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LĀNA`I RESORTS, LLC

BEFORE THE LAND USE COMMISSION

OF THE STATE OF HAWAII

In the Matter of the Petition of LĀNA`I RESORTS, LLC  To consider further matters relating to an Order To Show Cause as to whether certain land located at Mānele, Lāna`i, should revert to its former Agricultural and/or Rural land use classification due to Petitioner's failure to comply with Condition No. 10 of the Land Use Commission's Findings of Fact, Conclusions of Law, and Decision and Order filed April 16, 1991. Tax Map Key No. 4-9-002:049 (por.), formerly Tax Map Key No. 4-9-002:001 (por.).	DOCKET NO. A89-649 **CERTIFICATE OF SERVICE RE: PETITIONER LĀNA`I RESORTS, LLC'S EXHIBITS "43B", "43K", "43L", "45C", and "47A"**

CERTIFICATE OF SERVICE RE: PETITIONER LĀNA`I RESORTS, LLC'S EXHIBITS "43B", "43K", "43L", "45C", and "47A"

I hereby certify that the attached EXHIBITS "43B", "43K", "43L", "45C", and "47A"were duly served by mail to each of the following persons on the 28th day of October, 2016, as follows:

BRYAN C. YEE, ESQ. DAWN TAKEUCHI APUNA, ESQ. Department of the Attorney General Hale Auhau, Third Floor 425 Queen Street Honolulu, Hawaii 96813 Attorney for State Office of Planning	Via U.S. Postal Mail
LEO R. ASUNCION, Jr., AICP, Director RODNEY Y. FUNAKOSHI Office of State Planning 235 South Beretania Street, 6th Floor Honolulu, Hawaii 96813	Via U.S. Postal Mail
WILLIAM SPENCE, Director Planning Department, County of Maui 2200 Main Street One Main Plaza, Suite 315 Wailuku, HI 96793	Via U.S. Postal Mail
PATRICK K. WONG, ESQ. MICHAEL HOPPER, ESQ. CALEB ROWE, ESQ. Office of the Corporation Counsel 200 South High Street Wailuku, Hawaii 96793	Via U.S. Postal Mail
DAVID KOPPER, ESQ. LI'ULA NAKAMA, ESQ. Native Hawaiian Legal Corporation 1164 Bishop Street, Suite 1205 Honolulu, Hawaii 96813 Attorney for Intervenor LANAIANS FOR SENSIBLE GROWTH	Via U.S. Postal Mail

DATED: Honolulu, Hawaii, October 28, 2016.

BENJAMIN A. KUDO
CLARA PARK
Attorneys for
LĀNA'I RESORTS, LLC

Water Level and Pumpage of Well 1, 1948 to 2016

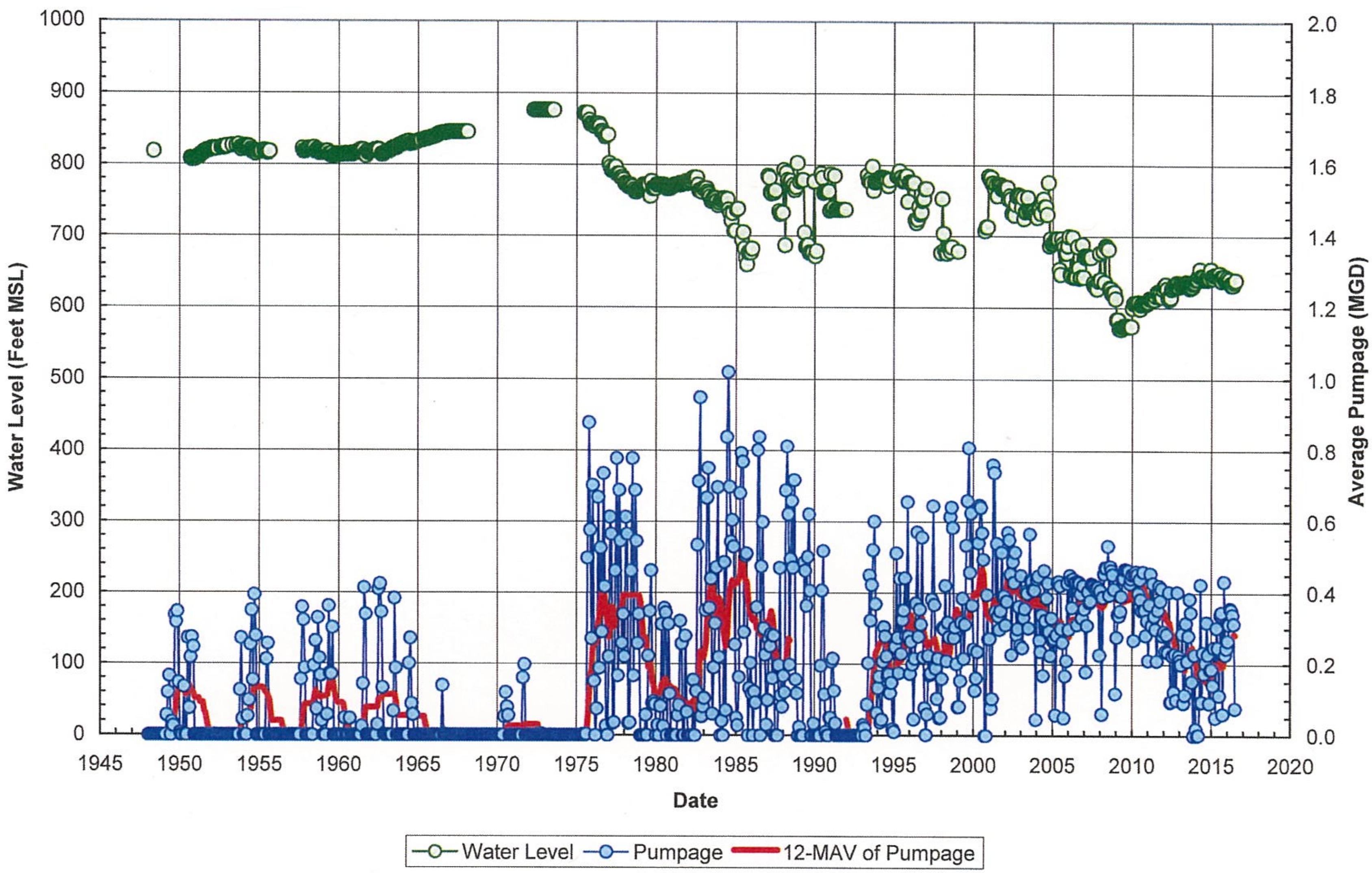
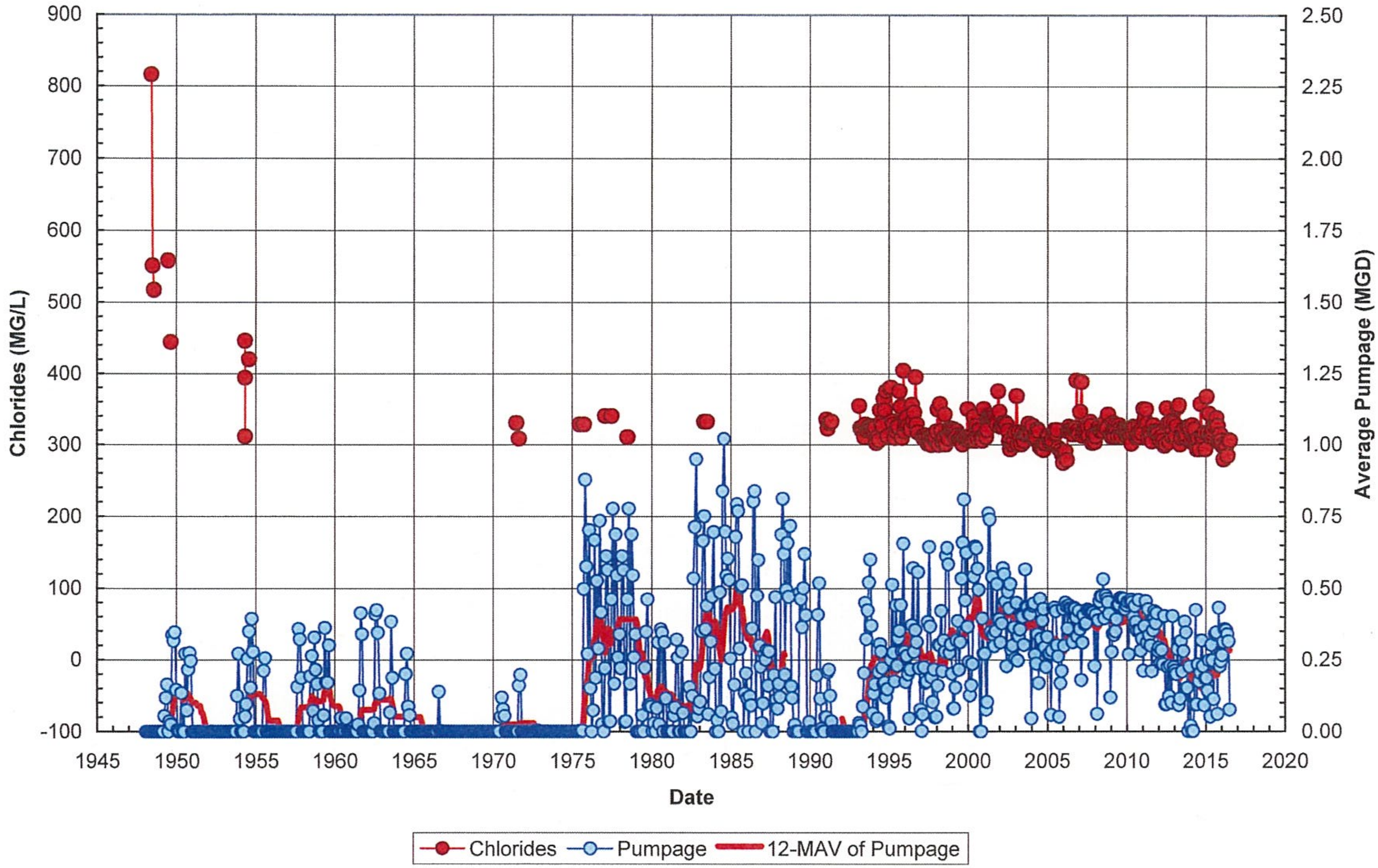


Exhibit 43B

Chlorides and Pumpage of Well 1, 1948 to 2016



TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 9
Email: jstubbart@pulamalanai.com
greg@tnwre.com
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Original ☐ will ☑ will not
be mailed to you.

October 10, 2016
16-191 | 16-35

MEMORANDUM

To: John Stubbart – Pulama Lanai

From: Tom Nance

Subject: Results of the Test of the Effects of Pumping Lanai Well 1 on the Upgradient Lanai Well 2

Introduction

A test was conducted to document whether pumping Well 1 in the Palawai Basin produces a detectable effect on the water level in Well 2. This memo and its attachments present the data and interpretations of this test. The ground elevation at Well 1 is 1263 feet. At Well 2, the ground elevation is 1905 feet. The static water level in Well 1 stands at 640 feet above sea level. The static water level in Well 2, standing at 1447 feet above sea level, is 807 feet higher. The wells are about 5250 feet (roughly a mile) apart. There are an unknown number of intruded dikes in the parent lavas between the two wells, but there is likely to be a significant number.

Given these circumstances, it is highly unlikely that pumping Well 1 over a practical test duration would produce a water level decline in Well 2. Nevertheless, such a test was conducted to see if such an impact could be documented.

Description of the Test

Water Level Recording of Lanai Well 2. On September 6, 2016, a Solinst F30 Edge Levelogger suspended on a stainless steel cable was installed in Well 2. The level in the well, measured with an electric sounder just prior to installation of the logger, was 1446.87 feet (MSL). The Edge Levelogger measures absolute pressure (the weight of water above the logger plus barometric pressure). To correct for the semi-diurnal barometric pressure variations, a Solinst Barologger was also suspended in the well to measure the barometric pressure in the column of air in the well.

Exhibit 43K

On October 3, 2016, both the F30 Edge Levelogger and the Barologger were removed from the well. The well's water level, measured at 9:57 AM which was about five minutes after the logger retrievals, was 1446.99 feet (MSL), about 0.12 feet higher than measured on September 6th.

Monitoring the Operation and Pumped Water Salinity of Well 1. The operating record of Well 1 is monitored by a SCADA System and also by the water company staff. The staff's record is logged by Curtis Ginoza, utility lead man for the water company. These sources provided pump start and stop times and pumping rates of Well 1. In addition, daily water samples and flow meter totalizer readings were taken by Patrick Untalan, utility meter reader, at 7:35 AM on each day that Well 1 was pumped.

The start of pumping Well 1 was at 7:30 AM on September 12th. It had not been run for more than a week prior to this start up. On September 17th at 11:20 PM (a Saturday night), the pump tripped off due to voltage imbalance. This was not discovered until Monday morning on September 19th. The pump was restarted at 9:00 AM on that morning and ran continuously until 8:08 AM on September 26th. It was not restarted until after the data loggers had been removed from Well 2 on October 3rd.

Presentation of the Collected Test Data

Figure 1 presents the recorded water level in Well 2 and the barometric pressure in the column of air inside the well. The scales on the graph have been selected to clearly show the semi-diurnal barometric pressure variations and the changes of the water level in Well 2 in response to this. The water level changes in Well 2 were on the order of 0.15 to 0.30 of the magnitude barometric pressure changes. The water level variations also, quite surprisingly, lag behind the barometric changes by one to six hours. The variable water level response to the barometric changes make it virtually impossible to satisfactorily "correct" the water level variations by applying a linear scale factor and time lag to the barometric data. As such, the "uncorrected" recorded water levels are used herein.

On Figure 2, the operating periods and pumping rates of Well 1 are superimposed on the recorded water level of Well 2. Initially, Well 1 pumped continuously for five days and 16 ours at an average of 237 GPM before the unscheduled shut down due to a voltage imbalance. After being off for 33 hours and 40 minutes, Well 1 was restarted and ran continuously for six days and 23 hours at an average of 245 GPM.

Figures 3 and 4 and Table 1 present the specific conductance and chlorides of the daily samples collected by Patrick Untalan. There are two aspects of these sample results to note. First, as recently discovered, the check valve on the discharge pipeline of Well 1 does not seat completely. When Well 1 is not running, a nominal amount of more saline water from Well 15 and/or the Manele Reservoir leaks back through the check valve and down into Well 1. For this reason, samples collected at the start up of Well 1, if it has been off for a period of time, include this more saline leaked back water. That is the reason why the salinity of water collected at the initial start up on September 12th and again at the restart on September 19th is anomalously high. Once the nominal amount of leaked back water is removed by pumping, the actual salinity of water from Well 1 is reflected in the subsequent samples.

The second aspect to note is the very gradual but definitely measurable salinity increase as Well 1 was continued to be pumped. The trend of increasing salinity with pumping duration, albeit not dramatic, was unmistakable and quite significant.

Interpretation of the Test Results

Recorded Water Leve in Well 2. Very clearly, no impact on the water level in Well 2 in response to pumping Well 1 was recorded. It can be reasonably argued, however, given the distance between the wells and the likelihood of multiple separate dike-(or fault-) confined groundwater compartments between them, that the test duration was far too short to prove that pumping Well 1 does not induce greater leakage from the groundwater compartment tapped by Well 2 than would otherwise occur naturally absent the use of Well 1.

I have carefully examined the available records of all wells drilled into high level groundwater on Lanai, as documented by Keith Anderson for the period from 1948 through 1984 and by the Periodic Water Reports from 1985 to the present. Except for replacement Well 3A which is about 25 feet from the collapsed Well 3, every well drilled into high level groundwater on Lanai taps into its own, separate groundwater compartment, even wells such as Well 2 and Shaft 3 which are only about 150 feet apart and Wells 4 and 5 which had almost identical static water levels when they were originally developed in 1950. There is not one instance in this available record where the pumping of one well produced a water level drawdown in another well. The reality is that the confining dikes (and/or fault surfaces) that create the separate groundwater compartments are very tight. That the water levels stand as high above sea level as they do with the very modest recharge that occurs provides pragmatic evidence of this.

Gradually Increasing Salinity of the Water Pumped by Well 1. In my opinion, the gradually increasing salinity in the water pumped by Well 1 is a far more significant result of the test than the lack of a water level response in Well 2. If the pumping of Well 1 actually increases the leakage from adjacent, higher head compartments containing lower salinity water than in the compartment tapped by Well 1, the expectation is that the salinity of water pumped by Well 1 would gradually decrease as Well 1 is continued to be pumped. That clearly did not occur.

Attachments

ec: Greg Fukumitsu and Todd Yonamine – TNWRE, Inc.

Figure 1
Recorded Water Level and Barometric Pressure at Lanai Well 2 from September 6 to October 3, 2016

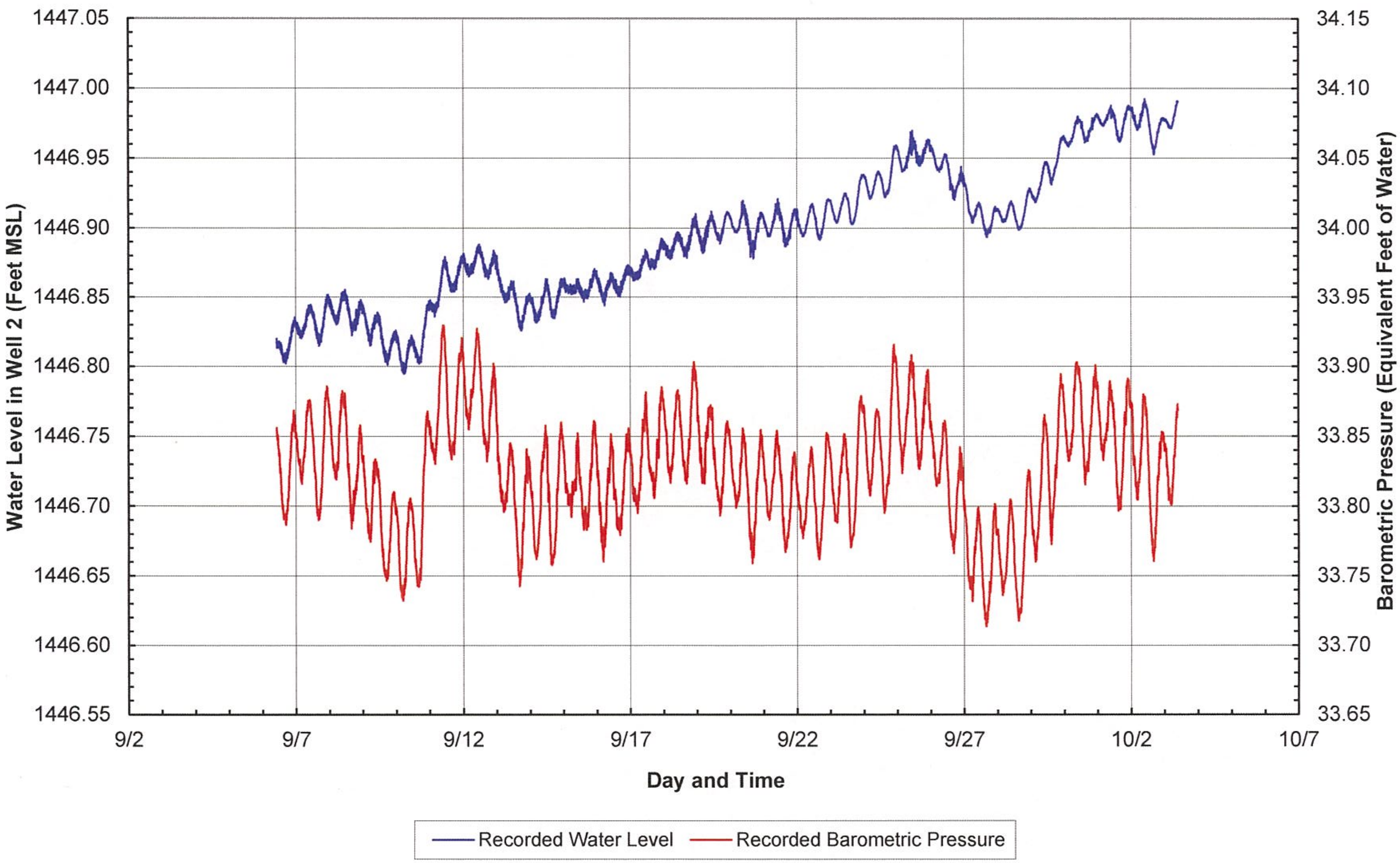

Figure 2

Operation of Lanai Well 1 Superimposed on the Recorded Water Level in Lanai Well 2

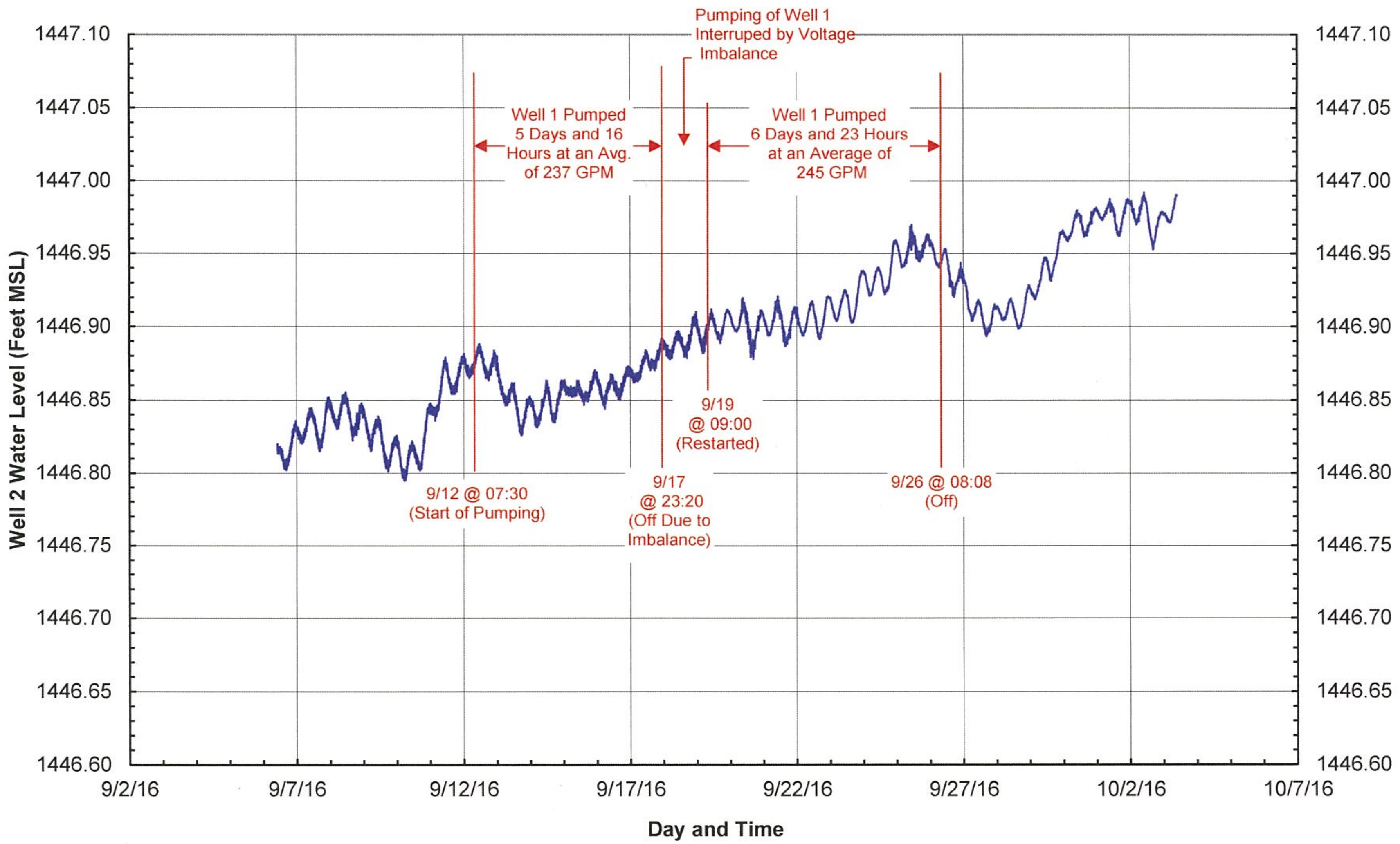

Figure 3. Specific Conductance of the Water Pumped by Well 1

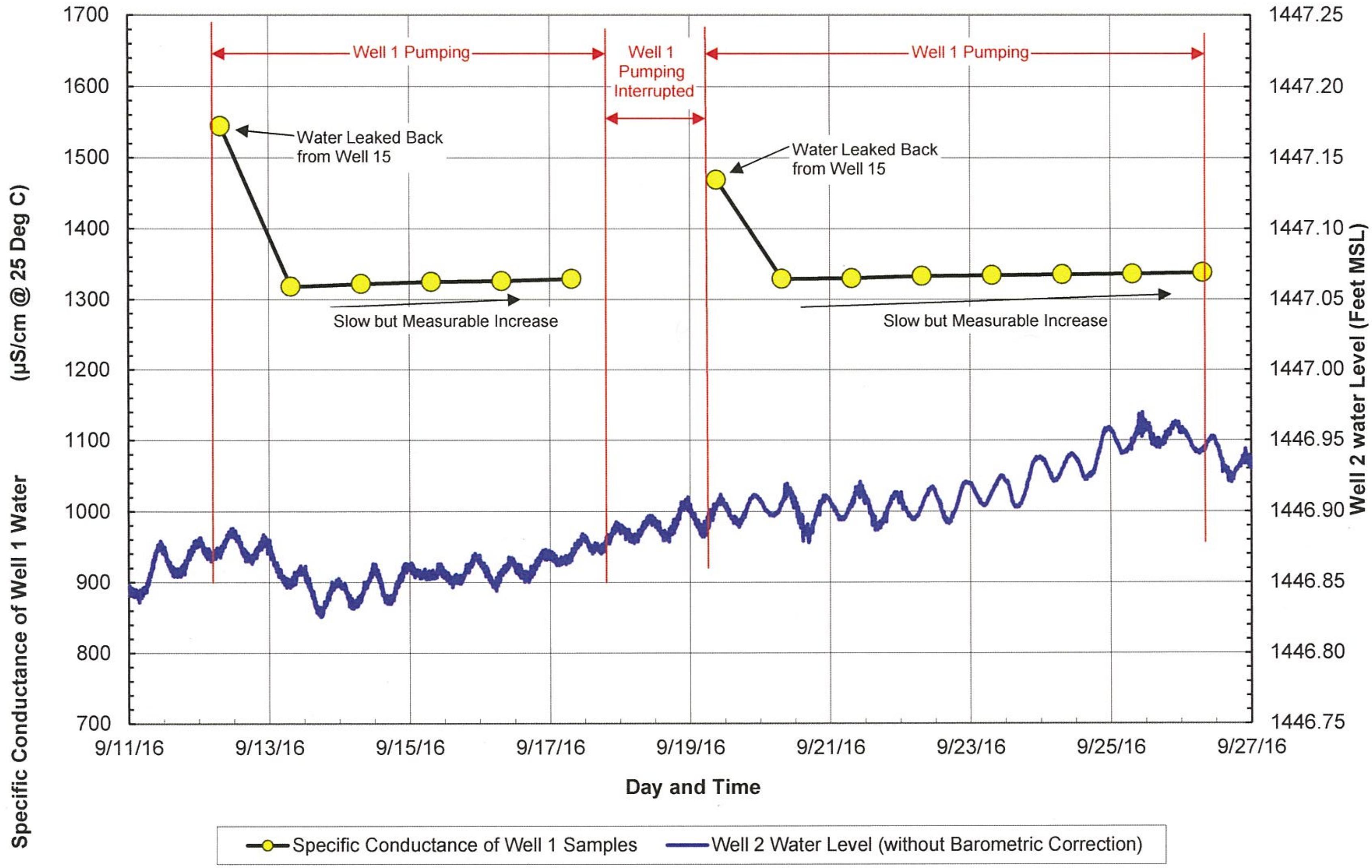

Figure 4. Chlorides of the Water Pumped by Well 1

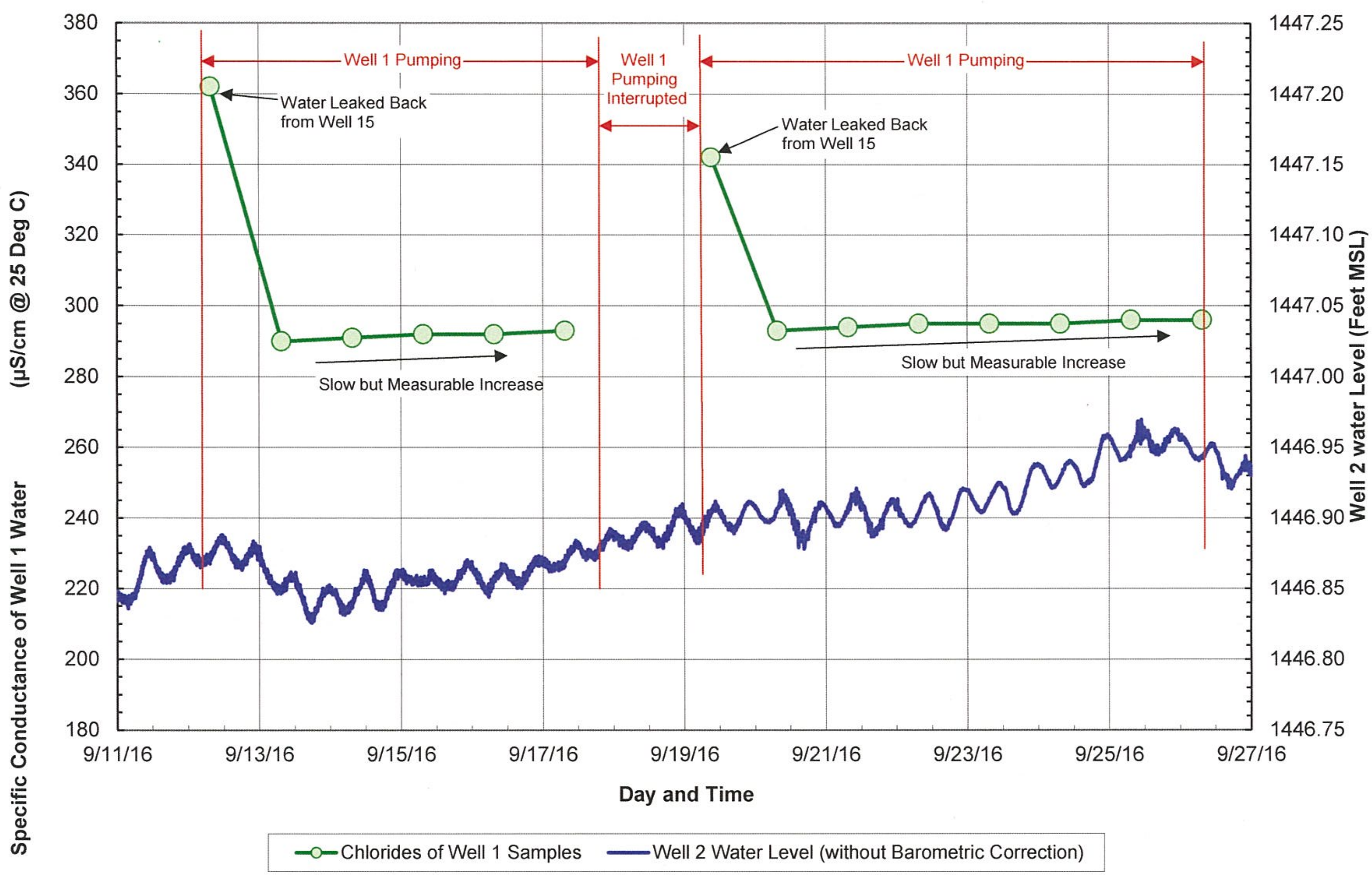

Table 1

Specific Conductance and Chlorides of Samples
from Lanai Well 1, September 12 to 26, 2016

Sample		Specific Conductance (µS/cm @ 25° C.)	Chlorides (MG/L)
Day	Time		
9/12	07:35	1544	364
9/13	07:35	1318	290
9/14	07:35	1322	291
9/15	07:35	1325	292
9/16	07:35	1326	292
9/17	07:35	1329	293
9/19	09:10	1469	339
9/20	07:35	1329	293
9/21	07:35	1330	294
9/22	07:35	1333	295
9/23	07:35	1334	295
9/24	07:35	1335	295
9/25	07:35	1336	296
9/26	07:35	1338	296

Notes:

1. Samples collected on September 12 and 19 were after periods when Well 1 was off. More saline water from Well 15 leaks back into Well 1 (past a check valve) when Well 1 is not pumping.
2. Specific conductance was measured in the TNWRE office using a HACH HQ30d meter calibrated with a 1413 µS/cm standard.
3. Chlorides determined by mercuric nitrate titration in the TNWRE office.

USGS
science for a changing world

NATIONAL BRACKISH GROUNDWATER ASSESSMENT

The amount of fresh or potable groundwater in storage has declined for many areas in the United States and has led to concerns about the future availability of water for drinking-water, agricultural, industrial, and environmental needs. Use of brackish groundwater could supplement or, in some places, replace the use of freshwater sources and enhance our Nation's water security. However, a better understanding of the location and character of brackish groundwater is needed to expand development of the resource and provide a scientific basis for making policy decisions. To address this need, the U.S. Department of Interior's WaterSMART initiative, through the USGS Groundwater Resources Program, is conducting a national assessment of brackish aquifers.

Why study brackish groundwater?

In many parts of the country, groundwater withdrawals exceed recharge rates and have caused groundwater-level declines, reductions to the volume of groundwater in storage, lower streamflow and lake levels, or land subsidence. It is expected that the demand for groundwater will continue to increase because of population growth, especially in the arid West. Further, surface-water resources are fully appropriated in many parts of the country, creating additional groundwater demand. Development of brackish groundwater as an alternative water source can help address concerns about the future availability of water and contribute to the water security of the Nation.

Brackish groundwater is potentially abundant. Early studies indicated that mineralized groundwater underlies most of the country (fig. 1). Further, advances in desalination technologies are making treatment and use of brackish groundwater for potable water supply more feasible.

Despite the need for alternative water sources and the potential availability of brackish groundwater, the most recent national map showing the distribution of mineralized groundwater was published in 1965. An updated evaluation is needed to take advantage of newer data that have been collected over the past 50 years. In addition, consistent information about chemical characteristics (such as major-ion concentrations) and hydrogeologic characteristics (such as aquifer material, depth, residence time, thickness, flow patterns, recharge rates, and hydraulic properties) of brackish groundwater has not been compiled at the national scale. Improved characterization is important for understanding and predicting occurrences in areas with few data and for assessing limitations imposed by different uses and (or) treatment options. This information is needed to understand the potential to expand development of the brackish groundwater resource and to provide reliable science for making policy decisions.

Groundwater in basin-fill aquifers of the Southwest often increases in dissolved-solids content as it travels along its flow path as a result of geochemical interactions with the aquifer matrix and through evaporative processes. At the end of its flow path, groundwater may be brackish or saline and discharges to the surface through springs such as this one in Death Valley. Photo by USGS hydrologist David Anning.

What is brackish groundwater?

All water naturally contains dissolved solids that, if present in sufficient concentration, can make a surface-water or groundwater resource "brackish," typically defined as distastefully salty. Although quantitative definitions of this term vary, it is generally understood that brackish groundwater is water that has a greater dissolved-solids content than occurs in freshwater, but not as much as seawater (35,000 milligrams per liter). It is considered by many investigators to have dissolved-solids concentration between 1,000 and 10,000 milligrams per liter (mg/L). The term "saline" commonly refers to any water having dissolved-solids concentration greater than 1,000 mg/L and includes the brackish concentration range.

About the Study

The objectives of the study are to identify and characterize significant brackish aquifers in the United States. Brackish aquifers are defined for purposes of this study as aquifers that have groundwater within 3,000 ft of land surface, contain dissolved-solids concentrations between 1,000 and 10,000 milligrams per liter, and can yield usable quantities of water. The study is intended to provide information about brackish aquifers at national and regional scales and is not for defining site-specific or localized conditions. Study results can be used to identify areas where further evaluation of the brackish aquifers will be most productive for potential users of the resource.

Salt deposits, such as halite or gypsum, are found in many sedimentary basins in the United States and are highly soluble. Other deposits are less soluble but can contribute dissolved solids when in contact with groundwater over longer periods of time. Source: Siim Sepp, http://www.sandatlas.org/.

Major components of the study

- Compiling existing information that can be used to assess brackish aquifers
- Describing, to the extent that available data permit, dissolved-solids concentrations, other chemical characteristics, horizontal and vertical extents of aquifers containing brackish groundwater, ability of the aquifers to yield water, and current brackish groundwater use
- Generating national maps of dissolved-solids concentrations
- Identifying data gaps that limit full characterization of brackish aquifers

Groundwater discharge and rainfall-runoff collect and evaporate from this brackish playa lake in Saline Valley, CA. Photo by USGS hydrologist David Anning.

Improvements upon previous work

- An updated national inventory of brackish groundwater: Previous national assessments of the distribution of brackish groundwater used only a limited amount of the dissolved-solids data that currently are available. A more complete set of information will be assembled from a wide variety of sources and will include more recently collected data.
- Publication of digital datasets: The national inventory and selected results will be published as digital datasets so that other scientists can conduct assessments tailored to their specific needs. Published digital data relating to brackish groundwater currently are limited to a small number of state and regional studies.
- Enhanced characterization: The updated dissolved-solids inventory will be used to characterize brackish aquifers at a higher spatial resolution than previous national work. In addition to dissolved-solids distribution, other chemical characteristics (such as major-ion concentrations) and hydrogeologic characteristics (such as aquifer material, depth, residence time, thickness, flow patterns, recharge rates, and hydraulic properties) will be assessed to determine brackish groundwater availability. Improved characterization is important for understanding and predicting occurrences in areas with few data, and also for assessing limitations imposed by different uses and (or) treatment options.
- Consistent approach: Although several detailed assessments of brackish aquifers have been conducted at state and regional scales, the methods differed among the studies. This work will describe brackish aquifers using consistent data analysis and assessment methods across the country.

Previous Work

A national compilation of data on mineralized (brackish) groundwater was completed in the 1960s (Feth and others, 1965). That study provided maps showing depth to the shallowest groundwater containing more than 1,000 mg/L of dissolved solids and chemical types of groundwater, serving as the primary source of information for subsequent assessments of the national distribution of brackish groundwater. Feth (1965b) also compiled a reference list of approximately 500 reports documenting saline groundwater conditions that "is by no means exhaustive, but it is representative of the types of information available and will serve to lead the reader into the literature." In addition, Feth (1981) and Richter and Kreitler (1991) summarized various models and mechanisms used to explain the spatial and temporal variability of dissolved solids in groundwater. Feth (1981) provided a national synthesis of chloride in natural waters, noting that the ratio of various other anions to chloride can be used to identify the source of brackish groundwater. Richter and Kreitler (1991) supplemented work by Feth and others (1965) with a map by Dunrud and Nevins (1981) showing the approximate extent of halite (sodium chloride salt) deposits, mapped locations of oil fields, estimates of the extent of seawater intrusion to coastal aquifers, and mapped saline springs and seeps to identify areas where brackish groundwater naturally occurs. Richter and Kreitler (1991) also provided a state-by-state summary of the occurrence of each source of groundwater salinization.

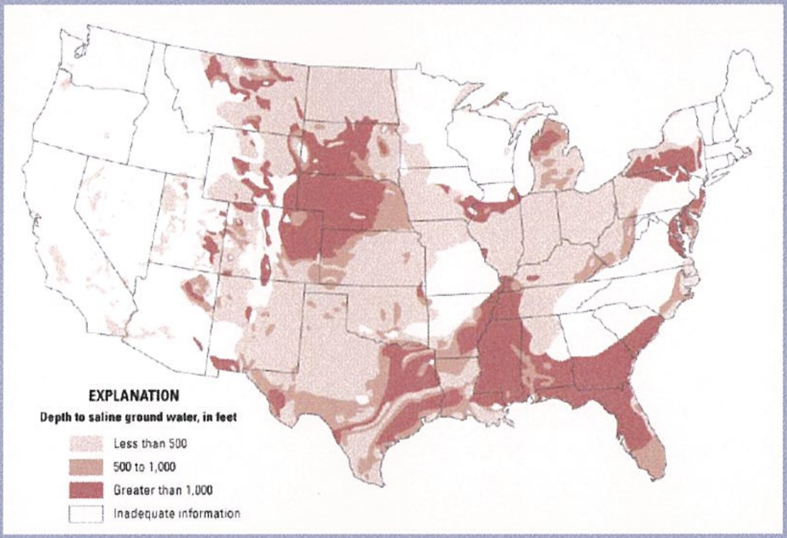

Figure 1. Depth to groundwater with total dissolved-solids concentration greater than 1,000 milligrams per liter in the United States (modified from Feth and others, 1965).

USGS Regional Aquifer-System Analysis (RASA) studies were conducted between 1978 and 1995 to define the regional geohydrology of the Nation's important aquifer systems. Maps showing dissolved-solids concentrations were published for many of these aquifer systems and compiled for the USGS Ground Water Atlas of the United States (U.S. Geological Survey, 2000). In some cases, regional RASA studies included geochemical characterization and modeling, which assisted with understanding, interpolating, and extrapolating brackish-water occurrence (for example, Busby and others, 1995).

More recently, Androwski and others (2011) used previously published USGS reports to conduct a national assessment of the total volume of the saline (dissolved-solids concentration between 1,000 and 35,000 mg/L) component of the principal aquifers of the conterminous United States that could be available for desalination. The primary sources of dissolved-solids and aquifer-dimension information for that study were digital maps from the USGS Ground Water Atlas of the United States (U.S. Geological Survey, 2000). No recently collected dissolved-solids data were used for the study, and depths to saline groundwater were estimated using simplistic assumptions and methods.

Examples of Regional Assessments of Brackish Aquifers

- Sandia National Laboratories is assessing the relative availability and cost of using shallow (less than 2,500 feet (ft) below land surface) brackish groundwater as a water source for thermoelectric power generation in 17 western states (Vince Tidwell, Sandia National Laboratories, written commun., 2013).
- Sources of information for estimating the availability of brackish groundwater include volumetric estimates of brackish groundwater in Texas and Arizona, USGS water-use information (Kenny and others, 2009), and data for wells in the USGS National Water Information System (NWIS) that contain brackish groundwater.
- The Texas Water Development board is conducting the Brackish Resources Aquifer Characterization System (BRACS) study to provide a detailed characterization of brackish aquifers in Texas using geophysical bore-hole logs and available aquifer data (Meyer and others, 2011).
- The USGS, through the Groundwater Resources Program, is completing three pilot studies that use geochemical, geophysical, and geostatistical methods and previously published work to describe saline aquifers for the southern midcontinent, Mississippi embayment, and the southeastern United States. These "Challenge Area" studies were conducted from 2010 through 2012 to supplement the Groundwater Resources Program's freshwater regional groundwater availability assessments already underway in order to achieve a more complete picture of the Nation's groundwater availability.

Top: Nuclear power plant cooled with brackish groundwater. Source: U.S. Nuclear Regulatory Commission. Right: Brackish water desalination facility in Harlingen, Texas. The plant was built in 2007 and has a capacity of 2.25 million gallons per day. Source: North Cameron Regional Water Supply Corporation.

How is Brackish Groundwater Being Used?

Brackish groundwater is directly used for purposes such as cooling water for power generation, aquaculture, and for a variety of uses in the oil and gas industry such as drilling, enhancing recovery, and hydraulic fracturing. For purposes requiring lower dissolved-solids content, especially drinking water, brackish water is treated through reverse osmosis or other desalination processes. In 2010, there were 649 active desalination plants in the United States with a capacity to treat 402 million gallons per day (Shea, 2010). Of the desalination plant capacity in the United States, 67 percent was for municipal purposes, 18 percent for industry, 9 percent for power, and the remaining 6 percent for other uses (Mickley, 2010). A total of 314 desalination facilities are used for municipal purposes, 49 percent of which were in Florida, 16 percent in California, 12 percent in Texas, and the remaining 23 percent dispersed among other states. More than 95 percent of the desalination facilities in the United States are inland (Mickley, 2010), and most facilities are designed to treat groundwater with dissolved-solids concentrations in the brackish range (Shea, 2010). Recent advances in technology have reduced the cost and energy requirements of desalination, making treatment of brackish groundwater a more viable option for drinking-water supplies (National Research Council, 2008).

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GOLF COURSE IRRIGATION
(based upon number of users)
Note: 26 Courses use multiple sources, but are listed as primary water source

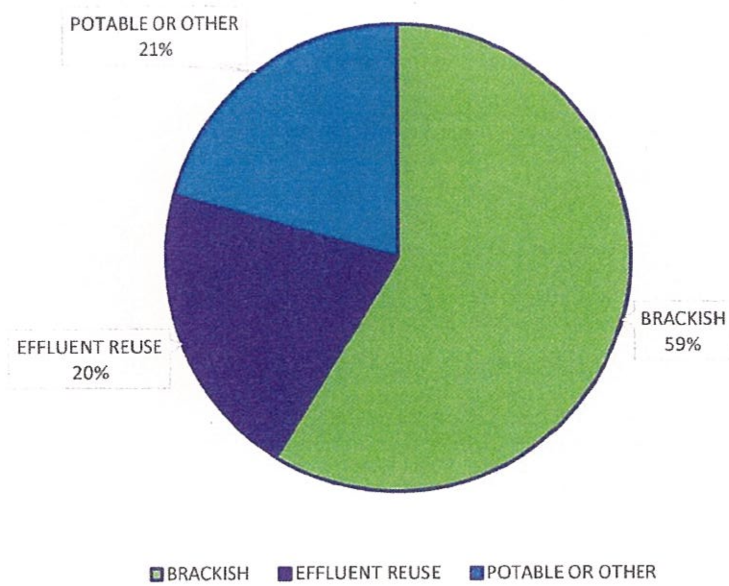


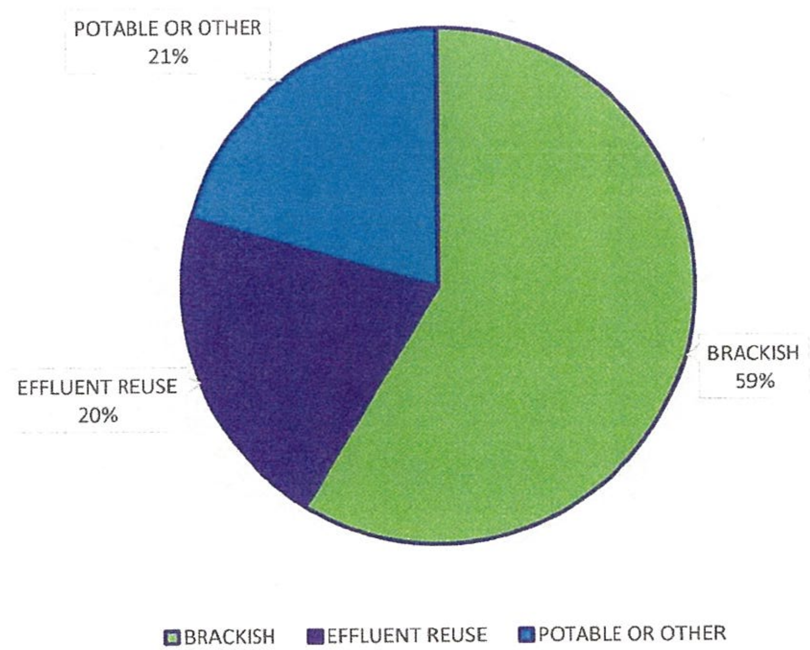
Exhibit 45C

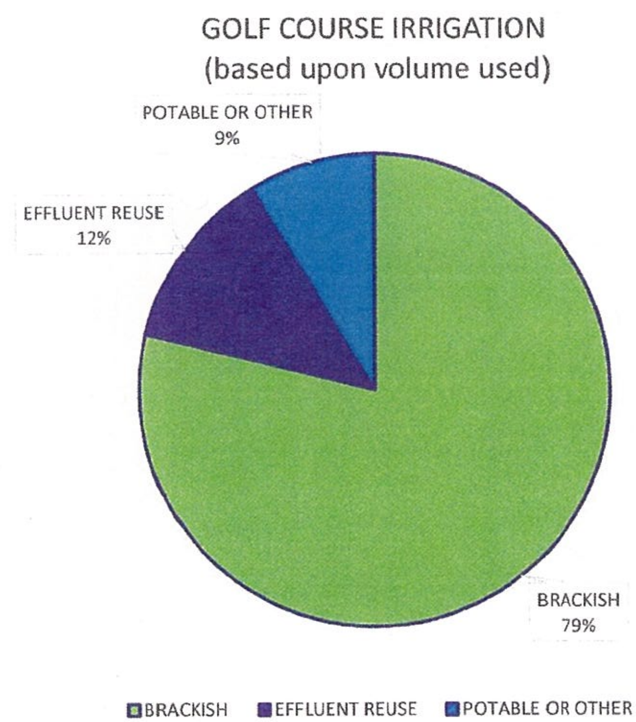
GOLF COURSE IRRIGATION		Percent
BRACKISH	74	58.73%
EFFLUENT REUSE	26	20.63%
POTABLE OR OTHER	26	20.63%
Total	126	100.00%

GOLF COURSE IRRIGATION

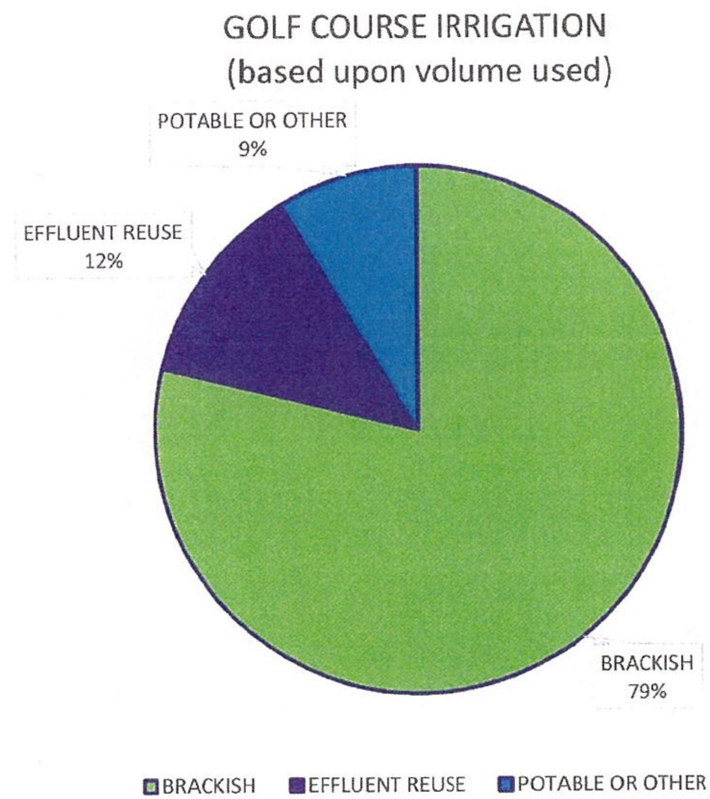
(based upon number of users)

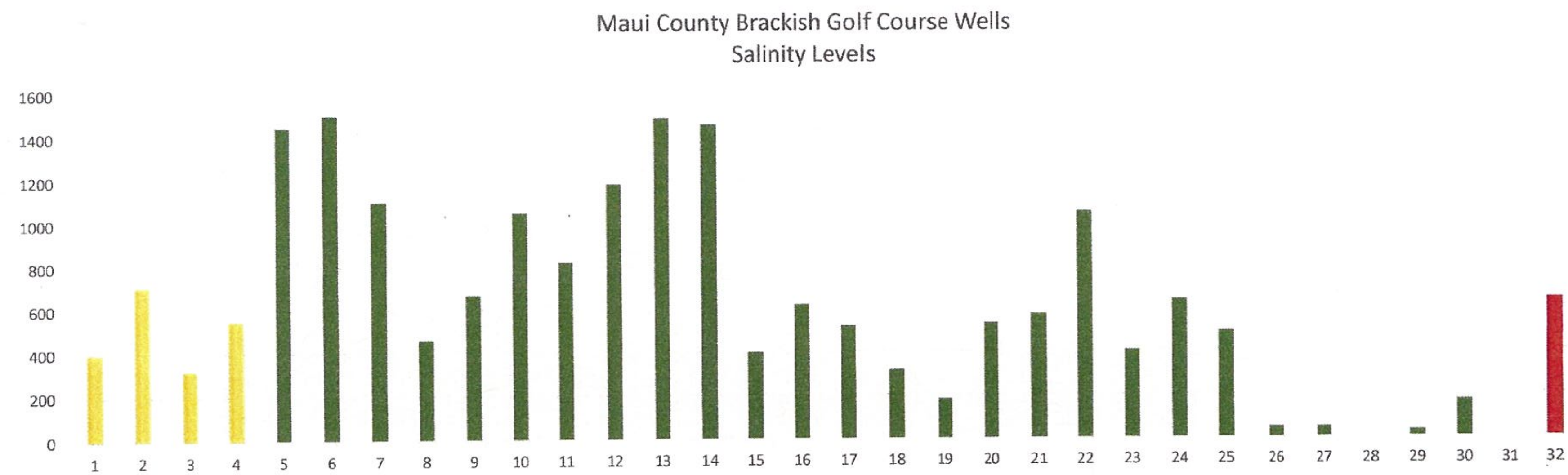
Note: 26 Courses use multiple sources, but are listed as primary water source




GOLF COURSE IRRIGATION
(based upon volume used)
POTABLE OR OTHER
9%
EFFLUENT REUSE
12%
BRACKISH
79%
BRACKISH
EFFLUENT REUSE
POTABLE OR OTHER

GOLF COURSE IRRIGATION		Percent
BRACKISH	77.21	78.83%
EFFLUENT REUSE	12.18	12.43%
POTABLE OR OTHER	8.56	8.74%
Total	97.95	100.00%




Maui County Brackish Golf Course Wells
Salinity Levels
1600
1400
1200
1000
800
600
400
200
0
1
2
3
4
5
6
7
8
9
10
11
12
13
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Many irrigation water samples we have seen from Coastal golf courses in South Carolina have salinities that range from 0.75 to 1.25 dS/m and salinities of 2 dS/m are not uncommon. These levels are sufficient to reduce the growth and quality of turf and necessitate additional management to produce high quality turfgrass.

Table 1. USDA Salinity Laboratory's classification of saline irrigation water based on salinity level, potential injury to plants, and management necessary for satisfactory utilization.

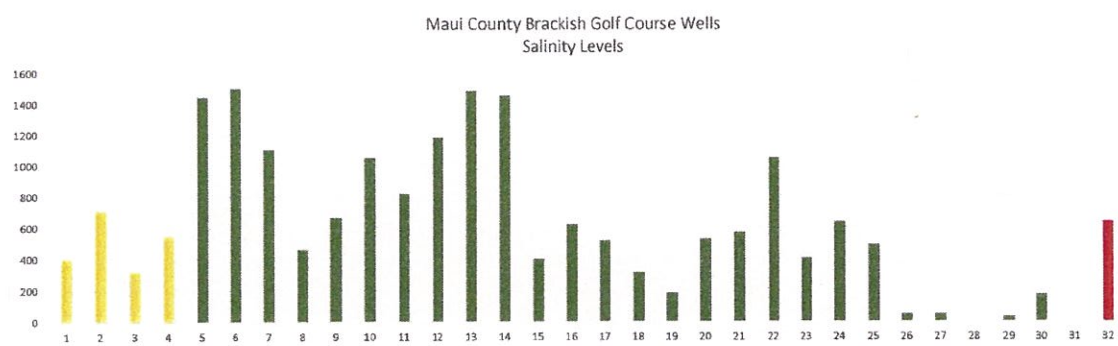
Salinity class	Electrical conductivity (dS/m)	Total dissolved salts (ppm)	Potential injury and necessary management for use as irrigation water
Low	<0.25	<150	Low salinity hazard; generally not a problem; additional management is not needed.
Medium	0.25 - 0.75	150 - 500	Damage to salt sensitive plants may occur. Occasional flushing with low salinity water may be necessary.
High	0.75 - 2.25	500 - 1500	Damage to plants with low tolerance to salinity will likely occur. Plant growth and quality will be improved with excess irrigation for leaching, and/or periodic use of low salinity water and good drainage provided.
Very High	>2.25	>1500	Damage to plants with high tolerance to salinity may occur. Successful use as an irrigation source requires salt tolerant plants, good soil drainage, excess irrigation for leaching, and/or periodic utilization of low salinity water.

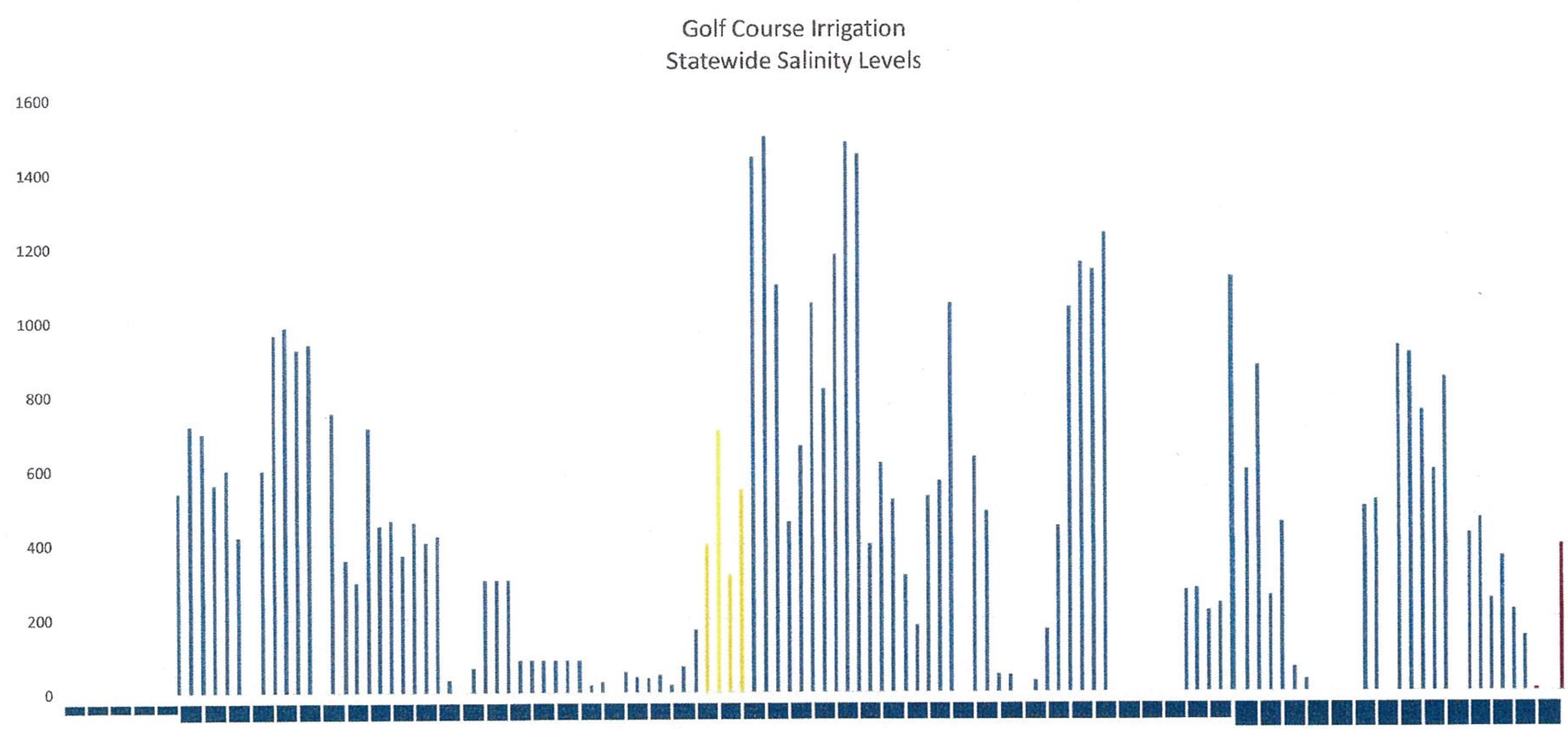
Assessing Soil Salinity

Soils are a key to continued use of saline irrigation water. Good drainage is essential to leach soluble salts through the soil profile. The better the drainage, the better one can keep soluble salts in the rootzone within tolerable limits. Poorly drained soils accumulate salts due to poor drainage. Although sandy soils are usually best suited for saline irrigation because of easy drainage, soil moisture must be maintained near field capacity in order to prevent intolerable salinity levels from occurring.

Soluble salts are measured in soils by the same basic method as water samples. A conductivity instrument measures electrical conductivity (EC) either from a saturated paste extract or from a soil:water dilution ratio. Electrical conductivity readings from these two methods are not comparable. Using the saturated paste extract, soils with EC readings of 2.0 to 4.0 dS/m are considered to have low salt levels (**Table 2**). Soils with EC readings of 4.0 to 12.0 dS/m have medium levels. When soil readings are above 12.0 dS/m, soils are considered to have high salt levels

Well No.	Pump GPM	Well Owner/User	Well Use	Year Drill	Longitude	Latitude	Island	Well Name	Init. Chlorides	Test Date	Test GPM	Draw Down	Test Chlorides	Pump MGPD	Pump EL	Pump Set Depth	TMK	Aquifer Code
5-4854-001	300	Manele Golf Course	IRRGC	1990	-156.914	20.81082	Lanai	Lanai 9	400	7/20/1990	336	105.1	400	0.432	461	951	(2) 4-9-002	50102
5-4854-002	350	Manele Golf Course	IRRGC	1995	-156.908	20.79771	Lanai	Lanai 14	700	12/15/2003	300	32.7	710	0.504	361	833	(2) 4-9-002	50102
		Manele Golf Course	IRRGC	1992			Lanai	Lanai 1	340				320	0.305				
		Manele Golf Course	IRRGC	2012			Lanai	Lanai 15	375				550	0.417				
6-3826-001	400	Makena Golf Course	IRRGC	1978	-156.436	20.64047	Maui	Seibu 2		3/20/1978	300		1445	0.576			(2) 2-1-005	60304
6-3826-002	400	Makena Golf Course	IRRGC	1978	-156.435	20.64281	Maui	Seibu 3		6/20/1978	400		1500	0.576			(2) 2-1-005	60304
6-3826-003	400	Makena Golf Course	IRRGC	1978	-156.436	20.64623	Maui	Seibu 4	1100	11/16/1978	400	0.6	1100	0.576			(2) 2-1-005	60304
6-3926-002	240	Makena Golf Course	IRRGC	1977	-156.434	20.65538	Maui	Makena 1		9/6/1977	440		460	0.576	-6.42	196	(2) 2-1-008	60304
6-3926-003	350	Wailea Golf LLC	IRRGC	1976	-156.434	20.66	Maui	Wailea 8	666	2/26/1976	400	15	666	0.504			(2) 2-1-008	60304
6-3926-004	400	Makena Golf Course	IRRGC	1984	-156.434	20.65307	Maui	Seibu 5		9/5/1984	500		1050	0.576			(2) 2-1-008	60304
6-3926-005	400	Makena Golf Course	IRRGC	1984	-156.434	20.65409	Maui	Seibu 6	668	11/13/1984	400	0.5	819	0.576			(2) 2-1-008	60304
6-3926-006	300	Makena Golf Course	IRRGC	1988	-156.434	20.65082	Maui	Seibu 8		3/10/1988	300	1	1182	0.432	-4.16	245	(2) 2-1-008	60304
6-3926-008		Makena Golf Course	IRRGC	1988	-156.434	20.648	Maui	Seibu 10		4/12/1988	350	1	1485				(2) 2-1-008	60304
6-3926-009	300	Makena Golf Course	IRRGC	1988	-156.434	20.6495	Maui	Seibu 11		10/25/1988	250	0.7	1454	0.288	-4.76	262	(2) 2-1-008	60304
6-4026-004	700	Wailea Golf LLC	IRRGC	1972	-156.438	20.67556	Maui	Wailea 4	363	8/25/1972	380	11.7	400	1.008	-10	189	(2) 2-1-008	60304
6-4026-006	700	Wailea Golf LLC	IRRGC	1975	-156.437	20.66556	Maui	Wailea 7	620	10/30/1975	700	2	620	1.008	-16	200	(2) 2-1-008	60304
6-4026-007	375	Wailea Golf LLC	IRRGC	1994	-156.435	20.67056	Maui	Wailea 6A	460	3/29/1994	714	23.5	520	0.54	-6	258	(2) 2-1-008	60304
6-4125-001	500	Kauapea Papaya, LLC	IRRGC	1991	-156.423	20.69056	Maui	Wailea 670 1		3/4/1991	350	0.7	316	0.72	-32	532	(2) 2-1-008	60304
6-4125-002	500	Kauapea Papaya, LLC	IRRGC	1991	-156.424	20.68889	Maui	Wailea 670 2		11/25/1991	420	2	182	0.72	-9	532	(2) 2-1-008	60304
6-4126-002	700	Wailea Golf LLC	IRRGC	1969	-156.436	20.68806	Maui	Wailea 2	490	7/5/1969	682	1.1	530	1.008	-7	188	(2) 2-1-008	60304
6-4126-003	750	Wailea Golf LLC	IRRGC	1969	-156.437	20.6825	Maui	Wailea 3	555	11/20/1969	460	1.2	571	1.08	-8	161	(2) 2-1-008	60304
6-4226-012	250	Wailea Golf LLC	IRRGC	1972	-156.437	20.69722	Maui	Wailea 5	1050	6/29/1972	800	1.8	1050	0.36	-19	198	(2) 2-1-008	60304
6-4226-013	400	Wailea Golf LLC	IRRGC	1989	-156.437	20.70444	Maui	Wailea 9		11/7/1989	405	7.9	405	0.576	-13	21	(2) 2-1-008	60304
6-4226-014	700	Wailea Golf LLC	IRRGC	1990	-156.436	20.70194	Maui	Wailea 10	600	7/9/1990	700	3.2	636	1.008	-5	239	(2) 2-1-008	60304
6-5021-001	1000	Pukalani Country Club, LLC	IRRGC	1972	-156.355	20.83389	Maui	Pukalani Golf	400		800	3	490	1.44	-38	1116	(2) 2-3-057	60303
6-5229-002	700	Maui Lani Partners	IRRGC	1980	-156.49	20.87193	Maui	Maui Lani 1		11/2/2004	492	3.6	49	1.008	-34	176	(2) 3-8-007	60301
6-5229-003	700	Maui Lani Partners	IRRGC	1980	-156.49	20.87283	Maui	Maui Lani 2		11/2/2004	499	0.61	48	1.008	-24	176	(2) 3-8-007	60301
6-5423-001		Maui Country Club	IRRGC	1899	-156.391	20.90889	Maui	Kailua Gulch	0				0					60302
6-5529-002	390	Department of Parks and Recreation, Central Maui, MDPR	IRRGC	1967	-156.496	20.92688	Maui	Waiehu Golf Course - Pc	32		190	0.3	32	0.561			(2) 3-2-013	60102
6-5530-004	300	Department of Parks and Recreation, Central Maui, MDPR	IRRGC	1995	-156.5	20.92583	Maui	Waiehu Golf Course - 13	80	9/20/1995	320	22.9	170	0.432	-42	119	(2) 3-2-013	60102
								Average					638.6666667	18.815				





Golf Course Irrigation
Statewide Salinity Levels
1600
1400
1200
1000
800
600
400
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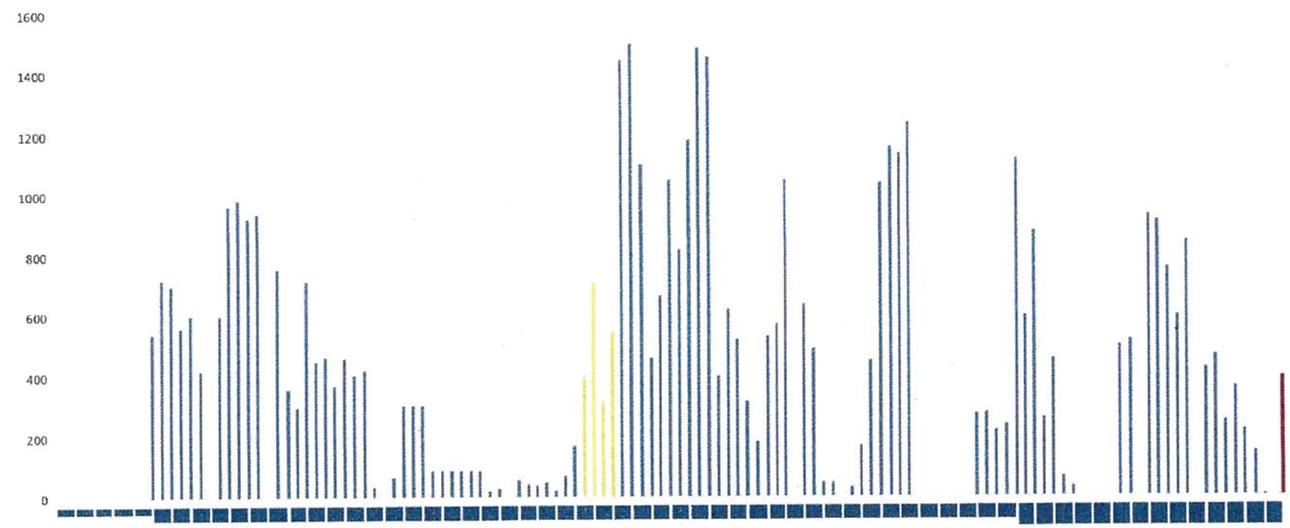
Well No.	Pump GPM	Well Owner/User	Well Use	Year Drill	Longitude	Latitude	Island	Well Name	Init. Chlorides	Test Date	Test GPM	Draw Down	Test Chlorides	Pump MGPD	Aquifer Code
2-5820-001	350	Kauai Lagoons Golf Course and Resort	IRRGC	1987	-159.3467	21.97278	Kauai	Well 3		5/20/1987	400	33.2		0.504	
2-5821-003	400	Kauai Lagoons Golf Course and Resort	IRRGC	1987	-159.3531	21.97306	Kauai	Well 1						0.576	
2-5821-004	350	Kauai Lagoons Golf Course and Resort	IRRGC	1987	-159.3481	21.97139	Kauai	Well 2		6/30/1987	500	30		0.504	
2-5821-005	200	Kauai Lagoons Golf Course and Resort	IRRGC	1987	-159.3478	21.96556	Kauai	Well 4						0.29	
2-5821-006	200	Kauai Lagoons Golf Course and Resort	IRRGC	1987	-159.3492	21.96583	Kauai	Well 5						0.288	
3-1646-001	600	Waialae Country Club	IRRGC	1881	-157.7783	21.27639	Oahu	Waialae Golf						0.864	
3-1646-004		Waialae Country Club	IRRGC	1970	-157.7728	21.27639	Oahu	Waialae Golf			72	21.6			
3-1649-018	300	Honolulu DPR - Ala Wai G. C.	IRRGC	1934	-157.8153	21.27667	Oahu	Ala Wai Pit 2						0.432	
3-1900-002	1760	Hawaii Prince Golf Club	IRRGC	1930	-158.0083	21.3275	Oahu	EP 22						2.534	
3-1900-016		Ewa Beach Golf Club	IRRGC	1988	-157.9994	21.32222	Oahu	New Ewa Intl G C		3/18/1988	350	3.7	540		
3-1900-017	300	Hawaii Prince Golf Club	IRRGC	1990	-158.0103	21.32439	Oahu	Haw Prince Irr 2		12/7/1989	210	0.3	720	0.432	
3-1900-018	210	Hawaii Prince Golf Club	IRRGC	1990	-158.007	21.32456	Oahu	Haw Prince Irr 3		1/12/1990	210	0.8	700	0.302	
3-1900-019	210	Hawaii Prince Golf Club	IRRGC	1990	-158.0048	21.32531	Oahu	Haw Prince Irr 4		1/15/1990	210	1.7	560	0.302	
3-1900-020	210	Hawaii Prince Golf Club	IRRGC	1990	-158.0038	21.32644	Oahu	Haw Prince Irr 5		1/17/1990	210	0.5	600	0.302	
3-1900-021	180	Ewa Beach Golf Club	IRRGC	1991	-158.003	21.32419	Oahu	New Ewa Intl G C		4/3/1991	250	4.1	420	0.259	
3-1900-022		Ewa Beach Golf Club	IRRGC	1988	-157.9978	21.32367	Oahu	Dug C					0		
3-1901-003	290	Hawaii Prince Golf Club	IRRGC	1990	-158.0131	21.32375	Oahu	Haw Prince Irr 1		1/19/1990	210	0.3	600	0.417	
3-1901-006	200	Haseko (Ewa) Inc.	IRRGC	2005	-158.0277	21.32156	Oahu	Ocean Pointe 4	930	2/18/2005	250	0.15	965	0.288	
3-1902-009	200	Haseko (Ewa) Inc.	IRRGC	2005	-158.0337	21.31886	Oahu	Ocean Pointe 1	925	3/14/2005	200	0.08	985	0.288	
3-1902-010	200	Haseko (Ewa) Inc.	IRRGC	2005	-158.0328	21.31892	Oahu	Ocean Pointe 2	890	2/17/2005	250	0.5	925	0.288	
3-1902-011	200	Haseko (Ewa) Inc.	IRRGC	2005	-158.0304	21.3205	Oahu	Ocean Pointe 3	880	2/17/2005	250	0.5	940	0.288	
3-1959-008		Ewa Beach Golf Club	IRRGC	1988	-157.9967	21.32472	Oahu	Dug D					0		
3-2001-012	430	Coral Creek Golf Course	IRRGC	1999	-158.0224	21.34406	Oahu	Keaunui Area 30		4/15/1999	300	0.2	755	0.619	
3-2002-015	800	Coral Creek Golf Course	IRRGC	1997	-158.0362	21.33378	Oahu	Coral Creek 1	110	7/16/1997	1008	1.8	358	1.152	
3-2002-017	800	Coral Creek Golf Course	IRRGC	1998	-158.0355	21.33508	Oahu	Coral Creek 2	110		800	3.6	298	1.152	
3-2002-019	800	Coral Creek Golf Course	IRRGC	1998	-158.0342	21.33108	Oahu	Lake A	715				715	1.152	
3-2003-001	350	Kapolei Golf Course	IRRGC	1991	-158.0571	21.33658	Oahu	Kapolei Irr A	465	6/18/1991	700	0.7	450	0.504	
3-2003-002	350	Kapolei Golf Course	IRRGC	1991	-158.0566	21.3365	Oahu	Kapolei Irr B	424	9/4/1991	500	2	464	0.504	
3-2003-004	500	Kapolei Golf Course	IRRGC	1991	-158.0615	21.33106	Oahu	Kapolei Irr D	370	9/24/1991	360	1	370	0.72	
3-2003-005	150	Kapolei Golf Course	IRRGC	1991	-158.0591	21.33853	Oahu	Kapolei Irr E	450	6/3/1991	150	12.6	460	0.216	
3-2003-007	500	Kapolei Golf Course	IRRGC	1994	-158.0584	21.33358	Oahu	Kapolei Irr C-1	405	10/31/1994	500	0.1	405	0.72	
3-2006-013	840	Ko Olina Resort & Golf Course	IRRGC	1986	-158.1059	21.33691	Oahu	Ko Olina	530	2/4/1986	722	1.2	422	1.209	
3-2050-001	300	Oahu Country Club	IRRGC	1993	-157.8397	21.33889	Oahu	Oahu C C Irr.	35	4/26/1995	400	11.6	35	0.432	
3-2145-004	110	Hawaii RHGC LLC, Royal Hawaiian Golf Club	IRRGC	1988	-157.7626	21.34803	Oahu	Well 4		7/19/1988	49	43.8	0	0.158	
3-2154-001	400	Honolulu Country Club, LLC	IRRGC	1909	-157.9014	21.35417	Oahu	Honolulu International C	67				67	0.576	
3-2201-003	2300	Honolulu DES - Ted Makalena G. C.	IRRGC	1891	-158.0286	21.37306	Oahu	EP 2	304				304	3.312	
3-2201-004		Honolulu DES - Ted Makalena G. C.	IRRGC	1891	-158.0286	21.37306	Oahu	EP 2	304				304		
3-2201-007		Honolulu DES - Ted Makalena G. C.	IRRGC	1921	-158.0288	21.37272	Oahu	EP 2	304				304		
3-2301-001	1800	Waikele Golf Club, Inc.	IRRGC		-158.0164	21.39639	Oahu	Waipahu WP1	88				88	2.592	
3-2301-002		Waikele Golf Club, Inc.	IRRGC		-158.0164	21.39639	Oahu	Waipahu WP1	88				88		
3-2301-003		Waikele Golf Club, Inc.	IRRGC		-158.0164	21.39639	Oahu	Waipahu WP1	88				88		
3-2301-004		Waikele Golf Club, Inc.	IRRGC		-158.0164	21.39639	Oahu	Waipahu WP1	88				88		
3-2301-005	1000	Waikele Golf Club, Inc.	IRRGC		-158.0164	21.39639	Oahu	Waipahu WP1	88				88	1.44	
3-2301-006		Waikele Golf Club, Inc.	IRRGC		-158.0164	21.39639	Oahu	Waipahu WP1	88				88		
3-2347-002	350	Koolau Golf Course	IRRGC	1988	-157.792	21.38322	Oahu	Koolau GC 1		5/5/1988	300	4.4	21	0.504	
3-2347-003	350	Koolau Golf Course	IRRGC	1988	-157.7927	21.38167	Oahu	Koolau GC 2	30	5/26/1988	400	6	30	0.504	
3-2356-054	700	Pearl Country Club	IRRGC	1966	-157.9317	21.39556	Oahu	Pearl C C Golf			450		0	1.008	
3-2401-007	1250	Royal Kunia Country Club	IRRGC	1996	-158.0291	21.40933	Oahu	Royal Kunia C C	57	10/29/1996	1420	0.9	57	1.8	
3-2603-001	300	Hawaii Country Club	IRRGC	1961	-158.0578	21.435	Oahu	Hawaii Country Club	43	6/16/1961	300	80	43	0.432	
3-2811-003	200	Makaha Valley Country Club	IRRGC	1989	-158.1959	21.478	Oahu	MVCC Irr 1	60	5/1/1989	200	27.7	40	0.288	
3-2811-004	200	Makaha Valley Country Club	IRRGC	1989	-158.1966	21.47794	Oahu	MVCC Irr 2	48	12/20/1989	200	46	48	0.288	
3-2811-007		Kapolei Golf Course	IRRGC	2014	-158.1978	21.47795	Oahu	DU-3	33	11/12/2014	354	40	22	40	
3-4100-001	550	Turtle Bay Mauka Lands, LLC	IRRGC	1978	-157.9976	21.69614	Oahu	Mauka Agriculture	71		2000	11.1	71	0.792	
3-4158-014	700	Turtle Bay Resort LLC	IRRGC	1990	-157.9779	21.695	Oahu	Kuilima 1	352	2/15/1990	704	12.9	170	1.008	
5-4854-001	300	Manele Golf Course	IRRGC	1990	-156.914	20.81082	Lanai	Lanai 9	400	7/20/1990	336	105.1	400	0.432	
5-4854-002	350	Manele Golf Course	IRRGC	1995	-156.9079	20.79771	Lanai	Lanai 14	700	12/15/2003	300	32.7	710	0.504	
		Manele Golf Course	IRRGC	1992			Lanai	Lanai 1	340				320	0.305	
		Manele Golf Course	IRRGC	2012			Lanai	Lanai 15	375				550	0.417	
6-3826-001	400	Makena Golf Course	IRRGC	1978	-156.4358	20.64047	Maui	Seibu 2		3/20/1978	300		1445	0.576	
6-3826-002	400	Makena Golf Course	IRRGC	1978	-156.4351	20.64281	Maui	Seibu 3		6/20/1978	400		1500	0.576	

6-3826-003	400	Makena Golf Course	IRRGC	1978	-156.4358	20.64623	Maui	Seibu 4	1100	11/16/1978	400	0.6	1100	0.576
6-3926-002	240	Makena Golf Course	IRRGC	1977	-156.4338	20.65538	Maui	Makena 1		9/6/1977	440		460	0.576
6-3926-003	350	Wailea Golf LLC	IRRGC	1976	-156.4342	20.66	Maui	Wailea 8	666	2/26/1976	400	15	666	0.504
6-3926-004	400	Makena Golf Course	IRRGC	1984	-156.434	20.65307	Maui	Seibu 5		9/5/1984	500		1050	0.576
6-3926-005	400	Makena Golf Course	IRRGC	1984	-156.4339	20.65409	Maui	Seibu 6	668	11/13/1984	400	0.5	819	0.576
6-3926-006	300	Makena Golf Course	IRRGC	1988	-156.4336	20.65082	Maui	Seibu 8		3/10/1988	300	1	1182	0.432
6-3926-008		Makena Golf Course	IRRGC	1988	-156.4343	20.648	Maui	Seibu 10		4/12/1988	350	1	1485	
6-3926-009	300	Makena Golf Course	IRRGC	1988	-156.4343	20.6495	Maui	Seibu 11		10/25/1988	250	0.7	1454	0.288
6-4026-004	700	Wailea Golf LLC	IRRGC	1972	-156.4375	20.67556	Maui	Wailea 4	363	8/25/1972	380	11.7	400	1.008
6-4026-006	700	Wailea Golf LLC	IRRGC	1975	-156.4367	20.66556	Maui	Wailea 7	620	10/30/1975	700	2	620	1.008
6-4026-007	375	Wailea Golf LLC	IRRGC	1994	-156.4347	20.67056	Maui	Wailea 6A	460	3/29/1994	714	23.5	520	0.54
6-4125-001	500	Kauapea Papaya, LLC	IRRGC	1991	-156.4233	20.69056	Maui	Wailea 670 1		3/4/1991	350	0.7	316	0.72
6-4125-002	500	Kauapea Papaya, LLC	IRRGC	1991	-156.4236	20.68889	Maui	Wailea 670 2		11/25/1991	420	2	182	0.72
6-4126-002	700	Wailea Golf LLC	IRRGC	1969	-156.4364	20.68806	Maui	Wailea 2	490	7/5/1969	682	1.1	530	1.008
6-4126-003	750	Wailea Golf LLC	IRRGC	1969	-156.4367	20.6825	Maui	Wailea 3	555	11/20/1969	460	1.2	571	1.08
6-4226-012	250	Wailea Golf LLC	IRRGC	1972	-156.4372	20.69722	Maui	Wailea 5	1050	6/29/1972	800	1.8	1050	0.36
6-4226-013	400	Wailea Golf LLC	IRRGC	1989	-156.4367	20.70444	Maui	Wailea 9		11/7/1989	405	7.9	0	0.576
6-4226-014	700	Wailea Golf LLC	IRRGC	1990	-156.4361	20.70194	Maui	Wailea 10	600	7/9/1990	700	3.2	636	1.008
6-5021-001	1000	Pukalani Country Club, LLC	IRRGC	1972	-156.3547	20.83389	Maui	Pukalani Golf	400		800	3	490	1.44
6-5229-002	700	Maui Lani Partners	IRRGC	1980	-156.4901	20.87193	Maui	Maui Lani 1		11/2/2004	492	3.6	49	1.008
6-5229-003	700	Maui Lani Partners	IRRGC	1980	-156.49	20.87283	Maui	Maui Lani 2		11/2/2004	499	0.61	48	1.008
6-5423-001		Maui Country Club	IRRGC	1899	-156.3914	20.90889	Maui	Kailua Gulch					0	
6-5529-002	390	Department of Parks and Recreation, Central Maui, MDPR	IRRGC	1967	-156.4964	20.92688	Maui	Waiehu Golf Course - Po	32		190	0.3	32	0.561
6-5530-004	300	Department of Parks and Recreation, Central Maui, MDPR	IRRGC	1995	-156.4999	20.92583	Maui	Waiehu Golf Course - 13	80	9/20/1995	320	22.9	170	0.432
8-3056-001	700	The Club at Hokuli'a G. C.	IRRGC	1993	-155.9353	19.51194	Hawaii	Hokukano 1	300	2/12/1993	840	5.3	450	1.008
8-3156-001	600	The Club at Hokuli'a G. C.	IRRGC	2000	-155.9375	19.51944	Hawaii	Hokukano Irr 2	900	12/19/2000	600	3.93	1040	0.864
8-3357-004	470	Kona Country Club, Inc.	IRRGC	1990	-155.9517	19.55028	Hawaii	Keauhou-Kona C C		10/12/1990	430	0.2	1160	0.677
8-3457-001	600	Kona Country Club, Inc.	IRRGC	1956	-155.9617	19.57556	Hawaii	Keauhou 1		1/1/1965	600	13.2	1140	0.864
8-3457-003	500	Kona Country Club, Inc.	IRRGC	1985	-155.9573	19.57097	Hawaii	Keauhou Irr 3		1/29/1985	705	2.4	1240	0.72
8-4161-004	250	Kohanaiki Shores, LLC	IRRGC	2007	-156.0339	19.70077	Hawaii	Kohanaiki 3		7/14/2008	231		0	0.36
8-4161-005	250	Kohanaiki Shores, LLC	IRRGC	2007	-156.033	19.69937	Hawaii	Kohanaiki 4			214		0	0.36
8-4161-006	250	Kohanaiki Shores, LLC	IRRGC	2007	-156.0321	19.69788	Hawaii	Kohanaiki 5					0	0.36
8-4161-007	250	Kohanaiki Shores, LLC	IRRGC	2007	-156.0314	19.69672	Hawaii	Kohanaiki 6					0	0.36
8-4161-008	250	Kohanaiki Shores, LLC	IRRGC	2007	-156.0304	19.69532	Hawaii	Kohanaiki 7					0	0.36
8-4262-002	250	Kohanaiki Shores, LLC	IRRGC	2007	-156.0346	19.70156	Hawaii	Kohanaiki 2		7/14/2008	219		0	0.36
8-4757-001	350	Hualalai Investors LLC	IRRGC	1991	-155.9588	19.79489	Hawaii	Kaupulehu Irr 1	250	3/25/1991	445	28.7	275	0.504
8-4757-002	550	Hualalai Investors LLC	IRRGC	1990	-155.9587	19.79485	Hawaii	Kaupulehu Irr 2		12/4/1990	500	5.8	280	0.792
8-4757-003	550	Nanea Golf Club, Inc.	IRRGC	2001	-155.9545	19.796	Hawaii	Kaupulehu Irr 3	220	1/10/2001	655	6.37	220	0.792
8-4757-004	550	Nanea Golf Club, Inc.	IRRGC	2002	-155.9508	19.79673	Hawaii	Kaupulehu Irr 4	240	3/28/2002	615	11.2	240	0.792
8-4759-001	540	Kukio Golf & Beach Club	IRRGC	1990	-155.9872	19.79194	Hawaii	KI-1	590	11/13/1990	620	1.3	1121	0.778
8-4759-002	500	Kukio Golf & Beach Club	IRRGC	1991	-155.9828	19.79417	Hawaii	KI-2	460	2/25/1991	500	4.4	600	0.72
8-4759-003	560	Kukio Golf & Beach Club	IRRGC	1992	-155.985	19.79306	Hawaii	KI-3	720	5/14/1992	500	8.1	880	0.806
8-4856-001	590	Hualalai Investors LLC	IRRGC	2001	-155.9468	19.79739	Hawaii	Kaupulehu Irr 5	250	1/15/2001	700	13.9	260	0.849
8-4856-002	550	Hualalai Investors LLC	IRRGC	2006	-155.9429	19.79821	Hawaii	Kaupulehu Irr 6	447	2/27/2006	550	2.1	458	0.792
8-4950-001	736	Mason Maikui (Big Island Country Club)	IRRGC	1992	-155.8417	19.82056	Hawaii	Big Island C C 1	43	3/6/1996	646		67	1.059
8-4950-002	700	Mason Maikui (Big Island Country Club)	IRRGC	1995	-155.8378	19.82222	Hawaii	Big Island C C 2		10/3/2005	720	20	34	1.008
8-5206-007		Vijay Singh	IRRGC		-155.1144	19.87961	Hawaii	Tee Box #2					0	
8-5452-001	900	Waikoloa Golf Course	IRRGC	1980	-155.88	19.9125	Hawaii	Nursery					0	1.29
8-5452-002	350	Waikoloa Golf Course	IRRGC	1980	-155.8753	19.91028	Hawaii	Fifty-One Ft STP					0	0.5
8-5452-003	350	Waikoloa Golf Course	IRRGC	1988	-155.8714	19.91278	Hawaii	Resort 1					0	0.5
8-5547-001	700	Waikolo Village Golf Course	IRRGC	2007	-155.7922	19.93028	Hawaii	WVA 1	400	5/29/2007	800	0.77	500	1.008
8-5548-001	400	Hawaii Water Service Company Inc.	IRRGC	1968	-155.7978	19.92639	Hawaii	Parker 1			400	1.8	518	0.576
8-5552-001	700	Hawaii Water Service Company Inc.	IRRGC	1988	-155.8441	19.91792	Hawaii	Resort Irr 2					0	1
8-5650-001	250	Mauna Lani Resort, Inc.	IRRGC	1991	-155.8433	19.93556	Hawaii	Entrance	910	5/23/1991	250	9	935	0.36
8-5650-002	350	Mauna Lani Resort, Inc.	IRRGC	1991	-155.84	19.93917	Hawaii	Culvert	875	2/4/1991	540	0.5	915	0.504
8-5651-001	425	Mauna Lani Resort, Inc.	IRRGC	1988	-155.8486	19.9325	Hawaii	Highway		11/11/1988	475	4.6	760	0.612
8-5749-001	450	Mauna Lani Resort, Inc.	IRRGC	1991	-155.8256	19.96083	Hawaii	North	600	6/10/1991	540	4	600	0.64
8-5750-003	425	Mauna Lani Resort, Inc.	IRRGC	1988	-155.8339	19.95	Hawaii	Fire Station		7/25/1988	600	0.1	848	0.612
8-5750-004		Mauna Lani Resort, Inc.	IRRGC		-155.84	19.94722	Hawaii	STP					0	
8-5849-002	550	Mauna Lani Resort Operations	IRRGC	1999	-155.8225	19.97028	Hawaii	Mauna Lani 8		11/15/1999	600	6.5	427	0.792
8-5849-003	450	Mauna Lani Resort Operations	IRRGC	1999	-155.8217	19.96917	Hawaii	Mauna Lani 9		11/15/1999	600	4.5	469	0.648

8-6047-001	450	Aina Ho'onaea LLC	IRRGC	1990	-155.7921	20.00747	Hawaii	Ouli C		11/13/1990	745	4.6	250	0.64
8-6047-002	450	Aina Ho'onaea LLC	IRRGC	1991	-155.7937	20.00381	Hawaii	Ouli D		7/5/1991	630	11.2	364	0.64
8-6047-004	450	Aina Ho'onaea LLC	IRRGC	2003	-155.7928	20.00942	Hawaii	Hapuna 3	200	5/29/2003	454	1.2	220	0.648
8-6047-005	0	Aina Ho'onaea LLC	IRRGC	2006	-155.7923	20.01169	Hawaii	Hapuna 4		8/21/2006	475	2.1	150	
8-6235-001	500	Waimea Country Club	IRRGC	1991	-155.5964	20.04363	Hawaii	Waimea C C	12	11/19/1991	540	0.7	8	0.72
													395.8730159	2.0127

Golf Course Irrigation
Statewide Salinity Levels



Golf Course Name using Effluent Reuse Water	Volume (MGPD)	Type	Comments
Kauai County			
Kauai Lagoons Resort	0.65	R-1	Blend with Brackish undiulted
Wailua Golf Course	0.55	R-2	Blend with Brackish undiulted
Princeville Makai G. C.	0.60	R-2	Supplement with rain water
Puakea Golf Course	0.40	R-1	Blend with Stream Water
Kiahuna Golf Course	0.30	R-1	Blend with Stream Water
Poipu Bay Resort & Golf Course	0.10	R-2	Blend with Stream Water
In Addition many Landscape Irrigation uses in Kauai County			
Maui County			
Experience at Koele	0.15	R-1	Blend with rain water
Challenge at Manele	0.08	R-1	Blend with Brackish Water
Elieair Maui Golf Club	0.56	R-1	Undiluted
Kaanapali Resort Golf Course	0.89	R-1	Blend with Brackish Water
Pukalani Golf Course	0.25	R-1	Blend with Potable Water
Kaluakoi Resort and Golf Course	0.04	R-2	Blend with Potable & Brackish Water
Makena South Golf Course	0.08	R-1	Blend with Brackish Water
In Addition many Landscape Irrigation users in Maui County			
Hawaii County			
Kona Country Club	0.30	R-2	Undiluted
Mauna Kea Resort	0.18	R-1	Blend with Brackish Water
Mauna Lani Resort	0.30	R-2	Blend with Brackish Water
Waikoloa Beach Resort Golf Course	0.50	R-1	Blend with Brackish Water
In Addition many Landscape Irrigation users in Hawaii County			
Honolulu County			
Barbers P:oint Golf Course	0.50	R-1	Undiluted
Coral Creek Golf Course	1.00	R-1	Blend with Brackish Water
Ewa Beach Golf Course	0.45	R-1	Blend with Brackish Water
Hawaii Prince Golf Course	1.00	R-1	Blend with Brackish Water
Ewa Villages Golf Course	1.00	R-1	Blend with Rain Water
West Loch Golf Course	0.90	R-1	Blend with Brackish Water
Turtle Bay Resort and Golf Course	0.20	R-2	Blend with Brackish Water

MCBH Klipper Golf Course	0.60	R-2	Undiluted
Hoakalei Country Club	0.60	R-1	Blend with Brackish Water
In Addition many Landscape Irrigation users in Honolulu County			
	12.18		

Golf Course Name using Potable or Other Water Sources	Volume (MGPD)	Type	Comments
Kauai County			
Kukui'ula Resort and Golf Course	1.20	Ditch	Using Ditch Water former Ag Sources
Kukuiolono Golf Course	0.20	Potable	Uses Kauai DWS water & rain
Anaina Hou Mini Golf	0.01	Well	Potable well water - minimual use
Maui County			
Hana Maui Par-3 Golf Course	0.10	Potable	Potable supplemented by Rain
Waiehu Golf Course	0.25	Blend	Blend of Potable and Brackish
Hawaii County			
Hilo Municipal Golf Course	0.05	Potable	Potable supplemented by Rain
Naniloa Golf Course	0.05	Potable	Potable supplemented by Rain
Seamountain Golf Course	0.20	Potable	Blend of Potable and Brackish Ag water
Waikoloa Beach Resort Golf Course	0.50	R-1	Blend with Brackish Water
In Addition many Landscape Irrigation users in Hawaii County			
Honolulu County			
Oahu Country Club	0.25	Potable	Honolulu BWS mixed with well water
Mid-Pacific Country Club	0.60	Potable	Honolulu BWS system
Hawaii Kai Country Club	0.80	Potable	Honolulu BWS system
Bayview Golf Links	0.25	Potable	Honolulu BWS system blended with stream water
Hickam Mamala Bay Golf Course	0.60	Potable	Honolulu BWS system
Hickam Kealohi Golf Course	0.25	Potable	Honolulu BWS system
Navy-Marine Golf Course	0.60	Potable	Honolulu BWS system
Olomana Golf Course	0.25	Potable	Honolulu BWS system
Moanalua Golf Course	0.20	Potable	Honolulu BWS system
Kuhuku Golf Course (C&C of Honolulu)	0.10	Potable	Honolulu BWS system
Pearl Country Club	0.10	Potable	Honolulu BWS system mixed with well water
Mililani Golf Course	0.60	Ditch	Waiahole Ditch Water (former Ag water)
Leilehua Golf Course	0.60	Potable	Army Water System (R-1 in future)
Pali Golf Course	0.25	Potable	Honolulu BWS System
Ala Wai Golf Course	0.30	Potable	Blended with Brackish water
Walter Nagorski Golf Course	0.25	Potable	Honolulu BWS System
Estimated minimum Potable Usage	8.56		

MANELE GOLF COURSE: ECONOMIC BENEFITS

Plasch Econ Pacific LLC

October 2016

The Manele Golf Course provides substantial economic benefits in four areas:

— Golf Course and Clubhouse

Green fees and purchases at the clubhouse (meals, clothes and golf items, and services) provide sales and jobs

— Operation of the Hotel at Manele (Four Seasons Resort Lāna'i)

All or nearly all luxury resorts on the Neighbor Islands feature one or more golf courses to help attract guests. Parties having one or more golfers rent rooms, and purchase goods and services. In turn, the room rentals and purchases generate jobs.

— Resort-residential Homes, Development

At full development of the Manele project, resort-residential homes will front much of the Manale Golf Course. If there were no golf course, few if any homes would be developed and sold at Manele. Construction activity provides employment, and home sales generate revenues.

— Resort-residential Homes, Use

Once built, maintenance of the resort-residential homes, and the purchases of goods and services by full- time and part-time residents, provide sales and employment.

Economic benefits that are provided by the above, and which are made possible by the existing golf course, include but are not limited to increases in:

— Economic activity as measured by on-site and off-site sales.

— On-site and off-site jobs.

— Payroll.

— Tax revenues to the State and County (excise tax, personal income tax, transient accommodation tax, conveyance tax, property tax, etc.).

Exhibit 47A