MWEL

Mastering Water Efficient Landscapes

A Deeper Dive into Stakeholder Roles



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Mastering Water Efficient Landscapes
A Deeper Dive into Stakeholder Roles

Module#1: MWELO Design and Compliance

Presented by:

Dave Phelps

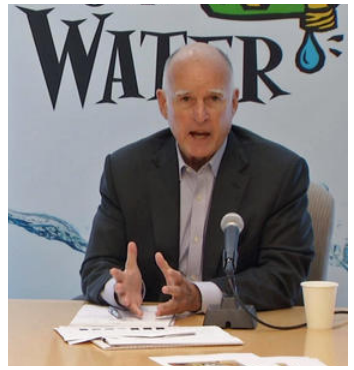
GardenEnlightenment.com

Landscape Architect, Consultant, QLP, QWEL

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Why?

"A New Abnormal"
"A New Way of Life:
Water Conservation"



- Promote Values the GO BEYOND conservation and efficient use of water.
- Provide structure
- Establish practices
- Reduce water waste and…

2018: EO B-37-16 (and SB606 & AB1668): "Eliminate Water Waste"

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Why?

- Promote Values that GO BEYOND conservation and efficient use of water.
- Provide structure
- Establish practices
- Reduce water waste and…

"MEP"

Maximum Extent Practicable

Reduce water use to it's lowest practical amount.

Save Our Water and Our Trees!

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Alignment…

- Sustainable Sites, LEED
- Low Impact Development (LID)
- ReScape California Principles
- Stormwater Pollution Prevention Program (SPPP), C3
- Executive Order N-82-20



THE Sustainable SITES Initiative®

LOW IMPACT SUSTAINABLE LID DEVELOPMENT

- Holistic
- Regenerative
- Watershed based



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Executive Order N-82-20:

"To combat the Climate and Biodiversity Crises"

- Nature-Based Solutions
- Build Resilience
- Restore Healthy Ecosystems
- Fire-Resistant, Sustainably Managed Landscapes
- Reinvigorate populations of pollinator insects
- Protect California's Native Plants
- Enhance Soil Health and Biodiversity



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MWELO

"Integrate and transcend the conservation and efficient use of water"

- Holistic Design
- Comprehensive approach
- Fosters Biodiversity and Healthy Soils
- Selection of native and adapted plants
- Provide food and habitat for native animals and insects
- In step with local fire fuel modification
- Promotes alternative water sources

- Avoiding Pesticides
- Reducing Power Equipment
- Creating New Habitat
- Increasing Carbon Storage
- Reducing Petroleum-based fertilizers

- Increase Stormwater Retention

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Legality & Enforcement

- 2016: CalGreen Building Code
- Update in 2023
- DWR
  - Landscape Stakeholder Advisory Group (LSAG)
  - DRAFT GuideBook


Unprecedented Lawsuit: Non-Profit Sues More Than Half of California's Cities and Counties

Jurisdictions Violated Water Conservation Rules Adopted During State's Recent Drought

December 18, 2019 | California

- CA Dept. of Water Resources
- Natural Resource Defense Council
- Water Agencies
- Municipalities:
  - Counties, Cities, Towns
    - Planning Departments
    - Building Departments

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Applicability… ”Triggers”



- **Residential vs. Commercial (WELO?)**
- **New Construction vs. Renovation (Rehabilitated)**
- **Permit, Design Review, and/or Plan Check**
- **Size of Landscape Area**
- **Exemptions**
- **Existing Landscapes**

This law is so good…
Compliance is the Right Thing To Do

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Existing Landscapes (and Cemeteries):

- Local Agency *MAY* designate another agency to implement SOME OR ALL of the ordinance requirements
  - "For all landscapes that have a water meter".
  - "For all landscapes that do NOT have a meter
  - "May Include, but not limited to…"
    - Irrigation Audit
    - Irrigation Survey
    - Water Use Analysis
  - MAWA = .8 (Eto) (.62)
  - "Provide *recommendations* as necessary in order to prevent waste"

- Over 1 Acre in Size installed before December 1, 2015
- *PROHIBIT* Irrigation Runoff into adjacent properties –**ESTABLISH PENALTIES AND INFORCE IT.**

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California Historical Landmarks

Exemptions:

- Registered Historical Sites
- Ecological Restoration Projects (Without Permanent Irrigation)
- Mined-land Reclamation Projects (Without Permanent Irrigation)
- Existing Plant Collections OPEN TO THE PUBLIC



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Size:



- New Construction: **500** Aggregate Square Feet of Landscape Area
- Rehabilitated: **2500** Aggregate Square Feet of Modified Landscape Area

Rehabilitated: Area modified = 50% of total landscape area ***and*** modifications will be completed within 1 year.

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"Landscape Area"





- All **Irrigated** Areas
  - Hydrozone Areas

- Not Hardscapes
- Not Footprints of buildings or structures
- Not Structures
- Not Permeable Surfaces
- Not Existing Native, Non-Irrigated vegetation

- ***PLUS***: ALL Pools, Spas, and Water Features

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Appendix D: Performance vs. Prescription

- Performance: Do all the Calculations for MAWA and ETU
- Prescription:
  - New Construction or Rehabilitation of landscapes 500-2500 Square Feet
  - Complete a Checklist of ”Must do” elements.
    - Different for Residential vs. Commercial (Non-Residential)
    - Lawn? Medium water use plants?

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…and additional Fees?

Prescriptive: Checklist

Model Water Efficient Landscape Ordinance: Prescriptive Path Process Flowchart
(new construction and rehabilitated landscapes 500 to 2,500 square feet)

	Building Permit: Construction Documents	Construction	Project Completion: Prior to Sign-off & Occupancy	Reporting
Applicant	Submit/Re-submit Landscape Documentation Package: 1. Project Information 2. Landscape Plan 3. Soil Analysis (unless	Construct according to approved plans Resubmit plans if there are significant changes Request open-trench inspection	Request final inspection Submit Certificate of Completion to agency and water provider: 1. Certificate of Installation 2. Irrigation Schedule 3. Schedule of Landscape & Irrigation Maintenance	Not Applicable
Agency	Review Construction Documents Track data for annual report	Perform open-trench inspection	Review Certificate of Completion Perform final inspection Track data for annual reporting	Submit Annual Report to DWR by January 31st each year

[1]If soil management report shows 6% organic matter

Performance: Calculations

Model Water Efficient Landscape Ordinance: Performance Path Process Flowchart
(new construction landscape ≥ 500 square feet and rehabilitated landscape ≥ 2,500 square feet)

	Entitlement: Design Review	Building Permit: Construction Documents	Construction	Project Completion: Prior to Sign-off & Occupancy	Reporting
Applicant	Review MWELO Requirements Develop Conceptual Plans and Documents Submit Conceptual Plans and Documents 1. Landscape Plan 2. Water Efficient Landscape Worksheet	Submit/Re-submit Landscape Documentation Package: 1. Plans: Cover Sheet, Site Plan, Landscape Irrigation, Grading 2. Water Efficient Landscape Worksheet 3. Soil Management Report[1] Provide copy of Worksheet to water provider	Construct according to approved plans Resubmit plans if there are significant changes Request open-trench inspection Request irrigation audit & make corrections	Submit Certificate of Completion: 1. Certificate of Installation 2. Irrigation Schedule 3. Schedule of Landscape & Irrigation Maintenance 4. Irrigation Zone Map (inside controller) 5. Irrigation Audit 6. As-Built Plans 7. Soil Management Report[1] 8. Verification of Soil Amendments[2] Request final inspection	Not Applicable
Agency	Determine if proposed project triggers MWELO Review and comment on Conceptual Plans & Documents Coordinate with local water purveyor, if needed	Review Construction Documents Track data for annual report Provide Landscape Documentation Package to local water purveyor and owner	Perform open-trench inspection Perform irrigation audit if provided by agency	Review Certificate of Completion Perform final inspection Provide Certificate of Completion to local water purveyor and owner Track data for annual reporting	Submit Annual Report to DWR by January 31st each year

[1]Submit with Certificate of Completion if mass grading will occur; [2]Verification that the Soil Management Report recommendations were installed

Appendix D: Prescriptive

Compost

- 4 CY Compost / 1000 sq. ft.
- Incorporated to 6”



Mulch

- 3” Layer of mulch to all exposed planting surfaces
- Except turf, seed, where “contraindicated”

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Appendix D: Prescriptive

Residental

- 75% of plants =WUCOLS “Low” or less
- No more than 25% = WUCOLS “High”
  - Includes pools, spas, water features
  - No Turf on slopes of 25% or more
  - No Turf in areas 10’ wide or less
    - Except if in parking strip AND subsurface

Non-Residential & Multi-Family

- 100% of plants= WUCOLS ”Low”
- **NO** Turf (Lawn)

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Appendix D: Prescriptive

F. Signature

I agree to comply with these Simplified Compliance requirements for the Water Efficient Landscape Plan Review.

_____ Date_____

Signature of Applicant or Property Owner or authorized representative

Irrigation

- Controllers must use Eto data or soil moisture sensors
- Controllers must have a rain sensor
- Pressure regulation is required
- Manual Shut-off required
- All nozzles must have a DU of .65 or higher

- No overhead irrigation on areas 10’ wide or less
- 1000 sq. ft. or more non-residential
  - =Irrigation Submeter required

!!! Check your Local WELO!!!

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Application

- Varies by Agency or Municipality…
  - Accessor's Parcel Number
  - Address
  - Meter # or Water Source
  - Owner Name and Contact Info
  - Landscape Architect or Agent Info
  - Project Description, Size (Landscape Area)
  - Irrigation Flow Requirement
  - Alternative Water Sources (Rain, Grey, Reclaimed)



Project Datasheet

District use only
Project Number:_____
Water Entitlement:_____

Please provide the following information:
Project Name:_____
Assessor Parcel Number(s):_____
Site Address:_____
Meter Numbers (if existing, as found on the meter cap):
_____

Owner Information
Name:_____
Business Name:_____
Mailing Address:_____
Email:_____
Phone Number:_____

Landscape Architect or Agent
Name:_____
Business Name:_____
Mailing Address:_____
Email:_____
Phone Number:_____

Project Description

Maximum operational flow requirement (gallons per minute):_____
Will there be any plantings in previously unplanted areas? ☐ YES ☐ NO

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Soil Management Report



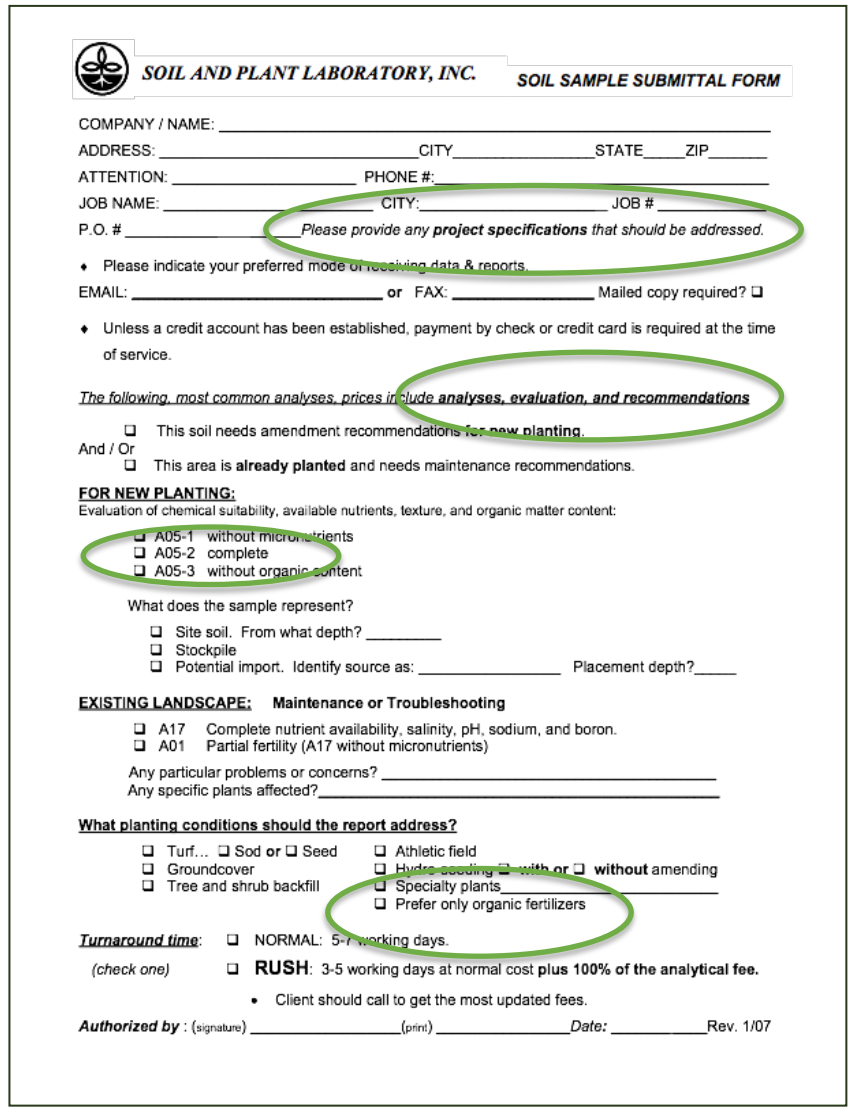


- Representative Soil Sample and Soil Lab Report
  - 2 cups
  - 15% of site for large lots
  - 1 in 7 lots for subdivisions
- Soil Lab Recommendations
- Fertilizer Specifications -Amendments
- …or Budget for bidding if “mass grading” (requiring a grading permit)

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Soil Lab Analysis

- Soil Texture
- Infiltration Rate
- pH
- Total Soluble Salts
- Sodium
- % Organic Matter
- Recommendations!



SOIL AND PLANT LABORATORY, INC. **SOIL SAMPLE SUBMITTAL FORM**

COMPANY / NAME: _____

ADDRESS: _____CITY_____STATE____ZIP_____

ATTENTION: _____ PHONE #:_____

JOB NAME: _____ CITY:_____ JOB # _____

P.O. # _____ *Please provide any **project specifications** that should be addressed.*

♦ Please indicate your preferred mode of receiving data & reports.

EMAIL: _____ **or** FAX: _____ Mailed copy required? ❑

♦ Unless a credit account has been established, payment by check or credit card is required at the time of service.

*The following, most common analyses, prices include **analyses, evaluation, and recommendations***

❑ This soil needs amendment recommendations for new planting.

And / Or

❑ This area is **already planted** and needs maintenance recommendations.

FOR NEW PLANTING:

Evaluation of chemical suitability, available nutrients, texture, and organic matter content:

❑ A05-1 without micronutrients
❑ A05-2 complete
❑ A05-3 without organic content

What does the sample represent?

❑ Site soil. From what depth? _____
❑ Stockpile
❑ Potential import. Identify source as: _____ Placement depth?____

EXISTING LANDSCAPE: **Maintenance or Troubleshooting**

❑ A17 Complete nutrient availability, salinity, pH, sodium, and boron.
❑ A01 Partial fertility (A17 without micronutrients)

Any particular problems or concerns? _____
Any specific plants affected?_____

What planting conditions should the report address?

❑ Turf… ❑ Sod **or** ❑ Seed
❑ Groundcover
❑ Tree and shrub backfill
❑ Athletic field
❑ Hydro seeding ❑ **with or** ❑ **without** amending
❑ Specialty plants_____
❑ Prefer only organic fertilizers

Turnaround time: ❑ NORMAL: 5-7 working days.

(check one) ❑ **RUSH**: 3-5 working days at normal cost **plus 100% of the analytical fee.**

• Client should call to get the most updated fees.

Authorized by : (signature) _____(print) _____***Date:*** _____Rev. 1/07

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pH **Total Salts** **Organic Matter**

City of Pittsburg
65 Civic Ave.

Pittsburg CA 94565

Project : City Hall Bay Friendly
IPM Garden
Contact #2013-09
Contact #2013-09

Soil & Plant Laboratory, Inc.
Leaders in Soil & Plant Testing Since 1946
4741 E. Hunter Ave, Suite A Anaheim, CA 92807 714-282-8777 (phone) 714-282-8575 (fax)
www.soilandplantlaboratory.com

Report No : **13-120-0050**
Purchase Order :
Date Received : 04/30/2013
Date Printed : 05/06/2013
Page : of 1

COMPREHENSIVE SOIL ANALYSIS

Sample Description - Sample ID	Half Sat %	pH	ECe dS/m	NO_3-N ppm	NH_4-N ppm	PO_4-P ppm	K ppm	Ca ppm	Mg ppm	Cu ppm	Zn ppm	Mn ppm	Fe ppm	Organic dry wt.	Lab No.
	TEC	Qual Lime		Sufficiency Factors											
Site Soil	23	7.1	1.2	26	4	20	200	2090	401	3.0	3.4	10	58	3.1	22838
	149	None		0.6		0.7	1.0	0.9	1.2	1.5	0.5	0.6	0.8		

Saturation Extract Values						SAR	Gravel %		Percent of Sample Passing 2 mm Screen					USDA Soil Classification	Lab No.
Ca meq/L	Mg meq/L	Na meq/L	K meq/L	B ppm	SO_4 meq/L		Coarse 5 - 12	Fine 2 - 5	Sand Very Coarse 1 - 2	Coarse 0.5 - 1	Med. to Very Fine 0.05 - 0.5	Silt .002-.05	Clay 0-.002		
3.5	1.9	6.9	0.4	0.48	3.0	4.2	5.9	2.4	1.5	4.7	43	25.1	25.6	Sandy Clay Loam	22838

22838 Chloride (Cl) = 0.939 meq/L

Sodium **Textural Class**

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Waypoint ANALYTICAL

Stopwaste
Report 16-048-0102 Updated

In terms of fertility, nitrogen, phosphorus and potassium are low. Calcium, magnesium and sulfate are sufficient for proper plant nutrition, as are the micronutrients copper, zinc, manganese and iron.

Recommendations

Nitrogen fertilizer is recommended along with soil sulfur in the Concrete sample area. Addition of a composted greenwaste amendment is also recommended in order to provide supplemental nutrients and also help improve soil nutrient and water holding capacity.

To Prepare for Mass Planting:
Drainage of the root zone should be improved by first loosening the top 10 inches of any undisturbed or compacted soil. The following materials should then be evenly spread and thoroughly blended with the top 6 inches of soil to form a homogenous layer:

Amount per 1000 Square Feet **Concrete Sample Area**

5 cubic yards	Composted Greenwaste Amendment*
12 pounds	Soil Sulfur
6 pounds	Blood Meal (12-0-0)
10 pounds	Feather Meal (12-0-0)

*The rate may change based on the analysis of the chosen organic amendment. This rate is based on 270 lbs. of dry weight of organic matter per cubic yard of amendment.

For areas where natives will be installed, the organic amendment and feather meal should be reduced by half and the blood meal should be omitted.

To Prepare Backfill For Trees and Shrubs:
- Excavate planting pits at least twice as wide as the diameter of the rootball.
- Soil immediately below the root ball should be left undisturbed to provide support but the sides and the bottom around the side should be cultivated to improve porosity.
- The top of the rootball should be at or slightly above final grade.
- The top 12 inches of backfill around the sides of the rootball of trees and shrubs may consist of the above amended soil or may be prepared as follows:

3 parts	Site Soil **Concrete Sample Area**
1 part	Composted Greenwaste Amendment *

Uniformly blended with:

Amount per Cubic Yard of Backfill **Concrete Sample Area**

2/3 pound	Soil Sulfur
6 pounds	Blood Meal (12-0-0)
10 pounds	Feather Meal (12-0-0)

- Backfill below 12 inches required for 24 inch box or larger material should not contain the organic amendment, soil sulfur, blood meal or feather meal. Iron sulfate should be incorporated at a 1 1/3 pound rate. **Caution: iron sulfate can stain moist concrete.**
- Ideally a weed and turf free zone should be maintained just beyond the diameter of the planting hole. A 2-4 inch deep layer of coarse mulch can be placed around the tree or shrub. Mulch should be kept a minimum 4 inches from the trunk.

Analysis

"Estimated Infiltration Rate"

Recommendations

Soil & Plant Laboratory, Inc
Leaders in Soil & Plant Testing Since 1946
www.soilandplantlaboratory.com

San Jose Office
May 9, 2013
Report 13-120-0050

City of Pittsburg
65 Civic Ave.
Pittsburg, CA 94565

Attn: Jolan Longway

RE: Bay Friendly/IPM Garden

Background

The soil sample received April 30, 2013 is from an area where a new native, bay-friendly demonstration garden will be installed. The sample was analyzed for horticultural suitability, fertility, and physical characteristics. The results of the analyses are attached. Recommendations for fertilizers and amendments are included below.

Analytical Results and Comments

The reaction of the soil is slightly alkaline at a pH of 7.1 with qualitative lime favorably absent. Salinity (ECe), sodium, chloride and boron are safely low. The SAR shows sodium adequately balanced by soluble calcium and magnesium; this balance is important for soil structure quality and how it relates to water infiltration in this soil.

According to the USDA Soil Classification system, the soil texture of the smaller than 2mm fraction is a sandy clay loam. The amount of organic matter present is moderate at 3.1%. Based on these characteristics, the estimated infiltration rate is favorable at 0.29 inch per hour. Infiltration rates may vary due to the potential differences in compaction across the site.

In terms of fertility, nitrogen is low and phosphorus is fair. Potassium, calcium and magnesium are well supplied. Of the micronutrients, copper, zinc, manganese and iron are all sufficient for proper plant growth.

Recommendations

California native plants are often installed without the use of fertilizers and amendments, since they are well adapted to low fertility soils. However, if these plants will be installed in the fall or next winter, you may wish to improve the nitrogen availability prior to planting. A slow release form of nitrogen can be broadcast over the area of concern and incorporated into the upper 3 inches of existing soil. A combination of 5 pounds of blood meal (12-0-0) and 10 pounds of feather meal (12-0-0) per 1000 square feet shortly before planting would be a good option.

Keep in mind that an application of nitrogen should not be made at the time of planting if these plants will be installed this spring or summer. Nitrogen application at these times can force a flush of top growth that can be at the expense of establishing a deep root system.

To Prepare For Mass Planting:
A composted greenwaste product is recommended to help increase potassium, phosphorus and micronutrient levels. Drainage of the root zone should be improved by first loosening the top 10 inches of any undisturbed or compacted soil. The following materials should then be evenly spread and thoroughly blended with the top 6 inches of soil to form a homogenous layer:

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Infiltration Rates vary by:

14.10.110 Soil Infiltration Rates.

Infiltration Rate (IR)
Inches/Hour

	Percent of Slope				
Soil Texture, Type	**0-4%**	**5-8%**	**8-12%**	**12-16%**	**Over 16%**
Coarse Sand	1.25	1.00	.75	.50	.31
Medium Sand	1.06	.85	.64	.42	.27
Fine Sand	.94	.75	.56	.38	.24
Loamy Sand	.88	.70	.53	.35	.22
Sandy Loam	.75	.60	.45	.30	.19
Fine Sandy Loam	.63	.50	.38	.25	.16
V. Fine Sandy Loam	.59	.47	.35	.24	.15
Loam	.54	.43	.33	.22	.14
Silt Loam	.50	.40	.30	.20	.13
Silt	.44	.35	.26	.18	.11
Sandy Clay	.31	.25	.19	.12	.08
Clay Loam	.25	.20	.15	.10	.06
Silty Clay	.19	.15	.11	.08	.05
Clay	.13	.10	.08	.05	.03

Note: Rates based on full cover. These figures decrease with time and percent of cover. Derived from USDA information.

- Soil Texture
- Slope
- Cover

Expressed in Inches / Hour and
Measured at Field Capacity

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Submittal Requirements

- **“Landscape Documentation Package”**
- Plan Set:
  - Grading?
  - Planting
    - Plant Legend
    - Compost and Mulch Specifications
  - Irrigation and Hydrozone Plans
    - Hydrozone Chart
    - Calculations for MAWA and ETWU
    - Controller Parameters
    - Component Specifications

Each Sheet:
Statements & Signature
APN

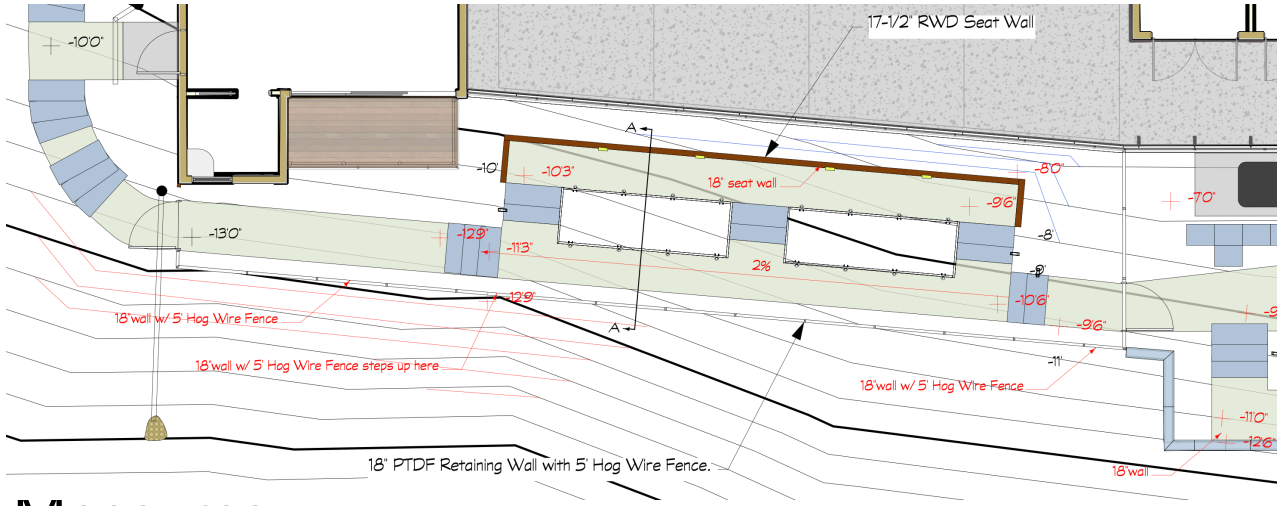
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Landscape Grading Plan

- Minimize soil erosion, runoff, and waste
- Elevations of Graded Slopes
- Existing and Proposed Contours
- Drainage Patterns
- Struture FFE's
- Pad Elevations
- Finish Grade
- Drainage and Stormwater Improvement Measures
  - If Applicable, Stormwater BMP's may be on the Stormwater Pollution Prevention Plan

Recommended Specifications:

- Measures to minimize Compaction during Construction
- Avoid Natural Drainage Areas
- Tree Protection Areas and Specs



Landscape Design Plan

- North Arrow, Scale
- Hardscapes
- Plants and Plant Legend
- Planting Details
- Water Features (“Recirculating!”)
- Compost and Mulch Specs
- Public Recreation Areas and/or Edible Areas
- Areas Irrigated with Rain, Grey, or Reclaimed Water

!!!Statement and Signature!:

“I have complied with the criteria of the ordinance and applied them for the efficient use of water in the landscape design plan.”

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Plant Legend… Check your local WELO!

- Scientific Name
- Common Name
- Number and Size Specified
- WUCOLS Value
- Mature Height and Spread

From ReScape CA Rating:

Quantity	Symbol	Botanical Name	Common Name	Size	Water Use[1]	Reference[1]	Adjacent to Obstruction?	Project Spread[2]	Min-Max Spread[3]	Reference Book[3]	Invasive[4]	Native[5]

% WUCOLS VL, L, M, H Pyrophytic? Type/ Category: **Trees**, Shrubs, etc.?

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Plants…

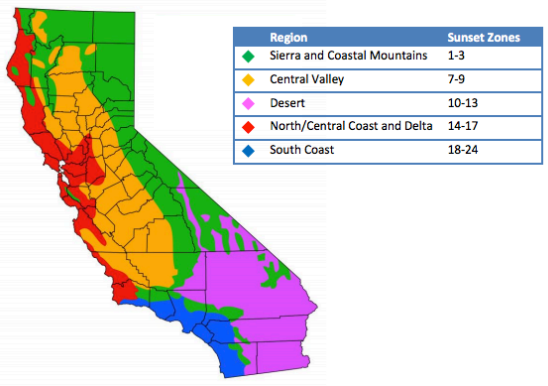
- Invasive (Check your local WELO!)
  - “Should” be avoided (Guidelines)
  - “Strongly Discouraged” (MWELO)

https://www.cal-ipc.org/

Cal-IPC provides science-based tools and information to help land managers and others make the best choices for California. Find some useful links below.

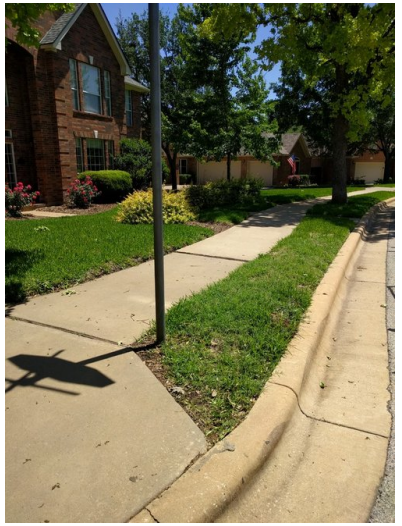
FOR Land Managers	FOR All Californians	FOR Landscape Pros
Inventory of invasive plants	Don't spread invasive species	Tips for responsible landscaping
Best Management Practices	Don't Plant a Pest landscaping alternatives	Checklist for California Landscaping
CalWeedMapper	Plants to avoid in landscaping	Don't Plant a Pest landscaping alternatives
Invasive Plant Management	Volunteer resources	Plants in horticulture

- “Highly Recommended”:
- 1:Protection and Preservation of Native Species and Vegetation
- Suitable for Local Climate
- Water conserving plants “especially local native plants”
- Trees based on Applicable Local Tree Ordinances
- Plants from Local and Regional Landscape Program lists



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Turf…



- Not allowed on slopes greater than 25% against hardscapes
- Not allowed in parkways less than 10’ wide
  - Unless a parking strip used to enter/exit vehicles AND irrigated with sub-surface drip.

  - Remember:
  - No Overhead Spray within 2’ of hardscapes unless it drains into the landscape
  - No Overhead Spray on areas less than 10’ wide



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Fire…

Figure I

HAZARD ASSESSMENT MATRIX

Hazard Points	1	2	3	4	5	6	7	8	Points
Aspect	NE, E	NW, N	SE, W	S	SW				
Slope		0-10		11-20		21-30		31+	
Fuel 0-30	Specimen Garden	Hardwood	Grass	Mostly Grass	Mostly Brush	Pyrophoric Hardwoods Chaparral	Conifer	Conifer w/brush under story	
Fuel 31-100	Grass, Mostly Grass	Mostly Brush		Pyrophoric Hardwoods Chaparral	Conifer with brush under story				

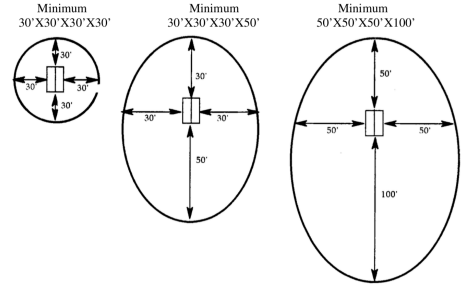
Total Hazard Points _____

Minimum Horizontal Modification Requirement in feet _____

Hazard Points:

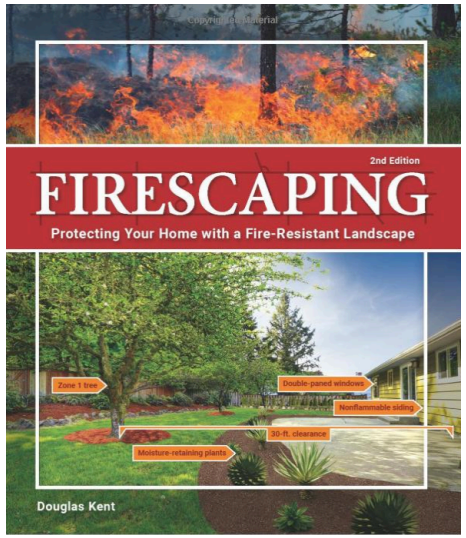
1 2 3 4 5 6 7	8 9 10 11 12 13 14	15 16 17 18 19 20 21 22 23 24 25 >
30x30x30 ft.	30x30x50 ft	50x50x100 ft.

Figure II
Defensible Space Zones



Level 0-10% | Moderate Slope 11-30% | Steep Slope Greater than 30%

- In Fire Prone Areas "the Landscape Design Plan SHALL address fire safety and prevention."
  - Defensible Space Zone
  - Avoid Fire-Prone Plant Materials
  - Avoid Flammable Mulch
  - Check Local WELO!



Fire Prone Species

Latin name	*Common name*
Abies spp.	Fir trees
Adenostoma fasciculatum	Chamise, Greasewood
Adenostoma sparsifolium	Redshank
Arctostaphylos spp.	Manzanitas
Artemesia californica	Sagebrush
Baccharis spp.	Coyote brush
Bambusa spp.	Bamboo
Cortaderia jubata	Jubata grass
Cortaderia selloana	Pampas grass
Cupressus spp.	Cypress species
Cytisus scoparius	Scotch broom
Eucalyptus globulus	Blue gum eucalyptus
Genista monspessulanus	French broom
Juniperus communis	Common juniper
Juniperus flaccida	Weeping juniper
Pennisetum spp.	Fountaingrasses
Picea spp.	Spruces
Pinus attenuata	Knobcone pine
Pinus coulteri	Coulter pine
Pinus muricata	Bishop pine
Pinus radiata	Monterey pine
Pinus sabiniana	Gray pine
Pinus serotina	Pond pine
Pinus sylvestris	Scots pine
Pinus torreyana	Torrey pine
Rosmarinus officinalis	Rosemary
Spartium junceum	Spanish broom
Thuja spp.	Arborivitae
Tsuga spp.	Hemlock
Ulex europea	Gorse

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Compost & Mulch

GUARANTEED ANALYSIS

TOTAL NITROGEN (N)	4.0%	Derived from: Fish Bone Meal, Soybean Meal, Langbeinite, Feather Meal, Rock Phosphate, Greensand and Kelp Meal
0.6% Water Soluble Nitrogen		
3.4% Water Insoluble Nitrogen		
AVAILABLE PHOSPHATE (P_2O_5)	2.0%	ALSO CONTAINS NON-PLANT FOOD
SOLUBLE POTASH (K_20)	4.0%	INGREDIENT(S):
		2.5% Humic Acids derived from Leonardite

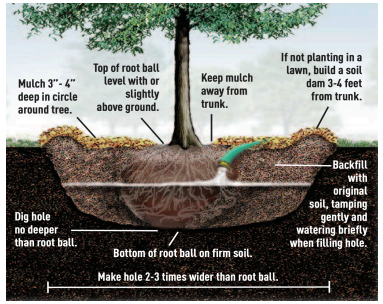
Endomycorrhizal fungi: Glomus intraradices, Glomus mosseae, Glomus aggregatum, Glomus etunicatum – 0.3 prop/gm each (544 prop/lb total).
Ectomycorrhizal fungi: Rhizopogon villosullus, Rhizopogon luteolus, Rhizopogon amylopogon, Rhizopogon fulvigleba – 56 prop/gm each; Pisolithus tinctorius – 5,500 prop/gm; Scleroderma cepa, Scleroderma citrinum – 137 prop/gm each (2.7 million prop/lb total).

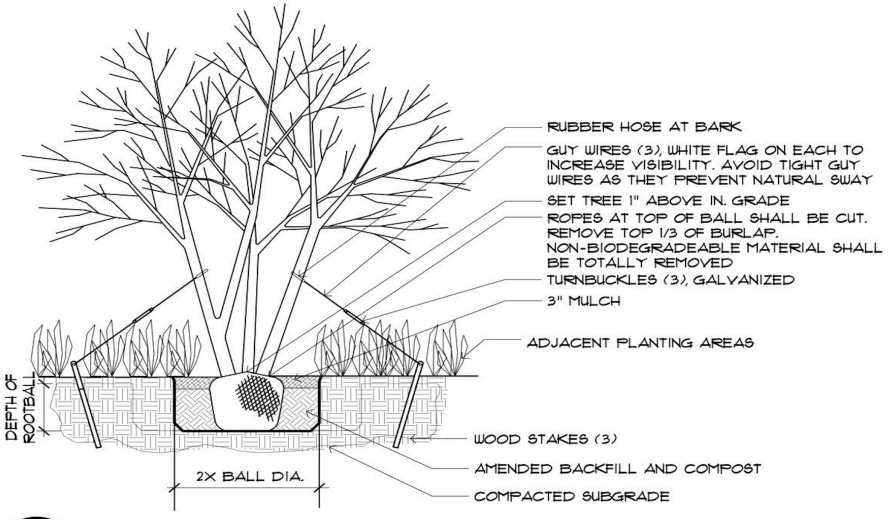
Pure Element	Multiply by	Oxide form	Multiply by	Pure Element
N	4.426	NO3	0.226	N
N	1.288	NH4	0.776	N
P	2.292	P2O5	0.436	P
K	1.205	K2O	0.83	K
Ca	1.399	CaO	0.715	Ca
Mg	1.658	MgO	0.603	Mg
S	2.996	SO4	0.334	S
S	2.497	SO3	0.4	S

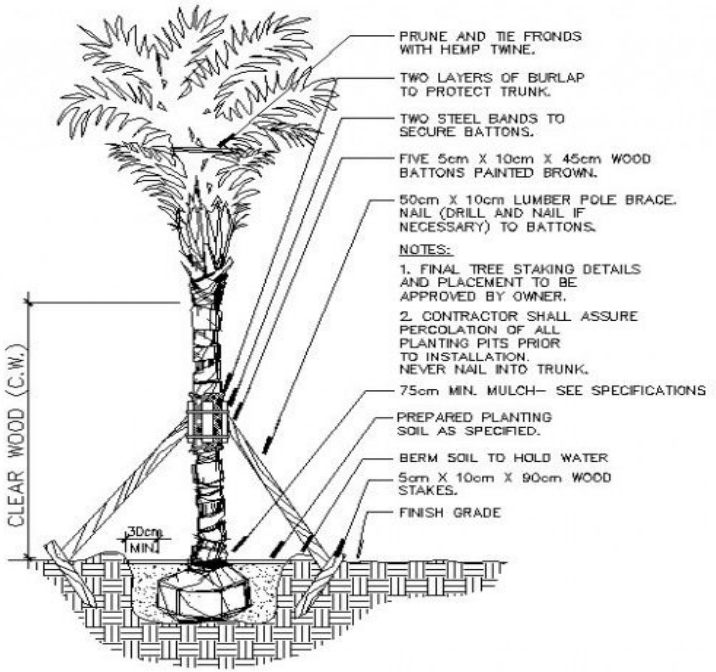
- Soil Analysis recommendations on plan and/or in specs: Amendments.
  - Organic? OMRI Listed? Favorites?: Calculate N,P,K
- Check your Local WELO!
- Sheet Mulch: No need to Incorporate
- Soil shall be de-compacted to a “Friable” condition
- 4 Cu. Yds. / 1000 sq. ft. (about 1.62”), -Or 6% based on lab report. Some WELO’s: 6”
- “What is appropriate for the plants”
- MWELO: 6”, some WELO’s: 8” “6-8”? Tree Roots?: “may waive tillage”.
- Mulch: ”Mulch Repository”? Native bee habitat? (5%)
- 3” Mulch in all planting areas. About 9.26 CY/1000 Sq. Ft. Inorganic?
- Organic may be prohibited. 5’ from structure? Inorganic at 3”. -All Exposed Soil.

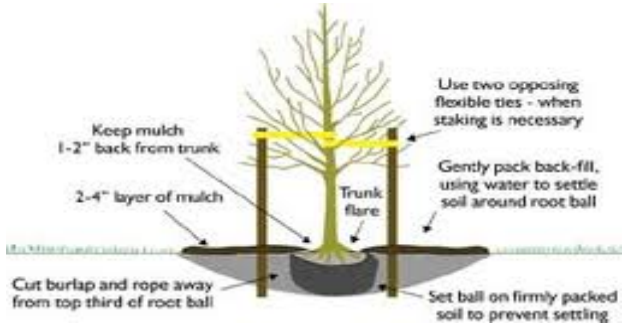
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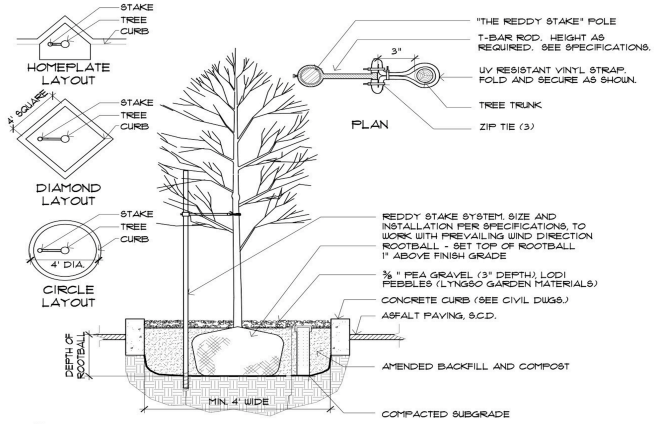
Planting Details

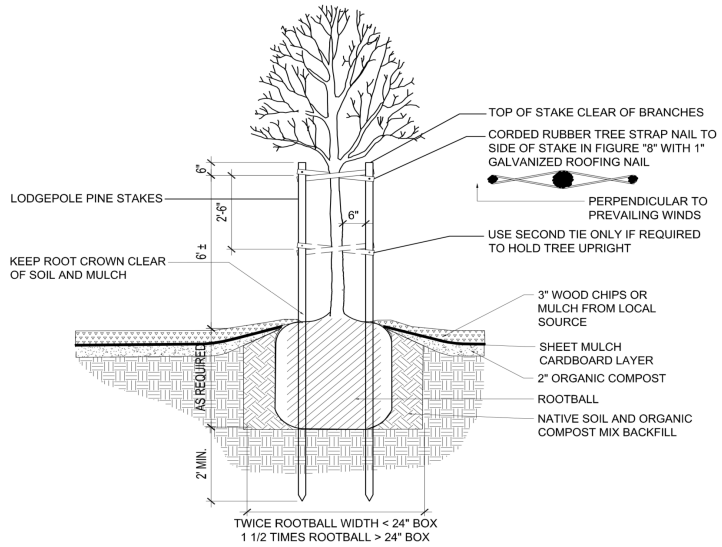












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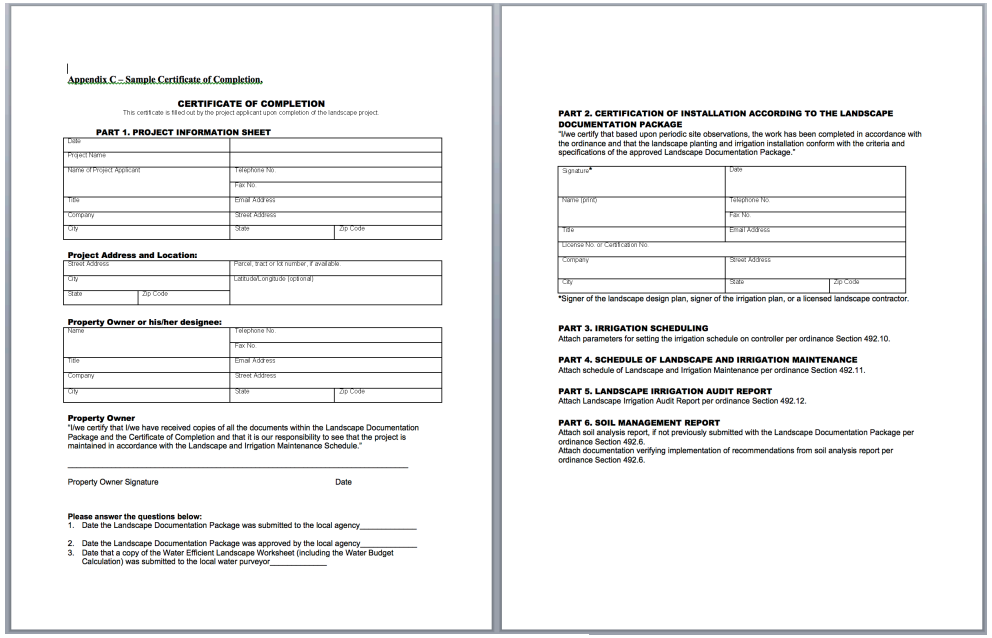
Planting Notes

LANDSCAPE PLANTING NOTES:
A Soil Management Report shall be completed by the project applicant or his/her designee as follows:
Submit soil samples to a laboratory for analysis and recommendations and make these available in a timely manner to design professionals to make adjustments to the amendments. Amendments shall be incoroporated according to the recommendations of the soil report and what is appropriate for the plants selected. if a grading permit is required, the soil analysis report shall be submitted to the City with the Certificate of Completion.
Soil analysis shall include: Texture, pH, Soluble Salts, Sodium, % Organic Matter.
Infiltration Rates shall be determined by laboratory test or soil soil texture infiltration rate table.
Recommendations shall be for organic amendments.
Existing soil is not to be worked while saturated.
Compacted soil from construction in areas to be planted are to be decompacted to a minimum depth of 8" before planting. Do not disturb sloped areas if erosion may be eminent.
Fertilizers and Soil Ammendments prohibited by OMRI are not to be used on site.
All planting areas and areas with exposed soils are to receive a minimum of 3" of organic wood chip mulch.
Shredded bark shall NOT be used.
Compost shall come from a supplier whose products are tested by the US Composting Council.
All Compost and Mulch are to come from a local supplier (Within 100 miles)
Compost is to be incorporated to a minimum depth of 8" at the minimum rate of 6 CY / 1000 Sq. FT. over all planting areas and/or until soil organic mater reaches a minimum of 6% in the top 6" of soil.
Compost is to be incorporated into most planting hole backfill mixes as appropriate for maximum plant health and soil fertility.
Ammendments Shall be budgeted at 4 lbs. each of blood and bone meal per 1000 sq. ft. and adjusted as per Soil Management Report.
All planting holes shall be dug 2-3x root ball diameter and 1x root ball depth.
Crowns of plants shall sit approx. 1" above final grade going across slope.
All 5-gallon and smaller plants to be planted into gopher cages.

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Prepare for Certificate of Completion Appendix C

- Verify: Documentation:
  - Receipts
  - Photos



Appendix C – Sample Certificate of Completion.

CERTIFICATE OF COMPLETION

This certificate is filled out by the project applicant upon completion of the landscape project.

PART 1. PROJECT INFORMATION SHEET

Date	
Project Name	
Name of Project Applicant	Telephone No.
	Fax No.
Title	Email Address
Company	Street Address
City	State / Zip Code

Project Address and Location:

Street Address	Parcel, tract or lot number, if available.
City	Latitude/Longitude (optional)
State / Zip Code	

Property Owner or his/her designee:

Name	Telephone No.
	Fax No.
Title	Email Address
Company	Street Address
City	State / Zip Code

Property Owner

"I/we certify that I/we have received copies of all the documents within the Landscape Documentation Package and the Certificate of Completion and that it is our responsibility to see that the project is maintained in accordance with the Landscape and Irrigation Maintenance Schedule."

Property Owner Signature Date

Please answer the questions below:

1. Date the Landscape Documentation Package was submitted to the local agency_____
2. Date the Landscape Documentation Package was approved by the local agency_____
3. Date that a copy of the Water Efficient Landscape Worksheet (including the Water Budget Calculation) was submitted to the local water purveyor_____

PART 2. CERTIFICATION OF INSTALLATION ACCORDING TO THE LANDSCAPE DOCUMENTATION PACKAGE

"I/we certify that based upon periodic site observations, the work has been completed in accordance with the ordinance and that the landscape planting and irrigation installation conform with the criteria and specifications of the approved Landscape Documentation Package."

Signature*	Date
Name (print)	Telephone No.
	Fax No.
Title	Email Address
License No. or Certification No.	
Company	Street Address
City	State / Zip Code

*Signer of the landscape design plan, signer of the irrigation plan, or a licensed landscape contractor.

PART 3. IRRIGATION SCHEDULING
Attach parameters for setting the irrigation schedule on controller per ordinance Section 492.10.

PART 4. SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE
Attach schedule of Landscape and Irrigation Maintenance per ordinance Section 492.11.

PART 5. LANDSCAPE IRRIGATION AUDIT REPORT
Attach Landscape Irrigation Audit Report per ordinance Section 492.12.

PART 6. SOIL MANAGEMENT REPORT
Attach soil analysis report, if not previously submitted with the Landscape Documentation Package per ordinance Section 492.6.
Attach documentation verifying implementation of recommendations from soil analysis report per ordinance Section 492.6.

PART 6. SOIL MANAGEMENT REPORT
Attach soil analysis report, if not previously submitted with the Landscape Documentation Package per ordinance Section 492.6.
Attach documentation verifying implementation of recommendations from soil analysis report per ordinance Section 492.6.

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Landscape Irrigation Plan

- Hydrozone Plan and Table
- Irrigation Plan and Legend
- Specifications
- Details
- Irrigation Notes
- Calculations: MAWA & ETWU

!!!Statement and Signature!:

"I have complied with the criteria of the ordinance and applied them for the efficient use of water in the landscape irrigation plan."

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Hydrozones

Large Hydrozones may have more than one valve / station.

- "A portion of the landscape having plants with similar water needs…"
  - WUCOLS Values (Plant Factors)
  - Solar Exposure
  - Solar Aspect
  - Slope
  - Root Depth
  - Soil Type (Textural Class)
  - Containers? Microclimate?
  - Trees "Where feasible" -Severe Drought Preparation (Resilience)!

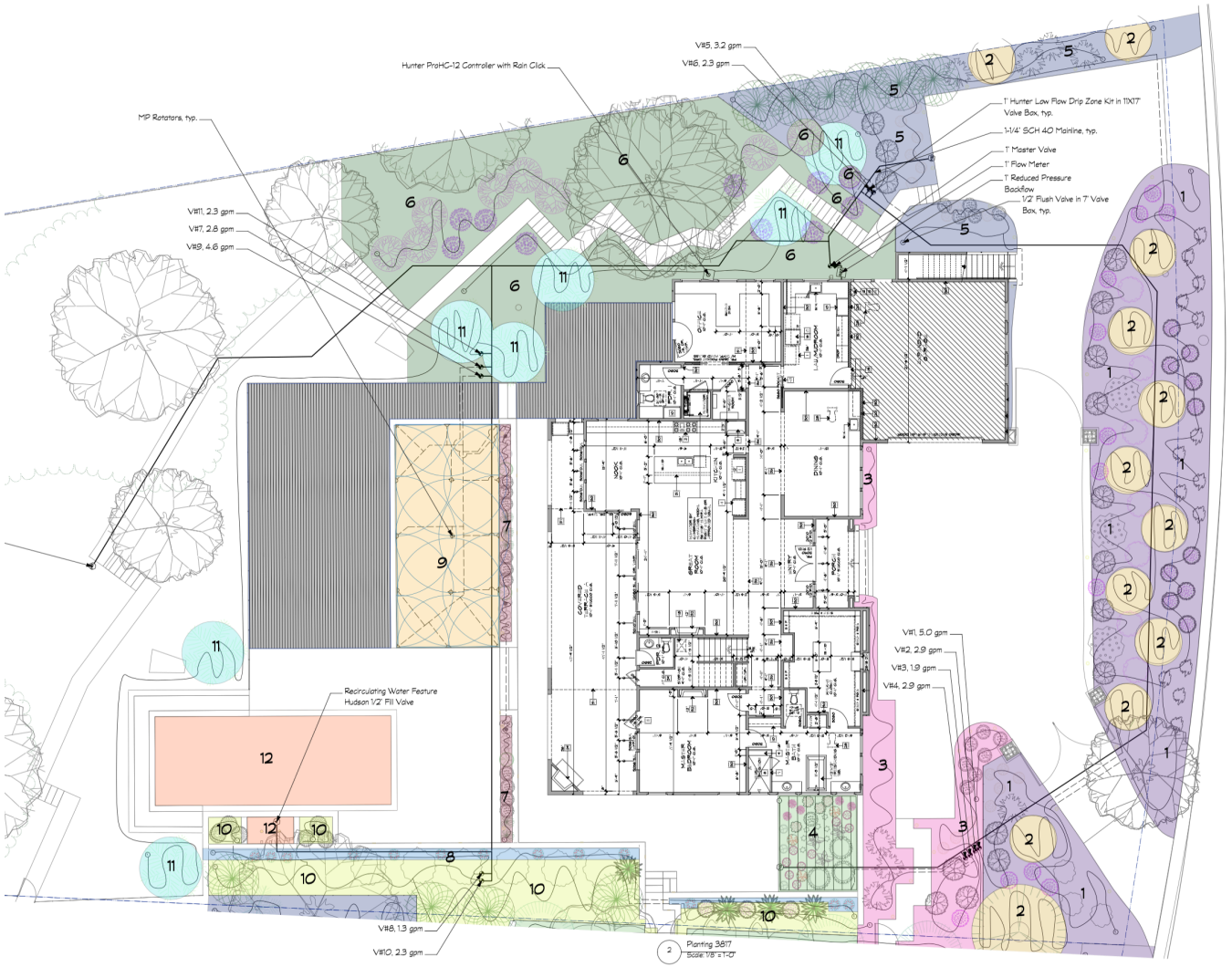
Prepare in Advance for "**Controller Parameters**"

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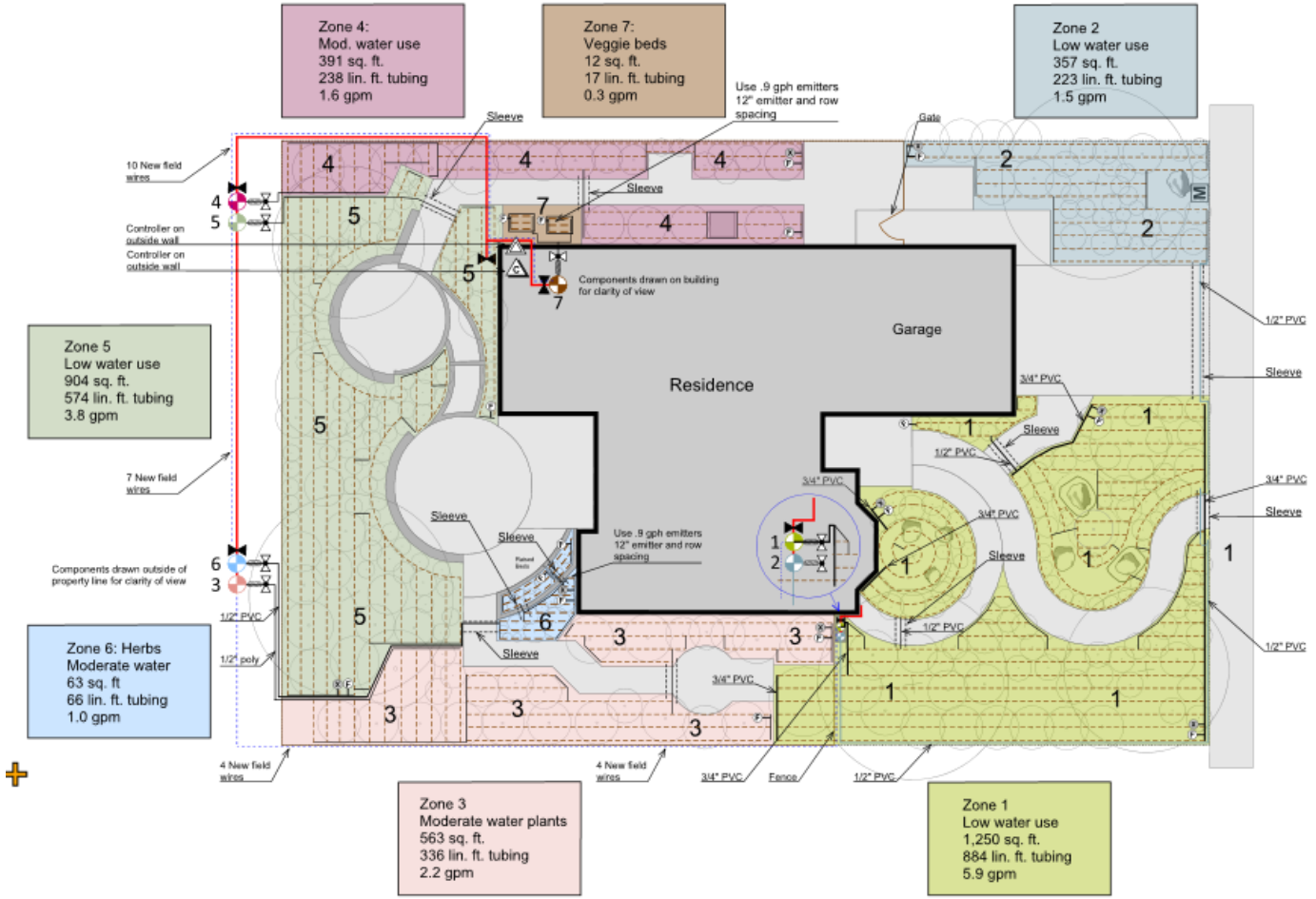
Hydrozone Plan:

- Number
- Square Footage
- WUCOLS Value
- Design Pressure
- Flow in GPM
- Special Landsacpe Areas

Valve Location
Valve Size
Length of drip pipe in zone



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Source: Lori Palmquist, Puddle-Stompers
puddle-stompers.com

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Hydrozone Table

- Hydrozone #
- Valve / Station #
- Description (Where is it?)
- Irrigation Type (Drip or Spray?)
- Square footage
- % of Irrigated Area
- Water Use (WUCOLS Value)
- Component Notes
- Manufacturer and Product
- Emitter Spacing and Pipe Spacing
- Application Rate (GPH) (per outlet)
- Total Zone Flow Rate in GPM

Hydrozone and Valve Chart

										Emitters Per Plant#				
										15-gal	5-gal	1-gal		
Hydrozone	Valve / Station #	Description	Irrigation Type	Square Feet	% of Irrigated area	Water Use	Component	Irrigation Notes	Application Rate in GPH	5	3	2	Total Emitters	Zone GPM
SLA	1	Fruit Trees	Drip	280	0.59%	SLA	18" Tree well Bubblers	18" Tree well Bubblers	0.25				0	3.50
SLA	2	Raised Beds, house side	Drip	128	0.27%	SLA	Techline EZ	12mm inline tubing, 6" emitters, 18" apart	0.4				0	2.85
Raised Bed	3	Cut Flower Bed	Drip	36	0.08%	Medium	Techline EZ	12mm inline tubing, 6" emitters, 18" apart	0.4				0	0.61
TREES	4	Trees at Horse Corral, Fenceline	Drip	3399	7.11%	Low	Hunter HE 020 B	Point Source Drip	2	24			120	4.00
Shrubs & Perennials	5	Gazebo Entry Path	Drip	992	2.07%	Low	Techline CV	18" O.C. emitters, 18" O.C. pipes	0.6				0	3.88
SLA	6	Raised Beds, Fence Side	Drip	128	0.27%	SLA	Techline EZ	12mm inline tubing, 6" emitters, 18" apart	0.4				0	2.85
Arbor Vines	7	Arbor Vines behind pool house	Drip	85	0.18%	Low	Hunter HE 020 B	Point Source Drip	4		10		30	2.00
TREES	8	Trees/Screen at Pool House Fence	Drip	875	1.83%	Low	Hunter HE 020 B	Point Source Drip	2	4	23		89	2.97
Existing	9	Existing Photinia at side fence	Drip	574	1.20%	Medium	Hunter HE 020 B	Point Source Drip	2		35		105	3.50
Raised Bed	10	Pool House Vege Garden side Plantings	Drip	1000	2.09%	Low	Techline CV	18" O.C. emitters, 18" O.C. pipes	0.6				0	3.45
TREES	11	Trees at Poolhouse, both sides	Drip	1270	2.65%	Medium	Hunter HE 020 B	Point Source Drip	2	15			75	2.50
Shrubs & Perennials	12	Pool Fenceside plantings	Drip	974	2.04%	Low	Hunter HE 020 B	Point Source Drip	2		7	42	105	3.50
TREES	13	Trees along pool fenceline screen by pool eq	Drip	1592	3.33%	Low	Hunter HE 020 B	Point Source Drip	2	8	18		94	3.13
TREES	14	Trees along lower gravel pathway towards gate	Drip	2566	5.36%	Low	Hunter HE 020 B	Point Source Drip	2	4	20	12	104	3.47
Meadow	15	Meadow areas Along gravel Path to lower gate	Drip	1481	3.10%	Low	Techline CV	24" O.C. Emitters, 24" O.C. Pipes	0.6				0	2.18
Meadow	16	Meadow area in Middle between bocce and vines	Drip	2067	4.32%	Low	Techline CV	24" O.C. Emitters, 24" O.C. Pipes	0.6				0	2.85
Meadow	17	Meadow area behind vines	Drip	1267	2.65%	Low	Techline CV	24" O.C. Emitters, 24" O.C. Pipes	0.6				0	2.03
Shrubs & Perennials	18	Bocce Lavender and hillside below pool wall	Drip	1998	4.13%	Low	Techline CV	18" O.C. emitters, 18" O.C. pipes	0.6				0	8.98
TREES	19	Bocce area Redbuds	Drip	347	0.72%	Low	Hunter HE 020 B	Point Source Drip	2	6			30	1.00
Shrubs & Perennials	20	Bocce area behind court and end planter	Drip	986	2.04%	Low	Hunter HE 020 B	Point Source Drip	2		10	23	76	2.53
Turf	21	Turf in Pool Area, water feature side	Spray	512	1.06%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	3.04
Turf	22	Turf in Pool Area, Pool House side	Spray	407	0.84%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	4.93
Shrubs & Perennials	23	Pool Wall Border	Drip	216	0.45%	Low	Hunter HE 020 B	Point Source Drip	2			40	80	2.67
Shrubs & Perennials	24	Plantings below Vines	Drip	388	0.80%	Low	Hunter HE 020 B	Point Source Drip	2		2	35	76	2.53
TREES	25	Trees in lower corner and back fence	Drip	2840	5.88%	Low	Hunter HE 020 B	Point Source Drip	2	4	13	17	93	3.10
SLA: Grape Vines	26	Vines, House Side, 3 rows	Drip	723	1.50%	SLA	Hunter HE 010 B	Point Source Drip	1		68		204	3.40
SLA: Grape Vines	27	Vines, Meadow Side, 4 rows	Drip	114	2.31%	SLA	Hunter HE 010 B	Point Source Drip	1		110		330	5.50
Existing	28	Existing shrubs at driveway, Fence side	Drip	116	2.31%	Low	Hunter HE 020 B	Point Source Drip	2		40		120	4.00
TREES	29	Redwoods and old trees at lower driveway & Parking	Drip	1710	3.54%	Medium	Hunter HE 020 B	Point Source Drip	2	17	15		130	4.33
Shrubs & Perennials	30	Plants around side lawn, by parking, and below lower path	Drip	956	1.98%	Low	Hunter HE 020 B	Point Source Drip	2	4	6	58	174	5.78
Shrubs & Perennials	31	Plants below rear deck	Drip	1178	2.44%	Low	Techline CV	18" O.C. emitters, 18" O.C. pipes	0.6				0	4.91
Shrubs & Perennials	32	Plants between pool house and house along path	Drip	1473	3.05%	Low	Hunter HE 020 B	Point Source Drip	2			137	274	9.13
Trees	33	Japanese Maples	Drip	314	0.65%	Medium	Hunter HE 020 B	Point Source Drip	2	8			40	1.33
Shrubs & Perennials	34	House Perimeter, Front and pool sides, planter	Drip	995	2.06%	Medium	Hunter HE 020 B	Point Source Drip	2		34	46	194	6.47
Turf	35	Front Lawn, creekside	Spray	1828	2.75%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	5.95
Turf	36	Front Lawn, Parking Entry and Redwoods	Spray	732	1.51%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	3.72
Turf	37	Front Lawn, Front Door	Spray	950	1.97%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	4.21
Shrubs & Perennials	38	Barn Entry Plantings, steel containers, under RWDs	Drip	2828	5.85%	Low	Hunter HE 020 B	Point Source Drip	2	25			125	4.17
Existing	39	Barn Parking -Xylosma hedge	Drip	600	1.24%	Medium	Hunter HE 020 B	Point Source Drip	2		35		105	3.50
Shrubs & Perennials	40	Driveway, Side Entry, Deck plantings, guest bed planter	Drip	1187	2.46%	Low	Hunter HE 020 B	Point Source Drip	2		22	62	190	6.33
Existing Trees	41	Barn Parking Entry and existing fenceline trees	Drip	578	1.20%	Medium	Hunter HE 020 B	Point Source Drip	2	25		0	125	4.17
Existing lg shrubs	42	Existing shrubs at entry road, stable side	Drip	1898	3.93%	Low	Hunter HE 020 B	Point Source Drip	2	25			125	4.17
Shrubs & Perennials	43	Plantings at side entry	Drip	930	1.92%	Low	Techline CV	18" O.C. emitters, 18" O.C. pipes	0.6				0	2.63
Turf	44	Lawn, side deck area by Redwoods	Spray	670	1.39%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	9.73
Turf	45	Lawn side deck area by parking	Spray	637	1.32%	High	MP Rotators	40 psi 6" pop up bodies	0.45				0	6.55
Water	N/A	Pool/Spa	N/A	648		High							0	0.00
Water	N/A	Wate Feature	N/A	12		High							0	0.00
													0	0.00
													0	0.00

Point Source? How many emitters per each size plant?

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Reference ET

- Cool Season Grass, like Fescue
- Mowed to 6”
- Extremely well watered
- 100 % 1.0 Plant Factor, Plant Coefficient Reference ET

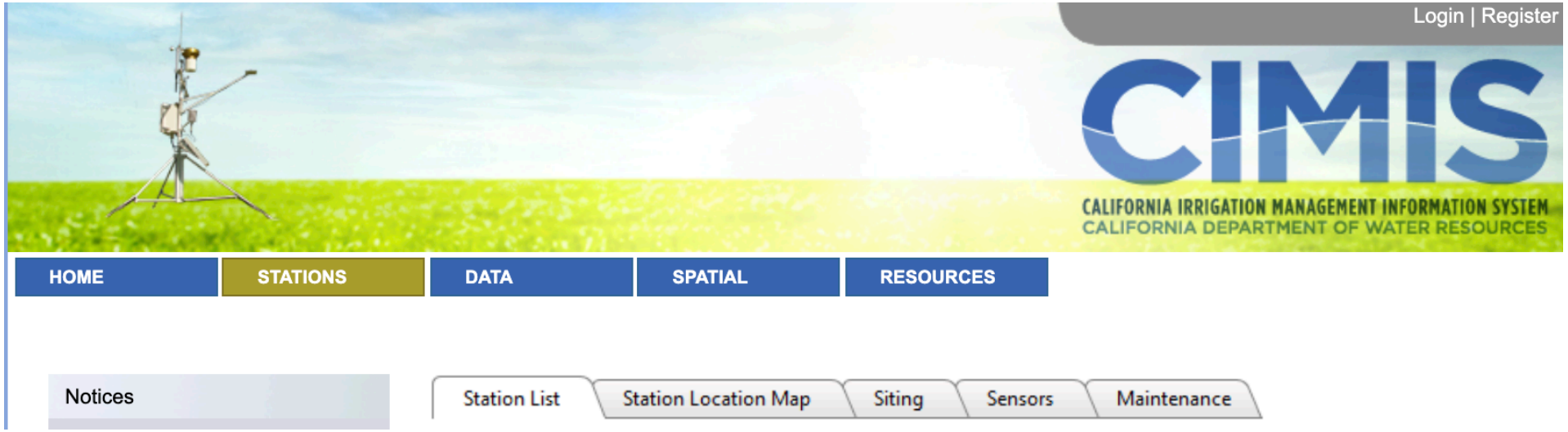
Surface Evaporation

+

Plant Transpiration



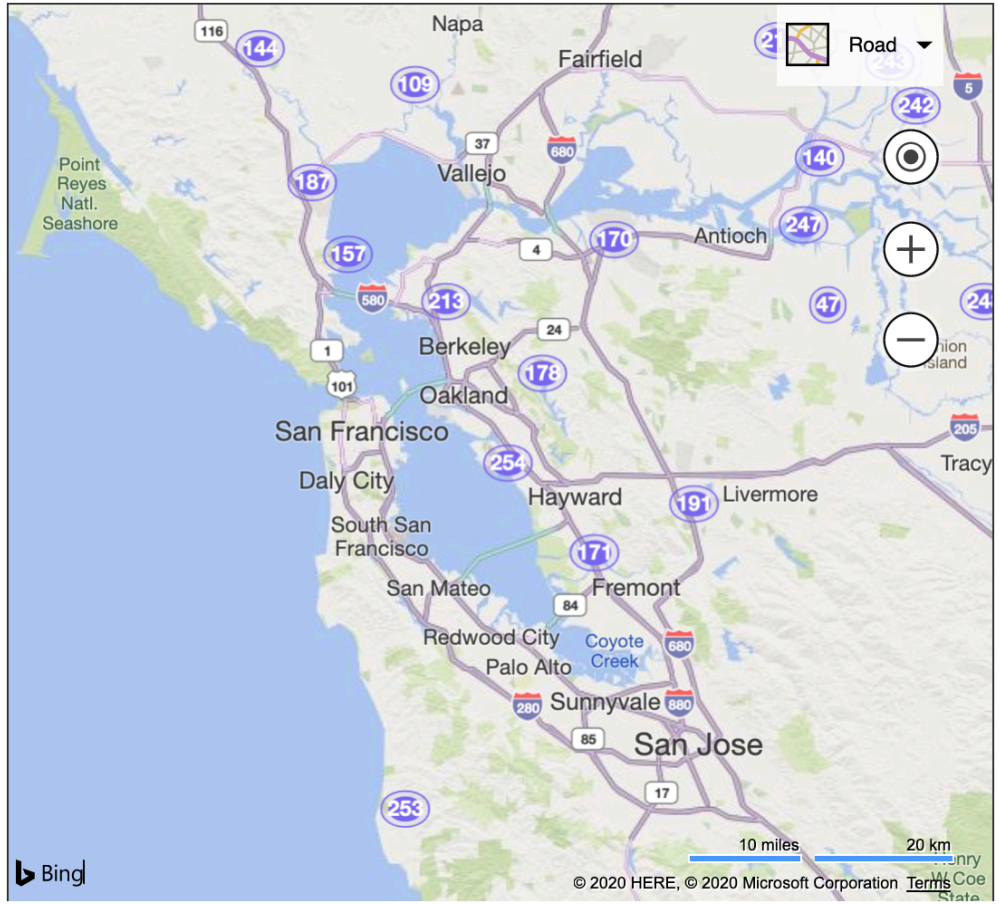
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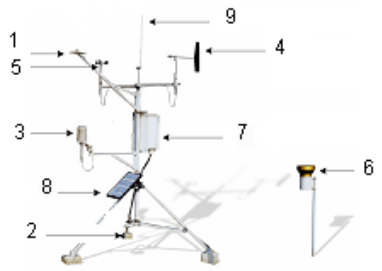


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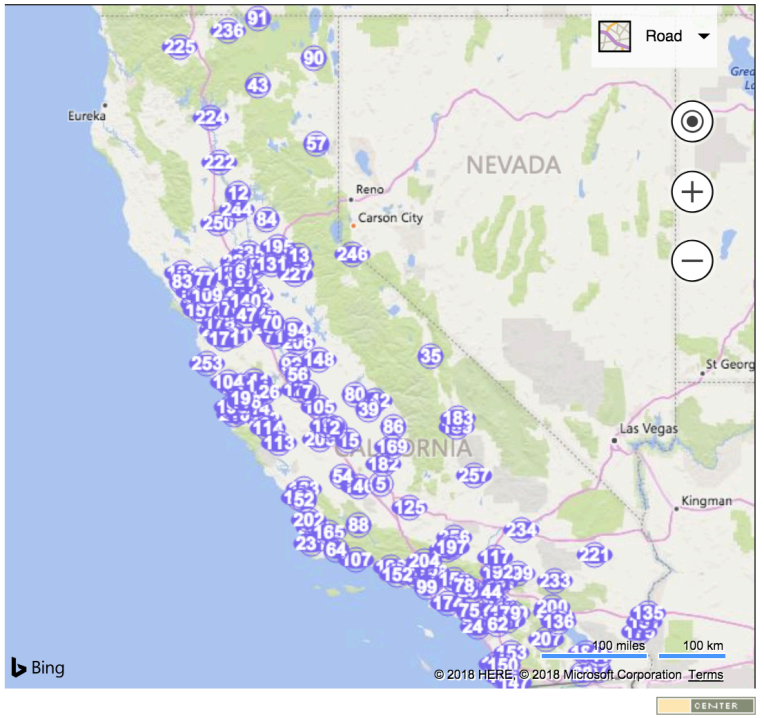


1 = Pyranometer 2= Soil Thermister
3 = Air Temp & Humidity
4 = Wind Vane 5 = Anemometer
6 = Rain Gauge 7 = Datalogger
8 = Solar Panel 9 = Lightning Rod



This Bing Map shows CIMIS station coordinate points. You can zoom in and out to see the exact station locations. Click the station marker for more detailed information.

- Active Stations
- Inactive Stations



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A Deeper Dive into Stakeholder Roles

Pescadero - San Francisco Bay - Station 253

Date	Hour (PST)	ETo (in)	Precip (in)	Sol Rad (Ly/day)	Vap Pres (mBars)	Air Temp (°F)	Rel Hum (%)	Dew Point (°F)	Wind Speed (mph)	Wind Dir (0-360)	Soil Temp (°F)
2/27/2020	0100	0.00	0.00	0	7.4	39.3	90	36.6	1.3	108	50.2
	0200	0.00	0.00	0	7.6	39.8	92	37.5	1.6	96	49.7
	0300	0.00	0.00	0	7.5	39.3	92	37.3	1.8	99	49.3
	0400	0.00	0.00	0	7.2	37.8	94	36.1	1.2	98	48.9 Y
	0500	0.00	0.00	0	7.1	37.1	95	35.8	1.3	135	48.6 Y
	0600	0.00	0.00	0	7.2	37.0	96	36.1	1.6	92	48.2 Y
	0700	0.00	0.00	9	7.2	36.9	97	36.2	1.4	88	47.9 Y
	0800	0.00	0.00	103	8.3	39.9	99	39.7	1.8	76	47.6 Y
	0900	0.00	0.00	549	11.1	50.8	88	47.3	1.8	91	47.3 Y
	1000	0.01	0.00	860	11.7	61.6	62	48.6	1.6	296	47.1 Y
	1100	0.02 Y	0.00	1297	12.3	69.8 Y	49 Y	50.0 Y	2.8	320	47.2 Y
	1200	0.02	0.00	1413	11.4	67.9	49	47.9	5.2	284	47.5 Y
	1300	0.02	0.00	1522	12.2	66.6	55	49.9	4.6	267	48.1 Y
	1400	0.02	0.00	1415	12.6	68.7	53	50.7	4.7	270	49.0
	1500	0.01	0.00	1199	14.0	66.4	63	53.5	4.6	238	50.0
	1600	0.01	0.00	803	14.3	63.6	71	54.0	4.7	224	51.0
	1700	0.00	0.00	405	13.7	60.2	77	52.9	3.3	223	51.8
	1800	0.00	0.00	104	13.1	56.7	83	51.7	3.3	251	52.4
	1900	0.00	0.00	2	11.8	51.7	90	48.8	1.2	105	52.6
	2000	0.00	0.00	0	10.9	48.5	94	46.7	1.2	114	52.6
	2100	0.00	0.00	0	10.2	46.4	95	45.2	1.5	116	52.3
	2200	0.00	0.00	0	10.0	45.4	97	44.6	1.3	105	51.9
	2300	0.00	0.00	0	9.7	44.3	98	43.7	1.7	111	51.5
	2400	0.00	0.00	0	9.6	43.8	99	43.4	1.2	98	51.1
Tots/Avgs		0.11	0.00	403	10.3	50.8	82	44.8	2.4	162.7	49.7

Oakland Metro - San Francisco Bay - Station 254

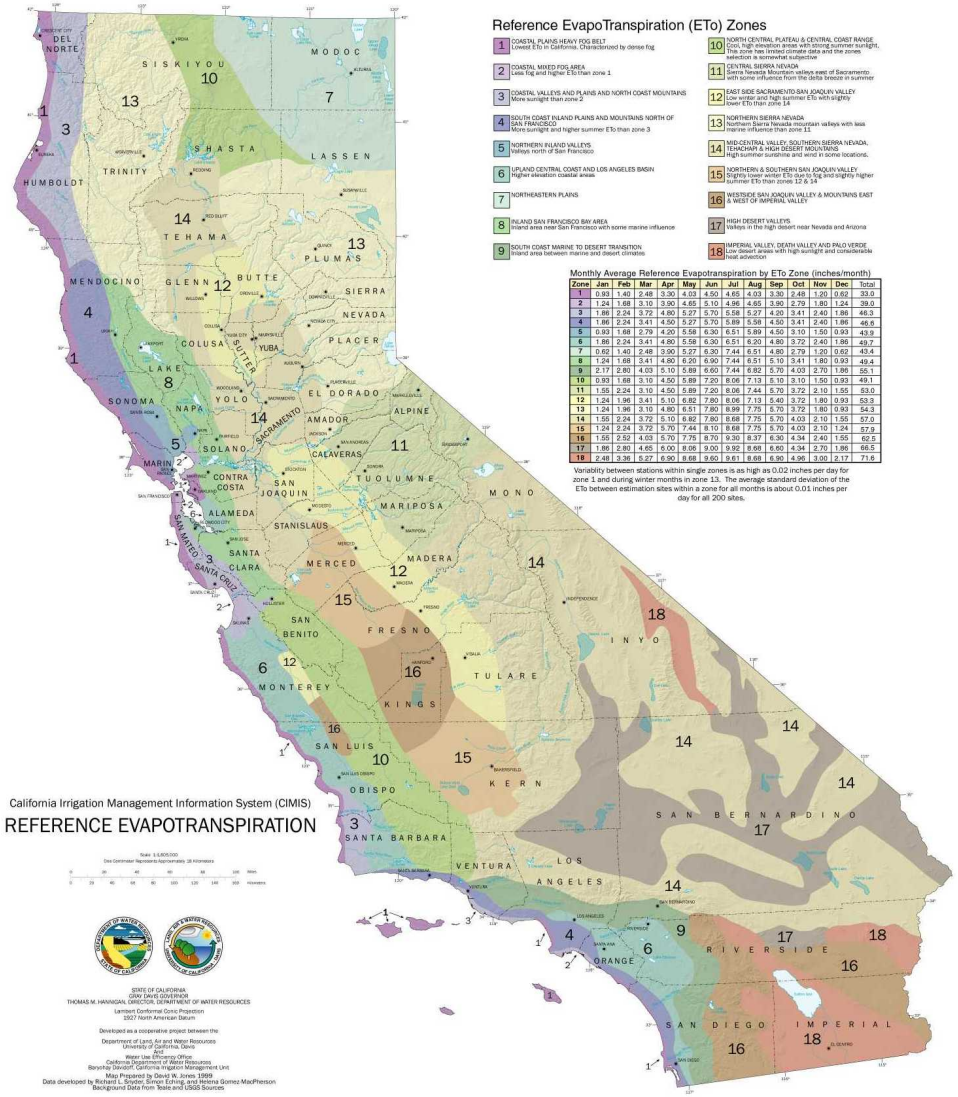
Date	Hour (PST)	ETo (in)	Precip (in)	Sol Rad (Ly/day)	Vap Pres (mBars)	Air Temp (°F)	Rel Hum (%)	Dew Point (°F)	Wind Speed (mph)	Wind Dir (0-360)	Soil Temp (°F)
2/27/2020	0100	0.00	0.04	0	9.6	46.4	90	43.6	1.7	31	53.1
	0200	0.00	0.00	0	9.5	45.9	90	43.2	2.3	62	52.8
	0300	0.00	0.00	0	9.0	44.3	91	41.8	1.3	50	52.5
	0400	0.00	0.00	0	8.6	42.6	92	40.5	1.3	27	52.2
	0500	0.00	0.00	0	8.4	41.8	93	40.0	1.2	274	51.9
	0600	0.00	0.00	0	8.8	42.7	95	41.3	1.7	49	51.6
	0700	0.00	0.00	13	8.9	42.7	95	41.4	1.9	78	51.4
	0800	0.00	0.00	279	10.5	47.2	95	45.8	1.3	23	51.2
	0900	0.01	0.00	677	13.6	58.3	82	52.8	1.5	236	51.0
	1000	0.01	0.00	1049	11.4	60.6	63	48.0	5.0	194	51.3
	1100	0.01	0.00	1301	12.2	61.4	65	49.7	6.1	191	52.0
	1200	0.02	0.00	1502	11.8	64.5	57	49.0	4.9	197	53.0
	1300	0.02	0.00	1431	12.1	68.1	52	49.6	4.6	224	54.1
	1400	0.02	0.00	1349	12.2	70.2	48	49.8	5.5	231	55.1
	1500	0.02 Y	0.00	1245	11.6	73.1 Y	42 Y	48.4 Y	5.1	252	55.8
	1600	0.01 Y	0.00	941	11.8	74.6 Y	40 Y	48.9 Y	5.9	253	56.3
	1700	0.01 Y	0.00	432	11.7	73.5 Y	42 Y	48.8 Y	6.2	280	56.5
	1800	0.00 Y	0.00	98	12.0	68.6 Y	50 Y	49.4 Y	3.8	281	56.4
	1900	0.00	0.00	1	12.9	61.4	70	51.4	2.2	175	56.1
	2000	0.00	0.00	1	12.2	55.9	80	49.7	1.4	12	55.7
	2100	0.00	0.00	0	11.4	54.5	78	48.0	1.3	267	55.2
	2200	0.00	0.00	1	11.6	53.6	83	48.4	2.6	339	54.8
	2300	0.00	0.00	1	11.7	54.2	82	48.7	2.0	158	54.4
	2400	0.00	0.00	1	10.9	50.8	86	46.8	1.3	2	54.1
Tots/Avgs		0.13	0.04	430	11.0	56.5	73	46.9	3.0	161.9	53.7

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Zone	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0.93	1.40	2.48	3.30	4.03	4.50	4.65	4.03	3.30	2.48	1.20	0.62	33.0
2	1.24	1.68	3.10	3.90	4.65	5.10	4.96	4.65	3.90	2.79	1.80	1.24	39.0
3	1.86	2.24	3.72	4.80	5.27	5.70	5.58	5.27	4.20	3.41	2.40	1.86	46.3
4	1.86	2.24	3.41	4.50	5.27	5.70	5.89	5.58	4.50	3.41	2.40	1.86	46.6
5	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93	43.9
6	1.86	2.24	3.41	4.80	5.58	6.30	6.51	6.20	4.80	3.72	2.40	1.86	49.7
7	0.62	1.40	2.48	3.90	5.27	6.30	7.44	6.51	4.80	2.79	1.20	0.62	43.4
8	1.24	1.68	3.41	4.80	6.20	6.90	7.44	6.51	5.10	3.41	1.80	0.93	49.4
9	2.17	2.80	4.03	5.10	5.89	6.60	7.44	6.82	5.70	4.03	2.70	1.86	55.1
10	0.93	1.68	3.10	4.50	5.89	7.20	8.06	7.13	5.10	3.10	1.50	0.93	49.1
11	1.55	2.24	3.10	4.50	5.89	7.20	8.06	7.44	5.70	3.72	2.10	1.55	53.0
12	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40	3.72	1.80	0.93	53.3
13	1.24	1.96	3.10	4.80	6.51	7.80	8.99	7.75	5.70	3.72	1.80	0.93	54.3
14	1.55	2.24	3.72	5.10	6.82	7.80	8.68	7.75	5.70	4.03	2.10	1.55	57.0
15	1.24	2.24	3.72	5.70	7.44	8.10	8.68	7.75	5.70	4.03	2.10	1.24	57.9
16	1.55	2.52	4.03	5.70	7.75	8.70	9.30	8.37	6.30	4.34	2.40	1.55	62.5
17	1.86	2.80	4.65	6.00	8.06	9.00	9.92	8.68	6.60	4.34	2.70	1.86	66.5
18	2.48	3.36	5.27	6.90	8.68	9.60	9.61	8.68	6.90	4.96	3.00	2.17	71.6

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Reference EvapoTranspiration (ETo) Zones

1 **COASTAL PLAINS HEAVY FOG BELT** lowest ETo in California, characterized by dense fog

2 **COASTAL MIXED FOG AREA** less fog and higher ETo than zone 1

3 **COASTAL VALLEYS & PLAINS & NORTH COAST MOUNTAINS** more sunlight than zone 2

4 **SOUTH COAST INLAND PLAINS & MOUNTAINS NORTH OF SAN FRANCISCO** more sunlight and higher summer ETo than zone 3

5 **NORTHERN INLAND VALLEYS** valleys north of San Franciaco

6 **UPLAND CENTRAL COAST & LOS ANGELES BASIN** higher elevation coastal areas

7 **NORTHEASTERN PLAINS**

8 **INLAND SAN FRANCISCO BAY AREA** inland area near San Francisco with some marine influence

9 **SOUTH COAST MARINE TO DESERT TRANSITION** inland area between marine & desert climates

10 **NORTH CENTRAL PLATEAU & CENTRAL COAST RANGE** cool, high elevation areas with strong summer sunlight; zone has limited climate data & the zones selection is somewhat subjective

11 **CENTRAL SIERRA NEVADA** mountain valleys east of Sacramento with some influence from delta breeze in summer

12 **EAST SIDE SACRAMENTO-SAN JOAQUIN VALLEY** low winter & high summer ETo with slightly lower ETo than zone 14

13 **NORTHERN SIERRA NEVADA** northern Sierra Nevada mountain valleys with less marine influence than zone 11

14 **MID-CENTRAL VALLEY, SOUTHERN SIERRA NEVADA, TEHACHAPI & HIGH DESERT MOUNTAINS** high summer sunshine and wind in some locations

15 **NORTHERN & SOUTHERN SAN JOAQUIN VALLEY** slightly lower winter ETo due to fog and slightly higher summer ETo than zones 12 & 14

16 **WESTSIDE SAN JOAQUIN VALLEY & MOUNTAINS EAST & WEST OF IMPERIAL VALLEY**

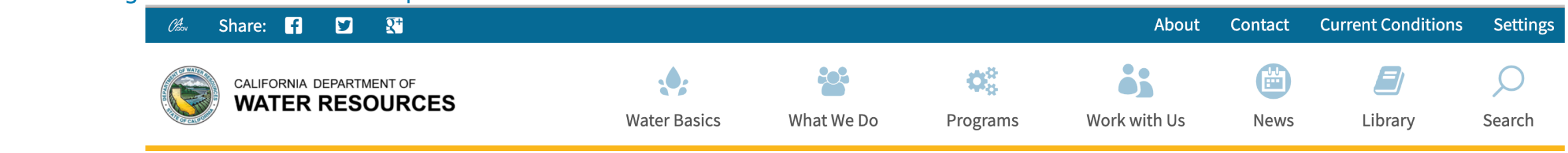
17 **HIGH DESERT VALLEYS** valleys in the high desert near Nevada and Arizona

18 **IMPERIAL VALLEY, DEATH VALLEY & PALO VERDE** low desert areas with high sunlight & considerable heat advection

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Monthly Average Reference Evapotranspiration by ETo Zone (inches/month)

Zone	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0.93	1.40	2.48	3.30	4.03	4.50	4.65	4.03	3.30	2.48	1.20	0.62	32.9
2	1.24	1.68	3.10	3.90	4.65	5.10	4.96	4.65	3.90	2.79	1.80	1.24	39.0
3	1.86	2.24	3.72	4.80	5.27	5.70	5.58	5.27	4.20	3.41	2.40	1.86	46.3
4	1.86	2.24	3.41	4.50	5.27	5.70	5.89	5.58	4.50	3.41	2.40	1.86	46.6
5	0.93	1.68	2.79	4.20	5.58	6.30	6.51	5.89	4.50	3.10	1.50	0.93	43.9
6	1.86	2.24	3.41	4.80	5.58	6.30	6.51	6.20	4.80	3.72	2.40	1.86	49.7
7	0.62	1.40	2.48	3.90	5.27	6.30	7.44	6.51	4.80	2.79	1.20	0.62	43.3
8	1.24	1.68	3.41	4.80	6.20	6.90	7.44	6.51	5.10	3.41	1.80	0.93	49.4
9	2.17	2.80	4.03	5.10	5.89	6.60	7.44	6.82	5.70	4.03	2.70	1.86	55.1
10	0.93	1.68	3.10	4.50	5.89	7.20	8.06	7.13	5.10	3.10	1.50	0.93	49.1
11	1.55	2.24	3.10	4.50	5.89	7.20	8.06	7.44	5.70	3.72	2.10	1.55	53.1
12	1.24	1.96	3.41	5.10	6.82	7.80	8.06	7.13	5.40	3.72	1.80	0.93	53.4
13	1.24	1.96	3.10	4.80	6.51	7.80	8.99	7.75	5.70	3.72	1.80	0.93	54.3
14	1.55	2.24	3.72	5.10	6.82	7.80	8.68	7.75	5.70	4.03	2.10	1.55	57.0
15	1.24	2.24	3.72	5.70	7.44	8.10	8.68	7.75	5.70	4.03	2.10	1.24	57.9
16	1.55	2.52	4.03	5.70	7.75	8.70	9.30	8.37	6.30	4.34	2.40	1.55	62.5
17	1.86	2.80	4.65	6.00	8.06	9.00	9.92	8.68	6.60	4.34	2.70	1.86	66.5
18	2.48	3.36	5.27	6.90	8.68	9.60	9.61	8.68	6.90	4.96	3.00	2.17	71.6



Model Water Efficient Landscape Ordinance

Contact Us

§ 493.1. Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis.

§ 493.2. Water Waste Prevention.

§ 494. Effective Precipitation.

§ 495. Reporting.

Appendix A. Reference Evapotranspiration (ETO) Table

Appendix B - Sample Water Efficient Landscape Worksheet.

Appendix C - Sample Certificate of Completion.

Appendix D - Prescriptive Compliance Option.

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Appendix A

SAN FRANCISCO													
San Francisco	1.5	1.3	2.4	3.0	3.7	4.6	4.9	4.8	4.1	2.8	1.3	0.7	35.1

SACRAMENTO													
Fair Oaks	1.0	1.6	3.4	4.1	6.5	7.5	8.1	7.1	5.2	3.4	1.5	1.0	50.5
Sacramento	1.0	1.8	3.2	4.7	6.4	7.7	8.4	7.2	5.4	3.7	1.7	0.9	51.9
Twitchell Island	1.2	1.8	3.9	5.3	7.4	8.8	9.1	7.8	5.9	3.8	1.7	1.2	57.9

Appendix A - Reference Evapotranspiration (ETo) Table*													
County and City	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual ETo**
RIVERSIDE													
Desert Center	2.9	4.1	6.4	8.5	11.0	12.1	12.2	11.1	9.0	6.4	3.9	2.6	90.0
Elsinore	2.1	2.8	3.9	4.4	5.9	7.1	7.6	7.0	5.8	3.9	2.6	1.9	55.0
Indio	**3.1**	3.6	6.5	8.3	10.5	11.0	10.8	9.7	8.3	5.9	3.7	2.7	83.9
La Quinta	2.4	2.8	5.2	6.5	8.3	8.7	8.5	7.9	6.5	4.5	2.7	2.2	66.2
Mecca	2.6	3.3	5.7	7.2	8.6	9.0	8.8	8.2	6.8	5.0	3.2	2.4	70.8
Oasis	2.9	3.3	5.3	6.1	8.5	8.9	8.7	7.9	6.9	4.8	2.9	2.3	68.4
Palm Deser	2.5	3.4	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.6
Palm Springs	2.0	2.9	4.9	7.2	8.3	8.5	11.6	8.3	7.2	5.9	2.7	1.7	71.1
Rancho California	1.8	2.2	3.4	4.8	5.6	6.3	6.5	6.2	4.8	3.7	2.4	1.8	49.5
Rancho Mirage	2.4	3.3	5.3	6.9	8.7	9.6	9.6	8.7	6.9	5.0	3.0	2.2	71.4
Ripley	2.7	3.3	5.6	7.2	8.7	8.7	8.4	7.6	6.2	4.6	2.8	2.2	67.8
Salton Sea North	2.5	3.3	5.5	7.2	8.8	9.3	9.2	8.5	6.8	5.2	3.1	2.3	71.7
Temecula East II	2.3	2.4	4.1	4.9	6.4	7.0	7.8	7.4	5.7	4.1	2.6	2.2	56.7
Thermal	2.4	3.3	5.5	7.6	9.1	9.6	9.3	8.6	7.1	5.2	3.1	2.1	72.8
Riverside UC	2.5	2.9	4.2	5.3	5.9	6.6	7.2	6.9	5.4	4.1	2.9	2.6	56.4
Winchester	2.3	2.4	4.1	4.9	6.4	6.9	7.7	7.5	6.0	3.9	2.6	2.1	56.8
SACRAMENTO													
Fair Oaks	1.0	1.6	3.4	4.1	6.5	7.5	8.1	7.1	5.2	3.4	1.5	1.0	50.5
Sacramento	1.0	1.8	3.2	4.7	6.4	7.7	8.4	7.2	5.4	3.7	1.7	0.9	51.9
Twitchell Island	1.2	1.8	3.9	5.3	7.4	8.8	9.1	7.8	5.9	3.8	1.7	1.2	57.9
SAN BENITO													
Hollister	1.5	1.8	3.1	4.3	5.5	5.7	6.4	5.9	5.0	3.5	1.7	1.1	45.1
San Benito	1.2	1.6	3.1	4.6	5.6	6.4	6.9	6.5	4.8	3.7	1.7	1.2	47.2
San Juan Valley	1.4	1.8	3.4	4.5	6.0	6.7	7.1	6.4	5.0	3.5	1.8	1.4	49.1
SAN BERNARDINO													
Baker	2.7	3.9	6.1	8.3	10.4	11.8	12.2	11.0	8.9	6.1	3.3	2.1	86.6
Barstow NE	2.2	2.9	5.3	6.9	9.0	10.1	9.9	8.9	6.8	4.8	2.7	2.1	71.7
Big Bear Lake	1.8	2.6	4.6	6.0	7.0	7.6	8.1	7.4	5.4	4.1	2.4	1.8	58.6
Chino	2.1	2.9	3.9	4.5	5.7	6.5	7.3	7.1	5.9	4.2	2.6	2.0	54.6
Crestline	1.5	1.9	3.3	4.4	5.5	6.6	7.8	7.1	5.4	3.5	2.2	1.6	50.8
Lake Arrowhead	1.8	2.6	4.6	6.0	7.0	7.6	8.1	7.4	5.4	4.1	2.4	1.8	58.6
Lucerne Valley	2.2	2.9	5.1	6.5	9.1	11.0	11.4	9.9	7.4	5.0	3.0	1.8	75.3
Needles	3.2	4.2	6.6	8.9	11.0	12.4	12.8	11.0	8.9	6.6	4.0	2.7	92.1
Newberry Springs	2.1	2.9	5.3	8.4	9.8	10.9	11.1	9.9	7.6	5.2	3.1	2.0	78.2
San Bernardino	2.0	2.7	3.8	4.6	5.7	6.9	7.9	7.4	5.9	4.2	2.6	2.0	55.6
Twentynine Palms	2.6	3.6	5.9	7.9	10.1	11.2	11.2	10.3	8.6	5.9	3.4	2.2	82.9
Victorville	2.0	2.6	4.6	6.2	7.3	8.9	9.8	9.0	6.5	4.7	2.7	2.1	66.2
SAN DIEGO													
Chula Vista	2.2	2.7	3.4	3.8	4.9	4.7	5.5	4.9	4.5	3.4	2.4	2.0	44.2
Escondido SPV	2.4	2.6	3.9	4.7	5.9	6.5	7.1	6.7	5.3	3.9	2.8	2.3	54.2
SAN DIEGO													
Miramar	2.3	2.5	3.7	4.1	5.1	5.4	6.1	5.8	4.5	3.3	2.4	2.1	47.1
Oceanside	2.2	2.7	3.4	3.7	4.9	4.6	4.6	5.1	4.1	3.3	2.4	2.0	42.9
Otay Lake	2.3	2.7	3.9	4.6	5.6	5.9	6.2	6.1	4.8	3.7	2.6	2.2	50.4
Pine Valley	1.5	2.4	3.8	5.1	6.0	7.0	7.8	7.3	6.0	4.0	2.2	1.7	54.8
Ramona	2.1	2.1	3.4	4.6	5.2	6.3	6.7	6.8	5.3	4.1	2.8	2.1	51.6
San Diego	2.1	2.4	3.4	4.6	5.1	5.3	5.7	5.6	4.3	3.6	2.4	2.0	46.5
Santee	2.1	2.7	3.7	4.5	5.5	6.1	6.6	6.2	5.4	3.8	2.6	2.0	51.1
Torrey Pines	2.2	2.3	3.4	3.9	4.0	4.1	4.6	4.7	3.8	2.8	2.0	2.0	39.8
Warner Springs	1.6	2.7	3.7	4.7	5.7	7.6	8.3	7.7	6.3	4.0	2.5	1.3	56.0

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WUCOLS – Water Use Classification of Landscape Species

Over 3500 Plant taxa
Plant Factors for SIX Climate Zones (PF)
Plant Coefficient
Percent of REFERENCE EVAPOTRANSPIRATION (Eto)

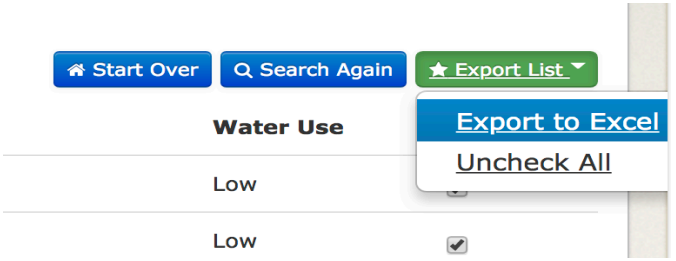
Number	WUCOLS Region	Sunset climate zones*	CIMIS ET_0 zones**	Representative Cities
1	North-Central Coastal	14, 15, 16, 17	1, 2, 3, 4, 6, 8	Healdsburg, Napa, San Jose, Salinas, San Francisco, San Luis Obispo
2	Central Valley	8, 9, 14	12, 14, 15, 16	Auburn, Bakersfield, Chico, Fresno, Modesto, Sacramento
3	South Coastal	22, 23, 24	1, 2, 4, 6	Irvine, Los Angeles, Santa Barbara, Ventura, Vista
4	South Inland	18, 19, 20, 21	9	Corona, Escondido, Pasadena, Riverside, San Bernardino, Santa Paula
5	High and Intermediate Desert	11	14, 17	Apple Valley, Barstow, Bishop, Lancaster, Lone Pine, Tehachapi
6	Low Desert	13	18	Borrego Springs, Blythe, Death Valley, El Centro, Needles, Palm Springs

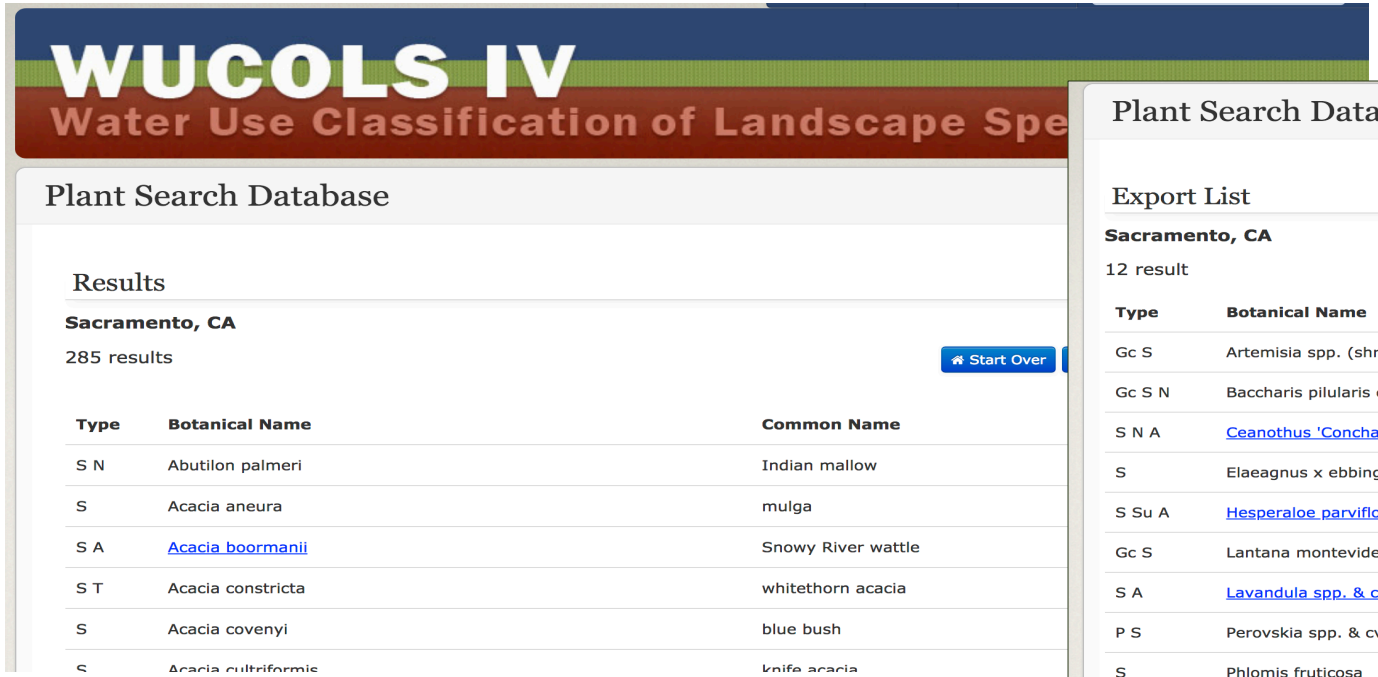
Categories of Water Needs

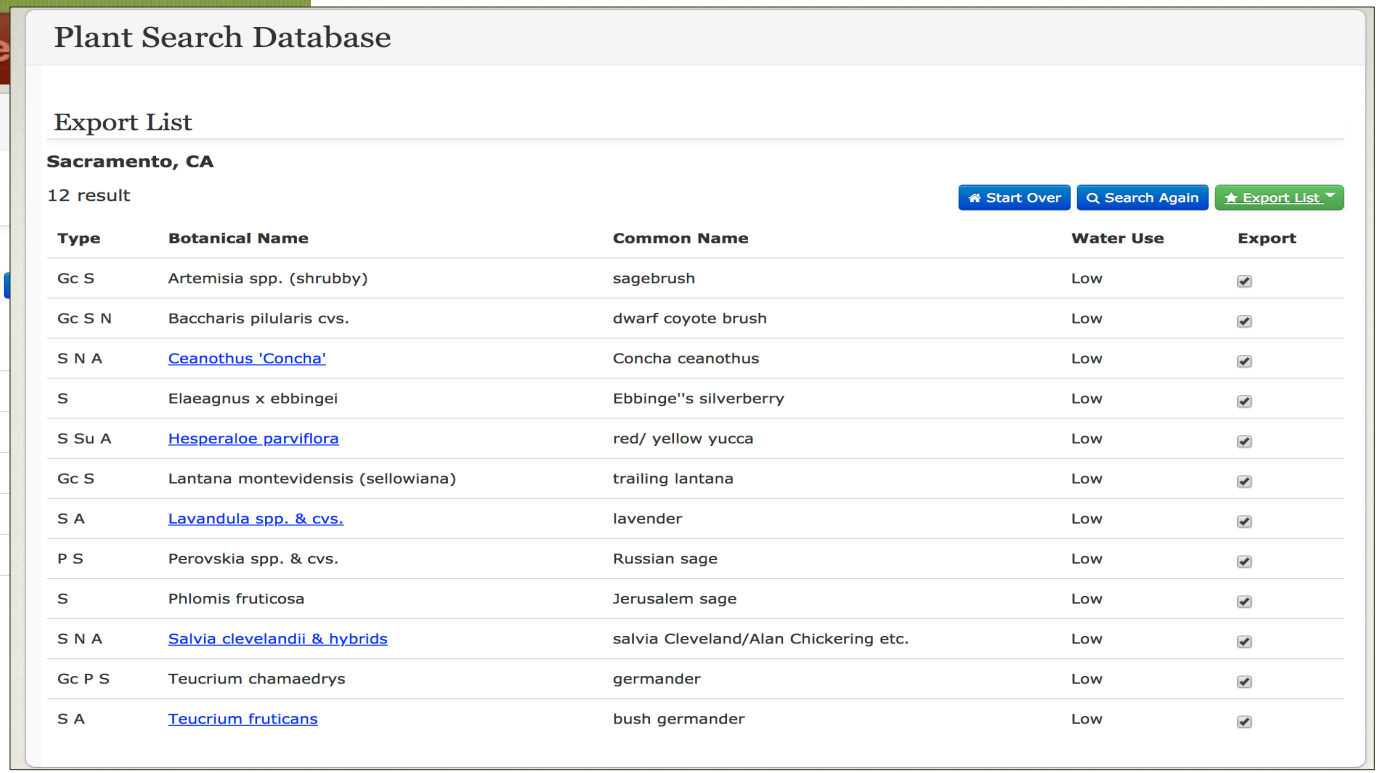
Category	Abbreviation	Percentage of ET_o	
High	H	70–90	.7-.9
Moderate/Medium	M	40–60	.4-.6
Low	L	10–30	.1-.3
Very Low	VL	< 10	

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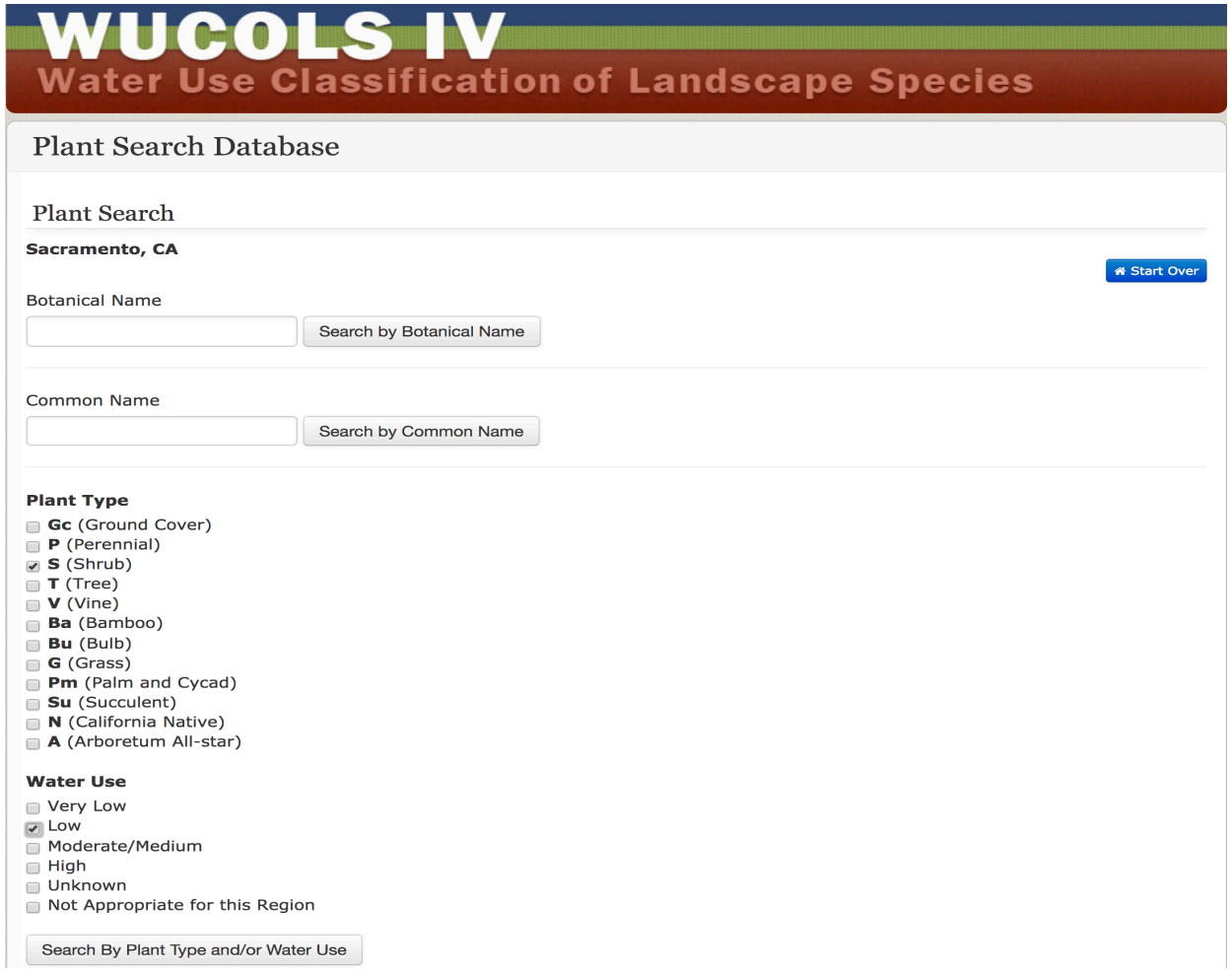
WUCOLS Export Function to Database

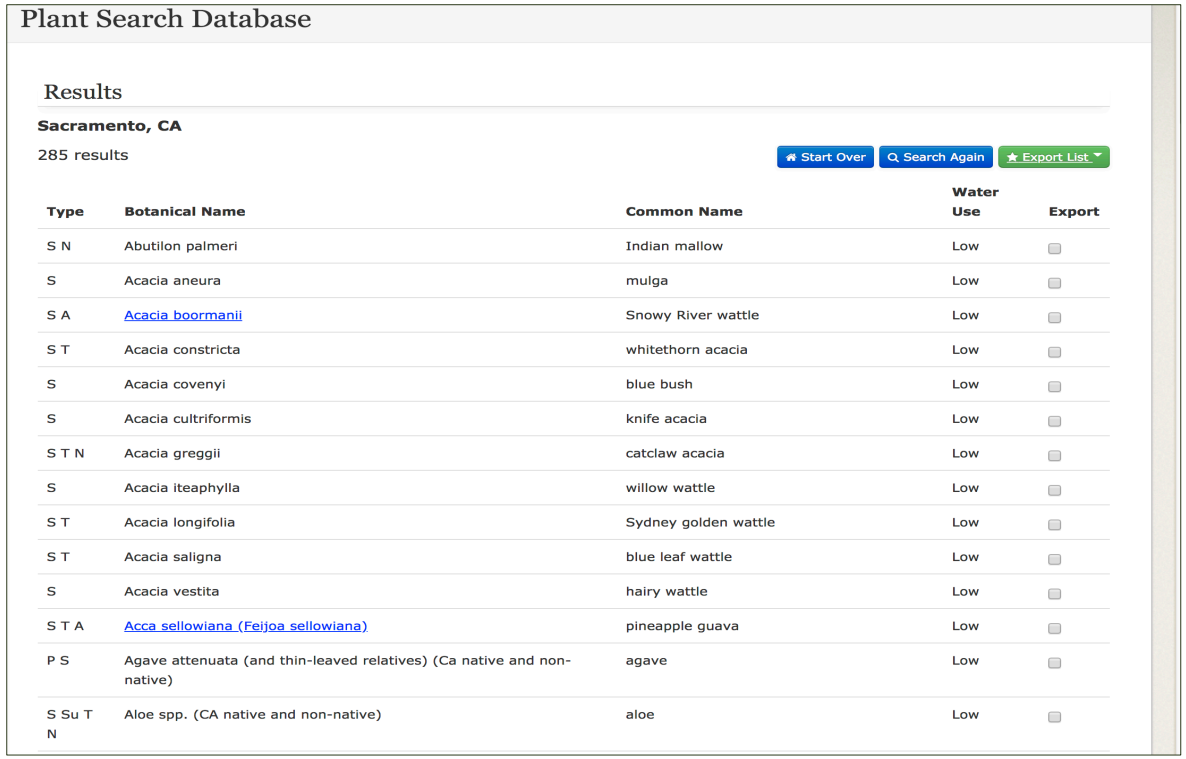






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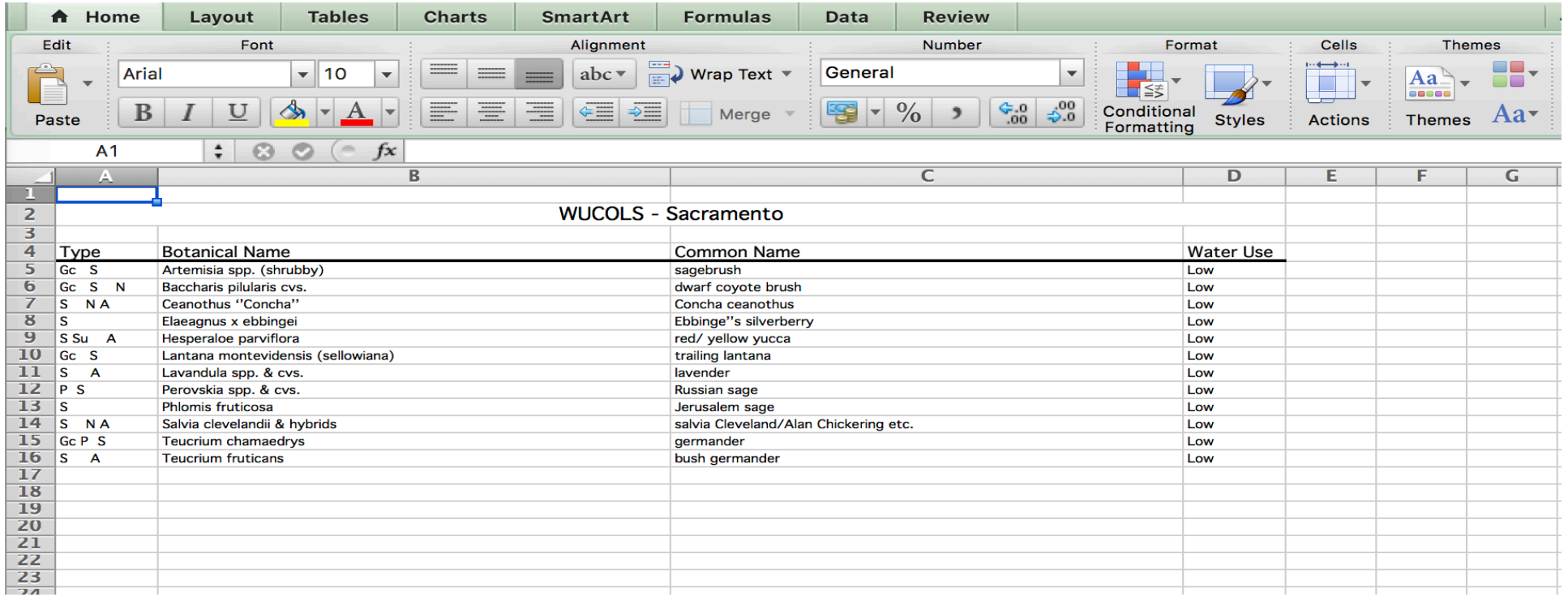


Type	Botanical Name	Common Name	Water Use	Export
S N	Abutilon palmeri	Indian mallow	Low	
S	Acacia aneura	mulga	Low	
S A	Acacia boormanii	Snowy River wattle	Low	
S T	Acacia constricta	whitethorn acacia	Low	
S	Acacia covenyi	blue bush	Low	
S	Acacia cultriformis	knife acacia	Low	
S T N	Acacia greggii	catclaw acacia	Low	
S	Acacia iteaphylla	willow wattle	Low	
S T	Acacia longifolia	Sydney golden wattle	Low	
S T	Acacia saligna	blue leaf wattle	Low	
S	Acacia vestita	hairy wattle	Low	
S T A	Acca sellowiana (Feijoa sellowiana)	pineapple guava	Low	
P S	Agave attenuata (and thin-leaved relatives) (Ca native and non-native)	agave	Low	
S Su T N	Aloe spp. (CA native and non-native)	aloe	Low	

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WUCOLS - Sacramento

Type	Botanical Name	Common Name	Water Use
Gc S	Artemisia spp. (shrubby)	sagebrush	Low
Gc S N	Baccharis pilularis cvs.	dwarf coyote brush	Low
S N A	Ceanothus ''Concha''	Concha ceanothus	Low
S	Elaeagnus x ebbingei	Ebbinge''s silverberry	Low
S Su A	Hesperaloe parviflora	red/ yellow yucca	Low
Gc S	Lantana montevidensis (sellowiana)	trailing lantana	Low
S A	Lavandula spp. & cvs.	lavender	Low
P S	Perovskia spp. & cvs.	Russian sage	Low
S	Phlomis fruticosa	Jerusalem sage	Low
S N A	Salvia clevelandii & hybrids	salvia Cleveland/Alan Chickering etc.	Low
Gc P S	Teucrium chamaedrys	germander	Low
S A	Teucrium fruticans	bush germander	Low

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Calculations

- MAWA –Maximum Allowable Water Allowance (Water Budget per year)
- ETWU –Estimated Total Water Use (Amount of water the landscape is designed to use)
  - Expressed in gallons

Hint: **ETWU** must be *LESS THAN* the **MAWA**

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Poll!



1) WUCOLS is…
   A. A database with over 3500 plants
   B. A system that divides California up into 6 different Climate Zones
   C. Determines the relative water use of plants compared to really happy turf
   D. The classification used to divide plants up into appropriate hydrozones
   E. All of the above

2) Soil Infiltration Rates are determined by:
   A. Slope, Soil Texture, and Cover
   B. Rainfall and Runoff rates
   C. Soil depth, Organic Matter Content, and Irrigation Application Rate

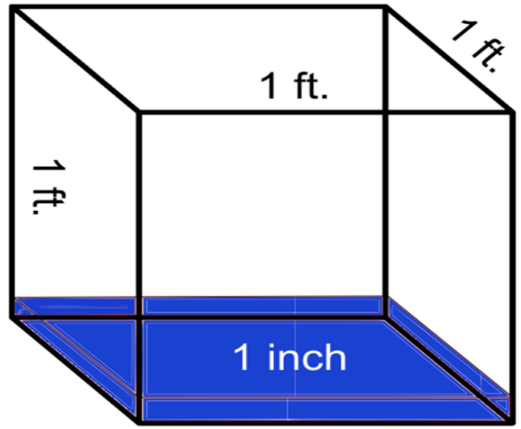
3) MAWA should always be less than ETWU
   A. True
   B. False

4) It's OK to put Low and High water use plants together as long as the hydrozone is classified as "High" in the hydrozone plan and chart
   A. True
   B. False

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MAWA = Eto * ETAF * .62 * LA =gallons per year

- Eto: Reference Evapotranspiration in inches for site -Appendix A!
- .62: Conversion factor for "gallons per square foot-inch"
- LA: Landscape Area



- ETAF for MAWA: **E**vapo**T**ranspiration **A**djustment **F**actor
  - As of 2015: **Residential = .55 Non-Residential: .45**

= your NOT TO EXCEED water budget for the year in gallons

ETAF for MAWA

- Pre- 2010 Landscapes: 80% of Eto
- 2010 – 2015: 70% of Eto
- 2016 to 2023:
  - Residential: 55% of Eto
  - Non-Residential and Multi-family: 45% of Eto
- 2024….? Join LSAG!

But What about SLA's???



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Special Landscape Areas (SLA's)

- Areas Dedicated to Recreation
- Areas Dedicated to Growing Food Crops
- Areas Irrigated with Rain, Grey, or Reclaimed Water

$$MAWA = (ETo)(.62)[(ETAF*LA)+((1-ETAF)*SLA)]$$

But What about EPPT???

~Essentially gives SLA's an ETAF of 1.0 or 100% of ETo

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Effective Precipitation (EPPT)

MAWA = (ETo-**Eppt**)(.62)[(ETAF*LA)+((1-ETAF)*SLA)]

- Determined by Local Agency/Municipality as part of their WELO
- Not included in MWELO
- “Usable Rainfall”… water that is “available for plant growth”
- Check your Local WELO!
- Usually .25 -Can make a HUGE difference in your water budget.

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ETWU = ETo * .62 * ETAF * Landscape AreaArea

- **ETAF** for ETWU = **PF / IE**
  - Plant Factor (WUCOLS rating expressed as a coeffient (ie: .3, .6, .9)
  - Irrigation Efficiency (NOT Distribution Uniformity)

  - Sprays, Rotors, Microsprays, Mini-Rotors… "Overhead" = **.75**
  - Point source drip, In-line drip, Bubblers, tree wells, "Subsurface" =**.81**

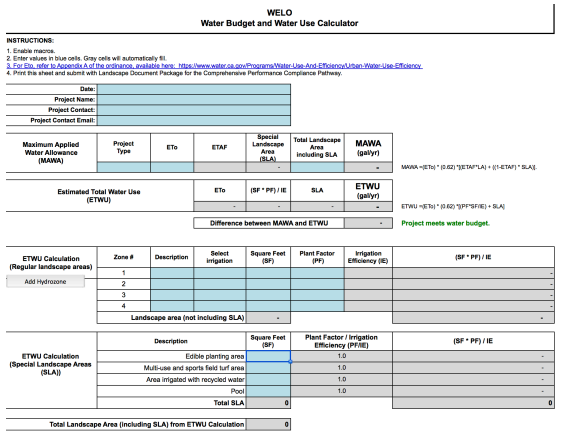
- **ETWU *IF* Using Effective Precipitation=**

(ETo-Eppt)(.62)(PF/IE)(Hydrozone Area)

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Confused? Use a Form .. Or an online Calculator!

- DWR
- CLCA
- StopWaste
- ReScape
- Local Agency !!!
  - Local Agency WELO Calculators Vary.



WELO
Water Budget and Water Use Calculator

INSTRUCTIONS:
1. Enable macros.
2. Enter values in blue cells. Gray cells will automatically fill.
3. For Eto, refer to Appendix A of the ordinance, available here: https://www.water.ca.gov/Programs/Water-Use-And-Efficiency/Urban-Water-Use-Efficiency
4. Print this sheet and submit with Landscape Document Package for the Comprehensive Performance Compliance Pathway.

Date:	
Project Name:	
Project Contact:	
Project Contact Email:	

Maximum Applied Water Allowance (MAWA)	Project Type	ETo	ETAF	Special Landscape Area (SLA)	Total Landscape Area including SLA	MAWA (gal/yr)
				-		-

MAWA =[ETo] * (0.62) *[(ETAF*LA) + ((1-ETAF) * SLA)].

Estimated Total Water Use (ETWU)	ETo	(SF * PF) / IE	SLA	ETWU (gal/yr)
	-	-	-	-

ETWU =[ETo] * (0.62) *[(PF*SF/IE) + SLA]

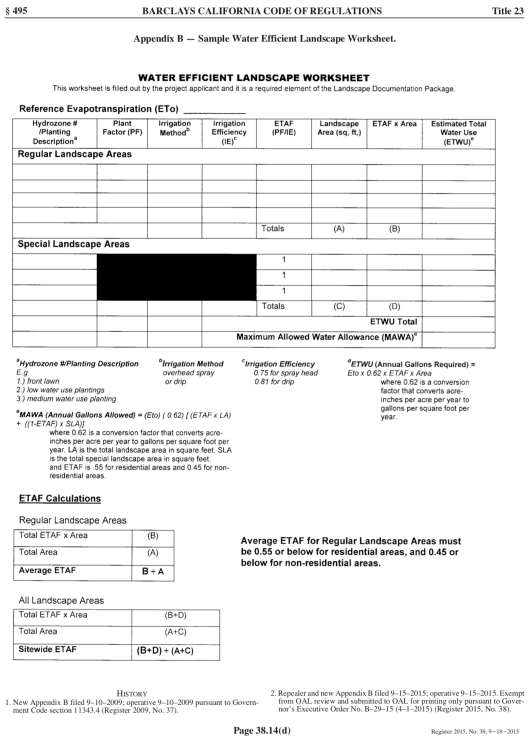
Difference between MAWA and ETWU: -

Project meets water budget.

ETWU Calculation (Regular landscape areas)	Zone #	Description	Select irrigation	Square Feet (SF)	Plant Factor (PF)	Irrigation Efficiency (IE)	(SF * PF) / IE
Add Hydrozone	1						-
	2						-
	3						-
	4						-
	Landscape area (not including SLA)			-			-

ETWU Calculation (Special Landscape Areas (SLA))	Description	Square Feet (SF)	Plant Factor / Irrigation Efficiency (PF/IE)	(SF * PF) / IE
	Edible planting area		1.0	-
	Multi-use and sports field turf area		1.0	-
	Area irrigated with recycled water		1.0	-
	Pool		1.0	-
	Total SLA	0		0

Total Landscape Area (including SLA) from ETWU Calculation: 0



§ 495 BARCLAYS CALIFORNIA CODE OF REGULATIONS Title 23

Appendix B — Sample Water Efficient Landscape Worksheet.

WATER EFFICIENT LANDSCAPE WORKSHEET

This worksheet is filled out by the project applicant and it is a required element of the Landscape Documentation Package.

Reference Evapotranspiration (ETo) _____

Hydrozone # /Planting Description[a]	Plant Factor (PF)	Irrigation Method[b]	Irrigation Efficiency (IE)[c]	ETAF (PF/IE)	Landscape Area (sq. ft.)	ETAF x Area	Estimated Total Water Use (ETWU)[d]
Regular Landscape Areas							
				Totals	(A)	(B)	
Special Landscape Areas							
				1			
				1			
				1			
				Totals	(C)	(D)	
						ETWU Total	
						Maximum Allowed Water Allowance (MAWA)[e]	

[a] *Hydrozone #/Planting Description*
E.g.
1.) front lawn
2.) low water use plantings
3.) medium water use planting

[b] *Irrigation Method*
overhead spray or drip

[c] *Irrigation Efficiency*
0.75 for spray head
0.81 for drip

[d] *ETWU* (Annual Gallons Required) = Eto x 0.62 x ETAF x Area
where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year.

[e] *MAWA (Annual Gallons Allowed)* = (Eto) (0.62) [(ETAF x LA) + ((1-ETAF) x SLA)]
where 0.62 is a conversion factor that converts acre-inches per acre per year to gallons per square foot per year, LA is the total landscape area in square feet, SLA is the total special landscape area in square feet, and ETAF is .55 for residential areas and 0.45 for non-residential areas.

ETAF Calculations

Regular Landscape Areas

Total ETAF x Area	(B)
Total Area	(A)
Average ETAF	B ÷ A

Average ETAF for Regular Landscape Areas must be 0.55 or below for residential areas, and 0.45 or below for non-residential areas.

All Landscape Areas

Total ETAF x Area	(B+D)
Total Area	(A+C)
Sitewide ETAF	(B+D) ÷ (A+C)

History
1. New Appendix B filed 9–10–2009; operative 9–10–2009 pursuant to Government Code section 11343.4 (Register 2009, No. 37).
2. Repealer and new Appendix B filed 9–15–2015; operative 9–15–2015. Exempt from OAL review and submitted to OAL for printing only pursuant to Governor's Executive Order No. B–29–15 (4–1–2015) (Register 2015, No. 38).

Page 38.14(d) Register 2015, No. 38, 9–18–2015

DWR 2019 Excel Calculator: https://data.cnra.ca.gov/dataset/water-budget-calculators

Non-Residential Water Budget Calculator 🔥 — Preview | Download

Residential Water Budget Calculator - Long 🔥 — Preview | Download

Residential Water Budget Calculator - Short 🔥 — Preview | Download

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Residential Long Form MAWA

Instructions

Cells with pale blue background are for entering data

Results show in cells with tan background

Messages and warnings are displayed in cells with yellow background

1) Select city by clicking on blue cell and choosing a city from the drop down menu ETo appears in the tan cell below the name of the city

2) Enter square footage of overhead spray irrigated landscape area

3) Enter square footage of drip irrigated landscape area

4) Enter square footage of Special Landscape Area (SLA)

5) MAWA results appear in the tan cells

6) If you are considering effective precipitation (Eppt), enter total annual precipitation.

7) Eppt

8) For comparison, MAWA without effective precipitation is displayed below

MAWA without Eppt (Gallons)

Maximum Applied Water Allowance Calculations for New and Rehabilitated Residential Landscapes

Enter value in Pale Blue Cells

Tan Cells Show Results

Messages and Warnings

Click on the blue cell on right to Pick City Name	Davis	Name of City
ET_o of City from Appendix A	52.50	ET_o (inches/year)
	8000	Overhead Landscape Area (ft^2)
	40000	Drip Landscape Area (ft^2)
	2000	SLA (ft^2)
Total Landscape Area	50,000.00	
Results:		
$(ET_o) \times (0.62) \times [(0.55 \times LA) + (1.0 - 0.55) \times SLA)]$	924,420.00	Gallons
	123,577.39	Cubic Feet
	1,235.77	HCF
	2.84	Acre-feet
	0.92	Millions of Gallons
MAWA calculation incorporating Effective Precipitation (Optional)		
Precipitation (Optional)		
ET_o of City from Appendix A	52.50	ET_o (inches/year)
Total Landscape Area	50,000.00	LA (ft^2)
Special Landscape Area	2,000.00	SLA (ft^2)
		Total annual precipitiation (inches/year)
Enter Effective Precipitation	0.00	Eppt (in/yr)(25% of total annual precipitation)
Results:		
$MAWA = [(ET_o - Eppt) \times (0.62)] \times [(0.55 \times LA) + ((1.0 - 0.55) \times SLA)]$	-	Gallons
	-	Cubic Feet
	-	HCF
	-	Acre-feet
	-	Millions of Gallons

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Residential Long Form ETWU

Estimated Total Water Use

Equation: ETWU = ET_o x 0.62 x [((PF x HA)/IE) + SLA]; Considering precipitation ETWA =(ETo-Eppt) x 0.62 x [((PF x HA)/IE) +SLA]

Enter values in Pale Blue Cells

Tan Cells Show Results

Messages and Warnings

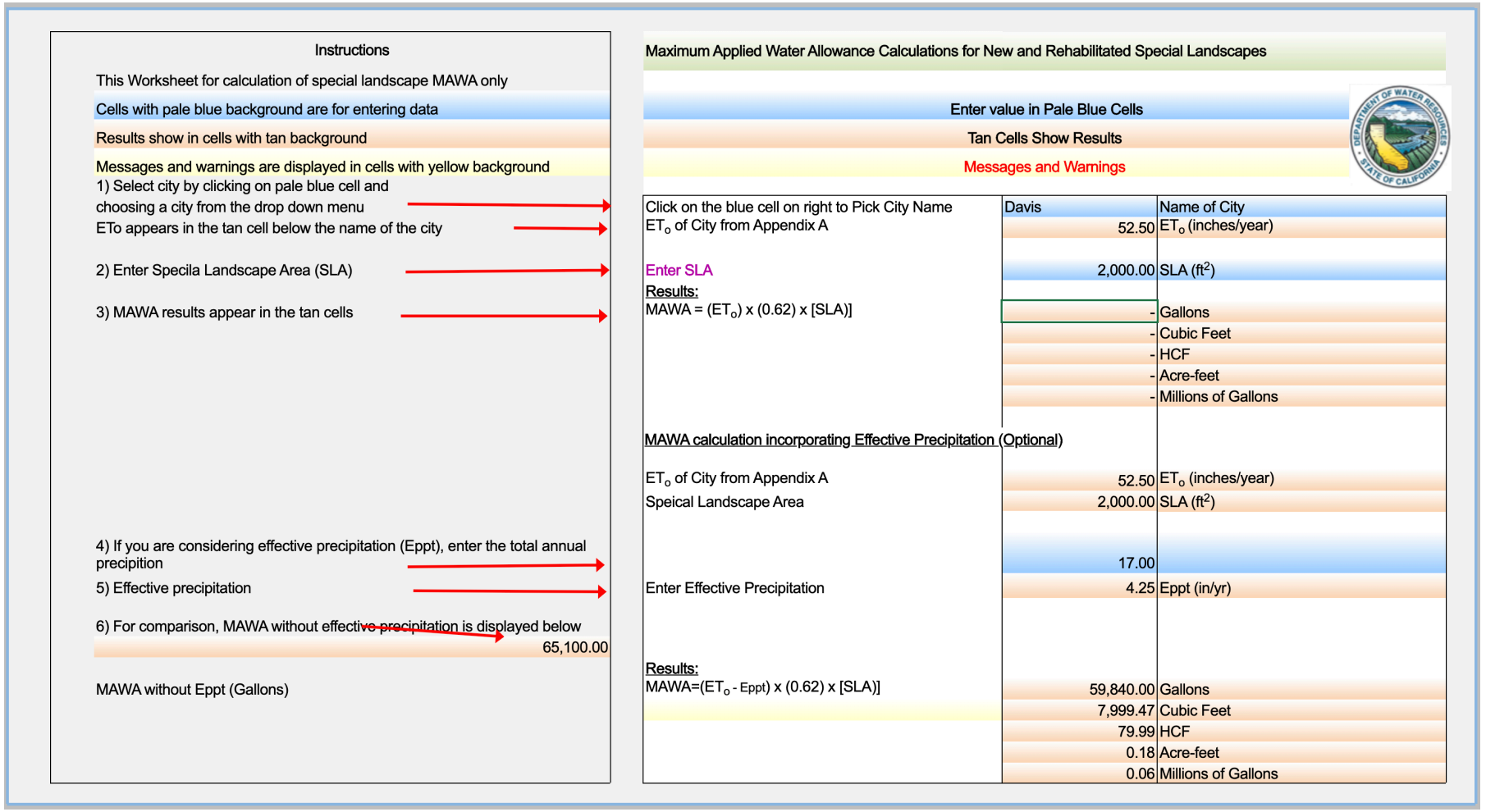
Irrigation Efficiency Default Value for overhead 0.75 and drip 0.81.

Plant Water Use Type	Plant Factor
Very Low	0 - 0.1
Low	0.2 - 0.3
Medium	0.4 - 0.6
High	0.7 - 1.0
SLA	1

Hydrozone	Select System From the Dropdown List click on cell below	Plant Water Use Type (s) (low, medium, high)	Plant Factor (PF)	Hydrozone Area (HA) (ft^2) Without SLA	Enter Irrigation Efficiency (IE)	(PF x HA (ft^2))/IE
Zone 1	Overhead Spray	High	0.86	6,000	0.75	6,880
Zone 2	Overhead Spray	Medium	0.50	1,000	0.75	667
Zone 3	Overhead Spray	Medium	0.50	1,000	0.75	667
Zone 4	Drip	Low	0.30	17,000	0.81	6,296
Zone 5	Drip	Low	0.30	10,000	0.81	3,704
Zone 6	Drip	Low	0.20	13,000	0.81	3,210
Zone 7						
Zone 8						
Zone 9						
Zone 10						
Zone 11						
Zone 12						
Zone 13						
Zone 14						
Zone 15						
Zone 16						
Zone 17						
Zone 18						
Zone 19						
Zone 20						
Zone 21						
Zone 22						

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Residential Long Form SLA



Instructions

This Worksheet for calculation of special landscape MAWA only

Cells with pale blue background are for entering data

Results show in cells with tan background

Messages and warnings are displayed in cells with yellow background

1) Select city by clicking on pale blue cell and choosing a city from the drop down menu

ETo appears in the tan cell below the name of the city

2) Enter Specila Landscape Area (SLA)

3) MAWA results appear in the tan cells

4) If you are considering effective precipitation (Eppt), enter the total annual precipition

5) Effective precipitation

6) For comparison, MAWA without effective precipitation is displayed below

65,100.00

MAWA without Eppt (Gallons)

Maximum Applied Water Allowance Calculations for New and Rehabilitated Special Landscapes

Enter value in Pale Blue Cells

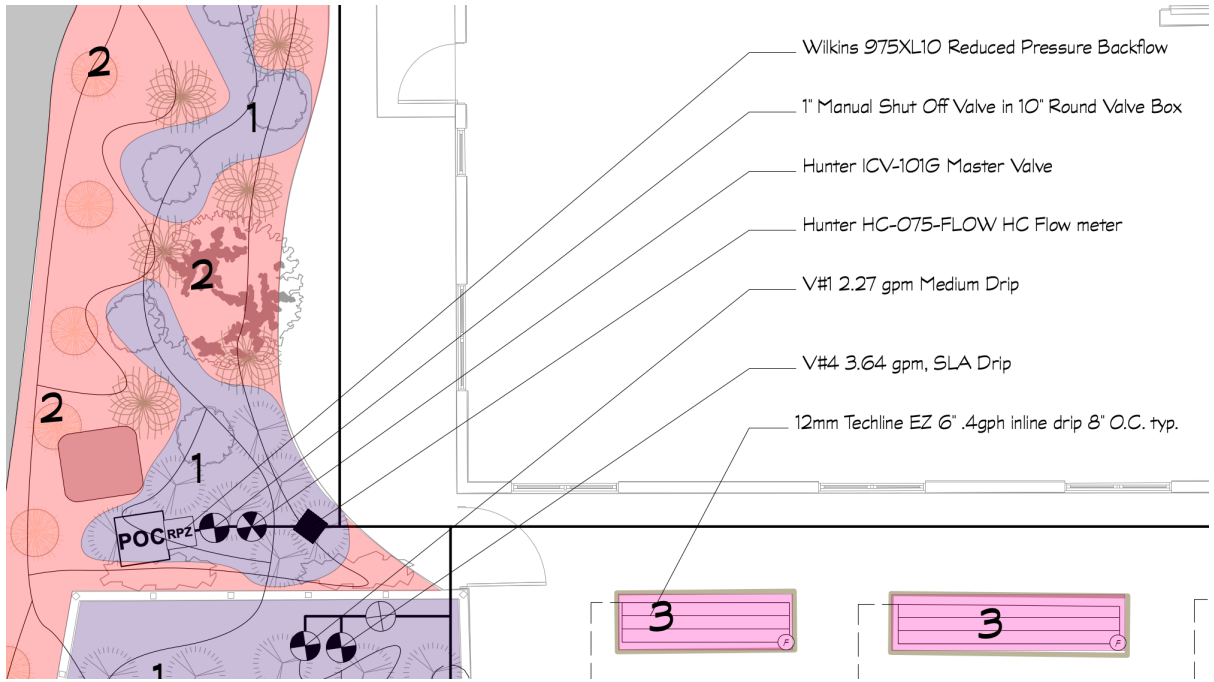
Tan Cells Show Results

Messages and Warnings

Click on the blue cell on right to Pick City Name	Davis	Name of City
ET_o of City from Appendix A	52.50	ET_o (inches/year)
Enter SLA	2,000.00	SLA (ft^2)
Results:		
MAWA = (ET_o) x (0.62) x [SLA)]	-	Gallons
	-	Cubic Feet
	-	HCF
	-	Acre-feet
	-	Millions of Gallons
MAWA calculation incorporating Effective Precipitation (Optional)		
ET_o of City from Appendix A	52.50	ET_o (inches/year)
Speical Landscape Area	2,000.00	SLA (ft^2)
	17.00	
Enter Effective Precipitation	4.25	Eppt (in/yr)
Results:		
MAWA=(ET_o - Eppt) x (0.62) x [SLA)]	59,840.00	Gallons
	7,999.47	Cubic Feet
	79.99	HCF
	0.18	Acre-feet
	0.06	Millions of Gallons

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But Wait… what about the Irrigation Plan???



Irrigation Component Callouts on Plan

- Location and Size of Water Meter
- Location, Type, and Size of <u>all Irrigation Components</u>
- Static pressure at Point of Connection (**POC**)

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Irrigation Components





- Submeter:
  - Residential: Required if over 5000 sq. ft.
  - Non-Residential / Multifamily: Required over 1000 sq. ft.
  - Non-Residential over 5000 sq. ft.: Separate Landscape Meter (water code #535)
    - Not required for wells, rain, or grey water systems.
    - Reclaimed water sources usually have meters
- Backflow Device is required on all potable water sources
  - Include detail and note height above finish grade
- Flow Meter:
  - Required on Residential projects over 5000 sq. ft.
  - Required on ALL non-residential projects

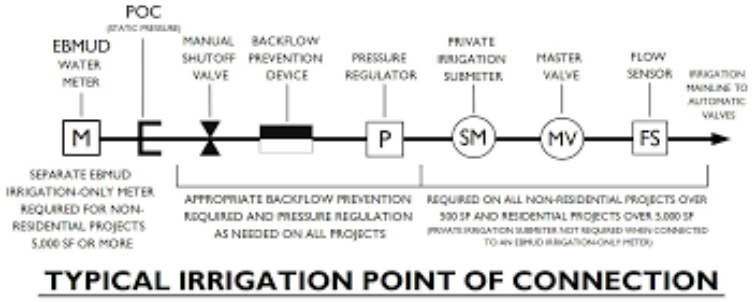




“You can’t manage what you don’t measure”

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Irrigation Components

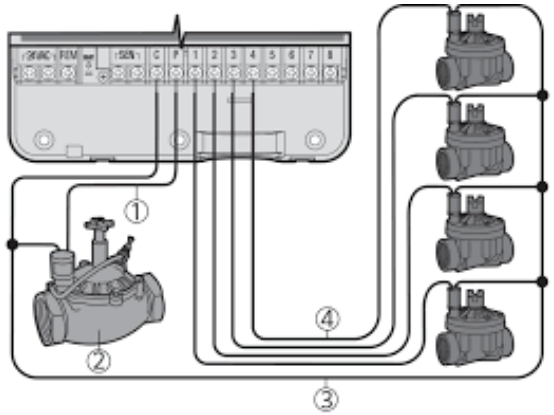


TYPICAL IRRIGATION POINT OF CONNECTION





- Pressure Regulation
  - Required if pressure Is too high… or if pressure is to low.
- Manual Shut Off
  - Required
- Master Valve
  - Required
  - Normally open or closed?









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Irrigation Components

- Controller
  - Non-volatile Memory
  - Weather Based OR Soil Moisture Based
  - Rain Shut Off
  - Other sensors for high wind areas or areas prone to freezing
- Can be web based or use on-site weather data

Executive Order B-40-17:
Irrigation must be stopped during and 48 hours after a rain event of ¼" or more.













Irrigation Components





- Control Valves and Manifolds
  - Must be isolated with a Manual Isolation Valve
  - Type and size on plan
  - Pressure regulation / Filtration
    - Drip Kit?
  - Flow Rate and Application Rate
  - Design Operating Pressure



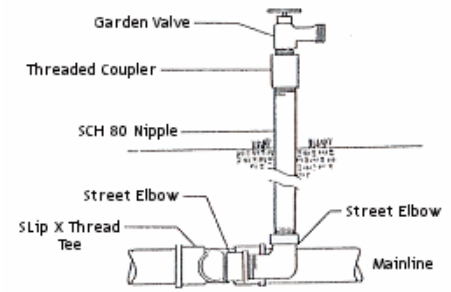


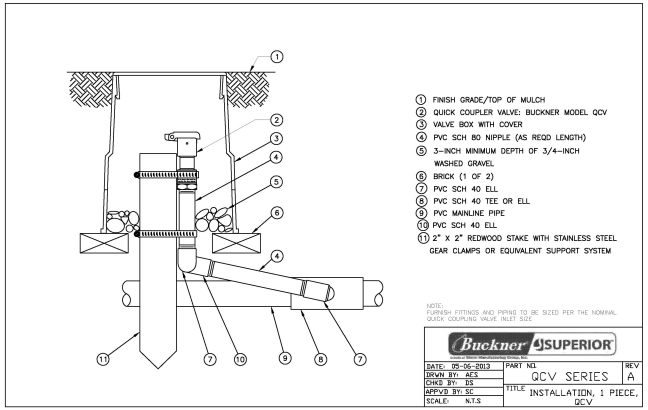
Irrigation Components

- Emission Devices:
  - **As of October 1, 2020 ALL spray sprinklers MUST have an internal pressure regulation device.**
  - All irrigation emission devices must meet ANSI Standards
  - Irrigation efficiency (IE) of overhead sprays/rotors must equal .75 or better
  - Distribution Uniformity (LQDU) of overhead sprays/rotors must be .65 or better
  - Irrigation efficiency of micro-irrigation (drip/bubblers) must be .81 or better
  - May not exceed .75 inches/hr. on slopes exceeding 25%

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Irrigation Components





- Pipe
  - Size (Do not exceed 6 ft. per second)
  - Type (SCH 40 PVC, Class 200, Galvanized, Polyethylene, etc.)
  - Sleeves
  - Buried or Exposed: Freeze tolerance, UV Screen
- Hose Bibbs and/or Quick Couplers
  - Past Backflow= “non-potable”
  - Swing Joints
- Water Feature Fill Valves
- Control Valve Wiring
  - Multi-strand, single strand, 2-wire system?
  - Distance and gauge



Valve Wire Sizing (Maximum One-Way Distance in Feet Between Controller and Valve)							
Ground Wire Size	Control Wire (ft)						
	18 AWG / 1.0 mm	16 AWG / 1.2 mm	14 AWG / 1.6 mm	12 AWG / 2.0 mm	10 AWG / 2.5 mm	8 AWG / 3 mm	6 AWG / 4 mm
18 AWG / 1.0 mm	850	1040	1210	1350	1460	1540	1590
16 AWG / 1.2 mm	1040	1340	1650	1920	2150	2330	2440
14 AWG / 1.6 mm	1210	1650	2150	2630	3080	3450	3700
12 AWG / 2.0 mm	1350	1920	2630	3390	4170	4880	5400
10 AWG / 2.5 mm	1460	2150	3080	4170	5400	6670	7690
8 AWG / 3 mm	1540	2330	3450	4880	6670	8700	10530
6 AWG / 4 mm	1590	2440	3700	5400	7690	10530	13330

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Pipe Sizing

Sch 40 PVC rule of thumb pipe sizing

- 0-8 gpm: ¾”
- 9-12 gpm: 1”
- 13-22 gpm: 1-1/4”
- 23-22 gpm: 1-1/2”
- 31-50 gpm: 2”
- 51-70 gpm: 2-1/2”
- 71-110 gpm: 3”

RAIN BIRD

Reference
PVC Schedule 40 IPS Plastic Pipe

PVC Schedule 40 IPS Plastic Pipe

(1120, 1220) C=150

psi Loss per 100 Feet of Pipe (psi/100 ft.)

Sizes 1/2" through 6" Flow 1 through 600 gpm

Size	1/2"		3/4"		1"		1 1/4"		1 1/2"		2"		2 1/2"		3"		4"		6"	
O.D.	0.840		1.050		1.315		1.660		1.900		2.375		2.875		3.500		4.500		6.625	
I.D.	0.622		0.824		1.049		1.380		1.610		2.067		2.469		3.068		4.026		6.065	
Wall Thk	0.109		0.113		0.133		0.140		0.145		0.154		0.203		0.216		0.237		0.280	
Flow gpm	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss	Velocity fps	psi Loss
1	1.06	0.43	0.60	0.11	0.37	0.03	0.21	0.01	0.16	0.00	0.10	0.00	0.07	0.00	0.04	0.00	0.03	0.00	0.01	0.00
2	2.11	1.55	1.20	0.39	0.74	0.12	0.43	0.03	0.32	0.02	0.19	0.00	0.13	0.00	0.09	0.00	0.05	0.00	0.02	0.00
3	3.17	3.28	1.80	0.83	1.11	0.26	0.64	0.07	0.48	0.03	0.29	0.01	0.20	0.00	0.13	0.00	0.08	0.00	0.03	0.00
4	4.22	5.58	2.41	1.42	1.48	0.44	0.86	0.12	0.64	0.06	0.38	0.02	0.26	0.01	0.17	0.00	0.10	0.00	0.04	0.00
5	5.28	8.43	3.01	2.15	1.86	0.66	1.07	0.17	0.80	0.09	0.48	0.02	0.33	0.01	0.22	0.00	0.13	0.00	0.06	0.00
6	6.34	11.81	3.61	3.01	2.23	0.93	1.29	0.24	0.96	0.12	0.57	0.03	0.40	0.01	0.26	0.01	0.15	0.00	0.07	0.00
7	7.39	15.71	4.21	4.00	2.60	1.24	1.50	0.33	1.12	0.16	0.67	0.05	0.46	0.02	0.30	0.01	0.18	0.00	0.08	0.00
8	8.45	20.12	4.81	5.12	2.97	1.58	1.72	0.42	1.28	0.20	0.76	0.06	0.53	0.02	0.35	0.01	0.20	0.00	0.09	0.00
9	9.50	25.01	5.41	6.37	3.34	1.97	1.93	0.52	1.44	0.25	0.86	0.07	0.59	0.03	0.39	0.01	0.23	0.00	0.10	0.00
10	10.56	30.40	6.02	7.74	3.71	2.39	2.15	0.63	1.60	0.31	0.96	0.09	0.66	0.04	0.43	0.01	0.25	0.00	0.11	0.00
11	11.61	36.26	6.62	9.23	4.08	2.85	2.36	0.75	1.76	0.37	1.05	0.11	0.73	0.04	0.48	0.02	0.28	0.00	0.12	0.00
12	12.67	42.59	7.22	10.84	4.45	3.35	2.57	0.88	1.91	0.43	1.15	0.12	0.79	0.05	0.52	0.02	0.30	0.00	0.13	0.00
14	14.78	56.64	8.42	14.42	5.20	4.45	3.00	1.17	2.23	0.57	1.34	0.16	0.92	0.07	0.61	0.02	0.35	0.01	0.16	0.00
16	16.89	72.52	9.63	18.46	5.94	5.70	3.43	1.50	2.55	0.73	1.53	0.21	1.06	0.09	0.69	0.03	0.40	0.01	0.18	0.00
18	19.01	90.17	10.83	22.95	6.68	7.09	3.86	1.87	2.87	0.91	1.72	0.26	1.19	0.11	0.78	0.04	0.45	0.01	0.20	0.00
20	21.12	109.58	12.03	27.89	7.42	8.62	4.29	2.27	3.19	1.10	1.91	0.32	1.32	0.13	0.87	0.05	0.50	0.01	0.22	0.00
22			13.24	33.27	8.17	10.28	4.72	2.71	3.51	1.32	2.10	0.38	1.45	0.15	0.95	0.06	0.55	0.01	0.24	0.00
24			14.44	39.08	8.91	12.07	5.15	3.18	3.83	1.55	2.29	0.45	1.58	0.18	1.04	0.07	0.60	0.02	0.27	0.00
26			15.64	45.32	9.65	14.00	5.58	3.69	4.15	1.79	2.49	0.52	1.71	0.21	1.13	0.08	0.66	0.02	0.29	0.00
28			16.85	51.98	10.39	16.06	6.01	4.23	4.47	2.06	2.68	0.59	1.85	0.24	1.22	0.09	0.71	0.02	0.31	0.00
30			18.05	59.05	11.14	18.24	6.44	4.80	4.79	2.34	2.87	0.67	1.98	0.27	1.30	0.10	0.76	0.03	0.33	0.00
35					12.99	24.26	7.51	6.39	5.58	3.11	3.35	0.89	2.31	0.36	1.52	0.13	0.88	0.03	0.39	0.00
40					14.85	31.06	8.58	8.18	6.38	3.98	3.82	1.15	2.64	0.46	1.74	0.17	1.01	0.04	0.44	0.01
45					16.71	38.62	9.65	10.17	7.18	4.95	4.30	1.42	2.97	0.58	1.95	0.21	1.13	0.06	0.50	0.01
50					18.56	46.94	10.73	12.36	7.98	6.02	4.78	1.73	3.30	0.70	2.17	0.25	1.26	0.07	0.56	0.01
55							11.80	14.74	8.78	7.18	5.26	2.06	3.63	0.84	2.39	0.30	1.39	0.08	0.61	0.01
60							12.87	17.32	9.57	8.43	5.74	2.43	3.96	0.98	2.60	0.36	1.51	0.09	0.67	0.01
65							13.94	20.08	10.37	9.78	6.21	2.81	4.29	1.14	2.82	0.41	1.64	0.11	0.72	0.01
70							15.02	23.03	11.17	11.21	6.69	3.23	4.62	1.31	3.04	0.47	1.76	0.13	0.78	0.02
75							16.09	26.17	11.97	12.74	7.17	3.66	4.95	1.48	3.25	0.54	1.89	0.14	0.83	0.02
80							17.16	29.49	12.77	14.36	7.65	4.13	5.28	1.67	3.47	0.60	2.02	0.16	0.89	0.02
85							18.23	32.99	13.56	16.06	8.13	4.62	5.60	1.87	3.69	0.68	2.14	0.18	0.94	0.02
90							19.31	36.67	14.36	17.85	8.61	5.14	5.93	2.08	3.91	0.75	2.27	0.20	1.00	0.03
95									15.16	19.73	9.08	5.68	6.26	2.30	4.12	0.83	2.39	0.22	1.06	0.03
100									15.96	21.69	9.56	6.24	6.59	2.53	4.34	0.91	2.52	0.24	1.11	0.03
110									17.55	25.88	10.52	7.44	7.25	3.01	4.77	1.09	2.77	0.29	1.22	0.04
120									19.15	30.40	11.47	8.74	7.91	3.54	5.21	1.28	3.02	0.34	1.33	0.05
130											12.43	10.14	8.57	4.11	5.64	1.48	3.28	0.40	1.44	0.05
140											13.39	11.63	9.23	4.71	6.08	1.70	3.53	0.45	1.55	0.06
150											14.34	13.21	9.89	5.35	6.51	1.93	3.78	0.52	1.67	0.07
160											15.30	14.89	10.55	6.03	6.94	2.18	4.03	0.58	1.78	0.08
170											16.25	16.65	11.21	6.74	7.38	2.44	4.28	0.65	1.89	0.09
180											17.21	18.51	11.87	7.50	7.81	2.71	4.54	0.72	2.00	0.10
190											18.17	20.46	12.53	8.29	8.25	2.99	4.79	0.80	2.11	0.11
200											19.12	22.50	13.19	9.11	8.68	3.29	5.04	0.88	2.22	0.12
225													14.84	11.33	9.76	4.09	5.67	1.09	2.50	0.15
250													16.48	13.77	10.85	4.98	6.30	1.33	2.78	0.18
275													18.13	16.42	11.93	5.94	6.93	1.58	3.05	0.22
300															13.02	6.97	7.56	1.86	3.33	0.25
325															14.10	8.09	8.19	2.16	3.61	0.29
350															15.19	9.27	8.82	2.47	3.89	0.34
375															16.27	10.54	9.45	2.81	4.16	0.38
400															17.36	11.87	10.08	3.16	4.44	0.43
425															18.44	13.28	10.71	3.54	4.72	0.48
450															19.53	14.76	11.34	3.93	5.00	0.54
475																	11.97	4.35	5.28	0.59
500																	12.60	4.78	5.55	0.65
550																	13.86	5.70	6.11	0.78
600																	15.12	6.70	6.66	0.91

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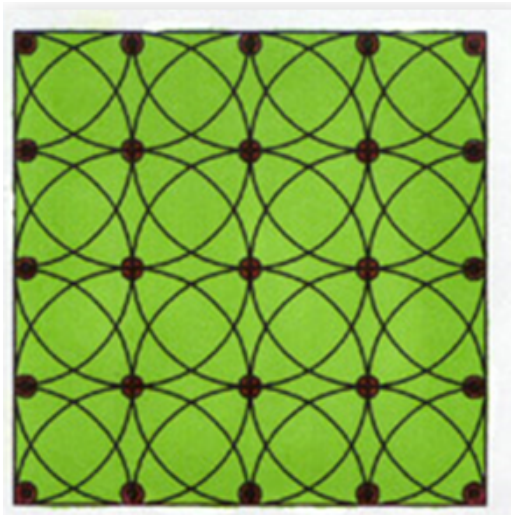
Irrigation Components





- Spray Heads
  - Check-Valve Equipped
  - Matched Precipitation
  - Pressure Compensating
  - Head to Head Coverage
  - Swing Joints





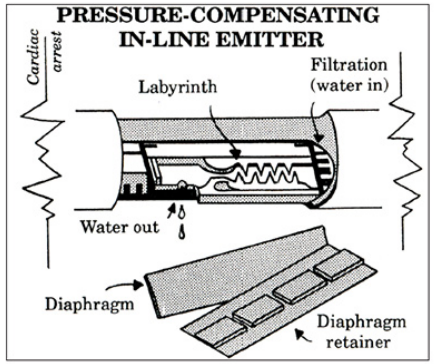
- Not within 2’ of a hardscape unless it drains back into the landscape
- Not in areas less than 10’ wide

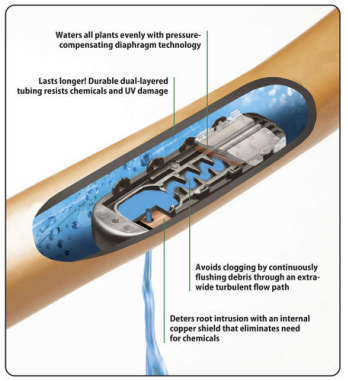
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Irrigation Components

- Drip
  - In-Line Drip
  - Point Source Drip
  - Sub-Surface Drip
- Pressure Compensating
- Self Flushing
- Check Valve Equipped
- Root Intrusion Protection















Irrigation Components





- Drip
  - Flush Valves
  - Air Release Valves
  - Indicators
- How Much per Valve?





FLOW PER 100 FEET

EMITTER SPACING	0.26 EMITTER		0.4 EMITTER		0.6 EMITTER		0.9 EMITTER	
	GPH	GPM	GPH	GPM	GPH	GPM	GPH	GPM
12″	26.4	0.44	42.3	0.71	60.8	1.01	92.5	1.54
18″	17.6	0.29	28.2	0.47	40.5	0.68	61.6	1.03
24″	-	-	-	-	30.4	0.51	46.2	0.77

MAXIMUM LENGTH OF A SINGLE LATERAL (FEET)

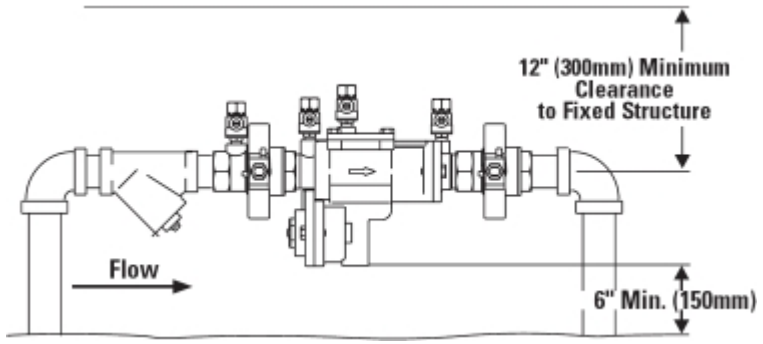
EMITTER SPACING		12″				18″				24″	
EMITTER FLOW (GPH)		0.26	0.4	0.6	0.9	0.26	0.4	0.6	0.9	0.6	0.9
INLET PRESSURE	20 psi	331	242	190	144	468	344	270	204	342	260
	25 psi	413	302	238	180	584	429	338	257	430	326
	35 psi	518	380	299	227	737	540	426	323	542	412
	45 psi	594	436	343	260	845	620	489	371	622	472
	55 psi	655	480	378	287	932	684	539	410	686	522
	60 psi	681	500	393	298	969	713	561	426	716	544

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Irrigation Details, Notes, and Legend

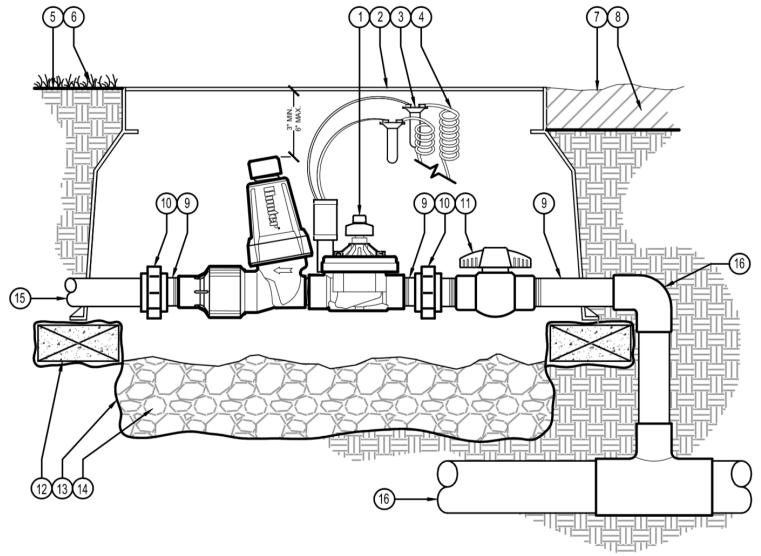
IRRIGATION LEGEND

	ICV–100–AS–ADJ	HUNTER REMOTE CONTROL VALVE WITH ADJUSTABLE PRESSURE REGULATOR
	ICZ–101	HUNTER REMOTE CONTROL VALVE DRIPZONE KIT
	T–4660–S–1.25"	NIBCO PVC BALL VALVE
	T–580–A–1.25"	NIBCO BRASS BALL VALVE
	ICV–101G	HUNTER MASTER VALVE (NORMALLY CLOSED)
	HC–100–FLOW–B	HUNTER FLOW METER–1" COUPLING
	975XLSEU–1"/ 114–NR3XLDU	WILKINS REDUCED PRESSURE BACKFLOW ASSEMBLY WITH PRESSURE REDUCING VALVE.
C	PHC–2400	HUNTER PRO–HC CONTROLLER IN A WALL MOUNTED ENCLOSURE INCLUDES WIFI CONNECTION.
R	WR–CLIK	HUNTER WIRELESS RAIN–CLIK SYSTEM. AUTOMATICALLY SHUTS THE SYSTEM OFF AS SOON AS IT STARTS RAINING



LEGEND:

1. HUNTER REMOTE CONTROL VALVE (ICZ) PER PLAN
2. IRRIGATION VALVE BOX PER PLAN HEAT STAMP LID WITH "RCV" IN 2" LETTERS
3. WATERPROOF CONNECTORS (2)
4. 18"-24" COILED WIRE TO CONTROLLER
5. FINISHED GRADE IN TURF
6. ADJACENT TURF
7. ADJACENT MULCH
8. FINISHED GRADE IN PLANTER BED
9. SCH. 80 T.O.E. NIPPLE - MATCH SIZE TO VALVE AND UNION -LENGTH AS NEEDED
10. PVC SLIP UNION
11. BALL VALVE - LINE SIZED
12. BRICK SUPPORTS (4)
13. FILTER FABRIC - WRAP TWICE AROUND BRICK SUPPORTS
14. 3/4" WASHED GRAVEL - 4" MIN. DEPTH
15. IRRIGATION LATERAL
16. MAINLINE LATERAL AND FITTNGS



XX REMOTE CONTROL VALVE (ICZ) WITH ISOLATION VALVE

Hunter

NOT TO SCALE

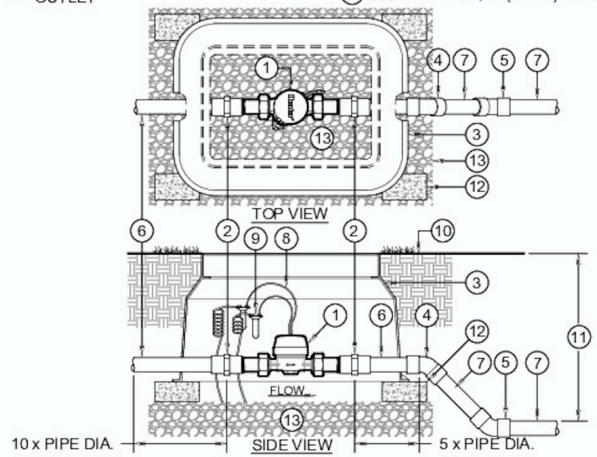
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Details

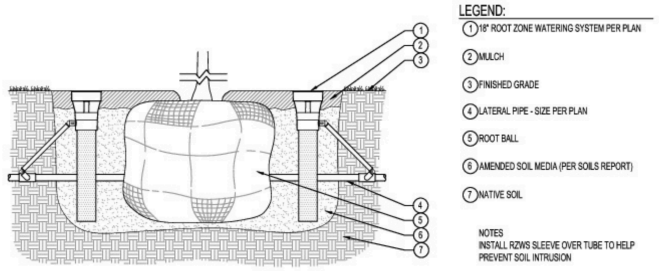
NOTE: INLET PIPE ENTERING METER: LENGTH MUST BE A MIN. OF 10 X PIPE DIA.
OUTLET PIPE LEAVING METER: LENGTH MUST BE MIN. OF 5 X PIPE DIA.
INLET AND OUTLET PIPE MUST BE STRAIGHT PIPE WITH NO FITTINGS OR TURNS UNTIL AFTER THESE SPECIFIED LENGTHS. PIPE AND FITTINGS MAY BE SCH 80 PVC SOLVENT WELD, THREADED SCH 80 PVC OR BRASS, AS REQUIRED FOR PROJECT.

DETAIL LEGEND:

1. HUNTER HC FLOW METER HC-100 WITH UNION CONNECTIONS
2. SCH 80 PVC FEMALE ADAPTER (S X T)
3. RECTANGULAR VALVE BOX PER SPECIFICATIONS
4. SCH 80 PVC 45 DEGREE ELBOW (S X S) TO LOWER MAIN LINE TO PROPER DEPTH (SIZE FOR LARGER MAIN LINE AS NEEDED)
5. SCH 80 PVC 45 DEGREE ELBOW (S X S) TO LOWER MAIN LINE TO PROPER DEPTH
6. 1.5" DIA. (40 mm) MAIN LINE AT INLET & OUTLET
7. MAIN LINE TO SYSTEM (SEE LEGEND AND PLANS FOR TYPE AND SIZE)
8. TWO WIRES TO FLOW SENSOR TERMINALS AT CONTROLLER. MIN. 18 AWG-UF (2.08 mm²) SHIELDED WIRE WITH DIFFERENT COLOR FROM CONTROL/COMMON WIRE.
9. WEATHERPROOF WIRE CONNECTOR
10. FINISH GRADE
11. SPECIFIED SOIL COVER (SEE LEGEND)
12. COMMON BRICK
13. GRAVEL BASE, 6" (15 cm) DEEP



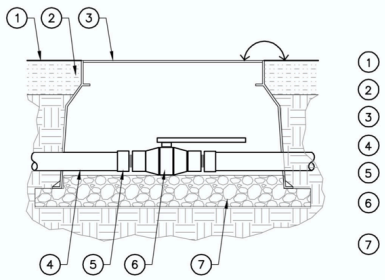
XX HC-100 FLOW METER (1"/25 mm)
Hunter IRRIGATION DETAIL NOT TO SCALE



LEGEND:
1. 18" ROOT ZONE WATERING SYSTEM PER PLAN
2. MULCH
3. FINISHED GRADE
4. LATERAL PIPE - SIZE PER PLAN
5. ROOT BALL
6. AMENDED SOIL MEDIA (PER SOILS REPORT)
7. NATIVE SOIL

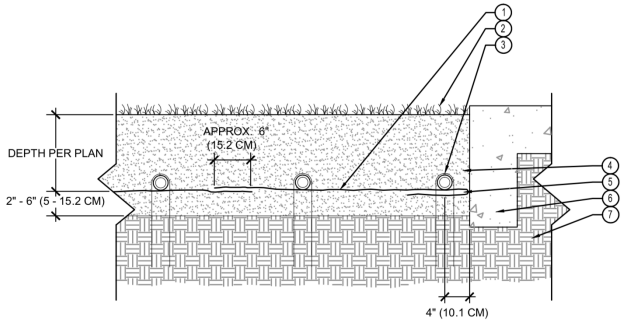
NOTES
INSTALL RZWS SLEEVE OVER TUBE TO HELP PREVENT SOIL INTRUSION

XX ROOT ZONE WATERING SYSTEM - 18"
Hunter HM.RZWS.02 NOT TO SCALE



1. FINISH GRADE
2. MULCH
3. VALVE BOX
4. MAIN LINE
5. MALE ADAPTERS
6. BRASS BALL VALVE, SIZED TO MATCH PIPE
7. FILL BOTTOM OF BOX WITH 3" DEPTH DRAIN ROCK

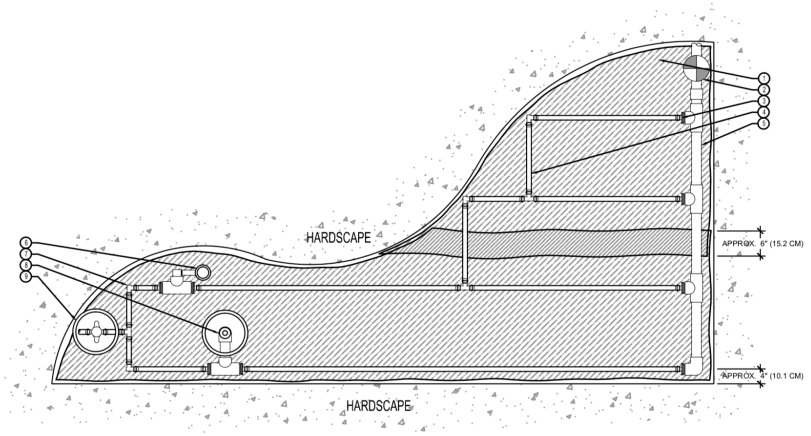
2 ISOLATION VALVE - BALL VALVE
SCALE: N.T.S.



LEGEND:
1. ECO-MAT PER PLAN
2. PLANT MATERIAL (SEE PLANTING PLAN)
3. STAKE INSTALLED APPROX. 8' (2.4 M) ON CENTER OVER TUBING TYP.
4. AMENDED SOIL MEDIA (PER SOILS REPORT)
5. FOLD EXCESS FLEECE UNDER MAT ADJACENT TO HARDSCAPE EDGE
6. ADJACENT HARDSCAPE EDGE PER PLAN
7. NATIVE SOIL

NOTES
RECOMMENDED INSTALLATION DEPTH BY PLANT TYPE
TURF AREAS: 4" - 8" (10.2 CM - 20.4 CM)
GROUND COVER AREAS: 6" - 8" (15.2 CM - 20.4 CM)
SHRUB AREAS: 12" (30.5 CM)

XX ECO-MAT - SECTION ADJACENT TO HARDSCAPE
Hunter HM.EM.05 NOT TO SCALE



LEGEND:
1. ECO-MAT PER PLAN - CUT MAT TO FIT LIMITS OF PLANTED AREA
2. DRIP CONTROL ZONE KIT PER PLAN
3. PVC TO DRIP LINE TUBING CONNECTION (PLD OR PLD-LOC FITTINGS) TYP.
4. ECO-WRAP CONNECTIONS
5. PVC SUPPLY HEADER - SIZE PER PLAN
6. PLD OR PLD-LOCK FITTING (TYP.)
7. ECO-INDICATOR ON SWING ARM
8. AIR RELIEF VALVE IN VALVE BOX
9. FLUSH POINT (PLD-BV) IN SUBTERRANEAN BOX PER PLAN

NOTES
AIR RELIEF VALVE (PLD-AVR) INSTALLED IN VALVE BOX AT OPTIMAL HIGHEST POINT FROM CONTROL ZONE KIT. MULTIPLE AIR RELIEF VALVES MAY BE NEEDED TO ACCOMMODATE DIFFERENCES IN GRADE.

ECO-INDICATOR TO BE INSTALLED AT OPTIMAL FURTHEST POINT FROM CONTROL ZONE KIT IN CLEAR VIEW WHEN POPPED UP.

FLUSH POINT TO BE INSTALLED AT OPTIMAL FURTHEST POINT FROM CONTROL ZONE KIT TO ALLOW FOR MAXIMUM DEBRIS FLUSH IN SYSTEM

XX ECO-MAT - IRREGULAR PLANTED AREA
Hunter HM.EM.13 NOT TO SCALE

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Notes

"Upon completion of the installation, the contractor SHALL submit to the (building inspector) a completed and signed Certificate of Completion stating that the project has been installed as designed."

Water Efficient Landscape Ordinance Notes:
Upon Completion of the installation, the contractor shall submit to the building inspector a copleted and signed "Certificate of Completion" stating that the project has been installed as designed.
The Certificate of Completion shall be accompanied by an irrigation audit, irrigation schedule, and maintenance schedule, as described in the City Ordinanace.
A Final City Inspection shall be performed. The installation contractor shall attend this inspection and make all required repairs and adjustments to achieve approval and completion from the City. Talk to your building inspector prior to final inspection about getting the WELO signed off at that time.

WELO: I have complied with the criteria of the ordinance and applied them for efficient use of water in the irrigation design.
Signed: Dave Phelps
Dave Phelps, Landscape Architect #LA4133

LANDSCAPE IRRIGATION NOTES:
All irrigation except for the Veggie Garden and citrus is to be point source drip with pressure compensating, and self-flushing emitters applying water at the rate indiated.
Drip Emitter Schedule:
36" box: 12 emitters per plant
24" box: 8 emitters per plant
15-gal: 5 emitters per plant
5-gal: 3 emitters per plant
1-gal: 2 emitters per plant
4": 1 emitter per plant
A weather-based, ET controller equipped with a rain shut off device, solid state memory shall be installed and programmed to operate at less than 45% of ETo.
1" inline electric solenoid valves equipped with 3/4" wye filters and 40 psi pressure regulators shall be installed in manifolds in 11x17 valve boxes.
(Hunter ICZ-101-LF Drip Control Zone Kits)
1" bent nose hose bibbs shall be installed on galvainized or better risers at mainline ends as shown and mounted on 4x4 PTDF or RWD posts set in concrete, typ.
Mainline to be 1-1/4" SCH 40 PVC. Lateral and lateral drip manifolds to be 1" or 3/4" Sch 40 PVC downstream of the valve, minimum.
Mainline sleeves under concrete shall be 2" sch 40 PVC minimum.
1/2" flush valves in 7" round v. boxes shall be installed at the end and lowest point of each drip zone, typ.
MP2000 Rotators to be installed on 12" 40PSI Pressure Regulating Bodies on swing joints.

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Irrigation Schedules

- Establishment (may not exceed 100% of Eto)
  - "means the first year" -or 2 years if temporary
- Temporary
- Mature

- By Designer
- By 3rd Party Auditor

- Water Window
- Run Times
- Minutes to Run-off
- Cycles –Start Times
- Intervals –Days between irrigation events
- Monthly or Weekly Run times

EPA Watersense:

$$LWR_H = \frac{1}{DU_{LQ}} \times [(ET_o \times K_L) - R_a] \times A \times C_u$$

Where:
LWR_H = Landscape water requirement for the hydrozone (gallons/month)
DU_{LQ} = Lower quarter distribution uniformity
ET_o = Local reference evapotranspiration (inches/month)
K_L = Landscape coefficient for the type of plant in that hydrozone (dimensionless)
R_a =Allowable rainfall, designated by WaterSense as 25% of average peak monthly rainfall (R)
A = Area of the hydrozone (square feet)
C_u = Conversion factor (0.6233 for results in gallons/month)

CLCA Resources:

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

Irrigation Scheduling Worksheet

Enter Precipitation Rate:
Enter Station Run Time:

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:
Enter Station Run Time:

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:
Enter Station Run Time:

Shrubs & Trees (no ground cover)

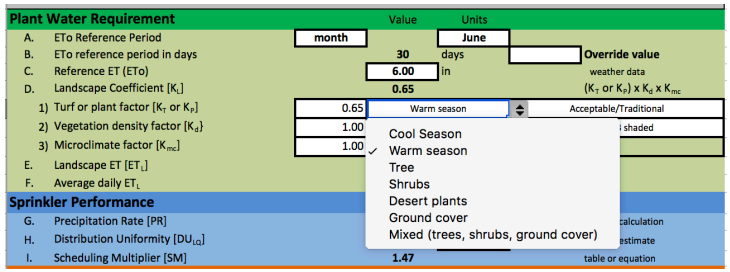
Month	Reference ET	Season	adj.	Crop	k	Exposure	System k	Required H2O	Minutes per week	Number of cycles/week
January	1.35	1		0.5	1		0.55	1.23	26	2
February	1.87	1		0.5	1		0.55	1.70	36	3
March	3.45	1		0.5	1		0.55	3.14	67	6
April	5.03	1		0.5	1		0.55	4.57	97	8
May	5.93	1		0.5	1		0.55	5.39	115	10
June	6.71	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		

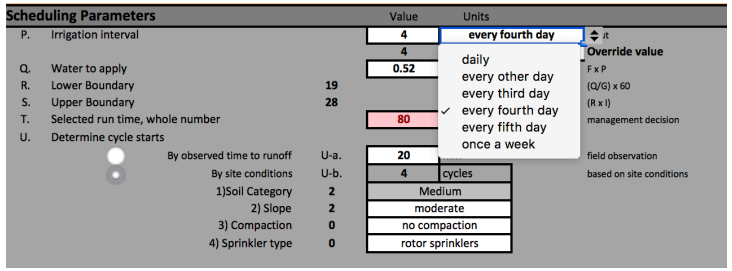
…Or use online Calculators!

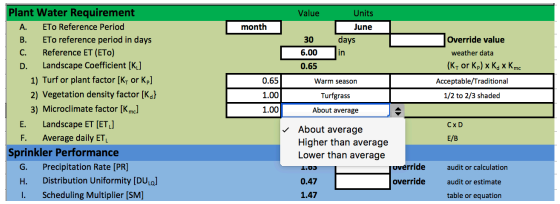
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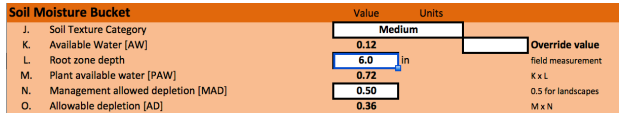
Irrigation Association

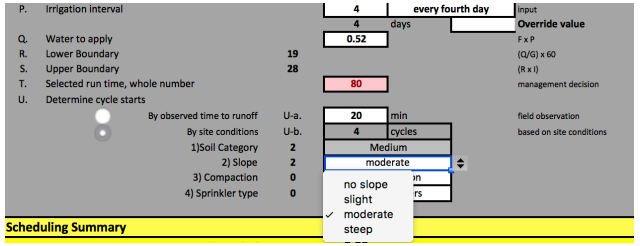
More Acronyms:
Available Water (AW)
Plant Available Water (PAW)
Scheduling Multiplier (SM)

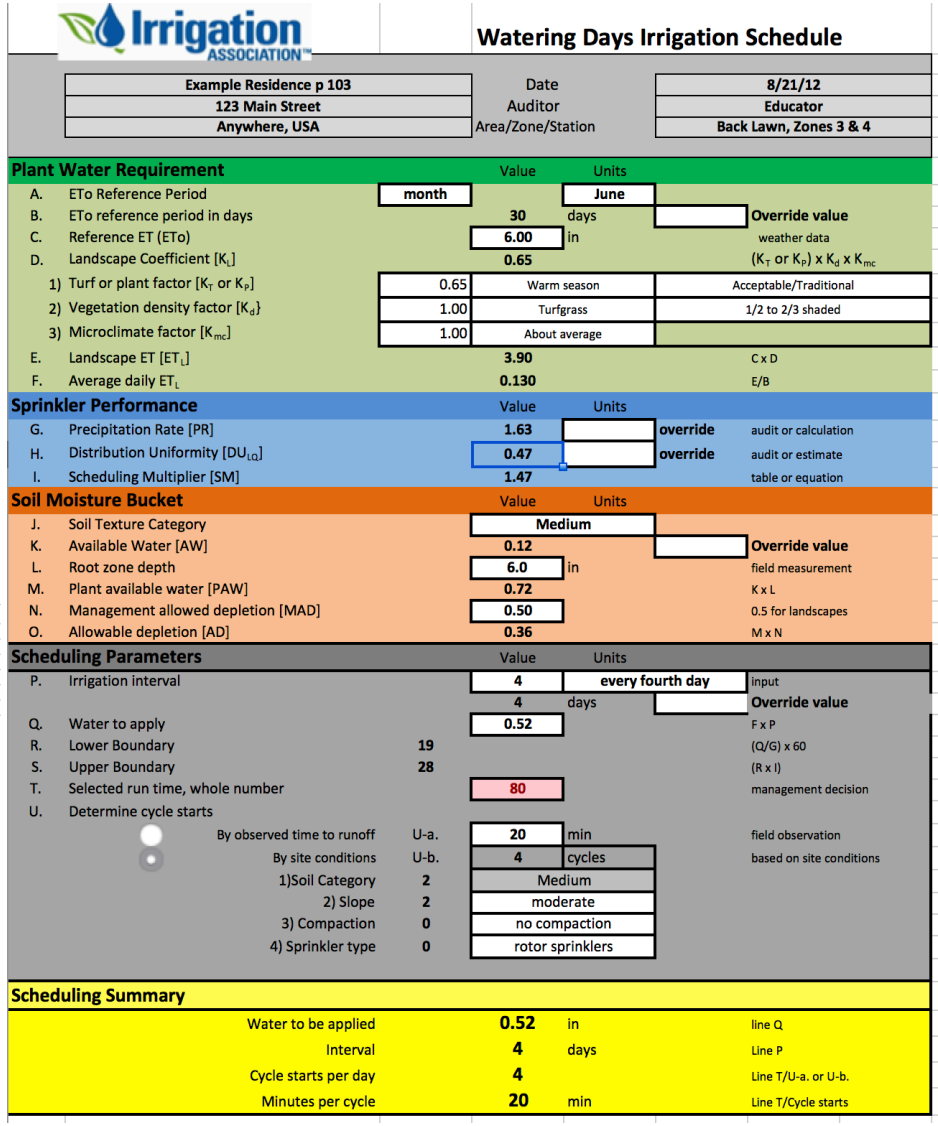








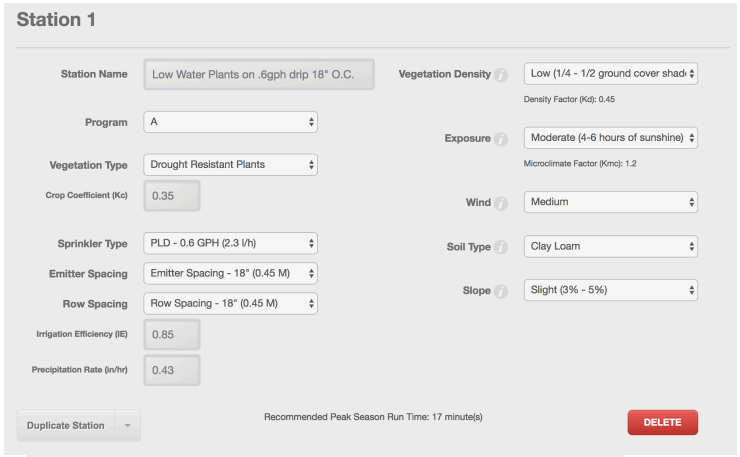


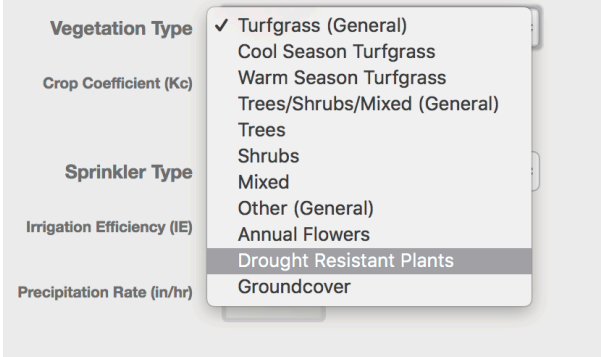


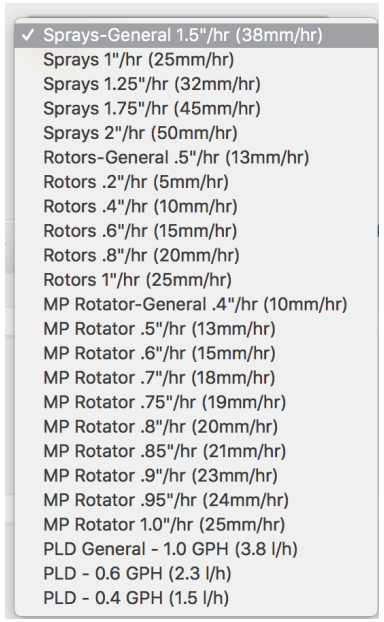
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Online Schedule Calculators

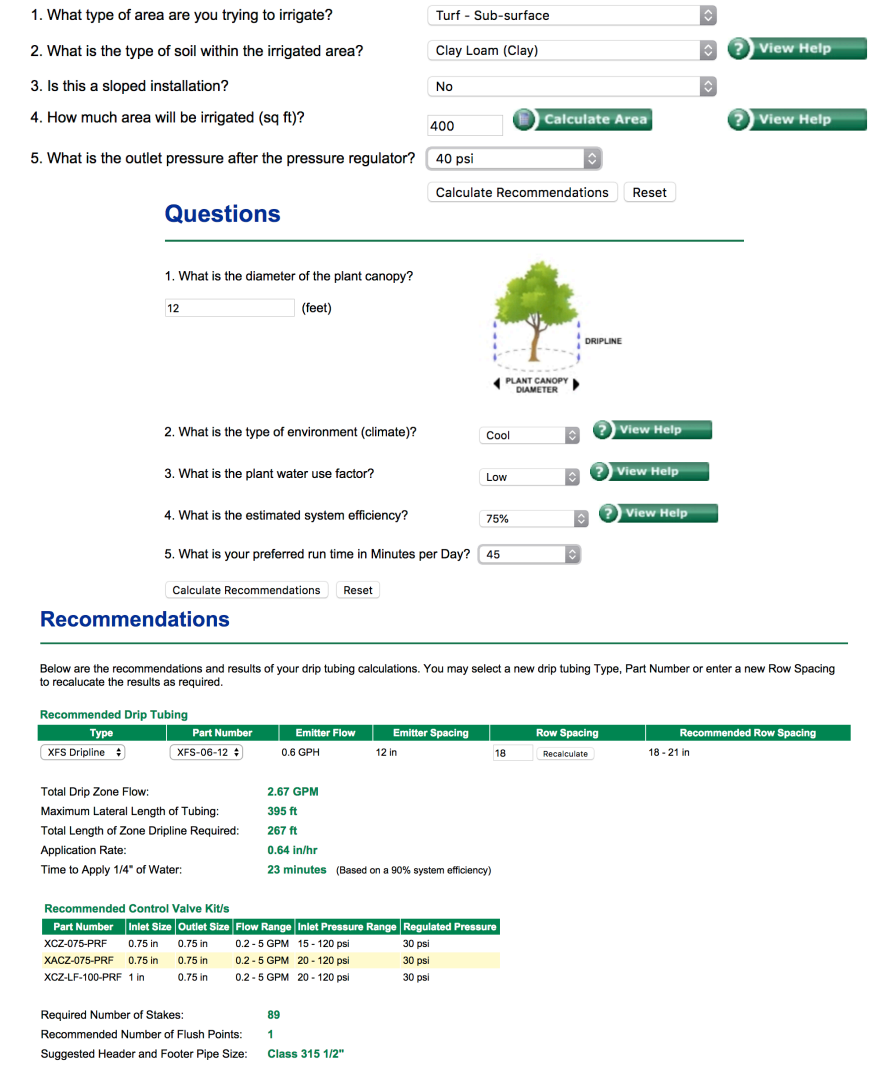
https://www.hunterindustries.com/tools/runtime







http://softwarerepublic.com/rainbirdps/



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TECHLINE® DRIPLINE



Netafim

CONTROL ZONES



CALCULATIONS ON THE GO



Dripline Placement: ON-SURFACE | SUB-SURFACE

Types of Plants: SHRUBS / GROUNDCOVER | TURF

Soil Type: CLAY | LOAM | SAND | COARSE

Inlet Pressure (psi): 25 — 60 — 50

Irrigated Area (sq ft): 20

Select Product: TLCV

Flow Rate (gph) (Recommended: 0.26 Clay): 0.26 Clay | 0.42 Loam | 0.61 Sand | 0.92 Coarse

Emitter Spacing (in) (Recommended: 18): 12 | 18 | 24

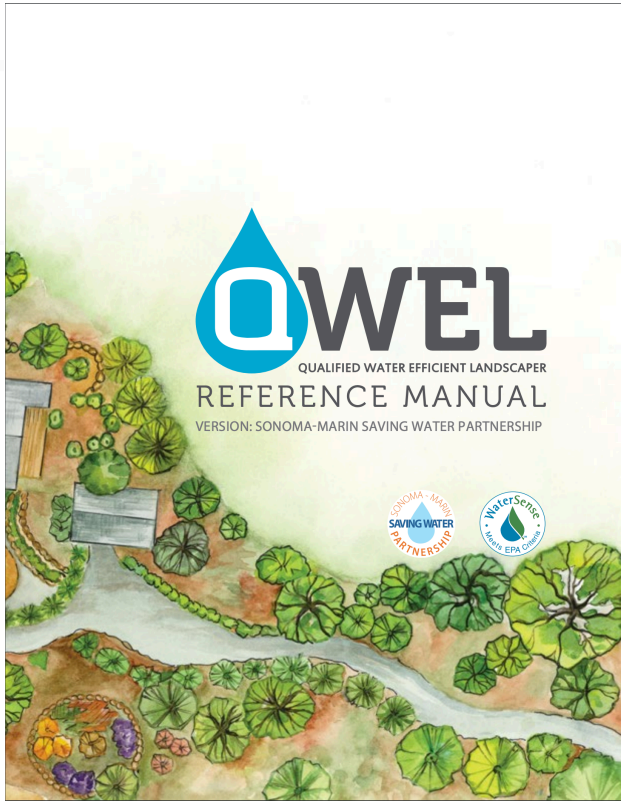
Row / Lateral Spacing (in) (Recommended: 18 - 24): 6 — 24 — 18

Application Rate (in/hr): 0.19

Acceptable Precipitation Rates for Soil Type: 0.14" - 0.19"

Preferred Coil Length: 100' | 250' | 500' | 1000'

Desired Disc Filter Mesh: 120 | 140



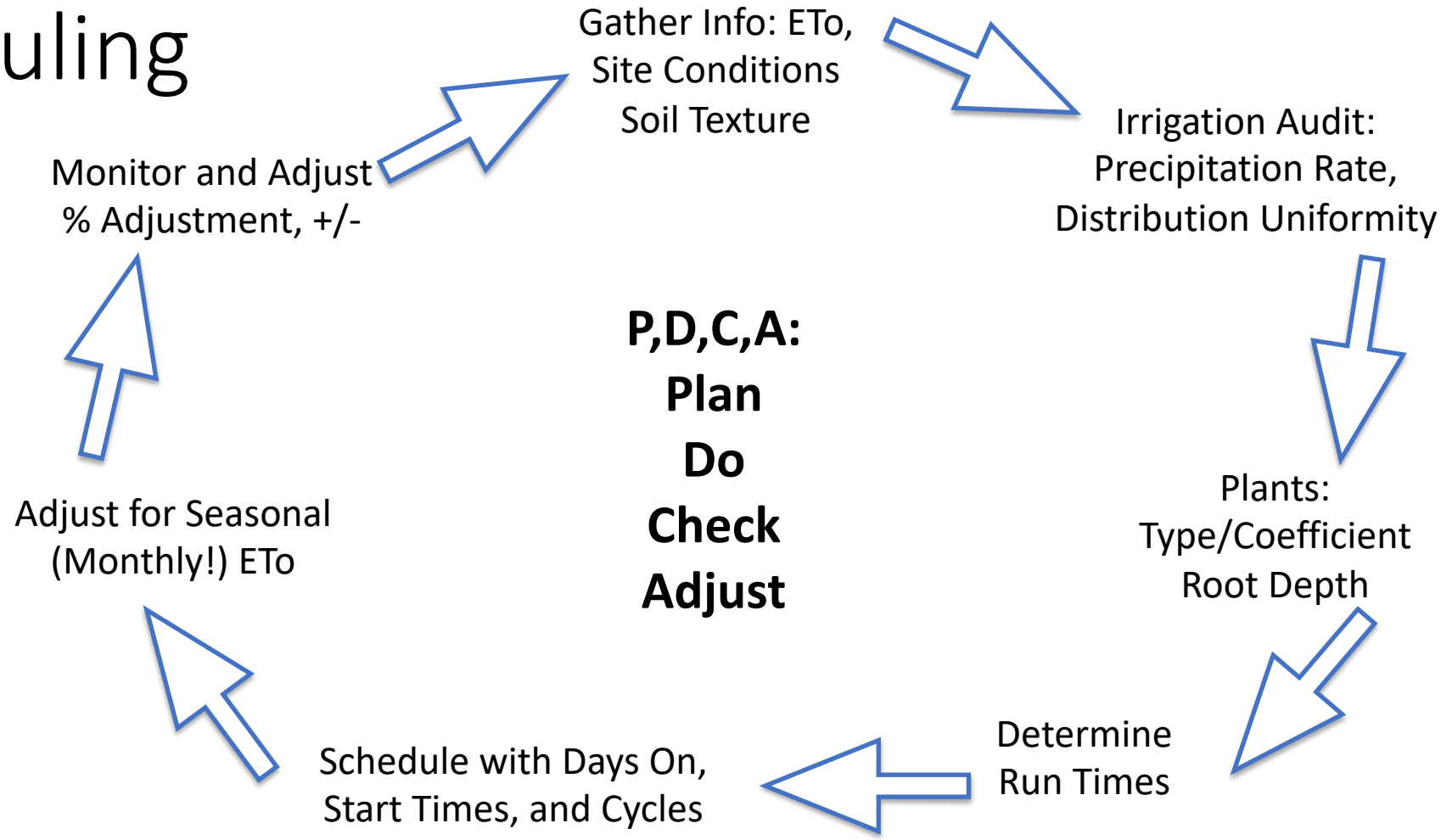
WATERSENSE CERTIFIED

QWEL
QUALIFIED WATER EFFICIENT LANDSCAPER

https://www.qwel.net/files/QWEL_Reference_Manual_SMSWP_INTERACTIVE.pdf

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Irrgation scheduling



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Certificate of Completion

- Project Info

CERTIFICATE OF COMPLETION

This certificate is filled out by the project applicant upon completion of the landscape project.

PART 1. PROJECT INFORMATION SHEET

Date		
Project Name		
Name of Project Applicant	Telephone No.	
	Fax No.	
Title	Email Address	
Company	Street Address	
City	State	Zip Code

Project Address and Location:

Street Address		Parcel, tract or lot number, if available.
City		Latitude/Longitude (optional)
State	Zip Code	

Property Owner or his/her designee:

Name	Telephone No.	
	Fax No.	
Title	Email Address	
Company	Street Address	
City	State	Zip Code

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Certificate of Completion

- Certification:
  - Installed according to the Landscape Documentation Package
  - Contains Audit
  - Contains Schedule
  - Contains Maintenance

Landscape Architect / Designer

Landscape Contractor / Installer

Certify with Signatures

PART 2. CERTIFICATION OF INSTALLATION ACCORDING TO THE LANDSCAPE DOCUMENTATION PACKAGE

"I/we certify that based upon periodic site observations, the work has been substantially completed in accordance with the ordinance and that the landscape planting and irrigation installation conform with the criteria and specifications of the approved Landscape Documentation Package."

Signature*	Date	
Name (print)	Telephone No.	
	Fax No.	
Title	Email Address	
License No. or Certification No.		
Company	Street Address	
City	State	Zip Code

*Signer of the landscape design plan, signer of the irrigation plan, or a licensed landscape contractor.

Part 2. Landscape Architect and Landscape Contractor/Installer

Landscape Architect Name:	Telephone No.:	
	Fax No:	
Title:	Email Address:	
License No. or Certification No.:	Street Address:	
Company:	City:	
	State:	ZIP Code:

Landscape Contractor Name:	Telephone No.:	
	Fax No:	
Title:	Email Address:	
License No. or Certification No.:	Street Address:	
Company:	City:	
	State:	ZIP Code:

"I/we certify that the work has been completed in accordance with the ordinance and that the landscape planting and irrigation installation conform to the criteria and specifications of the approved Landscape Documentation Package. Additionally, a landscape audit and irrigation maintenance schedule have been completed and are attached to this certificate showing that the system meets the efficiency requirements used in the Maximum Applied Water Allowance calculation".

Landscape Architect Signature Date

Landscape Contractor Signature Date

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Certificate of Completion

- Irrigation Schedule
- Maintenance
- Audit
- Soil Management Report

PART 3. IRRIGATION SCHEDULING
Attach parameters for setting the irrigation schedule on controller per ordinance Section 492.10.

PART 4. SCHEDULE OF LANDSCAPE AND IRRIGATION MAINTENANCE
Attach schedule of Landscape and Irrigation Maintenance per ordinance Section 492.11.

PART 5. LANDSCAPE IRRIGATION AUDIT REPORT
Attach Landscape Irrigation Audit Report per ordinance Section 492.12.

PART 6. SOIL MANAGEMENT REPORT
Attach soil analysis report, if not previously submitted with the Landscape Documentation Package per ordinance Section 492.5.
Attach documentation verifying implementation of recommendations from soil analysis report per ordinance Section 492.5.

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Maintenance Schedule

- Routine Inspection, Audits, Adjustments, and Repair of the Irrigation
- Topdressing of Mulch Schedule
- Aerating / Dethatching / Topdressing Turf areas Schedule
- Fertilizing Products, Amounts, and Schedule
- Pruning Schedules
- IPM: Weeds and Pests Management Schedule and Guidelines
  - Look for Local Agency Maintenance Manual example
  - Use ReScape California Maintenance Manual Example/Verbiage

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3rd Party Audit



- Details in Talk #2
- Legally, the Designer can NOT perform the Audit.
  - Onsite Inspection
  - Hydrozone Chart/Plan in Controller -Reduced, Laminated Color Chart is best
  - Catch Can test for Overhead Spray

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Correction Form

MWELO Plan Check Standard Corrections

Requires Correction	Code Sec. No.	Ordinance Description	Correction/Comment
	492.3	Landscape Documentation Package	
	492.4	Water Efficient Landscape Worksheet	
	492.5	Soil Management Report	
	492.6	Landscape Design Plan	
	492.7	Irrigation Design Plan	
	492.8	Grading Design Plan	
	492.9	Certificate of Completion	
	492.14	Recycled Water	
	492.15	Graywater Systems	
	493.2	Water Waste Prevention	
	494	Effective Precipitation	
	492 Appendix D	Prescriptive Compliance Option	

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~Thank You~

Dave Phelps

(415) 215-5785

Dave@GardenEnlightenment.com

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