Water Management Certification Program

Study Guide

version 2

WATER MANAGEMENT CERTIFICATION PROGRAM

A WaterSense Labeled Program

Founding Partners

Charter Partner

www.clca.org/water-pro

California Landscape Contractors Association™

In This Guide

WATER MANAGEMENT CERTIFICATION PROGRAM

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About CLCA

The California Landscape Contractors Association is a nonprofit trade organization of licensed landscape and landscape-related contractors. Also included among its approximately 3,000 members are landscape suppliers, landscape architects, public officials, educators, and students. Although formally incorporated in 1952, CLCA has been meeting as an association since 1937. CLCA is an active force in the statewide effort to conserve water.

The California Landscape Contractors Association's Water Management Certification Program was started in 2007 and helps reduce landscape water usage through the use of a water audit and budget and utilization of advanced irrigation technology. The program carries the WaterSense Label from the U.S. Environmental Protection Agency and is also approved for continuing education units by PLANET.

To become a Certified Water Manager, a green industry professional must:

- Pass a challenging written exam
- Conduct an irrigation audit
- Complete a performance assessment by managing one or more prosperities to an assigned water budget for 12 months.

About The Study Guide.

This interactive Study Guide reviews the information needed to pass the Water Management Certification written test, and provides links to additional information needed to complete the certification requirements.

If you print this document, you will need to check the Page Scaling or Fit To Page option in your print dialogue window. A printer-friendly version is available click here.

For assistance, please contact program manager David Silva at the California Landscape Contractors Association, davidsilva@clca.org or (916) 830-2780.

Why Certify?

WATER MANAGEMENT CERTIFICATION PROGRAM

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Water Management Certification Gives You the Edge Over Your Competitors!

Water Management Certification increases your professional credibility in the industry and in the eyes of your customer because you are required to prove and maintain a professional level of skill in order to achieve and maintain your certification. Certified Water Managers stand out when selecting a contractor for the job and certification also provides the contractor additional opportunities to profit including:

- Good water management improves landscapes making them faster to maintain. This results in lower labor costs each visit.
- Monitoring water usage can be a win-win for you and the customer. They save water costs and you have the opportunity to profit from upgrades, retrofits and repairs. Most clients would rather pay the landscape contractor than a city or water district.
- Water Management is another service you can add to the list of services you provide. CLCA's online program, which monitors your performance, produces reports which show how much water you are saving for your clients. These reports are a great marketing tool for getting new customers and building client loyalty.
- CLCA Water Managers are listed on the CLCA Website and several water districts throughout California have provided links to these website listings. Also CLCA actively markets its Water Management Certification Program resulting in additional publicity opportunities for Certified Water Managers.

Once certified, green industry professionals are automatically enrolled for WaterSense Partnership through the U.S. Environmental Protection Agency's prestigious **WaterSense** program. CLCA will submit all the necessary paperwork to complete your partnership. All certified water managers in good standing qualify for WaterSense Partnership.

- The program allows certified individuals to conduct irrigation audits on new landscape projects that fall under California's Model Water Efficient Landscape Ordinance.
- It also allows Certified Water Managers, once they become WaterSense Partners, to do new home irrigation work under the WaterSense Single Family New Home Specification.
- CLCA's Certified Water Managers are allowed to use the WaterSense Partner logo next to their name on their website and on their printed materials.

Objectives of Certified Water Managers

- Provide clients with good to excellent landscape appearance while using the right amount of water
- Charge customers a fair price for water management services

Certification Overview

WATER MANAGEMENT CERTIFICATION PROGRAM

A WaterSense Labeled Program

Introduced in 2007, CLCA's Water Management Certification Program validates that Certified Water Managers have demonstrated the ability to manage landscape water usage by passing a challenging exam, submitting an irrigation audit and by maintaining a landscape water budget for at least a year.

CLCA's Water Management Certification Program carries the WaterSense Label from the U.S. Environmental Protection Agency and is also approved for continuing education units by PLANET and the Landscape Architecture Continuing Education System. In response to our state's water crisis, the program is available to anyone in California who would like to learn water management.

A WaterSense Partnership allows certified individuals to conduct irrigation audits on new landscape projects that fall under California's newly updated Model Water Efficient Landscape Ordinance. It also allows Certified Water Managers, once they become WaterSense Partners, to do new home irrigation work under the recently released WaterSense Single Family New Home Specification.

Levels of Certification

CLCA offers two levels of certification: basic and expert.
To become a Certified Water Manager, you must complete the following requirements.

Basic Certification

- Pass a written test of 50 multiple choice questions with a grade of 70% or higher.
- Complete an Irrigation Audit to required specifications.
- Manage one property to an assigned water budget for one year.
- In the performance portion of the program, water usage may not exceed 80% of ETo. However if a local jurisdiction has water budget requirements that are more demanding than 80% of ETo, the program will require the local standard.
- Once certified, continue to manage a property to a water budget and ETo requirements. Meter readings must be posted monthly.

Expert Certification

- Pass a written test of 50 multiple choice questions with a grade of 70% or higher.
- Complete an Irrigation Audit to required specifications.
- Manage at least 5 properties to an assigned water budget for one year.
- In the performance portion of the program, water usage may not exceed 80% of ETo. However if a local jurisdiction has water budget requirements that are more demanding than 80% of ETo, the program will require the local standard.
- Once expert certified, continue to manage at least five properties to a water budget and ETo requirements. Meter readings must be posted monthly.

The Certification Process

WATER MANAGEMENT CERTIFICATION PROGRAM

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The Written Examination

To become certified, participants must pass a written test of 50 multiple choice questions with a grade of 70% or higher. Tests are scheduled throughout the state and are posted at www.clca.us/water-pro. If you wish to be contacted when dates are available in your area, please email watermanagement@clca.org.

Tests are also available in Spanish, but intended to be used with the English version for those who may have occasional trouble with English. The Spanish version does not include a translation of the test supplemental book, which includes maps, graphs and charts. The study guide is not yet available in Spanish.

Exam Fees

CLCA Members $100

Green Industry Professionals $200

Students $50

Additional information and sample test questions

Performance Program

Annual Registration

CLCA Members ..... $100 per year

Green Industry Professionals ..... $200 per year

Annual Site Fee

CLCA Members $40

Green Industry Professionals $80

One time website enrollment fee

CLCA Members $25

Green Industry Professionals $50

Discounts available for multiple managers and/or sites

The Irrigation Audit

Participants must complete a irrigation audit, which is an in depth evaluation of the irrigation system. Conducting an irrigation audit involves calculating water use and identifying ways to reduce landscape water usage. For more information about the irrigation audit click here.

The Water Budget (Performance) Requirement

A water budget is an amount of water allocated for landscape water use based on a property's soil, plants, climate, irrigation and other factors. In order to achieve certification, participants must manage a property of their choice to an assigned water budget for one year. This is the performance portion of the program.

In the basic certification performance portion of the program, water usage may not exceed 80% of ETo. However if a local jurisdiction has water budget requirements that are more demanding than 80% of ETo, the program will require the local standard.

In the expert certification performance portion of the program, water usage may not exceed 80% of ETo. However if a local jurisdiction has water budget requirements that are more demanding than 80% of ETo, the program will require the local standard.

Benefits Of Water Management

An important part of any community, landscaping positively alters our environment, reduces carbon emissions, improves air quality, protects the land, provides food, creates oxygen and sustains life. Using water management along with responsible ecological choices not only saves water, but helps protect our environment and shape our future.

According to the study "Urban CII Landscape Water Use and Efficiency in California" by Dr. John B Whitcomb, removing turf and replacing with native plants is not the answer to water savings. The study proves that efficient irrigation management is the key to water efficiency.

Water Management has many additional benefits:

- Improves landscape by reducing over watering which can lead to weeds, pests and disease.
- Protects property, including fences, patios, asphalt and more, by eliminating overspray, which helps to protect from erosion, rot and other forms of water damage.
- Saves money, because water costs continue to climb. So saving water is saving money!

Irrigation Basics

Basic Principles Of Weather

Plants absorb water from the rootzone via root hairs and their water is supplied through rainwater or irrigation.

Different weather affects how much water a plant needs. Some of the items that affect the amount of water required include:

- Solar Radiation
- Temperature
- Wind
- Humidity
- Rainfall

Long days with bright, warm, windy, dry, weather increases the amount of water needed for irrigation. Short days with cloudy, cool, calm, humid weather reduces needed irrigation amounts. An excellent source for weather data in California is the California Irrigation Management Information System (CIMIS). The CIMIS website provides instant access to weather data which California Water Managers can use to help manage our State's water resources.

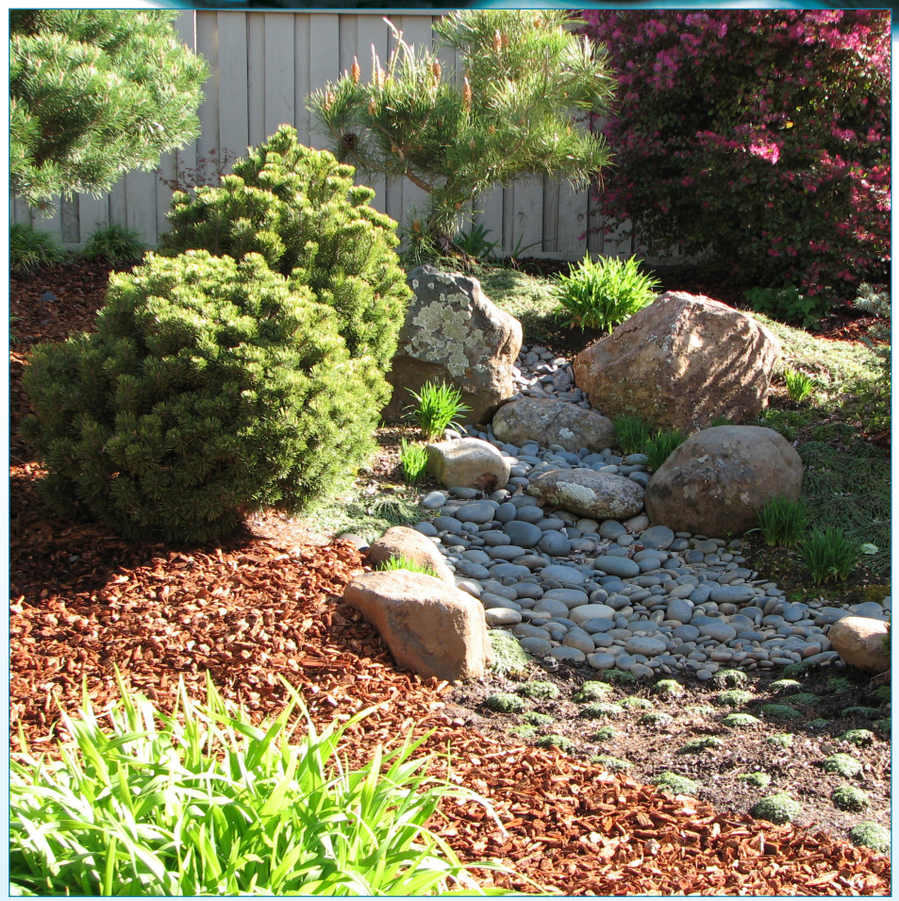
Basic Principles Of Plants

Most plants absorb water through their roots and need it to survive. Without water plants could not perform photosynthesis, cooling or stand up.

Because all plants and their watering requirements are different, when selecting how much water is needed for the landscape, you will need to water to the requirement of the plant with the highest water demand.

To help identify the water needs of plants for irrigation purposes, the State of California created the **Water Use Classification of Landscape Species Guide**, also known as WUCOLS (PDF). This study assigns a water use index to thousands of common plants. It can be used for the selection of plants for the landscape or to help develop irrigation schedules for existing landscapes by government and water entities.

According to the WUCOLS Study, plant water usage can range up to 500% based on the species of the plant being irrigated.



Basic Principles Of Soil

Soils are the natural medium for plant growth in most areas of the earth. Soils support plants in the landscape and often provide nutrients as well as allow water and other substances to reach the plant's roots including oxygen. Soils that are not overly wet also allow oxygen to reach the roots.

When planning an irrigation schedule, it is important to know how much water can be stored in the root zone of the plant, as well as how much water can reach the root zone. The soil type influences how much water can be stored in the soil, along with the root depth and size of the plant. The types of soil determine the type of irrigation needed to water efficiently.

Additional Resources

USDA Estimating Soil Moisture

Basic Principles Of Sprinklers

A sprinkler is a device used to apply water to the landscape at a rate low enough that it can be absorbed by plant and stored in the root zone.

The key to achieving good watering efficiency at any site is to inspect the sprinklers and then adjust them accordingly (tune-up) to ensure reasonable performance. Then the watering schedule needs to be adjusted until optimum water efficiency is met.

Types of sprinklers include

- Sprinklers
- Geared Rotors
- Impact Rotors
- Rotating Stream Rotors
- Fixed and Popup Sprays
- Microspray
- Drip Emitters
  - Single Port
  - Multiport
- Dripline
- Bubblers

The terms used to measure top water efficiency (performance) are:

Precipitation Rate — Rate at which water is applied. Expressed in inches per hour

Distribution Uniformity — How evenly water is being applied. A steady, even rainfall under "no wind" conditions where every square foot of landscaped area receives exactly the same amount of water would be considered as having a Distribution Uniformity (DU) of 100%.

If good judgment and adjustments do not produce acceptable results, then further analysis and tests need to occur. For example, leaks in the system, faulty sprinkler heads, a problem with the irrigation controller and/or more may be responsible for not being able to maintain the assigned budget.

For more detailed information about sprinkler systems or troubleshooting, the Southern California Metropolitan Water District has an excellent guide on irrigation systems

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Basic Principles Of Controllers

Today's electronic controllers have many features which can help you keep a landscape on budget. These devices generally have:

- Multiple programs
- Multiple start times (cycles)
- The ability to adjust by percentage for changes in the weather.

1. Basics

- Group into hydrozones
- Reduce runtimes and start times to avoid runoff
- To ensure adequate water pressure, make sure the programming times do not overlap
- Monitor soil moisture and plant appearance

2. Conventional Electronic Controllers

Use days per week, starts per day and percentage adjust

3. Weather-Based Irrigation Controllers

Calibrate at installation and monitor performance. (See page 29)

Photo courtesy of Hunter Industries

Additional Resources

Information on specific irrigation controller models

Auditing Component

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Completing The Irrigation Audit Component

An Irrigation Audit Includes:

- Inspection
- System Tune-up
- System Testing
- Measurements to determine Precipitation Rate (PR)
- Measurements to determine Distribution Uniformity (DU)
- Measurement of Distribution Uniformity Low Quarter (DUlq)
- Preparation of an Irrigation Schedule

You will be required to:

Set-up

- Water meter reading
- Measure area to be tested (square footage)
- Flag sprinklers to be tested
- Adjust sprinklers/system as needed
- Diagram layout of sprinklers on paper
- Place a minimum of 24 catch cans (no closer than 2 feet from each sprinkler and or hardscape area and then half way between sprinklers in a grid pattern
- Mark catch can locations on layout map

Run Test

- Remove flags (do not want to block sprinklers)
- Run valve or valves for a set amount of time each – 3-6 minutes for sprays and 8-16 minutes (at least five full passes) if testing rotors
- These times are approximate. Be sure there is a measurable amount in all catch cans and that none are overflowing.
- Collect data

Program The Irrigation System To Low Quarter:

- DUlq represents the driest locations for a given area
- To obtain greenest look for area, controller programming must be adjusted to DUlq
- Improving sprinkler coverage (DU) will decrease run times and save water.

Perform Calculations

Precipitation Rate (PR) (Average of water collected in all catch cans) x 3.66* ÷ (run time x catch can throat area (sq. inches))

* 3.66 is a conversion factor to change millimeters to inches and needed if your irrigation audit kit uses catch cans that measure in milliliters.

Distribution (DU) (Average catch can volume of low quarter) ÷ ((average of all catch cans) x 100)

Five Steps to Get Your Performance Site

On Budget

- Map & Measure Your Site
- Document Potential Water & Cost Savings
- Perform Site Inspection & Tune Up
- Establish Schedules & Program Controllers
- Feedback Loop

Map & Measure Your Site

In order to effectively create a water budget, we need to know the type of plants, watering areas (hydrozones) and the square footage of the site you will be entering into the program.

Map Irrigated Area By Hydrozone To Create Controller Station Map

Hydrozones are used in landscaping so that plants with common watering requirements can be irrigated within a common zone. Create a site map noting where watering stations are grouped by the controller and note the type of plant material within each hydrozone. Using Google Earth Pro or Terra Server, Aerial Photos or a measuring wheel, measure the site for the each hydrozone's square footage. Be sure to check that when added together the square footage of the hydrozones equals the square footage of the entire site.

If a system is designed correctly, all of the plants on a given station will have similar watering requirements (hydrozones). A controller station zone map can contain mixed hydrozones.

Measuring

A proper landscape water budget requires an accurate measurements of a site's landscaped area, expressed in square footage. Landscaped area measurements are curb-to-curb only and only apply to planted, irrigated areas. Non-irrigated planting areas cannot be included in the landscaped area measurements. Although square footage can be determined using a variety of tools, the most accurate method is manually taking measurements using a measuring wheel.

Additional Resources

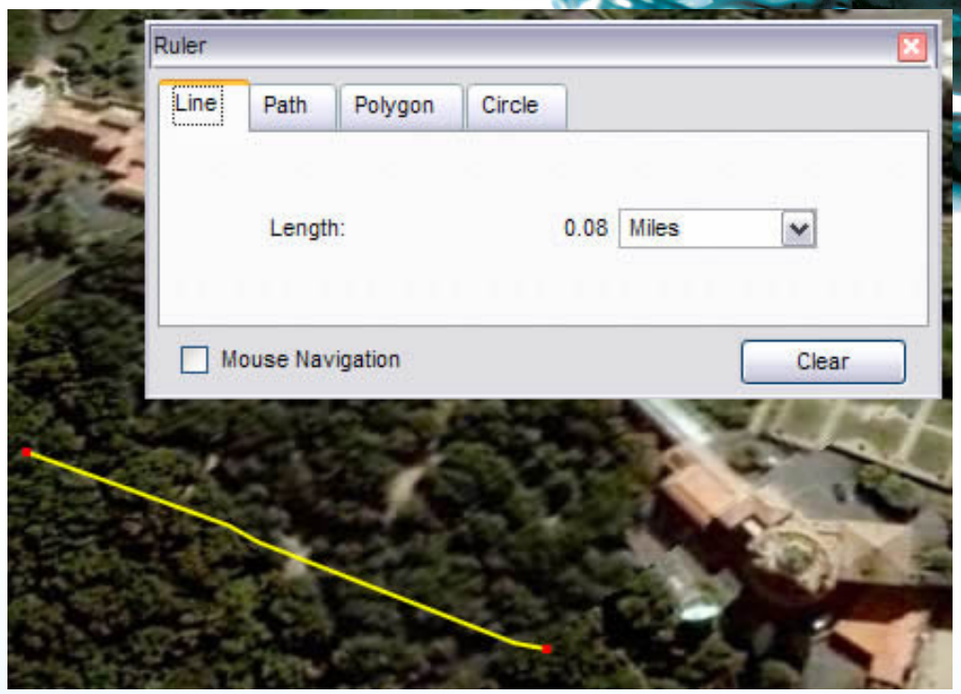
For sample maps and additional information, download Tips For Succeeding in the Water Management Program.

Photo courtesy of Hunter Industries

Add Remote Capability

Although technically not mandatory, remote capability makes managing water much easier by reducing on-site visits and boosting worker efficiency. When selecting Remote Access tools, be sure to look for vendor compatibility. Remember that technology is always changing and becoming more full featured.

Performance Program



Irrigation System Mapping

The purpose of this manual is to give you the basic information needed to produce both budget and high-end digital maps for your maintenance properties.

The first task is to identify the intended uses for the map you will be creating. If it is to be an internal document for use by your staff only, it need only be a "guide" to navigate your way around the site when doing maintenance tasks or repairs. If your client is receptive to purchasing these maps, the need for accuracy and quality becomes more important. There is a market for high-quality digital maps that are good for the life of the property. This is particularly true for industrial/commercial facilities managers who have an engineering background.

NOTE: This is not intended to be a training manual for the use of a computer or any software application. It is assumed that you have the basic knowledge and training needed to perform the required tasks. For digital mapping, Adobe Illustrator is our preferred software application.

The following are some tips that will save you time in mapping any site:

- Efficient use of manpower mandates that the irrigation controller be remote capable and that you have a RainMaster ProMaxUA or a Remote Control Technologies "TRC Commander" remote control actuator. ***Remote actuation is needed to effectively manage water on any property.***
- It is recommended that you visually check the controller for unused stations and use a volt-ohm meter to measure the electrical resistance between the common wire and every station to identify broken wires, spare wires, or any wire that is not activating a valve. The time spent doing this process will eliminate spending large blocks of time searching for non-existent or inoperative stations.
- Physically observe each valve in operation. Consider re-arranging the sequence into a logical progression or "walking order".
- To the best of your ability, using a pencil, mark the perimeter of the area covered by the valve. Repeat the process for all irrigation stations or zones in your system.
- Be sure to indicate the station number alongside or within the polygon that you have created to show the area covered by each valve.
- Controller location, water meter, and backflow prevention device location are all needed pieces of information that should be included on your map(s). As discovered, isolation valves (if any) should be noted on the map.

Mapping Resources

Performance Program

- Map & Measure Your Site
- Document Potential Water & Cost Savings
- Perform Site Inspection & Tune Up
- Establish Schedules & Program Controllers
- Feedback Loop

Document Potential Savings

Obtain Water Meter or Mixed Meter Records.

Often these can be found on the water bill.

Compare Baseline Water Use to Recent Water Use.

Established a baseline or average of how much water is used and compare it to recent water usage. Subtract the current amount being used from the average amount to get an amount over or under.

To document potential savings, multiply the number over the average rate by local water rates.

Compare the potential savings below to the costs of water management.

Use the Benefit/Cost Analysis chart to compare the water savings and benefits for the customer and for the contractor to determine how to bid the job.

Cost of Irrigation Management	
Start Up & First Year	$1,250
Each Year	$600
Three Year Cost	**$2,450**
Annual Savings at Site	$1,000
Three Year Savings	**$3,000**
Net Benefit	$550

How To Read A Water Meter

The above meter reads **506,370.68 cubic feet** or **5,063.71 HCF (Hundred Cubic Feet)**.

For more information on reading a meter visit: www.h2ouse.org

Performance Program

Water Management
Pays Off

Property Size Irrigated	ETo Inches (annual)	Water Cost (ccf)	Water Cost for 100% ETo	Annual Savings of 20% over budget	First year Water Management Cost	2nd & 3rd year Water Management Costs	3 Year Net Value of Water Management
1 acre	49.2	$1	$1,785	$357	$1,225	$591	($1,336)
2 acres	49.2	$1	$3,570	$714	$1,838	$887	($1,469)
5 acres	49.2	$1	$8,924	$1,785	$3,675	$1,773	($1,866)
10 acres	49.2	$1	$17,849	$3,570	$6,738	$3,251	($2,529)
1 acre	49.2	$2	$3,570	$714	$1,225	$591	($252)
2 acres	49.2	$2	$7,139	$1,428	$1,838	$887	$673
5 acres	49.2	$2	$17,849	$3,570	$3,675	$1,773	$3,488
10 acres	49.2	$2	$35,697	$7,139	$6,738	$3,251	$8,180
1 acre	49.2	$3	$5,355	$1,071	$1,225	$591	$806
2 acres	49.2	$3	$10,709	$2,142	$1,838	$887	$2,815
5 acres	49.2	$3	$26,773	$5,355	$3,675	$1,773	$8,843
10 acres	49.2	$3	$53,546	$10,709	$6,738	$3,251	$18,889
1 acre	49.2	$4	$7,139	$1,428	$1,225	$591	$1,877
2 acres	49.2	$4	$14,279	$2,856	$1,838	$887	$4,957
5 acres	49.2	$4	$35,697	$7,139	$3,675	$1,773	$14,197
10 acres	49.2	$4	$71,395	$14,279	$6,738	$3,251	$29,598

Additional notes on cost

- Water management cost 1 acre first year = $1225, following years =$591
- Water management cost for additional acres increases water management cost per acre 50% of 1 acre cost

Additional notes on ETo

- SF Bay Area ETo = 49.17
- Kern County ETo = 66.19

Performance Program

Year One

Task	#	Hours	Internal Cost	Total Cost	Billable Rate	Billable Amount
Initial data collection & basic color map	1	5	$40.00	$200.00	$65.00	$325.00
Develop watering schedule(s)	1	0.5	$40.00	$20.00	$65.00	$32.50
Install schedule(s) in controller	1	0.25	$40.00	$10.00	$65.00	$16.25
Inspect site/adjust schedule(s)	1	1.5	$40.00	$60.00	$65.00	$97.50
Turn on controller (Spring)	1	0.1	$40.00	$4.00	$65.00	$6.50
Modify schedule (April)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify Schedule (May)	1	0.33	$40.00	$13.20	$65.00	$21.45
Inspect site/ adjust schedule(s)	1	1.5	$40.00	$60.00	$65.00	$97.50
Modify Schedule (June)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify Schedule (July)	1	0.33	$40.00	$13.20	$65.00	$21.45
Inspect site/adjust schedule(s)	1	1.5	$40.00	$60.00	$65.00	$97.50
Modify schedule (August)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify Schedule (September)	1	0.33	$40.00	$13.20	$65.00	$21.45
Inspect site/ adjust schedule(s)	1	1.5	$40.00	$60.00	$65.00	$97.50
Modify schedule (October)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify schedule (November)	1	0.33	$40.00	$13.20	$65.00	$21.45
Turn off controller (Winter)	1	0.1	$40.00	$4.00	$65.00	$6.50
Rainy weather shut down (inc. travel)	3	0.75	$40.00	$90.00	$65.00	$146.25
Submit annual report/upgrade proposals	1	2	$40.00	$80.00	$65.00	$130.00
TOTAL YEAR ONE				**$753.60**		**$1,224.60**

Additional Years- Annual Cost

Task	#	Hours	Burden	Cost	Billable Rate	Billable Amount
Turn on controller (Spring)	1	0.1	$40.00	$4.00	$65.00	$6.50
Modify schedule (April)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify schedule (May)	1	0.33	$40.00	$13.20	$65.00	$21.45
Inspect site/adjust schedule(s)	1	1	$40.00	$40.00	$65.00	$65.00
Modify schedule (June)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify schedule (July)	1	0.33	$40.00	$13.20	$65.00	$21.45
Inspect site/adjust schedule(s)	1	0.5	$40.00	$20.00	$65.00	$32.50
Modify schedule (August)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify schedule (September)	1	0.33	$40.00	$13.20	$65.00	$21.45
Inspect site/adjust schedule(s)	1	0.5	$40.00	$20.00	$65.00	$32.50
Modify schedule (October)	1	0.33	$40.00	$13.20	$65.00	$21.45
Modify schedule (November)	1	0.33	$40.00	$13.20	$65.00	$21.45
Turn off controller (Winter)	1	0.1	$40.00	$4.00	$65.00	$6.50
Rainy weather shut down (inc. travel)	1	0.75	$40.00	$80.00	$65.00	$146.25
Submit annual report/upgrade proposals	1	2	$40.00	$80.00	$65.00	$130.00
Sub-total Each Additional Year				**$353.60**		**$590.85**

Cost Estimate of

Assumes site is typical, free-standing concrete tilt-up building with shrubs, ground cover and turf. Maximum 24 station controller. No rain sensor.

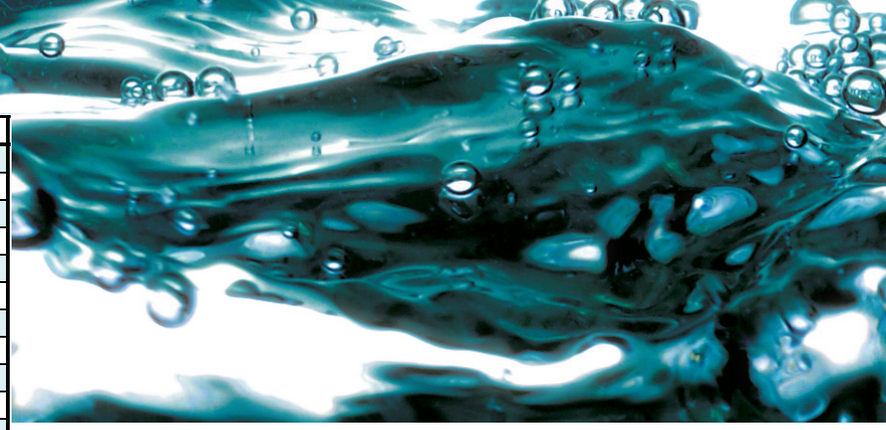
Company	Service Area	Billing	Unit	Base Rate	Tier 2	Tier 3	Tier 4
City of Fresno	Fresno	Monthly	HCF	$0.44			
Southern California Water	Rancho Cordova	Monthly	HCF	$0.46			
California Water Co.	Chico - Hamilton City	Monthly	HCF	$0.58			
Carmichael Water Dist.	Carmichael	Bimonthly	HCF	$0.66			
Desert Water Co.	Palm Springs	Monthly	HCF	$0.77			
City of San Bernardino	San Bernardino	Monthly	HCF	$0.91			
Irvine Ranch Water District	Irvine, Costa Mesa	Monthly	HCF	$0.91	$1.82	$3.64	$7.28
California Water Co.	King City	Monthly	HCF	$0.93			
California Water Co.	Dixon	Monthly	HCF	$1.00			
California Water Co.	Bakersfield	Monthly	HCF	$1.02			
California Water Co.	Oroville Area	Monthly	HCF	$1.08			
Victor Valley Water Dist.	Victorville area	Monthly	HCF	$1.08			
California Water Co.	Salinas	Monthly	HCF	$1.17			
California Water Co.	Stockton	Monthly	HCF	$1.23			
City of Pomona	Pomona (inside city limits)	Bimonthly	HCF	$1.24			
City of Santa Clara	Santa Clara	Monthly	HCF	$1.24			
Azusa Light & Water	Azusa	Monthly	HCF	$1.30			
Golden State Water	Placentia	Bimonthly	HCF	$1.41			
California Water Co.	Lancaster-Antelope Valley	Monthly	HCF	$1.44			
City of El Segundo	El Segundo	Monthly	HCF	$1.54			
City of Pomona	Pomona (outside city limits)	Bimonthly	HCF	$1.56			
California Water Co.	Dominguez Service Area	Monthly	HCF	$1.56			
California Water Co.	East Los Angeles	Monthly	HCF	$1.60			
Golden State Water	Barstow/San Bernardino County	Monthly	HCF	$1.72			
California Water Co.	Livermore	Monthly	HCF	$1.78			
City of Fairfield	Fairfield	Monthly	HCF	$1.82			
San Jose Municipal Water	San Jose	Bimonthly	HCF	$1.76 - 1.91			
California Water Co.	South San Francisco	Monthly	HCF	$1.88			
Southern California Water	Simi Valley	Monthly	HCF	$1.88			
City of San Diego	San Diego	Monthly	HCF	$2.00			
California Water Co.	Los Altos-Suburban area	Monthly	HCF	$2.04			
Golden State Water	Metropolitan Dist./ South LA	Monthly	HCF	$2.09			
ACWD	Fremont-Newark	Bimonthly	HCF	$2.10			
California Water Co.	Westlake Village, Thousand Oaks	Monthly	HCF	$2.11			
California Water Co.	Apple Valley, Victorville	Monthly	HCF	$2.11			
San Jose Water	San Jose	Monthly	HCF	$2.15			
City of Petaluma	Petaluma	Monthly	HCF	$2.16	$2.37	$2.61	
California Water Co.	Hermosa, Redondo Beaches	Monthly	HCF	$2.17			
EBMUD	Oakland-Hayward-San Ramon	Monthly	HCF	$2.28			
Contra Costa Water	Walnut Creek - Concord	Monthly	HCF	$2.28			
California Water Co.	Palos Verdes Estates	Monthly	HCF	$2.29			
California Water Co.	Mid - SF Peninsula	Monthly	HCF	$2.42			
Marin Municipal Water	Marin County (Irrigation)	Bimonthly	HCF	$2.43	$4.86	$9.72	
Marin Municipal Water	Marin County (Residential)	Bimonthly	HCF	$2.43	$4.86	$9.72	$14.58
Rincon Del Diablo Municipal	Escondido	Bimonthly	kGal	$2.43	$2.74		
City of Milpitas	Milpitas (Commercial)	Bimonthly	HCF	$3.19			
City of Santa Rosa	Santa Rosa	Monthly	kGal	$3.22	$4.02	$6.03	
Redwood City	Redwood City	Bimonthly	HCF	$3.63			
City of Milpitas	Milpitas (Irrigation)	Bimonthly	HCF	$3.65			
City of Palo Alto	Palo Alto (Irrigation Meters)	Monthly	HCF	$4.04			
City of Palo Alto	Palo Alto (Commercial)	Monthly	HCF	$4.25			

Water Rates

Of California Irrigation

As Of 2006

State Average: $2.00/HCF



Water Rates

California Irrigation

As of 2013

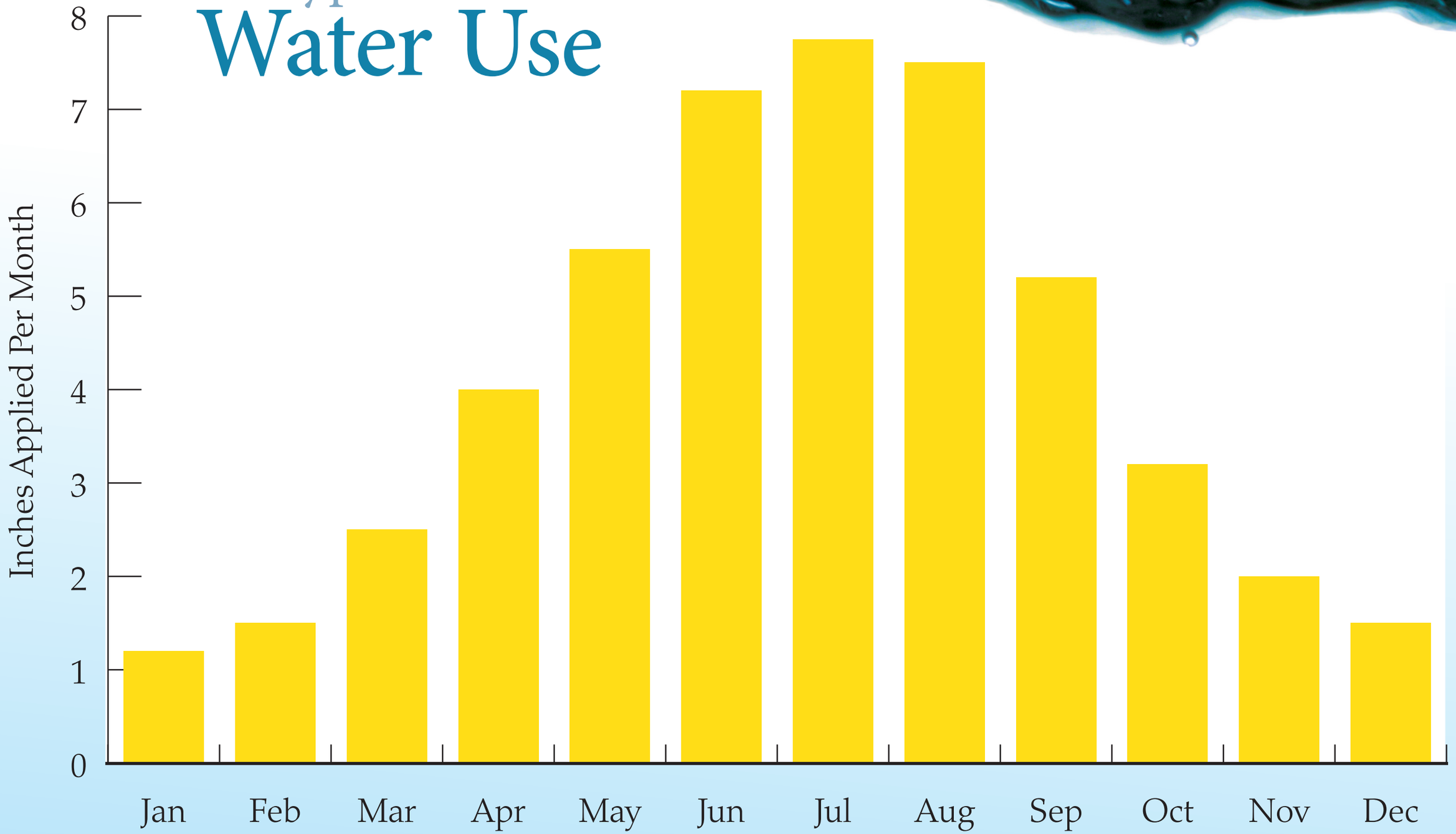
Company	Service Area	Billing	Unit	Base Rate	Tier 2	Tier 3	Tier 4	Tier 5	Tier 6
City of Fresno	Fresno	Monthly	HCF	$0.745					
County of Sacramento Water	Rancho Cordova	Monthly	HCF	$0.860					
Irvine Ranch Water District	Irvine, Costa Mesa	Monthly	HCF	$0.910	$1.240	$2.760	$4.700	$9.840	
City of Pomona	Pomona (inside city limits)	Bi-Monthly	HCF	$0.920	$1.670	$2.070			
Azusa Light & Water	Azusa	Monthly	HCF	$1.007	$1.953				
California Water Co.	Chico - Hamilton City	Monthly	HCF	$1.031					
City of Folsom Water	Rancho Cordova	Monthly	HCF	$1.080	$1.300	$1.600			
Pasadena Water & Power	Pasadena	Monthly	HCF	$1.125	$2.719	$3.219	$3.970		
Carmichael Water Dist.	Carmichael	Bi-Monthly	HCF	$1.130					
Burbank Water & Power	Burbank	Monthly	HCF	$1.140	$1.372	$1.727			
City of San Bernardino	San Bernardino	Monthly	HCF	$1.150					
City of Pomona	Pomona (outside city limits)	Bi-Monthly	HCF	$1.160	$2.080	$3.750			
Golden State Water Co.	Rancho Cordova	Monthly	HCF	$1.271					
Desert Water Co.	Palm Springs	Monthly	HCF	$1.290					
Victorville Water District	Apple Valley, Victorville	Monthly	HCF	$1.470					
California Water Co.	Bakersfield	Monthly	HCF	$1.511					
Eastern Municipal WD	Perris, Hemet	Monthly	HCF	$1.610	$2.960	$5.306	$9.706		
California Water Co.	Oroville Area	Monthly	HCF	$1.783					
City of El Segundo	El Segundo	Monthly	HCF	$1.787	$2.402	$3.017	$3.631		
Great Oaks Water Company	San Jose	Month;y	HCF	$1.846	$1.999	$2.305			
Western Municipal WD	Riverside	Monthly	HCF	$1.908	$2.102	$2.774	$4.312	$5.202	
California Water Co.	Stockton	Monthly	HCF	$1.957					
Las Virgenes Municipal WD	Calabasas	Monthly	HCF	$1.980	$2.370	$3.290	$4.680		
City of Oceanside	Oceanside (Multiple Family)	Monthly	HCF	$1.990	$2.280				
California Water Co.	Salinas	Monthly	HCF	$2.007					
City of Milpitas	Milpitas (Residential)	Bi-Monthly	HCF	$2.020	$2.980	$4.020	$4.500		
California Water Co.	King City	Monthly	HCF	$2.089					
Golden State Water	Placentia	Bi-Monthly	HCF	$2.106					
City of Oceanside	Oceanside (Single Family)	Monthly	HCF	$2.150	$2.460				
California Water Co.	Dixon	Monthly	HCF	$2.223					
San Dieguito WD	Encinitas (Partial_Residential)	Monthly	HCF	$2.260	$3.370	$3.980	$5.030		
City of Oceanside	Oceanside (Commercial & Irrigation)	Monthly	HCF	$2.330					
Olivenhain MWD	Encinitas (Residential)	Monthly	HCF	$2.360	$3.610	$4.620			
City of Fairfield	Fairfield (Irrigation)	Monthly	HCF	$2.370					
Long Beach Water Dept.	Long Beach (Irrigation)	Monthly	HCF	$2.439					
California-American Water	Rancho Cordova	Monthly	HCF	$2.467					
California Water Co.	Lancaster-Antelope Valley	Monthly	HCF	$2.549					
San Jose Water	San Jose	Monthly	HCF	$2.702					
San Jose Municipal Water	San Jose	Bi-Monthly	HCF	$2.736	$2.829	$2.945	$3.084		
Ventura County Water #8	Simi Valley	Monthly	HCF	$2.910					
City of Petaluma	Petaluma (Single Family Residential)	Monthly	HCF	$2.990	$3.590	$4.480	$5.820		
California Water Co.	Dominguez Service Area	Monthly	HCF	$3.055					
Golden State Water	Barstow/San Bernardino County	Monthly	HCF	$3.115					
ACWD	Fremont-Newark	Bi-Monthly	HCF	$3.152					
Contra Costa Water	Walnut Creek - Concord	Monthly	HCF	$3.157					
City of Santa Clara	Santa Clara	Monthly	HCF	$3.170					
EBMUD	Oakland-Hayward-San Ramon	Monthly	HCF	$3.170					
City of Carlsbad	Carlsbad (Single Family)	Monthly	HCF	$3.200	$4.130	$5.620			
Golden State Water Co.	Simi Valley	Monthly	HCF	$3.244					
California Water Co.	East Los Angeles	Monthly	HCF	$3.276					
Vallecitos Water District	San Marcos, Vista, Escondido	Monthly	HCF	$3.310	$4.130	$4.960			
Scotts Valley Water District	Scotts Valley (Residential)	Bi-Monthly	1001 gallons	$3.310	$5.550	$7.160	$8.640	$11.050	$12.490
City of Petaluma	Petaluma (Commercial & Irrigation)	Monthly	HCF	$3.330					
California Water Co.	Los Altos-Suburban area	Monthly	HCF	$3.444					
California Water Co.	Livermore	Monthly	HCF	$3.453					
Santa Monica Public Works	Santa Monica	Monthly	HCF	$3.480	$8.550				
Vista Irrigation District	San Marcos, Vista	Monthly	HCF	$3.520	$4.060	$4.060			
Valley of the Moon Water Dist.	Sonoma	Monthly	1000 Gallons	$3.530	$5.300	$7.920			
Soquel Creek Water Dist,	Capitola (Single-Family Residential)	Bi-Monthly	HCF	$3.600	$5.800	$8.500	$13.000		

State Average: $3.05/HCF

To see the complete list, please visit www.clca.org/water-pro/water-rates.pdf

Performance Program

Typical Baseline
Water Use



Perform

Site Inspection & Tune-up

Inspect the Site

- Document problems by station.
- Submit a list of items for repair (punchlist) to the customer.
- Obtain customer approval for punchlist repairs.

- Map & Measure Your Site
- Document Potential Water & Cost Savings
- Perform Site Inspection & Tune Up
- Establish Schedules & Program Controllers
- Feedback Loop

Performance Program

Sample Punchlist

IRRIGATION SYSTEM ANALYSIS REPORT

SITE NAME: **Prepared by:** **Date of Report:**

CONTROLLER MAKE AND MODEL: Controller Designation: Make & Model of valves:

PROBLEM	STATION NUMBERS 1	2	3	4	5	6	7	8	9	10	11	12	TOTAL QTY.	URGENT REPAIR COST	NEEDED REPAIR COST	SYSTEM UPGRADE COST	COMMENTS
Broken shrub sprinkler													0	.			
Broken shrub riser		4		1									5	68.55			Repair broken equipment
Broken bubblers(tree)			2										2	31.28			Repair broken equipment
Broken drip emitters, tubing, etc.													0	.			
Broken 4" pop-up					3								3	48.36			Repair broken equipment
Broken 6" pop-up													0	.			
Broken 12" pop-up													0	.			
Broken Toro 300 stream rotor													0	.			
Broken Toro 300 nozzle/arc disc													0	.			
Broken Toro 300 shrub rotor													0	.			
Broken Hunter I-10 ADV shrub rotor													0	.			
Broken Hunter PGH-12" rotor													0	.			
Broken Hunter I-20 rotor													0	.			
Broken Hunter I-25 rotor													0	.			
Replace damaged nozzle (spray)													0	.			Repair broken equipment
Adjust sprinkler height				5	6	7	3			2			23	316.25			Repair broken equipment
Straighten sprinklers													0	.			
Broken pipe(lateral)													0	.			
Broken pipe (main line)			1										1	240.63			Plus parts as needed
Stuck valve(running constantly)													0	.			
Weeping valve (internal leak)													0	.			
Leaking valve (external)													0	.			
Valve won't open auto.													0	.			
Valve won't open fully													0	.			
Additional analysis required													0				
													0				
													0				
													0				
Replace damaged nozzle (spray)													0		.		For improved coverage
Adjust sprinkler height													0		.		For improved coverage
Straighten sprinklers													0		.		For improved coverage
													0				
													0				
													0				
Move sprinklers to improve coverage													0				System modifications needed
Add sprinklers to improve coverage													0				System modifications needed
Separate mixed hydrozone(s)													0				System modifications needed
Mature shrubs blocking spray													0				System modifications needed
Change nozzle type/size													0				For improved coverage
													0				
													0				
													0				
REPAIR CREW DAMAGE (N/C)													0				
							TOTAL ESTIMATE (12 STATIONS)							**$705.07**	**$0.00**	**$0.00**	

Performance Program

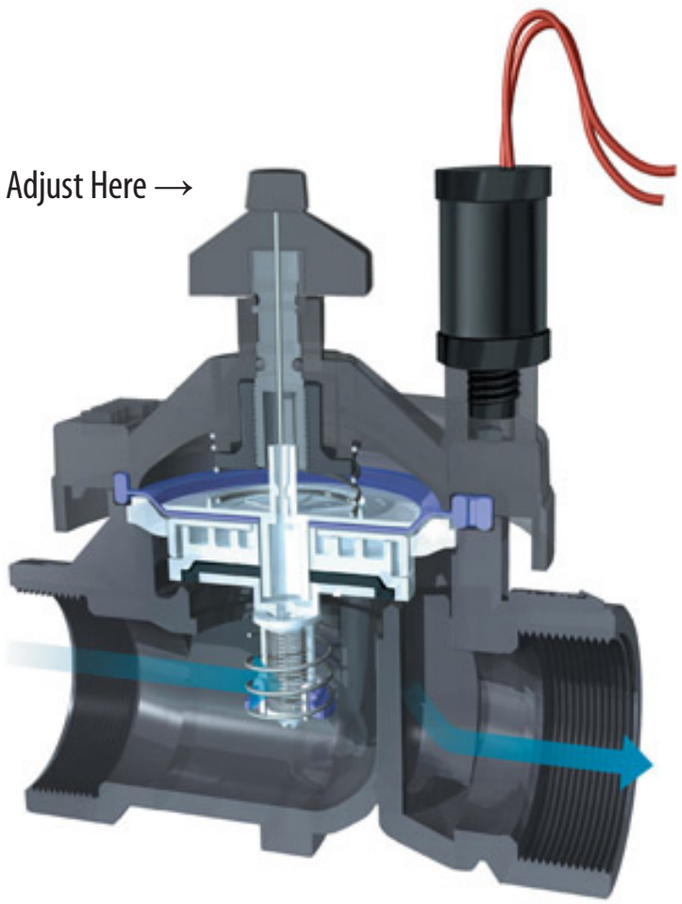
Site Inspection & Tune-up

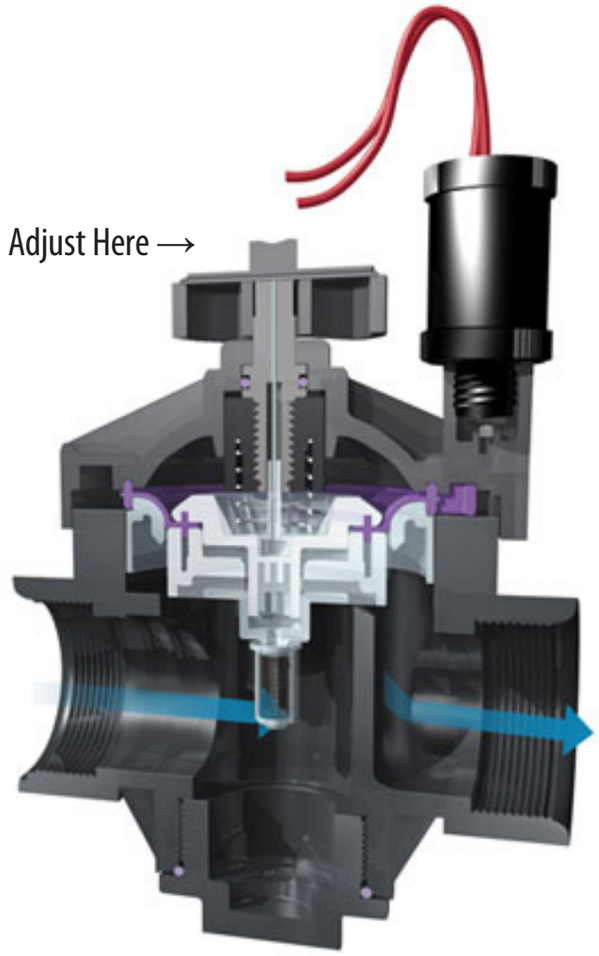
Site Tune Up

- Remove and replace any damaged equipment.
- Adjust the pressure at each valve.
- Align the arc (30–360º) for the appropriate water distribution (30–360º). Adjust the grade or height of the sprinkler and straighten crooked sprinklers.
- Examine the nozzle to make sure water is flowing out correctly. If not make any necessary changes.
- For low elevation heads, considering using a check valve which allows the water to only flow in one direction.

Valves

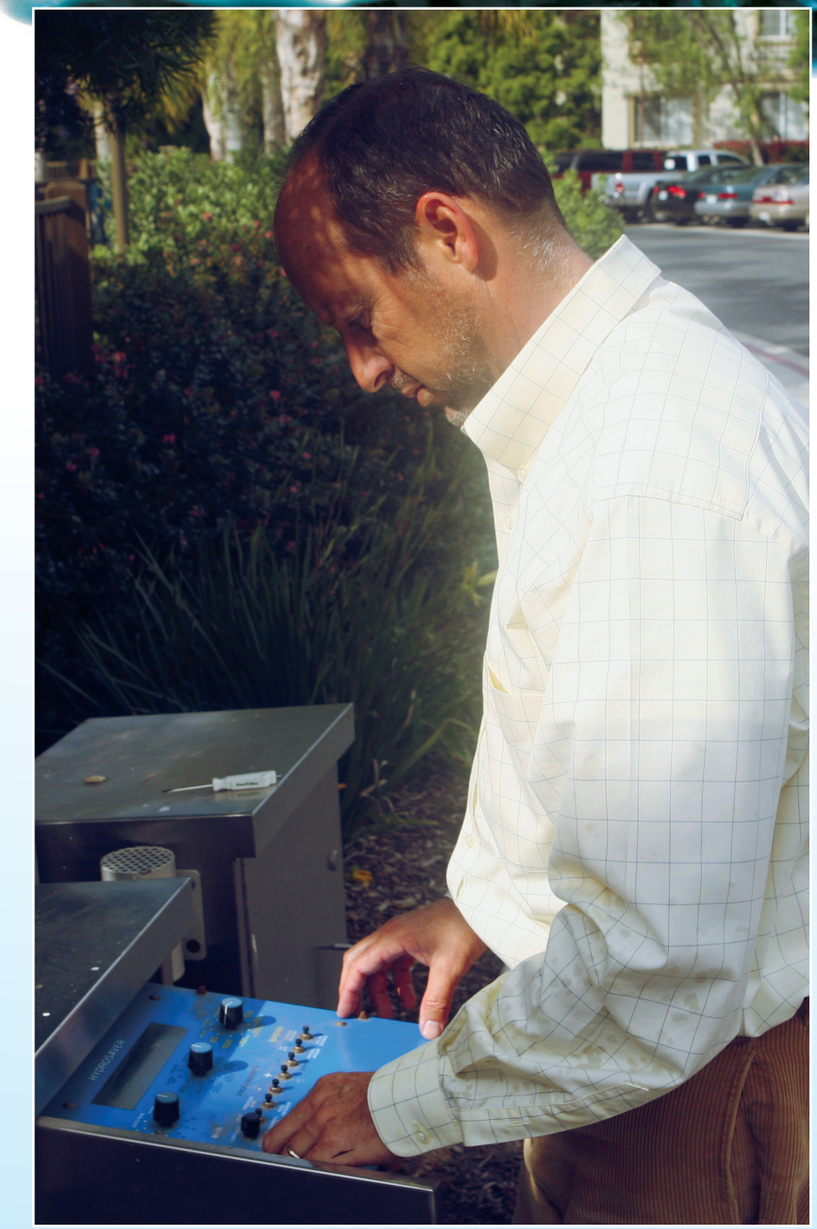
Control Flow





- Map & Measure Your Site
- Document Potential Water & Cost Savings
- Perform Site Inspection & Tune Up
- Establish Schedules & Program Controllers
- Feedback Loop

Establish



1 Now it is time to assign each valve to a controller station based on the type of plants used in the landscape as per below: (Some controller stations can contain mixed hydrozones)

Program 1: Turf and Annual Color

Program 2: Groundcover and Shrubs

Program 3: Shrubs and Trees

Program 4: Special (e.g., Natives)

- Map & Measure Your Site
- Document Potential Water & Cost Savings
- Perform Site Inspection & Tune Up
- Establish Schedules & Program Controllers
- Feedback Loop

Establish Schedules & Program Controllers

2

To help you determine the best way to schedule your irrigation controller go to the CLCA irrigation scheduler. This document will give you the information necessary to calculate:

- Minutes per watering cycle
- How many cycles per day/week
- Adjustments for plant types, density, climate and slope of the property
- A Sample irrigation schedule

Note: There are other software programs available for calculating and tracking a landscape water budget including Green Leaf (fees or subscriptions may apply) and Water Budget Manager (free).

- Map & Measure Your Site
- Document Potential Water & Cost Savings
- Perform Site Inspection & Tune Up
- Establish Schedules & Program Controllers
- Feedback Loop

Establish Schedules & Program Controllers

3

After you have created an irrigation schedule and programmed it into the irrigation controller, you'll want to monitor the site.

After one week with the new schedule, inspect the soil with a probe. Look for areas that have too much water or not enough, plants that are discolored or dying, dry or cracked soil or areas of too much water. Adjust the controller according to your observations.

Performance Program

Minimum and Maximum Station Runtimes

		Spray		*Gear Rotor		*Impact Sprinkler		Stream Rotor		Rotating Nozzles	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Soil Type	**Slope**	1.8 in/hr		.7 in/hr		.65 in/hr		.6 in/hr		.45 in/hr	
Sand	Mild	16	5	33	8	37	6	37	8	50	10
Sand	Moderate	10	5	21	8	22	6	24	8	31	10
Sand	Steep	7	5	12	8	8	6	10	8	13	10
Sandy Loam	Mild	13	5	23	8	25	6	26	8	36	10
Sandy Loam	Moderate	8	5	15	8	17	6	18	8	24	10
Sandy Loam	Steep	5	4	8	8	8	6	9	8	13	10
Loam	Mild	10	5	18	8	21	6	23	8	30	10
Loam	Moderate	7	5	12	8	12	6	14	8	19	10
Loam	Steep	4	4	8	8	7	6	8	8	11	10
Clay Loam	Mild	8	5	15	8	17	6	18	8	24	10
Clay Loam	Moderate	5	4	8	8	10	6	11	8	16	10
Clay Loam	Steep	3	3	8	8	6	6	8	8	10	10
Clay	Mild	5	4	10	8	12	6	13	8	18	10
Clay	Moderate	3	3	8	8	8	6	10	8	13	10
Clay	Steep	3	3	8	8	6	6	8	8	10	10

Flat to Mild Slope = 0 to 5 degrees
Mild to Moderate slope = 5 to 20 degrees
Steep Slope = More than 20 degrees

CAUTION: These station runtimes are approximate and are intended to be used as a guide to allow you to develop the optimum runtimes for your particular property.

NOTE: Minimum runtimes for rotary sprinklers:

The engineered rotational speed is 1 to 1 1/2 minutes per rotation of the sprinkler. Four passes or rotations are needed to apply meaningful amounts of water per cycle for full circle sprinklers. If valved separately, half circle sprinklers runtimes can be reduced 50%. 90 degree sprinklers can be reduced 75%.

Rotating Nozzles:

MP Rotator nozzles are .45 in/hr.
Rain Bird R13-18 are .70 in/hr.
Rain Bird R17-24 nozzles are .75 in/hr. at most pressures.

Calculated minimum precipitation per cycle as follows: **Spray heads** - (1.8in/hr) - @ 5minutes = .15in/cycle. @ 3 min. = .09in/cycle. **Gear Rotors** - (.7 in/hr) @ 8 min. = .0 in/cycle. **Impact Rotors** - (.65 in/hr) @ 6 min. = .065 in/cycle. **Stream Rotors** - (.60 in/hr) - @ 8 min. = .08 in/cycle. Rotating Nozzles - (.45 in/hr) - @ 10 min. = .075 in/cycle.

Performance Program

Irrigation Scheduling Worksheet

Enter Precipitation Rate: 0.9
Enter Station Run Time: 12

Turf

Month	Reference ET	Season adj.	Crop k	Exposure	System k	Required H2O	Minutes per week	Number of cycles/week
January	1.35	1	0.8	1	0.55	1.96	30	3
February	1.87	1	0.8	1	0.55	2.72	42	3
March	3.45	1	0.8	1	0.55	5.02	77	6
April	5.03	1	0.8	1	0.55	7.32	113	9
May	5.93	1	0.8	1	0.55	8.63	133	11
June	6.71	1	0.8	1	0.55	9.76	150	13
July	7.11	1	0.8	1	0.55	10.34	159	13
August	6.29	1	0.8	1	0.55	9.15	141	12
September	4.84	1	0.8	1	0.55	7.04	108	9
October	3.61	1	0.8	1	0.55	5.25	81	7
November	1.8	1	0.8	1	0.55	2.62	40	3
December	1.36	1	0.8	1	0.55	1.98	30	3
Totals	49.35					71.78		

Enter Precipitation Rate: 0.7
Enter Station Run Time: 12

Shrubs & Ground Cover

Month	Reference ET	Season adj.	Crop k	Exposure	System k	Required H2O	Minutes per week	Number of cycles/week
January	1.35	1	0.6	1	0.55	1.47	29	2
February	1.87	1	0.6	1	0.55	2.04	40	3
March	3.45	1	0.6	1	0.55	3.76	75	6
April	5.03	1	0.6	1	0.55	5.49	109	9
May	5.93	1	0.6	1	0.55	6.47	128	11
June	6.71	1	0.6	1	0.55	7.32	145	12
July	7.11	1	0.6	1	0.55	7.76	154	13
August	6.29	1	0.6	1	0.55	6.86	136	11
September	4.84	1	0.6	1	0.55	5.28	105	9
October	3.61	1	0.6	1	0.55	3.94	78	6
November	1.8	1	0.6	1	0.55	1.96	39	3
December	1.36	1	0.6	1	0.55	1.48	29	2
Totals	49.35		0.6			53.84		

Enter Precipitation Rate: 0.65
Enter Station Run Time: 12

Shrubs & Trees (no ground cover)

Month	Reference ET	Season adj.	Crop k	Exposure	System k	Required H2O	Minutes per week	Number of cycles/week
January	1.35	1	0.5	1	0.55	1.23	26	2
February	1.87	1	0.5	1	0.55	1.70	36	3
March	3.45	1	0.5	1	0.55	3.14	67	6
April	5.03	1	0.5	1	0.55	4.57	97	8
May	5.93	1	0.5	1	0.55	5.39	115	10
June	6.71	1	0.5	1	0.55	6.10	130	11
July	7.11	1	0.5	1	0.55	6.46	138	11
August	6.29	1	0.5	1	0.55	5.72	122	10
September	4.84	1	0.5	1	0.55	4.40	94	8
October	3.61	1	0.5	1	0.55	3.28	70	6
November	1.8	1	0.5	1	0.55	1.64	35	3
December	1.36	1	0.5	1	0.55	1.24	26	2
Totals	49.35					44.86		

Performance Program

CONTROLLER PROGRAMMING CHART

JOB NAME:	CONTROLLER:	DESIGNATION:	VALVES:	MOW DAY:	PREPARED BY:

PROGRAM 1				PROGRAM 2				PROGRAM 3				PROGRAM 4			
STA.#	RUN TIME	AREA WATERED	SPKLR.	STA.#	RUN TIME	AREA WATERED	SPKLR.	STA. #	RUN TIME	AREA WATERED	SPKLR.	STA.#	RUN TIME	AREA WATERED	SPKLR.
TOTALS	0				0				0				0		
DATE	DAYS ON	START TIMES	CY/WK	DATE	DAYS ON	START TIMES	CY/WK	DATE	DAYS ON	START TIMES	CY/WK	DATE	DAYS ON	START TIMES	CY/WK

CY / WK = Cycles per week. Multiply number of "Days On" by number of "Start Times".

How To Maximize Efficiency Of Weather-Based Irrigation Controllers

Smart controllers, also known as weather based controllers, are one of the many valuable water saving technologies available to help make landscape water usage more efficient. These devices adjust the amount of water applied to a landscape in response to environmental changes.

Using sensors and/or weather information, these controllers adjust your irrigation system automatically in response to rain, wind or temperature changes. Smart controllers can help reduce landscape water usage, help you keep on budget and in some cases can offer dramatic savings. They can also help you maintain a more healthy landscape. However, if used incorrectly this device may not give the desired water saving results.

Program It Correctly

In order to maximize and maintain water efficiency, the smart controller needs to be programmed correctly. These mini computers need in-depth information about soil, plants, exposure, type of irrigation etc. because they are customized for your property.

Like any computer, if it receives inaccurate information, it will not achieve the desired results, possibly resulting in over or under irrigated areas and damaged plants or hardscapes.

Monitor Your Site

Site conditions must be monitored, especially the first few weeks after installing your controller to fine tune and adjust your controller settings. Look for run off, poor plant heath, color changes and/or any other signs that settings might need to be modified, perhaps several times.

Water Mandates & Restrictions

Smart controllers and good water management are often more effective at reducing landscape water usage than assigned watering days because most people soak their lawns during their allocated time, actually using more water than the site actually needs. Some cities and water districts are now allowing those with smart controllers to be exempt from limited day watering restrictions. Be sure to check with your local water district regarding restriction exceptions.

Regular Maintenance Of Current Irrigation System

It is important to regularly inspect your irrigation system and repair leaks and/or other problems. Since these controllers consistently adjust your watering, if there is a leak or other problem with the irrigation system, even if programmed correctly, your landscape may not receive the correct amount of water that it needs. Learning to read your water meter will help you determine if you have a leak.

Feedback Loop

1

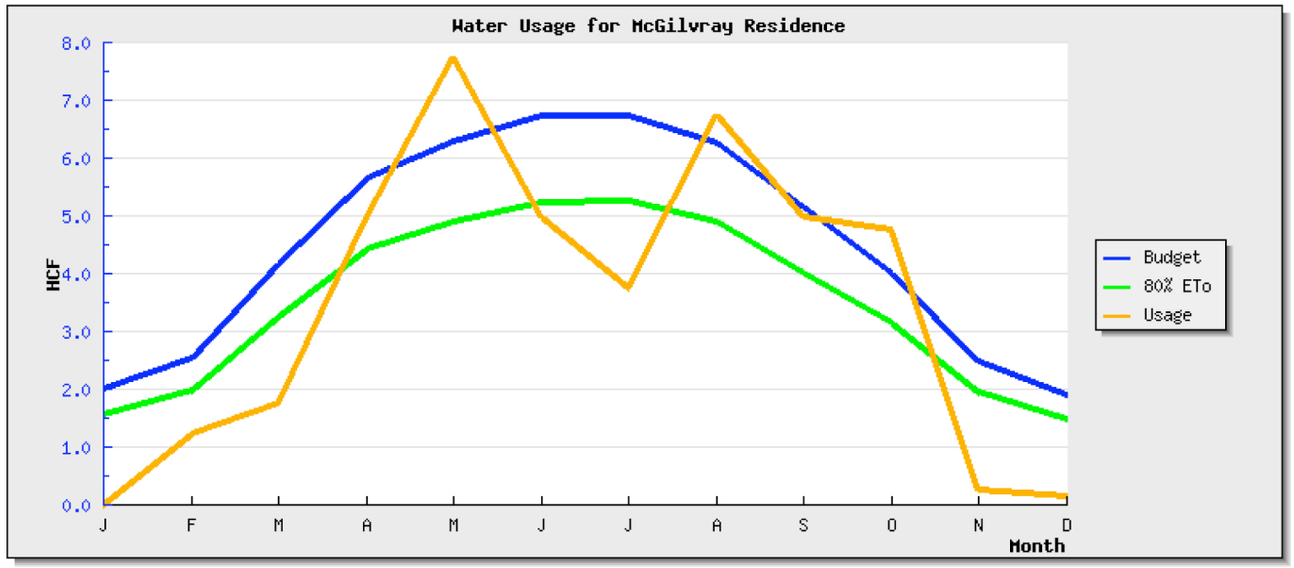
Read Water Meters the first week of the month.

- Enter your information into CLCA's easy-to-use online water management program at www.clcaengine.com to track your information and instantly check your progress.
- CLCA's monthly usage reports are easy to produce and let you know instantly the status of your property and whether it is on budget.

2

www.clcaengine.com can help you to determine if you need to adjust the irrigation schedule. This online water management program helps make landscape water management easy. Some adjustments that might be necessary include:

- Site Monthly Adjustments.
  - Changes in number of days a week watering.
  - How many watering cycles per day.
  - Adjusting the amount of water applied up or down based on findings.
- Site Walkthrough Adjustments using a soil probe, wet on dry spots or changes in a plant's appearance.



2008 Water Use History						
Month	ETo (inches)	Water Budget (HCF)	Water Usage (HCF)	Over/Under (HCF)	% Budget	% ETo
jan	1.64	1.99	0	-1.99	0	0
feb	2.09	2.54	1.21	-1.33	47.64%	48.89%
mar	3.42	4.16	1.75	-2.41	42.07%	43.21%
apr	4.65	5.65	4.98	-0.67	88.14%	90.44%
may	5.16	6.27	7.75	+1.48	123.60%	126.84%
jun	5.52	6.71	4.98	-1.73	74.22%	76.19%
jul	5.54	6.73	3.75	-2.98	55.72%	57.16%
aug	5.15	6.26	6.75	+0.49	107.83%	110.68%
sep	4.23	5.14	4.98	-0.16	96.89%	99.42%
oct	3.30	4.01	4.75	+0.74	118.45%	121.55%
nov	2.04	2.48	0.24	-2.24	9.68%	9.94%
dec	1.55	1.88	0.14	-1.74	7.45%	7.63%
total	44.29	53.82	41.28			
ytd	44.29	53.82	41.28	-12.54	76.70%	78.71%

Contractor Information	Site Location and Description	Site Notes
WaterAware 1[redacted] S[redacted] 8[redacted]	McGilvray Residence 335 12th Ave Santa Cruz,CA [redacted] Landscaped Area: 1421 square feet	100% ETo =52.45HCF ETo used is McGilvray Residence=44.29"

Site Managers	
Scott McGilvray	scottm@wateraware[redacted]
Scott McGilvray	SCOTT.MCGILVRAY
Chris McGilvray	CHRIS.MCGILVRAY

Crop	Square Footage	Crop k	Effective DU	Annual Budgeted Water
Cool Season Turf	668	0.80	0.000	0.00
Shrubs and Ground Covers	240	0.60	0.000	0.00
Shrubs and Trees	513	0.50	0.000	0.00

Sample Monthly Landscape Water Usage Report

Generated at www.clcaengine.com

Tools

Additional tools to help you manage water.

Areas can be measured using a number of different tools, including:

- Measuring Wheel
- Aerial Photography
- GIS Area Measurement: This great site explains how GIS is used to measure area

These two sites measure area using GIS

- Google Earth Pro
- Terraserver (formerly Microsoft Research Maps)

Here are a couple of excellent sources:

- CIMIS
- Weather Based Irrigation Controllers
- Meter Reading —Information on different types of meters and how to read them.

Additional Resources

California Landscape Contractors Association

CLCA Certified Water Management Program

California Urban Water Conservation Council

Cooperative Extension Service

CSU Fresno Center for Irrigation Technology

Irrigation Association

Irvine Ranch Water District

Santa Clara Valley Water District

US Bureau of Reclamation

Plant Species

Sprinkler Type

Glossary

WATER MANAGEMENT CERTIFICATION PROGRAM
A WaterSense Labeled Program

CIMIS — The California Irrigation Management Information System (CIMIS) is a program in the Office of Water Use Efficiency (OWUE), California Department of Water Resources (DWR) that manages a network of over 120 automated weather stations in the state of California. The primary purpose of CIMIS is to make available to the public, free of charge, information useful in estimating water use for irrigation scheduling. 6, 35

Distribution Uniformity (DU) — Distribution Uniformity is a measure of how evenly water is applied across a field during irrigation. 9, 11

DUlq — Low Quarter Distribution Uniformity. The most common measure of DU is the Low Quarter DU, which is a measure of the average of the lowest quarter of samples, divided by the average of all samples. The higher the DU, the better the performance of the system. If all samples are equal, the DU is 100%. 11

Effective Rainfall — The Amount of rainfall that is beneficial to the plant. Expressed in inches. Too little rain merely wets the surface. Too much rain runs off.

Evapotranspiration (ETo) — Evapotranspiration (ETo) is the loss of water to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is an indicator of how much water your crops, lawn, garden, and trees need for healthy growth and productivity. 4, 5

GIS — A geographic information system (GIS) integrates hardware, software, and data for capturing, managing, analyzing, and displaying all forms of geographically referenced information. This can be used to measure landscape areas using aerial photos.

HCF or CCF — Water is measured in cubic feet. One cubic foot equals 7.48 gallons. For simplification, most water agencies calculate water usage on one hundred cubic feet – 748 gallons. (HCF)

Hydrozone — This is a grouping of plants based on water usage. Hydrozones are used in landscaping so that plants with common watering requirements can be irrigated within a common zone. 13

Irrigation Audit — Participants must complete an irrigation audit, which is basically an assessment of how much water is used and how much water can be saved. Conducting an irrigation audit involves calculating water use and identifying ways to reduce landscape water usage.

KGal — 1 kGal (1000 gallons) = 1.34 HCF or 134 cu. ft.

On Budget — A site is considered "on budget" if it meets or exceeds minimum standards as defined on the CLCA Water Management Certification Program website. If a local jurisdiction uses different standards, the local standard will prevail.

Precipitation Rate (PR) — The rate at which water is applied over an irrigated area. 9, 11

Valve — This is a device used to control the flow of water. 25

Comprehensive Glossary of Irrigation Terms

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Credits

Study guide originally developed by Scott McGilvray, John Moore, Gary Kah and Chris Willig. Updates and support provided by Peter Estournes CLP, CLIA, David Silva CWM, Barbara Landrith, Aaron Winters, Susi Harris, John Sassaman, Stephanie King and Larry Rohlfes CAE.

Change Log

8/17/2011	v2.02	Updated location of online supplemental files
1/4/2012	v2.03	Updated Partner logos
4/5/2012	v2.04	Updated ETo basic requirements.
8/22/2012	v2.05	Updated Water Management Certification Program and Partner logos.
2/28/2013	v2.06	Updated Partner logos and copyright date