PER- AND POLYFLUOROALKY SUBSTANCES (PFAS)

MONITORING PROJECT

in HAWAII DRINKING WATER

Prepared by:

State of Hawaii

Department of Health

Safe Drinking Water Branch

Groundwater Protection Program

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ACKNOWLEDGMENTS

This project was a U.S. Environmental Protection Agency (EPA) work plan, written, directed, and managed by staff of the State of Hawaii, Department of Health, Safe Drinking Water Branch (SDWB). Initially, Mr. Daniel Chang, SDWB-Monitoring and Analysis Section Supervisor, conceived the project. Under the direction of Mr. Chang, Ms. Jammie Aroni, Environmental Health Specialist II / Field Sampler with the SDWB, was instrumental in writing the project plan and making initial coordination with the laboratory. Mr. Melvin Tokuda, current Monitoring and Analysis Section Supervisor, Ms. Kelsey Yap, Environmental Health Specialist (EHS)-II and Ms. Ann Kam, EHS-IV, were instrumental in conducting field sampling and ensuring that all samples collected were shipped in accordance with Per- and Polyfluorinated Substances (PFAS) sampling protocols. Eurofins Eaton Analytical Laboratory, of Monrovia, California, provided laboratory analysis and timely reports. Mr. Robert Whittier, Geologist with the SDWB – Groundwater Pollution Control Section provided historical groundwater information for this project.

EXECUTIVE SUMMARY

The PFAS monitoring project, an EPA workplan, was designed to characterize the drinking water resources in the State of Hawaii and identify areas where PFAS is present in drinking water sites. The nature and degree of PFAS contamination in Hawaii has not been fully characterized. Although Hawaii is without PFAS manufacturing facilities, there are other potential sources of PFAS contamination, such as military installations, firefighting training facilities, landfills, and wastewater treatment plants. The baseline data generated from this sampling project will provide valuable information about the current condition/health of Hawaii's water resources with regards to PFAS contamination.

Monitoring conducted in subsequent years will allow the State to begin to track changes in water quality over time and to assess potential future environmental impacts of PFAS on the state's drinking water resources.

The goal of this project was to quantify the burden of PFAS contamination in drinking water and begin to assess the potential exposure risks to humans.

Twenty-five (25) drinking water sources/sites were selected from across the state, where PFAS sample collections would be collected. The state of Hawaii is comprised of seven islands, divided into five counties: Kauai County, Honolulu County, Maui County, Kalawao County, and Hawaii County. Kalawao County encompasses the Kalaupapa Peninsula, on the north coast of the island of Moloka'i. Because of its small population, Kalawao County falls under the judicial district of Maui County. Samples were collected from the four counties.

The objective of this project was to identify ground water resources that may have been affected by PFAS and to access the overall health of Hawaii's drinking water resources regarding PFAS.

Long-term use of the PFAS monitoring project will be to provide information to help the State establish necessary water quality standards and regulations for the State's drinking water resources and strategies to protect water resources and health of the public. Prior to the start of the Hawaii PFAS monitoring project, the SOH-DOH-SDWB did not have a maximum contaminant level (MCL) for PFAS in drinking water and EPA did not have MCL's for PFAS in drinking water.

The data collected from the PFAS monitoring project will be compared to other states and national water quality standards for PFAS and used to determine and understand the sources of PFAS contamination in drinking water in the State of Hawaii and enable the SOH-DOH-SDWB to act proactively to protect Hawaii's drinking water sources from PFAS contamination and provide consumer confidence in Hawaii's drinking water quality.

INTRODUCTION

Per- and Polyfluoroalkyl Substances (PFAS) are a group of manufactured chemicals, invented in the 1930s, that have been used in industry and consumer products since the 1940s because of their useful properties. They are known as "forever chemicals" because of their resistance to breaking down in the environment.

There are thousands of different PFAS, some more commonly used than others. Perfluorooctanoic Acid (PFOA) and Perfluorooctane Sulfonic acid (PFOS) are two of the most widely used and studied chemicals in the PFAS group.

PFAS is found in many places and can be present in our water, soil, air, and food as well as in materials found in our homes or workplaces, including:

- **Drinking water** – in public drinking water systems and private drinking water wells.
- **Soil and water at or near waste sites** - at landfills, disposal sites, and hazardous waste sites such as those that fall under the federal Superfund and Resource Conservation and Recovery Act programs.
- **Fire extinguishing foam** - in aqueous film-forming foams (or AFFFs) used to extinguish flammable liquid-based fires. Such foams are used in training and emergency response events at airports, shipyards, military bases, firefighting training facilities, chemical plants, and refineries.
- **Manufacturing or chemical production facilities that produce or use PFAS** – for example at chrome plating, electronics, and certain textile and paper manufacturers.
- **Food** – for example in fish caught from water contaminated by PFAS and dairy products from livestock exposed to PFAS.
- **Food packaging** – for example in grease-resistant paper, fast food containers/wrappers, microwave popcorn bags, pizza boxes, and candy wrappers.
- **Household products and dust** – for example in stain and water-repellent used on carpets, upholstery, clothing, and other fabrics; cleaning products; non-stick cookware; paints, varnishes, and sealants.
- **Personal care products** – for example in certain shampoo, dental floss, and cosmetics.
- **Biosolids** – for example fertilizer from wastewater treatment plants that is used on agricultural lands can affect ground and surface water and animals that graze on the land.

METHODS

The PFAS monitoring project's purpose is to get an initial evaluation of the health of the State's drinking water quality in respect to PFAS. Samples were collected from five islands to ensure that an even representation of the State's public drinking water systems were represented.

Prior to beginning the project, staff was trained in the proper sampling techniques for collecting PFAS samples. A video from the Massachusetts Department of Public Health – Drinking Water Program was viewed: Sample Collection for PFAS Testing at Public Water Supplies - Bing video (https://www.youtube.com/watch?v=zrwhwSI-R9M)

Literature, entitled, "Eurofin's PFAS Sampling Protocol (effective January 1, 2019)", was read and followed for each date of sampling. (INSERT HANDOUT)

PFAS sampling was scheduled at the beginning of the workday, to avoid possible contamination.

Clothing for the day had been previously washed a minimum of 5 times and no fabric softener was used. Sampling crew did not wear waterproof, water-repellent, fire-repellent or stain-resistant clothing or footwear. The day of sampling only PFAS-free soap and shampoos were used by sample collection staff.

Fluoride-free toothpaste was used, no mouthwash or dental floss was used, no lotions, moisturizers, deodorants, cosmetics, makeup, sunscreen, or insect repellents were used on the day of sampling.

The sampling team refrained from eating and handling any packaged food or drinks, aluminum foil, adhesive labels at or around the sampling site.

Sampling bottles, received from Eurofins Monrovia Laboratory, were labeled prior to arrival at the sampling site. Only ball-point pens were used on the sampling labels. No permanent markers were used during the collection day or were present. No waterproof logbooks or plastic clipboards were used. Only untreated paper and aluminum clipboards were allowed to be used on the day of sampling.

At the sampling site, we ensured that the well pump was on and running, to ensure that a representative sample was collected. Aerators were removed and the sample tap was flushed/purged for ten minutes. Disposable nitrile gloves were used by the sampler and extra caution was taken not to touch any surface prior to sample collection.

A chlorine residual test was taken after the ten-minute purge and prior to collection of the PFAS samples. A field blank was collected first. PFAS free deionized water, provided by the State of Hawaii – Department of Health lab was used for the field blank collection. The sampler opened the high-density polyethyle (HDPE) and added the deionized water at the sampling site, and caped the sample. The sample was inverted five times before being placed into a ziplock bag and placed into the sampling collection cooler with the trip blank. Collection of three containers of water samples from the sampling site was done next. Sampler ensured not to contaminate bottle or cap during sampling. Each sample was inverted five times before being placed into a ziplock bag and placed into the sampling collection cooler.

On 09-21-22, the SOH-DOH-SDWB-MAS began their PFAS Statewide Survey. Twenty-five (25) sites were selected from across the state. The state of Hawaii is comprised of seven islands, divided into five counties: Kauai County, Honolulu County, Maui County, Kalawao County, and Hawaii County. Kalawao County encompasses the Kalaupapa Peninsula, on the north coast of the island of Moloka'i. Because of its small population, Kalawao County falls under the judicial district of Maui County.

Water samples were collected from five (5) islands, encompassing four counties. All samples were shipped, via Federal Express, to Eurofins Eaton Monrovia Analytical, for analysis of PFAS compounds using Method 533 and Method 537.1. Samples were collected from the following sites and are summarized in Table 1-1.

Table 1-1. PFAS Sample Identification / Sites

Collection Date	PFAS Sample Identification / Sites	Site #	Island	PWS ID
9-21-22	Aina Koa Well 2 Chlorinator	1	Oahu	HI0000331
9-21-22	Kahuku Wells Chlorinator	2	Oahu	HI0000365
9-21-22	Kahuku Air Base Well Chlorinator	3	Oahu	HI0000315
9-21-22	Mokuleia Well Chlorinator	4	Oahu	HI0000326
9-21--22	Dillingham Well Chlorinator	5	Oahu	HI0000338
9-21-22	Del Monte Kunia 3 & 4	6	Oahu	HI0000303
9-29-22	Maui Lani Wells Chlorinator	7	Maui	HI0000212
9-29-22	Maui Highlands Wells 1 & 2 Chlorinator	8	Maui	HI0000256
10-12-22	Maka Ridge Well Chlorinator	9	Kauai	HI0000403
10-12-22	Anahola Wells A,B,C Chlorinator	10	Kauai	HI0000401
10-12-22	Olokele Shaft Chlorinator	11	Kauai	HI0000417
10-18-22	Blend of 2 Kauluwai Wells Chlorinator	12	Molokai	HI0000230
10-18-22	Kawela Wells Chlorinator	13	Molokai	HI0000248
10-18-22	Ualapue Shaft Chlorinator	14	Molokai	HI0000233
10-19-22	Barbers Point Shaft Chlorinator	15	Oahu	HI0000355
10-19-22	Kipapa Acres Pre-Treatment	16	Oahu	HI0000328
10-25-22	Lalamilo Wells & Parker Wells Chlorinator	17	Hawaii	HI0000160
10-25-22	Paauilo Well Chlorinator	18	Hawaii	HI0000134
10-25-22	Ookala Well Chlorinator	19	Hawaii	HI0000104
10-25-22	Laupahoehoe Wells P1 & P2 Chlorinator	20	Hawaii	HI0000102
10-25-22	Chaves Springs Chlorinator (Ninole)	21	Hawaii	HI0000103
10-25-22	Pepeekeo	22	Hawaii	HI0000106
10-25-22	Papaikou	23	Hawaii	HI0000107
11-01-22	Kipapa Acres Pre Treatment	16	Oahu	HI0000328
11-16-22	Hawaii Country Club b/f Treatment	24	Oahu	HI0000304
11-16-22	Poamoho	25	Oahu	HI0000371
11-16-22	Del Monte Kunia 3 & 4	6	Oahu	HI0000303

RESULTS

Twenty-five (25) sites, from five (5) islands, were sampled **(Figure 1.1).** Only two (2) sites had detections of PFAS. The Kipapa Acres Pre-Treatment site and Del Monte Kunia 3 & 4 sites were the only two (2) sites sampled with PFAS detection results. Resampling of both sites with PFAS detections were conducted on 11-01-22 and 11-16-22, respectively. The following detection levels were reported for Kipapa Acres Pre-Treatment and Del Monte Kunia 3 & 4 and are summarized in **Table 1-2**.

Table 1-2. Sample Sites: Positive PFAS Results.

Collection Date	Sample Identification / Site	Analyte	Result	Reporting Limit (RL)	Unit	Method	Note(s)
10-19-22	Kipapa Acres Pre Treatment	Perfluorooctanesulfonic acid (PFOS)	**3.4**	2.0	ng/L	EPA 533 *	
10-19-22	Kipapa Acres Pre Treatment	Perfluoropentanoic acid (PFPeA)	**2.0**	2.0	ng/L	EPA 533 *	
10-19-22	Kipapa Acres Pre Treatment	Perfluorooctanesulfonic acid (PFOS)	**2.7**	2.0	ng/L	EPA 537.1**	
11-01-22	Kipapa Acres Pre Treatment	Perfluorooctanesulfonic acid (PFOS)	**3.1**	2.0	ng/L	EPA 533 *	Confirmation
11-01-22	Kipapa Acres Pre Treatment	Perfluoropentanoic acid (PFPeA)	**2.0**	2.0	ng/L	EPA 533 *	Confirmation
11-01-22	Kipapa Acres Pre Treatment	Perfluorooctanesulfonic acid (PFOS)	**2.6**	2.0	ng/L	EPA 537.1**	Confirmation
9-21-22	Del Monte Kunia 3 & 4	Perfluorobutanoic acid (PFBA)	**6.1**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluoropentanoic acid (PFPeA)	**19**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluorohexanoic acid (PFHxA)	**30**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluoroheptanoic acid (PFHpA)	**9.9**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluorooctanoic acid (PFOA)	**22**	2.0	ng/L	EPA 537.1**	
9-21-22	Del Monte Kunia 3 & 4	Perfluorobutanesulfonic acid (PFBS)	**8.9**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluoropentanesulfonic acid (PFPeS)	**9.0**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluorohexanesulfonic acid (PFHxS)	**69**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	Perfluorooctanesulfonic acid (PFOS)	**47**	2.0	ng/L	EPA 533 *	
9-21-22	Del Monte Kunia 3 & 4	1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	**19**	2.0	ng/L	EPA 533 *	

Collection Date	Sample Identification / Site	Analyte	Result	Reporting Limit (RL)	Unit	Method	Note(s)
9-21-22	Del Monte Kunia 3 & 4	Perfluorooctanesulfonic acid (PFOS)	**49**	1.9	ng/L	EPA 537.1**	
9-21-22	Del Monte Kunia 3 & 4	Perfluorohexanoic acid (PFHxA)	**30**	1.9	ng/L	EPA 537.1**	
9-21-22	Del Monte Kunia 3 & 4	Perfluorooctanoic acid (PFOA)	**27**	1.9	ng/L	EPA 537.1**	
9-21-22	Del Monte Kunia 3 & 4	Perfluorohexanesulfonic acid (PFHxS)	**73**	1.9	ng/L	EPA 537.1**	
9-21-22	Del Monte Kunia 3 & 4	Perfluorobutanesulfonic acid (PFBS)	**8.7**	1.9	ng/L	EPA 537.1**	
9-21-22	Del Monte Kunia 3 & 4	Perfluoroheptanoic acid (PFHpA)	**11**	1.9	ng/L	EPA 537.1**	
11-16-22	Del Monte Kunia 3 & 4	Perfluorobutanesulfonic acid (PFBS)	**9.7**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluoroheptanoic acid (PFHpA)	**10**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorohexanesulfonic acid (PFHxS)	70	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorohexanoic acid (PFHxA)	**33**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Pu Kunia 3 & 4	Perfluorooctanesulfonic acid (PFOS)	**50**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorooctanoic acid (PFOA)	**23**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorobutanoic acid (PFBA)	**6.4**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	1H,1H,2H,2H-Perfluorooctane sulfonic acid (6:2 FTS)	**18**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluoropentanoic acid (PFPeA)	**21**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluoroheptanesulfonic acid (PFHpS)	**2.7**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluoropentanesulfonic acid (PFPeS)	**10**	2.0	ng/L	EPA 533 *	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorobutanesulfonic acid (PFBS)	**9.3**	2.0	ng/L	EPA 537.1**	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluoroheptanoic acid (PFHpA)	**10**	2.0	ng/L	EPA 537.1**	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorohexanesulfonic acid (PFHxS)	**70**	2.0	ng/L	EPA 537.1**	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorohexanoic acid (PFHxA)	**35**	2.0	ng/L	EPA 537.1**	Confirmation
11-16-22	Del Monte Kunia 3 & 4	Perfluorooctanesulfonic acid (PFOS)	**45**	2.0	ng/L	EPA 537.1**	Confirmation

Collection Date	Sample Identification / Site	Analyte	Result	Reporting Limit (RL)	Unit	Method	Note(s)
11-16-22	Del Monte Kunia 3 & 4	Perfluorooctanoic acid (PFOA)	**23**	2.0	ng/L	EPA 537.1**	Confirmation

* Perfluorinated & Polyfluorinated Alkyl Substances in Drinking Water

** Perfluorinated Alkyl Acids (LC/MS)

STATE MAP OF SAMPLE SITES

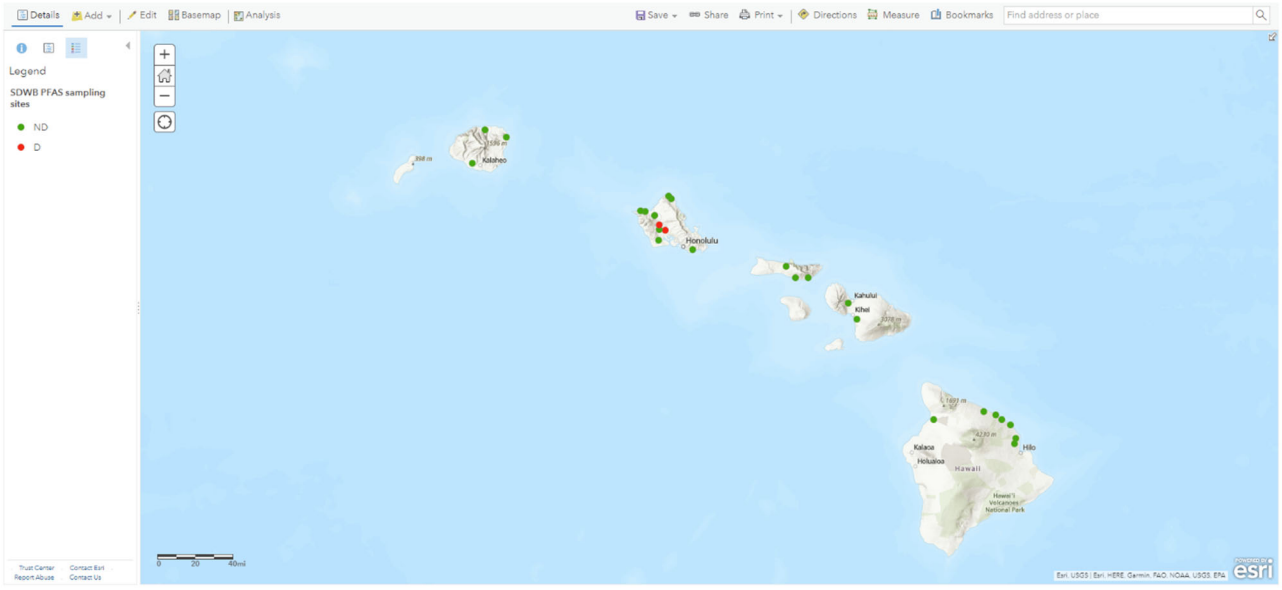

Figure 1.1 - Map of 25 sites sampled.

Two sites with PFAS detections (D) (red dots). No Detection (ND) is indicated by a green dot.

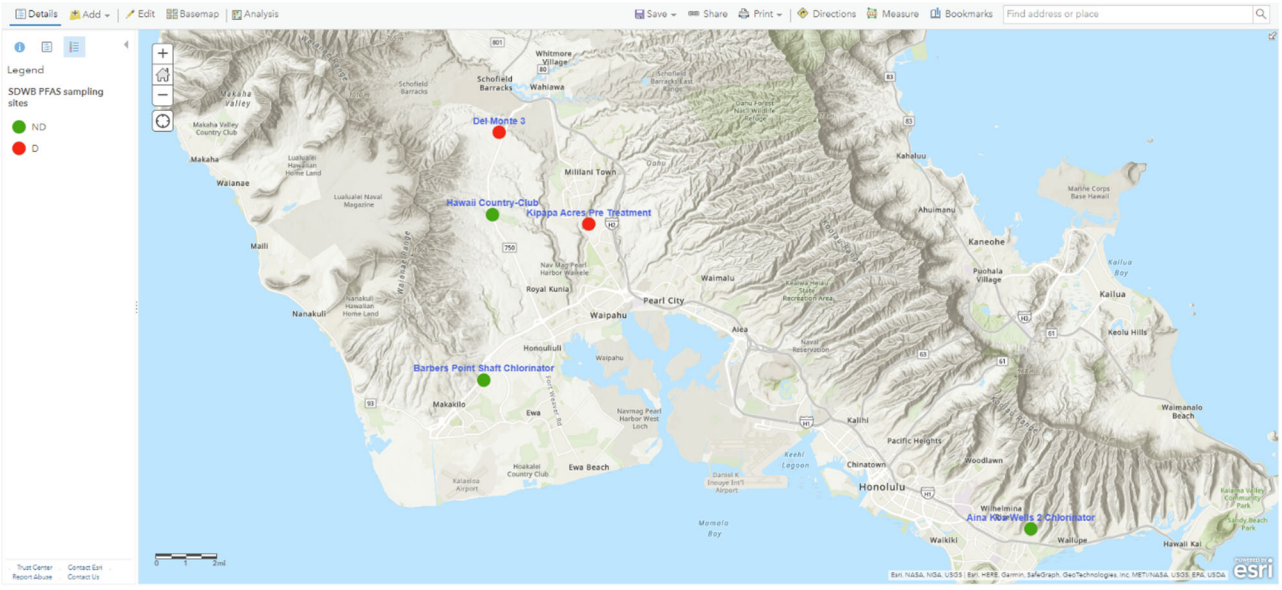

Figure 1.2 - Map of Oahu and two sampling sites detected with PFAS.

DISCUSSION

Sources of PFAS in the Environment

PFAS is in air emissions from industrial facilities, wastewater from industrial and municipal sources, soil and water surrounding firefighting training sites, groundwater surrounding landfills, building materials, and are sometimes found with no obvious source at all. (https://www.pca.state.mn.us/air-water-land-climate/minnesotas-pfas-blueprint) (pfas-building-materials-2021.pdf (greensciencepolicy.org))

The State of Hawaii, fortunately, does not have many industrial, manufacturing facilities that use PFAS in their production process. PFAS in the State is mainly attributed to facilities that have used and trained with AFFF, water from wastewater facilities and leachate from landfills.

Kipapa Acres Historical Information

In 1957, the original well, Well No. 2600-02, was drilled in the Kipapa Gulch area and was named Dairy Co. Well. Dairy Co., Inc. originally drilled to provide water needed to handle the dairy operations on that parcel **(Figure 1.3)**. The dairy ceased operations in 1977 but the well continued to provide water to the housing that was built for the dairy workers and the agricultural activities that replaced the dairy in Kipapa Gulch. In 2003, the property was sold, and the well was renamed to Kipapa Acres Association of Owners Well (aka - Kipapa Acres Well).

The areas surrounding the Kipapa Acres Well site has several Potentially Contaminating Activities (PCAs) within the groundwater source area to be examined as possible sources of PFAS. A ground water model should be used to better understand the movement of ground water in this water shed.

1) Poultry Activity
   In the late-70s, an egg farm **(Figure 1.4)** replaced the dairy operations in Kipapa Gulch. The poultry egg laying operation stopped some time in 2000. They continued with a periodic brooder operation until 2010, when the entire poultry operations ceased operations. The egg farm was approximately 750 feet from the well site. The egg farm is in Zone B of the of the well site.

2) Agricultural Activity
   Located on the ridge east, northeast, and south above the Kipapa Acres well site, is approximately 450 acres of Agricultural Zoned land in Waipio that had been farmed for decades. Sugar cane was the first crop grown on this ridge, followed by pineapple. During sugar production, furrow irrigation from the Waiahole ditch was used to irrigate the fields. In 1978, Oahu Sugar Company converted from the furrow system to using polyurethane irrigation drip lines. Cane was a two-year crop. The drip lines and field risers were not removed prior to harvest. Cane fields were burned to aid in harvesting the crop. Depending on the placement and depth of the drip line determined if the drip line got burned during the cane fires or remained in the field after harvest. Harvested cane fields were plowed and disked prior to replanting. Plastics were not removed from the cane fields. Pineapple fields used a synthetic black plastic in the fields at the time of planting, to aid with weed control and soil fumigation for nematodes. Drip tubing, generally made of polyethylene material, was used for drip irrigation in pineapple fields. Pineapple was a two- or three- fruit crop cycle which required 32 or 46 months, respectively, for completion. The black plastic and drip irrigation were not removed from the fields at the end of the crop cycle and prior to field preparation and were usually plowed and disced into the soil. Del Monte pineapple ceased operations in 2006 and the

James Campbell Company sold the agriculture zoned land in the area to Kunia Loa Ridge Farmlands, where truck crops were grown till recent.

3) Sewage Treatment Plants

Located west-southwest of the Kipapa Acres well site is the Mililani Sewage Treatment Plant (STP), located on Makapipipi Street **(Figure 1.5)**. In 1971, the Mililani STP began operations and disposal of the secondary treated effluent was into the Kipapa Stream, located below the facility, in Kipapa Gulch. The area of release into Kipapa Stream is not known at this time but is highly plausible to have been located on the fringe of Zone B of the Kipapa Acres well site. In 1978, the Hawaii State Department of Health placed stringent effluent limitations on the Mililani STP which discharged into the Kipapa Stream which eventually drained into West Loch, Pearl Harbor. Portions of West Loch were designated as Class AA, the highest receiving water classification in the State of Hawaii's Water Quality Standards (DOH, 1974). The discharge from the Mililani STP did not meet the effluent nutrient limitations stated in the National Pollutant Discharge Elimination System (NPDES) permit. The two nutrients in concern were the total nitrogen and total phosphorus. In 1990, the County of Honolulu converted the Mililani STP facility to initially processes influent and remove the solids and diverted its effluent to a sewage line, to Honouliuli Wastewater Treatment Plant (WTP) for final processing.

Located west-southwest of the Kipapa Acres well site, above Kipapa Gulch, on Punono Street, is the City and County of Honolulu - Mililani Wastewater Pump Station **(Figure 1.6).** This site receives influent and gives it it's last "push" to the Honouliuli WTP.

4) Residential Parcels

Located west and northwest of the Kipapa Acres well site, across and above the Kipapa Gulch, are residential homes in Mililani. PFAS is found in building materials such as: roofing, coating, flooring, sealants and adhesives, glass, fabrics, wires and cables, tape, timber-derived products, solar panels, artificial turf, and seismic damping systems (pfas-building-materials-2021.pdf (greensciencepolicy.org).

5) Waikakalau Ammunition Storage **(Figure 1.7)**

This site is located slightly North – North-East of the Kipapa Acres well site, approximately 5,135 feet further up Kipapa Gulch. This armored site historically held four (4) fuel tanks for Pearl Harbor and Hickam Air Force Base. Each tank held 2.65 million gallons of fuel **(Figure 1.8).** The underground storage tanks were constructed horizontally into the northwestern cliff of Kipapa Valley and was in use between May 1946 until February 1993. It has been documented that there were historical releases into Kipapa Gulch. It is unknown if fire retardant systems were used or stored at the facility, but is highly plausible, given the fact that fuel was stored there. Historically, the sludge from the fuel tanks were drained out of the fuel storage tanks and disposed of on the ground fronting the facility.

MAPS & INFORMATION RELEVANT TO KIPAPA ACRES WELL

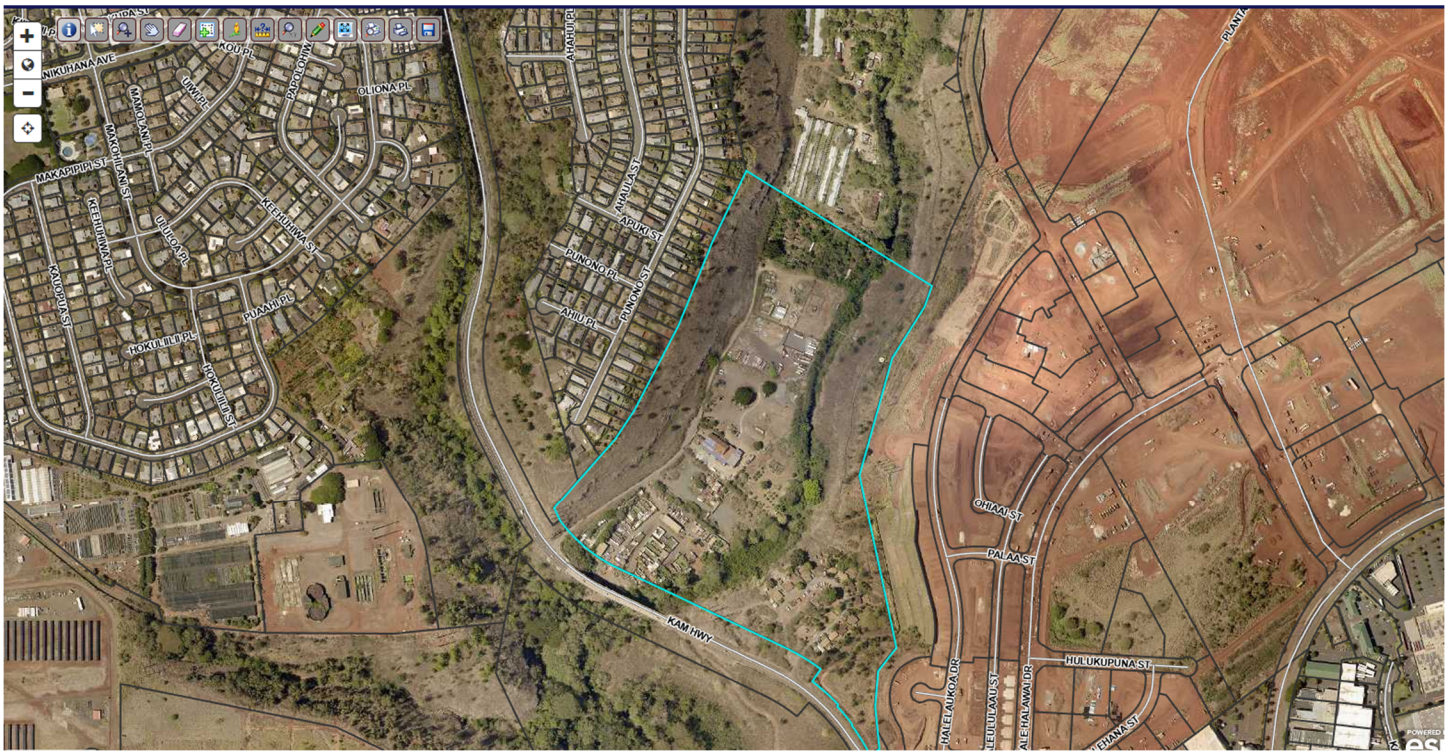

Figure 1.3 - TMK Parcel that Kipapa Acres Well is associated with and provides water to.

Figure 1.4 - Site of Pueo Acres Egg Farm (historical) and Peterson Egg Farm (historical).

Figure 1.5 - Mililani Preliminary Treatment Facility (PTF) formerly Mililani Sewage Treatment Plant (STP).

MILILANI WASTEWATER PUMP STATION

Tax Map Key:	9-4-141:086
Address:	94-490 Punono St Mililani, HI 96789

Year in service:	1989
Number of pumps:	2
Avg design flow:	0.12 mgd
Max design flow:	NA
Peak design flow:	0.64 mgd
Design data as of:	1995
Downstream TP:	Honouliuli WWTP
WTD number:	049

LEE.HN.PS2

Figure 1.6 - **Mililani Wastewater Pump Station on Punono Street.**

(https://www.honolulu.gov/rep/site/env/wwm_docs/wwm_honouliuli.pdf)

Field Constructed Tanks
Permanently Out of Use

- Kipapa Gulch Fuel Storage Annex
  - Formerly Operated by the Air Force
- Hickam POL Annex (Waikakalaua)
  - Formerly Operated by the Air Force

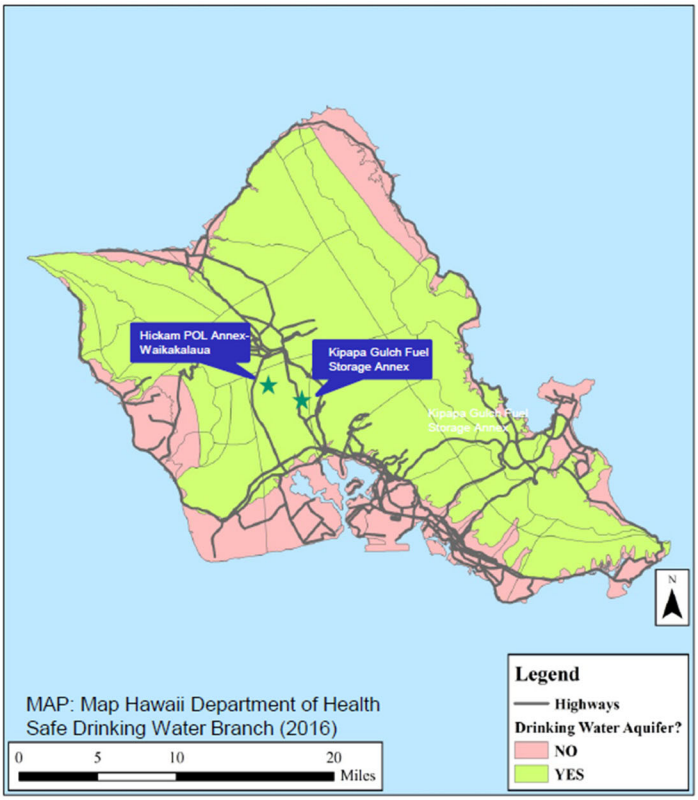

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Figure 1.7 - Waikakalau Ammunition Storage

Map of military fuel storage annex in Kipapa Gulch.

(https://ngmdb.usgs.gov/img4/ht_icons/overlay/HI/HI_Waipahu_349802_1983_24000_geo.jpg)

Figue

Kipapa Gulch Fuel Storage Annex

- Four (4) permanently closed tanks operated by Air Force – 2.65 M gallons each
- USTs constructed in horizontal tunnels excavated into basalt in the northwestern cliff face of Kipapa Valley
- Operated from May 1943 until February 1993
- Indication of historical releases. Long term efforts included monitored natural attenuation enhanced with bioventing and LUCs
- Investigated under the Comprehensive Environmental Response, Compensation and Liability Act; however remedy implemented under State Contingency Plan
- Record of Decision/Response Action Memorandum approved and signed by State Department of Health on 3 February 2012

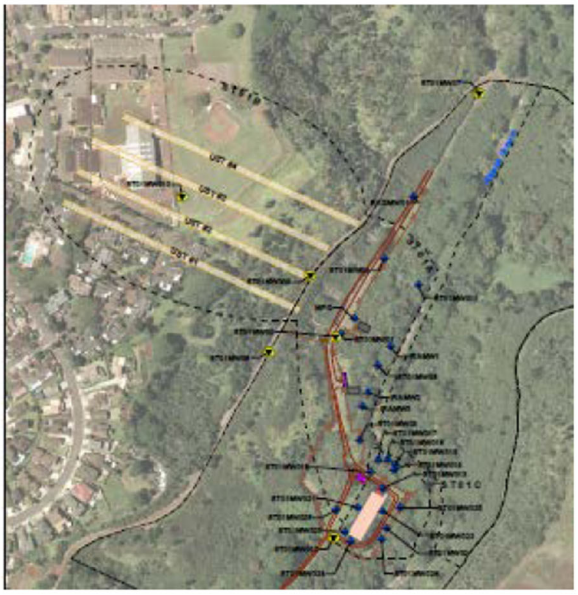

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Figure 1.8 – Kipapa Gulch Fuel Storage Annex

Map of military fuel storage annex in Kipapa Gulch.

(https://ngmdb.usgs.gov/img4/ht_icons/overlay/HI/HI_Waipahu_349802_1983_24000_geo.jpg)

MAPS AND INFORMATION RELEVANT TO KUNIA WELLS

Del Monte Historical Information

In 1977, Del Monte pineapple reported a spill of approximately 495 gallons of ethylene dibromide (EDB) while transferring the fumigant from its bulk shipment into their 25,000-gallon storage tank. The area of the spill was about 50 feet away from Del Monte's domestic water well. The well site supplied more than 600 residents at the Kunia Camp.

In June 1979, the well was tested for the presence of another soil fumigant, dibromochloropropane (DBCP) and the results indicated DBCP was present at the detection limit.

In April 1980, at the urging of EPA, testing of more than 60 wells in areas where soil fumigants were applied on Oahu and Maui were conducted. Test results from the Kunia Camp well showed EDB present at 92 mg/liter – 2,300 times the .04 mg/L maximum EDB contaminant level that was in effect. The Kunia Camp well showed EDB present at 92 mg/liter – 2300 times the .04 me/L maximum EDB contaminant level that was in effect. On April 24, 1980, the Kunia Camp well was retested. The concentration of EDB stood at 300 mg/L, or 7,500 times the maximum contaminant level. The following day, the State Department of Health ordered Del Monte to stop using the well as a source of potable water for Kunia Camp.

In April 1995, a "Data Summary and Evaluation Report for the Del Monte … Superfund Site" prepared for the Environmental Protection Agency by ICF Technology, Inc. stated that the shallow wells aiding in Del Monte's site clean-up suggests that Del Monte's drilling and pumping may have contributed to contamination of the basal aquifer.

The Del Monte spill site became a Superfund Site. Other sites throughout the property were identified as possible Superfund sites.

Del Monte has historically disposed of materials at various sites throughout their leased property over the years, that may contribute to PFAS in the environment.

Schofield Barracks and Wheeler Army Airfield

Schofield Barracks is directly adjacent to Wheeler Army Airfield, across Kunia Road. Wheeler Army Airfield is located approximately 3,548 feet northwest of the Kunia Wells that tested positive for PFAS **(Figure 1.9)**. Wheeler Army Airfield was established in 1922. In June of 1923, the designation of a new flying field, shop hangars, airplane hangars, and oil storage tanks were erected. (https://aviation.hawaii.gov/airfields-airports/oahu/wheeler-field/). In World War II it was a primary target and site of the first attack on December 7, 1941.

Figure 1.9 – Map showing distance between Kunia Wells (Del Monte Kunia 3 & 4) and Wheeler Army Airfield.

CONCLUSION AND RECOMMENDATIONS FOR FUTURE WORK

With the small sample size, it is difficult to come to a comprehensive conclusion. Further studies will be prudent to attempt to characterize the types of potential contamination activities that are contributing to these detections.

Kipapa Acres was initially a dairy operation with housing for its workers. Through the years the dairy eventually ceased operations and the housing remained. The Kipapa Acres well is in proximity to historic agricultural activity on the ridge above and east of the well; military activities were also on the opposite ridge, above and northwest of the well, where there was possibly an air strip; the military also had large fuel storage tanks that were in the hillside, northwest of the Kipapa Acres well, that may have contributed to the PFAS detections.

The detection at Kunia Village may be a result of historical agricultural use or possibly from its proximity to the Wheeler Army Airfield, Schofield Barracks, and Kunia Regional Special Operations Center. These military instillations have historically had airfields on property and is highly probable that aqueous firefighting foam (AFFF) was used and trained with. Further studies and research will help to determine if activities at these locations may be associated with the presence of PFAS in the Del Monte Kunia #3 Well.

The Del Monte Kunia 3 & 4 exceeded the HDOH – Hazard Evaluation and Emergency Response (HEER) emergency action levels (EAL) for PFOA, PFOS, and PFHxS.

After the 09-21-22 sampling of Del Monte Kunia 3 & 4, the HDOH – HEER Voluntary Clean Up Specialist, Mr. Sven Lindstrom, reviewed our PFAS sampling results and informed us that the levels of PFOA, PFOS and PFHxS, exceeded HDOH-HEER's emergency action levels (EAL). A meeting was called with the water system supplier to ensure that they addressed the potential threat to human health. The HDOH-HEER staff also reached out to the United States Army (Army), since they are the owners of the Del Monte Kunia 3 & 4. The HDOH-HEER wants the Army to act. The Army stated they will provide an alternative water source for the Del Monte Kunia 3 & 4 Well customers.

To date, the HDOH-SDWB does not have a maximum contaminant level (MCL) set for PFAS in the drinking water.

On 03-14-23, EPA announced the proposed National Primary Drinking Water Regulations (NPDWR) for six PFAS including perfluorooctanoic acid (PFOA), perfluorooctane sulfonic acid (PFOS), perfluorononanoic acid (PFNA), hexafluoropropylene oxide dimer acid (HFPO-DA, commonly known as GenX Chemicals), perfluorohexane sulfonic acid (PFHxS), and perfluorobutane sulfonic acid (PFBS). The proposed PFAS NPDWR does not require any actions until it is finalized. EPA anticipates finalizing the regulation by the end of 2023.

To further build our knowledge and portfolio of the health of our State's drinking water, we need to determine and identify, for future sampling and studies, all present sites, and historical sites where PFAS was stored and used: military installations, airports, firefighting training facilities, landfills, sewage treatment plants, and underground injection control systems. A further study of drinking water sources that are in proximity and down gradient from military bases and military activities needs to be done to determine if there is a correlation between the two.

Information from studies and sampling conducted by the HEER office should be reviewed to make determinations and best reasonable estimations on potential sources of PFAS contaminations in Hawaii. Coordination with HEER would be advantageous to identify further drinking water sampling sites to test at. HEER has EALs for PFAS, which may be lower levels than EPA's proposed MCL's for drinking water.

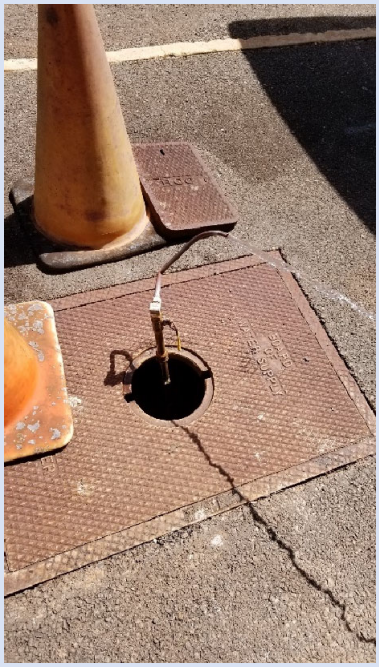
With more PFAS sampling, we will be able to get a better picture of the state's water quality health in relation to PFAS. More data should be reviewed with assistance from the state geologist and verification of groundwater models should be incorporated to determine how and where PFAS has moved from and has the potential to move to.

PHOTOGRAPHS OF SAMPLING SITES

Site #1: Aina Koa Wells 2 Chlorinator

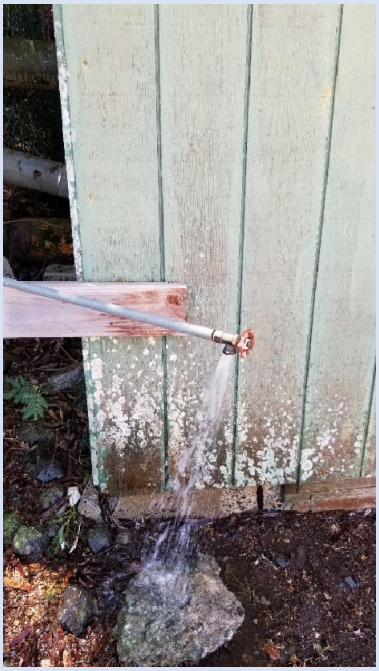
Site #1: Aina Koa Wells 2 Chlorinator

Site #2: Kahuku Wells Chlorinator



Site #2: Kahuku Wells Chlorinator

Site #3: Kahuku Airbase



Site #3: Kahuku Airbase

Site #4: Mokuleia Wells Chlorinator

Site #4: Mokuleia Wells Chlorinator

Site #5: Dillingham Well Chlorinator

Site #5: Dillingham Well Chlorinator

Site #6: Del Monte Kunia 3 & 4

Site #6: Del Monte Kunia 3 & 4

Site #15: Barbers Point

Site #15: Barbers Point

Site #16: Kipapa Acres

Site #16: Kipapa Acres

Site #18: Poamoho

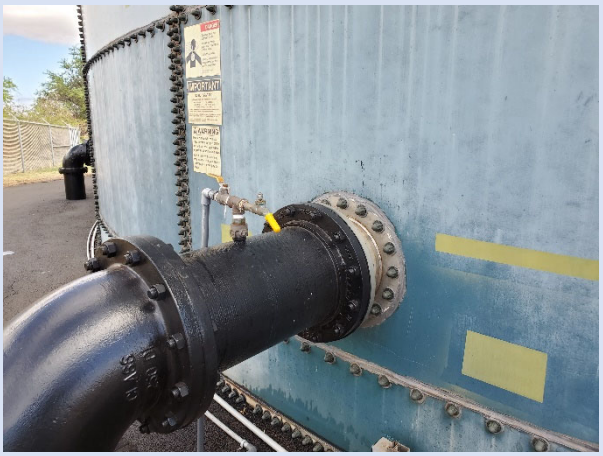
Site #18: Site Poamoho

Site #24: Hawaii Country Club

Site #7: Maui Lani Wells Chlorinator

Site #7: Maui Lani Wells Chlorinator

Site #8: Maui Highland Wells 1 and 2 Chlorinator



Site #8: Maui Highland Wells 1 and 2 Chlorinator

Site#9: Maka Ridge Wells Chlorinator

Site #9: Maka Ridge Wells Chlorinator

Site #10: Anahola Wells A, B and C Chlorinator

Site #10: Anahola Wells A, B and C Chlorinator

Site #11: Olokele Shaft Chlorinator

Site #11: Olokele Shaft Chlorinator

Site 12: Blend of Kauluwai Wells Chlorinator

Site #12: Blend of Kauluwai Wells Chlorinator

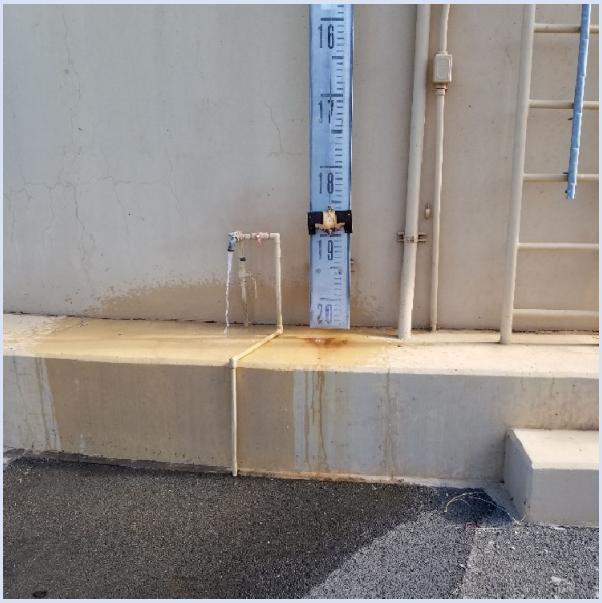
Site #13: Kawela Plantation Wells Chlorinator

Site #13: Kawela Plantation Wells Chlorinator

Site #14: Ualapue Shaft Chlorinator

Site #14: Ualapue Shaft Chlorinator

Site #17: Lalamilo Wells and Parker Wells



Site #17: Lalamilo Wells and Parker Wells

Site #18: Paauilo Wells Chlorinator EPD

Site #18: Paauilo Well Chlorinator EPD

Site #19: Ookala Well Chlorinator

Site #19: Ookala Well Chlorinator

Site #20: Laupahoehoe Wells P1 and P2 Chlorinator

Site #20: Laupahoehoe Wells P1 and P2 Chlorinator

Site #21: Chaves Spring Chlorinator

Site #21: Chaves Spring Chlorinator

Site #22: Peepekeo

Site #22: Peepekeo

Site #23: Papaikou

Site #23: Papaikou