

## Smart Irrigation Technology Stories - Three Communities, Three Experiences

### Summary

A growing number of local agencies irrigate publicly-owned landscaped areas with smart irrigation technology to save water, energy, staff time and money. Smart irrigation technology acts like a thermostat for irrigation systems by responding to weather and moisture content in the soil and thus adjusting the amount of water provided. Estimates suggest that installing smart irrigation systems (also referred to as “controllers”) can reduce water use by 20 percent. Additional benefits may include reducing:

- Energy costs related to pumping water.
- Vehicle miles traveled by agency staff and related fuel costs.
- Staff resources needed to manage irrigation systems.

Three California communities, Woodland, Simi Valley, and Santa Clarita, use smart irrigation technology and shared their experiences and lessons learned. The three cities participate in the sustainability and climate change recognition program, the Beacon Award: Local Leadership toward Solving Climate Change.

#### **Beacon Award: Local Leadership Towards Solving Climate Change**

The Beacon Award is a program of the Institute for Local Government and the Statewide Energy Efficiency Collaborative. More information is available at:  
[www.ca-ilg.org/BeaconAward](http://www.ca-ilg.org/BeaconAward).

### Understanding Smart Irrigation Systems

Traditional irrigation systems typically operate on a timer and do not respond to weather conditions or to the amount of water a plant actually needs. Smart irrigation system technology consists of a computer-based system that interacts with irrigation controllers located at a park or other irrigated site. The centralized computer system<sup>1</sup> interacts with field measurements to adjust watering in one of two ways:

1. Weather-based systems use on-site weather data to adjust irrigation to reflect changing weather conditions.

<sup>1</sup> Some centralized computer systems require an annual subscription to a web-based system that sends daily updates to self-adjust irrigation schedules based on weather information.

2. Soil-moisture based systems use remote probes, buried in the ground at the irrigation site, that measure soil-moisture content to adjust irrigation.

Smart irrigation technology generally pays for itself in four to six years, depending on several factors. These include:

- Weather patterns.
- Age and effectiveness of the existing irrigation system.
- Water and energy rates.
- Related labor costs.

## Lessons Learned from Three Communities

Based upon their experiences with smart irrigation technology, the cities of Woodland, Santa Clarita and Simi Valley identified lessons learned that can help other local agencies as they consider whether to install smart irrigation systems.

- Installing smart irrigation technology may require additional costs to upgrade older irrigation systems. For example, an agency may need to upgrade its electrical system to safely support the weather-based irrigation controllers installed at parks and other irrigated areas.
- Several years of average water-use information may be necessary to accurately understand the true water savings achieved from a system, since irrigation water use greatly depends upon annual weather conditions.
- Using flow sensors to help detect leaks will lead to additional water savings.
- The appropriate location of the smart irrigation equipment will contribute to its success. The equipment should be accessible for maintenance staff, but the location also should minimize opportunities for unintentional damage or vandalism.
- Smart irrigation systems and on-site controller equipment is only as smart or effective as the people operating them, since the technology still requires a hands-on approach. Staff needs to fully understand the system's requirements in order to achieve the full water saving benefits.
- Education and training is a key component for success. Agency staff, as well as contractors, will benefit from learning about the equipment itself and about general irrigation principles. This includes topics such as soil type, slope, and ground cover, in order to maximize water efficiency through correct equipment programming and management.

- While staff may initially resist the switch to smart irrigation technology, they generally embrace the new system once the water, energy and cost savings become apparent.
- Understanding existing staff capacity will help an agency decide whether to use internal staff to install and maintain a smart irrigation system, whether to contract with an outside firm for the service or whether to use a combination of each.

## **Woodland: Just Out of the Gate**

Population: 55,000      County: Yolo

### **Program Highlights:**

- Woodland received a grant from the California Department of Water Resources in 2008 to automate all city park irrigation systems.
- The new system helps the city irrigate parks more efficiently, as well as cope with reduced staff resources due to city budget constraints and a smaller park department's budget.
- As a result of the smart irrigation system and based upon the experience of other cities, Woodland estimates that it will reduce water use in agency parks by about 30 percent annually.

### **The Rest of the Story...**

The City of Woodland is an agricultural community about 20 miles northwest of Sacramento. Until 2007, seven Woodland parks were manually irrigated and city staff traveled to each park to turn sprinklers on and off. With initial funding from the California Department of Water Resources,<sup>2</sup> the city began a project to improve its irrigation system efficiency by automating park irrigation systems and then connecting them to a central weather-based control system.

During the first stage of the project, completed between 2008 and 2011, city staff conducted a full irrigation system upgrade at parks that previously used manual systems. They also installed more efficient sprinkler heads on already automated systems. The second stage of the project began in 2011 with the city connecting irrigation controllers to a centralized computer-based system. The city plans to purchase and install a weather station and use the computer system to connect the weather station to irrigation controllers at various city parks.

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<sup>2</sup> A voter approved local half cent sales tax measure, which funds parks and libraries in Woodland, supplemented grant funding for the project.

Budget cuts limited the ability of city staff to visit parks as frequently, resulting in delays in identifying and repairing irrigation system leaks. Installing the centralized computer control system allows park staff to monitor the system with the computer and turn off water at specific sites when needed, thus increasing water efficiency even with smaller staff capacity.

Upgrading city parks to smart irrigation technology is part of a larger effort to conserve water community-wide that includes installing water meters and offering rebates to residents to help conserve water. For example, the city's Water Conservation Program offers rebates to city residential and commercial water customers for installing weather-based irrigation controllers and for rain sensors in July 2011.<sup>3</sup>

Water use in Woodland historically has not been metered, so the city will not know how much water the smart irrigation system actually saves. Based on experience in the other cities, however, Woodland estimates it will reduce water use by about 30 percent annually as a result of the smart irrigation system.

### **Simi Valley: Implementation in Stages**

Population: 126,000

County: Ventura

#### **Program Highlights**

- Simi Valley includes a wide variety of landscapes from flat to steep hillsides.
- The city installed two types of weather-based irrigation controllers, electric and battery powered, because of limited electric power availability at some older street medians.
- Installing the smart irrigation system required upgrading the city's older irrigation system. Improvements included fixing unexpected breaks, rerouting irrigation pipes, and upgrading electrical systems to provide grounding for newer technology. This resulted in additional costs to complete the overall smart irrigation project.
- Simi Valley used in-house staff to install the smart irrigation controller system.

#### **The Rest of the Story...**

Simi Valley is a median size city located in the southeast portion of Ventura County, near the Los Angeles County line. The City's Landscape Maintenance District is responsible for watering 142 acres of landscaped area within the city and is funded through landscape benefit assessments.<sup>4</sup> Landscape and yard irrigation accounts for two thirds of the City's

<sup>3</sup> Water customers in Woodland can receive a \$150 rebate for installing weather-based irrigation controllers and a \$25 rebate (or 50% of the purchase price, whichever is less) for installing rain sensors.

<sup>4</sup> Landscape Maintenance District staff are Simi Valley city employees.

total water use. Thus, Simi Valley started converting to smart irrigation technology to save water and money in 2007. As of 2011, approximately 70 percent of the irrigation controllers in the city are “smart.”

The smart irrigation controllers in Simi Valley are connected to a central computer system. Converting to the new technology increased effective management of the City’s more than 250 irrigation controllers, since they can all be managed from a single computer desktop location. The ability to automatically shut-off controllers is very useful, especially when anticipating a rain event.

To minimize costs for irrigation programs, Simi Valley used in-house staff with the necessary expertise to do all of the controller installation. If onsite staff does not have a lot of experience with the new systems, Simi Valley recommends using an outside vendor to install the controllers because the installation project involved more work than anticipated.

Installing the weather-based irrigation controllers involved retrofitting the existing irrigation system. The need to upgrade sprinklers and water controllers that were over 40 years old resulted in unanticipated costs. For example, while installing the new equipment, staff discovered broken irrigation equipment that needed repairing. As the staff upgraded the irrigation technology, they also removed and re-routed part of the older irrigation system. Finally, the new smart irrigation controller stations needed to be electrically grounded, a step that necessitated additional resources not required for conventional irrigation technology.

While installing the new equipment, staff considered the potential problem of accidental damage or vandalism. For example, a sidewalk next to a school or park might be avoided due to heavy pedestrian, skateboard or bicycle traffic. To respond to these concerns, staff located the irrigation controllers to be easily accessible for maintenance purposes, but not so accessible to be compromised by accidents or vandalism. Concrete pads and cages were also installed in some locations to protect the equipment.

During one phase of installation, the city installed 85 smart irrigation controllers in greenbelts and medians. The upfront purchase cost of the 85 smart controllers in 2010 was about \$222,000, which was partially offset by a grant and rebates from the two water districts that serve the city. Based on an expected twenty percent reduced water use and corresponding annual savings of approximately \$40,000, the smart irrigation controllers will likely pay for themselves in five years. The smart controllers have a lifespan of ten to fifteen years. As funding becomes available, the City plans to continue improving the system. Improvements would include:

- Upgrading older hardware such as irrigation heads.
- Enhancing automatic metering infrastructure technology to access real time water use data.

The City of Simi Valley is progressing towards reducing water use 20 percent by the year 2020. This reduction is a goal of the City's Green Community Action Plan. According to the City of Simi Valley Urban Water Management Plan, published in June 2011, water use has been decreasing since 2007.

## **Santa Clarita: Two Routes to Water Savings**

Population: 180,000

County: Los Angeles

### **Program Highlights:**

- Santa Clarita's parks department purchased and installed the city's own weather station in 2008 as a first step toward implementing a "smart irrigation" system. Two city staff provide programming and maintenance of system.
- An irrigation system weather station and computer system send information each morning to irrigation controllers in city parks with instructions on how much water to dispense at individual irrigation sites throughout the city.
- The city's Landscape Maintenance District retrofitted over 500 irrigation controllers since 2007 with weather-based irrigation controllers. The district contracts with a company for the internet-based computer system, wireless controller network, technology updates and customer support.
- The Parks Department provides continual education for its small staff to keep them engaged and comfortable with the new technology. The Landscape Maintenance District provides training for the large number of landscape contractors it uses to maintain its parks and open space.
- Using the smart irrigation system, the city Parks Department saved 15 million gallons of water from 2009 to 2010. Using the smart irrigation system, the Landscape Maintenance District saved 180 million gallons of water in 2010, compared to the amount used in 2007.

### **The Rest of the Story...**

#### **Santa Clarita Parks Division Story**

Santa Clarita is a city of 180,000 residents located about 30 miles north of Los Angeles. Beginning in the late 1980s, the parks department began researching computerized irrigation controllers that would enable staff to remotely monitor what was going on in the field. About 20 years ago, the parks department staff started installing weather sensing irrigation equipment in city parks. In 2008, the department purchased a weather station, located in the city's Central Park, that communicates to a centralized computer system. Every morning the weather station and computer system send information to

irrigation controllers in city parks with instructions on how much water to dispense at individual irrigation sites throughout the city.

Since the city owns the weather station and on-site weather controllers, it does not pay a subscription fee for the service. The Parks Department assigns responsibility for programming irrigation controllers to two employees. These staff receive computer-related training to ensure that the centralized computer system is appropriately programmed in order to maximize efficiency.

Programming the computer system and the onsite irrigation controllers is both a science and an art. Parks department staff still “walk the parks” with soil probes to make adjustments to the controllers, as needed. Staff typically adjusts the system’s computer program three to four times per year, reflecting seasonal weather changes. The turf team, which is responsible for mowing parks, also alerts the computer programmers about needed irrigation system adjustments.

The smart irrigation and weather station system saved approximately 15 million gallons of water in 2010 compared to 2009.

### **The Landscape Maintenance District Story**

The City of Santa Clarita formed a Landscape Maintenance District, a benefit assessment district,<sup>5</sup> in 1997. The District maintains 780 acres of irrigated landscapes, including slopes, medians, and any other common areas assessed for the benefit.<sup>6</sup> It also is responsible for additional non-irrigated open space and for brush clearance to reduce fire hazards.

After evaluating the amount of water used each year (890 million gallons), staff believed they could improve efficiency and reduce water use by 20 to 40 percent. Based upon successful tests at pilot locations that achieved 20 to 25 percent water savings, staff projected that installing “smart” irrigation controllers would have the most significant and immediate impacts. Thus, between 2007 and 2011, district staff replaced 526 existing irrigation controllers with weather-based irrigation controllers. The district also contracted with a vendor to install and support an internet-based central irrigation management and control system.

The Landscape Maintenance District anticipated that educating staff and contractors would be important to achieving the desired water savings. Thus, the district required the vendor to provide training sessions for staff in English and Spanish during each phase of installation. Additionally, the district also provided six training sessions to every landscape contractor with whom it works.

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<sup>5</sup> For more information on assessment districts see “Understanding the Basics of County and City Revenues,” Institute for Local Government (2008), [www.ca-ilg.org/revenueguide](http://www.ca-ilg.org/revenueguide), pages 11 & 17.

<sup>6</sup> For more information of Santa Clarita’s Landscape Maintenance District visit [www.santa-clarita.com/Index.aspx?page=196](http://www.santa-clarita.com/Index.aspx?page=196).

While installing the first 103 controllers, the district found that field staff and landscaping contractors needed training on how to program the controllers and operate the computer technology. In addition, since many landscaped areas were found to be oversaturated, the training included education about changing irrigation practices from flood irrigation to watering for minimal plant needs. The transition to watering for minimal plant needs was difficult at first as there was slight distrust of the new technology. Over time however, the new system proved effective, thus demonstrating to staff the value of the smart irrigation system.

Water use decreased substantially as a result of the smart irrigation system. The district uses 2007, when it used 700 million gallons of water, as a base year for comparisons. In 2010, even with some marginal growth in irrigated acreage, the district used 25 percent less water compared to 2007 (or 525 million gallons). The district realized a three year average (2007-2009) savings of 147 million gallons per year, achieving its goal of reducing water use by 20 percent (compared to 2007).

In addition, the local water provider recognized the city's Landscape Maintenance District for helping achieve the 20 percent reduction in urban water use by 2020 as required by state law.<sup>7</sup> The district plans to retrofit hardware, monitor different water pressures and refurbish medians with low water-use plants to achieve further savings in the future.

## Resources to Learn More

### General Information about Smart Irrigation Technology

- U.S. Environmental Protection Agency fact sheet on smart irrigation controllers: [www.epa.gov/watersense/docs/ws-fact-controller\\_Nov\\_2011.pdf](http://www.epa.gov/watersense/docs/ws-fact-controller_Nov_2011.pdf)
- The Irrigation Association tests smart controller efficiency, offers general information about the technology, and hosts case stories: [www.irrigation.org/SWAT/Case\\_Studies/Case\\_Studies.aspx](http://www.irrigation.org/SWAT/Case_Studies/Case_Studies.aspx)

### Local Agency Resources

- City of Woodland Water Conservation webpage: [http://web.cityofwoodland.org/gov/depts/pw/areas/environmental\\_services/water/default.asp](http://web.cityofwoodland.org/gov/depts/pw/areas/environmental_services/water/default.asp)
- City of Simi Valley Water Conservation webpage: [www.simivalley.org/waterconservation](http://www.simivalley.org/waterconservation)

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<sup>7</sup> Existing state law requires a twenty percent reduction in urban water use. See California Water Code Sections 10608, 10631.5 and 10800 and following.



- City of Simi Valley Green Community Action Plan: [www.simivalley.org/livegreen](http://www.simivalley.org/livegreen)
- City of Simi Valley Urban Water Management Plan: [www.simivalley.org/2010urbanwatermanagementplan](http://www.simivalley.org/2010urbanwatermanagementplan)
- Santa Clarita Water Conservation page: [www.santa-clarita.com/index.aspx?page=660](http://www.santa-clarita.com/index.aspx?page=660)
- Green Santa Clarita: Water Conservation: [www.greensantaclarita.com/resWaterConservation.asp](http://www.greensantaclarita.com/resWaterConservation.asp)
- “Santa Clarita’s Smart Water Irrigation System: Achieving sustainable water efficiency standards,” Green Technology Magazine: [www.green-technology.org/green\\_technology\\_magazine/sc.htm](http://www.green-technology.org/green_technology_magazine/sc.htm) (linked on Green Santa Clarita- much more detail about how the technology works, really good photos too)

### Beacon Award Participant Profiles

- City of Woodland Beacon Profile: [www.ca-ilg.org/BeaconAward/Woodland](http://www.ca-ilg.org/BeaconAward/Woodland)
- City of Simi Valley Beacon Profile: [www.ca-ilg.org/BeaconAward/SimiValley](http://www.ca-ilg.org/BeaconAward/SimiValley)
- City of Santa Clarita Beacon Profile: [www.ca-ilg.org/BeaconAward/SantaClarita](http://www.ca-ilg.org/BeaconAward/SantaClarita)

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The Institute welcomes feedback on this resource:

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