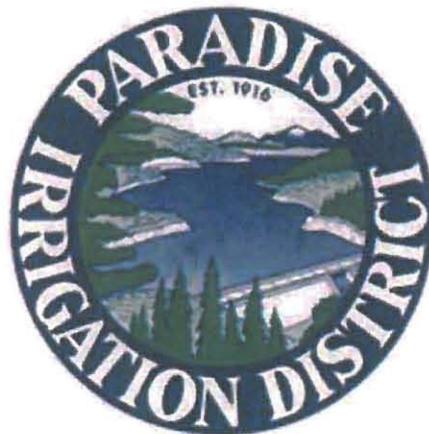


# Final Report



## Water Line Leak Detection Project for: Paradise Irrigation District, CA



### Project Dates:

03/10/2014 through 03/14/2014

03/24/2014 through 04/09/2014



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**COVER LETTER**

May 2, 2014

Paradise Irrigation District  
Attn: Keith O'Brien  
6332 Clark Rd  
Paradise, CA 95969

Re: March / April 2014 Water Leak Detection Survey and Pinpointing Project

Dear Mr. O'Brien:

Utility Services Associates, LLC, (USA) is pleased to submit the enclosed Final Report on leak detection services recently completed.

The information contained in this Final Report details the procedures and results specific to this project. When applicable, recommendations have been made concerning the best approach for the repair of leaks detected and preparation for future leak detection projects.

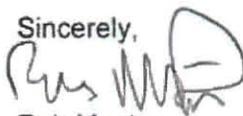
**As you review this Final Report, please pay close attention to the Leak Consultant's remarks and field observations in the Project Observation section of this report. These may assist you in determining the best course of action regarding specific leaks.**

At times specific individual Leak Reports may differ in the Final Report from those provided during the course of the project. These changes, usually insignificant, generally pertain to the manner in which we report leaks and do not alter the methods used or results of pinpointing.

**We strongly suggest you contact us prior to excavating any leak that we have labeled with "CAUTION" for further explanation.**

This leak detection project is productive since we pinpointed leakage that, when repaired, can reduce your water loss, saving Paradise Irrigation District dollars now and in the future. We appreciate your confidence in USA. If you have any questions, call us at (877) 585-5325 or (206) 244-0370.

Sincerely,



Rob Meston  
President

## **EXECUTIVE SUMMARY**

## LEAK DETECTION EXECUTIVE SUMMARY

From March 10, 2014 through April 10, 2014, USA performed a leak survey for **Paradise Irrigation District, CA**. Our Leak Consultant, Greg Hagen, used and appreciated the information provided by Rick Stier and Jason Becker to expedite and provide an accurate survey. The tables below detail the information gathered.

### Time Spent on Project

Surveying:	53.75 Hr
Pinpointing:	46.83 Hr
Other Time:	43.42 Hr
<b>Total Time:</b>	<b>144 Hr</b>

### Total Areas Surveyed

Total Distance in Miles	59.3
Total Distance in feet	313,104

The mileage was estimated by the consultant and may not match maps.

### Access Points Contacted

Hydrants	256
Valves	742
Services	159
Other	1
<b>Total</b>	<b>1,158</b>

### Leak Type Noises Detected

Hydrants	6
Valves	77
Services	16
Other	0
<b>Total</b>	<b>99</b>

### Leaks Pinpointed

Main	43
Valve	3
Hydrant	0
Service Line	5
Service Connection	1
Meter	1
Other	1
<b>Total</b>	<b>54</b>

### Total Water Loss Identified

Gallons Per Minute (GPM):	113.5
Gallons Per Day:	163,440
Gallons Per Month:	4,971,300
Gallons Per Year:	59,655,600

### Unidentified Water Loss

Faulty Meters	0
Unidentified Leaks	16
Possible Consumer Side Leaks	0

This project was divided into two phases; the survey phase and the pinpointing phase. The following pages outline exactly how those two phases progressed and the results of each. Any leaks pinpointed will be detailed in the attached Leak Reports.

## Clothes Washer Water Savings

Replacing your old clothes washer with a new high-efficiency model can save water – lots of water. Clothes washing is typically the second largest user of water indoors after toilet flushing.

A recent study conducted in Seattle measured water use in single-family homes before and after installation of high efficiency clothes washers (DeOreo, et. al. 2001). Three different makes and models of clothes washer were tested and all three saved water and all three received high satisfaction ratings from the study participants. Most major manufacturers now offer at least one high-efficiency model. The results are shown below in Table 1.

**Table 1: Water use in homes with standard and high efficiency clothes washers**

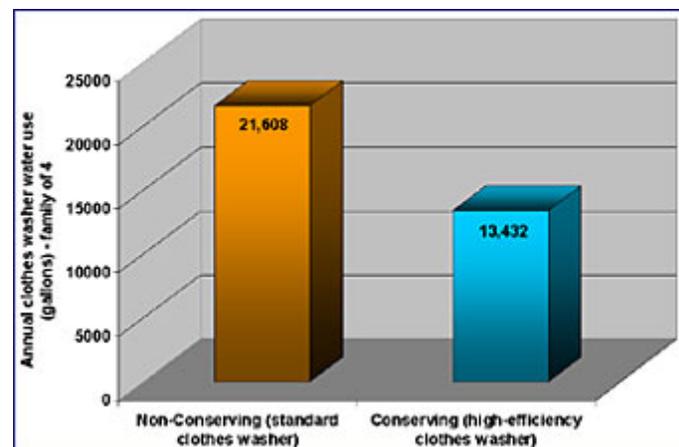
	Avg. Volume per Load (gal.)	Avg. Hot Water volume per load (gal.)	Avg. Loads per Capita per Day	Avg. Gallons per Person Per Day
<b>Non-conserving Home</b>	40.9	11.4	0.36	14.8
<b>Conserving home</b>	24.3	4.2	0.38	9.2

The average hot water volume was input in the the US DOE energy calculator for electric and gas water heaters to estimate the hot water savings associated with the replacement of non-conserving clothes washers with HE clothes washers.

\*Mayer, et. al. 1999

High-efficiency clothes washers reduced the average volume per load by 40% overall. Hot water use was reduced by 63% and per capita use was reduced by 38%.

What happens when a family of four replaces their old clothes washer with new high efficiency model. Figure 1 shows a projection of the difference in water use for the non-conserving homes. The family would save more than 8,000 gallons of water per year by installing a high efficiency clothes washer. Many of these machines will also reduce energy consumption by using less hot water and because they feature higher spin speeds and hence the clothes come out of the washer with a lower moisture content and require less drying time.



**Figure 1: Annual clothes washer use, standard and high-efficiency machines.**

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## ENERGY COST CALCULATOR FOR ELECTRIC AND GAS WATER HEATERS

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Vary equipment size, energy cost, hours of operation, and /or efficiency level.

INPUT SECTION		
Input the following data (if any parameter is missing, calculator will set to default value).		<i>Defaults</i>
<b>Type of Water Heater</b>	<input type="button" value="Electric"/>	<i>Electric</i>
<b>Average Daily Usage (gallons per day)*</b>	<input type="text" value="11"/> gallons	<i>64*</i>
<b>Energy Factor†</b>	<input type="text" value="0.92"/>	<i>0.92 (electric) 0.61 (gas)</i>
<b>Energy Cost</b>	<input type="text" value="\$0.1"/> / kWh	<i>\$0.06 per kWh \$.60 per therm</i>
<b>Quantity of Water Heaters to be Purchased</b>	<input type="text" value="1"/> unit(s)	<i>1 unit</i>
<p>* See assumptions for various daily water use totals.</p> <p>† The comparison assumes a storage tank water heater as the input type. To allow demand water heaters as the comparison type, users can specify an input EF of up to 0.85; however, 0.66 is currently the best available EF for storage water heaters.</p>		
<input type="button" value="Calculate"/> <input type="button" value="Reset"/>		
OUTPUT SECTION		

Performance per Water Heater	Your Choice	Base Model	FEMP Recommended Level	Best Available
New Energy Factor	0.92	0.86	0.92	0.95
Annual Energy Use kWh	816	873	816	791
Annual Energy Costs	\$82 <>	\$87	\$82	\$79
Lifetime Energy Costs	\$796	\$845	\$796	\$767
Lifetime Energy Cost Savings	\$49	\$0	\$49	\$78
Lifetime Energy Cost Savings for 1 Water Heater(s)	\$49	\$0	\$49	\$78
<p>Your selection of a electric water heater using 11 gallon(s) per day will have a \$ 49 energy cost savings per water heater over an estimated 13 year life expectancy compared to the base model.</p>				

## D V V X P S W I R Q V

- "Base model" has an efficiency that just meets the national minimum standard for gas and electric water heaters.
- Lifetime energy cost is the sum of the discounted value of the annual energy costs based on assumed water heater life of 13 years.
- Future electricity price trends and a discount rate of 3.2% are based on Federal guidelines.
- \$0.09 per kWh for electricity is the Federal average price in the U.S.
- \$0.93 per therm for gas is the Federal average price in the U.S.
- Hot water usage estimates:
  - Average shower (8 minutes) = 10 gallons of hot water
  - Average clothes washer (one load) = 7 gallons of hot water
  - Average dishwasher (one load) = 6 gallons of hot water
  - Average kitchen faucet flow = 2 gpm
  - Average bathroom faucet flow = 0.5 gpm
  - Average daily usage = 64 gallons of hot water.

## G IVF OD IP HU

This cost calculator is a screening tool that estimates a product's lifetime energy cost savings at various efficiency levels. Maintenance and installation costs do not vary significantly among the same product having different efficiencies; so, these costs are not included in this calculator tool. For a detailed life cycle cost analysis, the Federal Energy Management Program has developed a tool called [Building Life Cycle Cost \(BLCC\)](#). This downloadable tool allows the user to vary interest rates, installation costs, maintenance costs, salvage values, and life expectancy for a product or an entire energy project.

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Vary equipment size, energy cost, hours of operation, and /or efficiency level.

### INPUT SECTION

Input the following data (if any parameter is missing, calculator will set to default value).

*Defaults*

Type of Water Heater

Electric

*Electric*

Average Daily Usage (gallons per day)\*

4 gallons

*64\**

Energy Factor†

0.92

*0.92 (electric)  
0.61 (gas)*

Energy Cost

\$.1 / kWh

*\$.06 per kWh  
\$.60 per therm*

Quantity of Water Heaters to be Purchased

1 unit(s)

*1 unit*

\* See assumptions for various daily water use totals.

† The comparison assumes a storage tank water heater as the input type. To allow demand water heaters as the comparison type, users can specify an input EF of up to 0.85; however, 0.66 is currently the best available EF for storage water heaters.

Calculate Reset

### OUTPUT SECTION

Performance per Water Heater	Your Choice	Base Model	FEMP Recommended Level	Best Available
<b>New Energy Factor</b>	0.92	0.86	0.92	0.95
<b>Annual Energy Use</b> kWh	297	318	297	288
<b>Annual Energy Costs</b>	\$30 <>	\$32	\$30	\$29
<b>Lifetime Energy Costs</b>	\$291	\$311	\$291	\$282
<b>Lifetime Energy Cost Savings</b>	\$20	\$0	\$20	\$29
<b>Lifetime Energy Cost Savings for 1 Water Heater(s)</b>	\$20	\$0	\$20	\$29
<p>Your selection of a electric water heater using 4 gallon(s) per day will have a \$ 20 energy cost savings per water heater over an estimated 13 year life expectancy compared to the base model.</p>				

#### D V V X P S W I R Q V

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