A-1 URBAN WATER CONSERVATION GRANT APPLICATION
COVER SHEET

1. Applicant (Organization or affiliation): Regional Water Authority
2. Project Title: Rain Sensor Device Installation Program

3. Person authorized to sign and submit proposal:

Name, Title	Edward Winkler, Executive Director
Mailing address	5620 Birdcage Street, Suite 180, Citrus Heights, CA 95610
Telephone	916-967-7692
Fax	916-967-7322
E-mail	ewinkler@rwah2o.org

4. Contact person (if different):

Name, Title	Charlie Pike, Regional Water Efficiency Manager
Mailing address	5620 Birdcage Street, Suite 180, Citrus Heights, CA 95610
Telephone	916-967-7692
Fax	916-967-7322
E-mail	cpike@rwah2o.org

5. Funds requested (dollar amount): $1,902,000
6. Applicant funds pledged (local cost share) (dollar amount): $75,000
7. Total project costs to DWR and Participating Agencies (dollar amount): $1,977,000

8. Estimated net water savings (acre-feet/year): 1,040
   Estimated total amount of water to be saved (acre-feet) over 10 years (project life): 21,840
   Benefit/cost ratio of project for applicant: 1.6
   Estimated average $/acre-feet of water to be saved: $89/AF

9. Project life (month/year to month/year): 10/03 – 12/06

10. State Assembly District where the project is to be conducted: 4, 5, 9 and 10

11. State Senate District where the project is to be conducted: 1, 4, 5 and 6

12. Congressional District(s) where the project is to be conducted: 3, 4, 5

13. County where the project is to be conducted: El Dorado, Sacramento and Placer County

14. Do the actions in this application involve physical changes in land use, or potential future changes in land use?
    (a) Yes
    (b) No — No

A-2 APPLICATION SIGNATURE PAGE

By signing below, the official declares the following:

The truthfulness of all representations in the application;

The individual signing the form is authorized to submit the application on behalf of the applicant;

The individual signing the form read and understood the conflict of interest and confidentiality section and waives any and all rights to privacy and confidentiality of the application on behalf of the applicant; and

The applicant will comply with all terms and conditions identified in this Application Package if selected for funding.

	Edward D. Winkler, Executive Director	12/1/02
Signature	Name and Title	Date

A-3 APPLICATION CHECKLIST

Part A: Project Description, Organizational, Financial and Legal Information
__X__A-1 Urban Water Conservation Grant Application Cover Sheet
__X__A-2 Application Signature Page
__X__A-3 Application Checklist
__X__A-4 Description of Project
__X__A-5 Maps
__X__A-6 Statement of work, schedule
__X__A-7 Monitoring and evaluation
__X__A-8 Qualification of applicant and cooperators
__X__A-9 Innovation
__X__A-10 Agency authority
__X__A-11 Operation and maintenance (O&M)

Part B: Engineering and Hydrologic Feasibility (construction projects only)
__X__B-1 Certification statement
__X__B-2 Project reports and previous studies
_NA_B-3 Preliminary project plans and specifications
__X__B-4 Construction inspection plan

Part C: Plan for Environmental Documentation and Permitting
_NA_C-1 CEQA/NEPA
_NA_C-2 Permits, easements, licenses, acquisitions, and certifications
_NA_C-3 Local land use plans
_NA_C-4 Applicable legal requirements

Part D: Need for Project and Community Involvement
__X__D-1 Need for project
__X__D-2 Outreach, community involvement, support, opposition

Part E: Water Use Efficiency Improvements and Other Benefits
__X__E-1 Water use efficiency improvements
__X__E-2 Other project benefits

Part F: Economic Justification, Benefits to Costs Analysis
__X__F-1 Net water savings
__X__F-2 Project budget and budget justification
__X__F-3 Economic efficiency

Appendix A: Sacramento Metropolitan Area Housing Trends
Appendix B: Example of Outreach Materials on Efficient Residential Outdoor Water Use
Appendix C: Project Managers Resumes
Appendix D: External Cooperator Commitment Letters
Appendix E: Rain Sensor Equipment Specifications
Appendix F: Cost Estimate for Labor & Rain Sensor Devices
Appendix G: Background Documentation
Appendix H: Sample Data from Sacramento County Customer with Rain Sensor Devices
Appendix I: Letter of Support – Sacramento Water Forum
Appendix J: Results Economic Uncertainty Analysis

A-4 DESCRIPTION OF PROJECT

The project consists of installing rain sensor switches by retrofitting irrigation controllers serving existing homes, businesses, and by coordinating with local homebuilders to upgrade irrigation systems with rain sensors within the metropolitan region of Sacramento, California. This project will be regionally administered through the Regional Water Authority (RWA) in Sacramento, California to install 15,000 rain sensors.

The efficient use of California's limited water supplies is a critical local, regional, and statewide water issue. RWA assists 18 member water suppliers serving more 756,000 acre- feet of water per year to more than 1.2 million people. These retail water suppliers utilize both surface water from the Sacramento River and American River and groundwater as part of their water supply. This project can be considered a potential Best Management Practice (PBMP) implementation program, as it is not contained within the *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU) list of fourteen Best Management Practices (BMPs). By providing funding for purchase and installation of rain sensor devices, this project will build upon commitments by the participating agencies to honor the Sacramento Water Forum Agreement including Water Forum BMP 1 for Indoor and Exterior Residential Surveys, BMP 5 for large landscapes, and BMP 9 for Commercial Institutional and Industrial (CII) and Multi-family Account Surveys.

This project is a regional expansion of the pilot project currently being implemented by the County of Sacramento Water Resources, which has installed approximately 250 rain sensors between 2000 and 2002. Eleven (11) retail agencies will participate in this program as external cooperators. to have a minimum of 100 sites within their respective service areas receive rain sensors. The additional rain sensors are proposed, based on current discussion with local builders, to be installed in new homes, which are currently being built at the rate of over 10,000 per year in the Sacramento area. (Appendix A)

<u>External cooperating water agencies for this project are:</u>
Citrus Heights Water District
City of Folsom
City of Lincoln
City of Roseville
City of Sacramento
County of Sacramento
El Dorado Irrigation District
Fair Oaks Water District
Placer County Water Agency
Sacramento Suburban Water District
San Juan Water District

The project cost is $1,977,000 including local agencies' contribution. The total proposed grant amount is $1,902,000. This project can be considered scalable but not separable as described in Section A.6.3 of the application. As described further in Section F, this project will result in total annual average net water savings of **1,040 ac-ft/year**, and total estimated water savings of **21,840 ac-ft** with a favorable benefit cost ratio of **1.6**. The benefits-cost summary tables are presented in Section F, which are in lieu of DWR provided benefit cost tables.

A-5 MAP

Figure 1 depicts the location of water sources of supply and service areas of RWA member agencies. Figure 2 and 3 present the service area boundaries for Placer County Water Agency and El Dorado Irrigation District, respectively. Figure 4 illustrates the USGS topographical vicinity map for the regional area.

A-6 STATEMENT OF WORK, SCHEDULE

This section describes the nature, scope, and objectives of the project.

A.6.1 Nature, Scope, and Objectives of the Project

The overall goal of this project is the reduction of consumptive water use for irrigating landscaped areas within the Sacramento region. Although this program is designed to target residential customers, any site will be eligible with landscaped area more than 0.12 acres that possesses an automatic irrigation controller that is not evapotranspiraton (ET) based. The top 20 percent of water consumers will be targeted for surveys and rain sensor device installation.

The objective of this project is to install a rain sensor device for the owners of homes and commercial large landscape sites that qualify for an audit of their irrigation system. The site audit program will be funded by local agencies, but each agency has no provisions for funding the purchase and installation, estimated as 2 hours labor and $12 unit cost. Thus, goal of this project is fund the cost of device and cost of installation while on-site for the landscape audits. With this incentive provided by water utilities, site owners would be more inclined to participate and there will be guaranteed immediate implementation of a recommended upgrades for their automatic irrigation systems that would be uncovered during the site audits.

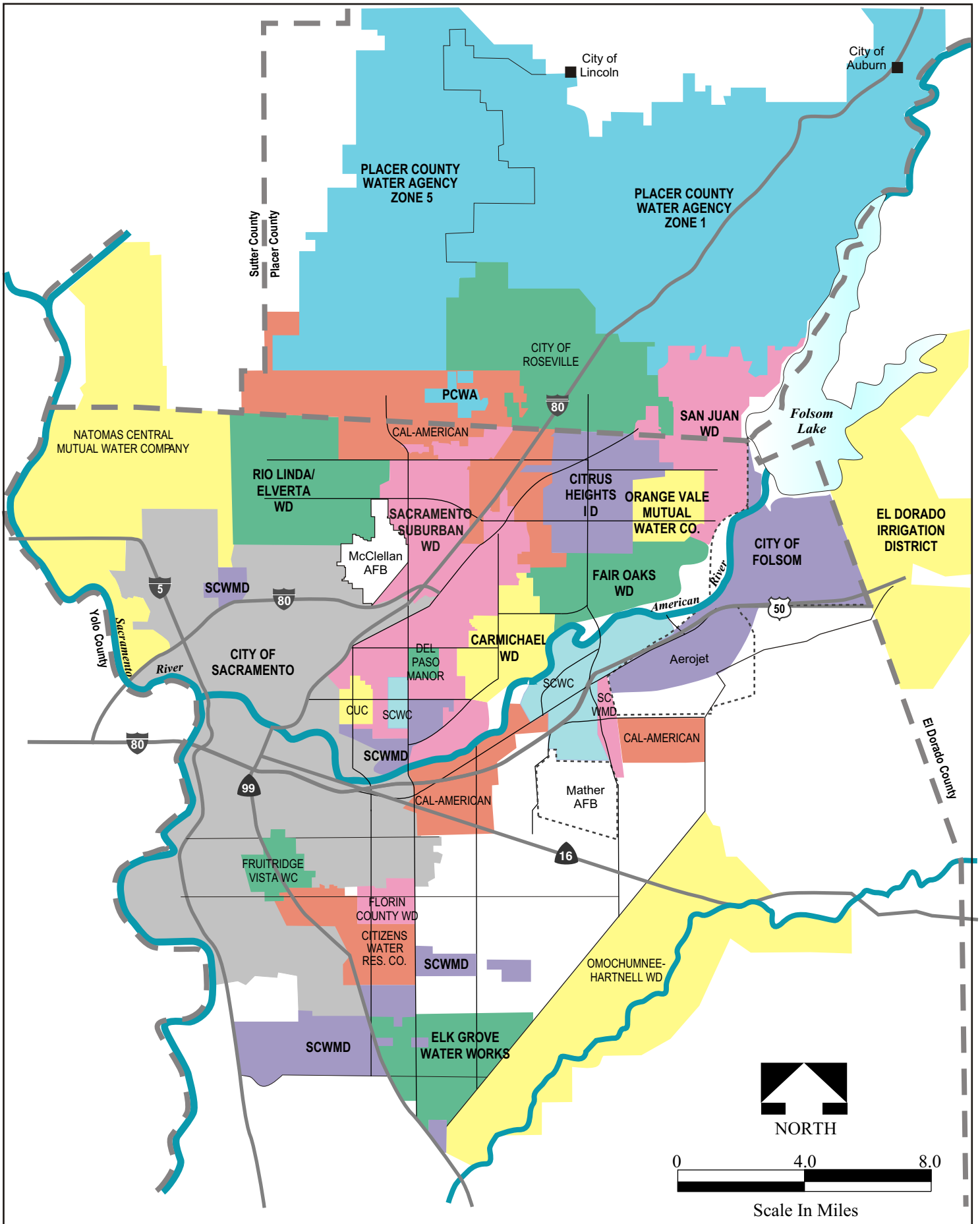
The installation program will be regionally administered through RWA providing all administrative duties associated with the grant from DWR and the retail agencies covering the administrative costs of providing the installation for the customer. RWA will administer bulk purchase of 15,000 devices and contractor and/or agency personnel installation costs over the three-year project time frame. Work for this project will be conducted by a competitively bid contractor and/or in-house water agency staff. This project will not include contracting out the regional administration of the grant, unless retail agencies specifically request the additional assistance in lieu of receiving administrative funding.

A.6.2 Scope of Work: Technical/Scientific Merit, Feasibility, Monitoring and Assessment

This section describes the methods, procedures and facilities associated with the project. A task list and schedule and quarterly expenditure of the project are also included in this section.

Methods, Procedures, and Facilities

This project is a regional approach to purchase and install rain sensors to improve the efficiency of irrigation systems. The costs of the project primarily involve the agency match share and RWA administrative costs to implement the three-year program. Approximately 15,000 installations to occur over the three-year period between October 2003 and December 2006.



DATE	12-2-02	PROJECT	23546	SITE	DWR WUE Grant Application	FIGURE
BROWN AND CALDWELL				TITLE	Sacramento Regional Area Water Suppliers	1

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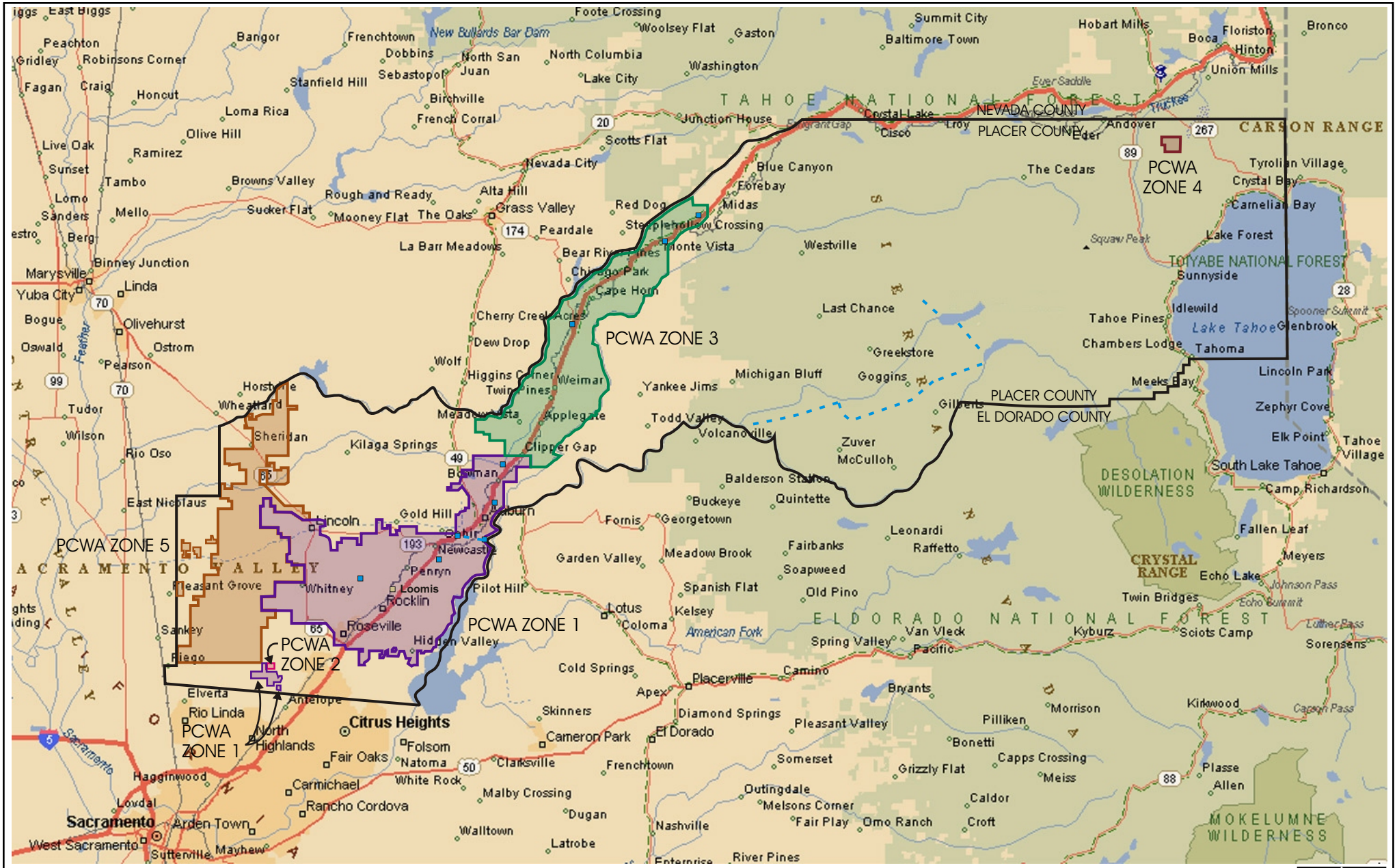

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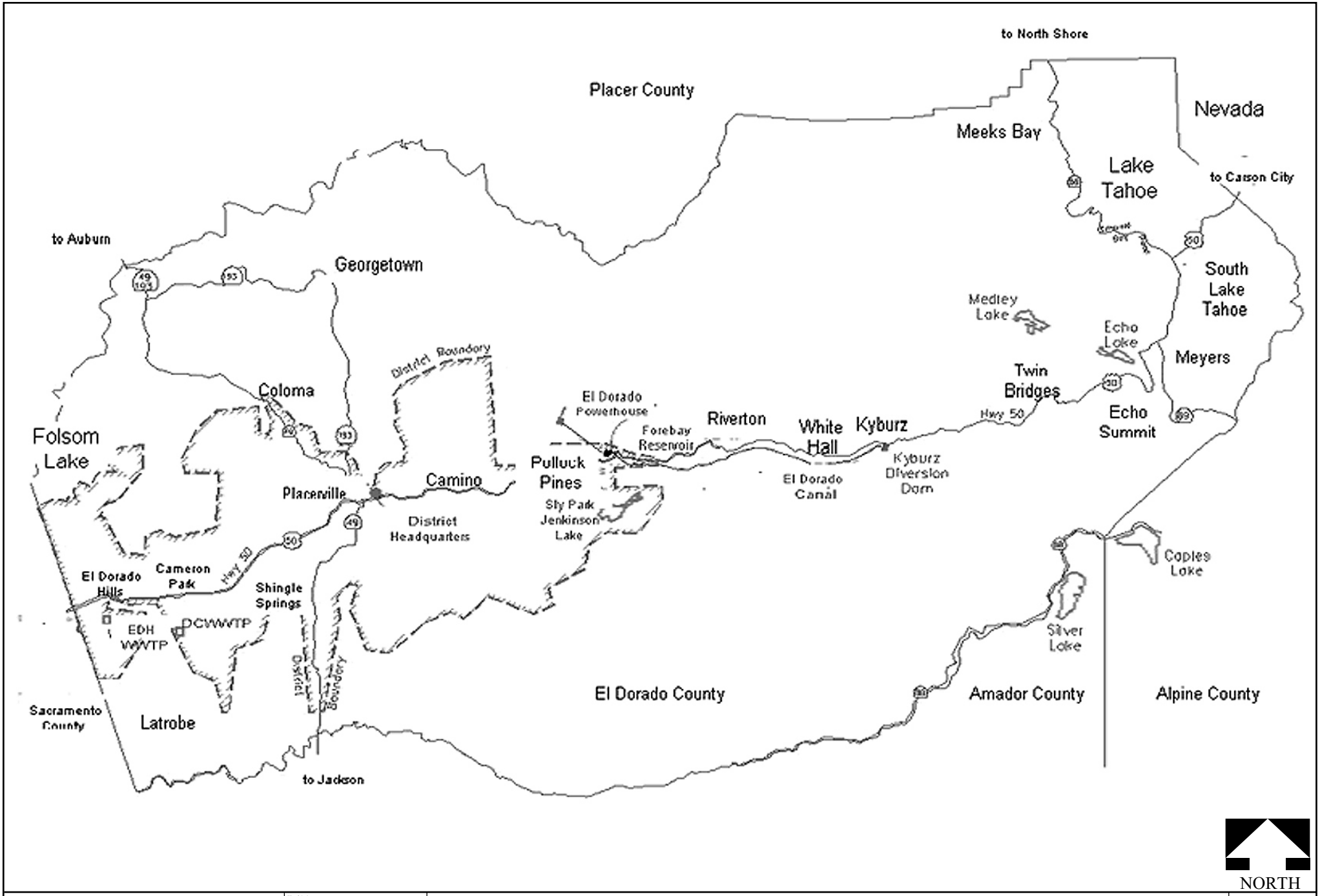
BROWN AND CALDWELL	DATE 12-2-02	DWR WUE Grant Application	FIGURE
	PROJECT 23546	TITLE Placer County Water Agency Service Area Map	2



BROWN AND CALDWELL	DATE 12-2-02	DWR WUE Grant Application	FIGURE
	PROJECT 23546	TITLE El Dorado Irrigation District Service Area Map	3

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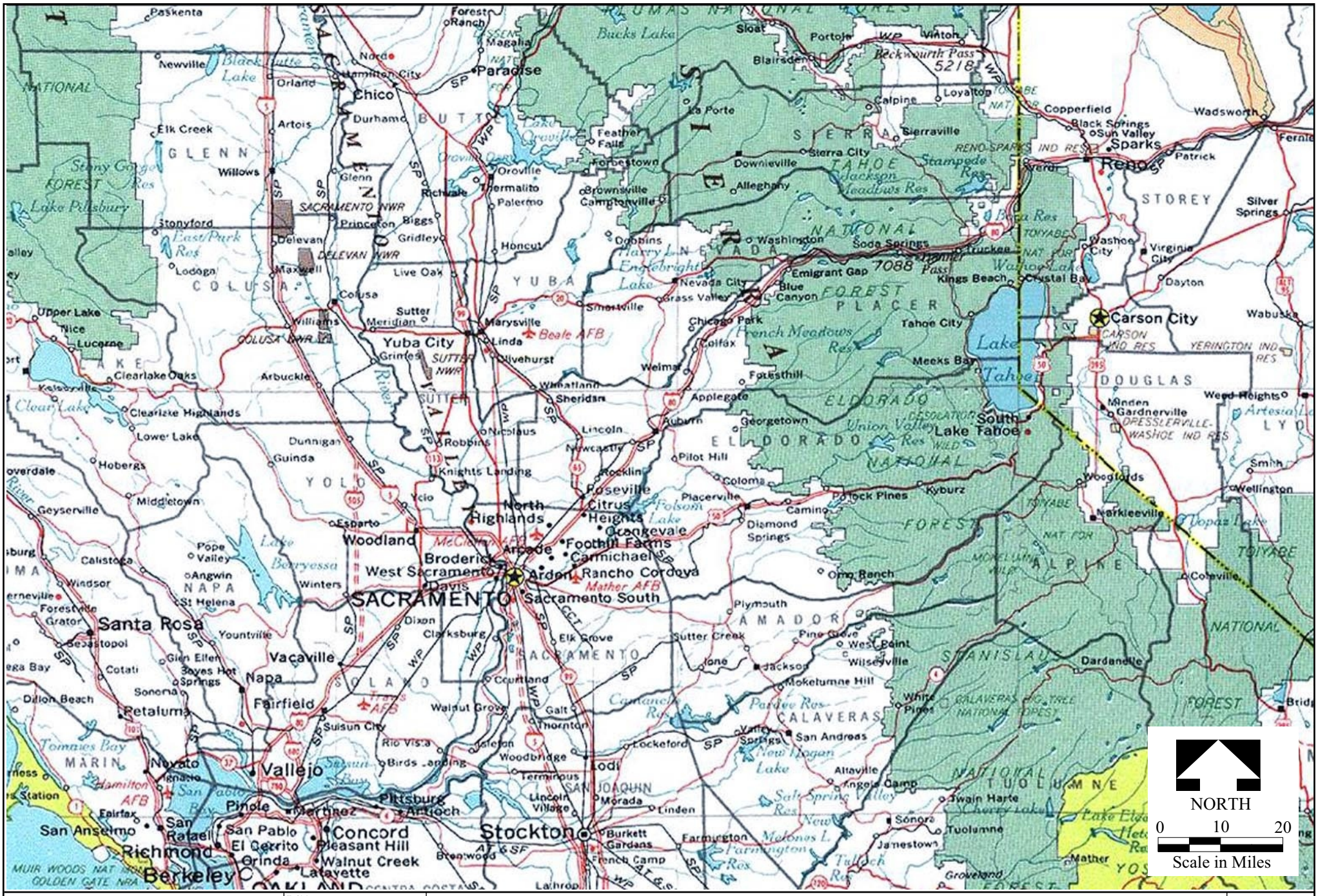

Paskenta
Newville
Orland
Chico
Durham
Paradise
Magalia
Forest Ranch
Nord
Hamilton City
Elk Creek
Artois
Willows
GLENN
Stony Gorge Res
Lake Pillsbury
Stonyford
Lodoga
Maxwell
Delevan
Princeton
Glenn
Richvale
Biggs
Gridley
Oroville
Thermalito
Palermo
Honcut
Live Oak
Colusa
Williams
Sutter
Meridian
Yuba City
Marysville
Linda
Olivehurst
Beale AFB
Arbuckle
Clearlake Oaks
Upper Lake
Nice
Lucerne
Clearlake Highlands
Lower Lake
Hobergs
Middletown
Geyserville
Calistoga
Windsor
Santa Rosa
Sebastopol
Cotati
Sonoma
Petaluma
Napa
Fairfield
Vacaville
Vallejo
Novato
San Rafael
Richmond
Berkeley
San Anselmo
Pinole
Martinez
Pittsburg
Antioch
Concord
Pleasant Hill
Walnut Creek
Lafayette
Orinda
San Pablo
El Cerrito
Stockton
Lodi
Woodbridge
Galt
Elk Grove
Sacramento
Sacramento South
Rancho Cordova
Mather AFB
McClellan AFB
Arden
Arcade
Carmichael
Foothill Farms
Citrus Heights
Roseville
Rocklin
Lincoln
Auburn
Newcastle
Woodland
West Sacramento
Davis
Winters
Dixon
Knights Landing
Yolo
Colusa
Sutter
Yuba
Placer
Nevada
Sierra
Tahoe
Lake Tahoe
Truckee
Reno
Sparks
Carson City
Minden
Gardnerville
South Lake Tahoe
Meeks Bay
Tahoe City
Kings Beach
Crystal Bay
Emigrant Gap
Blue Canyon
Nevada City
Grass Valley
Colfax
Foresthill
Georgetown
Placerville
Pollock Pines
Kyburz
Camino
Diamond Springs
Coloma
Pilot Hill
Plymouth
Sutter Creek
Jackson
Ione
Mokelumne Hill
Calaveras
San Andreas
Angels Camp
Altaville
Jamestown
Sonora
Tuolumne
Twain Harte
Mariposa
Groveland
Mather
Lockeford
Lodi
Morada
Linden
Stockton
Burkett Gardens
French Camp
Lathrop
Manteca
Ripon
Escalon
Modesto
Turlock
Merced
Livermore
Pleasanton
Dublin
Hayward
San Leandro
Oakland
Alameda
Fremont
Sunnyvale
San Jose
Santa Cruz
Monterey
Salinas
Gilroy
Hollister
Watsonville
Carmel
Big Sur
Paso Robles
Atascadero
San Luis Obispo
Morro Bay
Cambria
Lompoc
Santa Barbara
Ventura
Oxnard
Port Hueneme
Malibu
Santa Monica
Hollywood
Los Angeles
Long Beach
Anaheim
Santa Ana
Fullerton
Pomona
Ontario
Riverside
San Bernardino
Redlands
Yucaipa
Hemet
San Jacinto
Temecula
Fallbrook
Escondido
Oceanside
Carlsbad
San Diego
Chula Vista
Imperial Beach
Coronado
Tijuana
Mexicali
Calexico
Yuma
Needles
Barstow
Victorville
Apple Valley
Hesperia
Adelanto
Lancaster
Palmdale
Bakersfield
Taft
Maricopa
Lemoore
Hanford
Visalia
Tulare
Porterville
Delano
Ridgecrest
Mojave
Tehachapi
Frazier Park
Ojai
Fillmore
Simi Valley
Thousand Oaks
Camarillo
Moorpark
Chatsworth
Sylmar
Pacoima
Tujunga
Glendale
Burbank
Pasadena
Alhambra
Monterey Park
Whittier
Norwalk
Downey
Bellflower
Lakewood
Cerritos
Hawthorne
Torrance
Redondo Beach
Manhattan Beach
Inglewood
Culver City
Beverly Hills
Westwood
Bel Air
Malibu
Topanga
Calabasas
Agoura Hills
Westlake Village
Newbury Park
Ventura
Oxnard
Port Hueneme
Ojai
Fillmore
Santa Paula
Piru
Fillmore
Saticoy
Camarillo
Moorpark
Simi Valley

The scope of this project consists of ten primary steps to be performed by RWA in conjunction with the member agency staff:

1. Continue to perform landscape audits.
2. Identify potential additional candidate sites by working with local builders and targeting the top 20 percent water using accounts in aggressive regional marketing efforts.
3. Develop additional program marketing materials and printing more publications, such as "Rules to Thumb for Water Wise Gardening" (see Appendix B).
4. Conduct surveys and perform device installations on automatic irrigation systems.
5. Create quarterly summary reports of activity levels for DWR invoices.
6. Perform monitoring through randomly verifying installations and conducting customers for assessment of satisfaction.
7. Complete final report to DWR.

RWA will use standard administrative procedures to implement this regional program. Due to the heterogeneity and liability with utility purchasing and installing irrigation system equipment on customer's facilities, it is foreseen that the most economical and feasible means for the purchase and installation is to hire a contractor. An additional benefit of RWA conducting and coordinating the project is that, separate participating agencies will not be required to each use their different purchasing and contracting procedures. This project does not require the purchase of land or easements, design, engineering, or encroachment permits.

For this project, RWA will have a formal written agreement with the participating utilities. RWA will have one designated project manager and each member agency will assign one designated landscape program contact for the administration of the project within their service area. RWA project manager is responsible for the overall conduct of the project.

RWA project manager will be responsible for ensuring that each member agency fulfills its commitment and implement the installation to qualified sites under the stipulations of RWA directed regional rain sensor device installation project guidelines. The retail water agency staff will, or alternatively RWA staff may elect to, randomly inspect installation recipients to ensure rain sensor devices are installed on the irrigation systems, as indicated in the application.

A.6.3 Task List and Schedule

The tasks for implementation of this project and the project schedule are described below and presented on Figure 5. The schedule includes deliverable items and projected due dates for each task. The schedule bar chart also identifies which tasks are considered to be inseparable if only a portion of the project is funded. The project may be considered scalable to the minimum number of 5,500 devices (for approximately 500 installations per participating agency on average) before it's considered too administratively costly for implementation. RWA would be willing to commitment to a maximum of 20,000. Table A-1 presents a quarterly expenditure projection.

<u>Tasks</u>

1. Develop action plan per agency of a short-list of priority accounts to target based on metered data or information. Site surveys are not considered a funded part of this project but are a necessary component to the work to be performed on retrofitted systems under

this project. Site surveys are not necessary for new homes if installations occur by homebuilders prior to sale.

2. Contact site owners and discuss possibilities for performing an on-site survey and rain sensor installation on automatic irrigation systems according to manufacturer specifications.
3. Track number of surveys and number of rain sensor device installations.
4. Randomly inspect sites by RWA, and/or water agency staff, or other independent third party (e.g., California Conservation Corps) to verify contractor installation.
5. Complete Monitoring and Evaluation Report. This report will be written following the end of the project for submission to DWR regarding the total project outcomes. It will include summary results of the irrigation system surveys, devices installed, a summary the implementation protocol, and estimated water savings.

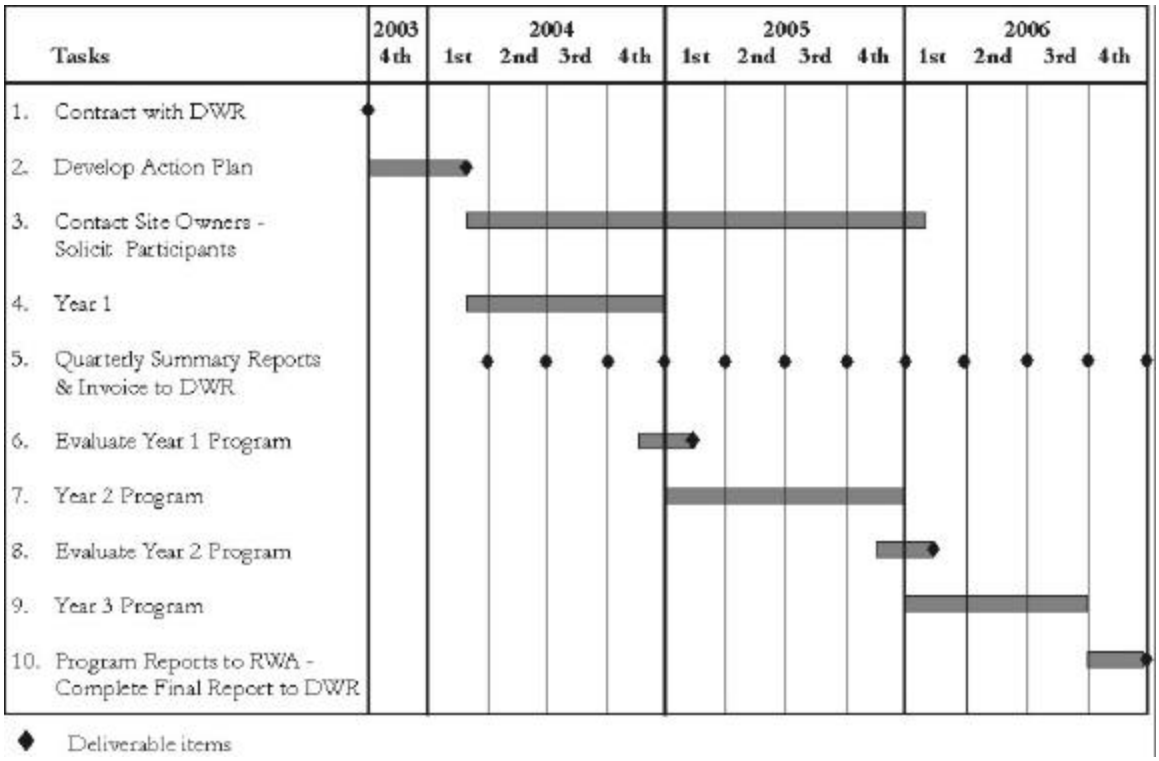


Figure 5. Project Timeline

Table A-1. Quarterly Expenditure Projection for DWR Matching Funds*

Quarter	Months	Activity	Expenditure
2003			
4	October-December	RWA-DWR Contract Administration	$35,000
2004		Initiate Phase 1, Goal 3,000 sensors installed	
1	January-March	RWA management Agreement with water suppliers; Issue request for rain sensor bids. Select vendor and schedule purchase. Select installation contractor(s). Develop agreements with homebuilders. Marketing, begins.	$40,000
2	April-June	Marketing continues, receive initial shipments of rain sensors. Installation begins. Site inspections. Quarterly reports begin.	$80,000
3	July-September	Marketing continues. Installation continues. Contractor oversight.	$85,000
4	October-December	Marketing continues. Installation continues. Site inspections. Marketing continues. Installation continues. Phase 1 ends. Evaluation of outcomes Year 1.	$85,000
2005		Phase 2 begins, Goal 7,000 sensors installed	
1	January-March	Marketing continues. Installation continues. Quarterly reports Contractor oversight. Receive shipments of rain sensors as needed.	$205,000
2	April-June	Marketing continues. Installation continues. Site inspections. Quarterly reports	$205,000
3	July-September	Marketing continues. Installation continues. Contractor oversight. Quarterly reports	$205,000
4	October-December	Marketing continues. Installation continues. Site inspections. Phase 2 ends. Evaluation of outcomes Year 2.	$205,000
2006		Phase 3 begins, Goal 5,000 sensors installed	
1	January-March	Marketing continues. Installation continues. Quarterly reports	$175,000
2	April-June	Receive shipments of rain sensors as needed. Installation continues. Quarterly reports	$175,000
3	July-September	Site inspections. Installation continues. Quarterly reports	$175,000
4	October – December	End project. Final project reports.	$55,000
Total			$1,725,000

*Note: Costs within table do not include contingency or RWA agencies matching funds.

A-7 MONITORING AND EVALUATION

The key performance measure is the actual water savings that are realized as a result of this project. Overall water savings will be quantified based on the amount of avoided applied water to the landscape. The quantifiable savings due to rain shut-off will be based on information collected during the on-site survey including but not limited to:

- amount of irrigable area to be determined at the time of the survey,

- existing conditions of the irrigation system (turned off if surveyed during November through March months or otherwise as self-reported by the customer by simply asking how often they change their timer),
- metered data, if available,
- comparison to the number of precipitation events above 0.2-inches reported at CIMIS Station 131 in Fair Oaks, to verify the number of avoided irrigation cycles since time of installation.

A list of project-specific performance measures that will be also be used to assess project success in relation to its goals is as follows:

- Participating water suppliers will provide monthly or bi-monthly water use data for a minimum of 500 participating customers (50 customers per agency) where meters are available. The data will be compared with usage date prior to device installation and outdoor survey recommendations (including irrigation schedule) to estimate reduction in outdoor water use based on total annual use by account (without weather normalization of data).
- Quarterly summary reports will be prepared by RWA on behalf of each participating member agency. This report will be a status report summarizing preliminary number of devices installed to date. This interim report will be used to document the progress of the project and determine if the project is on schedule and aid in project control. Each summary report will be sumbitted to DWR along with a quarterly invoice.
- One Final Report will be prepared by each member agency for submission to RWA in beginning 4th quarter 2006.
- A Monitoring and Evaluation Report will be prepared by RWA following project completion during 4th quarter 2006. This report will summarize the monitoring and evaluation both the before and after water use for the selected account data pre and post device installation.

The Quarterly Summary Reports and the Final Monitoring and Evaluation Report will be made available to the public at the RWA office. The information will be made available to the public through various outreach methods.

A-8 QUALIFICATIONS OF THE APPLICANT AND COOPERATORS

The qualifications of the project manager, cooperators, and partners to be involved in the financial incentive program for RWA are discussed in this section.

A.8.1 Resumes. The project manager responsible for irrigation system incentive program will be Charlie Pike, Regional Water Efficiency Manager, for the Regional Water Authority. Mr. Tim Crowley will serve as co-manager. Mr. Pike has 19 years of experience associated with administration of incentive programs. Mr. Tim Crowley, Water Management Coordinator, City of Folsom will be assisting Mr. Pike, along with other water conservation coordinators for all external cooperating agencies. Mr. Pike's and Mr. Crowley's resumes are included in Appendix C.

A.8.2 External Cooperators. Letters of commitment are provided in Appendix D.

External cooperating water agencies for this project are:
Citrus Heights Water District
City of Folsom
City of Lincoln

City of Roseville
City of Sacramento
County of Sacramento
El Dorado Irrigation District
Fair Oaks Water District
Placer County Water Agency
Sacramento Suburban Water District
San Juan Water District

A-9 INNOVATION

Rain sensor devices have had limited application in California. Numerous other regions in the United States, namely the Northwest states, Utah, Florida and North Carolina have strongly promoted their installation for nearly 10 years (see Section B-2). Although these states can experience higher summer precipitation rates, the installation of rain sensor devices is economically feasible in the Sacramento region. This project is an extension to the regional implementation of the current pilot project by the County of Sacramento Water Resources. Currently the County of Sacramento has a higher unit cost for the model and can only provide a limited budget allocation for implementation. Grant funding will allow for a regional full-scale implementation of rain sensors installation.

Innovation with these devices is on-going with a new product just being released in the past 2 months that will considerably reduce the amount of installation time with a wireless relay to the irrigation controller from the rain sensor device. The equipment specifications for the wireless Mini-Clik manufactured by Hunter are provided in Appendix E. Additional equipment specifications for the more conventional wired models are also provided in Appendix E. The project is cost effective with the installation of any of these models. Cost of labor and unit costs of rain sensors are provided in Appendix F. Even though the wireless model is more expensive, the reduction in labor for installation offsets the increased unit cost. The competitive bidding process for both the contractor installation and bulk purchase will determine the final product selection.

With proven beneficial implementation here in the Sacramento region, extension to other parts of California, particularly Northern California can investigate the value of their quantifiable water savings as a part of their water efficiency programs. This project can be considered a potential Best Management Practice (PBMP) implementation program, as it is not contained within the *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU) list of standard fourteen Best Management Practices (BMPs).

The extension of regional collaboration on this scale directly to 15,000 customers will assist in further educating customers regarding the role of the RWA and all the participating agencies in providing a safe and reliable water supply for Sacramento area citizens. Additionally, it will expand on the current BMPs focused on more efficient landscape irrigation. This project will be a valuable marketing tool to allow for more one-on-one contact with customers to open doors for participation in other programs, for example BMP 16 toilet rebate program as defined the Sacramento Water Forum Agreement (www.waterforum.org) being implemented by participating agencies in this application. The Sacramento region is one of the State's largest and has

historically had relatively little attention to water use efficiency until the past few years. Increased visibility of the agencies with tangible water savings results and implementation "on the spot" with immediate installation of new water conservation devices will benefit the entire region and California.

A-10 AGENCY AUTHORITY

Authority to Submit an Application and Enter Into a Funding Contract with the State

At their regular meeting on October 23, 2002, the Regional Water Authority Executive Committee authorized the Executive Director to enter into a contract to prepare applications for 2003 Proposition 13 Urban Water Conservation Grant Funds due on December 3, 2002. The Executive Director is authorized to sign the applications and submit application materials for qualifying water suppliers. Each of the water suppliers participating in the grant applications have entered into an agreement with RWA to fund the applications and participate in the projects should they be funded. Should the application be funded, the Regional Water Authority will consider a separate resolution to enter into an agreement with the State to accept grant funds and implement the proposed project. The RWA has existing funding contracts with the State.

The Regional Water Authority ("RWA"), a joint exercise of powers authority formed under California Government Code section 6500 formed to serve and represent regional water supply interests and to assist its members in protecting and enhancing the reliability, availability, affordability and quality of water resources. The RWA has created the Regional Water Efficiency Program to assist water suppliers to meet the Best Management Practices for Urban Water Conservation. To this end the Regional Water Efficiency Program Activities includes projects to improve landscape irrigation efficiency.

The joint powers agreement ("RWA JPA") pursuant to which RWA was formed and operates, authorizes RWA to enter into a "Project or Program Agreement," which is defined in the RWA JPA as an agreement between RWA and two or more of its Members or Contracting Entities to provide for carrying out a project or program that is within the authorized purposes of RWA, and sharing in the cost and benefits by the parties to the Project or Program Agreement.

Article 21 of the RWA JPA states: "The Regional Authority's projects are intended to facilitate and coordinate the development, design, construction, rehabilitation, acquisition or financing of water-related facilities (including sharing in the cost of federal, State or local projects) on behalf of Members and/or Contracting Entities. The Regional Authority may undertake the development, design, construction, rehabilitation, acquisition or funding of all or any portion of such projects on behalf of Members and/or Contracting Entities in the manner and to the extent authorized by such Members and/or Contracting Entities as provided in this Agreement, but shall not accomplish these functions, nor acquire or own water-related facilities in its own name."

RWA knows of no requirement that an election be conducted before entering into a funding contract with the State with respect to the proposed project.

RWA knows of no requirement that other government agencies review and/or approve a funding agreement between RWA and the State for the proposed project.

There is no impending litigation that may impact the financial condition of RWA, or its ability to complete the project. RWA has no water facilities.

A-11 OPERATIONS AND MAINTENANCE

RWA proposes to support the operation and maintenance of the rain sensor devices from that date of installation through life of the warranty provided by each respective manufacturer, which is 5 years as indicated in the equipment specification information attached in Appendix E. The actual warranty details will depend on the selected bidder of rain sensor device, which may be Rainbird, Toro, Hunter or other manufacturer source, as determined by RWA through the competitive bidding process for the equipment purchase. RWA will confirm at the time of RWA purchase from the selected bidder, that the warranty specifications conform to the DWR contractual requirements, if necessary and as applicable. The selected contractor will assume liability assume liability for correct installation and initial operation. The customer will be provided with appropriate manufacturer guidelines for operation and maintenance, product warranty information and will retain responsibility for rain sensor device operation and maintenance post installation.

PART B—ENGINEERING AND HYDROLOGIC FEASIBILITY

B-1 CERTIFICATION STATEMENT

I, Lisa Maddaus, a California registered civil engineer, have reviewed the information presented in support of this application. Based on this information, and any other knowledge I have regarding the proposed project, I find that it can be preliminarily designed to accomplish the purpose for which it is planned. The information I have reviewed to document this statement included:

- Available information on landscape areas within the respective RWA water supplier service areas.
- Equipment specifications from vendor catalogs and discussions with sales representatives.
- Avoided cost and other data as provided by RWA (Appendix G).
- Statement of Work, Schedule
- Budget Projections
- Economic Analysis

B-2 PROJECT REPORTS AND PREVIOUS STUDIES

There are two prinicipal documents that provide additional background for this project:

Rain Sensor Device Installation Case Study – A description provided by the Volusian Water Alliance, Florida is presented in Appendix G. The water district had a cost sharing arrangement, installed 3,331 sensors in their service area of population 400,000 (similar size to City of Sacramento). Water savings estimation methodology is similar to that presented in Section E, Water Efficiency Improvements. However, the estimated 17 percent water savings from rain sensors are not transferable since the Florida seasonal plant growth patterns and climate is different from the irrigation season and rainfall patterns in the Sacramento region.

Rain Sensor Installation Pilot Program Sacramento County Department of Water Resources – Given this is a new program with limited historical metered data after the installation of the rain sensor, one residence's account data is provided as the best available information in Appendix H. Note in the chart provided below in Figure 6 that the lower Spring and Fall bi-monthly water demand in both 2001 and 2002, Figure is also presented in Appendix H. This data is considered preliminary due to lack of post installation meter readings and requires further analysis to determine irrigation season net water savings.

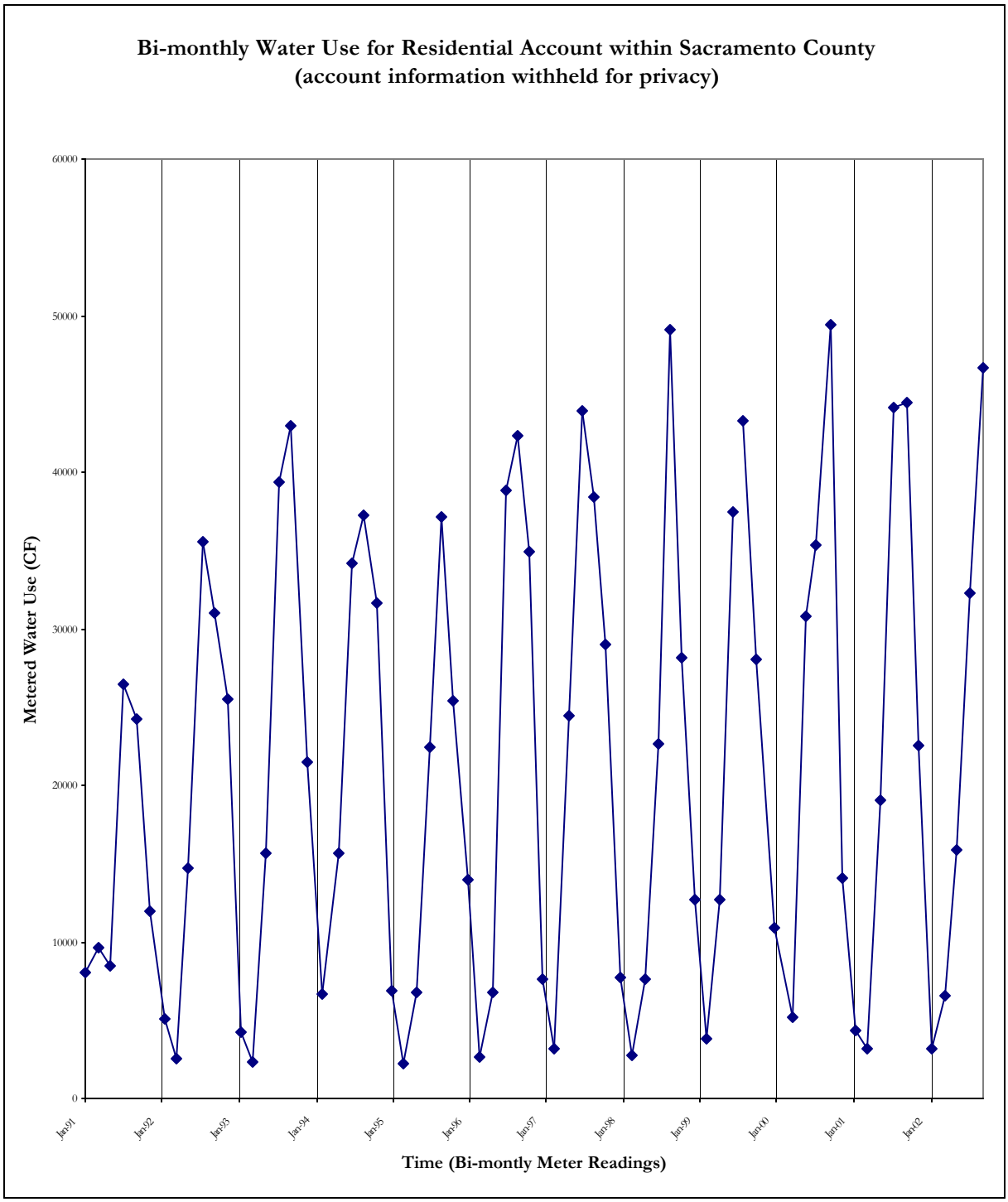


Figure 6. Metered Data from Sacramento County Resident with Rain Sensor Installed in October 2001 (Note readings indicate water demand for previous 2 month period)

B-3 PRELIMINARY PROJECT PLANS AND SPECIFICATIONS

Preliminary plans and specifications are not required under this project as proposed. Customers will submit and verify irrigation system equipment to be installed within the application subjected to the agencies for consideration.

B-4 CONSTRUCTION INSPECTION PLAN

Water Agencies Personnel or Independent third party will randomly inspect for completion of the following:

Scope of Work for Site Audit and Rain Sensor Installation

- Work cooperatively with participating water supplier to provide landscape irrigation efficiency surveys and rain sensor installation at targeted sites.
- Contact targeted customers to make appointments for surveys. Provide and have customer sign a "hold harmless" agreement protecting DWR, RWA, and its members.
- Determine the irrigated area for each site and state the result in the reports.
- Survey irrigation system function.
- Determine irrigation efficiency.
- Identify needed irrigation system repairs and changes.
- Install rain sensor.
- Recommend irrigation schedules.
- Recommend water efficiency measures.
- Provide Customer On-Site Report/checklist.
- Prepare Quarterly Summary report based on number installations customer describing the results and recommendations of the project to date with copies to RWA and customer's water supplier.

PART C—PLAN FOR COMPLETION OF ENVIRONMENTAL DOCUMENTATION AND PERMITTING REQUIREMENTS

C-1 CALIFORNIA ENVIRONMENTAL QUALITY ACT AND NATIONAL ENVIRONMENTAL POLICY ACT

CEQA/NEPA documentation is not applicable for this project, notice of exemption will be completed prior to contract execution between DWR and RWA.

C-2 PERMITS, EASEMENTS, LICENSES, ACQUISITIONS, AND CERTIFICATIONS

Not applicable.

C-3 LOCAL LAND USE PLANS

Not applicable. No proposed land use changes.

C-4 APPLICABLE LEGAL REQUIREMENTS

Not applicable.

PART D- NEED FOR PROJECT AND COMMUNITY INVOLVEMENT

D-1 NEED FOR THE PROJECT

This section includes a statement of critical local, regional, Bay-Delta, State and federal water issues that form the foundation of need for this project and a description of how this project is consistent with local and regional water management plans and other resource management plans.

In summary, the principal need for this project is founded in the following:

- The efficient use of California's limited water supplies is a critical local, regional, and statewide water issue. The Sacramento region historically has not focused on water use efficiency and has in the past several years undertaken water use efficiency programs with the newly formed Regional Water Authority.
- The water supply for the retail agencies participating in this project comes partially or wholly from the Sacramento River and/or American River in addition to local groundwater supplies. Use of surface and groundwater supplies is being extensively coordinated through the regional conjunctive use projects. Demand management augments the effectiveness of the conjunctive use efforts. Decreased water withdrawals from the Sacramento and American Rivers directly increases Bay-Delta flows.
- This project will provide benefit to the Bay-Delta by ensuring that water diverted upstream is used efficiently. An important objective of the Water Forum Agreement is for signatory water suppliers to reduce diversions from the Lower American River during critical dry years, so that flows may be maintained for aquatic life.
- Grant funding assists to essentially "kick-start" this regional effort to all for enhance collaboration among member water agencies that initiated their Water Forum commitments to water conservation programs in 2000 (allow some were signatories to the CUWCC MOU prior to 2000). As many agencies are committing budget to these programs, additional funding for potential BMPs is not a current priority, but strongly viewed as complementary to educating the public and marketing for their customer's participation in all their programs. Collectively funded region wide radio announcements for water use efficiency were broadcast in the spring and autumn of 2002. Regional radio announcements were first used in the summer 2001 to link water and energy efficiency.

Water Supply Reliability - This project will positively impact the Bay-Delta systems by increasing instream flows and reducing the overall reliance on the surface water supplies from the American and Sacramento Rivers upstream from the Bay-Delta. The RWA's and its member agencies' conservation efforts are an important part of a long-term, comprehensive effort to reduce pressure on the Bay-Delta system to meet regional and state-wide water needs. One of the fundamental objectives of the CALFED Bay-Delta program is to reduce the mismatch between Bay-Delta water supplies and the current and projected beneficial uses dependent on the Bay-Delta system. Water use efficiency projects are one of the cornerstone strategies the CALFED Bay-Delta program is deploying to achieve this objective. Actual incentives for the purchase of efficient irrigation system equipment will reduce the demand for a significant urban end-use of Bay-Delta water supplies. It is anticipated that the 15,000 rain sensors to be installed under this project will result in water savings of approximately 1,040 acre-feet per year and a total of 21,840 acre-feet by 2014.

Water Quality - By reducing the amount of water use by customers in the agencies' water supply areas, other beneficial uses will be realized, such as providing flow to improve aquatic ecosystems and the habitat of many Federally listed species including: Delta Smelt, Splittail, Steelhead, Chinook salmon, fresh water shrimp, Coho salmon, and Steelhead along the American River and Lower Sacramento River watersheds.

Regional Partnerships - RWA is a joint powers agency of 18 water suppliers serving more than 1.2 million people in the greater Sacramento Region. The mission is to serve and represent regional water supply interests and assist RWA members with protecting and enhancing the reliability, availability, affordability and quality of water resources.

Urban Water Management Plans - This project is compatible with each of this project's cooperating agencies' 2000 UWMP and RWA's ongoing efforts to achieve greater water use efficiency. RWA's Board of Directors recognizes the importance of water management and conservation programs. RWA's has the general policy that states in part that RWA will supports its member agencies in operating and maintaining each individual purveyor's water system in an efficient and economical manner and distribute and supply water as fairly and equitably as possible.

Water Use Efficiency Programs - A major component of RWA, the Regional Water Efficiency Program is designed to expand measures to help area water providers fulfill Water Forum best management practices (BMPs). The Regional Water Efficiency Program offers two tiers of services: Core activities serve as the fundamental building blocks necessary for implementing the BMPs and includes public information, school education, program marketing coordination, grant applications and technical assistance.

In addition, agencies can choose from subscription activities according to organizational and customer needs. These can include landscape irrigation surveys, marketing partnerships with landscape retailers, training for staff and customers, pilot projects, leak detection surveys and report preparation.

RWA and its member agencies are stakeholders in three major water management teams: Sacramento Area Water Forum (Water Forum), the American River Basin Cooperating Agencies (ARBCA), and the Sacramento Groundwater Authority (SGA). The project is consistent with the local water management plans including the SGA. This project is consistent with regional water management plans such as the ARBCA Regional Water Master Plan (RWMP) and Water Forum Agreement. This project is also consistent with statewide water management plans such as the California Urban Water Conservation Council's Memorandum of Understanding regarding Urban Water Conservation in California.

Ten of the retail agencies that are external cooperating agencies are members of the Sacramento Water Forum.

In the year 2000, the Water Forum finalized the *Water Forum Agreement* (Agreement) which contains seven major elements to meet its objectives. Water conservation is the fifth major element in the Agreement. The water conservation portion of the Agreement describes each water purveyor's commitments to implement BMPs. These BMPs were derived from the original MOU developed by the CUWCC, and then customized for the Water Forum conservation agreements prepared for the individual purveyors.

This project involves the implementation of urban water conservation best management practice for the Water Forum (BMP) numbers 1 in the context that it may be used as an incentive for customers to participate in home water use surveys. In a broader context the project may be considered a Potential Best Management Practice since it is not listed specifically as one to the 14 BMPs as originally defined by the California Urban Water Conservation Council (CUWCC). The unpredictable water supply and ever increasing demand on California's complex water resources have resulted in a coordinated effort by the California Department of Water Resources (DWR), water utilities, environmental organizations, and other interested groups to develop a list of urban BMPs for conserving water. This consensus-building effort resulted in the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), which formalizes an agreement to implement these BMPs, seek new approaches to water efficiency, and make a cooperative effort to reduce the consumption of California's water resources.

Currently, the retail water agencies within the Sacramento area are undergoing the conversion to water meters including dedicated irrigation meters. The conversion of these newly metered customers to a water billing rate structure based on their individual metered use from a flat-rate structure is causing these customers to take note of their water use, particularly higher summer water use for outdoor irrigation. While there is some incremental cost savings to the customer from water savings on their water bill, the benefits in immediate and verifiable installation of the rain sensor as an outdoor water conservation device largely accrue to the participating water agencies.

This project is cost effective relative to savings in production and operating costs as shown in Section F of this application. Even though this project proves to be locally cost effective, agencies need grants for seemingly cost effective projects. The substantiation that a project is cost effective is not enough to get project approval, since project managers and engineers must compete for available utility dollars. There is seldom enough money to serve all of the needs. Regulatory issues often take priority, such as: monitoring water quality for an ever-broadening list and lowering detectable levels of constituents of concern; meter installation commitments (in the Sacramento region); and keeping up with new building development. In the private sector, the competition might use return-on-investment analysis where paybacks of 1-2 years receive budget allocations, but paybacks of more than 5 years seldom are considered for funding. Water efficiency measures, while meaningful investments, often have much longer paybacks.

D-2 OUTREACH, COMMUNITY INVOLVEMENT, SUPPORT, OPPOSITION

This project is consistent with the California Urban Water Conservation Council's Memorandum of Understanding regarding water conservation. It is also consist with the Sacramento Water Forum Agreement and RWA goals and objectives. A letter of support from the Sacramento Water Forum is included in Appendix I.

During 2002, the Sacramento region and especially Placer county have been reported as the fastest growing areas in California. New development is region wide, extending from Elk Grove in the south, Folsom and El Dorado in the east, Natomas on the west and Roseville, Rocklin, and Lincoln to the north. This growth includes development of homes, commercial campuses, parks and schools – all of which have landscapes which will drive up summer water use.

Beginning in 2003, the Regional Water Authority Water Efficiency Program intends to develop a Landscape Advisory Committee. The committee will be modeled after those of the East Bay Municipal Water District and the Santa Clara Valley Water District. Probable members will represent landscape contractors, landscape designers, home owners associations, real estate developers, retailers of landscape plant products, nurseries, and land use permitting agencies. Their purpose will to promote cooperative approaches for better water efficiencies in landscape. The results of this collaboration will lend direction to future RWA landscape projects and their implementation. High on the list will be the implementation of landscape oriented grant projects.

Outreach efforts support a regional-wide benefit, and will focus on particularly on those customers with the highest 20% water use. Primary written or telephone contact will be made by the individual water agency staff (or if requested of RWA staff or contractor) to the targeted customers. To the extent practical, the project will specifically target disadvantaged communities within El Dorado, Sacramento and Placer Counties. There are no tribal entities particularly impacted by this project.

Information on the results of this project will be disseminated through RWA's public outreach program. RWA is in the process of building a broad public information program and associated schools program, which assist its member agencies through providing materials, speakers, and outreach activities to the general public.

Outreach activities will also include water agency community newsletters publications sent to its customers and Web site development, public meetings, RWA participation at community events, multimedia campaigns, interagency partnerships, corporate environmental fairs, professional trade shows, water conservation workshops and seminars and a speakers bureau.

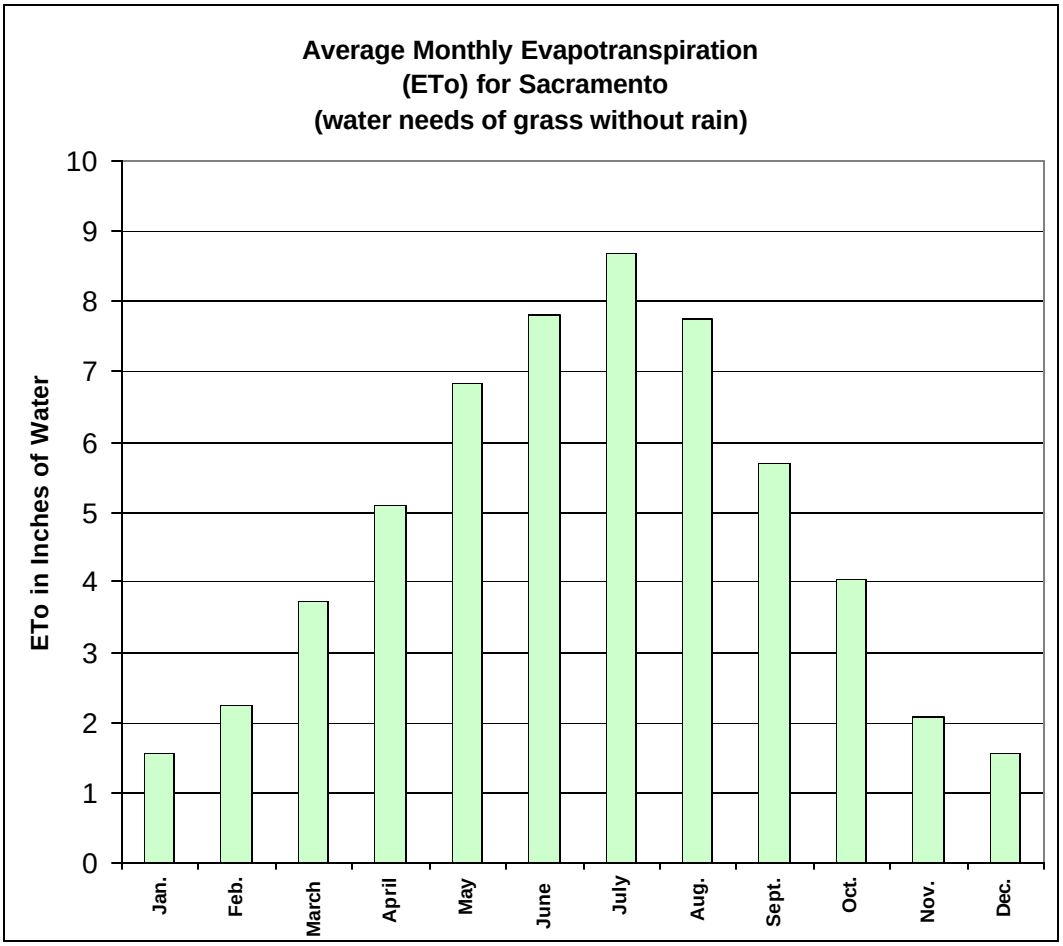
Summaries of the results and benefits of this project will be developed by RWA staff and made available to RWA agency membership and its member agency customers. Member agencies will advertise this program through additional means such as inserts will be included in billing mailer inserts for those customers with irrigation accounts, newsletters, and agency Web sites.

PART E—WATER USE EFFICIENCY IMPROVEMENTS AND OTHER BENEFITS

E-1 WATER USE EFFICIENCY IMPROVEMENTS

The sole objective of this project is an immediate improvement in outdoor water efficiency of residential or commercial customers. There are multiple expected beneficial outcomes of this project with the physical change of installing the rain sensor that will improve water use efficiency as a result. The value of those outcomes is both quantifiable and non-quantifiable. The quantifiable values of physical changes that will occur as a result of this project and the beneficiary of each benefit are listed in Table E-1. Project outcomes and benefits will be shared among the project's beneficiaries and will directly and indirectly contribute to CALFED goals.

The direct, quantifiable improvements in water use efficiency are the avoided outdoor watering due installation of 15,000 rain sensors within the Sacramento Metropolitan area. The area is predominately within Climate Zones 14 and 9 with evaporation rates averaging over 45.88 inches per between April and October, as illustrated below in Figure 7.



Source: Regional Water Authority from data by California Department of Water Resources, "California Irrigation Management Information System Reference Evapotranspiration, Station 131 Fair Oaks"

Figure 7. Monthly ETo based on DWR CIMIS Data for Station 131, Fair Oaks

The estimated water savings is based on 1.04 AF/acre per year based on the following:

1. According to data from the CIMIS Station 131 Fair Oaks, between 1998 and 2001 the average number of precipitation events over 0.2-inches during the April to October irrigation season was 6.2 events.
2. There was an additional 10.68 events over 0.2 inches on average between November 1st and March 31st if an estimated 70 percent of residents diligently turn off their irrigation systems in the low irrigation season. (If 50 percent of customers neglect to turn off systems, the number of avoided events increase to 24 events).
3. Assuming a total of 17 events that trigger a rain sensor shut-off of the irrigation system that avoids one irrigation cycle. This is conservatively assumed since the sensor will only allow irrigation cycles to resume when sufficient evaporation has occurred to restore the circuit connection turned off by the solenoid switch. However, since daily watering is not recommended, it is assumed that the one of the 3 times weekly watering events is avoided during an estimated two day system shut-off (see Rules for Water Wise Gardening attached in Appendix B).
4. The average irrigation season ET to be replaced by the irrigation system is 1.76 inches per week to be applied in 3 separate irrigation events. Thus, one irrigation cycle should at minimum be applying 0.59 inches.
5. Because irrigation distribution uniformity is often 60-85 percent, more water is applied than ET requires to maintain the landscape in good condition. It is assumed that 125 percent of ET is applied for a total of 0.75-inches per irrigation cycle.
6. Only improvements in applied water to appropriate ET levels are considered with no improvements in reductions in runoff accounted for in net water savings.

Assessors parcel data and landscape irrigation surveys indicate that the irrigable area for an average residential landscape is approximately 0.2 acres for Sacramento area homes. The total avoided water applied per rain sensor annually based on the above assumptions is 0.21 acre-feet. This project will result in total annual average water savings of 1,040 ac-ft/year, or 21,840 ac-ft over a 10-year useful life. A 10-year useful life based on product specifications for rain sensor devices, and additional experience in Florida and other water agencies. The net water savings assume 5 years of 100% water savings during the manufacturer warranty period and 20% reduction in water savings per year over the following 5 years.

Table E-1. Quantifiable Physical Changes, Expected Benefits, and Beneficiaries

Physical change	Expected benefit	Beneficiary
Reduce water use on landscape irrigation by updating irrigation systems to better match applied water to evapotranspiration needs.	1,040 ac-ft/year 21,840 acre-feet for 10 year project life	CALFED goal to increase instream flows water in American and Sacramento River located upstream of the Bay-Delta system. Use local water supplies more efficiently
Water agencies in this project will save money on avoided costs of a new water supply	$160/acre-foot of water saved	Water agency/customer

E-2 OTHER PROJECT BENEFITS

Non-quantifiable project outcomes and benefits are listed and described in Table E-2. It is indicated how each non-quantified outcome or benefit will be shared among the project beneficiaries. The non-quantified outcomes expected to directly or indirectly contribute to CALFED goals are also identified and delineated.

Table E-2. Non-Quantifiable Benefits

Physical change	Expected benefit	Beneficiary
Reduce consumptive water use during summer peak demand period for irrigation by watering according to efficient evapotranspiration rates with the upgraded equipment	Improved Bay-Delta ecosystem	CALFED goal
Less water pumped from wells and less water diverted from the Lower American River. In addition, more water may be available for hydropower generation at Folsom Dam and Natomas Dam.	Energy savings from reduced pumping and energy generation from hydropower production.	USBR, and local water supplier participants of RWA
Appropriate amounts of applied water improve condition of landscapes:	More attractive landscapes Improved condition and utility of sports fields	Customers, regional residents, and visitors

PART F – ECONOMIC JUSTIFICATION: BENEFITS TO COSTS

This section includes a breakdown and justification of the project budget and cost sharing information. Also described and analyzed are the benefits and costs of this project. Tables within this Section F, particularly the summary of benefits and cost analysis in Table F-2, are provided in lieu of the DWR Benefit Cost Summary Tables provided in the grant application package.

F-1 NET WATER SAVINGS

Details of the estimated net water savings of 0.21 AF per year per device is provided in Section E-1. It is expected that net water savings are the result of avoided irrigation cycles due to rain shut-off by precipitation events over 0.20 inches. Each rain event over 0.2 inches will trigger 0.75 inches of applied savings for each of the 15,000 rain sensors installed. The annual net water savings for the program is on average 1,040 ac-ft annually for 5 years and 21,840 ac-ft over a 10-year useful life.

Fundamental to the water savings estimates is an overall conservative assumption that water applied by the irrigation systems either evaporates or transpires by plants. When nature provides precipitation during programmed irrigation events, the water is wasted. Optimistically (and conservatively for purposes of these estimates) these irrigation systems are assumed to be properly designed, with corrected irrigation schedules (due to on-site visit) and at least 75% distribution uniformity. NO water recovered that is part of net water savings is assumed for water lost due to runoff. This additional unaccounted water savings potential results in water prevented from run-off decreases the volume of pollutant carried to the American and Sacramento Rivers and their tributaries.

Additional background information for the project net water savings is provided following Section F with summary tables that breakdown the estimated benefits and costs in additional detail. Table F-2 is provided in lieu of the DWR Benefit Cost Summary Tables provided in the grant application package. The economic uncertainty analysis in Section F-3.1 illustrates that net water savings potential could be reduced by 40% and would still produce a locally cost effective project.

F-2 PROJECT BUDGET AND BUDGET JUSTIFICATION

Table F-1 presents a detailed estimated budget that includes relevant line items for capital outlay project proposals and justification of each line item. This table also indicates the amount of cost sharing for each element.

Table F-1. Detailed Budget – Capital Outlay Project Proposal

Item	Justification	Labor		Other direct costs, dollars	Total, dollars	RWA portion	Prop 13 portion
		Hours	Dollars				
Land Purchase /Easement	Not applicable					0	0
Planning/Design/Engineering	Not applicable					0	0
Materials/Installation	$88 per sensor (cost includes $12 materials and 2 hours installation @ $38/hr)	30,000	1,140,000	180,000	1,320,000	0	1,320,000
Structures	Not applicable					0	0
Equipment Purchases/Rentals	$12 per conventional model of rain sensor			180,000	180,000	0	180,000
Environmental Mitigation/ Enhancement	Not applicable					0	0
Construction/Administration/ Overhead	$20 per sensor for RWA administration and overhead.		300,000		300,000	75,000	225,000
Project/Legal/License Fees	Not applicable					0	0
Contingency	To ensure sufficient funding				177,000	0	177,000
Other	Not applicable					0	0
Project Total					1,977,000	75,000	1,902,000

F.2.1 Cost Sharing

RWA's participating agencies are providing 4 percent cost sharing and RWA is thus requesting 96 percent in funding ($1,902,000) from the Proposition 13 Urban Water Conservation Program. Given that this is a project solely funded by the participating agency contributions ($75,000) and no additional cost recovery mechanisms are available for RWA to cover the eleven (11) member agencies committed to this program, RWA requests a $177,000 contingency to ensure that funding available over the 12-month periods for the installation program are sufficient given the contractual arrangements required by RWA bylaws, a Joint Powers Authority. Grant funded projects are structured on a subscription bases by the participating agencies. RWA bylaws prohibit the encumbrance of no-participants (even though they may be RWA members) with liabilities of subscription activities. RWA will make every effort to maintain the budget within the requested $1,902,000.

There are no additional funding commitments or cost sharing agreements for this project. The previously mentioned landscape irrigation audit program is a separate subscription activity, with separate funding that cannot be used in this project.

F-3 ECONOMIC EFFICIENCY

This section includes an assessment that summarizes the costs and benefits of the proposed project. The major analysis assumptions are listed and explained. This section also shows the present value of the quantified costs and benefits to the applicant, CALFED, and other parties affected by the project and summarizes non-quantified costs and benefits to the applicant,

CALFED, and other parties affected by the project. In addition, a break even analyses determining the sensitivity of the project's water savings assumptions to cost effectiveness is also provided.

This project is locally cost effective to the RWA. Based on the simplified benefit-cost ratio assessment in Table F-2, using project benefits and costs, the project has a **benefit to cost ratio of 1.6**. Since this number is greater than one, it indicates an economically justifiable project.

Below is a list and explanation of all the quantifiable benefits/costs assumptions and methodologies.

1. A total of 15,000 residential customers will installation of the rain sensors (3,000 installations in 2004, 7,000 installations in 2005, and 5,000 installations in 2006)
2. The maximum cost of installation is $88 per sensor (2 hours of labor assumed at $38 per hour plus $12 materials) with device cost of $12 per unit (Appendix F).
3. The administration cost per sensor is $20. This is the combined cost for RWA and its eleven participating member agencies to administer contracting, marketing, site inspection of 5 percent of the installations. The cost used in the analysis does not include the contingency.
4. The average total applied water use per site is estimated as 0.21 acre-feet annually, as described in Section E-1 above. Average ETo measured from the Fair Oaks CIMIS station is 45.88 inches for the April through October period. It is estimated that the irrigable area for these systems average 0.2 acres based on discussions with contractors on residential landscape irrigation surveys and the Sacramento County Planning Division (Personal Communication, November 26, 2002).
5. The effective life of the installation is 10 years. Water savings from installations are assumed to be 100 percent effective for the first 5 years from the time of the installation. Water savings are estimated to decrease 20 percent per year from the 6th to the 10th year, assuming routine operation and maintenance.
6. All quantified benefits and costs are expressed in year 2002 dollars using a 6.00 percent discount rate as required by DWR Urban WUE Grant Application Package.
7. The weighted value of conserved water for the water agencies under RWA used for this project is $160/ac-ft. The justification for the weighted value of $161/AF as the appropriate avoided cost of water supply is further described in Appendix G. In brief summary, this cost is based on the estimated surface water purchase costs and groundwater supply costs for the Sacramento Region presented in the *Economic Evaluation of Water Management Alternatives, Screening Analysis and Scenario Development,* for the CALFED Bay-Delta Program, October 1999.

An economic analysis of this project, based on the assumptions listed above is shown in Table F-2. The present values of the quantified costs and benefits for the applicant RWA are quantified in Table F-2 below, in lieu of the DWR project benefit cost summary Tables 1-6. A summary of the non-quantified costs and benefits to the applicant, DWR and others are summarized in Table F-3.

Table F-2. Summary Economic Analysis

List of Assumptions		
No.	**Assumption**	
1	Value of conserved water ($/AF) =	160
2	Discount rate (real) =	6.00%
3	Water saved per year per acre (ft/acre/yr) =	1.04
4	Average lot size (acres) =	0.20
5	Cost of Device ($) =	12
6	Administration/Installation cost per sensor ($) =	108
7	Number rain sensor installed in 2004 =	3000
8	Number rain sensor installed in 2005 =	7000
9	Number rain sensor installed in 2006 =	5000

				Benefits ($)					Costs ($)				
Calendar Year	**Rebates Awarded**	**Incremental Water Savings (AF/yr)**	**Annual Water Savings (AF/yr)**	**Avoided Capital Costs**	**Avoided Variable Costs**	**Avoided Purchase Costs**	**Total Undiscounted Benefits**	**Total Discounted Benefits**	**Incentives Costs**	**Capital Costs**	**Operating Expenses**	**Total Undiscounted Costs**	**Total Discounted Costs**
Assumptions													
2004	3000	624	624	0	99,840	0	99,840	94,189	0	36,000	324,000	360,000	339,623
2005	7000	1,456	2,080	0	332,800	0	332,800	296,191	0	84,000	756,000	840,000	747,597
2006	5000	1,040	3,120	0	499,200	0	499,200	419,138	0	60,000	540,000	600,000	503,772
2007		0	3,120	0	499,200	0	499,200	395,413	0	0	0	0	0
2008		0	3,120	0	499,200	0	499,200	373,031	0	0	0	0	0
2009		0	2,995	0	479,232	0	479,232	337,840	0	0	0	0	0
2010		0	2,579	0	412,672	0	412,672	274,450	0	0	0	0	0
2011		0	1,955	0	312,832	0	312,832	196,275	0	0	0	0	0
2012		0	1,331	0	212,992	0	212,992	126,070	0	0	0	0	0
2013		0	707	0	113,152	0	113,152	63,183	0	0	0	0	0
2014		0	208	0	33,280	0	33,280	17,531	0	0	0	0	0
2015		0	0	0	0	0	0	0	0	0	0	0	0
2016		0	0	0	0	0	0	0	0	0	0	0	0
2017		0	0	0	0	0	0	0	0	0	0	0	0
2018		0	0	0	0	0	0	0	0	0	0	0	0
2019		0	0	0	0	0	0	0	0	0	0	0	0
2020		0	0	0	0	0	0	0	0	0	0	0	0
2021		0	0	0	0	0	0	0	0	0	0	0	0
2022		0	0	0	0	0	0	0	0	0	0	0	0
2023		0	0	0	0	0	0	0	0	0	0	0	0
2024		0	0	0	0	0	0	0	0	0	0	0	0
2025		0	0	0	0	0	0	0	0	0	0	0	0
Totals:	15,000	3,120	21,840	0	3,494,400	0	3,494,400	2,593,311	0	180,000	1,620,000	1,800,000	1,590,991

Notes:
(1) 100 percent water efficiency life of rebates is assumed to be 10 years at which time, water savings decrease by two percent per year for the following 10 years.
(2) Cost does not include contigency.

Benefit cost ratio: **1.6**

Table F-3. Summary of Non-quantifiable Costs and Benefits

	Non-quantified costs	Non-quantified benefits
RWA Agencies	None	• Increased water supply reliability
DWR/CALFED	None	• Increased instream flows during summer peak irrigation season and dry-years • Increased water supply reliability to water users while at the same time assuring the availability of sufficient water to meet fishery protection and restoration recovery needs • More water for Bay-Delta water quality improvements and aquatic ecosystems
Energy provider	None	• Energy savings as a result of less water pumped into the system.
Groundwater Basin	None	• Decreased overdraft and improved water quality • Increased flexibility in dry-year water supply options
American River Ecosystem	None	• Improved aquatic and terrestrial habitat in the American River watershed • More water available to meet fishery protection and restoration recovery near-term needs

Section F-3.1. Analysis of Uncertainty

This section addresses the uncertainty analyses performed for this project. The sensitivities of the cost effective analysis to modifications of the average annual water savings per sensor and effect on the Benefit Cost ratio are presented.

Because the avoided cost of water, average annual water savings per sensor, residential landscape lot size, unit cost of the device, labor and administrative costs constitute a potential source of uncertainty in cost-effectiveness analysis, a sensitivity analysis was conducted to test results over a range of values. While the average annual water use per sensor acted as a variable, the other variables were held constant. Likewise, while the each value was modified one at a time to act as a variable (high/low or break-even values as noted in Table F-4), the other values were held constant such as the annual water savings at 1.04 ac-ft/acre/yr.

As shown in Table F-4, the analysis is not sensitive (project remains cost effective) with the following modifications in assumptions:

- decrease in applied net water savings per sensor per irrigated area could be reduced by approximately 40%,
- decrease of avoided cost of water supply by approximately 40%,
- decrease in irrigated area of a residential lot by 40% to about 5,200 square feet (sf) or approximately 0.12 acres (Sacramento County Planning Division quotes average residential size lot in the Sacramento area as 9,400 square (so footprint of structures, plus hardscape could be 45% of the parcel size and 55% irrigated area would remain cost effective for rain

sensor installation) (Personal Communication, Tom Kohaya, Sacramento County, November, 26, 2002),

- using a wireless rain sensor (which would also reduce installation labor costs – not modified) at $70 per sensor plus 15% markup to $80 per unit would still produce a cost effective project,
- unit cost of labor could be increased by 200% to $184 (add 2 hours to total 4 hours installation time @ $38 hour plus $12 per unit material costs), or
- unit administrative cost could be increased by 450% to $90.

For the upper range of the sensivitivity analysis, there was a near doubling of cost effective to B/C ratio of 2.0 modest changes in input variables. For example, if the number of residential customers turning off their irrigation systems are estimated to range from 30-70 percent. If the number of neglectful customers was adjusted up to 70 percent, this serves to increase the number of avoided irrigation cycles from 17 .8 up to 24 and results showed a total savings of 1.475 acre-feet per acre per year for a **B/C ratio of 2.3.**

The economic analysis spreadsheet for each of these analyses is provided in Appendix J of this application.

Table F-4. Results of Sensitivity Analysis

Variable[a]	High/Low		Assumed		Break-even value[b]	
	Value	B/C ratio	Value	B/C ratio	Value	B/C ratio
Average water applied per sensor per irrigation cycle (ac-ft/yr)	1.475	2.3	1.045	1.6	0.65	1.0
Avoided cost of current water supplies (High value, Appendix G, page 15)	198	2.0	160	1.6	100	1.0
Residential landscaped lot size (Range 10,890 sf to 5,230 sf irrigated area)	0.25	2.0	0.2	1.6	0.12	1.0
Unit cost of sensor (Highest vendor quote + 15% = $20, Wireless unit cost @ $70/sensor) (see Appendix F)	9	1.7	12	1.6	80	1.0
Unit cost of labor (2 extra labor hours @ $42/hr (or 100% higher))	1.5 hrs @ $38/hr	1.9	$88/unit	1.6	$184/unit	1.0
Unit cost of administration	50% less	1.8	$20/unit	1.6	$90/unit	1.0

[a] All other assumptions except for variable remain constant.
[b] Break-even value is that variable value which causes the benefit to cost ratio to equal 1.0.

APPENDIX A

METROPOLITIAN AREA HOUSING TRENDS

APPENDIX B

RULES OF WATER WISE GARDENING PUBLICATION: AN EXAMPLE OF MATERIALS FOR EFFICIENT OUTDOOR WATER USE TO BE PROVIDED TO HOMEOWNERS

APPENDIX C

PROJECT MANAGERS RESUMES

APPENDIX D

LETTERS OF COMMITMENT

APPENDIX E

RAIN SENSOR EQUIPMENT SPECIFICATIONS

- **Hunter Wireless Rain-Clik Rain Sensors**
- **Rainbird Rain Shutoff Device/Rain Sensor**
- **Toro Rain Switch**
- **Hunter Mini-Clik, Rain Clik**

APPENDIX F

LABOR COST ESTIMATE AND RAIN SENSOR DEVICE UNIT COST ESTIMATES

- **Labor Cost Estimate provided by Irrigation Consultation and Evaluation (ICE), prices valid through October 2003**
- **Rain Bird Rain Sensor Device price quote provided by Normac, Inc. provided on November 22, 2002**

APPENDIX G

BACKGROUND DOCUMENTATION

- **Rain Sensor Device Installation Case Study - Volusian Water Alliance, Florida**
- **Avoided Cost of Water Source Documentation**

APPENDIX H

SAMPLE DATA FROM SACRAMENTO COUNTY CUSTOMERS WITH RAIN SENSOR DEVICES

APPENDIX I

LETTER OF SUPPORT

APPENDIX J

ECONOMIC UNCERTAINITY ANALYSIS