational demand), cogeneration is not the primary recommendation;
- **Fleet Fuel Offset:** Direct-use to replace fossil fuels, typically in vehicles and heavy duty equipment with compressed natural gas (CNG) fueling systems and engines; and
- **Gas Utility Offtake:** Production of alternative fuels by converting LFG to a high-BTU fuel, typically in the form of Renewable Natural Gas (RNG), which may be sold into natural gas distribution networks.

Exhibit CBS-5 summarizes energy recovery options for LFG utilization which are explored further herein. Energy recovery from LFG is cost effective and relies on proven technology to achieve the following identifiable benefits:

- Reduces greenhouse gas emissions and air pollution by replacing fossil fuels with renewable fuels (i.e., anaerobic degradation of organic matter gives rise to LFG).
- Generates revenue from the sale of LFG, upgraded fuel products, or electricity.
- Benefits the local economy through the creation of jobs associated with the design, construction and operation of the LFG upgrading, energy recovery and distribution systems.
- Provides resiliency for the County by leveraging an underutilized on-island energy source to power critical municipal infrastructure and associated operations.

Exhibit CBS-5. Options for Beneficial Use of Landfill Gas



LFG is a low-quality natural gas. The gas produced contains contaminants like hydrogen sulfide (H2S), siloxanes, moisture, and particulates. LFG is approximately 50% methane, with the remainder primarily composed of carbon dioxide and other compounds generated from the anaerobic decomposition of organic material in the landfill. Gas treatment is a necessary component of any alternative which contemplates recovering the energy content in LFG. Gas treatment removes contaminants that are harmful to the end use, whether combustion engines, gas turbines, fuel cells, or gas distribution systems. To be used in a typical electrical energy combustion generator, the gas needs to be treated to remove these contaminants using proven and commercially available gas conditioning systems. Alternative LFG monetization solutions like vehicle fleet fueling or RNG require additional levels of gas treatment.

Two primary avenues to consider for valuing the gas include electrical generation and direct use, each with several end uses. Johnson Controls will evaluate each of these options to identify the best value for the County.

Electrical Generation

The A-Mehr study contemplated that LFG could be used as fuel to produce 1.6 MW – 3 MW of electricity. Johnson Controls' preliminary estimate, which includes new information from the Tetra Tech 2021 LFG production model, confirms this range. The electricity produced can either be exported via an interconnection or used behind the meter, as outlined in the options below.

- **Interconnection:** Hawaiian Electric (HECO) is in the process of developing its Stage 3 Request for Proposals (RFP) for firm and variable renewable energy projects. HECO anticipated awarding power purchase agreements (PPAs) to successful proponents for up to 40 MW of firm renewable power connected to the Maui Electric distribution system. The May 2, 2022 draft RFP contemplates projects which produce a minimum of 2.5 MW contracted over a term of 30 years. With County approval, Johnson Controls may choose to act as the project Developer to evaluate the final HECO RFP and prepare a proposal to respond to the final RFP following an initial diligence evaluation. Our evaluation would consider the reliability of LFG gas projections versus the RFP requirements of 2.5 MW minimum delivery over a 30-year PPA term. Assuming the project clears these threshold issues, Johnson Controls would also evaluate preliminary costs, including interconnection requirements, as well as costs related to responding to the RFP, negotiating the PPA, securing LFG rights and an easement from the County (to demonstrate security of fuel supply), project development, permitting, financing, construction, and long-term operation and maintenance.

It is worth noting that the County may also consider developing a project smaller than 2.5 MW at the landfill and not participate in the HECO RFP process. Projects with a net output less than 2.5 MW are not subject to Hawaii's Framework for Competitive Bidding and may seek a waiver from the Hawaii Public Utilities Commission (PUC) to engage in bilateral negotiations with the utility for a PPA.

- **Direct Use Behind the Meter:** The County owns several facilities with large demand profiles. Exhibit CBS-6 shows the "top 10" facilities which may be candidates for dedicated behind-the-meter production of baseload power using highly reliable gas engines. Our preliminary analysis indicates that approximately 2.5 MW of electricity is needed to satisfy 75% of the average draw from these critical County facilities. This provides a level of comfort that Johnson Controls can match the potential maximum supply of upgraded LFG with the potential demand from these energy consumers. In addition to optimizing the LFG collection system for long-term reliability, installing and operating the requisite gas upgrading system, and installing and operating the distributed generating systems at County facilities, Johnson Controls will arrange for transport of gas from the CML to these sites in specially designed tube trailers. This "virtual pipeline" concept is used widely and routinely in the natural gas production industry, where wells are located remotely and it is not feasible to construct pipelines to transport gas to central hubs for upgrading and distribution. In this alternative, the County may retain control of LFG rights, and the savings in electricity payments to the utility will be used to support financing the

Exhibit CBS-6. County Top Ten Energy Consumers

Uses:	Baseline Energy Use	Avg Draw (kWh)	Max Draw (kW)	Design BTM Size (kW)
Site 1: Kihei WWTP	2,930,400	335	614	251
Site 2: Kahului WWTP	4,510,000	515	675	386
Site 3: Lahaina WWTP	3,772,800	431	738	323
Site 4: Waihee Pump	6,417,600	733	1,274	549
Site 5: Haliimaile Well	3,171,200	362	962	272
Site 6: Wailuku Well 2	2,034,000	232	260	174
Site 7: Mokuhau Well	2,029,200	232	763	174
Site 8: Lahaina WRF (alt site)	1,329,600	152	653	114
Site 9: Napili PS	1,738,750	198	269	149
Site 10: Kupaa Well	1,562,550	178	215	134
				2,525

activities to develop, install and operate system elements under a 20-year agreement. This solution also supports the County's efforts in establishing Resiliency Hubs by providing firm and fixed, locally-sourced renewable energy that improves disaster preparedness.

- **Indirect Use Behind the Meter (Third Party):** Johnson Controls has been a trusted contractor for Hawaii Department of Transportation (HDOT) since 2011 and has performed more than $300 million in energy savings projects for the three divisions within the department (Airports, Harbors, and Highways). HDOT-Air owns and operates Kahului Airport. As part of a larger $ 26 million contract completed over a 4-year period from 2014 through 2018, Johnson Controls completed the installation of 1.2 MW-dc of roof mounted solar photovoltaic panels to support the State's decarbonization and renewable energy goals. In 2018, HDOT-Air issued an RFP which contemplated providing on-site renewable energy generation to displace 100% of the electricity supplied by Maui Electric; the contract opportunity was abandoned due to the diversity of responses, wide range of proposed technologies, and conflicts with long term airport expansion plans.

Our history with the airport indicates that a single gas engine firing upgraded LFG may be connected to the Airport's primary electrical feed to provide the renewable energy supply desired – behind the meter. Like the "Top Ten" alternative described herein, Johnson Controls will arrange for transport of gas from the CML to the airport in specially designed tube trailers. In this alternative, Johnson Controls will act as project Developer to negotiate a long-term PPA with HDOT. As Developer, Johnson Controls will negotiate a back-to-back agreement with the County for long-term access to the CML with associated LFG rights. Revenues from the PPA will be used to finance development, implementation, and perform long-term operations. In addition to the County saving money on long-term operation & maintenance of the GCCS and associated regulatory compliance monitoring and reporting, our agreement would contemplate a profit-sharing mechanism, potentially converting LFG management from a cost center to a revenue center.

Renewable Natural Gas

The other primary avenue of gas valuation is as Renewable Natural Gas (RNG). The landfill gas has the capacity to produce as much as 4,000 diesel gallon equivalents (dge) per day. This supply outstrips the County's fleet demand. Therefore, the RNG produced can either be used to offset the County's fleet fuel use or sold to a third-party, as outlined in the options below.

- **Fleet Fuel Offset:** While the island does not have natural gas infrastructure, the County can consider opportunities to convert its heavy-duty vehicles to operate on compressed RNG produced at the CML. This supports resilience by using an island-generated energy source to displace fossil vehicular fuel. Johnson Controls' electrification of County vehicles as part of FIM 15 does not contemplate conversion of many of the County's large and heavy-duty vehicles (e.g., garbage trucks and dump trucks). CNG fueling systems and engines have been commercially available for these types of vehicles for years while electric systems are still being commercialized. Johnson Controls' preliminary analysis of County vehicles suitable for compressed RNG conversion indicates that six County Divisions (Solid Waste, Wastewater, Water, Highways, Parks, and Police) could consume approximately 25% of the RNG which may be produced at the CML – if <u>their entire fleets</u> were included in this FIM. Solid Waste Division alone represents about 7% of total potential RNG production. Consequently, this alternative would need to be implemented in conjunction with another alternative to ensure utilization of all upgraded LFG from the CML. With Johnson Controls as project Developer, requisite gas upgrading equipment will be installed at the CML. Depending on availability of space, vehicular fueling and maintenance may take place on County-owned property at or adjacent to the CML, or Johnson Controls can acquire or lease property in a central location to support fueling and maintenance activities. Cost savings from future fuel purchases will be used to support financing of gas upgrading systems, fleet conversion, and vehicular fueling and maintenance systems under a 20-year agreement.

- **Gas Utility Offtake:** On the mainland, RNG expansion is gaining momentum rapidly. Federal programs are widely available to incentivize RNG project development, and pipelines are widely available to connect producers and end users on a voluntary basis. On Oahu, RNG produced at the Honouliuli Wastewater Treatment plant is injected into the Hawaii Gas distribution network to displace liquefied natural gas (LNG) and synthetic natural gas (SNG). Johnson Controls initiated an introductory call with Hawaii Gas in early July 2022 to gauge their interest in a long-term partnership to develop the CML LFG resources and act as the off-taker for the RNG. Hawaii Gas communicated an interest in pursuing a long-term partnership, provided they could be an equity investor in the project. If the County is interested in pursuing this alternative, Johnson Controls can act as lead project Developer to structure and negotiate the necessary agreements with Hawaii Gas for their participation during development and as the credit-worthy counter-party responsible for transporting and marketing the RNG, either on- or off-island. In this alternative, the County would need to enter into an agreement with Johnson Controls for an easement to access the landfill with associated LFG rights to secure commitment for offtake. In addition to the County saving money on long-term operation and maintenance of the GCCS and associated regulatory compliance monitoring and reporting, our agreement would contemplate a profit-sharing mechanism, potentially converting LFG management from a cost center to a revenue center.

The *Options for Beneficial Reuse of LFG* Table at the end of this section presents a summary table of options Johnson Controls has developed to frame the discussion and evaluation of the various alternatives available to the County for beneficial use of LFG. Each option has clear pros and cons which will be evaluated and communicated to the County after an initial discussion to clarify any questions, preferences, or concerns. At this time and based on limited development and technical analysis to date, Johnson Controls recommends consideration of Alternative 2 (Electrical Generation, Direct Use Behind the Meter) as the preferred alternative, because it provides an on-island solution that relies on the least number discrete system elements, and avoids significant, time-consuming, and costly interactions with HECO, Hawaii Gas, and the PUC.

Landfill gas use behind the meter to generate electricity at key energy-using sites will reduce energy consumption, save energy costs, generate renewable energy credits, and improve resiliency.

Scope of Work

Given the conceptual level of development of this FIM, Johnson Controls recommends the following scope of work to advance utilization and monetization of LFG to provide the greatest benefit to the County:

1. Conduct an initial diligence evaluation of a LFG to electricity project sited at or adjacent to the CML. This will determine if this alternative is feasible technically and economically, regardless of whether of not the County chooses to participate in the forthcoming HECO RFP opportunity.

2. As stated previously, any alternative involves the design, permitting, installation, and long-term O&M of a LFG treatment and upgrading system to be located on or adjacent to the CML. The design and complexity of this system is dependent on the County's preferred option (see Options for Beneficial Reuse of LFG Table at the end of this section). Johnson Controls will evaluate if it makes sense to treat all gas to the least stringent requirements (i.e., assuming all LFG is upgraded for electricity production in combustion engines), the most stringent requirements (i.e., RNG), or provide a system which can produce different upgraded biogas products to match the quantities and associated quality requirements anticipated for the County's preferred alternative.

3. The County has communicated a preference to utilize the LFG resource on-island. Any alternative which involves distributed energy generation, either at County facilities or at the Kahului airport, will require transport of upgraded biogas from the landfill via tube filling stations located at or adjacent to the CML. The number and size of tube trailers is dependent on downstream end-users and logistics of moving gas to satisfy demand. Purchase or lease of tube trailers, or subcontracting this activity to a qualified third party, will be evaluated.

4. If vehicular fueling is preferred, Johnson Controls will evaluate leasing or purchasing new CNG vehicles to replace (at a minimum) Solid Waste Division vehicles which are within the Central Maui region. Many vehicles service remote parts of the island and are not candidates for RNG use. Johnson Controls will evaluate CNG conversion kits for newer gasoline and diesel vehicles. Third-party support will be needed for vehicle acquisition and any conversion kits to be installed. Johnson Controls will need direction from the County on the final list of Departments/Divisions and associated vehicles it wants to consider in this task before initiating any technical or commercial discussions.

5. If a vehicular fueling option is preferred, Johnson Controls will perform activities related to siting, developing, permitting, and constructing a dedicated vehicle maintenance garage near the land-fil (or modified use of the existing vehicle maintenance facility) along with a fueling station for County-identified vehicles. Johnson Controls will consider Solid Waste Division-owned land adjacent to the CML or leasing a portion of the nearby mothballed sugar mill, which may be a faster transaction since it avoids zoning and planning studies related to the 99-acre County parcel adjacent to the CML. Johnson Controls will also evaluate if operations (i.e., vehicle maintenance, fueling) can be subcontracted to a local qualified third party if the cost of risk transfer is acceptable.

6. For on-island distributed generation options, Johnson Controls will perform activities related to siting, developing, permitting, constructing and operating gas-fired baseload internal combustion generators at some or all of the Top 10 County facilities and the Kahului Airport. Availability of land, ease of tie-ins, transport and fuel transfer logistics, and other competing FIMs (i.e. solar + storage) will be considered when finalizing the proposed list of County facilities to be included in this FIM. In addition, Johnson Controls, with County support, will engage with HDOT to explore their interest in entering into a PPA for the Kahului Airport and, assuming they are interested, proceed with development activities which include negotiation of a term sheet and definitive agreement(s), along with evaluations of siting, tie-ins, fuel transport/transfer logistics, permitting, etc.

7. If the County is interested in pursuing an off-island offtake solution, Johnson Controls will engage with Hawaii Gas to explore their interest in investing in the project and being the primary off-taker. Development activities will include deal structuring, negotiation of a term sheet and definitive agreements. Since Hawaii Gas will be responsible for downstream RNG transport and logistics after taking title to the fuel at the CML, this option requires little incremental development beyond the gas upgrading system discussed in bullet #2 above.

OPTIONS FOR BENEFICIAL REUSE OF LFG

Option	Gas Cleanup – Quality[1]		Electricity Generator Location (s)			Vehicular Fueling[4]	On-island Gas Transport[5]	Off-taker				Comment
	Gen Set[2]	RNG	Top 10	OGG[3]	CML			County	HDOT	HECO	Hawaii Gas	
Alt. 1: Electrical Generation, Interconnection	■				■					■		• Net export to grid >2.5 MW requires HECO RFP response • PUC waiver for net export to grid <2.5 MW • High interconnection cost (relative to projects with higher net generation) • Expected highest payback term due to wholesale PPA rate • Not suitable for combining with other offtake options
Alt 2: Electrical Generation, Direct Use Behind the Meter	■		■	■			■	■	■			• OGG generation assumed to range 1 MW – 2 MW • Balance of gas consumed at fewest Top 10 sites, if required • Confirm need for separate on-site gas storage required vs. stationary use of tube trailers (i.e., drop and swap) • High CAPEX and OPEX • High savings from retail power
Alt 3: Mixed Electrical Generation and RNG for County Use Only	■	■	■			■	■	■				• County solution – retains gas rights for fueling vehicles and distributed generators • Includes centralized maintenance garage and fueling station • Confirm need for separate on-site gas storage required vs. stationary use of tube trailers (i.e., drop and swap) • Highest CAPEX and OPEX • High savings from both retail power and liquid fuels
Alt 4: Mixed Electrical Generation and RNG	■	■		■		■	■	■	■			• Larger OGG gas need simplifies development relative to Option 3 • Balance of gas for vehicles • Confirm need for separate on-site gas storage required vs. stationary use of tube trailers (i.e., drop and swap) • High CAPEX and OPEX • High savings vs retail power
Alt 5: RNG for Gas Utility Offtake		■									■	• Assume Hawaii Gas takes title to gas at CML gas treatment plant outlet and ships to Oahu • Lowest anticipated CAPEX and OPEX • Off-taker costs of downstream logistics establish the ceiling for the price of RNG under a long-term agreement

Notes

1. Implies additional treatment unit operations required to further refine gas to meet off-taker specifications; system able to extract gas at different levels of quality to meet end use requirements
2. Internal combustion engine generator assumed due to high availability of equipment, maintenance technicians, and spare parts in Hawaii
3. Kahului Airport
4. Assumes gas storage and tube trailer filling station at CML, central maintenance garage and vehicle filling station at or adjacent to CML (or a suitable nearby location), and procurement of new CNG vehicles (for older vehicles) in combination with fueling system retrofits of newer vehicles
5. Number and size of tube trailers dependent upon number of distributed energy generator locations, on-site fuel storage requirements, transport/access restrictions, and frequency of fueling trips

FIM 18 – Resiliency Centers

FIM Description

The County seeks to designate specific County-owned sites as Resilience Hubs. For the purposes of the scope of this project, Johnson Controls' scope of work for Resilience Hubs is to install solar PV, battery energy storage, and microgrid controls to enable the solar and energy storage to operate during a utility power outage.

This work will be performed in the solar plus energy storage PPA (Power Purchase Agreement). This means the solar and energy storage equipment will be owned and maintained by a third party PPA provider, and the County will purchase the solar PV produced at a prescribed rate per kWh, plus the County will purchase the energy storage capacity in that PPA contract. See the write-up for FIM-20 for more information about the solar plus energy storage PPA.

The table below summarizes the basis-of-design for the solar PV and battery energy storage systems at the (12) Resilience Hub sites. This is a basis-of-design because it is subject to change based on final engineering, and what physical site conditions could cause some of these system sizes to change slightly. Further, if the County wishes to increase the energy storage duration, then that can be included prior to final design of these systems. Finally, if there are additional site loads, such as adding air conditioning to a building, then that increased site load will require the recalculation and increase of the solar PV and battery system sizing.

Name	Address	Baseline HECO Annual Consumption (kWh)	Proposed Solar PV Size (kWDC)	Proposed Energy Storage Size (kWh)	Total Days of Backup	Proposed Annual Solar PV Production (kWh)
Eddie Tam Memorial Complex	931 Makawao Ave, Makawao, 96768	69,536	-	122	2.9	0
Haiku Community Center	2830 Hana Hwy at Pilialoha St, Haiku, 96708	34,490	21.4	162	4.5	33,982
Hana Community Center	5101 Uakea Rd, Hana	92,000	73.8	1,030	3.6	112,542
Kihei Community Center	303 E. Lipoa St, Kihei, 96753	137,760	93.6	1,545	3.9	158,608
Kualapu'u Recreational Center	1 Uwao St, Kaulapuu, 96757	13,521	21.4	122	5.3	34,054
Kula Community Center	E. Lower Kula Rd, Kula, 96790	20,600	21.4	230	4.2	31,009
Lahaina Civic Center	1840 Honoapiilani Hwy, Lahaina, 96761	305,140	148.1	496	-	228,700
Lāna'i Senior Center	309 Seventh St, Lanai City, 96763	29,020	21.4	324	3.9	33,346
Mayor Hannibal Tavares Community Center	91 Pukalani St Pukalani, Maui, HI 96768	41,306	27.8	419	3.9	44,155
Mitchell Pauole Community Center	90 Ainoa St, Kaunakakai, 96748	238,342	150.9	2,122	3.6	242,220
Paia Community Center	Hana Highway, Paia, 96779	14,170	21.4	149	4.7	34,532
Velma McWayne Santos Community Center	395 Waena Pl, Wailuku, 96793	24,618	21.4	270	4.0	34,386

The solar PV plus energy storage systems are sized to match each sites' normal operation under typical conditions. The solar PV is sized to offset as much of the existing electrical site load as feasible, and the

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battery systems are sized for self-consumption. Helioscope solar PV models for each of these sites are included in the Appendix.

A microgrid capable controls system, such as that offered by the Tesla Powerwall Gateway or the Generac PWRcell for example, will be included at each of these sites to provide backup power during a loss of utility power. The size of the battery energy storage can be increased to provide more hours of backup power, should the County choose to do so. Increasing the size of the battery energy storage beyond the baseline specification listed here does not create more energy savings from utility bills; instead, larger energy storage would just provide more hours of backup power. The solar plus energy storage PPA contract defines how the size of the solar PV and energy storage relates to the PPA rate cost to the County.

See the Description of Premises section for a more complete description for each of these sites . This section describes more about each site, such as use of air condition systems, if it exists. Additionally, the Helioscope solar PV designs for these sites can be found in the Appendix at the end of this IGA document.

FIM 19 – HVAC Upgrades

Existing Conditions

Lahaina Civic Center

The gym at the Lahaina Civic Center was not originally built with HVAC, it was added in approximately 2003. The gym's HVAC system is comprised of five (5) 40 ton Water Source Heat Pump (WSHP) Air Handler Units (AHU) connected to a 200 ton Cooling Tower for heat rejection. A dedicated MECO electric service was added for the HVAC equipment as part of the 2003 project. The system is at the end of life, and is scheduled to be replaced by the County. The County has begun work on a design to replace the existing HVAC system completely with a different type of air conditioning system. The system that the County is proceeding with in its current design is a DX (direct expansion) cooling system, which includes new air handlers and new outdoor condensing units.

Should the County decide to include the HVAC system replacement at Lahaina Civic Center in this performance contract with Johnson Controls, we have evaluated other options for HVAC replacement at this site, and are prepared to include the cost and savings in the next phase of this project. One advantage to proceeding with Johnson Controls is that we evaluate not only first costs, but also the long-term energy AND maintenance associated with new HVAC systems, with a perspective on the payback over time.

Year	Annual MECO Bill Meter# 143588
2018	$56,941.10
2019	$75,444.34
2020	$34,508.59
2021	$20,948.94

*2020 & 2021 usage lower due to COVID-19

JCI evaluated replacing the WSHP and refurbishing the Cooling Tower system. The direct replacement option was evaluated as the best value. It is the lowest installation cost and there is not much opportunity for energy savings given the minimal annual bills.

Kalana O Maui

The Kalana O Maui building is served by a central chilled water plant, pumped chilled water loop, and air handlers on each floor. This is a typical air conditioning design for an office building. The central plant equipment is at or near the end of its useful life.

Kalana O Maui has a chilled water HVAC system. The Chiller Plant is located in the rooftop mechanical room, it includes two (2) 146 ton chillers and two (2) cooling towers located outside. The chilled water and condenser water pumps are constant speed. Each of the nine (9) floors has a multizone Air Handler Unit. The first floor also has two (2) small Fan Coil Units. In addition to the chilled water HVAC equipment, there are miscellaneous DX split units that serve individual zones. Three (3) of the DX units are known to provide cooling to the second level IT Server Room.

The Chiller Plant equipment is in poor condition. The AHU for the ninth floor is located in the rooftop mechanical room (not conditioned) and has significant corrosion. The existing Building Automation System (BAS) appears to be in disrepair. There is BAS in the chiller plant, but all equipment is manually controlled. It is assumed the manual control is necessary because the controls are not functioning. The AHUs do not have chilled water control valves. The multi zone controls on the AHUs do not appear to be operational; air temperatures were measured in the low 70s.

Kihei Community Center

The HVAC system at Kihei Community Center is original to the building construction, approximately 1997. The main components of the HVAC in this building are two (2) air-cooled DX outdoor condensing units, with each outdoor unit paired with an indoor air handler with DX cooling coils.

The indoor air handlers each serve approximately half of the Community Center. A simple manual thermostat controls the on/off capability of the air handlers and also controls the space temperature setpoint. The thermostats are stand-alone; that is, they are not connected to a server or any other County network for remote control or remote monitoring.

The outdoor condensing units have experienced serious maintenance issues over the most recent months and years. Currently one of the units has a bad compressor circuit, and as such is only operating at 50% maximum cooling capacity. These units utilize R-22 refrigerant, a refrigerant which has been phased out by the EPA, which creates operations and maintenance issues going forward. The next time one of these units has a major refrigerant leak or requires a major overhaul and refrigerant replacement, R-22 may not be available, or if it is, it will likely be very costly to procure.

The following photos show the outdoor condensing units. The cooling coils in the second photo are evidence of the deteriorating condition of the current HVAC system at this site.


FIM Description

Kalana O Maui

Improvements to the Kalana O Maui HVAC system will be evaluated in the next phase of this project. Johnson Controls has already installed a chilled water BTU meter to collect baseline information about the buildings chilled water usage, in addition to collecting information about the electrical consumption of the chiller water plant components. This helps us evaluate the overall chiller plant baseline efficiency, in terms of kW/ton. Setting this baseline establishes how much energy could be saved from a replacement HVAC system, and it informs the JCI team of the biggest opportunities for chiller plant improvements.

The new chiller plant design that JCI will be pursuing will likely include,

- Replacement of existing chillers and chilled water pumps
- Conversion to an all variable speed plant, which includes variable speed drives on new pumps and variable speed chillers
- Building Automation System upgrades
- Air Handler improvements such as the installation of chilled water control valves

Finally, Johnson Controls is evaluating the option to extend the chilled water loop from the Kalana O Maui building to tie in the nearby Old Courthouse Building. This building has a chilled water loop system, and the chiller is severely at the end of its life and needs to be replaced. If we can feed the Old Courthouse from the same loop as the Kalana O Maui building, then that chiller would be abandoned permanently, reducing future maintenance and equipment replacement costs.

Kihei Community Center

In the continuation of this IGA phase, Johnson Controls will develop and HVAC replacement measure for the Kihei Community Center. We have performed a preliminary analysis of the site, and our preliminary recommendations are based on the following:

- The space is either utilized fully or barely at all. A new HVAC system should be able to handle both scenarios well.
- There should be centralized control and management of the system, as opposed to only having the existing manual simple thermostats.
- The new system will not utilize R-22 as a refrigerant, so that means the existing supply and return refrigerants lines need to be replaced.

- The indoor air handling coils also need to be replaced, which will likely necessitate a replacement of the air handlers.
- The existing ductwork appears in good condition, with the only current apparent issue that over time, dust has collected on the diffusers in the space, which could be fixed through cleaning the diffusers or replacing them.

Johnson Controls will include in the next phase of this project, a new HVAC system comprised of multiple outdoor DX condensing units, with two new air handlers and new refrigerant supply lines. The next steps for Johnson Controls is to evaluate equipment manufacturers compatible with the electrical service to the building (208V 3-phase), to utilize as the basis-of-design for pricing. The new system should also be capable of operating well at partial and low load conditions, in order to provide some dehumidification to the space, in addition to strictly temperature control when the space is being utilized for an event. Finally, the new system will use environmentally friendly refrigerant which is not phased out or planned to be phased out in the near future.

FIM 20 – Solar PV and Energy Storage

FIM Description

Johnson Controls proposes solar photovoltaic (PV) generation systems at various roofs, carport canopies, and ground-mounted systems at specified County sites. Our approach to designing the solar PV is to first analyze how much energy is being saved from energy conservation measures, such as lighting, and then, secondly, determine how much of the remaining load we can serve with solar PV.

At each site, we were able to specify solar PV systems that maximize the solar PV renewable generation to offset as much utility purchased electricity as possible. In many places, there is not enough roof space to install solar PV systems which are large enough to export power back to the utility. However, in the case where such a situation could occur, Hawaiian Electric (HECO) has programs designed for export, and the energy exported back to the grid qualifies for an offset, which is currently $0.1217 per kWh for HECO's CGS+ program. This program is available for systems 100 kW-AC or smaller. For systems larger than 100 kW-AC, HECO's SIA (Standard Interconnection Application) program is utilized. The SIA program sometimes allows energy to be exported back to the grid, but that program does not reimburse a customer anything for exported energy.

The designs considered the feasibility of coupling the solar PV systems with battery energy storage systems. For some sites with a large enough load, and with ample installation spaces, energy storage can be installed to capture that excess power which would have been curtailed to shift that usage to evening or nighttime hours. Additionally, there are other benefits of energy storage, such as demand savings or other grid services programs that can be offered by the utility company.

In terms of grid services, currently there is not an active procurement for grid services from HECO. Johnson Controls has participated in past HECO grid service procurements and is familiar with enrolling behind-the-meter battery energy storage systems in that program, which provide payments and benefits to the HECO account owner. The grid services payments will be shared with the storage system owner and the grid services provider to cover the additional storage maintenance and operational costs. If such a program does come about, Johnson Controls will examine the applicability and benefits to the City and County and make recommendations at that time.

The table below is a summary of the solar PV sites that are being considered for this project. This list is not finalized at the time of this Investment Grade Audit submittal. In fact, it is likely that there will be many more County sites added to this list as the solar PV project is developed. The estimated solar size is neither a maximum nor a minimum; it is just an estimate based on utility billing data. The finalization of this table will be completed after the solar PV designs are completed and routed through the County agency approval process.

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202010280560	Waihee - Pump	WAIHEE RD DWS	WAILUKU	3,914	1,106	6,262,800
202010610394	Kahului WWTP	AMALA RD	KAHULUI	3,080	565	4,928,000
202011411305	Environmental Management - Pumping	H PIILANI HWY	LAHAINA	2,379	664	3,807,000
201010198723	Department of Water Supply	HALIIMAILE RD	MAKAWAO	1,898	752	3,036,800

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202012265122	Environmental Management - Pumping	WELAKAHAO ST COM-WW	KIHEI	1,823	515	2,916,000
201014406429	Kehalani Community	KEHALANI MAUKA PKWY	WAILUKU	1,386	228	2,217,600
202010920140	Kalana O Maui Building	200 S HIGH ST	WAILUKU	1,367	425	2,187,300
202010284802	Police Dept - Kahului Tank SCADA	KAHULUI TANK SCADA	WAILUKU	1,351	278	2,161,200
202010894881	Mokuhau - Pump 501, 503	MOKUHAU RD CUST	WAILUKU	1,310	658	2,096,400
201011374828	Naplili Rd - Pump	NAPILI RD PUMP	LAHAINA	1,119	236	1,790,550
202010808337	Kupaa Well	KAHEKILI HWY	WAILUKU	1,023	204	1,636,500
202010840538	DWS Kaupakalua - Well	KAUPAKALUA RD WELL	HAIKU	888	433	1,420,400
202014118279	Lower Kula Boosters - E7 - 71B	OLINDA RD E7-71B	MAKAWAO	886	202	1,417,000
202011329390	DWS IAO Well	IAO WELL	WAILUKU	852	221	1,363,200
202013557261	North Waihee - 1 & 2	KAHEKILI HWY	WAILUKU	688	219	1,100,850
202013905403	Environmental Management - Pumping	S KIHEI RD SPS	KIHEI	666	190	1,065,500
201011367236	Department of Finance - Police Department	2201 PIILANI HWY	KIHEI	649	128	1,038,300
202014123600	Kualapuu Deepwell	KUALAPUU DEEP-WEL	KUALAPUU	589	175	942,540
201011534256	Maui Meadows - Pump 17	KILOHANA DR #17 PUMP	KIHEI	550	222	879,450
202010280149	Waihee Well - Pump - 514, 515	KAHEKILI HY CANE RD	WAILUKU	485	101	775,520
201013217744	Kehalani Community	KEHALANI MAUKA PKWY	WAILUKU	434	220	693,600
202011428135	Waiale - Pump - 581, 582	WAIALE DR	WAILUKU	424	99	677,760
202011882976	Honukahu Well	HONOKAHU WELL B CL-09	LAHAINA	409	178	654,000
202014359501	North Waihee Boosters - 1, 2, 3, 4	KAHEKILI HWY	WAILUKU	388	156	621,300
202010357558	Waikapu - Well	WAIKAPU WELL	WAILUKU	356	109	569,600
202010337121	Kanoa - Well 2	KAHEKILI HWY KANOA	WAILUKU	340	119	543,750
202013938149	Water Treatment Plant - Lahainaluna	LAHAINALUNA RD	LAHAINA	302	98	483,300
202010336610	Kanoa - Well 1	KAHEKILI HWY KANOA	WAILUKU	297	120	475,650
201012918466	Kuikahi - Pump 31	KUIKAHI DR PMP 31	WAILUKU	275	119	439,200
202010316950	Eluene Pl - Pumping Station?	ELUENE PL	WAILUKU	274	231	437,600
202014107009	Haiku Well	KOKOMO RD E58	HAIKU	262	66	418,800

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202011047075	Dept of Parks and Rec	KAAHUMANU AV MEM GYM AVE	WAILUKU	257	93	411,040
202014328845	Olinda Water Treatment Plant	3000 OLINDA RD	MAKAWAO	254	74	406,200
201013821933	Department of Water Supply	KULA KAI 541, 542 #2	KULA	245	168	392,250
202010792598	Kula Ag - Pump Station	OMAOPIO RD DITCH	KULA	238	47	380,200
201010700767	Department of Water Supply - REF NAPILI B, 570	NAPILI RD B	LAHAINA	230	89	367,800
202013685112	Lahaina Aquatic Center	SHAW ST	LAHAINA	221	58	354,160
201013648377	Department of Water Supply	HARRY FIELDS 543, 544	KULA	219	173	350,000
202010986158	Kepaniwai Well and Pump	IAO RD	WAILUKU	209	30	333,600
202010927723	Kula Ag - Pump Station	PULEHU RD 2	KULA	207	230	331,800
202010633701	Environmental Management - Pumping	HALAWAI DR	LAHAINA	206	51	329,850
202010358739	Diamond Resort Boosters	DIAMOND RESORT BOOSTERS	KIHEI	205	56	327,550
201013648914	Department of Water Supply	497 OLD HALEAKALA HWY	KULA	198	21	316,500
202010673145	Maui Lani Prkwy - Well 7	MAUI LANI PARKWAY WELL-7	WAILUKU	187	35	299,439
202010314849	Malu Ulu Olele - Pump - 533, 534	OLINDA RD	MAKAWAO	180	258	288,000
202013978665	Kula Water Treatment Plant	KAHAKAPAO RD	MAKAWAO	178	67	284,800
202010316000	Pookela Well - Pump - 531, 532	OLINDA RD	MAKAWAO	178	182	284,800
201013783984	Department of Water Supply	3445 HOOKIPA PL	KIHEI	173	88	276,750
202010472845	Olinda - Pump 535, 536	OLINDA RD	MAKAWAO	160	279	256,000
202011114040	Lahaina - Sewer Pump Station 2	2010 H PIILANI HWY 2	LAHAINA	158	55	252,960
202011783208	Sewer Pump Station - 10 - Grand Wailea	3850 WAILEA ALANUI DR GWSPS10	KIHEI	150	32	239,800
202011110857	Lahaina Civic Center	1762 H PIILANI HWY	LAHAINA	146	68	234,000
202010430876	Kahului Baseyard	PALAPALA DR	KAHULUI	141	49	225,507
202013566155	Old Court House Building	150 S HIGH ST	WAILUKU	141	53	225,040

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202010672709	Maui Lani Prkwy - Well 6	MAUI LANI PARKWAY WELL-6	WAILUKU	140	35	223,936
202011247196	Naplili-HNKW Sewer - NA-01	LOWER HONOAPIILANI RD NA01	LAHAINA	140	45	223,200
202013304615	Environmental Management	WASTE WATER TRTMNT PLNT CL-09	KAUNAKAKAI	134	31	213,920
202013956133	Lahaina - Sewer Pump Station 3	H PIILANI HWY E23	LAHAINA	133	50	212,000
202013943453	Pool	LIPOA ST POOL	KIHEI	131	60	208,800
202013877297	Mitchell Pauole Center	MITCHELL PAUOLE CENTER	KAUNAKAKAI	129	43	206,720
202010609388	Fire Station	ALANUI KA IMI IKE ST	KAUNAKAKAI	120	27	192,420
202011414325	Waipuna Well - Pump - 559, 560	LAHAINALUNA RD	LAHAINA	114	52	182,865
202011271725	Forensic Facility - The Milllyard	1831 WILI PA LOOP	WAILUKU	113	35	181,400
202013021789	Waiehu Golf Course	WAIEHU BEACH RD	WAILUKU	111	112	176,880
202011293695	Country Club - Pump 566, 567	HANA HWY ELEC	PAIA	106	33	169,413
202010364059	Pookela Well - E12	OLINDA RD E12	MAKAWAO	105	303	167,200
201013563857	Dept of Parks and Rec - Office	S KAM AV (OFF)	KAHULUI	102	50	162,950
202014198909	Pukalani Park Pool	PUKALANI ST POOL	PUKALANI	99	32	158,400
202013905288	Department of Finance - Claims Div Office	KANALOA AVE CENTRAL	KAHULUI	97	129	154,600
202011154178	Lanai Police Station	855 FRASER AVE	LANAI CITY	92	27	147,600
202010682369	Fire Station	300 KILOHANA DR	KIHEI	92	33	146,940
202011414366	Kanaha - Well 1	4300 LAHAINALUNA RD	LAHAINA	89	39	142,560
202011060128	Naplili-HNKW Sewer - NA-02	H PIILANI HWY NA-02	LAHAINA	89	27	141,760
202010634527	Pulehu - Flare	PULEHU RD FLARE	PUUNENE	84	21	134,250
202010681668	Kahului - Sewer Pump Station	58 HANA HWY	KAHULUI	81	34	130,200
202013943461	Kokua Pool	UHU ST POOL	KAHULUI	81	18	129,242
202014358008	Pool	LIPOA ST POOL	KIHEI	80	52	127,840
202011119353	Hamoa - Pump 597	HANA HAMOA PMP HWY E66A	HANA	78	26	125,120
202014331336	Department of Finance - Claims Div Office	KANALOA AVE	KAHULUI	76	42	122,080

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202011453315	Sewer Pump Station - 8	2995 S KIHEI RD SP8	KIHEI	74	19	119,000
202011089333	Police Station	1762 H PIILANI HWY	LAHAINA	74	19	117,780
202011232172	Maui Memorial Center	KANALOA BSBALL AVE	WAILUKU	73	110	117,450
202011399310	Sewer Pump Station - 7	2385 S KIHEI RD SPS7	KIHEI	72	29	115,600
202010034371	NASKA B Y	KEOLANI PL	KAHULUI	71	23	114,044
202014953170	Ualapue Well	UALAPUE WELL	KAUNAKAKAI	69	36	110,640
202010432872	Wailuku Gym & Pool	2026 PAKAHI ST	WAILUKU	68	20	109,384
202013551223	Waiehu Golf Course	WAIEHU GOLF COURSE	WAILUKU	67	20	107,748
202011523521	Sewer Pump Station - 4	S KIHEI RD SPS4	KIHEI	64	20	103,080
202010866475	Hana Community Complex	UAKEA RD	HANA	64	22	101,740
202011045608	Dept of Public Works - Office	41 KAAHUMANU AVE	WAILUKU	63	23	101,120
202010673632	Maui Lani Prkwy - Well 5	MAUI LANI PARKWAY WELL-5	WAILUKU	63	35	100,405
201012688903	Kekaa - Pump	KEKAA DR PUMP	LAHAINA	62	29	99,250
201015216470	Department of Water Supply	0000 W ALU RD	WAILUKU	60	34	96,540
202011089655	Police Station	1762 H PIILANI HWY A	LAHAINA	59	19	94,982
202013656428	Kawela Pump	KAWELA PUMP CL-09	KAUNAKAKAI	56	19	89,282
202011838325	Naplili-HNKW Sewer - NA-04	H PIILANI HWY NA-04	LAHAINA	53	22	84,160
202010762724	Department of Public Works	628 WHARF ST	LAHAINA	52	19	83,833
202014036281	Little League Park	REGIONAL PARK CL-09	KAUNAKAKAI	52	47	83,120
202013879871	Pool	SWIM POOL POLE1-1	KAUNAKAKAI	50	20	79,400
202010278978	Real Property Tax Division	70 E KAAHUMANU AVE A18	KAHULUI	50	18	79,237
202011231687	Maui Memorial Center	KANALOA AV FTBALL ST AVE	WAILUKU	49	80	77,600
202011381615	Fire Department	313 MANEA PL WHSE	WAILUKU	48	27	76,460
202011881457	Napili Water Treatment Plant	NAPILI RD	LAHAINA	47	176	75,400
202010082115	Kehalani Mid-Level Boosters	KEHALANI MIDLEVEL BOOSTERS	WAILUKU	47	56	75,150
202012265460	Sewer Pump Station - 5	S KIHEI RD SPS-5	KIHEI	47	19	74,880

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202011088699	Police Dept - Ulapalakua Radio Site	PUU MAHOE HILL	KULA	46	18	72,907
201012198606	Department of Water Supply.	KAHAKAPAO RD WTP	MAKAWAO	45	20	71,850
201013914043	Department of Parks and Rec	1501 LILOA DR PARK	KIHEI	45	99	71,700
202012032910	Irrigation Pumps - Kalama	KIHEI RD E-144	KIHEI	45	70	71,231
202010662163	Environmental Management - Pumping	PUNA RD	PAIA	44	19	70,189
202014328498	Claims Division	KANALOA AVE	WAILUKU	42	66	66,600
202011306554	Sewer Pump Station - 3	S KIHEI RD SPS3	KIHEI	41	19	64,840
202011392851	Dept of Parks and Rec - Pool	145 KAULAWAHINE ST	KAHULUI	40	20	64,667
202010532150	Sewer Maintenance Building	58 HANA HWY	KAHULUI	39	18	62,208
202011410117	Naplili-HNKW Sewer - NA-03	H PIILANI HWY NA-03	LAHAINA	39	24	61,680
202011339100	Dept of Public Works?	86 KAMEHAMEHA AVE	KAHULUI	37	20	59,998
202010433292	Kahului Fire Station	200 DAIRY RD	KAHULUI	36	33	57,600
202010160226	Waiehu Golf Course	HALEWAIU RD	WAILUKU	36	10	57,540
202011395748	Wailuku Fire Station	1972 KINIPOPO ST	WAILUKU	35	-	55,884
202011414424	Kahaha Well 2 - Pump 576	3500 LAHAINALUNA RD	LAHAINA	34	38	54,880
202011158294	Environmental Management - Landfill	PULEHU RD	PUUNENE	34	22	54,760
201013118710	Department of Water Supply	HANA HWY	HANA	33	17	53,539
202012094290	Naplili Fire Station	HANAWAI ST	LAHAINA	32	-	50,455
202011099522	Park	MILL ST BASEBALL	LAHAINA	30	57	48,433
202010480707	Paukukalo Pump Station	608 KALAKAUA ST	WAILUKU	30	-	47,850
202010150730	KCC - Irrigation Well	ONEHEE ST	KAHULUI	30	21	47,660
202013055076	Pukalani Community Center	PUKALANI ST	PUKALANI	29	-	45,784
202010152744	Malu Ulu Olele Pump Station 5	FRONT ST	LAHAINA	29	-	45,669
202012039774	Fire Station	S KIHEI RD FIRE	KIHEI	28	-	45,202
202010258699	Kaa Pump Station	ALAHAO ST	KAHULUI	28	-	44,223
202010566703	Omaopio Tank & Booster - Pump - 580	OLD HALEAKALA HWY	PUKALANI	28	9	44,160

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202011111541	Fire Station	HANA HWY	PAIA	27	-	43,518
202010402537	Papohaku Park	LOWER MAIN ST	WAILUKU	26	50	41,781
202011165364	Park	LILOA DR SOFTBALL	KIHEI	26	43	40,939
202011045152	Maui War Memorial Stadium	KAAHUMANU AVE	WAILUKU	25	32	40,657
202013492972	Fire Station	KULA HWY	KULA	25	-	40,424
202010068924	Central Wailuku Heights - Pump #3	LII WAY PMP#3	WAILUKU	25	25	39,780
202011236298	Makawao Fire Station	MAKAWAO AVE	PUKALANI	25	-	39,205
202011111749	Lahaina Civic Center	1762 H PIILANI HWY	LAHAINA	23	38	37,200
202011339290	Dept of Public Works?	86 KAMEHAMEHA AVE	KAHULUI	23	-	36,685
202010662940	Hana Civic Center	HANA HWY	HANA	22	-	34,486
202013339595	Park	KALAMA PKWY RINK	KIHEI	21	23	34,344
201011548975	Dept of Parks and Rec	211 KANALOA AVE	WAILUKU	21	-	33,880
202012386498	Environmental Management - Pumping	S KIHEI RD KIHEI-2	KIHEI	21	-	33,304
202013706314	Police Dept - Puu O Hoku Radio Station	PUU O HOKU CL-09	KAUNAKAKAI	21	-	33,213
202010428227	Dept of Finance - Office	1840 H PIILANI HWY	LAHAINA	20	161	32,250
202013781945	Fire Station	HOOLEHUA FIRE STATION CL-09	HOOLEHUA	20	-	31,954
202013812286	Hana Fire Station	HANA HWY	HANA	20	-	31,850
202010402818	Wailuku Community Center	395 WAENA ST WKU	WAILUKU	19	-	30,008
202010431064	Lanai Gym	LANAI AVE	LANAI CITY	19	-	29,897
202010343210	Keanae Well and Pump	WAILUA RD	HAIKU	18	-	29,592
202013875325	Molokai Community Center	MOLOKAI COMMUNITY CENTER CL-09	KAUNAKAKAI	18	-	29,216
202012039618	Lahaina Sewer Treatment Plant	H PIILANI HWY KAPALUA	LAHAINA	18	-	28,864
202010021105	Lanai Senior Center	309 SEVENTH ST	LANAI CITY	18	-	28,200
202014132494	Police Station	HANA AIRPORT SITE	HANA	18	-	28,105
202010842492	Environmental Management - Sewer	AKAKUU ST SEWER	WAILUKU	17	-	27,777
202011300847	Ainakea Park	ALAMOANA ST 4	LAHAINA	17	-	26,800
202013874856	Department of Water Supply	MAHINAHINA RD W	LAHAINA	17	22	26,800

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202011298462	Skill Village - Pump - 595, 596	BALDWIN AVE	PAIA	17	19	26,480
202011095405	Wailuku Country Estates - Booster 3	WKU CTRY EST #3 BOOSTER	WAILUKU	16	8	26,380
202014133518	Police Station	KEANAE	HANA	16	-	26,258
202013714466	Kamiloloa Booster	KAHINANI PL PUMP	KAUNAKAKAI	16	-	25,887
202010438010	Spreck Pump Station	LAULEA PL	PAIA	16	-	25,653
202010984203	Kaunoa Senior Center	HANA HWY	PAIA	16	-	25,342
202010738021	Wakea - Sewer Pump Station	WAKEA AVE	KAHULUI	16	-	25,291
202010063370	Wailuku Tennis Center	WELLS ST TENNIS CRT ST	WAILUKU	16	-	25,032
202010872440	Kalae - Well 1	KAPALUA PL WELL-1	LAHAINA	16	-	25,006
202010561100	Haleakala Acres - Pumps 547, 548	OLD HALEAKALA HWY	KULA	16	-	24,880
202010129445	Kahului Community Center	UHU ST	KAHULUI	15	-	24,519
202013304904	Environmental Management	SEWER TREATMENT STATION CL-09	KAUNAKAKAI	15	-	24,019
202010432419	Wailuku Gym & Pool	2026 PAKAHI ST	WAILUKU	15	-	23,937
202011030071	Environmental Management - Pumping	1827 KAOHU ST	WAILUKU	15	-	23,918
202010403170	Papohaku - Well Pump	LOWER MAIN ST PUMP-PAR	WAILUKU	15	-	23,516
202013682143	Department of Public Works	MLOA HWY	KAUNAKAKAI	15	-	23,458
201014619849	Hale Mahaolu Ewalu Senior Housing	65 OHIA KU ST COMM CTR	PUKALANI	15	20	23,400
202010068205	Wells Park & Tennis Court	1967 WELLS ST	WAILUKU	15	-	23,244
202010151050	Kahului Community Center Park	ONEHEE AVE	KAHULUI	14	-	23,189
202010130005	Kahalui Community Center	275 UHU ST	KAHULUI	14	-	22,887
202010435180	Kula Community Center	KULA HWY E2-103	KULA	13	-	21,160
202010212027	Leisure Estate - Sewer Pump Station	AKAKE ST	WAILUKU	13	-	21,002
202011746015	Environmental Management	WAILEA RD COM-WWP2	KIHEI	13	-	20,795
202010734038	"Flako" Gym and Paia Park	BALDWIN AVE E57	PAIA	13	-	20,353
202011481183	Lanai WWTP	LANAI CITY	LANAI CITY	12	-	19,730
202010311811	Lahaina Recreation Center	SHAW ST	LAHAINA	12	-	19,615
202011087683	Waiehu Golf Course - Clubhouse	2220 KAHEKILI HWY	WAILUKU	12	-	19,454

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
202011115096	Environmental Management	2020 H PIILANI HWY KA-02	LAHAINA	12	-	19,418
202013272572	Environmental Management - Landfill	KAMEHAMEHA V HWY	HOOLEHUA	12	-	19,360
202011035286	Lahaina Park	245 SHAW ST	LAHAINA	12	-	19,046
202011657931	Sewer Pump Station - 16	4850 MAKENA ALANUI RD SP16	KIHEI	12	-	18,758
202013185717	Koali Boosters	HANA HWY KOALI	HANA	12	-	18,645
202011746338	Park	WAILEA RD WLKWY	KIHEI	12	-	18,464
202011041961	Dept of Parks and Rec	544 IAO RD	WAILUKU	12	-	18,461
202013157880	Park	S KIHEI RD COMFORT	KIHEI	11	-	18,353
202010794222	Police Station	31 KEANINI DR POLICE	HANA	11	-	17,498
202011348218	Kahului Community Center Park	ONEHEE AVE TENNIS	KAHULUI	11	-	17,403
202013786670	Department of Public Works	MLOA HWY	KAUNAKAKAI	11	-	17,170
202011555192	Environmental Management	NOHEA KAI ST KA-01	LAHAINA	11	-	17,166
202010527739	Makawao Park	MAKAWAO AVE 3	MAKAWAO	11	31	17,117
202011205038	Haiku Community Center	1008 HANA HWY	HAIKU	11	-	17,008
202010100925	Park	LOWER KULA RD	KULA	11	23	16,920
202010242875	Park	MAIHA ST PARK	LAHAINA	11	-	16,854
202013946332	Lahaina Baseball Complex	H PIILANI HWY BASEBALL	LAHAINA	10	-	16,538
202010682898	Department of Finance - Office	788 PAUOA ST	LAHAINA	10	21	16,380
202013275757	Kalae - Booster	KALAE BOOSTER	KUALAPUU	10	-	16,349
201014675460	Department of Finance - Office	2154 KAOHU ST A	WAILUKU	10	-	16,296
202012060762	Naplili-HNKW Sewer - NA-05	H PIILANI HWY NA-05	LAHAINA	10	-	15,900
202014298295	Fire Station	PUKOO FIRE STATION CL-09	KAUNAKAKAI	10	-	15,675
201012194795	Environmental Management - Landfill	PULEHU RD	PUUNENE	10	-	15,475
202010839050	Wailuku Mini Park	70 N MARKET ST	WAILUKU	10	-	15,224
202011165661	Park	LILOA DR SOCCER	KIHEI	9	30	15,166
202010894394	Hana Garage	1510 UAKEA ST	HANA	9	-	14,614
201014259315	Dept of Parks and Rec	4655 KAMEHAMEHA AVE SWBD #3	KAHULUI	9	-	14,550

HECO Account	Location	Service Address	City	Est Solar PV Size based on usage (KWdc)	Estimated Storage Capacity (KW)	Baseline HECO kWh Metered Consumption
201012569772	Kahakuloa Radio Site	KAHAKULOA RADIO SITE	WAILUKU	9	-	14,536
201013118728	Department of Water Supply	HANA HWY	HANA	9	16	14,505
202013403698	Waiehu Terrace Park	ALIHILANI ST	WAILUKU	9	-	14,427
202011112879	Pukalani Community Center	252 HANA HWY	PAIA	9	-	14,270
202011393313	Kahalui Pool	145 KAULAWAHINE ST	KAHULUI	9	-	13,644
202014141826	Molokai Baseyard	MAKAENA PL	KAUNAKAKAI	8	-	13,590
202013561370	Police Station	POLICE COTT A	KAUNAKAKAI	8	-	12,347
202010657023	DHHL - Kula - Pump Station 2	KULA HWY PUMP	KULA	7	37	10,950
201013563824	Dept of Parks and Rec	4655 KAMEHAMEHA AVE SW BRD2	KAHULUI	7	7	10,700
202010496174	Hamakuapoko Well 2 & Boosters	HAMAKUAPOKO WELL-2	HAIKU	3	72	5,550
202013728573	Lanai Community Complex	FRASER AVE TENNIS	LANAI CITY	2	4	2,884
			Total	41,574	14,877	

The solar PV arrays will be funded through a Power Purchase Agreement (third party), or other third-party financing. The scope of work and costing described in this section is ultimately dictated between the Customer and the third-party financier. No up-front costs are included for this measure.

The table above shows the estimated system sizes throughout the various sites. These estimates are based on the target maximize size of a solar PV system built to offset nearly all of the utility purchased power at each site. The actual system size (kW-DC) and PV energy output (kWh) are subject to change, dependent on final design, permitting, and interconnection requirements. Additionally, there will be physical design constraints that will limit the maximum solar PV size at some of these sites.

In addition to the solar PV sizes included in the table above, an estimate of the battery energy storage sizes are shown. These are estimated based on the assumption that the PV systems would produce more during peak solar hours that a particular facility's load could use, and instead of exporting that production back to HECO, or curtailing that production, a battery energy storage system will absorb that extra solar PV production, and discharge it to the facility's load during the evening, night, and early morning. These battery energy storage sizes are subject to change based on the County's requirements for energy storage capacity, for other uses such as backup power or furnishing additional renewable energy at Resiliency Hubs.

The kWh production of the solar PV was estimated using Helioscope design software. There is no other calculation of savings for this FIM. The PPA provider will measure the AC Energy (kWh) output of each of the solar PV systems, which will be the basis for the PPA billing. The PPA provider is incentivized to ensure each PV system produces it maximum capability because the Customer only pays the PPA provider when the systems are on and generating power. If the solar PV systems do not operate or under-perform, the Customer will just continue to purchase power from HECO. If the solar PV systems over-produce, the Customer will purchase the solar production that exceed the estimated amounts at the agreed to PPA rate. The target PPA rate for the County's purchase of electric kWh in this project is an initial rate of between $0.21 to $0.25 per kWh with an escalator of 1.82% - 3.25% for 20 years (contingent on financing). The second component of the PPA rate is for the energy storage, also known as the Capacity Charge, and will be a fixed monthly charge per kW of battery capacity. The fixed monthly charge per kW of battery capacity will be set with a target to match the utility's monthly demand charge on a per kW basis. The Capacity Charge can be increased to compensate for larger battery energy storage systems at some, or any combination of sites, if the County chooses to increase the battery sizing for additional battery benefits such as microgrid capabilities, backup power, or participation in utility funded grid service programs.

Johnson Controls is not providing an additional guarantee of the performance or output of the annual kWh of the systems described in this FIM-20 Solar PV and Energy Storage as part of the Assured Performance Guarantee. Thus, an M&V method is not listed for this FIM because there are not additional guarantees of the solar PV FIM in this contract. JCI will not separately provide production results because solar PV system production will be reported by the County's PPA provider on a monthly basis.

FIM 21 – Genset Block Heater Replacement

Existing Conditions

Stand-by Diesel Generators must be kept hot at all times so that they can start instantaneously during a power outage. This heating process is achieved thru the use of electric resistance block heaters.

While most pumping stations, fire stations, police stations and wastewater facilities do have emergency generators, Johnson Controls estimates that the generators in the list below might be the best candidates for this solution, as these are believed to have the electric block heaters and that they are actually being used:

	Generator		
Building	**Make**	**Model**	**Engine Size (kW)**
Wailea Fire Station	Cummins	230DFAB- 2834	230
Lahaina Wastewater Reclamation Facility	Cummins	DFHA- 5567107	750
Napili Water Treatment Site A	Cummins	DFEJ -1616719	450
Wailuku Police Station	CAT	3406	375

FIM Description

Electric resistance block heaters can be replaced with much more efficient heating sources. The solution being evaluated is the use of Geo-Thermal Systems, Inc (GTS) Heat Pump to heat emergency diesel generators.

GTS Heat Pump users have experienced power savings as high as 84% versus heating with resistance block heaters that come installed with emergency diesel generators as standard equipment.

GTS Heat Pumps are installed in series with the existing block heater(s). This adds extra redundancy to further prevent cold start wear or failure of the generator. Resistance block heaters typically fail before 5 years of use, while the life expectancy of a GTS Heat Pump is over 20 years.

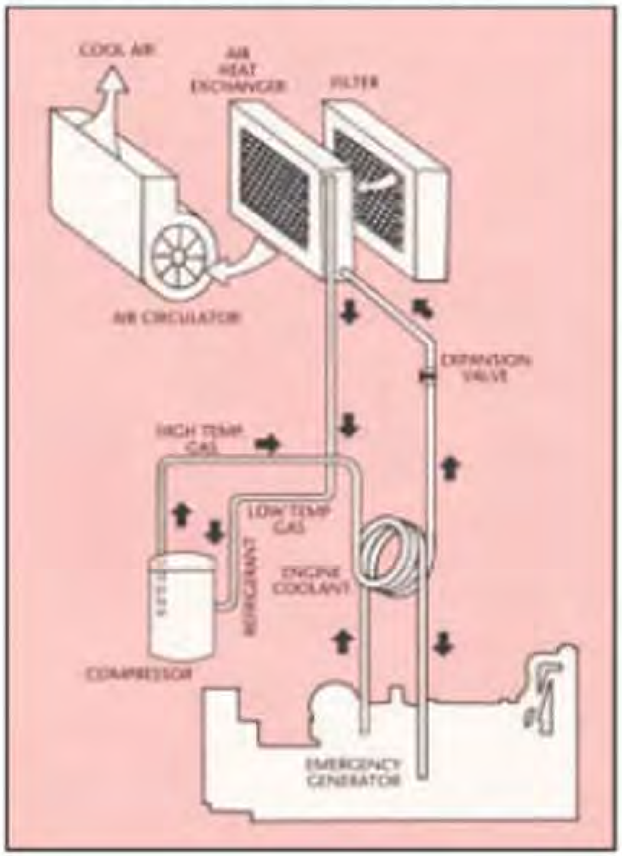
Installation of the GTS system involves the following:

- Mount heat pump within approximately 10 ft. of the block heaters
- Electrical service provided to the heat pump from nearby panel or disconnect
- Install breaker or disconnect (if not existing)
- Plumb silicone hose from the engine, through the heat pump, and back into the line side of the block heater so that the heat pump and block heater are "in series" related to the coolant flow.
- Set temperature thermostat in order to create redundant controls between heat pump and block heater
- Install PVC from condensate line to nearest drain or similar appropriate location.
- Location of heat pumps will be located in the best possible position to allow a complete installation and allow access to the generator for service and testing. The condensation tubing will be directed as to not interfere or pose a hazard to daily operations or the environment.

- The installation will not involve an interruption of power to any emergency circuits or unnecessary operation of the generator set.
- Provide Startup, commissioning and user training (O&M manuals included)
- One Year Warranty on materials and workmanship

How it works:

Heat pump technology takes available heat out of the air and transfers it efficiently to the engine coolant system by using refrigerant under pressure.



Specifications:

Heat Pump Model DH-12

Heating Capacity	19,800 BTU/Hr*
Cooling Capacity	15,200 BTU/Hr*
Voltage	208/230 phase I
Circuit Ampacity	10 AMP
Amps	5
Power Consumption	1.4 KW/Hr
C.O.P.	4.2*
Dimensions (DxWxH)	22" x 17" x 43"
Weight	160 Lbs.

GEO-THERMAL SYSTEMS, INC.®

We transfer energy into savings.

*90° F entering air and 100° F entering water

FIM 22 – Ice Machine Heat Exchanger Installation

Existing Conditions

The majority of Fire Station, Police Stations and Wastewater facilities have air-cooled ice machines on site.

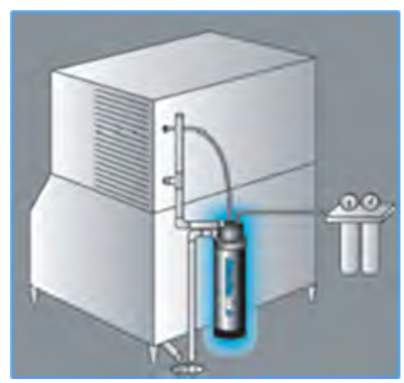
The attached list identifies ice machines located

Site	Ice Machine Count	ARI* rated ice production (lbs. / 24 hrs)	ARI* rated KWH usage (KWH / 100 lbs.)	MFG / Model
Fire Prevention Bureau	1	650	5	Hoshizaki KM-660MAJ
Hana Fire Station	1	660	5	Hoshizaki KM-660MAJ
Kahalui Firestation	2	660	5	hoshizaki KM-660MAH
Kahului Baseyard	2	800	5	(2) hoshizaki KM-340MAH
Kaunakakai Fire	1	650	5	Hoshizaki KM-650MAH
Kaunoa Senior Service	1	350	5	hoshizaki KM-350MAH
Kihei Firestation	1	340	5	hoshizaki KM-340MAH
Kihei Police Station	1	340	5	hoshizaki KM-340MAH
Kihei Wastewater Reclamation Wwtp	1	515	5	hoshizaki KM-515MAH
Kula Fire Station	1	350	5	hoshizaki KM-350MAH
Lahaina Fire Station	1	515	5	hoshizaki KM-515MAH
Lahaina Police	1	340	5	hoshizaki KM-340MAH
Lahaina Waste Water	1	451	5	Hoshizaki KML-451MAH
Lanai Baseyard	1	1301	5	hoshizaki km-1301SAJ
Lanai Fire Station	1	650	5	hoshizaki km-650mah
Lanai Police	1	381	5	hoshizaki FA381
Lanai Wtp	1	853	5	Hoshizaki SD853W
Lanai Senior Center	1	340	5	manitowac 340-A
Makawao Fire Station	1	350	5	hoshizaki KM-350MAH
Mitch Pauole	2	425	5	Hoshizaki KM-500MAH
Molokai Baseyard	1	660	5	Hoshizaki KM-660MAH
Napili Fire Station	1	340	5	hoshizaki KM-340MAH
Paia Fire Station	1	350	5	hoshizaki KM-340MAH
Wailea Fire Station	1	340	5	hoshizaki KM-340MAH
Wailuku Baseyard	1	660	5	Hoshizaki KM-660MAH
Wailuku Police Station	1	340	5	hoshizaki KM-340MAH

Existing Deficiencies

Most ice machines are protected in a garage or located in an exterior area. These machines continue to make ice until the bin is full.

FIM Description – Ice Machine Efficiency – Heat Exchanger



Refrigeration Line Heat Exchangers: With a refrigeration heat exchanger system installed, cold discharge water from an ice machine or refrigeration unit is exposed to incoming domestic water in a reservoir. This heat exchange can cool incoming water by more than 16%. This drop in temperature improves the efficiency of the ice machine by more than 18%. This creates energy savings by reducing the cooling load and cycle time of the ice machine or refrigeration unit.

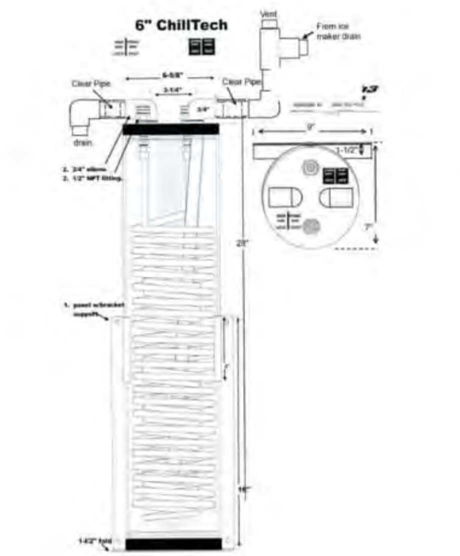
A summary of the proposed scope of work is in the table below.

Site	Ice Machine Count	MFG / Model	Quantity	Scope of Work
Fire Prevention Bureau	1	Hoshizaki KM-660MAJ	1	Chilltech - Ice Machine Heat Exhanger
Hana Fire Station	1	Hoshizaki KM-660MAJ	1	Chilltech - Ice Machine Heat Exhanger
Kahalui Firestation	2	hoshizaki KM-660MAH	2	Chilltech - Ice Machine Heat Exhanger
Kahului Baseyard	2	(2) hoshizaki KM-340MAH	2	Chilltech - Ice Machine Heat Exhanger
Kaunakakai Fire	1	Hoshizaki KM-650MAH	1	Chilltech - Ice Machine Heat Exhanger
Kaunoa Senior Service	1	hoshizaki KM-350MAH	1	Chilltech - Ice Machine Heat Exhanger
Kihei Firestation	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger
Kihei Police Station	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger
Kihei Wastewater Reclamation Wwtp	1	hoshizaki KM-515MAH	1	Chilltech - Ice Machine Heat Exhanger
Kula Fire Station	1	hoshizaki KM-350MAH	1	Chilltech - Ice Machine Heat Exhanger
Lahaina Fire Station	1	hoshizaki KM-515MAH	1	Chilltech - Ice Machine Heat Exhanger
Lahaina Police	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger
Lahaina Waste Water	1	Hoshizaki KML-451MAH	1	Chilltech - Ice Machine Heat Exhanger
Lanai Baseyard	1	hoshizaki km-1301SAJ	1	Chilltech - Ice Machine Heat Exhanger
Lanai Fire Station	1	hoshizaki km-650mah	1	Chilltech - Ice Machine Heat Exhanger
Lanai Police	1	hoshizaki FA381	1	Chilltech - Ice Machine Heat Exhanger
Lanai Wtp	1	Hoshizaki SD853W	1	Chilltech - Ice Machine Heat Exhanger
Lanai Senior Center	1	manitowac 340-A	1	Chilltech - Ice Machine Heat Exhanger
Makawao Fire Station	1	hoshizaki KM-350MAH	1	Chilltech - Ice Machine Heat Exhanger
Mitch Pauole	2	Hoshizaki KM-500MAH	2	Chilltech - Ice Machine Heat Exhanger
Molokai Baseyard	1	Hoshizaki KM-660MAH	1	Chilltech - Ice Machine Heat Exhanger
Napili Fire Station	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger
Paia Fire Station	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger
Wailea Fire Station	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger
Wailuku Baseyard	1	Hoshizaki KM-660MAH	1	Chilltech - Ice Machine Heat Exhanger
Wailuku Police Station	1	hoshizaki KM-340MAH	1	Chilltech - Ice Machine Heat Exhanger

Scope of Work

Johnson Controls shall provide Ice Machine Heat Exchanger Installation work that will include all necessary labor, materials, equipment, transportation, and storage for locations as identified in the detailed line by line, shown in Appendix 2 – Ice Machines – Refrigeration Line Heat Exchangers. Work will be performed in accordance with current applicable local, state, and federal codes and regulations promulgated at time of contract execution.

- Heat Exchanger shall be installed by taking the existing drain tubing from the ice maker (waste water) and installing it to the inlet. Then installing the continuation drain to the drain



Equipment Manufacturer

The following are the list of manufacturers and their warranties:

Product	Manufacturer	Warranty (yrs)
Ice Machine Heat Exchanger	Systems IV	1

Warranty does not cover damage by misuse, abuse, tampering or “acts of nature” outside our control.

Energy Savings Calculations

The savings will be calculated according to the following formulas:

There are electric savings specifically associated with the heat exchange of cool incoming water. This drop in temperature improves the efficiency of the ice machine. This creates energy savings by reducing the cooling load and cycle time of the ice machine or refrigeration unit.

The equations used are shown below:

Equations for Ice Machine Heat Exchangers

KWH rate for location (+ fuel charge): Electric Rate Supplied

Ice Machine Run Time (% per day)

AHRI rated ice production (lbs. / 24 hrs): Rated ice production in lbs of the ice for 24 period*

AHRI rated KWH usage (KWH / 100 lbs.)*

Current Kw/h = (ARI rated ice production (lbs. / 24 hrs) divided by 100) x ARI* rated KWH usage (KWH / 100 lbs.) x Ice Machine Run Time (% per day)*

Savings = Observed energy savings studies - Manitowoc, Hoshizaki of 15%

All machines Manitowoc, Hoshizaki

Baseline Measurements

The AHRI (Air Conditioning, Heating and Refrigeration Institute) Product Performance Certification Program is a voluntary program, administered and governed by AHRI, which ensures that various types of heating, ventilation, air conditioning, refrigeration, and water heating products perform according to manufacturers' published claims. Assumptions are based on AHRI ratings

** Ice Machine manufacturers certify ice production performance numbers at 90˚F*

**Ambient air and 70˚F water temperatures (ARI Standard 810 ratings).*

Commissioning Procedure

Installation is to be completed per manufacturer specifications.

Training Required

Standard Operations and Maintenance Overview of all standard plumbing material provided

Operation and Maintenance (O&M) Cost Savings Calculations

The following is calculated for annual repair and replacement based on total fixture population.

No O&M Factored

FIM 23 – Propane to Heat Pump Pool Heater Conversion

Existing Conditions

All of the aquatic centers have propane pool heaters, with the exception of Wailuku Pool which has already electric heat pumps.

Kihei Aquatic Center

Pools are heated using propane – Heating Season is September to March

Upcountry Pool

Pool is Heated Year Round

Lahaina Aquatic Center

Pools are heated using propane – Heating Season is September to March

Coach Sakamoto Pool

Pools are heated using propane – Heating Season is September to March

Kokua Pool

Pools are heated using propane – Heating Season is September to March

Wailuku Pool

Pool is heated using air source heat pumps

- Heating Season is approximately 8-10 months
- Extended heating season because pool is highly used by Kapuna for therapeutic purposes
- Heat pumps are scheduled for replacement, according to pool maintenance staff

Cooke Memorial Pool (Molokai)

Pool is heated using high efficiency Propane Year from September to March

Coach Spencer Shiraishi Memorial Pool

Pool Is heated using propane from September to March

The pictures below show some of the existing propane heaters.

Coach Sakamoto Pool Heater

Kokua Pool Heater

Coach Shiraishi Pool Heater

Upcountry Pool

FIM Description

The existing pool pump heaters that use propane as the fuel source are standard efficiency (82%) LPG boilers. While there are commercially available High efficiency propane boilers, the recommended solution is to replace the propane heaters with electric heat pumps which are significantly more efficient than propane heaters.

Since converting these heaters from propane to electric will require an evaluation of the electrical service on the building to make sure that it is adequate for the proposed equipment.

Scope of Work

Johnson Controls will evaluate the replacement of the existing standard efficiency LPG boilers with new air-to-water electric heat pumps.

Commercial Sized Heat Pump - Heats & Cools Large Commercial Pools

ICEBREAKER® Heat & Cool with Active Defrost
• Extends swimming season longer
• Continues to heat in freezing temperatures to minimize heat loss
• **Cool your pool to a refreshing temperature**
• Set to heat, cool or autotemp

High Performance Air Source Heating & Cooling

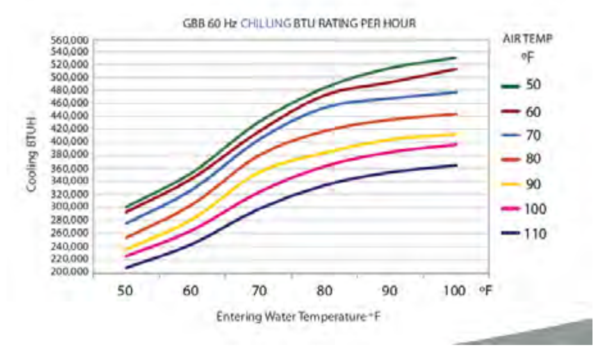
• Heavy Duty Design and Construction
• Quiet Operation
• Energy Efficiency

Titanium Heat Exchanger
• Patented counter-flow water management system
• Heats water faster and more efficiently
• Impervious to chemical corrosion
• Durability without sacrificing performance

PoolSync™ Ready
• Adjust the mode to heat, cool or autotemp, and set your temperature through the PoolSync app

*Additional purchase of PoolSync Wi-Fi Controller required
Microprocessor Controlled with LCD Display
• Microprocessor controlled defrost cycle

Corrosion Resistant Cabinet
• Rust resistant, heavy gauge G90 Galvanneal steel with 7 step Powder Coat process
• ElectroFin® epoxy polymer coated evaporator coils
• Polymer condensate drain system
Polymer coated fan guards



Equipment Manufacturer

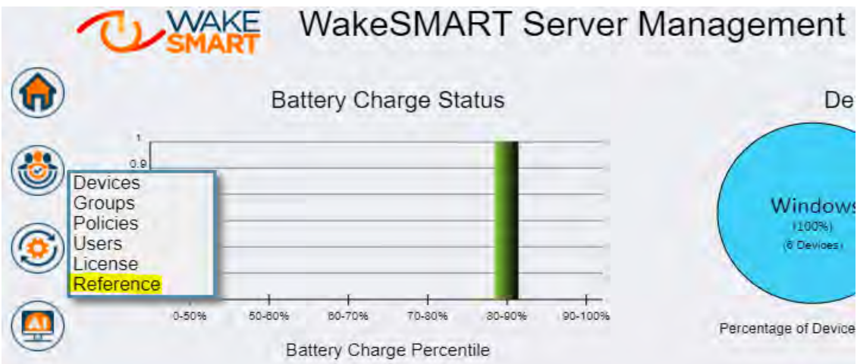
Johnson Controls will evaluate multiple suppliers of pool heat pumps for the County. To date, we have analyzed AquaCal, and in the next phase of the IGA, we will see if any heat pump pool equipment is available from local suppliers or distributors.

FIM 24 – PC Power Management

FIM Description

PC Power Management is the concept of centrally managing all of an organization's computer power settings for the purpose of dramatically reducing energy waste. While there are a lot of ways to turn off computers, few do the job in a way that is actually appropriate with real-world computer usage.

The proposed solution is to install PC (personal computer) power management software, which is a mechanism for controlling the power consumption/ usage of personal computer hardware. Energy savings is achieved through the use of a centralized, on-premise or cloud-based, management application that puts PC hardware into a low power state, when not in use. A typical office desktop PC may consume approximately 150 watts when active (PC base unit and monitor) and a mere one to three watts when placed into low power mode.



This solution is focused on providing energy savings through the placement of PC hardware into the lowest power demand state available. Although personal computers typically have access to lower power settings through their native operating systems, users tend to disable these settings or use them very inconsistently, as they're considered productivity reducers. The WakeSMART solution being proposed will enable the County to measure, manage, and monitor all of their computing and mobile devices and track their locations. Through energy savings and by reducing IT administration time, WakeSMART has a very short payback. On-premise Enterprise and Cloud-based options are available to suit the needs of the County.

Installation and system administration are fast and efficient. WakeSMART is a secure, encrypted platform. With this FIM and the centralized management application, the power consumption policies will be created and, more importantly, enforced. These policies can be individualized and customized for different groups such as: type of users, department, building, etc.

WAKE SMART

IT PC Energy and iOS Management

Basic PC Power Management Capabilities	SCCM	GPO	Surveyor	WakeSMART
Centralized Control and Administration	✓	✓	✓	✓
Collection-based Policies	✓	✓	✓	✓
Support for Simple Power Policies	✓	✓	✓	✓
Basic Usage and Savings Reporting	✓		✓	✓
Support for Windows 10	✓	✓	✓	✓
Support for MacOS				✓
Support for ChromeOS				✓
Support for Android OS				✓
Sleep, Restart, Shutdown	✓		✓	✓
Display Standby	✓	✓	✓	✓
Active Directory Integration	✓	✓	✓	✓
Wake-On-LAN	✓		✓	✓
Remote* Wake				✓

Other Capabilities	SCCM	GPO	Surveyor	WakeSMART
Wake-on-Web for Remote Users			✓	✓
One-click PC Sleep Disorder resolution			✓	✓
Real-time control of PC Power States			✓	✓
Multiple Intra-day Power Policies	✓		✓	✓
Historical Data Retention and Advanced Reporting			✓	✓
Battery Charge Capacity tracking				✓
Battery Life Extension				✓
Auto-upgrade Capable			✓	✓
White-List Applications			✓	✓

Energy Capabilities	SCCM	GPO	Surveyor	WakeSMART
Demand Reduction				✓
AdHoc Power State Control			✓	✓
30% Energy Savings Above all Other Solutions				✓

Johnson Controls started the process of evaluating this FIM during this IGA, but was unable to complete this due to concerns the County's Chief Information Security Office (CISO) expressed, thus delaying this until a future phase. To properly evaluate the feasibility and savings potential of this FIM, the software will need to be deployed to a sample of computers to collect baseline data of when the computers are in use, and on what power state it is in. This will obviously have to be performed in conjunction with the County's IT department and with their approval. A webinar can be setup to cover any questions or concerns before any further steps are taken.

Below is the list of questions that Johnson Controls needed answers to, along with the answers provided by the County, including some questions that the CISO was not able to answer.

Johnson Controls

PC Power Management Questionnaire

1. How many PCs (Windows-base) do you have across the County? Approximately 2585 How many Macs? No Macs supported by ITSD Are they all under one centralized IT Department? No Or does each Department have its own IT group and network? All departments other than Office of Council Services and County Clerk's Office are under centralized IT Services Division, Department of Management
2. What operating system runs on your computers? (clients/servers) Windows
3. What percentage of CRT vs. LCD monitors? All LCD, no CRT monitors How many dual-monitors, if any? Approximately 75% of desktops are dual-monitor configuration. About 80% of our computers are all-in-one models so the primary display is built in with a second monitor attached. Some dual-monitors are on small form factor or tower computers with two monitors attached.
4. How many Laptops vs. Desktops (are included in your first answer)? Laptops = 485 Desktops = 2100
5. Describe the PC power management policies, if any, that the County currently has in place? How are they enforced? Power Management policies vary. Majority of the computers are set for a High Performance Power Plan.

When computer is:	Plugged in	Running on batteries
Require a password on wakeup:	Yes	Yes
Turn off hard disk after:	Never	After 10 minutes
Sleep after:	Never	After 15 minutes
Allow hybrid sleep:	Off	Off
Hibernate after:	Never	Never
Lid close action:	Do nothing	Sleep
Power button action:	Shutdown	Shutdown
Start menu power button:	Do nothing	Do nothing
Link State Power Management:	Off	Moderate power savings
Minimum processor state:	After 100 minutes	After 5 minutes
Maximum processor state:	After 100 minutes	After 100 minutes
Turn off display after:	After 240 minutes	After 10 minutes
Adaptive display:	On	On
Critical battery action:	Do nothing	Shutdown
Low battery level:	After 10 minutes	After 10 minutes
Critical battery level:	After 5 minutes	After 5 minutes
Low battery notification:	Off	On
Low battery action:	Do nothing	Do nothing

6. Do you have Chromebooks? No How many Chromebooks are managed by the County?
7. How do you manage the Chromebook fleet? N/A
8. Do the Chromebooks go home every night? If so, what percentage goes home? N/A
9. How are the Laptops used (i.e., are they desktop replacements or are they used just during the day and charged at night)? Are they put in a charging-cart, or similar, at night? Approximately 80 laptops are desktop replacements with a dock and monitors in the office. These are left at the desk connected to the dock when not taken by the employee to be used for remote work. Most laptops are probably used outside of County facilities by employees working remote.

10. How do you normally deploy software? (Active Directory, Login Script, Group Policy Object (GPO), etc.) Per CISO, unable to provide this information
11. What Desktop Management System, if any, do you use? (SMS/SCCM, Altiris, Zenworks, etc.) Per CISO, unable to provide this information
12. What security software packages are in use (anti-virus, firewalls, anti-executable software, etc.)? Per CISO, unable to provide this information
13. Do you use Virtualization (Server or Client)? Not using client virtualization
14. Do you have specified/set times to do Maintenance, or run Patches? If so, when? Desktop patching is performed after hours on a regular monthly cycle
15. Are there individual Firewalls in-place on desktop or laptop computers (i.e. Bit Locker, Deep Freeze, Centurion Guard)? Windows firewall is enabled on the computers
16. Do you currently use Wake-on-LAN? No
17. Any issues with WOL? N/A
18. How/when is WOL used? N/A
19. Do any users VPN into their computers after-hours? Per CISO, unable to provide this information How?
20. What Directory services do you use to help manage your network? (Microsoft Active Directory, Novell eDirectory) Per CISO, unable to provide this information
21. If you have Macs in the environment, do you have ARD (Apple Remote Desktop)? N/A

FIM 25 – Pool Filter Media Replacement

Existing Conditions

All the pools have existing sand filtration systems that are in fair/good condition.

Kihei Aquatic Center

- Surge tanks need auto fill and modulation valve adjustment.
- Concrete failures throughout should be examined by a structural engineer.
- Lap, Training, and Keiki pools filtration system(s) are in fair/good condition.
- Pumping systems are in fair/good condition.

Upcountry Pool

- Teaching and Keiki pools filtration system(s) are in fair/good condition.

Lahaina Aquatic Center

- Lap and Keiki pools filtration system(s) are in fair/good condition.
- Lap pool filtration uses redundant systems. Heat and water quality treatment are running off one system making the second system less effective.
- Pool surge tank is in poor condition throughout.
- Pool surge tank needs auto fill and modulation valve replacement.

Coach Sakamoto Pool

- Lap pool filtration system(s) are in fair/good condition.
- Piping between pool pump and filter is undersized, as well as the filter connection causing a circulation issue.
- Pool surge tank needs auto fill and modulation valve adjustment.

Kokua Pool

- Lap pool filtration system(s) are in fair/good condition.
- Pool filtration uses multiple (5) pumps and filters. This is good if one system is down, not good because there is more to breakdown.
- Residential/light commercial grade UV systems on each filtration system.
- Chem and heat are run on one system.

Cooke Memorial Pool (Molokai)

- Lap pool filtration system(s) are in fair/good condition.
- Pool surge tank needs new auto fill and modulation valve.

Coach Spencer Shiraishi Memorial Pool

- County has converted this pool to a saline pool. The County purchases Salt for this pool.
- Pool filtration system(s) are in fair condition. No longer available.

Wailuku Pool

- Lap pool filtration system(s) are in fair/good condition.
- Pool filtration uses multiple two (2) pumps and filters. This is good if one system is down, not good because there is more to breakdown.
- Chem and heat are run on one system.

FIM Description

The solution being evaluated is to replace existing replace existing sand filters with updated sand filtration systems including automated backwash controls.

Regenerative Media Filters (RMF's) are a more efficient alternative to sand or D.E. filtration. These filters use up to 90% less water, take up a quarter of the space, and use less energy than traditional sand filters. Regenerative media filters are also more effective at removing contaminants. These filters can remove particles as small as 1 micron from water while traditional sand filters generally only remove particles in the 20-micron range. Additional benefits include up to 30% chemical consumption savings and heat retention. The combination of water, fuel, and chemical savings with these filters can translate into significant savings over time.

The use of a Regenerative Media Filter (RMF) allows you to utilize the latest in aquatics technology to filter your facility water. This technology allows you to reduce the consumption of water, while providing superior water quality and clarity. The RMF filter, through the reduction in the water needed to clean the filter, has a notable reduction of energy and chemical costs. These new systems require a minimal footprint and utilize an environmentally friendly filtering media. These features make it a sustainable solution for any facility.

- Powder coated stainless steel or fiberglass tank construction.
- Fully automated system.
- Space-saving flangeless lid design guarantees the smallest mechanical room footprint in the industry. This time-saving feature ensures that zero piping connections need to be un-flanged during filter clean-out or inspection. No lid removal required.
- In-field adjustable filter square footage provides industry-first, post-installation adaptability with zero change-out of major components.
- Large service manways allow industry-leading access for quick and safe inspection of internal components and easy filter clean-out. All components can be serviced without entering the tank.
- Four-position influent tee permits optimal supply and drain piping configuration layout in the mechanical room.
- Three interchangeable mount locations for the controller and vacuum modules provide unparalleled user interface options to address operator access constraints in congested mechanical rooms.
- Fully automated smart filter controller with a flowmeter, temperature monitoring, valve status, soil level alerts, performance trends, remote access, and more.
- 304L stainless steel tanks are ASME Certified National Board registered.
- Patent-pending diffuser plate providing laminar straightened influent water flows and reducing turbulence.
- The only NSF 50 tested and certified filter using NSF 50 approved perlite media.

Scope of Work

Kihei Aquatic Center

- Replace existing sand filtration with regenerative media filtration systems.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.

Lahaina Aquatic Center

- Replace existing sand filtration at Lap Pool with (1) regenerative media filtration system.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.
  - Retain redundant pumping system.

Sakamoto Memorial Swimming Pool

- Replace existing sand filtration at Lap Pool with one (1) regenerative media filtration system.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.

Shiriashi Memorial Swimming Pool

- Replace existing sand filtration at Lap Pool with one (1) regenerative media filtration system.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.

Cooke Memorial Swimming Pool

- Replace existing sand filtration at Lap Pool with one (1) regenerative media filtration system.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.

Kokua Swimming Pool

- Replace existing sand filtration at Lap Pool with one (1) regenerative media filtration system.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.

Wailuku Swimming Pool

- Replace existing sand filtration at Lap Pool with one (1) regenerative media filtration system.
  - Interface with existing filter influent, effluent, and backwash piping.
  - Media catchment system including waste pump, and DE catchment canisters.

Equipment Manufacturer

The following lists manufacturers and their warranties:

Product	Manufacturer	Warranty (yrs)
Aquafy Regenerative Filters	Aquafy	3 (Parts only)

Warranty does not cover damage by misuse, abuse, tampering or “acts of nature” outside our control.

Operation and Maintenance (O&M) Cost Savings Calculations

Regenerative Filter Savings:

Regenerative Media Filters (RMFs) use 90% less water than a sand or glass media filters. This is because unlike sand filters, RMFs do not need to be backwashed. They are drained to exchange media on an average 30–45-day cycle. Our calculator captures this water savings, as well as sewer, chemical, heat, power, and operational costs associated with sand filtration. All true costs are compared with the true costs associated with the RFMs over a 1-year period. We then factor in the installation of the filter, ancillary components to support the installation, and labor to determine a ROI timeframe within a 10-year period.

Enter Pool Flow Rate:

Pool Data

POOL DESCRIPTION		SUGGESTED FILTER	I/O	Flow (gpm)
Pool-1	Lap Pool	PMF-54-1200-FRP	O	1,300
Pool-2			O	
Pool-3			O	
Pool-4			I	
Pool-5			I	
Pool-6			I	
Pool-7			I	
Pool-8			I	
Pool-9			I	
Pool-10			I	

POOL DESCRIPTION		SUGGESTED FILTER	I/O	Flow (gpm)
Pool-11		0	I	
Pool-12		0	I	
Pool-13		0	I	
Pool-14		0	I	
Pool-15		0	I	
Pool-16			I	
Pool-17			I	
Pool-18				
Pool-19				
Pool-20				

Input cost variables:

Operative Cost Variables

VARIABLES	FORMULAS & DEFINITIONS		VALUES	UNIT
MECHANICAL SPACE COST	Cost per ft² to construct a room adequate to house filter equipment (indoor construction).		$0.00	$/ft²
INSTALLATION LABOR VARIANCE	Sand filters require an installation labor variance @ average cost of 50% of the filter.		50%	$
MEDIA LOADING: SAND FILTER	Average cost to load media based on historical averages for time and labor.		$12.00	$/bag
Media Cost: Sand Filter	Based on average market rate for #20 Silica Sand and 1/8 X 1/4 Pea Gravel. Weights drawn from correspond		$19.63	$/100lb
BACKFLUSH RESIDUAL LOAD FACT	BRLF = 1.38 x pump Hp to overcome residual sand plaquing versus Aquify PMF which automatically reverts to		1.38	factor
Media Cost: Aquify PMF	Based on average market rate for Perlite Filter Media. Annual Defender Filter Media Cost = Media weight in fil		$0.63	$/lb
BACKWASH VOL: SAND (BVS)	BVS = Backwash Rate x Total Filter Surface Area x Backwash Duration x Backwash Frequency.	Rate	15	gpm/ft²
		Surface Area	From Table	ft²
		Duration	5	minutes
		Frequency	52	#/season
BACKWASH VOL: DEFENDER (BVD)	BVD = Total Tank Volume x 2 x Media Replacement Frequency.	Tank Volume	From Table	gal
		Frequency	12	#/season
POTABLE WATER USAGE	Potable Water Usage fee includes a "Volume Charge" only and does not include the monthly meter charge. Se		$5.85	$/1000 gal
SANITARY SEWER FEE	Sanitary Sewer Fee = (Monthly Capacity Charge + Monthly Usage Charge) x annual sewerage volume.		$6.70	$/1000 gal
MAKE-UP WATER: CHEMICALS (M	MWC Cost = Water savings in gallons x Average market $cost/gal for pool chemicals.		$0.75	$/1000 gal
MAKE-UP WATER: HEAT (MWH)	Represents cost to reheat backwash makeup water by average temperature delta°. MV	Temp Delta	9°	degrees F
		Cost/Therm	$4.31	$/therm
OPERATING DAYS PER SE	Average number of days of operation each year across all pools included in the project.		365	days
ELECTRICAL COSTS	Pump Motor HP x.746 Rating Conversion x $Cost/Kw x 24 hrs x Average Operating Days.	Kw	$0.19	$/Kwh
ANNUAL INCREASE	Average cumulative increase in labor, materials and maintenance costs (applies to both Sand and Aquify PMF		7%	%

Determine Filter Rate based on Flow Rate:

12-15GPM per square foot of filter area for sand filters.

POOL DATA		SAND FILTER DATA					
Pool Description	Flow (gpm)	Qty	DIA x LENGTH	Filter Surface Area (sf)	Filtration Rate (gpm/sf)	B/W Rates @ 15 gpm/sf (gpm)	Total Media Wt (lb)
Lap Pool	1,300	4	48x84	94.0	13.8	1,410	19,600

.5-2GPM per square foot of filter area for regenerative.

Pool Data		Aquify PMF Data					
Pool Description	Flow (gpm)	Qty	Aquify PMF Model #	Filter Surface Area (sf)	Filtration Rate (gpm/sf)	Tank Volume (gal)	Total Media Wt (lb)
Lap Pool	1,300	1	PMF-54-1200	1,200	1.1	554	90

Determine annual filter backwash volume and associated costs:

ANNUAL OPERATING COSTS * SAND FILTER						
FILTER BACKWASH					PUMP DATA	
Volume (gal)	Potable Water	Sanitary Sewer Fee	Make-up Water: Chem	Make-up Water: Heat	Brake HP Req'd @ 70'TDH	Electrical Cost with VFD
366,600	$2,145	$2,456	$275	$1,421	39.64	$25,200

ANNUAL OPERATING COSTS * Aquify PMF						
FILTER BACKWASH					PUMP DATA	
Volume (gal) (NOTE 1)	Potable Water	Sewer Discharge	Make-up Water: Chem	Make-up Water: Heat	Brake HP Req'd @ 55'TDH	Electrical Cost with VFD
13,296	$78	$89	$40	$52	22.57	$14,348

Determine capital costs associated with each filter:

This varies by sight and installation factors. For this project we assumed the new Regenerative filter cost VS no new sand filter installation as these filters were existing. We assumed one sand change VS regular regen media changes.

Heat:

The calculation starts by determining how many BTUs are needed to heat and maintain a desired temperature in a vessel. This is in comparison to average air temperatures at the vessel's regional location. We factor heat lost to evaporation, convection, and thermal radiation. We have determined factors for our calculator using typical swimming pool or water tank heat-up and heat loss calculations. We then add passive heat gained by sunlight converted to BTU per square foot of surface area. The level of BTU's gained depends on the latitude of the vessel.

Energy use is determined by converting BTUs to therms of natural gas, gallons of propane, or kilowatts of power. We then determine an appliances' efficiency and/or coefficient of performance to calculate how much energy is wasted or gained. Finally, we determine the 30-day cost of using an appliance to maintain heat in the vessel based on the cost of fuel or power in the area.

The total required heat to increase and maintain the temperature in an outdoor pool can be calculated as

htotal = total heat load (btu/hr, W) or hsurface + hheat-up
hsurface = heat loss from pool through the surface - mainly evaporation of water (btu/hr, W)
hheat-up = heat load required to increase the pool temperature (btu/hr, W)

Swimming Pool Heating

Heat-Up Load:
The heat-up load depends on the volume of the pool. The volume can be calculated as:

V = 7.48 x l x w x d

V = volume (Gal)
l = length (ft)
w = width (ft)
d = depth (ft)
The heat-up load can be calculated as

hheat-up = 8.34 x V x (dTw / dt)

dTw = difference between initial temperature and the final temperature of the water in the pool (oF)
dt = heat pick-up time (hr)

Surface Heat Loss due to Temperature Difference

The heat load required to replace the surface heat loss due to the temperature difference between the pool surface and the ambient air can be expressed as

$h_{surface} = k_s \, dT_{aw} \, A$

k_s = *surface heat loss factor - for sheltered positions with average wind velocity 2 to 5 (mph), the surface heat loss factor is in the range 4 to 7 (Btu/hr ft^2 ^oF)*
dT_{aw} = *temperature difference between the air and surface water in the pool (^oF)*
A = surface area of the pool (ft^2)

Note that the major part of the heat loss from a swimming pool surface is a result of evaporation of water from the surface.

The amount of evaporated water can be expressed as:

$g_s = \Theta A (x_s - x) / 3600$

or

$g_h = \Theta A (x_s - x)$

g_s = *amount of evaporated water per second (kg/s)*
g_h = *amount of evaporated water per hour (kg/h)*
$\Theta = (25 + 19 v)$ = *evaporation coefficient* (kg/m^2h)
v = velocity of air above the water surface (m/s)
A = water surface area (m^2)
x_s = *maximum humidity ratio of saturated air at the same temperature as the water surface (kg/kg) (kg* H_2O *in kg Dry Air)*
x = humidity ratio air (kg/kg) (kg H_2O *in kg Dry Air)*

Humidity Ratio by Mass

Humidity ratio by mass can be expressed as

$x = m_w / m_a$

x = humidity ratio (kg_{water}/kg_{dry_air}, lb_{water}/lb_{dry_air})
m_w = *mass of water vapor (kg, lb)*
m_a = *mass of dry air (kg, lb)*

Humidity Ratio by Vapor Partial Pressure

Based on the Ideal Gas Law the humidity ratio can be expressed as

$x = 0.62198\, p_w / (p_a - p_w)$ (2)

p_w = *partial pressure of water vapor in moist air (Pa, psi)*
p_a = *atmospheric pressure of moist air (Pa, psi)*

Energy Savings Guarantee

PROJECT BENEFITS

A. Certain Definitions. For purposes of this Agreement, the following terms have the meanings set forth below:

Annual Project Benefits are the portion of the projected Total Project Benefits to be achieved in any one year of the Guarantee Term.

Annual Project Benefits Realized are the Project Benefits actually realized for any one year of the Guarantee Term.

Annual Project Benefits Shortfall is the amount by which the Annual Project Benefits exceed the Annual Project Benefits Realized in any one year of the Guarantee Term.

Annual Project Benefits Surplus is the amount by which the Annual Project Benefits Realized exceed the Annual Project Benefits in any one year of the Guarantee Term.

Baseline is the mutually agreed upon data and/or usage amounts that reflect conditions prior to the installation of the Improvement Measures as set forth in the Facility Improvement Measures Description Section.

Guarantee Term will commence on the first day of the month next following the Substantial Completion date and will continue through the duration of the M&V Services, subject to earlier termination as provided in this Agreement.

Installation Period is the period beginning on JCI's receipt of Customer's Notice to Proceed and ending on the commencement of the Guarantee Term.

Measured Project Benefits are the utility savings and cost avoidance calculated in accordance with the methodologies set forth in the Facility Improvement Measures Description Section below.

Non-Measured Project Benefits are identified in the Facility Improvement Measures Description Section. The Non-Measured Project Benefits have been agreed to by Customer and will be deemed achieved in accordance with the schedule set forth in the Total Project Benefits table below. Customer and JCI agree that: (i) the Non-Measured Project Benefits may include, but are not limited to, future capital and operational costs avoided as a result of the Work and implementation of the Improvement Measures, (ii) achievement of the Non-Measured Project Benefits is outside of JCI's control, and (iii) Customer has evaluated sufficient information to conclude that the Non-Measured Project Benefits will occur and bears sole responsibility for ensuring that the Non-Measured Project Benefits will be realized. Accordingly, the Non-Measured Project Benefits shall not be measured or monitored by JCI at any time during the Guarantee Term, but rather shall be deemed achieved in accordance with the schedule set forth in the Total Project Benefits table below.

Project Benefits are the Measured Project Benefits plus the Non-Measured Project Benefits to be achieved for a particular period during the term of this Agreement.

Total Project Benefits are the projected Project Benefits to be achieved during the entire term of this Agreement.

B. **Project Benefits Summary.** Subject to the terms and conditions of this Agreement, JCI and Customer agree that Customer will be deemed to achieve a total of **$14,719,799** in Non-Measured Project Benefits and JCI guarantees that Customer will achieve a total of **$58,287,738** in Measured Project Benefits during the term of this Agreement, for Total Project Benefits of **$73,007,537**, as set forth in the Total Project Benefits table below.

Total Project Benefits

Year	Utility Cost Avoidance (Measured)*	Utility Cost Avoidance (Non-Measured)*	Operations & Maintenance Cost Avoidance**	Annual Project Benefits
1	$2,023,488	$125,534	$274,247	$2,423,269
2	$2,093,447	$129,876	$324,393	$2,547,716
3	$2,166,592	$134,416	$359,740	$2,660,748
4	$2,243,079	$139,163	$387,769	$2,770,011
5	$2,323,072	$144,128	$412,429	$2,879,629
6	$2,406,743	$149,321	$433,051	$2,989,115
7	$2,494,273	$154,754	$454,703	$3,103,730
8	$2,585,851	$160,438	$477,438	$3,223,727
9	$2,681,676	$166,386	$501,310	$3,349,372
10	$2,781,959	$172,610	$526,376	$3,480,945
11	$2,886,917	$179,125	$552,695	$3,618,737
12	$2,996,782	$185,944	$580,329	$3,763,055
13	$3,111,795	$193,083	$609,346	$3,914,224
14	$3,232,210	$200,557	$639,813	$4,072,580
15	$3,358,295	$208,383	$671,804	$4,238,482
16	$3,490,329	$216,579	$705,394	$4,412,302
17	$3,628,605	$225,161	$740,664	$4,594,430
18	$3,773,433	$234,151	$777,697	$4,785,281
19	$3,925,137	$243,567	$816,582	$4,985,286
20	$4,084,055	$253,432	$857,411	$5,194,898
Total	**$58,287,738**	**$3,616,608**	**$11,103,191**	**$73,007,537**

* Utility Cost Avoidance figures in the table above are based on anticipated increases in unit energy costs as set forth in the table in the Baseline Energy Consumption and Utility Rates Section.
** Operations & Maintenance Cost Avoidance are Non-Measured Project Benefits. Operations & Maintenance Cost Avoidance figures in the table above are based on a mutually agreed fixed annual escalation rate of five (5%).

Within sixty (60) days of the commencement of the Guarantee Term, JCI will calculate the Measured Project Benefits achieved during the Installation Period plus any Non-Measured Project Benefits applicable to such period and advise Customer of same. Any Project Benefits achieved during the Installation Period may, at JCI's discretion, be allocated to the Annual Project Benefits for the first year of the Guarantee Term. Within sixty (60) days of each anniversary of the commencement of the Guarantee Term, JCI will calculate the Measured Project Benefits achieved for the applicable year plus any Non-Measured Project Benefits applicable to such period and advise Customer of same.

Customer acknowledges and agrees that if, for any reason, it (i) cancels or terminates receipt of M&V Services, (ii) fails to pay for M&V Services in accordance with the Compensation to ESCO Section, (iii) fails to fulfill any of its responsibilities necessary to enable JCI to complete the Work and provide the M&V Services, or (iv) otherwise cancels, terminates or materially breaches this Agreement, the Assured Performance Guarantee shall automatically terminate and JCI shall have no liability hereunder.

C. Project Benefits Shortfalls or Surpluses.

- *Project Benefits Shortfalls*. If an Annual Project Benefits Shortfall occurs for any one year of the Guarantee Term, JCI shall, at its discretion and in any combination, (a) set off the amount of such shortfall against any unpaid balance Customer then owes to JCI or (b) pay to Customer the amount of such shortfall, or (c) subject to Customer's agreement, provide to Customer additional products or services, in the value of such shortfall, at no additional cost to Customer.

- *Additional Improvements*. Where an Annual Project Benefits Shortfall has occurred, JCI may, subject to Customer's approval (which approval shall not be unreasonably withheld, conditioned, or delayed), implement additional Improvement Measures, at no cost to Customer, which may generate additional Project Benefits in future years of the Guarantee Term.

Measured Utility Savings Summary

FIM	Electric Savings ($)	Demand Savings ($)	Water Savings ($)	Sewer Savings ($)	Total
Interior Lighting	$430,349	$60,094	$0.00	$0.00	**$490,443**
Exterior Lighting	$173,812	$0.00	$0.00	$0.00	**$173,812**
Plug Load Controls	$10,449	$0.00	$0.00	$0.00	**$10,449**
Transformers	$50,078	$53,698	$0.00	$0.00	**$103,776**
Domestic Water Fixture Retrofits	$0.00	$0.00	$81,253	$54,463	**$135,716**
Shower Tower Retrofits	$0.00	$0.00	$220,719	$75,106	**$295,826**
Irrigation Wells	$0.00	$0.00	$174,989	$150,900	**$325,889**
On-site Sodium Hypochlorite Generation	$288,288	$0.00	$0.00	$0.00	**$288,288**
Infiltration Reduction	$0.00	$0.00	$0.00	$0.00	**$0.00**
Window Film	$7,074	$0.00	$0.00	$0.00	**$7,074**
TOTAL	**$960,051**	**$113,792**	**$476,961**	**$280,469**	**$1,831,273**

Due to the anticipated duration of the Installation Period (2 years), the agreed upon escalation will be applied to these savings to determine the savings by the end of Year 1 of the Guarantee Term.

Year 1 Utility Measured Savings = ($960,051+$113,792) * 1.05^3 + ($476,961+$280,469) * 1.01^3 = **$2,023,488**

For every year after this, the utility savings will be escalated at the agreed upon escalation rates.

Non-Measured Utility Savings Summary

FIM	Electric Savings ($)	Water Savings ($)	Sewer Savings ($)	Total
Interior Lighting	$44,542	$0	$0	**$44,542**
Domestic Water Plumbing Fixture Upgrades	$49,024	$0	$0	**$49,024**
On-site Hypochlorite Generation (OSHG penalty)	($42,302)	$27,449	$19,494	**$4,641**
On-site Hypochlorite Generation (Chloride Pump Savings)	$4,187	$0	$0	**$4,187**
Irrigation Wells	($22,419)	$0	$0	**($22,419)**
Infiltration Reduction	$33,630	$0	$0	**$33,630**
TOTAL	**$66,661**	**$27,449**	**$19,494**	**$113,604**

Due to the anticipated duration of the Installation Period (2 years), the agreed upon escalation will be applied to these savings to determine the savings by the end of Year 1 of the Guarantee Term.

Year 1 Utility Non-Measured Savings = $66,601 * 1.05^3 + ($27,449+$19,494) * 1.01^3 = **$125,534**

For every year after this, the utility savings will be escalated at the agreed upon escalation rates.

Non-Measured O&M Savings Summary

FIM	O&M Savings
Interior Lighting	$20,427.32
Exterior Lighting	$5,834.25
TOTAL	**$26,261.57**

The agreed upon escalation for O&M Savings will be applied to these savings to determine the savings by the end of Year 1 of the Guarantee Term.

Year 1 O&M Non-Measured Lighting Savings (one year of escalation) = $26,261.57 * 1.05 = **$27,575**

The table below shows the O&M Savings over the contract term:

Year	Int/Ext Lighting Retrofits*	Onsite Hypochlorite Generation	Total Annual O&M Savings
1	$27,575	$246,672	$274,247
2	$28,953	$295,439	$324,393
3	$30,401	$329,339	$359,740
4	$31,921	$355,848	$387,769
5	$33,517	$378,912	$412,429
6	$35,193	$397,858	$433,051
7	$36,953	$417,751	$454,703
8	$38,800	$438,638	$477,438
9	$40,740	$460,570	$501,310
10	$42,777	$483,599	$526,376
11	$44,916	$507,779	$552,695
12	$47,162	$533,167	$580,329
13	$49,520	$559,826	$609,346
14	$51,996	$587,817	$639,813
15	$54,596	$617,208	$671,804
16	$57,326	$648,068	$705,394
17	$60,192	$680,472	$740,664
18	$63,202	$714,495	$777,697
19	$66,362	$750,220	$816,582
20	$69,680	$787,731	$857,411
Total	**$911,782**	**$10,191,410**	**$11,103,191**

Savings Measurement and Calculations

MEASUREMENT & VERIFICATION (M&V) METHODOLOGIES

The following is a brief overview of the measurement and verification methodologies applicable to the Improvement Measures set forth below. JCI shall apply these methodologies, as more fully detailed in the guidelines and standards of the International Measurement and Verification Protocol (IPMVP) 2016, in connection with the provision of M&V Services hereunder.

Option A

Retrofit Isolation with Key Parameter Measurement

Measured Project Benefits are determined by partial field measurement of the energy use of the system(s) to which an Improvement Measure was applied separate from the energy use of the rest of the facility.

Partial measurement means that some but not all parameters will be measured. Careful review of the design and installation of Improvement Measures is intended to demonstrate that the stipulated values fairly represent the probable actual values. Agreed-upon values are shown in the FIM description sections. Engineering calculations using measurements and stipulations are used to calculate Measured Project Benefits for the duration of the Guarantee Term.

Measured Project Benefits from the following Improvement Measures will be calculated using Option A:

FIM 1 – Interior LED Lighting Retrofits
FIM 2 – Exterior LED Lighting Retrofits
FIM 3 – Plug Load Controls
FIM 4 – Transformer Replacements
FIM 5 – Domestic Water Upgrades
FIM 6 – Shower Tower Retrofits
FIM 7 – Irrigation Wells
FIM 8 – Smart Pool Pump Controls
FIM 10 – Window Film

OV Approach

Operational Verification

Verification that the FIMs are installed and operating properly and have the potential to generate savings. No field measurements are required.

Measured Project Benefits from the following Improvement Measures will be calculated using OV approach:

FIM 8 - On-Site Sodium Hypochlorite Generation
FIM 9 – Infiltration Reduction

M&V Method

The savings for the lighting retrofit part of this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated through a reduction in energy used by the lighting system; therefore, the measurement boundary is the lighting system itself.

Method to Adjust the Baseline

No baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Post-installation energy usage is determined by sampling fixture wattage, voltage and amps, where feasible. Otherwise, manufacturer wattage tables are used based on lamp and ballast combination. Project Benefits will be modified upon completion of the project and will be based upon the final scope of work as validated by the as-built documentation.

Key Parameter	Measurement Frequency	Measurement Description
Pre-Retrofit Fixture Power Draw (kW)	See *Energy Savings Calculations* section in the *FIM Descriptions*	The pre-retrofit power draw has been determined based upon measurements taken between 7/25/22 and 8/5/22 on a sample of fixtures that meet a confidence level of at least 80% and a precision of 20%– assuming a coefficient of variance of 0.5 – using a true RMS meter. These values will not be measured again.
Post-Retrofit Fixture Power Draw (kW)	One-time	The post-retrofit power draw on a sample of fixtures that meet a confidence level of at least 80% and a precision of 20%– assuming a coefficient of variance of 0.5 – will be measured using a true RMS meter. Fixtures with similar lamps and ballasts, counts and types will be grouped together with a lamp/ballast code. Measured wattages will be used when possible. In some situations, such as when a certain type of lighting fixture is not available by itself on a switch, typical wattages as published by ANSI (American National Standards Institute) will be used. The savings will be updated.
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Burn Hours	See *Energy Savings Calculations* section in the *FIM Descriptions*	The lighting system annual run hours by space type are agreed upon. These run hours are based on historical data from industry sources or from customer feedback. These values will not be measured.
Coincident Factor	See *Energy Savings Calculations* section in the *FIM Descriptions*	The coincident factor is estimated based on the number of fixtures in a space type expected to be operating at the same time during the on peak period and is agreed to remain at the same value after the retrofit. This estimate is based on industry standards.

FIM 3 – Plug Load Control

M&V Method

The savings for this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated by controlling the plug load equipment. The measurement boundary is therefore the controlled plug load controller.

Method to Adjust the Baseline

No baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Key Parameter	Measurement Frequency	Measurement Description
Post-installation Standby Hours	Continuous	Post-installation, controller software will be used to generate post-installation operation hours. Annual reporting will be provided although savings will be adjusted for devices removed and schedules operating outside the hours of operation in the FIM Description section.
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Plug Load power draw (Watts)	Agreed Upon See *Scope of Work* section in the *FIM Descriptions*	The plug load power draw is based on the Bert manufacturer's database.
Baseline Operational hours	Short Term See *Energy Savings Calculations* section in the *FIM Descriptions*	The pre baseline operational hours were estimated and agreed upon and they will be compared to the post operational hours that will be measured.

FIM 4 - Transformer Replacements

M&V Method

The savings for this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated through a gain in efficiency in the new equipment compared to the existing equipment; therefore, the measurement boundary is the transformer itself.

Method to Adjust the Baseline

No baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Key Parameter	Measurement Frequency	Measurement Description
Baseline Transformer Input Losses	Short-Term	Transformer input losses (kW) is measured typically for a duration of 15 min of each transformer measured.
Baseline Transformer % Load	Short-Term	Transformer % Load is measured typically for a duration of 15 min of each transformer measured.
Post Installation Transformer Input Power	Short-Term	Line side power will be measured via a third-party certified test lab modeled to match pre-retrofit test (measurement) conditions
Post Installation Transformer Output Power	Short-Term	Load side power will be measured via a third-party certified test lab modeled to match pre-retrofit test (measurement) conditions
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
kVA	See *Scope of Work* section in the *FIM Descriptions*	Transformer rating, assumed to be the same pre and post.
Hours & Days of Operation	See *Energy Savings Calculations* section in the *FIM Descriptions*	Assumed to be derived from data collected during audit.

Johnson Controls

FIM 5 & 6 – Domestic Water Fixture Retrofits and Shower Tower Retrofits

M&V Method

The savings for this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated through a reduction in water usage at the fixture; therefore, the measurement boundary is the fixture itself.

Method to Adjust the Baseline

Baseline measurements have been collected and will serve as the basis for baseline calculations. Therefore, no baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Key Parameter	**Measurement Frequency**	**Measurement Description**
Pre- retrofit Fixture gallons/flush gallons/minute	See *Energy Savings Calculations* section in the *FIM Descriptions*	The pre-retrofit flow rates were based upon measurements taken between 7/18/22 and 7/22/22 on a sample of fixtures that meet a confidence level of at least 80% and a precision of 20. These measurements form the basis for the baseline water consumption and will not be measured again.
Post-retrofit Fixture gallons/flush gallons/minute	Short-term	The post-installation fixture usages will be measured one time using the same measurement procedures. The measurements will occur in the same locations, up to the required sample size.
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Population	See *Energy Savings Calculations* section in the *FIM Descriptions*	The population counts are estimated or based on information collected during site audits. These values will not be measured.
Usage Factors	See *Energy Savings Calculations* section in the *FIM Descriptions*	The usage factors (flushes/day/person, seconds/handwashing/usage, etc.) values are based on American Water Works Association Research Foundation (AWWARF), 2000, Commercial and Institutional End Uses of Water, and some engineering estimates.
Efficiency	See *Energy Savings Calculations* section in the *FIM Descriptions*	The efficiency of the hot water heating equipment is based on manufacturer's data and will not be measured.
$Temp_{hot}$	See *Energy Savings Calculations* section in the *FIM Descriptions*	The hot water temperature is the typical temperature at which users wash their hands and take showers and will not be measured.
$Temp_{cold}$	See *Energy Savings Calculations* section in the *FIM Descriptions*	The cold-water temperature is the average annual ground water temperature from Maui.

FIM 7 – Irrigation Wells

M&V Method

The savings for this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated through a reduction in domestic water used for irrigation. The measurement boundary is at the pump discharge.

Method to Adjust the Baseline

No baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Key Parameter	**Measurement Frequency**	**Measurement Description**
Utility Bill Monthly Domestic Water Consumption	Baseline is last twelve months of water bills (kGal) Post-Install monthly Consumption (kGal)	Utility Bills have been obtained for all location where new wells are installed. Validate domestic water is not being used for irrigation. (Billed Consumption less actual well production is lower than remaining baseline domestic water use
Post Non-potable well production	Annual totalized water (kGal) produced	New wells will be provided with a totalizing water meter to measure water pumped.
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Allocated Water%	Varies by Location: See *Energy Savings Calculations* section in the *FIM Description*	Determined during audit as an estimate of irrigation water compared to total domestic water consumption on site. Locations with other water use (bathrooms, community centers) will have a lower allocated water %)
Irrigation Days Per week	Varies by Location: See *Energy Savings Calculations* section in the *FIM Description*	Determined during audit with Parks and Recreations site personnel.
Pump TDH	Varies by Location: See *Energy Savings Calculations* section in the *FIM Description*	The depth of the well is equal to the site elevation. An additional 10% head is estimated for friction losses. Operating pressure of the irrigation system is estimated at 30psi.
Pump Usage (kW)	Varies by Location: See Energy Savings Calculations section in the FIM Description	This is a calculated value based on the Pump TDH, pump and motor efficiency. None of these values will be measured.
Parasitic Electricity Use (kWh)	Varies by Location: See Energy Savings Calculations section in the FIM Description	This is a calculated value based on the Pump Usage (kW) and the operation hours of the pump. Pump is estimated to run 3-hours per day when site is irrigated. Irrigation days vary from 4 to 6 days per week. Actual pump operating hours will not be measured post-retrofit.

Johnson Controls

FIM 8 – On-Site Hypochlorite Generation and Smart Pool Pump Controls

M&V Method

The savings for this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated through a reduction in pump kW via VFDs and pump controllers; therefore, the measurement boundary is the pump itself.

Method to Adjust the Baseline

No baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Key Parameter	**Measurement Frequency**	**Measurement Description**
Post-Retrofit kW	Short-term	Quarterly the power reads will be read via controller with remote access during hours of non-bathing and bathing periods to average over the year to illustrate reduced pump speed.
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Baseline kWh	See *Energy Savings Calculations* section in the *FIM Descriptions*	The pre-retrofit pool pump energy use is based on the calculations shown. These values form the basis for the baseline pool pump energy use and will not be measured.
Run Hours – Baseline and Post-Retrofit	See *Energy Savings Calculations* section in the *FIM Descriptions*	It is agreed that the pumps operate 24 hours per day, 365 days per year. 7 hours per day in the “occupied/pool in use” and 17 hours per day in the “unoccupied” mode.

Operational Verification (OV) Approach for On-Site Hypochlorite Generation:
OV provides verification of a systems capability to produce the projected energy savings. Refer to table in OV section below.

FIM 10 – Window Film

M&V Method

The savings for this FIM will be verified using IPMVP-2016 Option A, Retrofit Isolation with Key Parameter Measurement. The savings for this FIM are generated through the installation of window film which reduces the cooling load of a space; therefore, the measurement boundary is the glass area where the window film is installed.

Method to Adjust the Baseline

No baseline adjustments will be made.

Method to Determine, Monitor and Track Energy Savings

Key Parameter	Measurement Frequency	Measurement Description
Post Installation Window Area	Short-Term	Actual glass area (sq ft) where window film is installed
Estimated Parameters	**Assumed Value**	**Justification, Source and Description**
Solar Heat Gain	See *Energy Savings Calculations* section in the *FIM Descriptions*	Values obtained from ASHRAE and adjusted for the building hours/days of operation and will not be measured.
SHGCpre	See *Energy Savings Calculations* section in the *FIM Descriptions*	Values obtained from ASHRAE for the existing glass types observed during site surveys and will not be measured.
SHGCpost	See *Energy Savings Calculations* section in the *FIM Descriptions*	Values obtained from window film manufacturer based on the proposed window film for the existing glass types observed during site surveys and will not be measured.
Cooling kW/ton	See *Energy Savings Calculations* section in the *FIM Descriptions*	Values estimated for the type and age of equipment providing the cooling and will not be measured.

Operational Verification (OV) Approach:
OV approach provides verification of a system's capability to produce the projected energy savings.

Detailed M&V isn't cost effective for the On-Site Hypochlorite Generation and Infiltration Reduction due to the relatively small amount of energy savings attributed to these FIMs. Post-installation M&V will consist of verifying installation of the FIMs as outlined below.

FIM	Frequency	Task Description
On-Site Hypochlorite Generation	One Time – Post installation	See *Energy Savings Calculations* section in the *FIM Descriptions* *Post Installation* • Onsite chlorine generator (Verify nameplate data). • Visually verify and document salt use to generate chlorine. Review the functional testing documents associated with the installation.
Infiltration Reduction	One Time – Post installation	*Post Installation* • Visually verify and document via digital photographs the areas affected by the envelope improvements. Review the pre and post leakage area (sqft).

The associated annual FIM-specific project benefit amounts will be agreed to for the entire duration of the Performance Contract and restated with rate escalation in future reports. Ongoing measurement and verification activities will not be performed.

METHODOLOGY TO ADJUST THE BASELINE

Customer agrees to notify JCI, within fourteen (14) days, of (i) any actual or intended change, whether before or during the Guarantee Term, in the use of any facility, equipment, or Improvement Measure to which this Schedule applies; (ii) any proposed or actual expansions or additions to the premises or any building or facility at the premises; (iii) a change to utility services to all or any portion of the premises; or (iv) any other change or condition arising before or during the Guarantee Term that reasonably could be expected to change the amount of Project Benefits realized under this Agreement.

Such a change, expansion, addition, or condition would include, but is not limited to: (a) changes in the primary use of any facility, Improvement Measure, or portion of the premises; (b) changes to the hours of operation of any facility, Improvement Measure, or portion of the premises; (c) changes or modifications to the Improvement Measures or any related equipment; (d) changes to the M&V Services provided under this Agreement; (e) failure of any portion of the premises to meet building codes; (f) changes in utility suppliers, utility rates, method of utility billing, or method of utility purchasing; (g) insufficient or improper maintenance or unsound usage of the Improvement Measures or any related equipment at any facility or portion of the premises (other than by JCI); (h) changes to the Improvement Measures or any related equipment or to any facility or portion of the premises required by building codes or any governmental or quasi-governmental entity; or (i) additions or deletions of Improvement Measures or any related equipment at any facility or portion of the premises.

Such a change or condition need not be identified in the Baseline in order to permit JCI to make an adjustment to the Baseline and/or the Annual Project Benefits. If JCI does not receive the notice within the time period specified above or travels to either Customer's location or the project site to determine the nature and scope of such changes, Customer agrees to pay JCI, in addition to any other amounts due under this Agreement, the applicable hourly consulting rate for the time it took to determine the changes and to make any adjustments and/or corrections to the project as a result of the changes, plus all reasonable and documented out-of-pocket expenses, including travel costs. Upon receipt of such notice, or if JCI independently learns of any such change or condition, JCI shall calculate and send to Customer a notice of adjustment to the Baseline and/or Annual Project Benefits to reflect the impact of such change or condition, and the adjustment shall become effective as of the date the change or condition first arose. Should Customer fail to promptly provide JCI with notice of any such change or condition, JCI may make reasonable estimates as to the impact of such change or condition and as to the date on which such change or condition first arose in calculating the impact of such change or condition, and such estimates shall be conclusive.

MEASUREMENT & VERIFICATION SERVICES

JCI will provide the M&V Services set forth below in connection with the Performance Assurance Agreement.

- During the Installation Period, a JCI Performance Assurance Specialist will track Measured Project Benefits. JCI will report the Measured Project Benefits achieved during the Installation Period, as well as any Non-Measured Project Benefits applicable to the Installation Period, to Customer within 60 days of the commencement of the Guarantee Term.

- Within 60 days of each anniversary of the commencement of the Guarantee Term, JCI will provide Customer with an annual report containing:

    - an executive overview of the project's performance and Project Benefits achieved to date;
    - a summary analysis of the Measured Project Benefits accounting; and
    - depending on the M&V Option, a detailed analysis of the Measured Project Benefits calculations.

- During the Guarantee Term, a JCI Performance Assurance Specialist will monitor the on-going performance of the Improvement Measures, as specified in this Agreement, to determine whether anticipated Measured Project Benefits are being achieved. In this regard, on a quarterly basis, the Performance Assurance Specialist will provide observations and recommendations regarding system performance based upon a review of operating parameters, contingent upon Customer providing JCI with remote access to the systems included in this Agreement, with respect to the following activities:

    - review of information furnished by Customer from the facility management system to confirm that control strategies are in place and functioning;
    - advise Customer's designated personnel of any performance deficiencies based on such information;
    - coordinate with Customer's designated personnel to address any performance deficiencies that affect the realization of Measured Project Benefits; and
    - inform Customer of opportunities to further enhance project performance and of opportunities for the implementation of additional Improvement Measures.

- For specified Improvement Measures utilizing an "Option A" M&V protocol, JCI will:

    - conduct post installation measurements required under this Agreement;
    - confirm the building management system employs the control strategies and set points specified in this Agreement; and
    - analyze actual as-built information and adjust the Baseline and/or Measured Project Benefits to conform to actual installation conditions (e.g., final lighting and water benefits calculations will be determined from the as-built information to reflect the actual mix of retrofits encountered during installation).
    - Trend data records maintained in the ordinary course of system operation shall be used and relied upon by Johnson Controls in connection with Project Benefit calculations. Johnson Controls will use commercially reasonable efforts to ensure the integrity of the data collected to calculate the required metrics. In the event data are lost due to equipment failure, power failure or other interruption in data collection, transmission or storage, Johnson Controls will use reasonable engineering methods to estimate the impact of or replace the lost data

- Energy Star
    - Johnson Controls to provide assistance with annual update of Customer Energy Star Portfolio Manager, for buildings over 10,000 square feet which are also an eligible building type to qualify for an Energy Star score.

- Johnson Controls to provide trending software to be used for data collection and reporting purposes.
    - JCI trending software is being furnished with this project as an interface program between the new Building Automation Systems and the ongoing monitoring tasks of JCI's Performance Specialist. This trending package is not specific to JCI Metasys and will work with many other Building Automation Systems.
    - In order to properly implement the system, the Customer will either allow JCI to install GoToAssist remote access software or provide JCI with remote access with administrator rights on the virtual machine. The Customer will also provide administrator rights for SQL to configure the JCI Performance Software database.

Baseline Energy Consumption and Utility Rates

BASELINE ENERGY CONSUMPTION

The unit utility costs for the Baseline period are set forth below as “Base Utility Cost” and shall be used for all calculations made under this Schedule. The Base Utility Cost shall be escalated annually by the actual utility cost escalation, but such escalation shall be no less than the mutually agreed “floor” escalation rate specified in the sections below for each utility type. The Base Utility Cost for each type of utility represents the 12-month total.

The following is a list of the electric and water/sewer accounts:

Electric Utility Baseline

Listed below are the annual details indicative of the electric energy costs from Jan 2019 to Dec 2019 for the County accounts served by Hawaiian Electric Company (HECO). The monthly details can be found in Appendix 4.

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
1	66 Market St Restroom	Dept of Public Works	MAUI		2	15,210	$ 5,761.28	G	0.372881	0
2	Daycare	Dept of Public Works	MAUI		1	7,064	$ 2,707.24	G	0.372881	0
3	State Run Old Courthouse	Dept of Public Works	MAUI		1	80,683	$28,028.28	J	0.32663	13
4	4th Marine Division Memorial Park	Dept of Parks & Recreation	MAUI		1	1,142	$ 757.30	G	0.372881	0
5	Alfred "Flako" Boteilho Gymnasium	Dept of Parks & Recreation	MAUI		1	19,544	$ 6,840.93	G	0.372881	0
6	Brooks Booster	Dept of Water Supply	MAUI		1	0	$17.98	G	0.372881	0
7	Central Maui Regional Sports Complex	Dept of Parks & Recreation	MAUI		4	206,850	$75,968.70	J	0.32663	13
8	Central Landfill	Environmental Management	MAUI	Yes	3	181,328	$63,094.97	J	0.32663	13
9	Central Wailuku Heights Pump	Dept of Water Supply	MAUI		1	37,380	$16,647.38	J	0.32663	13
10	Charley Young Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
11	Civic Center Boosters	Dept of Water Supply	MAUI		1	1,800	$ 1,188.52	G	0.372881	0
12	Coach Sakamoto Pool	Dept of Parks & Recreation	MAUI		1	363,760	$121,266.25	J	0.32663	13
13	Coach Shiraishi Memorial Pool	Dept of Parks & Recreation	MAUI		2	73,439	$26,777.12	J	0.32663	13
14	Cooke Memorial Pool	Dept of Parks & Recreation	MOLOKAI		1	83,240	$33,423.78	J	0.383907	13
15	Country Club Pump	Dept of Water Supply	MAUI		1	171,405	$56,407.35	J	0.32663	13
16	Credit Union Building	Dept of Water Supply	MAUI		0	0	$ -	N/A	N/A	N/A
17	David Trask Office Building	Environmental Management	MAUI		1	15,122	$ 5,384.96	G	0.372881	0
18	Diamond Resort Boosters	Dept of Water Supply	MAUI		1	326,650	$105,316.20	J	0.32663	13
19	D.T. Fleming Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
20	Duke Maliu Regional Park	Dept of Parks & Recreation	MOLOKAI		1	83,680	$38,969.67	J	0.383907	13

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
21	Eddie Tam Memorial Center	Dept of Parks & Recreation	MAUI	Yes	11	69,536	$38,832.63	G	0.372881	0
22	Eluene Pl Wastewater Pumping Station	Environmental Management	MAUI		1	402,400	$149,715.47	J	0.32663	13
23	Field Operations Lahaina Baseyard	Dept of Water Supply	MAUI		1	8,223	$ 3,104.22	G	0.372881	0
24	Fire Prevention Bureau	Maui Fire & Public Safety	MAUI		1	71,220	$26,416.98	J	0.32663	13
25	Forensic Facility	Maui Police Dept	MAUI		1	171,240	$56,471.13	J	0.32663	13
26	H.A. Baldwin Park	Dept of Parks & Recreation	MAUI		1	3,330	$ 1,476.15	G	0.372881	0
27	Haiku Community Center	Dept of Parks & Recreation	MAUI		3	34,490	$12,823.81	G	0.372881	0
28	Haiku Well	Dept of Water Supply	MAUI		1	429,300	$137,246.59	J	0.32663	13
29	Hale Mahaulu Ewalu Senior Housing	Dept of Housing & Human Concerns	MAUI		63	204,164	$78,166.02	R	N/A	N/A
30	Haleakala Acres Pumps	Dept of Water Supply	MAUI		1	23,920	$ 8,451.25	G	0.372881	0
31	Haleakala Hwy Pump	Dept of Water Supply	MAUI		1	2,400	$ 947.28	G	0.372881	0
32	Haliimaile Park & Tennis	Dept of Parks & Recreation	MAUI		3	7,794	$ 3,848.93	G	0.372881	0
33	Haliimaile Well	Dept of Water Supply	MAUI		0	0	$ -	N/A	N/A	N/A
34	Hamakuapoko Well 1	Dept of Water Supply	MAUI		1	3,900	$ 2,512.41	G	0.372881	0
35	Hamakuapoko Well 2	Dept of Water Supply	MAUI		1	7,350	$45,303.60	P	0.30271	25
36	Hamoa Pump	Dept of Water Supply	MAUI		1	129,060	$43,171.34	J	0.32663	13
37	Hana Bay Beach Park	Dept of Parks & Recreation	MAUI		1	229	$ 539.40	G	0.372881	0
38	Hana Community Center & Ball Park	Dept of Parks & Recreation	MAUI		5	158,857	$55,686.80	J	0.32663	13
39	Hana Fire Station	Maui Fire & Public Safety	MAUI		1	33,547	$11,649.00	G	0.372881	0
40	Hana Landfill	Environmental Management	MAUI		0	0	$ -	N/A	N/A	N/A
41	Hana Police Station	Maui Police Department	MAUI		2	23,991	$ 8,882.17	G	0.372881	0
42	Hanakao'o Park	Dept of Parks & Recreation	MAUI		1	6,914	$ 2,882.67	G	0.372881	0
43	Harry Fields Booster Station	Dept of Water Supply	MAUI		1	195,000	$117,456.74	P	0.30271	25
44	Haycraft Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
45	Helene Hall	Dept of Parks & Recreation	MAUI		1	2,695	$ 1,251.42	G	0.372881	0
46	Honokowai Beach Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
47	Honokowai Booster Pump	Dept of Water Supply	MAUI		1	1,700	$ 1,155.49	G	0.372881	0
48	Honolii Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
49	Honukahu Well	Dept of Water Supply	MAUI		2	747,600	$261,383.69	P	0.30271	25
50	Ho'okipa Beach Park	Dept of Parks & Recreation	MAUI		2	6,508	$ 2,898.83	G	0.372881	0
51	Hoolehua Fire Station	Maui Fire & Public Safety	MOLOKAI		1	22,953	$10,204.59	G	0.466151	0

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
52	Huliau Housing	Dept of Housing & Human Concerns	Maui		1	55,650	$19,538.16	J	0.32663	13
53	Hyatt Wastewater Pumping Station	Environmental Management	MAUI		1	17,529	$ 6,405.02	G	0.372881	0
54	Iao Water Treatment Plant	Dept of Water Supply	MAUI		4	81,434	$32,135.48	J	0.32663	13
55	Iao Well	Dept of Water Supply	MAUI		1	1,254,600	$395,852.30	P	0.30271	25
56	Kaa Wastewater Pumping Station	Environmental Management	MAUI		1	41,123	$14,128.11	G	0.372881	0
57	Kaanapali Wastewater Pumping Station	Environmental Management	MAUI		1	100,200	$35,377.99	J	0.32663	13
58	Kaenae Well	Dept of Water Supply	MAUI		1	30,205	$10,610.28	G	0.372881	0
59	Kahala Well	Dept of Water Supply	MAUI		1	100,160	$36,811.80	J	0.32663	13
60	Kahului Baseyard	Dept of Water Supply	MAUI		2	314,965	$105,387.80	J	0.32663	13
61	Kahului Community Center	Dept of Parks & Recreation	MAUI		2	49,313	$17,031.25	G	0.372881	0
62	Kahului Community Center Park	Dept of Parks & Recreation	MAUI		2	42,450	$14,685.85	G	0.372881	0
63	Kahului Fire Station	Maui Fire & Public Safety	MAUI	Yes	1	55,680	$23,515.25	J	0.32663	13
64	Kahului Park	Dept of Parks & Recreation	MAUI		2	10,234	$ 4,111.74	G	0.372881	0
65	Kahului Park Irrigation Well	Dept of Parks & Recreation	Maui		1	10,295	$ 4,024.69	G	0.372881	0
66	Kahului Wastewater Pumping Station	Environmental Management	MAUI		1	132,250	$45,439.17	J	0.32663	13
67	Kahului Wastewater Reclamation Facility	Environmental Management	MAUI		1	4,510,000	$ 1,349,113.06	P	0.30271	25
68	Kalae Booster	Dept of Water Supply	MOLOKAI		1	16,335	$ 7,512.47	G	0.466151	0
69	Kalae Well	Dept of Water Supply	MAUI		1	25,785	$ 9,141.87	G	0.372881	0
70	Kalama Irrigation Pumps	Dept of Parks & Recreation	MAUI		1	72,849	$35,181.25	J	0.32663	13
71	Kalama Park	Dept of Parks & Recreation	MAUI		5	68,660	$28,496.49	G	0.372881	0
72	Kalama Skate Park	Dept of Parks & Recreation	MAUI		1	2,452	$ 1,482.12	G	0.372881	0
73	Kalana O Maui Building	Dept of Public Works	MAUI		1	1,987,800	$638,945.81	P	0.30271	25
74	Kalana Pakui	Dept of Public Works	MAUI		0	0	$ -	P	0.30271	25
75	Kamaole I Beach Park	Dept of Parks & Recreation	MAUI		1	5,850	$ 2,303.62	G	0.372881	0
76	Kamaole II Beach Park	Dept of Parks & Recreation	MAUI		2	10,711	$ 4,289.58	G	0.372881	0
77	Kamaole III Beach Park	Dept of Parks & Recreation	MAUI		1	4,906	$ 1,992.31	G	0.372881	0
78	Kamehameha Iki Park	Dept of Parks & Recreation	MAUI		1	10,150	$ 3,740.29	G	0.372881	0
79	Kamiloa Booster	Dept of Water Supply	MOLOKAI		1	26,205	$11,736.80	G	0.466151	0
80	Kamole Water Treatment Plant	Dept of Water Supply	MAUI		1	3,171,200	$ 1,060,574.01	J	0.32663	13
81	Kanaha Beach Park	Dept of Parks & Recreation	MAUI		1	7,268	$ 2,768.72	G	0.372881	0
82	Kanaha Well	Dept of Water Supply	MAUI		1	158,240	$54,963.83	J	0.32663	13

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
83	Kanoa Well 1	Dept of Water Supply	MAUI		1	515,100	$170,073.79	J	0.32663	13
84	Kanoa Well 2	Dept of Water Supply	MAUI		1	534,150	$176,163.97	J	0.32663	13
85	Kaunakakai Ball Park	Dept of Parks & Recreation	MOLOKAI		3	6,528	$ 4,225.41	G	0.466151	0
86	Kaunakakai Fire Station	Maui Fire & Public Safety	MOLOKAI		1	194,580	$73,674.15	J	0.383907	13
87	Kaunakakai Tennis Courts	Dept of Parks & Recreation	MOLOKAI		1	1,822	$ 1,175.07	G	0.466151	0
88	Kaunakakai Wastewater Pumping Station	Environmental Management	MOLOKAI		1	24,142	$10,851.36	G	0.466151	0
89	Kaunoa Senior Services	Dept of Housing & Human Concerns	MAUI	Yes	8	31,934	$18,692.67	G	0.372881	0
90	Kaupakalua Well	Dept of Water Supply	MAUI		1	1,391,600	$510,826.68	P	0.30271	25
91	Kawela Pump	Dept of Water Supply	MOLOKAI		1	90,099	$35,915.79	J	0.383907	13
92	KCC Irrigation Well	Dept of Parks & Recreation	MAUI		1	47,740	$19,098.30	J	0.32663	13
93	Keanae Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
94	Kehalani Boosters	Dept of Water Supply	MAUI		1	71,100	$31,520.21	J	0.32663	13
95	Kehalani Makai Park	Dept of Parks & Recreation	MAUI		1	23	$ 531.40	G	0.372881	0
96	Kehalani Mauka Park	Dept of Parks & Recreation	MAUI		1	3,193	$ 1,424.54	G	0.372881	0
97	Kelawea Mauka Makai Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
98	Kenolio Recreation Complex	Dept of Parks & Recreation	MAUI		2	44,385	$15,478.74	G	0.372881	0
99	Keokea Park	Dept of Parks & Recreation	MAUI		1	1,576	$ 894.92	G	0.372881	0
100	Keonekai Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
101	Keopuolani Regional Park	Dept of Parks & Recreation	MAUI		2	138,000	$63,722.58	G	0.372881	0
102	Keopuolani Skate Park	Dept of Parks & Recreation	MAUI		1	128,200	$45,580.33	J	0.32663	13
103	Kepaniwai Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
104	Kepaniwai Well	Dept of Water Supply	MAUI		1	306,560	$93,922.91	J	0.32663	13
105	Kihei Aquatic Center	Dept of Parks & Recreation	MAUI	Yes	1	208,800	$72,555.35	J	0.32663	13
106	Kihei Community Center	Dept of Parks & Recreation	MAUI	Yes	1	137,760	$52,999.58	J	0.32663	13
107	Kihei Elementary School	Dept of Parks & Recreation	MAUI		1	5,719	$ 2,265.26	G	0.372881	0
108	Kihei Fire Station	Maui Fire & Public Safety	MAUI		1	46,013	$15,624.50	G	0.372881	0
109	Kihei Police Station	Maui Police Department	MAUI		1	1,046,550	$325,120.16	J	0.32663	13
110	Kihei 2 Wastewater Pumping Station	Environmental Management	MAUI		1	32,870	$11,487.88	G	0.372881	0
111	Kihei 3 Wastewater Pumping Station	Environmental Management	MAUI		1	64,760	$23,382.64	J	0.32663	13
112	Kihei 4 Wastewater Pumping Station	Environmental Management	MAUI		1	103,400	$34,537.09	J	0.32663	13
113	Kihei 5 Wastewater Pumping Station	Environmental Management	MAUI		1	74,600	$26,179.10	J	0.32663	13

Johnson Controls

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
114	Kihei 6 Wastewater Pumping Station	Environmental Management	MAUI	Yes	1	1,077,500	$346,042.73	P	0.30271	25
115	Kihei 7 Wastewater Pumping Station	Environmental Management	MAUI		1	116,400	$40,111.20	J	0.32663	13
116	Kihei 8 Wastewater Pumping Station	Environmental Management	MAUI		1	120,500	$39,306.99	J	0.32663	13
117	Kihei 9 Wastewater Pumping Station	Environmental Management	MAUI		1	21,166	$ 7,593.16	G	0.372881	0
118	Kihei 10 Wastewater Pumping Station	Environmental Management	MAUI		1	242,600	$76,614.79	J	0.32663	13
119	Kihei 16 Wastewater Pumping Station	Environmental Management	MAUI		1	17,028	$ 6,243.23	G	0.372881	0
120	Kihei Wastewater Reclamation Facility	Environmental Management	MAUI		2	2,930,400	$890,032.61	P	0.30271	25
121	Kilohana Community Center	Dept of Parks & Recreation	MOLOKAI		1	6,741	$ 3,403.58	G	0.466151	0
122	Kilohana Park (Maui)	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
123	Kilohana Park (Molokai)	Dept of Parks & Recreation	MOLOKAI		1	625	$ 702.64	G	0.466151	0
124	Koali Boosters	Dept of Water Supply	MAUI		1	17,445	$ 6,205.93	G	0.372881	0
125	Kokua Pool	Dept of Parks & Recreation	MAUI		1	132,679	$42,473.81	J	0.32663	13
126	Kuau 1 Wastewater Pumping Station	Environmental Management	MAUI		1	8,431	$ 3,387.08	G	0.372881	0
127	Kuau 2 Wastewater Pumping Station	Environmental Management	MAUI		1	9,757	$ 3,823.58	G	0.372881	0
128	Kuau 3 Wastewater Pumping Station	Environmental Management	MAUI		1	12,027	$ 4,572.57	G	0.372881	0
129	Kuau 4 Wastewater Pumping Station	Environmental Management	MAUI		1	9,992	$ 3,904.73	G	0.372881	0
130	Kualapuu Park & Community Center	Dept of Parks & Recreation	MOLOKAI		2	13,521	$ 6,558.72	G	0.466151	0
131	Kualapuu Well	Dept of Water Supply	MOLOKAI		1	888,060	$309,202.11	P	0.316293	18
132	Kuikahi Pump	Dept of Water Supply	MAUI		1	420,100	$142,747.26	J	0.32663	13
133	Kula Ag Pump A Station	Dept of Water Supply	MAUI		1	372,600	$116,544.28	J	0.32663	13
134	Kula Ag Pump B Station	Dept of Water Supply	MAUI		1	323,000	$167,044.37	P	0.30271	25
135	Kula Ag Pump C Station	Dept of Water Supply	MAUI		1	308	$ 542.81	G	0.372881	0
136	Kula Community Center	Dept of Parks & Recreation	MAUI		1	20,600	$ 7,382.13	G	0.372881	0
137	Kula Fire Station	Maui Fire & Public Safety	MAUI		1	46,574	$15,935.68	G	0.372881	0
138	Kula Kai Booster	Dept of Water Supply	MAUI		1	1,900	$ 1,220.94	G	0.372881	0
139	Kula Pump Station	Dept of Water Supply	MAUI		4	240,649	$157,758.75	P	0.30271	25
140	Kula Water Treatment Plant	Dept of Water Supply	MAUI		0	0	$ -	N/A	N/A	N/A
141	Kupaa Well	Dept of Water Supply	MAUI		1	1,562,550	$475,298.00	P	0.30271	25
142	Lahaina Aquatic Center	Dept of Parks & Recreation	MAUI		1	337,920	$109,087.81	J	0.32663	13
143	Lahaina Banyan Court	Dept of Public Works	MAUI		0	0	$ -	N/A	N/A	N/A
144	Lahaina Baseyard	Dept of Public Works	MAUI	Yes	3	5,585	$ 5,240.46	G	0.372881	0

Johnson Controls

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
145	Lahaina Civic Center	Dept of Parks & Recreation	MAUI		4	305,140	$176,819.66	J	0.32663	13
146	Lahaina Fire Station	Maui Fire & Public Safety	MAUI	Yes	1	76,200	$27,640.44	J	0.32663	13
147	Lahaina Gateway Center	Unknown	MAUI		1	48,209	$16,571.99	G	0.372881	0
148	Lahaina Police Station	Maui Police Department	MAUI		2	218,260	$72,395.35	J	0.32663	13
149	Lahaina Recreation Center	Dept of Parks & Recreation	MAUI		6	110,255	$54,569.09	G	0.372881	0
150	Lahaina 1 Wastewater Pumping Station	Environmental Management	MAUI		1	338,850	$107,947.20	J	0.32663	13
151	Lahaina 2 Wastewater Pumping Station	Environmental Management	MAUI		1	257,600	$85,541.70	J	0.32663	13
152	Lahaina 3 Wastewater Pumping Station	Environmental Management	MAUI		1	209,500	$70,586.90	J	0.32663	13
153	Lahaina 4 Wastewater Pumping Station	Environmental Management	MAUI		1	27,680	$ 9,765.32	G	0.372881	0
154	Lahaina 5 Wastewater Pumping Station	Environmental Management	MAUI		1	43,798	$15,066.01	G	0.372881	0
155	Lahaina 6 Wastewater Pumping Station	Environmental Management	MAUI		1	10,482	$ 3,842.21	G	0.372881	0
156	Lahaina 7 Wastewater Pumping Station	Environmental Management	MAUI		1	5,865	$ 2,537.68	G	0.372881	0
157	Lahaina Wastewater Reclamation Facility	Environmental Management	MAUI	Yes	3	5,102,400	$ 1,731,158.19	P	0.30271	25
158	Lahainaluna Water Treatment Plant	Dept of Water Supply	MAUI	Yes	1	460,200	$152,261.36	J	0.32663	13
159	Lanai Community Complex	Dept of Parks & Recreation	LANAI		2	1,088	$ 1,211.12	G	0.473758	0
160	Lanai Baseyard	Dept of Public Works	LANAI	Yes	1	4,402	$ 2,282.76	G	0.473758	0
161	Lanai Fire Station	Maui Fire & Public Safety	LANAI	Yes	1	9,227	$ 4,626.78	G	0.473758	0
162	Lanai Gymnasium	Dept of Parks & Recreation	LANAI		2	31,835	$14,049.51	G	0.473758	0
163	Lanai Park & Tennis Courts	Dept of Parks & Recreation	LANAI		1	3,283	$ 1,782.21	G	0.473758	0
164	Lanai Police Station	Maui Police Department	LANAI	Yes	1	140,820	$61,796.96	J	0.45423	13
165	Lanai Senior Center	Dept of Parks & Recreation	LANAI		1	29,020	$12,695.52	G	0.473758	0
166	Lanai Wastewater Reclamation Facility	Environmental Management	LANAI		1	20,146	$ 8,987.34	G	0.473758	0
167	Launiupoko Beach Park	Dept of Parks & Recreation	MAUI		1	1,833	$ 978.23	G	0.372881	0
168	Leisure Estate Wastewater Pumping Station	Environmental Management	MAUI		1	19,505	$ 7,015.98	G	0.372881	0
169	Lower Kula Boosters	Dept of Water Supply	MAUI		1	1,371,600	$429,290.29	J	0.32663	13
170	Lower Paia Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
171	Mahinahina Baseyard	Dept of Water Supply	MAUI		1	1,685	$ 928.87	G	0.372881	0
172	Mahinahina Water Treatment Plant	Dept of Water Supply	MAUI	Yes	1	29,400	$16,410.86	J	0.32663	13
173	Makawao Baseyard	Dept of Water Supply	MAUI	Yes	3	4,851	$ 5,426.97	G	0.372881	0
174	Makawao Fire Station	Maui Fire & Public Safety	MAUI		1	39,567	$13,405.33	G	0.372881	0
175	Makawao Veterans Cemetery	Dept of Public Works	MAUI		1	7,423	$ 2,811.84	G	0.372881	0

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
176	Malu Ulu Olele Park	Dept of Parks & Recreation	MAUI		2	3,330	$ 2,250.98	G	0.372881	0
177	Malu Ulu Olele Pump	Dept of Water Supply	MAUI		1	350,720	$170,045.02	J	0.32663	13
178	Maui County Service Center	Dept of Public Works	Maui		2	411,600	$140,813.69	J	0.32663	13
179	Maui Lani Regional Park	Dept of Parks & Recreation	MAUI		1	2,865	$ 1,316.57	G	0.372881	0
180	Maui Lani Well 5	Dept of Water Supply	MAUI		1	77,686	$30,291.08	J	0.32663	13
181	Maui Lani Well 6	Dept of Water Supply	MAUI		1	224,463	$71,682.66	J	0.32663	13
182	Maui Lani Well 7	Dept of Water Supply	MAUI		1	300,446	$93,699.83	J	0.32663	13
183	Maui Mall	Unknown	MAUI		2	375,325	$125,781.93	J	0.32663	13
184	Maui Meadows Pump	Dept of Water Supply	MAUI		1	878,850	$308,754.72	P	0.30271	25
185	Maunaloa Community Center	Dept of Parks & Recreation	MOLOKAI		1	1,823	$ 1,164.62	G	0.466151	0
186	Mayor Hannibal Tavares Community Center	Dept of Parks & Recreation	MAUI		2	41,306	$14,643.71	G	0.372881	0
187	Mitchel Pauole Community Center	Dept of Parks & Recreation	MOLOKAI		2	238,342	$94,341.93	J	0.383907	13
188	Mokuhau Park	Dept of Parks & Recreation	MAUI		1	1,284	$ 796.17	G	0.372881	0
189	Mokuhau Well	Dept of Water Supply	MAUI		2	2,540,400	$843,100.07	P	0.30271	25
190	Molokai Baseyard	Dept of Water Supply	MOLOKAI		1	13,093	$ 5,999.38	G	0.466151	0
191	Molokai Kuha'o Business Center	Dept of Public Works	MOLOKAI		3	17,302	$ 8,546.75	G	0.466151	0
192	Molokai Police Station	Maui Police Department	MOLOKAI		0	0	$ -	J	0.383907	13
193	Molokai Wastewater Reclamation Facility	Environmental Management	MOLOKAI		1	216,160	$81,803.92	J	0.383907	13
194	Nagamatsu Booster Station	Dept of Water Supply	MAUI		1	154,250	$122,308.04	P	0.30271	25
195	Napili 1 Wastewater Pumping Station	Environmental Management	MAUI		1	224,600	$74,429.56	J	0.32663	13
196	Napili 2 Wastewater Pumping Station	Environmental Management	MAUI		1	142,240	$47,160.77	J	0.32663	13
197	Napili 3 Wastewater Pumping Station	Environmental Management	MAUI		1	61,440	$23,253.38	J	0.32663	13
198	Napili 4 Wastewater Pumping Station	Environmental Management	MAUI		1	83,680	$29,278.98	J	0.32663	13
199	Napili 5 Wastewater Pumping Station	Environmental Management	MAUI		2	26,959	$10,390.48	G	0.372881	0
200	Napili 6 Wastewater Pumping Station	Environmental Management	MAUI		2	39,644	$14,596.37	G	0.372881	0
201	Napili Fire Station	Maui Fire & Public Safety	MAUI		1	52,245	$17,903.81	G	0.372881	0
202	Napili Park	Dept of Parks & Recreation	MAUI		1	13,501	$ 4,901.42	G	0.372881	0
203	Napili Rd Pump	Dept of Water Supply	MAUI		1	1,738,750	$530,169.89	P	0.30271	25
204	Napili Water Treatment Plant	Dept of Water Supply	MAUI		1	79,800	$86,674.89	P	0.30271	25
205	Napili Well B	Dept of Water Supply	MAUI		1	430,850	$149,941.89	J	0.32663	13
206	North Waihee Boosters	Dept of Water Supply	MAUI		1	575,800	$193,419.21	J	0.32663	13

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
207	North Waihee Well	Dept of Water Supply	MAUI		1	923,850	$317,410.93	P	0.30271	25
208	Old Courthouse Building	Dept of Prosecuting Attorney	MAUI		1	201,120	$67,953.87	J	0.32663	13
209	Old Lahaina Center	Unknown	Maui		1	8,433	$ 3,154.10	G	0.372881	0
210	Old Lahaina Prison	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
211	Olinda Pump	Dept of Water Supply	MAUI		1	321,280	$164,266.86	J	0.32663	13
212	Olinda Water Treatment Plant	Dept of Water Supply	MAUI		1	494,550	$157,801.76	J	0.32663	13
213	Omaopio Boosters	Dept of Water Supply	MAUI		1	24,000	$16,390.26	J	0.32663	13
214	One Alii Park	Dept of Parks & Recreation	MOLOKAI		1	8,509	$ 4,029.10	G	0.466151	0
215	Paia Community Center	Dept of Parks & Recreation	MAUI		1	14,170	$ 5,066.24	G	0.372881	0
216	Paia Fire Station	Maui Fire & Public Safety	MAUI		1	44,000	$15,193.60	G	0.372881	0
217	Paia Park	Dept of Parks & Recreation	MAUI		1	7,896	$ 2,989.59	G	0.372881	0
218	Paia Wastewater Pumping Station	Environmental Management	MAUI		1	68,549	$24,531.99	J	0.32663	13
219	Pakele St Wastewater Pumping Station	Dept of Public Works	MAUI		1	7,891	$ 3,194.16	G	0.372881	0
220	Papohaku Beach Park	Dept of Parks & Recreation	MOLOKAI		1	1,679	$ 1,101.08	G	0.466151	0
221	Papohaku Park	Dept of Parks & Recreation	MAUI		1	31,027	$18,988.01	J	0.32663	13
222	Papohaku Well	Dept of Water Supply	MAUI		1	23,053	$ 8,279.26	G	0.372881	0
223	Paukukalo Wastewater Pumping Station	Environmental Management	MAUI		1	43,650	$14,973.43	G	0.372881	0
224	Paunau Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
225	Piiholo Water Treatment Plant	Dept of Water Supply	MAUI		2	338,000	$115,988.72	J	0.32663	13
226	Pi'ikea Park	Dept of Parks & Recreation	MAUI		1	282	$ 538.69	G	0.372881	0
227	Polehu Pump	Environmental Management	MAUI		1	1,393	$ 871.89	G	0.372881	0
228	Pookela Well	Dept of Water Supply	MAUI		2	936,160	$432,305.16	P	0.30271	25
229	Puamana Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
230	Public Works DSA Office Building	Dept of Public Works	MAUI		2	86,724	$31,707.25	J	0.32663	13
231	Pukoo Fire Station	Maui Fire & Public Safety	MOLOKAI		1	16,435	$ 7,387.16	G	0.466151	0
232	Pu'u Hauoli Park	Dept of Parks & Recreation	MOLOKAI		0	0	$ -	N/A	N/A	N/A
233	Puuohala Park	Dept of Parks & Recreation	MAUI		1	886	$ 676.02	G	0.372881	0
234	Sewer Maintenance Building	Environmental Management	MAUI		1	60,638	$22,145.03	J	0.32663	13
235	Skill Village Pump	Dept of Water Supply	MAUI		1	27,280	$12,843.27	J	0.32663	13
236	South Maui Community Center & Park	Dept of Parks & Recreation	MAUI	Yes	5	148,259	$113,260.25	P	0.30271	25
237	Spreckelsville Wastewater Pumping Station	Environmental Management	MAUI		1	25,597	$ 9,071.38	G	0.372881	0

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
238	Ualapue Well	Dept of Water Supply	MOLOKAI		1	114,720	$43,730.36	J	0.383907	13
239	Ukumehame Firing Range	Dept of Parks & Recreation	MAUI		4	8,636	$ 4,477.83	G	0.372881	0
240	Ulumalu Arena	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
241	Upper Maui Meadows Pump	Dept of Water Supply	MAUI		1	276,150	$97,088.81	J	0.32663	13
242	Wells St Professional Center	County Auditor	MAUI		4	22,879	$ 9,465.38	G	0.372881	0
243	Victims Advocate Building	Dept of Prosecuting Attorney	MAUI		1	63,540	$23,017.39	J	0.32663	13
244	Hawaii Telecom Building	Dept of Public Works	MAUI		0	0	$ -	N/A	N/A	N/A
245	Sheraton Wastewater Pumping Station	Environmental Management	MAUI		1	18,436	$ 6,711.80	G	0.372881	0
246	Upcountry Pool	Dept of Parks & Recreation	MAUI		2	177,009	$58,675.62	G	0.372881	0
247	Velma McWayne Santos Community Center	Dept of Parks & Recreation	MAUI		1	24,618	$ 8,762.70	G	0.372881	0
248	Wahikuli Terrace Park	Dept of Parks & Recreation	MAUI		1	3	$ 525.23	G	0.372881	0
249	Wahikuli Wayside Park	Dept of Parks & Recreation	MAUI		3	1,304	$ 1,712.32	G	0.372881	0
250	Waiakoa Gymnasium	Dept of Parks & Recreation	MAUI		1	3,900	$ 1,660.52	G	0.372881	0
251	Waiale Booster Station	Dept of Water Supply	MAUI		1	4,650	$ 2,127.95	G	0.372881	0
252	Waiehu Kou Wastewater Pumping Station	Environmental Management	MAUI		1	26,283	$ 9,251.68	G	0.372881	0
253	Waiale Pump	Dept of Water Supply	MAUI		1	717,600	$225,188.70	J	0.32663	13
254	Wailea Tank Booster	Dept of Water Supply	MAUI		1	1,600	$ 1,442.47	G	0.372881	0
255	Waiehu Golf Course	Dept of Parks & Recreation	MAUI		8	367,291	$138,254.06	G	0.372881	0
256	Waiehu Terrace Park	Dept of Parks & Recreation	MAUI		1	12,814	$ 4,586.88	G	0.372881	0
257	Waihee 514,515 Well	Dept of Water Supply	MAUI		1	735,040	$229,122.27	J	0.32663	13
258	Waihee 577,578,579 Well	Dept of Water Supply	MAUI		1	6,417,600	$ 1,894,360.56	P	0.30271	25
259	Waihee Beach Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
260	Waikapu Community Center & Park	Dept of Parks & Recreation	MAUI		2	6,068	$ 2,896.54	G	0.372881	0
261	Waikapu Well	Dept of Water Supply	MAUI		1	383,600	$194,870.81	P	0.30271	25
262	Wakiu Well B	Dept of Water Supply	MAUI		2	50,897	$20,131.23	J	0.32663	13
263	Wakiu Well C	Dept of Water Supply	MAUI		1	21,553	$12,556.85	J	0.32663	13
264	Waikuli Terrace Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
265	Wailea Beach Park	Dept of Parks & Recreation	MAUI		2	1,745	$ 1,446.73	G	0.372881	0
266	Wailea Fire Station	Maui Fire & Public Safety	MAUI	Yes	1	149,220	$50,388.44	J	0.32663	13
267	Wailuku Baseyard	Dept of Public Works	MAUI	Yes	7	51,977	$21,813.56	G	0.372881	0
268	Wailuku Country Estates Booster 2	Dept of Water Supply	MAUI		1	3,480	$ 1,742.42	G	0.372881	0
269	Wailuku Country Estates Booster 3	Dept of Water Supply	MAUI		1	24,020	$10,123.08	G	0.372881	0

No.	Facility Name	Dept	Island	Exist PV	Qty Accts	Annual Elec kWh	Annual Elec Cost	MECO Sch	Elec Rate ($/kWh)	Demand Rate ($/kW)
270	Wailuku Elementary School Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
271	Wailuku Fire Station	Maui Fire & Public Safety	MAUI		2	52,339	$18,483.93	G	0.372881	0
272	Wailuku Police Station	Maui Police Department	MAUI		1	1,999,800	$613,513.52	P	0.30271	25
273	Wailuku Pool	Dept of Parks & Recreation	MAUI		2	118,740	$39,792.54	J	0.32663	13
274	Wailuku Well 1	Dept of Water Supply	MAUI		1	679,600	$249,962.09	P	0.30271	25
275	Wailuku Well 2	Dept of Water Supply	MAUI		1	2,034,000	$607,276.15	P	0.30271	25
276	Waiolani Mauka Park	Dept of Parks & Recreation	MAUI		1	8	$ 532.94	G	0.372881	0
277	Waipuilani Park	Dept of Parks & Recreation	MAUI		0	0	$ -	N/A	N/A	N/A
278	Waipuka Well	Dept of Water Supply	MAUI		1	257,477	$84,917.58	J	0.32663	13
279	Wakea Wastewater Pumping Station	Environmental Management	MAUI		1	24,544	$ 8,680.38	G	0.372881	0
280	War Memorial Complex	Dept of Parks & Recreation	MAUI		12	411,173	$187,531.15	J	0.32663	13
281	Wells Park	Dept of Parks & Recreation	MAUI		3	53,898	$18,875.26	G	0.372881	0
282	West Maui Senior Center	Dept of Housing & Human Concerns	MAUI	Yes	1	20,340	$13,953.94	J	0.32663	13
283	Streetlight	Dept of Public Works	LANAI		27	3,697,353	$ 2,033,919.64	F	0.47692	0
284	Tank	Dept of Water Supply	MAUI		19	3,747	$ 9,560.77	G	0.372881	0
285	Traffic Signal	Dept of Public Works	MAUI		29	63,180	$31,629.94	G	0.372881	0
286	Siren	Civil Defense Agency	MAUI		25	3	$15,759.98	G	0.372881	0
287	Radio Site	Maui Police Department	MAUI		3	91,366	$34,593.86	G	0.372881	0
288	Ulapalakua Radio Site	Maui Police Department	MAUI		1	75,494	$26,346.43	J	0.32663	13
289	Kahakuloa Radio Site	Maui Police Department	MAUI		1	13,379	$ 4,788.94	G	0.372881	0
290	Unknown accounts	Various	MAUI		47	268,566	$132,001.38			
291	Small Unknown accounts	Various	MAUI		19	82,251	$32,125.64			
	TOTAL				**617**	**72,767,059**	**$ 25,697,603**			

Water/Sewer Utility Baseline

Listed below are the annual details indicative of the water and sewer invoices from the data that was provided by the County between Jan 2018 and May 2020 (varies by account). Water is provided by various utilities, including the Department of Water Supply, Lanai Water Company, Molokai Public Utilities, Hawaii Water Service Company, Laniupoko Water/Irrigation Company, and Consolidated Waiko Water Association, and the sewer services are provided by the Department of Environmental Management.

The monthly details can be found in Appendix 4.

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
1	66 Market St Restroom	Dept of Public Works	MAUI	1	267	$4,978.91	Dept of Water Supply	5.85	6.7
2	Daycare	Dept of Public Works	MAUI	1	0	$505.89	Dept of Water Supply	2.05	6.7
3	State Run Old Courthouse	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
4	4th Marine Division Memorial Park	Dept of Parks & Recreation	MAUI	1	2,362	$13,900.61	Dept of Water Supply	5.85	0
5	Alfred "Flako" Boteilho Gymnasium	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
6	Brooks Booster	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
7	Central Maui Regional Sports Complex	Dept of Parks & Recreation	MAUI	1	164	$3,598.70	Dept of Water Supply	3.9	6.7
8	Central Landfill	Environmental Management	MAUI	0	0	$ -	No water data	-	-
9	Central Wailuku Heights Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
10	Charley Young Park	Dept of Parks & Recreation	MAUI	1	207	$1,262.82	Dept of Water Supply	5.85	0
11	Civic Center Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
12	Coach Sakamoto Pool	Dept of Parks & Recreation	MAUI	1	12,238	$72,938.41	Dept of Water Supply	5.85	0
13	Coach Shiraishi Memorial Pool	Dept of Parks & Recreation	MAUI	1	597	$ 8,974.35	Dept of Water Supply	5.85	6.7
14	Cooke Memorial Pool	Dept of Parks & Recreation	MOLOKAI	3	590	$9,440.05	Dept of Water Supply	3.9	0
15	Country Club Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
16	Credit Union Building	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
17	David Trask Office Building	Environmental Management	MAUI	1	0	$490.22	Dept of Water Supply	2.05	0
18	Diamond Resort Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
19	D.T. Fleming Park	Dept of Parks & Recreation	MAUI	1	536	$9,036.20	Hawaii Water Service	5.05	10.65
20	Duke Maliu Regional Park	Dept of Parks & Recreation	MOLOKAI	1	983	$13,244.00	Dept of Water Supply	5.85	6.7
21	Eddie Tam Memorial Center	Dept of Parks & Recreation	MAUI	2	8,218	$48,934.98	Dept of Water Supply	5.85	0
22	Eluene Pl Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
23	Field Operations Lahaina Baseyard	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
24	Fire Prevention Bureau	Maui Fire & Public Safety	MAUI	1	150	$262.00	Consolidated-Waiko Water Association	1.75	6.7

Johnson Controls

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
25	Forensic Facility	Maui Police Dept	MAUI	1	43	$1,251.03	Dept of Water Supply	2.05	6.7
26	H.A. Baldwin Park	Dept of Parks & Recreation	MAUI	1	741	$10,157.83	Dept of Water Supply	5.85	6.7
27	Haiku Community Center	Dept of Parks & Recreation	MAUI	1	82	$1,908.44	Dept of Water Supply	3.9	0
28	Haiku Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
29	Hale Mahaulu Ewalu Senior Housing	Dept of Housing & Human Concerns	MAUI	0	0	$ -	No water data	-	-
30	Haleakala Acres Pumps	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
31	Haleakala Hwy Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
32	Haliimaile Park & Tennis	Dept of Parks & Recreation	MAUI	1	77	$2,069.75	Dept of Water Supply	3.9	6.7
33	Haliimaile Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
34	Hamakuapoko Well 1	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
35	Hamakuapoko Well 2	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
36	Hamoa Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
37	Hana Bay Beach Park	Dept of Parks & Recreation	MAUI	1	398	$2,107.80	Dept of Water Supply	5.85	0
38	Hana Community Center & Ball Park	Dept of Parks & Recreation	MAUI	2	336	$2,601.30	Dept of Water Supply	3.9	0
39	Hana Fire Station	Maui Fire & Public Safety	MAUI	1	254	$1,407.90	Dept of Water Supply	5.85	0
40	Hana Landfill	Environmental Management	MAUI	1	14	$3,210.81	Dept of Water Supply	2.05	6.7
41	Hana Police Station	Maui Police Department	MAUI	1	68	$1,332.55	Dept of Water Supply	3.9	0
42	Hanakao'o Park	Dept of Parks & Recreation	MAUI	3	8,013	$91,230.31	Dept of Water Supply	5.85	0
43	Harry Fields Booster Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
44	Haycraft Park	Dept of Parks & Recreation	MAUI	1	666	$3,749.94	Dept of Water Supply	5.85	0
45	Helene Hall	Dept of Parks & Recreation	MAUI	1	0	$570.00	Dept of Water Supply	2.05	0
46	Honokowai Beach Park	Dept of Parks & Recreation	MAUI	1	1,356	$17,908.59	Dept of Water Supply	5.85	6.7
47	Honokowai Booster Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
48	Honolii Park	Dept of Parks & Recreation	MAUI	1	401	$2,581.34	Dept of Water Supply	5.85	0
49	Honukahu Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
50	Ho'okipa Beach Park	Dept of Parks & Recreation	MAUI	1	2,097	$12,837.23	Dept of Water Supply	5.85	0
51	Hoolehua Fire Station	Maui Fire & Public Safety	MOLOKAI	1	0	$3,884.16	Dept of Hawaiian Home Lands	0	0
52	Huliau Housing	Dept of Housing & Human Concerns	Maui	0	0	$ -	No water data	-	-
53	Hyatt Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
54	Iao Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
55	Iao Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
56	Kaa Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
57	Kaanapali Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
58	Kaenae Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
59	Kahala Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
60	Kahului Baseyard	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
61	Kahului Community Center	Dept of Parks & Recreation	MAUI	2	26	$1,240.71	Dept of Water Supply	2.05	6.7
62	Kahului Community Center Park	Dept of Parks & Recreation	MAUI	2	109	$3,717.07	Dept of Water Supply	2.05	0
63	Kahului Fire Station	Maui Fire & Public Safety	MAUI	1	1,572	$20,610.60	Dept of Water Supply	5.85	6.7
64	Kahului Park	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
65	Kahului Park Irrigation Well	Dept of Parks & Recreation	Maui	0	0	$ -	No water data	-	-
66	Kahului Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
67	Kahului Wastewater Reclamation Facility	Environmental Management	MAUI	1	176	$2,333.70	Dept of Water Supply	3.9	0
68	Kalae Booster	Dept of Water Supply	MOLOKAI	0	0	$ -	No water data	-	-
69	Kalae Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
70	Kalama Irrigation Pumps	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
71	Kalama Park	Dept of Parks & Recreation	MAUI	2	2,729	$32,097.71	Dept of Water Supply	5.85	0
72	Kalama Skate Park	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
73	Kalana O Maui Building	Dept of Public Works	MAUI	1	1,981	$30,894.54	Dept of Water Supply	5.85	6.7
74	Kalana Pakui	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
75	Kamaole I Beach Park	Dept of Parks & Recreation	MAUI	1	2,049	$12,331.64	Dept of Water Supply	5.85	0
76	Kamaole II Beach Park	Dept of Parks & Recreation	MAUI	1	1,217	$7,558.97	Dept of Water Supply	5.85	0
77	Kamaole III Beach Park	Dept of Parks & Recreation	MAUI	1	0	$241.76	Dept of Water Supply	2.05	0
78	Kamehameha Iki Park	Dept of Parks & Recreation	MAUI	1	1,729	$10,609.82	Dept of Water Supply	5.85	0
79	Kamiloa Booster	Dept of Water Supply	MOLOKAI	0	0	$ -	No water data	-	-
80	Kamole Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
81	Kanaha Beach Park	Dept of Parks & Recreation	MAUI	2	22,895	$290,296.25	Dept of Water Supply	5.85	6.7
82	Kanaha Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
83	Kanoa Well 1	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
84	Kanoa Well 2	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
85	Kaunakakai Ball Park	Dept of Parks & Recreation	MOLOKAI	1	7,383	$99,425.29	Dept of Water Supply	5.85	6.7
86	Kaunakakai Fire Station	Maui Fire & Public Safety	MOLOKAI	1	287	$4,483.85	Dept of Water Supply	5.85	6.7

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
87	Kaunakakai Tennis Courts	Dept of Parks & Recreation	MOLOKAI	0	0	$ -	No water data	-	-
88	Kaunakakai Wastewater Pumping Station	Environmental Management	MOLOKAI	0	0	$ -	No water data	-	-
89	Kaunoa Senior Services	Dept of Housing & Human Concerns	MAUI	1	3,575	$46,348.25	Dept of Water Supply	5.85	6.7
90	Kaupakalua Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
91	Kawela Pump	Dept of Water Supply	MOLOKAI	0	0	$ -	No water data	-	-
92	KCC Irrigation Well	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
93	Keanae Park	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
94	Kehalani Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
95	Kehalani Makai Park	Dept of Parks & Recreation	MAUI	1	1,033	$6,996.75	Dept of Water Supply	5.85	6.7
96	Kehalani Mauka Park	Dept of Parks & Recreation	MAUI	1	13,741	$173,985.75	Dept of Water Supply	5.85	6.7
97	Kelawea Mauka Makai Park	Dept of Parks & Recreation	MAUI	1	6,008	$34,916.68	Dept of Water Supply	5.85	0
98	Kenolio Recreation Complex	Dept of Parks & Recreation	MAUI	1	95	$2,279.76	Dept of Water Supply	3.9	6.7
99	Keokea Park	Dept of Parks & Recreation	MAUI	1	163	$1,210.50	Dept of Water Supply	3.9	0
100	Keonekai Park	Dept of Parks & Recreation	MAUI	1	5,320	$31,761.45	Dept of Water Supply	5.85	0
101	Keopuolani Regional Park	Dept of Parks & Recreation	MAUI	4	4,327	$58,586.26	Dept of Water Supply	5.85	6.7
102	Keopuolani Skate Park	Dept of Parks & Recreation	MAUI	1	75	$1,482.42	Dept of Water Supply	3.9	6.7
103	Kepaniwai Park	Dept of Parks & Recreation	MAUI	3	968	$8,928.02	Dept of Water Supply	2.05	0
104	Kepaniwai Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
105	Kihei Aquatic Center	Dept of Parks & Recreation	MAUI	1	2,967	$39,235.11	Dept of Water Supply	5.85	6.7
106	Kihei Community Center	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
107	Kihei Elementary School	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
108	Kihei Fire Station	Maui Fire & Public Safety	MAUI	1	222	$3,685.65	Dept of Water Supply	3.9	6.7
109	Kihei Police Station	Maui Police Department	MAUI	1	2,251	$30,846.72	Dept of Water Supply	5.85	6.7
110	Kihei 2 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
111	Kihei 3 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
112	Kihei 4 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
113	Kihei 5 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
114	Kihei 6 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
115	Kihei 7 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
116	Kihei 8 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
117	Kihei 9 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
118	Kihei 10 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
119	Kihei 16 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
120	Kihei Wastewater Reclamation Facility	Environmental Management	MAUI	1	1,249	$8,536.65	Dept of Water Supply	5.85	0
121	Kilohana Community Center	Dept of Parks & Recreation	MOLOKAI	1	128	$2,307.35	Dept of Water Supply	3.9	0
122	Kilohana Park (Maui)	Dept of Parks & Recreation	MAUI	1	4,505	$28,320.04	Dept of Water Supply	5.85	0
123	Kilohana Park (Molokai)	Dept of Parks & Recreation	MOLOKAI	1	0	$570.00	Dept of Water Supply	2.05	0
124	Koali Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
125	Kokua Pool	Dept of Parks & Recreation	MAUI	1	1,022	$13,708.10	Dept of Water Supply	5.85	6.7
126	Kuau 1 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
127	Kuau 2 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
128	Kuau 3 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
129	Kuau 4 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
130	Kualapuu Park & Community Center	Dept of Parks & Recreation	MOLOKAI	2	226	$1,734.26	Molokai Public Utilities	7.22	0
131	Kualapuu Well	Dept of Water Supply	MOLOKAI	0	0	$ -	No water data	-	-
132	Kuikahi Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
133	Kula Ag Pump A Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
134	Kula Ag Pump B Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
135	Kula Ag Pump C Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
136	Kula Community Center	Dept of Parks & Recreation	MAUI	1	390	$3,112.53	Dept of Water Supply	5.85	0
137	Kula Fire Station	Maui Fire & Public Safety	MAUI	1	233	$1,492.50	Dept of Water Supply	5.85	0
138	Kula Kai Booster	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
139	Kula Pump Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
140	Kula Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
141	Kupaa Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
142	Lahaina Aquatic Center	Dept of Parks & Recreation	MAUI	3	10,275	$72,758.91	Dept of Water Supply	5.85	6.7
143	Lahaina Banyan Court	Dept of Public Works	MAUI	1	1,763	$18,142.07	Dept of Water Supply	5.85	6.7
144	Lahaina Baseyard	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
145	Lahaina Civic Center	Dept of Parks & Recreation	MAUI	2	8,176	$72,070.21	Dept of Water Supply	5.85	6.7
146	Lahaina Fire Station	Maui Fire & Public Safety	MAUI	1	993	$13,344.15	Dept of Water Supply	5.85	6.7
147	Lahaina Gateway Center	Unknown	MAUI	0	0	$ -	No water data	-	-
148	Lahaina Police Station	Maui Police Department	MAUI	1	344	$4,677.20	Dept of Water Supply	5.85	6.7

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
149	Lahaina Recreation Center	Dept of Parks & Recreation	MAUI	1	80	$2,087.12	Dept of Water Supply	3.9	6.7
150	Lahaina 1 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
151	Lahaina 2 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
152	Lahaina 3 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
153	Lahaina 4 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
154	Lahaina 5 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
155	Lahaina 6 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
156	Lahaina 7 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
157	Lahaina Wastewater Reclamation Facility	Environmental Management	MAUI	2	332	$3,293.85	Dept of Water Supply	3.9	0
158	Lahainaluna Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
159	Lanai Community Complex	Dept of Parks & Recreation	LANAI	0	0	$ -	No water data	-	-
160	Lanai Baseyard	Dept of Public Works	LANAI	0	0	$ -	No water data	-	-
161	Lanai Fire Station	Maui Fire & Public Safety	LANAI	1	252	$2,420.85	Lanai Water Company	1.62	6.7
162	Lanai Gymnasium	Dept of Parks & Recreation	LANAI	0	0	$ -	No water data	-	-
163	Lanai Park & Tennis Courts	Dept of Parks & Recreation	LANAI	0	0	$ -	No water data	-	-
164	Lanai Police Station	Maui Police Department	LANAI	1	642	$5,682.68	Lanai Water Company	1.62	6.7
165	Lanai Senior Center	Dept of Parks & Recreation	LANAI	0	0	$ -	No water data	-	-
166	Lanai Wastewater Reclamation Facility	Environmental Management	LANAI	0	0	$ -	No water data	-	-
167	Launiupoko Beach Park	Dept of Parks & Recreation	MAUI	3	16,264	$77,300.60	Dept of Water Supply	5.85	0
168	Leaisure Estate Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
169	Lower Kula Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
170	Lower Paia Park	Dept of Parks & Recreation	MAUI	1	0	$246.89	Dept of Water Supply	2.05	0
171	Mahinahina Baseyard	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
172	Mahinahina Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
173	Makawao Baseyard	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
174	Makawao Fire Station	Maui Fire & Public Safety	MAUI	1	146	$854.10	Dept of Water Supply	3.9	0
175	Makawao Veterans Cemetery	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
176	Malu Ulu Olele Park	Dept of Parks & Recreation	MAUI	1	0	$1,944.00	Dept of Water Supply	2.05	6.7
177	Malu Ulu Olele Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
178	Maui County Service Center	Dept of Public Works	Maui	0	0	$ -	No water data	-	-
179	Maui Lani Regional Park	Dept of Parks & Recreation	MAUI	1	94	$1,666.99	Dept of Water Supply	3.9	6.7

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
180	Maui Lani Well 5	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
181	Maui Lani Well 6	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
182	Maui Lani Well 7	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
183	Maui Mall	Unknown	MAUI	0	0	$ -	No water data	-	-
184	Maui Meadows Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
185	Maunaloa Community Center	Dept of Parks & Recreation	MOLOKAI	1	828	$5,967.19	Molokai Public Utilities	7.16	0
186	Mayor Hannibal Tavares Community Center	Dept of Parks & Recreation	MAUI	1	2,446	$15,581.60	Dept of Water Supply	5.85	0
187	Mitchel Pauole Community Center	Dept of Parks & Recreation	MOLOKAI	0	0	$ -	No water data	-	-
188	Mokuhau Park	Dept of Parks & Recreation	MAUI	1	1,779	$22,721.15	Dept of Water Supply	5.85	6.7
189	Mokuhau Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
190	Molokai Baseyard	Dept of Water Supply	MOLOKAI	1	298	$1,707.59	Dept of Water Supply	5.85	0
191	Molokai Kuha'o Business Center	Dept of Public Works	MOLOKAI	0	0	$ -	No water data	-	-
192	Molokai Police Station	Maui Police Department	MOLOKAI	1	1,353	$19,469.38	Dept of Water Supply	5.85	6.7
193	Molokai Wastewater Reclamation Facility	Environmental Management	MOLOKAI	0	0	$ -	No water data	-	-
194	Nagamatsu Booster Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
195	Napili 1 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
196	Napili 2 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
197	Napili 3 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
198	Napili 4 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
199	Napili 5 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
200	Napili 6 Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
201	Napili Fire Station	Maui Fire & Public Safety	MAUI	1	204	$2,920.20	Dept of Water Supply	5.85	6.7
202	Napili Park	Dept of Parks & Recreation	MAUI	2	61	$1,346.05	Dept of Water Supply	2.05	0
203	Napili Rd Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
204	Napili Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
205	Napili Well B	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
206	North Waihee Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
207	North Waihee Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
208	Old Courthouse Building	Dept of Prosecuting Attorney	MAUI	0	0	$ -	No water data	-	-
209	Old Lahaina Center	Unknown	Maui	0	0	$ -	No water data	-	-
210	Old Lahaina Prison	Dept of Parks & Recreation	MAUI	1	861	$10,817.72	Dept of Water Supply	5.85	6.7

Johnson Controls

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
211	Olinda Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
212	Olinda Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
213	Omaopio Boosters	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
214	One Alii Park	Dept of Parks & Recreation	MOLOKAI	1	17	$272.45	Dept of Water Supply	2.05	0
215	Paia Community Center	Dept of Parks & Recreation	MAUI	1	209	$3,779.53	Dept of Water Supply	5.85	6.7
216	Paia Fire Station	Maui Fire & Public Safety	MAUI	1	269	$3,737.90	Dept of Water Supply	5.85	6.7
217	Paia Park	Dept of Parks & Recreation	MAUI	1	1,349	$19,420.33	Dept of Water Supply	5.85	6.7
218	Paia Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
219	Pakele St Wastewater Pumping Station	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
220	Papohaku Beach Park	Dept of Parks & Recreation	MOLOKAI	7	608	$4,866.06	Molokai Public Utilities	7.22	0
221	Papohaku Park	Dept of Parks & Recreation	MAUI	1	0	$1,344.00	Dept of Water Supply	2.05	6.7
222	Papohaku Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
223	Paukukalo Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
224	Paunau Park	Dept of Parks & Recreation	MAUI	1	882	$5,413.91	Dept of Water Supply	5.85	0
225	Piiholo Water Treatment Plant	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
226	Pi'ikea Park	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
227	Polehu Pump	Environmental Management	MAUI	0	0	$ -	No water data	-	-
228	Pookela Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
229	Puamana Park	Dept of Parks & Recreation	MAUI	1	556	$3,820.54	Dept of Water Supply	5.85	0
230	Public Works DSA Office Building	Dept of Public Works	MAUI	1	11	$903.63	Dept of Water Supply	2.05	6.7
231	Pukoo Fire Station	Maui Fire & Public Safety	MOLOKAI	1	66	$385.85	Dept of Water Supply	3.9	0
232	Pu'u Hauoli Park	Dept of Parks & Recreation	MOLOKAI	1	1,070	$6,367.50	Dept of Water Supply	5.85	0
233	Puuohala Park	Dept of Parks & Recreation	MAUI	1	70	$894.90	Dept of Water Supply	3.9	0
234	Sewer Maintenance Building	Environmental Management	MAUI	0	0	$ -	No water data	-	-
235	Skill Village Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
236	South Maui Community Center & Park	Dept of Parks & Recreation	MAUI	1	180	$3,185.85	Dept of Water Supply	5.85	6.7
237	Spreckelsville Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
238	Ualapue Well	Dept of Water Supply	MOLOKAI	0	0	$ -	No water data	-	-
239	Ukumehame Firing Range	Dept of Parks & Recreation	MAUI	0	0	$ -	No water data	-	-
240	Ulumalu Arena	Dept of Parks & Recreation	MAUI	1	137	$1,122.64	Dept of Water Supply	3.9	0
241	Upper Maui Meadows Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
242	Wells St Professional Center	County Auditor	MAUI	0	0	$ -	No water data	-	-
243	Victims Advocate Building	Dept of Prosecuting Attorney	MAUI	1	48	$1,750.84	Dept of Water Supply	2.05	6.7
244	Hawaii Telecom Building	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
245	Sheraton Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
246	Upcountry Pool	Dept of Parks & Recreation	MAUI	1	3,099	$19,150.59	Dept of Water Supply	5.85	0
247	Velma McWayne Santos Community Center	Dept of Parks & Recreation	MAUI	2	412	$8,418.72	Dept of Water Supply	5.85	9
248	Wahikuli Terrace Park	Dept of Parks & Recreation	MAUI	1	2,900	$17,863.85	Dept of Water Supply	5.85	0
249	Wahikuli Wayside Park	Dept of Parks & Recreation	MAUI	2	13,333	$114,074.40	Dept of Water Supply	5.85	0
250	Waiakoa Gymnasium	Dept of Parks & Recreation	MAUI	1	4	$256.18	Dept of Water Supply	2.05	0
251	Waiale Booster Station	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
252	Waiehu Kou Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
253	Waiale Pump	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
254	Wailea Tank Booster	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
255	Waiehu Golf Course	Dept of Parks & Recreation	MAUI	1	5,677	$35,736.45	Dept of Water Supply	5.85	0
256	Waiehu Terrace Park	Dept of Parks & Recreation	MAUI	1	7,479	$44,982.15	Dept of Water Supply	5.85	0
257	Waihee 514,515 Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
258	Waihee 577,578,579 Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
259	Waihee Beach Park	Dept of Parks & Recreation	MAUI	1	47	$732.89	Dept of Water Supply	2.05	0
260	Waikapu Community Center & Park	Dept of Parks & Recreation	MAUI	1	64	$745.60	Dept of Water Supply	3.9	0
261	Waikapu Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
262	Wakiu Well B	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
263	Wakiu Well C	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
264	Waikuli Terrace Park	Dept of Parks & Recreation	MAUI	1	1,460	$9,599.60	Dept of Water Supply	5.85	0
265	Wailea Beach Park	Dept of Parks & Recreation	MAUI	1	8,920	$115,926.52	Dept of Water Supply	5.85	6.7
266	Wailea Fire Station	Maui Fire & Public Safety	MAUI	2	1,392	$13,084.20	Dept of Water Supply	5.85	9
267	Wailuku Baseyard	Dept of Public Works	MAUI	1	2,394	$33,194.64	Dept of Water Supply	5.85	6.7
268	Wailuku Country Estates Booster 2	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
269	Wailuku Country Estates Booster 3	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
270	Wailuku Elementary School Park	Dept of Parks & Recreation	MAUI	1	2,981	$40,189.55	Dept of Water Supply	5.85	6.7
271	Wailuku Fire Station	Maui Fire & Public Safety	MAUI	1	261	$4,161.45	Dept of Water Supply	5.85	6.7
272	Wailuku Police Station	Maui Police Department	MAUI	2	6,330	$83,974.15	Dept of Water Supply	5.85	6.7

No.	Facility Name	Dept	Island	Qty accts	Water kgal	Water / Sewer Cost	Water Utility	Water Rate ($/kgal)	Sewer Rate ($/kgal)
273	Wailuku Pool	Dept of Parks & Recreation	MAUI	2	1,229	$14,793.37	Dept of Water Supply	5.85	0
274	Wailuku Well 1	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
275	Wailuku Well 2	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
276	Waiolani Mauka Park	Dept of Parks & Recreation	MAUI	1	3,267	$19,754.37	Dept of Water Supply	5.85	0
277	Waipuilani Park	Dept of Parks & Recreation	MAUI	1	72	$1,150.15	Dept of Water Supply	3.9	6.7
278	Waipuka Well	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
279	Wakea Wastewater Pumping Station	Environmental Management	MAUI	0	0	$ -	No water data	-	-
280	War Memorial Complex	Dept of Parks & Recreation	MAUI	1	15,216	$195,934.80	Dept of Water Supply	5.85	6.7
281	Wells Park	Dept of Parks & Recreation	MAUI	1	2,477	$15,986.36	Dept of Water Supply	5.85	0
282	West Maui Senior Center	Dept of Housing & Human Concerns	MAUI	0	0	$ -	No water data	-	-
283	Streetlight	Dept of Public Works	LANAI	0	0	$ -	No water data	-	-
284	Tank	Dept of Water Supply	MAUI	0	0	$ -	No water data	-	-
285	Traffic Signal	Dept of Public Works	MAUI	0	0	$ -	No water data	-	-
286	Siren	Civil Defense Agency	MAUI	0	0	$ -	No water data	-	-
287	Radio Site	Maui Police Department	MAUI	0	0	$ -	No water data	-	-
288	Ulapalakua Radio Site	Maui Police Department	MAUI	0	0	$ -	No water data	-	-
289	Kahakuloa Radio Site	Maui Police Department	MAUI	0	0	$ -	No water data	-	-
290	Unknown sites	Various	MAUI	1	4,208	$25,358.71	Dept of Water Supply	5.85	0
291	Small or unknown Sites	Various	MAUI	21	1,012	$22,547.45	Dept of Water Supply	2.05	0
	TOTAL			**183**	**281,605**	**$2,728,213**			

Propane Utility Baseline

Listed below are the annual details indicative of the propane usage and expenditures only for the Aquatic Centers, as provided by the County from July 2020 to June 2022 (FY20, FY21, FY22). No other data has been obtained from the County on other facilities. It is assumed that propane is supplied by Hawaii Gas.

	FY2020		FY2021		FY2022		3- Yr Average	
Facility	**Propane Use (Gal)**	**Cost**	**Propane Use (Gal)**	**Cost**	**Propane Use (Gal)**	**Cost**	**Propane Use (Gal)**	**Cost**
Cooke Memorial	0.00	$124.62	8,744.10	$93,284.53	3,678.50	$38,530.89	**4,140.87**	**$43,980.01**
Kihei Aquatic	10,493.30	$22,875.14	8,456.00	$18,482.79	12,178.10	$26,982.65	**10,375.80**	**$22,780.19**
Kokua	2,206.80	$4,882.89	923.00	$2,115.21	490.50	$1,285.57	**1,206.77**	**$2,761.22**
Lahaina	2,107.40	$4,668.98	20.84	$125.04	2,925.40	$6,525.23	**1,684.55**	**$3,773.08**
Sakamoto	5,127.60	$11,181.09	11,022.20	$23,890.94	7,274.20	$15,912.51	**7,808.00**	**$16,994.85**
Shiraishi	4,200.60	$9,190.39	5,458.50	$11,894.54	2,450.80	$5,512.32	**4,036.63**	**$8,865.75**
Upcountry	28,504.28	$61,585.45	27,596.60	$59,568.86	21,595.90	$47,180.28	**25,898.93**	**$56,111.53**
Total	**52,639.98**	**$114,508.57**	**62,221.24**	**$209,361.91**	**50,593.40**	**$141,929.45**	**55,151.54**	**$155,266.64**

Utility Rates

Electric Rates

The following are the HECO effective rate schedules for each of the HECO tariffs used by the facilities. The numbers in the table below are the average from the values published by the utility from July 2021 to June 2022. The agreed upon floor escalation for electric rates is 5%.
Rates will be escalated to account for the construction period during the Guarantee Term.

HECO - Maui Division

Utility Rate Component	Sch G	Sch J	Sch P	Sch F
Energy Cost Adjustment ($/kWh)	0.21136	0.21136	0.21136	0.21136
Energy Charge ($/kWh)	0.14294	0.09685	0.07299	0.13349
Purchase Power Adjustment ($/kWh)	0.00081	0.00065	0.00059	0.00140
RBA Rate Adjustment ($/kWh)	0.01468	0.01468	0.01468	0.01468
Public Benefits Fund Surcharge ($/kWh)	0.00360	0.00360	0.00360	0.00360
IRP Cost Recovery Surcharge ($/kWh)	-0.00009	-0.00009	-0.00009	
DRAC ($/kWh)	-0.00043	-0.00043	-0.00043	
Renewable Surcharge ($/kWh)				
Demand Charge ($/kW)	0	13	25	0
Customer Charge ($/mo) – 3 phase	49	82	350	0
Green Infrastructure Fee ($/mo)	1.33	25.61	436.07	5.7
Effective Energy Consumption Rate ($/kWh)	**0.37288**	**0.32663**	**0.30271**	**0.36454**
Effective Demand Rate ($/kW)	**0**	**13**	**25**	**25**

HECO - Lanai Division

Utility Rate Component	Sch G	Sch J	Sch P	Sch F
Energy Cost Adjustment ($/kWh)	0.29876	0.29876	0.29876	0.29876
Energy Charge ($/kWh)	0.15672	0.13719	0.11790	0.15988
Purchase Power Adjustment ($/kWh)	0.00000	0.00000	0.00000	0.00000
RBA Rate Adjustment ($/kWh)	0.01468	0.01468	0.01468	0.01468
Public Benefits Fund Surcharge ($/kWh)	0.00360	0.00360	0.00360	0.00360
IRP Cost Recovery Surcharge ($/kWh)	0	0	0	
DRAC ($/kWh)	0	0	0	
Renewable Surcharge ($/kWh)				
Demand Charge ($/kW)	0	13	25	0
Customer Charge ($/mo) – 3 phase	50	82	300	0
Green Infrastructure Fee ($/mo)	1.33	25.61	436.07	5.7
Effective Energy Consumption Rate ($/kWh)	**0.47376**	**0.45423**	**0.43495**	**0.47692**
Effective Demand Rate ($/kW)	**0**	**13**	**25**	**25**

HECO - Molokai Division

Utility Rate Component	Sch G	Sch J	Sch P	Sch F
Energy Cost Adjustment ($/kWh)	0.23326	0.23326	0.23326	0.23326
Energy Charge ($/kWh)	0.21460	0.13236	0.06474	0.17281
Purchase Power Adjustment ($/kWh)	0.00000	0.00000	0.00000	0.00000
RBA Rate Adjustment ($/kWh)	0.01468	0.01468	0.01468	0.01468
Public Benefits Fund Surcharge ($/kWh)	0.00360	0.00360	0.00360	0.00360
IRP Cost Recovery Surcharge ($/kWh)	0	0	0	
DRAC ($/kWh)	0	0	0	
Renewable Surcharge ($/kWh)				
Demand Charge ($/kW)	0	13	18	0
Customer Charge ($/mo) – 3 phase	43	55	300	0
Green Infrastructure Fee ($/mo)	1.33	25.61	436.07	5.7
Effective Energy Consumption Rate ($/kWh)	**0.46615**	**0.38391**	**0.31629**	**0.42435**
Effective Demand Rate ($/kW)	**0**	**13**	**25**	**25**

Water Rates

The current water rates from the various water utilities are shown below. The agreed upon floor escalation for water rates is **1%**. Rates will be escalated to account for the construction period during the Guarantee Term.

Dept of Water Supply

From (gal)	To (Gal)	$/kgal
0	5,000	$2.05
5,001	15,000	$3.90
	15,001	$5.85

Mtr Size Code	Mt size (in)	Meter chg ($)
2	5/8 in	$19.80
3	3/4 in	$32
4	1 in	$47.50
6	1.5 in	$91
7	2 in	$141
9	3 in	$249
12	4 in	$432
15	6 in	$793
18	8 in	$1,251

Lanai Water Company

From (gal)	To (Gal)	$/kgal
0	25,000	$1.10
	25,001	$1.62

Mtr Size Code	Mt size (in)	Meter chg ($)
2	5/8 in	$5
3	3/4 in	$5
4	1 in	$10
6	1.5 in	$10
7	2 in	$25
9	3 in	$50
12	4 in	$75
15	6 in	$150
18	8 in	$250

Hawaii Water Service Company

From (gal)	To (Gal)	$/kgal
0	12,500	$3.53
	12,501	$5.05

Mtr Size Code	Mt size (in)	Meter chg ($)
2	5/8 in	$9.66
3	3/4 in	$14.49
4	1 in	$24.15
6	1.5 in	$48.29
7	2 in	$77.27
9	3 in	$169.03
12	4 in	$313.91
15	5 in	$869.29

Launiupoko Water Company

From (gal)	To (Gal)	$/kgal
0	10,000	$2.03
10,001	25,000	$2.53
	25,001	$2.91

Launiupoko Irrigation Company

From (gal)	To (Gal)	$/kgal
All		$0.76
From bills. Website shows a different structure		

Mtr Size Code	Mt size (in)	Meter chg ($)
2	5/8 in	$35
3	3/4 in	$43
4	1 in	$52
6	1.5 in	$57
7	2 in	$62
9	3 in	$67
12	4 in	$72
15	6 in	$85

Mtr Size Code	Mt size (in)	Meter chg ($)
4	1 in	$15
6	1.5 in	$17
7	2 in	$20
9	3 in	$25
12	4 in	$27
15	6 in	$29
16	>6 in	$35

Consolidated-Waiko Water Association

From (gal)	To (Gal)	$/kgal
All		$ 1.75

From bills. Unknown rate structure

Molokai Public Utilities

From (gal)	To (Gal)	$/kgal
All		$ 7.22

From bills. Unknown rate structure

With the water consumption data that was provided by the County, the effective rate that used to determine water savings is the rate shown in the Water/Sewer Utility Baseline Table above.

Sewer Rates

The sewer user fee for non-residential customers is a base charge plus a water volume charge on all water used based on the customer class.

The effective sewer rate from the Dept of Environmental Management sewer utility is **$6.70/kgal** (if sewer charges apply) for single meter non-residential service; and **$9/kgal** for dual meter non-residential service (refers to customers with separate irrigation meter. Rate is applied to domestic water meter only, not the irrigation meter)**.**

The sewer rate is only applicable for sites that do have sewer consumption charges. The agreed upon floor escalation for sewer rates is **1%.**

Rates will be escalated to account for the construction period during the Guarantee Term.

Propane Rates

The average baseline propane rate for the last three years (2020 to 2022) is **$2.82/gal** of propane rate from Hawaii Gas. Any propane savings will be calculated using this rate, and with an agreed upon **3%** floor annual escalation.

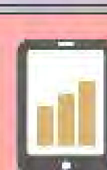
Rates will be escalated to account for the construction period during the Guarantee Term.

Environmental Impact

The following table shows the **annual** environmental impact in terms of GHG reduction for all of the FIMs included:

No.	FIM Description	GHG Savings (Tons CO2)
1	Interior LED Lighting Retrofits	1,059
2	Exterior LED Lighting Retrofits	382
3	Plug Load Controls	25
4	Transformer Replacements	119
5	Domestic Water Plumbing Fixture Upgrades	107
6	Shower Tower Retrofits	0
7	Irrigation Wells	(45)
8	Onsite Hypochlorite Generation and Smart Pool Pump Controls	556
9	Infiltration Reduction	74
10	Window Film	15
11	Energy/Water Tracking Tool	0
	TOTAL	**2,293**

The Project's Base Year reduced emissions would be equivalent to:

CO_2 sequestered by	51,216	tree seedlings grown for 10 years in urban scenario.	
CO_2 sequestered by	3,991	acres of U.S. forest.	
CO_2 emissions from	664	passenger vehicles.	
CO_2 emissions from	7,146	barrels of oil consumed.	
CO_2 emissions from	354	homes for one year.	
CO_2 emissions from	17	railcars of coal.	
CO_2 emissions from charging	392M	smartphones.	

Source: EPA GHG Equivalencies Reference

All carbon equivalencies extracted directly from the EPA website.
"Greenhouse Gas Equivalencies Calculator." Clean Energy. U.S. Environmental Protection Agency. (March 2021).

Customer Responsibilities

In order for JCI to perform its obligations under this Agreement with respect to the Work, the Assured Performance Guarantee, and the M&V Services, Customer shall be responsible for:

1. Providing JCI, its subcontractors, and its agents reasonable and safe access to all facilities and properties that are subject to the Work and/or M&V Services;

2. Providing for shut down and scheduling of affected locations during installation, including timely shutdowns of chilled water and hot water systems as needed to accomplish the Work and/or M&V Services;

3. Providing timely reviews and approvals of design submissions, proposed change orders, and other project documents;

4. Providing the following information with respect to the project and project site as soon as practicable following JCI's request:

    - surveys describing the property, boundaries, topography and reference points for use during construction, including existing service and utility lines;
    - geotechnical studies describing subsurface conditions, and other surveys describing other latent or concealed physical conditions at the project site;
    - temporary and permanent easements, zoning and other requirements and encumbrances affecting land use, or necessary to permit the proper design and construction of the project and enable JCI to perform the Work;
    - a legal description of the project site;
    - as-built and record drawings of any existing structures at the project site; and
    - environmental studies, reports and impact statement describing the environmental conditions, including hazardous conditions or materials, in existence at the project site.

5. Securing and executing all necessary agreements with adjacent land or property owners that are necessary to enable JCI to perform the Work;

6. Providing assistance to JCI in obtaining any permits, approvals, and licenses that are JCI's responsibility to obtain as set forth in the Scope of Work;

7. Obtaining any permits, approvals, and licenses that are necessary for the performance of the Work and are not JCI's responsibility to obtain as set forth in the Scope of Work;

8. Providing the utility bills, reports, and similar information reasonably necessary for administering JCI's obligations under the Energy Savings Guarantee within five (5) days of Customer receipt and/or generation or JCI's request therefor;

9. Providing all records relating to energy and/or water usage and related maintenance of the premises and relevant equipment requested by JCI;

10. Providing and installing utility sub-meters on all new construction and/or additions built during the Guarantee Term as recommended by JCI or, alternatively, paying JCI's applicable fees for calculating necessary adjustments to the Energy Savings Guarantee as a result of the new construction;

11. Providing and maintaining a dedicated telephone line and/or TCP/IP remote connection to facilitate remote monitoring of relevant equipment;

12. Promptly notifying JCI of any change in use or condition described in the FIM Descriptions or any other matter that may impact the Energy Savings Guarantee;

13. Taking all actions reasonably necessary to achieve the Non-Measured Project Benefits;

14. If any equipment is changed out it is the responsibility of the customer to move the controls and the controls programming to the new equipment;

15. Customer to provide a security escort, as required, for access to secure areas.

16. Provide Ethernet network drops for new servers, network engines and operator workstations as required for the controls scope of work. Also provide Ethernet IP to support a WEB accessible system and/or VPN connection.

17. Provide laydown areas for each facility, dumpster locations, badging as necessary, and allocate parking spots for workers onsite for company vehicles.

Compensation to ESCO

Customer shall make payments to JCI pursuant to this schedule.

1. *Work*. The price to be paid by Customer for the Work shall be **$28,803,233.00**. Payments (including payment for materials delivered to JCI and work performed on and off-site) shall be made to JCI as follows:

Month	% Draw	Payment
Oct-22	20%	$5,760,646.60
Nov-22	12%	$3,456,387.96
Dec-22	8%	$2,304,258.64
Jan-23	5%	$1,440,161.65
Feb-23	5%	$1,440,161.65
Mar-23	8%	$2,304,258.64
Apr-23	8%	$2,304,258.64
May-23	2%	$576,064.66
Jun-23	2%	$576,064.66
Jul-23	2%	$576,064.66
Aug-23	2%	$576,064.66
Sep-23	2%	$576,064.66
Oct-23	2%	$576,064.66
Nov-23	2%	$576,064.66
Dec-23	2%	$576,064.66
Jan-24	2%	$576,064.66
Feb-24	2%	$576,064.66
Mar-24	2%	$576,064.66
Apr-24	2%	$576,064.66
May-24	2%	$576,064.66
Jun-24	2%	$576,064.66
Jul-24	2%	$576,064.66
Aug-24	2%	$576,064.66
Sep-24	2%	$576,064.66
Total	**100%**	**$28,803,233.00**

2. *M&V Services*. The total price for M&V Services is as shown in the table below. Scope of these services and terms are included further in the Energy Savings Guarantee and M&V Methodology Section. This amount will be paid to JCI in annual installments according to the schedule below. These payments will be due and payable at the commencement of services, and shall be made throughout the Guarantee Term. Customer may cancel the M&V Services. If the Customer elects to cancel the M&V Services, the Customer must do so in writing within 30 days of the annual renewal date, otherwise full service will continue for the remainder of the year and the Customer will be responsible for payment of the full year.

Year	Total
10/1/2024	$53,906.00
10/1/2025	$56,602.00
10/1/2026	$59,432.00
10/1/2027	$62,403.00
10/1/2028	$65,523.00
10/1/2029	$68,800.00
10/1/2030	$72,240.00
10/1/2031	$75,852.00
10/1/2032	$79,644.00
10/1/2033	$83,626.00
10/1/2034	$87,808.00
10/1/2035	$92,198.00
10/1/2036	$96,808.00
10/1/2037	$101,648.00
10/1/2038	$106,731.00
10/1/2039	$112,067.00
10/1/2040	$117,671.00
10/1/2041	$123,554.00
10/1/2042	$129,732.00
10/1/2043	$136,218.00

3. Planned Service Agreement(s). The total price for maintenance is as follows:

The total price for JCI's Maintenance Services is as shown in the table below. Scope of these services and terms are included further into this section. This amount will be paid to JCI in annual installments according to the schedule below. These payments will be due and payable at the commencement of services, and shall be made throughout the Guarantee Term. Customer may cancel the Interior & Exterior Lighting Maintenance Services or the Pool Equipment Maintenance Services. If the Customer elects to cancel the the Services, the Customer must do so in writing within 30 days of the annual renewal date, otherwise full service will continue for the remainder of the year and the Customer will be responsible for payment of the full year.

If the maintenance services are cancelled, the Customer shall be responsible for the maintenance in order to ensure the performance of the equipment installed.

JCI Ongoing Services

Year	Interior & Exterior Lighting Maintenance	Pool Equipment Maintenance	Total
10/1/2024	$153,406.00	$0.00	$153,406.00
10/1/2025	$158,095.00	$421,251.00	$579,346.00
10/1/2026	$164,180.00	$433,888.00	$598,068.00
10/1/2027	$169,734.00	$446,905.00	$616,639.00
10/1/2028	$186,436.00	$460,312.00	$646,748.00
10/1/2029	$296,911.00	$474,122.00	$771,033.00
10/1/2030	$371,075.00	$488,345.00	$859,420.00
10/1/2031	$381,489.00	$502,996.00	$884,485.00
10/1/2032	$391,828.00	$518,085.00	$909,913.00
10/1/2033	$406,373.00	$533,628.00	$940,001.00
10/1/2034	$402,915.00	$549,637.00	$952,552.00
10/1/2035	$431,844.00	$566,126.00	$997,970.00
10/1/2036	$548,544.00	$583,110.00	$1,131,654.00
10/1/2037	$591,604.00	$600,603.00	$1,192,207.00
10/1/2038	$606,118.00	$618,621.00	$1,224,739.00
10/1/2039	$629,885.00	$637,180.00	$1,267,065.00
10/1/2040	$674,170.00	$656,295.00	$1,330,465.00
10/1/2041	$697,929.00	$675,984.00	$1,373,913.00
10/1/2042	$715,419.00	$696,263.00	$1,411,682.00
10/1/2043	$740,632.00	$717,151.00	$1,457,783.00

Planned Service Agreements Scope and Terms

The following summarizes the scope and terms of the Planned Service Agreements. The Terms and Conditions of the contract apply to these Planned Service Agreements also.

Interior and Exterior Lighting Maintenance:

The scope of JCI's Lighting Maintenance Contract is applicable to the Work that JCI installs in this contract. The final as-built lighting will form the basis of what is to be maintained in this Agreement. Lights installed by the Customer outside of the JCI contract are not covered in this Agreement.

JCI will perform scheduled interior inspections once every 6 months to record County location outages. The inspections will take place during County working hours.

The semi-annual inspections will take place in January and July of each year.

Frequency of visits are determined by utilizing Manufacturer L70 lamp/fixture life data, quantities of equipment installed, site burn hours, and historical knowledge of the product and historical failure rates.

Site Inspection- What to Expect

- Walkthrough with on-site representative
- Location of outage(s)
- Outage type
- Recording of materials needed to correct outage(s)
- Creation of a service ticket
- Material will be ordered, or sourced from project attic stock
- Due to exterior controls and varying burn hours, the Site rep will be asked if they are aware of any exterior outages during the interior inspection

The site representative will be contacted to schedule the repair.

Materials

JCI shall provide replacement materials which match the equipment installed during the lighting upgrade program. If materials carry a long manufacturer lead-time to procure, become unavailable, or have been upgraded by the manufacturer, like kind may be utilized.

Repairs Needed Outside of Covered Equipment

If issues arise outside of standard equipment failure, these issues can be addressed with County approval on a time and material basis. An example would be power supply and wiring issues, or product damaged outside of the intent of which the product is designed.

Warranties

Each of the product types carry manufacturer warranties for a specific amount of time. JCI will facilitate the warranties with the manufacturers. If necessary JCI will return failed product to the manufacturer to receive the appropriate replacement.

When product warranties end, JCI will continue to include the cost of the material under the yearly submitted price.

Wall Switches with wireless dimming

- Each wall switch has a CR2032 disc battery, and the switch+battery is warranted from the manufacturer for 5 years
- JCI will replace the CR2032 batteries with a new battery every 5 years during the inspection service in that year, total of 4 times throughout the 20 year Planned Service Agreement term
- If, during an interim period between these 5-Year scheduled battery replacement intervals, a battery fails, JCI will replace the battery during one of the scheduled inspection services, which will occur every 6 months

Program Efficiencies

It is the intent of JCI to provide the County with a custom maintenance program. Through detailed inspections and on-site communication, we can schedule repairs to provide the least amount of disruption to the workplace. The program is designed to limit the amount of time the County spends managing their lighting maintenance needs.

Customer's Maintenance Responsibilities

It is the responsibility of the Customer (Site rep) to provide interior failure information during the interior lighting inspections.

It is the responsibility of the customer to perform all repairs that are outside of the scope of work. Electrical repairs, Infrastructure repairs, and repairs of equipment not installed by JCI.

Pool Equipment Maintenance:

The tables below show the equipment that will be maintained by Johnson Controls:

No.	Facility	Proposed Generator	Chemistry Controller	Aquatic VFD
1	Kihei Pool	NEXGEN 200 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
2	Upcountry Pool	NEXGEN 150 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
3	Lahaina Aquatic Center	NEXGEN 150 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
4	Coach Sakamoto Pool	NEXGEN 150 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
5	Kokua Pool	NEXGEN 50 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
6	Wailuku Pool	NEXGEN 10 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
7	Cooke Memorial Pool	NEXGEN 80 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive
8	Coach Spencer Shiraishi Memorial Pool	NEXGEN 40 Sodium Hypochlorite Generator	ProMinent DCM5	Eco-Flow-C Aquatic Variable Frequency Drive

Aquatics Equipment

Chlorking Nexgen Equipment

QTY	MODEL
1	NEXGEN 40-R
5	NEXGEN 50-SMR
1	NEXGEN 10-R
1	NEXGEN 80-R

5	NEXGEN 100-SMR

Scope of Maintenance Services

Part #	Description	Qty.
ESTK25.0SMNEX	Replace cell stacks if needed	As Needed typically Year 3
PBAC2400NEXGEN	Replace one power supply if needed	As Needed typically Year 4
SU192RPNEXGEN	Replace one reverse polarity box if needed	As Needed typically Year 3
P6E6G-208-L	Replace booster pump if needed	As Needed typically Year 3
KITBEIN75110NEXGEN	Replace toroidal sensor if needed	As Needed typically Year 3
CKPH	Replace pH module if needed	As Needed typically Year 5
2680A	Replace Ball valve float assy. If needed	As Needed typically Year 4
2081	Replace Mazzi injector if needed	As Needed typically Year 4
DP10	Replace Mag pump wet end if needed	As Needed typically Year 3
150107215	Replace Actuated valve if needed	As Needed typically Year 4
PUMPFT5240	Replace Acid wash pump if needed	As Needed typically Year 3
17.101.983	Replace Flow meter if needed	As Needed typically Year 3
KITBLOWERXGEN24VDC	Replace Blower	Annually
KITAIRFLOWSENSORYR3T	Replace air flow sensor	Annually
FSKHARWIL2MSCNOT	Replace water flow sensor	Annually
KITFLOATSWITCH	Replace Acid empty switch	Annually
PHXT	Replace pH probe	Annually
20157	Replace Strainer	Annually
MCCP202 X1 MCCP205 X2	Replace Stenner pump hoses	Annually
ST114	Replace Strainer for salt feeder	Annually
MCDBINJ	Replace Injector fitting for salt	Annually
GEN	System Check	Quarterly
ProMinent	Monitor and Verification Chemistry Controller Programming	Quarterly
PMF-54-1200-FRP	Regenerative Filter - Less Media changes	Quarterly
SPCC	Monitor and Verification Smart Controller Programming	Quarterly

Notes:

1. Components above are replaced at no cost to the owner (unless components are damaged by forces out of our control per list of exclusions below).
2. The above table reflects the anticipated component replacement schedule for a NEXGEN system. Both components and labor required to install the component will be provided.
3. Inventory of replacement components will be held at a facility in Hawaii for expedited replacement as necessary.
4. Sensors and components shown with annual replacement in table above is a proactive approach to reduce downtime.
5. Each site (system) will be visited minimum two (2) times per month
6. Prominent Controller maintenance will only cover a quarterly monitoring and verification of the defined parameters established by the energy program. This will be a verification quarterly and reprogramming only if, the programming has been changed from the recorded contract set points.

7. SPCS and Traditional VFD maintenance will only cover a quarterly monitoring and verification of the defined parameters established by the energy program. This will be a verification quarterly and reprogramming only, if the programming has been changed from the recorded contract set points.
8. System checks will follow the NEXGEN summer startup Checklist
9. System checks will follow the NEXGEN maintenance task sheet
10. Regenerative Filtration maintenance only applies to Pukalani/Upcountry Pool

JCI and its subcontractor's obligation to perform long term preventative and corrective maintenance services does not cover failures, defects, malfunctions or complaints resulting from any of the following:

1. Normal wear and tear.
2. Items expected to be consumed or expended during the normal and routine operation and maintenance
3. Failure to properly install, operate or maintain the product in accordance with manufacturers published installation, operation and/or maintenance manuals.
4. Improper product misapplications.
5. The workmanship of any other installer.
6. Use of non-factory authorized parts or accessories in conjunction with the product(s).
7. Product modifications or adjustments that are not in accordance with manufacturers published installation, operation and/or maintenance manuals.
8. Not maintaining proper pool and/or spa chemical balance.
9. Corrosion, erosion, scaling, calcification or other conditions caused by water hardness, chemical imbalance, or lack of product maintenance.
10. Abuse, misuse, mishandling, tampering, vandalism, alterations, accidents, fires, floods, storms, earthquakes, power surges, lightning, or animals, insects and/or their hives or nests, negligence, or acts of God.
11. Freezing, corrosion, cracking, overheating, warping, flooding, moisture intrusion or any other condition caused by or related to weather, climate, improper winterization, improper equipment placement, inadequate ventilation, inadequate water circulation, roof run-off, sprinklers, irrigation systems, or lights or other products on or near the pool/spa or pool/spa equipment pad.

Customer's Maintenance Responsibilities

Customer is responsible for properly maintaining and performing appropriate preventative maintenance on any pool equipment not included in the ESCO Provided Maintenance above, in accordance with manufacturers' standards and specifications.

Customer is also responsible for the filter media change in any filters installed by Johnson Controls.

Proposed Final Project Cost and Cashflow

TOTAL GUARANTEED SAVINGS: $73,007,537
TOTAL IMPLEMENTATION COST: $28,803,233

	Measured Savings	Non-Measured Savings		Total Savings	Annual Costs			TELP Payment	Balance
Year	Utility Cost Avoidance	Utility Cost Avoidance	Operational Savings		Measurement and Verification	JCI Provided Services	Total Annual Costs		(Net Savings)
1	$2,023,488	$125,534	$274,247	$2,423,269	$53,906	$153,406	$207,312	$2,215,956	$1
2	$2,093,447	$129,876	$324,393	$2,547,716	$56,602	$579,346	$635,948	$1,911,767	$1
3	$2,166,592	$134,416	$359,740	$2,660,748	$59,432	$598,068	$657,500	$2,003,247	$1
4	$2,243,079	$139,163	$387,769	$2,770,011	$62,403	$616,639	$679,042	$2,055,506	$35,463
5	$2,323,072	$144,128	$412,429	$2,879,629	$65,523	$646,748	$712,271	$2,055,506	$111,852
6	$2,406,743	$149,321	$433,051	$2,989,115	$68,800	$771,033	$839,833	$2,055,506	$93,776
7	$2,494,273	$154,754	$454,703	$3,103,730	$72,240	$859,420	$931,660	$2,055,506	$116,564
8	$2,585,851	$160,438	$477,438	$3,223,727	$75,852	$884,485	$960,337	$2,055,506	$207,884
9	$2,681,676	$166,386	$501,310	$3,349,372	$79,644	$909,913	$989,557	$2,055,506	$304,309
10	$2,781,959	$172,610	$526,376	$3,480,945	$83,626	$940,001	$1,023,627	$2,055,506	$401,812
11	$2,886,917	$179,125	$552,695	$3,618,737	$87,808	$952,552	$1,040,360	$2,055,506	$522,871
12	$2,996,782	$185,944	$580,329	$3,763,055	$92,198	$997,970	$1,090,168	$2,055,506	$617,381
13	$3,111,795	$193,083	$609,346	$3,914,224	$96,808	$1,131,654	$1,228,462	$2,055,506	$630,256
14	$3,232,210	$200,557	$639,813	$4,072,580	$101,648	$1,192,207	$1,293,855	$2,055,506	$723,219
15	$3,358,295	$208,383	$671,804	$4,238,482	$106,731	$1,224,739	$1,331,470	$2,055,506	$851,506
16	$3,490,329	$216,579	$705,394	$4,412,302	$112,067	$1,267,065	$1,379,132	$2,055,506	$977,664
17	$3,628,605	$225,161	$740,664	$4,594,430	$117,671	$1,330,465	$1,448,136	$2,055,506	$1,090,788
18	$3,773,433	$234,151	$777,697	$4,785,281	$123,554	$1,373,913	$1,497,467	$2,055,506	$1,232,308
19	$3,925,137	$243,567	$816,582	$4,985,286	$129,732	$1,411,682	$1,541,414	$2,055,506	$1,388,366
20	$4,084,055	$253,432	$857,411	$5,194,898	$136,218	$1,457,783	$1,594,001	$2,055,506	$1,545,391
Total	**$58,287,738**	**$3,616,608**	**$11,103,191**	**$73,007,537**	**$1,782,463**	**$19,299,089**	**$21,081,552**	**$41,074,572**	**$10,851,413**

See Volume 2 for Appendices