

# Field Study Findings Report:

## Restroom Retrofit Self-Closing Sensor Faucet Retrofit

Marriott Hotel, Torrance, California



EcoGreen Services, LLC

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## INTRODUCTION

The purpose of this study was to measure the water usage associated with sensor faucet replacements in a major hotel complex. This study has focused on public area restrooms on the first and second floors of the Marriott Hotel in Torrance, CA. This study was initiated by the West Basin Municipal Water District under the management of Elise Goldman, Water-Use Efficiency Program Specialist and made possible through grant funding from the Metropolitan Water District of Southern California and the State of California Department of Water Resources.

## BACKGROUND

### **Hotel and Fixtures**

The Torrance Marriott was constructed in 1984 and currently manages 487 guest rooms and multiple ballrooms/meeting rooms on the first and second floors of the building. It features a restaurant popular bar, pool and fitness area as well. It is located at in the City of Torrance and is serviced by the California Water Service Company. The public area rest rooms selected for the sensor faucet retrofit study include women's and men's restrooms on the main (lobby) floor and the 2<sup>nd</sup> Floor.

### **Existing Manual Faucets**

Original faucets installed at Torrance Marriott were Delta Manual Faucets with separate hot/cold handles. These faucets had not been changed since the construction of the building in 1984.

The aerators found in the restrooms had a flow rate of 2.2 gallons per minute. For purposes of flow consistency, Neoperl

0.5 gpm aerators were installed on existing faucets immediately prior to meter installation. This was done to ensure that if water savings were found, they would be attributed to a change from the manual faucet to the self-closing model rather than an immediate reduction in the flow rate.



### **Faucet Aerators**

Neoperl 0.5 gpm Dual-thread non PCA .5 gpm needle flow regular size dual-thread (15/16x27 outside threads and 55/64x27 inside threads) solid brass housing w/ chrome finish flow rates at 80psi max.



### **Meters**

Both cold water and hot water meters were installed at each of the 26 faucet locations on 10/12/2009 for a total of 52 meters. A diagram was created and the meter numbers were recorded onto a spreadsheet. Initial readings from each meter were taken prior to installation of the meter and input into the same spreadsheet. These readings were used as the baseline for subsequent readings. Initial meter reading taken on 10/12/2009; reading 2 taken 47 after installation of meters on 11/28/2009; reading 3 took place 12/28/2009 30 days post-retrofit. The readings have been normalized to account for the difference in the amount of days to both represent 30 day periods.

Meters installed for this study are DLJ SJ50 (cold) and DLJ SJ50C (hot). Meters are factory-calibrated for accuracy. Accuracy of this model at .5 GPM is certified at 95.5% or better.

## DLJ Single Jet Water Meters

Models DLJ SJ50, SJ50C, SJ75, SJ75C

**Direct Read Register** The register is contained in a hermetically sealed polymer casing. The totalizer wheels are large and easy to read, and the odometer reads down to the tenth of a gallon, for precision reading. The large spinning trickle indicator is excellent for leak detection. Each register clearly shows its applicable meter size.



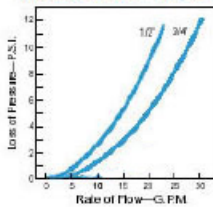
**Pulse Output** The DLJ SJ line is available with a dry contact reed switch pulse output. This requires external DC power, 4 watts, 30VDC maximum. Contact closure is 1 pulse per gallon.



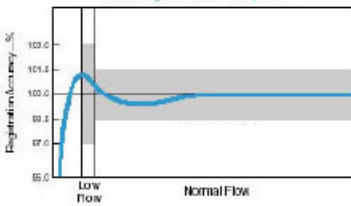
**Magnetic Drive** The magnetic drive design facilitates coupling between the measuring chamber and the register assembly. The coupling will remain unless the flow rates are higher than recommended.

**Connections** Meter casing spuds conform to ANSI B2.1 and have external straight threads (referred to as non-tapered meter threading). All meters come with full bronze meter coupling sets bringing you to Male NPT.

Head Loss Curves - 1/2", 3/4"



Accuracy Curves - 1/2", 3/4"



Specifications	Size	
	DLJSJ50/SJ50C 1/2"	DLJSJ75/SJ75C - 3/4"
Length	4 1/2"	5 1/8"
Height	3"	3"
Width	2 7/8"	2 7/8"
Weight (lbs.)	2	2

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## Sensor Faucets

Sensor Faucets installed at the Torrance Marriott are Sloan Model SF-2200. This model was installed with a standard 0.5 gpm aerator. Additionally, it should be noted that the shut off mechanism was set to the minimum setting allowing the water to stay on only for a maximum of 14 seconds rather than the highest setting which allows for up to 70 seconds of hand washing.

**SLOAN®**  
Faucets

SF-2200  
SF-2250

Sensor Activated  
**Electronic  
Gooseneck Faucet**



- ▶ **Description**  
Sensor Activated, Electronic, Gooseneck Hand Washing Faucet for tempered or hot/cold water operation.
- ▶ **Models**
  - SF-2200 Series 6 VDC Plug-in Transformer Powered with Battery Backup
  - SF-2250 Series Battery Powered
- ▶ **Flow Rate**
  - 1.5 gpm/5.7 Lpm Laminar Spray Head
- ▶ **Specifications**  
ADA Compliant, Sensor Activated, 6 VDC, Chrome Plated Brass, Gooseneck Hand Washing Faucet with the following features:
  - Splash-proof Circuit Control Module
  - Adjustable Infrared Sensor Range
  - 36" (914 mm) Long Sensor Cable
  - 24" (610 mm) Long Flex Hose
  - Filtered Solenoid Valve with serviceable Strainer Filter
  - Back-Check® Tee for Hot/Cold Supply
  - 6 VDC Plug-in Transformer (Model SF-2200 only)
  - Laminar Spray Head
  - Includes Four (4) AA-size Batteries
  - Includes appropriate Mounting Hardware
  - Trim Plate Kit for 4" (102 mm) Centerset Sink
- ▶ **Variations** (add suffix to Model Number for inclusion with Faucet)
  - **Trim Plate** (specify one)
    - 4 4" Trim Plate for 4" Centerset Sink
    - 8 8" Trim Plate for 8" Centerset Sink
  - **Temperature Mixing Valves**
    - BDM** MIX-60-A Below Deck Mechanical Mixing Valve
- ▶ **Accessories** (specify separately)
  - **Standard Outlet**
    - SFP-14** 1.5 gpm/5.7 Lpm Laminar Spray Head
  - **Transformers**
    - SFP-6** 120 VAC/6 VDC Plug-in Transformer
    - SFP-20** 240 VAC/6 VDC Type G Rectangular (UK) Plug-in Transformer
    - SFP-25** 240 VAC/6 VDC Type C Round Pin (Euro) Plug-in Transformer
    - SFP-26** 240 VAC/6 VDC Type A Flat Blade (Asia) Plug-in Transformer
    - SFP-35-A** Gang Transformer Kit, includes 1 Plug-in Gang Transformer, 5 Splitter Cables and 1 Extension Cable
    - SFP-36** 71" (1800 mm) 120 VAC/6 VDC Plug-in Gang Transformer
    - SFP-38** 51" (1300 mm) Splitter Cable
    - SFP-37** 51" (1300 mm) Extension Cable

- ▶ **ADA Compliant**
- ▶ **Automatic**  
The Sloan SF-2200 and SF-2250 Electronic Gooseneck Hand Washing Faucets operate by means of an infrared sensor. When the user enters the sensor's effective range, the Solenoid activates the water flow. Tempered water flows from the Faucet until the user steps away. The Faucet then automatically shuts off.
- ▶ **Hygienic**  
The ultimate in sanitary protection — there are no handles to turn or buttons to push. Helps to control the spread of infectious diseases.
- ▶ **Economical**  
Automatic operation provides water usage savings over other faucet devices. Reduces maintenance and operation costs.
- ▶ **Warranty**  
1 year (limited)
- ▶ **Compliant to:**  
ASME A112.18.1 and CSA B125.1



<http://www.usalandlord.com/n3205t.html>

### **Faucet Replacement Project**

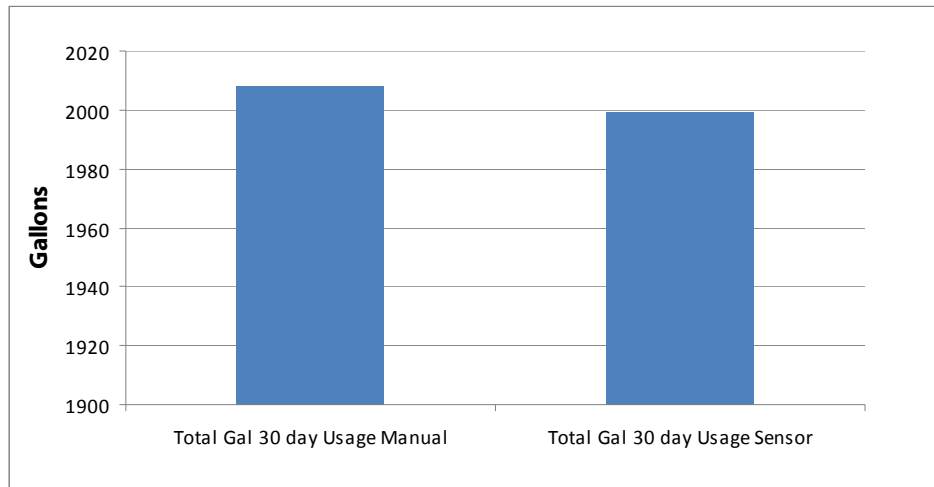
The faucet retrofit is just one component of the changes that have been going on in an effort to reduce total water and energy consumption at the Torrance Marriott. The Marriot Corporation has adopted sustainability principals at a corporate level and is conducting a number of initiatives related to water conservation in light of significant regional water shortages and the increased cost of water in the region. In conjunction with West Basin Municipal Water District the Torrance Marriott elected to take part in a faucet retrofit study for the purpose of comparing savings offered by replacing manual faucets with sensor faucets.

### **Study Results**

Water use was tracked by sub-metering each hot and cold supply line on each faucet (26 faucets = 52 Meters) in four different public restrooms located on the first and second floors of the hotel. Existing faucets (manual) were flow- restricted to 0.5 gpm using a Neoperl aerator in order to establish a flow consistent with new (retrofit) faucets which are manufactured with 0.5 gpm aerators installed. Existing (aerated) faucets were monitored over a 47 day period from October 12, 2009 through November 28, 2009. New (retrofit) faucets were installed in place of existing faucets and metered in the same fashion for a with meter data recorded at the end of the 30 day period. The meter data recorded at the end of the 77 day period to establish total flow over this period. Pre-installation data was normalized to reflect a consistent 30 day period with post-installation data.

Using data obtained directly from meter readings, a 0.4% reduction in water demand was recorded during the study period. Total usage went from 2008.1 gallons per 30 days to 1999.4 gallons per 30 days.

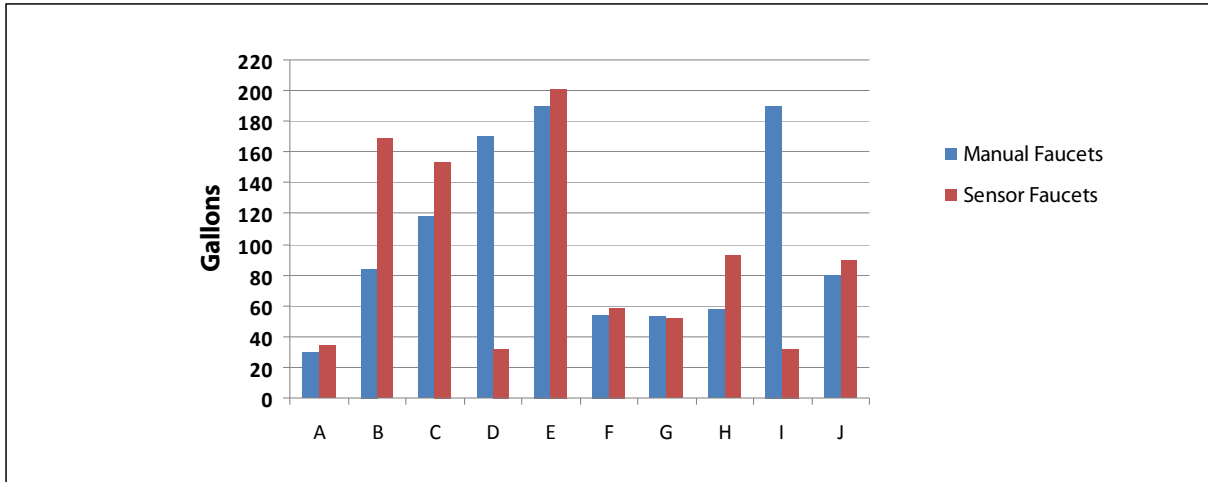
**Figure 1: Total Usage All Faucets**



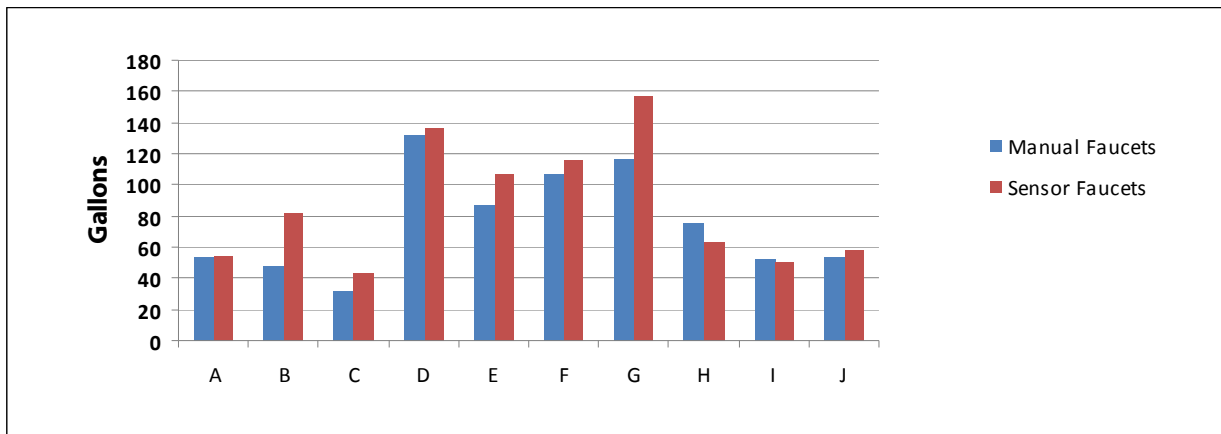
**Total % Savings as a result of Sensor Faucet Retrofits = 0.4%**

The figures below break down the usage per restroom and further per fixture in each restroom. Figures 2-4 below show usage per faucet in four restrooms; Men's First Floor Lobby, Women's First Floor Lobby and Men and Women's Second Floor Lobby (combined table, separate rooms).

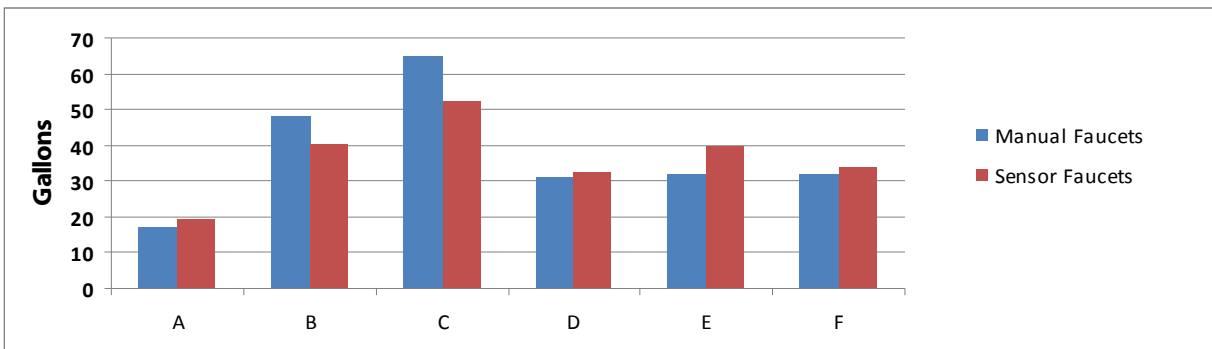
**Figure 2: Men's First Floor Lobby Restroom**



**Figure 3: Women's First Floor Lobby Restroom**



**Figure 4: Women (A-C) and Men (D-F) Second Floor Lobby Restrooms**



### **Hotel Occupancy or Usage during the Study Period**

Information regarding occupancy rates and other “day user” guests (or guests using ballroom or other meeting facilities, not staying overnight) was obtained for the duration of the study period. Of most relevance to the purposes of this study, the “day users” are shown in the table below. These average daily guest figures were derived from total guest numbers obtained from Marriott staff. Total guests for October 12-31, 2009 were 3,200; November 1-30, 2009, 10,870; December 1-28, 2009, 11,975. This shows an approximate 67% increase in the amount of potential use.

**Table 1: Guests Utilizing Hotel Facilities during Study Period**

<b>Monitoring Period</b>	<b>Daily Average guests</b>	<b># of days</b>	<b>Total Guests</b>
<b>October 12 – November 28, 2009</b>			
Oct 12-31, 2009	168	19	3,192
Nov 1-28, 2009	362	28	10,136
total	283	47	13,328
<b>30 day average (Normalized)</b>		<b>30</b>	<b>8,507</b>
<b>November 28 - December 28, 2009</b>			
11/28/09-11/30/09	362	2	724
12/1/09 – 12/28/09	428	28	11,984
<b>30 day average</b>		<b>30</b>	<b>12,708</b>

Based on the increase in potential usage of the facilities from the initial baseline month to the retrofit month, it could be assumed that the usage should have increased at the same rate (67%) however since we saw a 0.4% decrease in water usage, more savings could be attributed to the installation of the self-closing faucets. Since daily average guests increased from 283 to 428 over the course of the pre-installation monitoring period to the post-installation monitoring period, it can also be surmised that we should have expected an increase in the amount of water used.

### **Conclusions**

From the data collected on site, it was found that a minimal reduction in actual water usage was achieved as a result of changing manual faucets to self-closing sensor faucets. However, while we saw only a 0.4% reduction in the amount of water used, there was a 67% increase of potential users from the pre-installation baseline month to the post-installation retrofit month; we can assume then that had the faucets not been changed, water usage may have been much higher. The daily average usage during the both the pre-install and post-install period was virtually the same: 66.94 gallons per day during pre-install monitoring period; 66.64 gallons per day during post-installation monitoring period. However, the usage per person per day varies significantly. It appears that the “per person, per day” usage decreased from 0.236 gallons per person per day to 0.157 gallons per person per day. This is a 33.5% reduction in per person per day usage from the pre-installation monitoring period to the post-installation period. It is important to note that the faucet’s self closing feature was set to the low end of the range to only allow water to flow for a maximum of 14 seconds which may also increase the water saving potential of the device. We may also assume that the initial change of the aerator from 2.2 gpm to 0.5 gpm will yield savings still to be determined. Water bill analysis will take place over the next few months to determine possible savings attributed to the change of aerators.

*Our sincere thanks go to the staff at the Torrance Marriott for helping with the Restroom Retrofit Monitoring Program. This could not have taken place without the support of Pam Ryan, General Manager and Dennis Keefe, Director of Engineering.*