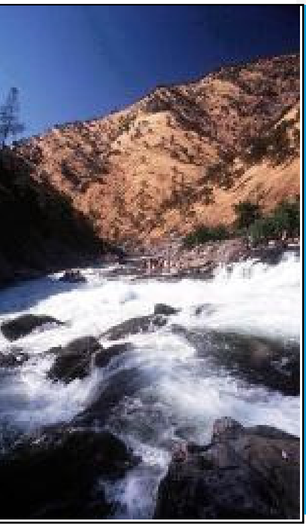


TUOLUMNE – STANISLAUS INTEGRATED REGIONAL WATER MANAGEMENT REGION

2014 IRWM DROUGHT GRANT PROPOSAL

ATTACHMENT 3 – PROJECT JUSTIFICATION

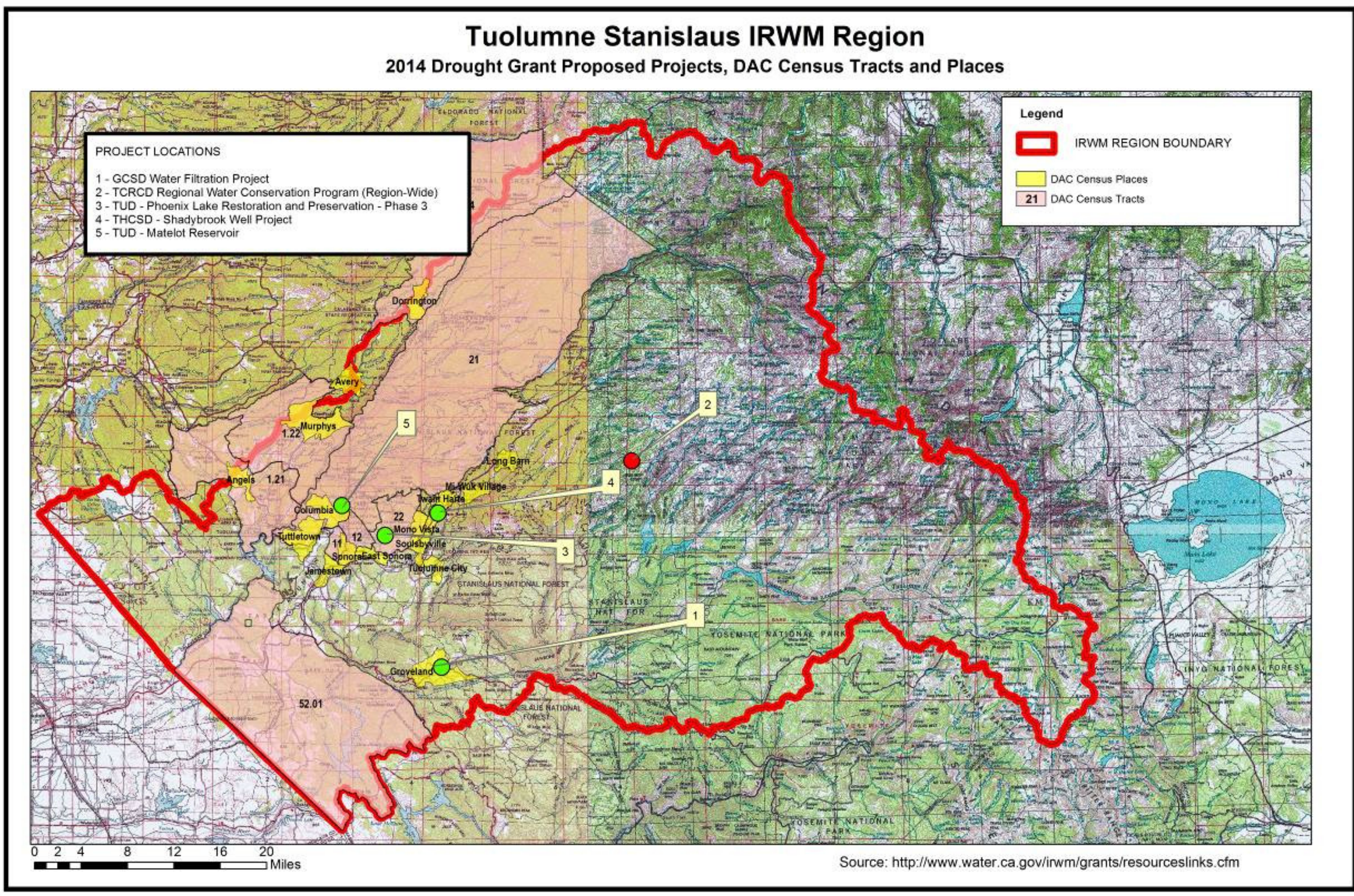
Integrated Regional Water Management Program
Applicant: Tuolumne-Stanislaus Integrated Regional Water Management Authority

CONTENTS

INTRODUCTION

The Tuolumne Stanislaus 2014 IRWM Grant Proposal includes a suite of five (5) water storage, supply and conservation projects that provide an immediate response to severe drought impacts within the region. Groveland Community Services District (GCSD) is proposing to construct a water filtration station in order to meet increased potable water treatment needs that have been caused by a shift in the primary source of water provided to GCSD by San Francisco. Twain Harte Community Services District is proposing to develop a new groundwater well designed to provide an additional source of potable water to their District. Tuolumne Utilities District is proposing two storage facility improvements at Phoenix Lake and Matelot Reservoir to increase storage capacity and protect against supply outages. Finally, the Tuolumne County Resource Conservation District, in partnership with all of the water Districts in the region, Amador Tuolumne Community Action Agency, the Tuolumne River Trust and UC Extension, proposes an aggressive region-wide water conservation program that includes numerous components that are not locally cost effective.

Each of these projects, and their relationship to DAC communities is shown on the map below. Individual Project Justification sections follow.



Groveland Community Services District Water Filtration System (TS IRWM Project No. 32)

I. Project Summary Table

Table 4 – 2014 IRWM Drought Solicitation Project Summary Table		
Drought Project Element		Project Name/ID Add 1 column per Project
D.1	Provide immediate regional drought preparedness	
D.2	Increase local water supply reliability and the delivery of safe drinking water	Yes
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective	Yes
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	
IRWM Project Element		
IR.1	Water supply reliability, water conservation, and water use efficiency	Yes
IR.2	Stormwater capture, storage, clean-up, treatment, and management	
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	
IR.4	Non-point source pollution reduction, management, and monitoring	
IR.5	Groundwater recharge and management projects	
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	
IR.7	Water banking, exchange, reclamation, and improvement of water quality	Yes
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.10	Drinking water treatment and distribution	Yes
IR.11	Ecosystem and fisheries restoration and protection	

II. Project Description

The project consists of installing a 700 gpm (1 MGD) trailer mounted water filtration system at the second garrote shaft site. The applicant is Groveland Community Services District.

Project Description Discussion

The proposed trailer mounted water filtration system will utilize micro-filtration membranes. GCSD's Alternative Water Supply (AWS) WTP also consists of a trailer mounted microfiltration membrane system to filter water from Pine Mountain Lake. GCSD staff is familiar with this process and satisfied with its performance.

Microfiltration is a pressure driven process that uses a semi-permeable (porous) membrane to separate particulate matter from soluble components in the carrier fluid, such as water. Microfiltration membranes act much like a very fine sieve to retain particulate matter, while water and its soluble components pass through the membrane as filtrate, or filtered water. The retained solids are concentrated in a waste stream that is discharged from the membrane system. The pore size of the membrane and the integrity of the sealing mechanism control the fraction of the particulate matter that is removed. Membranes, with their fine pore size and absolute seal, remove virtually all of the fine matter, such as silica, bacteria, and parasite cysts.

Trailer mounted microfiltration systems are available up to 1.0 MGD. A single trailer mounted systems would be required to meet GCSD's demand. A typical microfiltration system consists of membrane modules, one feed/CIP tank and pump, one reverse filtration tank and pump, manual and automatic valves, flow meter, pressure and temperature sensors, PLC control, and a control panel. These components are mounted on a painted carbon steel frame.

The trailer or container that houses the filtration equipment will protect the equipment from the elements. The trailer mounted equipment will occupy a surface area of 8' x 45' approximately.
Finally, new piping will be required to divert raw water from the existing pump to the water filtration system and convey filtered water to disinfection. Other site improvements such as security fencing and site grading are also included in this project.

Drought Impact Alleviation

The project proposed in this application consists of adding filtration capacity to the Second Garrote water treatment plant that is supplied water from the Mountain Tunnel. GCSD uses primarily water from the Hetch-Hetchy reservoir to meet potable water demands. Water from PML is only used during times when the Mountain Tunnel is out of service due to maintenance.

The introduction of additional water supplies into the Mountain Tunnel by SFPUC will obligate GCSD to filter the water or apply for filtration avoidance. CDPH does not favor the filtration avoidance and has indicated that the process would take longer and does not warrant that GCSD would obtain the filtration avoidance classification. Thus, GCSD must filter the water in order to comply with the Long Term Enhanced Surface Treatment Rule. Without filtration GCSD would not be able to meet its water demand.

Project Eligibility and Funding Timing

As required by the 2014 Drought Grant solicitation guidelines, the project will increase GCSD's water supply reliability and the delivery of safe drinking water as a primary benefit. In addition, the project also includes drinking water treatment and distribution elements.

SFPUC is planning to introduce water from Cherry Reservoir into the Mountain tunnel through the Lower Cherry Aqueduct. The project is expected to be completed by the end of 2014 with the first introduction of Cherry Reservoir water taking place early 2015.

SFPUC is pursuing an aggressive schedule and recently informed the GCSD that the LCA Project will be completed in October 2014 and will begin introducing Cherry Lake water as soon as November 2014. This places GCSD into an emergency situation because GCSD does not have filtration equipment and will not be able to supply potable water after Cherry Lake water is introduced in the Mountain Tunnel. GCSD must complete this project ahead of the LCA project. Funding must be expedited for this project because final delivery of the treatment system is expected in October 2014.

III. Project Map

GCSD is located on the Central Sierra due east from San Francisco in Tuolumne County, 30 miles south of Sonora and 26 miles from the west entrance to Yosemite National Park. Figure 1 shows a general map of GCSD and its boundaries. Figure 2 shows the location of the Second Garrotte Pump Station where the water filtration equipment is proposed to be located.

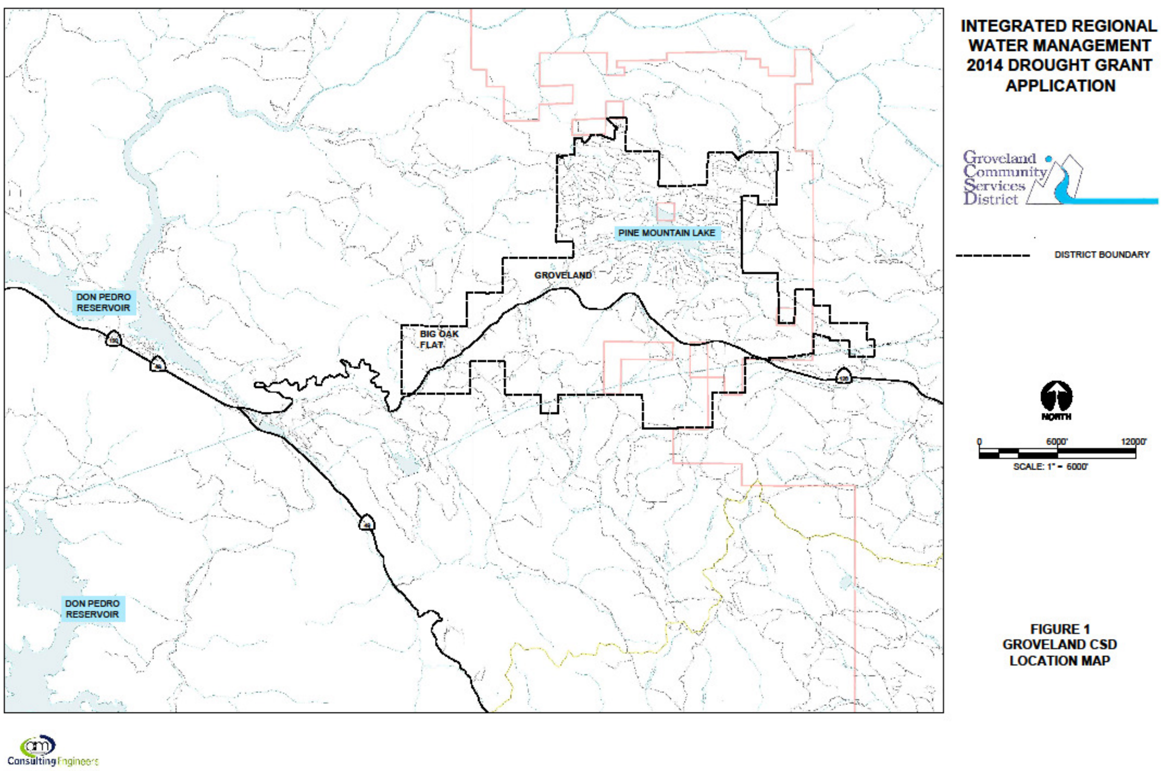


FIGURE 1
GROVELAND CSD
LOCATION MAP

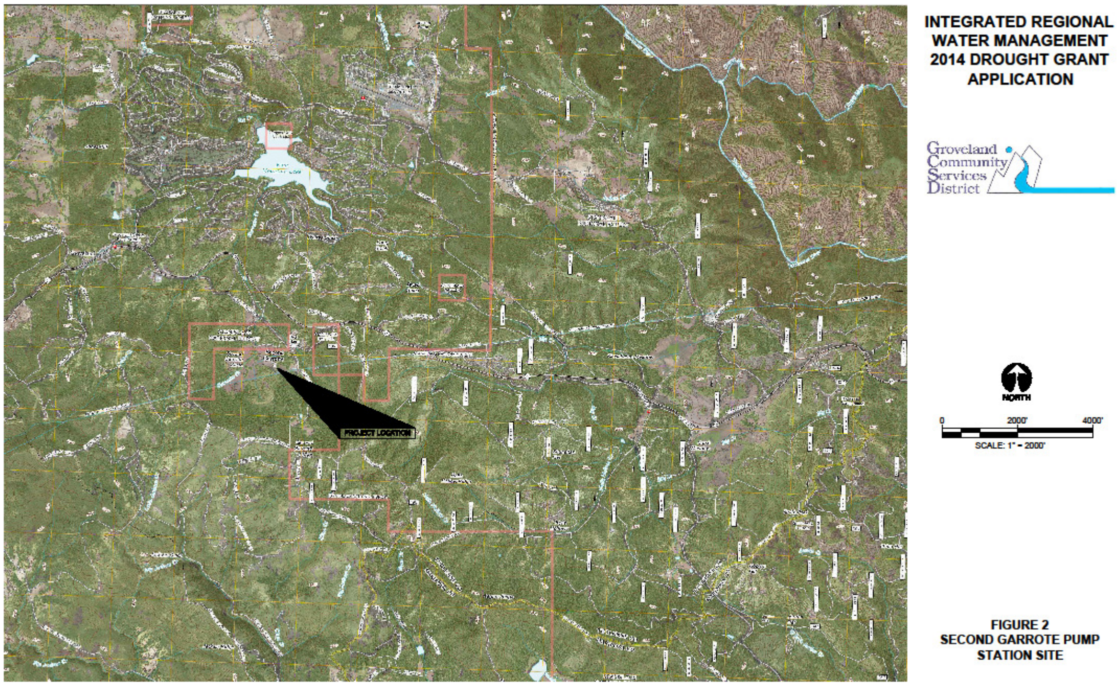


FIGURE 2
SECOND GARROTE PUMP STATION SITE

IV. Project Physical Benefits

The water filtration system will offer the following physical benefits:

- Reduce Water Wastage
- Reduce Power Consumption
- Increase reliability of supply (production days)
- Reduce Chemical Demand

The following tables summarize the Project's physical benefits:

Table 5.1 – Annual Project Physical Benefits			
Project Name: GCSD Water Filtration System			
Type of Benefit Claimed: Reduction in water waste			
Units of the Benefit Claimed : ac-ft			
Additional Information About this Benefit			
(a)	(b)	(c)	(d)
	Physical Benefits		
Years	Without	With Project	Change Resulting from Project

	Project		(b) – (c)
2015	3.01	1.50	1.51
2016	3.01	1.50	1.51
2017	3.01	1.50	1.51
2018	3.01	1.50	1.51
2019	3.01	1.50	1.51
2020	3.01	1.50	1.51
2021	3.01	1.50	1.51
2022	3.01	1.50	1.51
2023	3.01	1.50	1.51
2024	3.01	1.50	1.51
2025	3.01	1.50	1.51
2026	3.01	1.50	1.51
2027	3.01	1.50	1.51
2028	3.01	1.50	1.51
2029	3.01	1.50	1.51
2030	3.01	1.50	1.51
2031	3.01	1.50	1.51
2032	3.01	1.50	1.51
2033	3.01	1.50	1.51
2034	3.01	1.50	1.51
Comments:			

Table 5.2 – Annual Project Physical Benefits			
Project Name: GCSD Water Filtration System			
Type of Benefit Claimed: Reduction in Power Consumption			
Units of the Benefit Claimed : kWh			
Additional Information About this Benefit			
(a)	(b)	(c)	(d)
	Physical Benefits		
Years	Without Project	With Project	Change Resulting from Project (b) – (c)
2015	262,800	0	262,800
2016	262,800	0	262,800
2017	262,800	0	262,800
2018	262,800	0	262,800
2019	262,800	0	262,800
2020	262,800	0	262,800
2021	262,800	0	262,800
2022	262,800	0	262,800
2023	262,800	0	262,800

2024	262,800	0	262,800
2025	262,800	0	262,800
2026	262,800	0	262,800
2027	262,800	0	262,800
2028	262,800	0	262,800
2029	262,800	0	262,800
2030	262,800	0	262,800
2031	262,800	0	262,800
2032	262,800	0	262,800
2033	262,800	0	262,800
2034	262,800	0	262,800
Comments:			

Table 5.3 – Annual Project Physical Benefits			
Project Name: GCSD Water Filtration System			
Type of Benefit Claimed: Increase reliability of supply			
Units of the Benefit Claimed : days off			
Additional Information About this Benefit			
(a)	(b)	(c)	(d)
	Physical Benefits		
Years	Without Project	With Project	Change Resulting from Project (b) – (c)
2015	15	0	15
2016	15	0	15
2017	15	0	15
2018	15	0	15
2019	15	0	15
2020	15	0	15
2021	15	0	15
2022	15	0	15
2023	15	0	15
2024	15	0	15
2025	15	0	15
2026	15	0	15
2027	15	0	15
2028	15	0	15
2029	15	0	15
2030	15	0	15
2031	15	0	15
2032	15	0	15
2033	15	0	15
2034	15	0	15

Comments:

Table 5.4 – Annual Project Physical Benefits			
Project Name: GCSD Water Filtration System			
Type of Benefit Claimed: Reduction in chemical consumption (chlorine/ammonia)			
Units of the Benefit Claimed lbs			
Additional Information About this Benefit			
(a)	(b)	(c)	(d)
	Physical Benefits		
Years	Without Project	With Project	Change Resulting from Project (b) – (c)
2015	123/566	99/443	24/123
2016	123/566	99/443	24/123
2017	123/566	99/443	24/123
2018	123/566	99/443	24/123
2019	123/566	99/443	24/123
2020	123/566	99/443	24/123
2021	123/566	99/443	24/123
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2027	123/566	99/443	24/123
2028	123/566	99/443	24/123
2029	123/566	99/443	24/123
2030	123/566	99/443	24/123
2031	123/566	99/443	24/123
2032	123/566	99/443	24/123
2033	123/566	99/443	24/123
2034	123/566	99/443	24/123
Comments:			

V. Technical Analysis of Physical

The primary benefit for this project is the ability to produce safe drinking water for the residents and businesses of Groveland and Big Oak Flat. Besides the primary benefit, the following secondary benefits will also be realized:

<u>Reduction in water waste:</u>
Under the current operating conditions, colloidal particles and sediments enter the distribution system and accumulate on the far end of distribution mains. GCSD conducts automatic flushing of the lines by

opening fire hydrants at certain locations to flush sediments in the lines. GCSD tracks the volume of water wasted in flushing and it averages approximately 980,000 gallons per year. The filtration system will remove most of the sediments and colloidal particles in the water before it enters the distribution system. It is impossible to determine what the required flushing frequency will be after the filtration system is installed. However, GCSD staff estimated that the flushing frequency would be 50 percent, thereby reducing the amount of water wasted in flushing by 490,000 gal.

<u>Reduction in Power consumption</u>

In order to meet the requirements of the Long-Term Enhanced Surface Water Rule, GCSD is required to use chloramination followed by ultraviolet (UV) disinfection at its water treatment plants. The microfiltration system will receive credits towards the reduction of Giardia and Cryptosporidium (>6-log) and viruses (0.5-2.5 log). These credits will allow GCSD to rely on chloramination alone without the need to use UV disinfection. The power consumption of the UV system at Second Garrote is 262,800 kWh annually. Using a cost of $0.07/kWh the microfiltration system will result in annual savings of $18,396 and reduce power consumption by 5,256,000 kWh over the life of the project.

<u>Increase reliability of supply:</u>

The water filtration system will improve the reliability of the water supply to GCSD customers. GCSD currently relies on disinfection to meet the pathogen requirements. At times, usually after storm events, raw water turbidities in the Mountain Tunnel rise above 1 NTU and GCSD must take extra precautions to ensure adequate disinfection. Since 2004, turbidities in the raw water have been above 1 NTU for an average of 15 days per year. During these events, GCSD either stopped producing water or adopted more frequent monitoring to ensure water quality met the required disinfection criteria. Microfiltration will produce potable water regardless of the raw water turbidity, and will enable GCSD to maintain the supply stream for the 15 days per year when the supply would have been turned off (295 days over life of the project.)

<u>Reduction in Chemical Consumption:</u>

Raw water from Hetch Hetchy is very good in quality and chlorine demands are very low. However, it contains organics that can create disinfection-by-products. To avoid the formation of DBPs, GCSD injects ammonia after chlorination to form chloramines. Ammonia is dosed at 5 times the chlorine concentration to ensure adequate chloramination.

The water filtration system will reduce the chlorine demand of the treated water and the ammonia required for chloramination. The current chlorine dose is approximately 1.9 mg/l into the chlorine contact tank. Using a reduction in chlorine demand by the membrane filters of 20 percent and an annual water production of 155 MG (2013), the annual reduction in chlorine dosage would be approximately 491 lbs and the annual reduction in ammonia demand would be 2,456 lbs (491 x5).

VI. Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project name: <u>GCSD Water Filtration System</u>**	
Question 1	Types of benefits provided as shown in Table 5: The main benefit of this project is that the GCSD will be able to produce potable water that

	is safe for drinking. GCSD does not have enough capacity in its AWS plant to meet year round demand. Without the project GCSD would not have the ability to produce potable water. The benefit of providing safe drinking water is not quantifiable. However, other quantifiable physical benefits from this project include: • Reduction of water wasted for flushing • Reduction in power consumption • Increase reliability (production days) • Reduction in chemical use
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes, two other alternatives were considered as follows: I. Expand existing AWS Water Treatment Plant The first alternative considered consisted of expanding the AWS Water Treatment Plant to handle the entire GCSD's water demand. The AWS WTP can supply approximately 500 gpm of water from PML. The AWS WTP consists of a trailer mounted microfiltration system. According to the manufacturer, the trailer is not designed to accept any additional membrane modules. Thus, in order to expand its treatment capacity it would be required to either purchase an additional trailer mounted system or mount the additional modules in a building. The AWS WTP was installed in 2007 at the District's Maintenance Yard. Treated water is pumped into a 6" distribution pipe in PML. Pressures in the system when the AWS WTP is in operation increase significantly due to the headloss in the system. Treated water must reach Tank 3 to be distributed to the rest of GCSD's service area. Expanding the AWS WTP would require upgrading approximately miles of pipeline to Tank No. 3. The construction cost for this alternative was estimated to be $2,075,000. II. Install Filtration Equipment at the Big Creek Pump Station This second alternative consisted of installing filtration equipment at the Big Creek Pump Station. As described earlier, Big Creek Pump station has a production capacity of approximately 1,600 gpm and can supply GCSD's Maximum Day Demand. There is a 16" Water Main that conveys water to other tanks within GCSD. However, Big Creek Pump Station is not a reliable source of supply. The Mountain Tunnel where Big Creek draws water from is also used to convey water to the Moccasin Power House. During times when the Moccasin Power House is in operation, the hydraulics in the tunnel are such that the turbine pump does not have enough submergence to draw water. This situation is usually more severe during the summer months. Installing the filtration equipment at Big Creek would require a commitment from SFPUC to stop the operation of the Moccasin Power House for certain periods of time. This request is likely unfeasible. The construction cost for this alternative was estimated to be $1,400,000. III. Install Filtration Equipment at the Second Garrote Pump Station. The third Alternative consists of installing new filtration equipment at the Second Garrotte Pump Station. The Second Garrotte Pump station is capable of producing 680 gpm and in combination with the AWS WTP, GCSD's demands would be met. The second garrote pump station is already equipped with disinfection equipment including chlorine contact and UV lights. There is also adequate transmission capacity to convey the water to Tank No. 1 and Tank No. 3. The site will also permit the location of the additional infrastructure. The construction cost for this alternative was estimated to be $1,400,000.

Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The preferred alternative is the least cost alternative, tied with Alternative II, but it offers a more reliable water supply than Alternative II.
Comments:	

Tuolumne County Resource Conservation District Regional Water Conservation Program (TS IRWM Project No. 36)

I. Project Summary Table

Table 4 – 2014 IRWM Drought Solicitation Project Summary Table		
Drought Project Element		**TCRCD Regional Water Conservation Program**
D.1	Provide immediate regional drought preparedness	Yes
D.2	Increase local water supply reliability and the delivery of safe drinking water	Yes
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective	Yes
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	Yes
IRWM Project Element		
IR.1	Water supply reliability, water conservation, and water use efficiency	Yes
IR.2	Stormwater capture, storage, clean-up, treatment, and management	Yes
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	
IR.4	Non-point source pollution reduction, management, and monitoring	Yes
IR.5	Groundwater recharge and management projects	Yes
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	
IR.7	Water banking, exchange, reclamation, and improvement of water quality	
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.10	Drinking water treatment and distribution	
IR.11	Ecosystem and fisheries restoration and protection	

II. Project Description

Implement integrated regional water conservation program activities that are not cost-effective on a local level, and cannot be implemented solely through utility ratepayer charges. Tuolumne County Resource Conservation District.

Project Description Discussion

The TCRCD Regional Water Conservation Program is an aggressive and proactive water end-user engagement strategy involving water conservation activities, water use efficiency education and improvements, water demand response/control methods and alternative water source development programs. This project significantly expands the existing water conservation programs developed by the water providers in the region. Six specific program elements are proposed that will provide quantifiable and sustainable water savings including: 1) Regional Water Conservation coordination sponsored and hosted by TCRCD, 2) A regional program of Water Conservation Education and Outreach including workshops and use of infographics, flyers, PSA's, door hangers and tent cards for restaurants and hotels, bill stuffers, web site widgets, multi-media, etc., (Sponsored by TCRCD, Water Purveyors, UC Extension, and Tuolumne River Trust) 3) A Housecall program of providing free water use evaluations and audits, leak repair, water saving devices and leak detection tablets to DAC and non-DAC households and businesses throughout the region (Sponsored by TCRCD and Amador-Tuolumne Community Action Agency). 4) A coordinated and integrated rebate program including cash rebates for residential and commercial/industrial users for High-Efficiency Toilets and Urinals, High Efficiency-Washers, Rain Barrel rainwater harvesters, rain gardens, weather based smart irrigation devices, laundry to landscape irrigation systems; and commercial kitchen pre-rinse sprayers (Sponsored by TCRCD and Water Purveyors); 5) Large scale rainwater to irrigation program (Sponsored by TCRCD and Water Purveyors); 6) Development of Elementary and High School, Vacation Home, Motel, and Restaurant water conservation Programs (Sponsored by TCRCD, Tuolumne River Trust, UC Extension, and Water Purveyors).

Drought Impact Alleviation

The regional conservation program will provide immediate region-wide drought impact alleviation by creating and maintaining both short and long term water supply savings by decreasing the use domestic and CII water supplied from major water purveyors, small private water companies and independent users.

Project Eligibility and Funding Timing

This project provides immediate regional drought preparedness through an aggressive regional approach to integrated water conservation that will address consumer behavior, improve landscape irrigation efficiencies, and result in short and long term water use savings. By reducing use and demand, the limited local water supply can be used more efficiently and reliably over the short and long term. Most critically, this project assists the local water suppliers (inclusive of the many smaller private systems in the region) to implement conservation programs and measures that are not locally cost-effective.

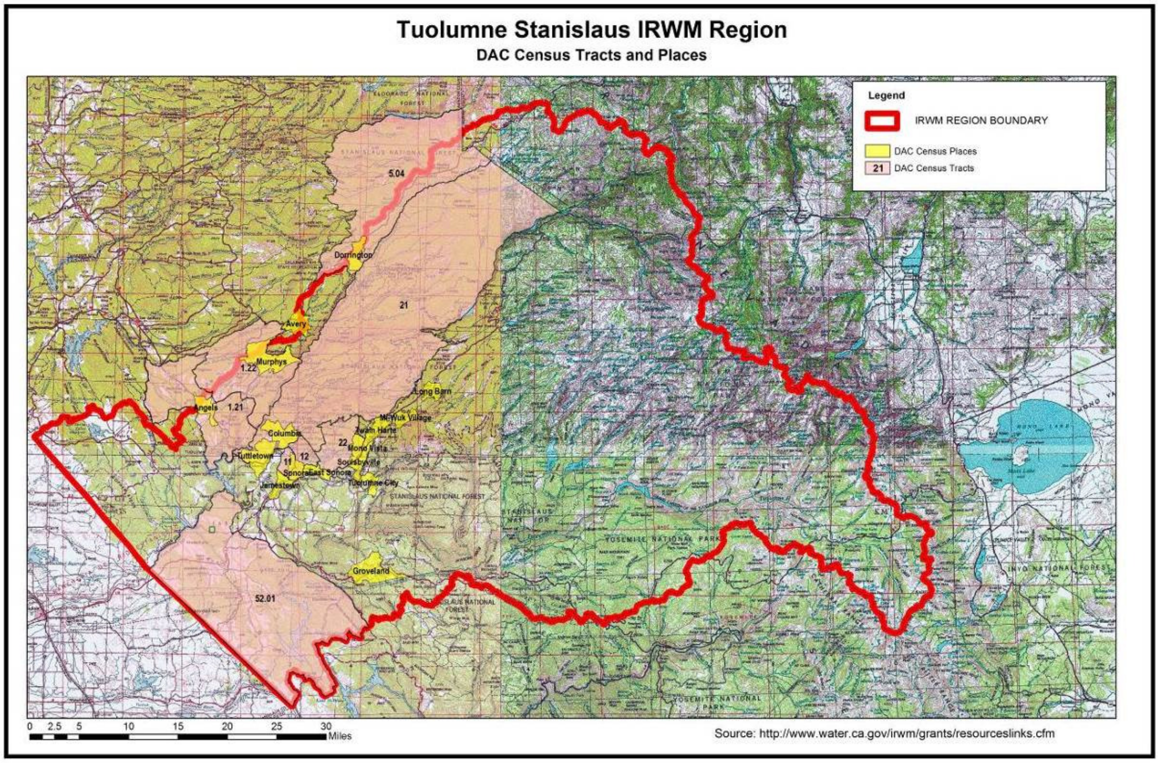
Using an average price of $500 per acre-foot, the conservation program's savings value (at 186 AF/YR) is approximately $93,000/yr. This is significantly less than what the cost of implementing an aggressive conservation program would be for each of the major water purveyors, not to mention all of the smaller independent systems.

For example, Twain Harte CSD alone implemented the following water conservation measures this year: public outreach (mailers, signs, newspaper/radio ads, public info forums, website updates, etc.) ; free low-flow showerheads, aerators and leak dye tabs; customer leak detection and leak repair enforcement; mandatory conservation measures and enforcement. Their estimated costs this past year for these efforts (including labor) are approximately $100,000 (Normal budget for Conservation is about $15,000/yr). Consuming that much staff time has kept them from performing normal maintenance and repair work and completing budgeted capital projects. It also has kept their office staff from being able to perform normal duties. CCWD' and TUD's typical budget for conservation is about $18,000 to $20,000 per year.

Additional conservation measures that should be implemented, such as more aggressive fixture replacement rebates, ongoing public education campaigns, water surveys, rain barrel/cistern installations, and landscape efficiencies etc., are simply not affordable at a local level. The regional integrated conservation program will immediately and efficiently utilize funds to spread out the benefits region-wide. The annualized cost of the conservation program over a 15 year life is $3,317,346 (approx. $221,000 per year). With a present value of approximately $93,000 per year for water saved, the 15 year benefit of the program is $1,395,000. The annualized cost of the program over the life of the project exceeds the annualized monetary benefit realized from the program.

III. Project Map

The Regional Water Conservation Program covers the entire Tuolumne-Stanislaus IRWM Region. A map of the Region and DAC Census Tracts and Places is shown below. Most of the Region located to the south and east of the Highway 108 corridor is either within the Stanislaus National Forest or Yosemite National Park.



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IV. Project Physical Benefits

The Primary benefit of the Regional Water Conservation Program will be the immediate and long term reduction of water use by residential and CII users throughout the entire region (186 Acre-feet of water per year) through installation of water efficient fixtures and landscape irrigation efficiencies.

Secondary benefits will include reduced energy usage due to decreased water pumping, water heating, and treatment needs; potential improvement of groundwater recharge quality and quantity due to decreased on-site wastewater treatment needs (WWTP and Septic tank use); new small-scale water source development through the installation of rain barrels and cisterns; deceased financial burdens on DAC community members through decreases in water and power bills; and increased understanding of water resources within the region through implementation of an aggressive outreach/education campaign.

Table 5 – Annual Project Physical Benefits

Project Name: _ Regional Water Conservation Program

Type of Benefit Claimed: _Amount of Water Saved_(Potable water demand decreases)

Units of the Benefit Claimed : __Acre-feet per year

Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (b) – (c)**
2014	0	93	93
2015	0	93	93
2016	0	186	186
2017	0	186	186
2018	0	186	186
2019	0	186	186
2020	0	186	186
2021	0	186	186
2022	0	186	186
2023	0	186	186
2024	0	186	186
2025	0	186	186
2026	0	186	186
2027	0	186	186
2028	0	186	186
2029	0	186	186
Total Savings over Life of Project		2790 AF	2790 AF

Comments: Assumption of 15 year life span of project. Implementation includes replacement or installation of 3500 showerheads, 7600 sink aerators, 1040 high efficient toilets and/or urinals, 250 washers, 200 commercial pre-rinse sprayers, 385,253 gallons (1 AF)of rain catchment/storage installation, 200 smart irrigation and spray irrigation to drip system conversions, 10 acres of rain/drought resilient landscapes, 1000 laundry to landscape improvements. It is further assumed that half of the installations will occur in each of the first 2 years of the project.

V. Technical Analysis of Physical

Technical basis for project:

Typical cost effective water conservation programs involve offering some form of small incentive funding for landscape water efficiencies, fixture and appliance upgrades. In this region, TUD, GCSD, THCSD and CCWD all offer modest rebates for installation of high efficiency toilets, but have very few other incentive programs that are cost effective for the Districts. The financial incentives offered through this program will cover the majority of the cost for completion of the water conservation improvements, and should result in a significantly higher participation level by the general public.

Water conservation practices are only marginally accepted by the general public in this region. This program will use a community saturation approach in raising awareness, educating, analyzing and informing water users about options for improved water use efficiency. Audits and incentives will produce immediate results. Consistent messaging, massive public outreach, workshops and education should increase consumer acceptance of water-efficient technology and practices and result in long-term demand reduction that improves the region's capacity to manage drought scenarios and other strains on extremely limited Regional water supplies.

This program uses proven and easily quantifiable water conservation and demand control projects, methods and technologies, diffused into the community at a rapid pace and at an incentive level that is significantly greater than the region is familiar with. In addition, these proven techniques are directly matched with the water use practices/needs of the water user through the onsite water audits. Audited water users will receive an efficiency report containing a list of potential improvements, estimated costs, incentive amounts, deadlines, qualified installers, inspections required and long term water savings/cost benefits quantified. This program is focused on both indoor and outdoor conservation actions and education for residences, businesses and industry. A regional approach is the only way to provide an equitable conservation program within the region that will reach not only the major water purveyor customers, but also the remaining 30+% of the regional population that relies on private wells, springs, and small private water systems.

The participating agencies have developed programs to provide quantifiable and sustainable water savings, but many of the components defined in various Urban Water Management Plans or Operational Plans are not locally cost effective because the rate-payer base is simply not large enough to support these programs. The water supply benefits generated over the 10 to 15 year course of this program will reduce water demand, thus preserving current potable supplies and reducing stress on the local supplies and ultimately on the numerous downstream users and the CALFED Bay-Delta.

More than 50% of water use is typically for landscape irrigation. Excess spray irrigation runs to local storm drains or surface waters and are often polluted with pesticides, herbicides and /or fertilizers. Cutting back on landscape irrigation will prevent stormwater pollution and also result in energy savings (less water must be pumped, treated, and conveyed to customers). This will reduce the carbon foot print of water agencies and the various private water systems.

Recent and historical conditions that provide background for benefits to be claimed:

The waters of the Stanislaus and Tuolumne rivers are relied upon as critical supplies for invaluable river ecosystems, millions of people, hundreds of thousands of acres of prime farmland, and hydroelectric resources that are used throughout California. The history of the Region and development of specific linkages between the water resources of the upper watersheds of the T-S Region to the downstream water users in the Bay Area, San Joaquin Valley, and southern California is described throughout the T-S IRWM Plan.

Understanding the historical influences on water supply development and use in the T-S Region provides essential context for the complex relationships that surround water management and the way these relationships have affected the water resources landscape over time. Historical understanding also provides a common foundation for addressing the T-S Region's challenges with water supply.

Over 95% of the region's water supply is derived from the surface waters of the Stanislaus and Tuolumne Rivers. Groundwater of adequate quantity is unavailable to serve the region's water demand. Water supply for use within the T-S Region is also largely controlled by downstream senior water rights holders. For example, Tuolumne Utilities District (TUD), which provides water to many of the water users in the T-S Region, relies on an agreement with PG&E to obtain water from Lyon's Reservoir. The City of Sonora and Twain Harte Community Services District (THCSD) rely on agreements with TUD. Groveland Community Services District (GCSD) similarly relies on agreements with San Francisco Public Utilities Commission (SFPUC) through the Hetch Hetchy system. Calaveras County Water District (CCWD) and Utica Power Authority (UPA) are the only municipal water purveyors in the Region with existing water rights, although these rights are not adequate to fully provide for current or projected future demands. The City of Angels relies on UPA to provide water. Water exports for consumptive uses outside the Region comprise approximately 98% of the overall water deliveries from the Stanislaus and Tuolumne rivers on an average annual basis. Approximately 1.7 Million Acre-feet of water per year is exported out of the Region from the two rivers for agriculture and municipal purposes.

Of the water that is retained for consumptive use within the region, 6 public utility districts, and over 25 private/mutual water companies all work to manage the majority of the region's potable water supply. This unusually large number of water providers for a region of this size is a legacy of the region's gold mining history, relationship with PG&E and large downstream water districts, and history of dispersed development leaves the community with unique challenges and inefficiencies. These challenges become further exacerbated when dealing with drought conditions and the need to conserve.

In-Region water demands include predominantly municipal and agricultural uses and in 2010 total demand was approximately 29,000 acre-feet. Currently, the largest demand within the T-S Region is for municipal residential, commercial, and industrial uses.

Currently the greatest demand within the T-S Region is in the TUD service area, with approximately 15,000 AFY of water use. Current water use in areas outside of the major water purveyors is estimated to be approximately 15% of the total water use within the T-S Region.

The table below shows existing and predicted future demand within the T-S Region.
Projected Water Demand by Agency (AFY)

Agency	2010	2015	2020	2025	2030	2035
CCWD	4,484	14,897	24,179	34,800	44,159	54,248
GCSD[1]	1,038	1,090	1,140	1,193	1,244	1,300
UPA	2,761	2,998	3,278	3,641	4,011	4,510
TUD	15,513	18,920	20,659	22,592	24,741	26,074
Tuolumne County-Other[2]	4,313	4,551	4,802	5,067	5,346	5,641
Calaveras County-Other[3,4]	876	935	997	1,064	1,135	1,211
Alpine County-Other[5]	25	27	28	30	31	33
Total	**29,010**	**43,416**	**55,083**	**68,386**	**80,668**	**93,017**

Source: CCWD, GCSD, TUD 2010 UWMP; UPA projections provided by UPA
1. Assumed 4.5% growth between 2030 and 2035
2. Assumed a growth rate of 1.08% per year and a gpcd of 187 based on TUD 2010 UWMP
3. Assumed a growth rate of 1.3% per year based on 2030 General Plan Update Housing Element
4. Assumed a gpcd of 215 based on CCWD 2010 UWMP
5. Assumed a growth rate of 1.08% per year and a gpcd of 187 based on TUD 2010 UWMP

Groundwater supply in the T-S Region is largely considered unreliable, but still provides as much as 30% of the domestic water supply in Tuolumne County, and historically has been a significant water supply in southern Calaveras County. Groundwater wells constructed in fractured bedrock and metamorphic formations are owned and operated by private landowners, small public water systems (systems with less than 200 connections), and larger water utilities. Groundwater is the only water supply source for many of the small water systems in the T-S Region, including a portion of the Lake Don Pedro Community Services District. The majority of the small water systems within Tuolumne County that are regulated by the County's Environmental Health Division and/or California Department of Public Health rely exclusively on individual small capacity wells. A large portion of these small water systems are also disadvantaged communities, and are currently unable to afford needed infrastructure investments to procure a more reliable and longterm water source, or to offer any sort of conservation program for their constituents. These 100+ small water systems in the region typically have no alternative supply leaving them extremely vulnerable to long term water outages and further, they have very little to no capacity to implement a water conservation program on their own.

The Regional Water Conservation Program will provide assistance to private landowners, small public water systems, local disadvantaged communities, and larger water utilities. The program is designed for immediate, widespread implementation and includes integrated capacity building and ongoing education/monitoring to ensure that both larger and smaller systems and individuals can successfully continue the conservation and drought resiliency into the future.

<u>Estimates of without-project conditions:</u>
"Without project" conditions were assumed to remain as status-quo. Residences and businesses will continue to use existing fixtures or maintain existing landscapes and to respond to drought and calls for water conservation as an emergency condition. Current water use is expected to decrease slightly because of mandatory conservation efforts implemented by the various water purveyors, but permanent reductions in water use are unlikely without the implementation of an aggressive regional conservation program and effort.

Small water system and private landowners within the region (~30% of the water users in Tuolumne County) are not customers of any utility district and as such do not benefit from the limited District programs available.

Description of methods used to estimate physical benefits:

Education, replacement of water dependent landscaping, improvement in outdoor water application means and methods and installation of high efficiency fixtures are proven methods for decreasing the use of potable water in residences, businesses and industry. For example, old inefficient toilets currently use between 2.22 and 3.72 gallons per flush (gpf) more than high efficiency toilets (HET). The old urinals use between 1.0 and 4.5 gpf more than high efficiency urinals (HEU). Regular clothes washers require nearly double the volume of water per load compared to high efficiency washers. EPA provides lists of "certified watersense toilets" and other fixtures that are backed by independent, third–party testing and certification, and meet EPA's specifications for water efficiency and performance.

TCRCD staff conducted a web-based search of various programs that included replacement of inefficient fixtures and installation of water efficient landscaping to develop a summary water savings table for the various components of the Regional Water Conservation Program. Average annual savings per unit were obtained from various web sites including manufacturers of EPA certified fixtures. Where differing annual savings were found, the lower or more conservative estimate was used to populate the table. Estimates of water savings generated on an annual basis from each of the program components is shown below.

Water Savings Calculations

Fixture or Program	Total Regional Rebates or Installations	Rebate Unit	Annual Unit Water Savings (Gal/YR)	Annual Total Water Savings (Gal/YR)	Water Savings (AF/YR) [325,853 gal/AF]
Showerhead replacements	3,580	showerhead	3,600	12,888,000	39.55
Aerator Replacement	7,620	aerator	964	7,345,680	22.54
High Efficiency Toilet and Urinal Replacement Rebate Program	1,040	HET or Urinal	5,681	5,908,240	18.13
High Efficiency Washer Replacement Rebate	250	Washer	7,978	1,994,500	6.12
Commercial Kitchen Pre-rinse Sprayer Rebate	200	sprayer	30,492	6,098,400	18.72
Rain Barrel/Cistern Rainwater Harvesting Rebate	385,253	Gallons	400	770,506	2.36

Weather based Smart Irrigation System/Timer Rebate	200	Station	1,268	253,600	0.78
Rain Gardens (Residential & CII - 10 Acres)	217,800	sq ft	75	16,335,000	50.13
Washer Laundry to Landscape Rebate	1,000	System	9,125	9,125,000	28
TOTAL				**60,718,926**	**186**

In addition to the savings described above, the way the general public uses water is expected to be modified through education and water audits (perhaps up to 5000 gallons per year per household). Smart weather and moisture based irrigation systems have also been shown to save 8 to 10 times as much water as described above. Depending on the number and types of incentives and conversions that are ultimately installed through the program, an additional 50 acre-feet per year could be saved.

Identification of all new facilities, policies, and actions required to obtain the physical benefits:
No new major facilities or policies are required to obtain the benefits described. Each of the various regional water purveyors (TUD, GCSD, THCSD, CCWD etc.) have, at various IRWM Advisory Committee and JPA meetings, agreed to participate in the Regional Water Conservation Program.

Description of any potential adverse physical effects:
There are no potential adverse physical effects of implementing a Region-wide conservation program.

VI. Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis Project name: TCRCD Regional Water Conservation Program	
Question 1	Types of benefits provided as shown in Table 5: **Acre-feet per year of water saved** **Additional Benefits not quantified include:** 1. Reduced financial burden on the DAC. 2. Maximum awareness of drought impacts throughout the region resulting in increased conservation. 3. Reduction of energy required for heating water. 4. New source project avoidance
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? **YES,** Each of the Districts have implemented voluntary and mandatory conservation measures, but they are unable to fund a more comprehensive and/or integrated conservation program.

	If no, why?
	If yes, list the methods (including the proposed project) and estimated costs. All of the major water districts have urban water management plans (UWMP) that describe demand management measures (DMM's). Most of the highly effective DMM's (such as those proposed herein) are not cost-effective in rural communities such as Tuolumne and Calaveras Counties because the rate payer base for the Districts is so small. See discussion in Attachment 2 for district-specific details.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. This suite of projects is not the least-cost alternative. However, it is the preferred alternative because the costs listed in the various districts' UWMP's for DMM's are impossibly high for the districts to fund with such a small rate-payer base. (The largest District has only approximately 10,000 rate payers). Each of the Districts have implemented voluntary and mandatory conservation measures, but they are unable to fund a more comprehensive conservation program. Many of the 20 smaller private and mutual water companies have no conservation programs at all because they serve only a few hundred connections each. Additionally, up to 30 percent of the area is served by private wells and springs and these businesses and residences comprise the majority of the groundwater users, but are not ratepayers to the various service Districts. As such, a comprehensive and integrated conservation program that touches all of the water users in our Region is the preferred alternative. It can serve both the service District constituents, non-Service District residents and DAC members on an equal basis.
Comments:	

Tuolumne Utilities District Phoenix Lake Preservation and Restoration – Phase 3 (TS IRWM Project No. 39)

I. Project Summary Table

Table 4 – 2014 IRWM Drought Solicitation Project Summary Table		
Drought Project Element		**Phoenix Lake Phase 3**
D.1	Provide immediate regional drought preparedness	Yes
D.2	Increase local water supply reliability and the delivery of safe drinking water	Yes
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective	
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	Yes
IRWM Project Element		
IR.1	Water supply reliability, water conservation, and water use efficiency	Yes
IR.2	Stormwater capture, storage, clean-up, treatment, and management	Yes
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	Yes
IR.4	Non-point source pollution reduction, management, and monitoring	
IR.5	Groundwater recharge and management projects	
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	
IR.7	Water banking, exchange, reclamation, and improvement of water quality	Yes
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.10	Drinking water treatment and distribution	Yes
IR.11	Ecosystem and fisheries restoration and protection	Yes

II. Project Description

Phoenix Lake Preservation and Restoration – Phase 3 will create access to approximately 170 ac-ft of raw water storage for the District's Sonora/Jamestown Water System. Tuolumne Utilities District.

Project Description Discussion

The Phoenix Lake Preservation and Restoration (PLPR) - Phase 3 project is designed to improve the water quality and restore storage capacity in Phoenix Lake and the Phoenix Lake watershed. A very comprehensive and diverse plan has been developed for the restoration and preservation of Phoenix Lake and the surrounding watershed (Phase 1). Phase 2 (in progress, funded by Round 2 IRWM Implementation Grant) will finalize the 30% design completed in the plan, complete all necessary environmental reviews and obtain the required permits to implement the plan and excavate approximately 45,000 cubic yards(cy) of sediment restoring 28 acre-feet(ac-ft) of storage capacity.

The goal of this project is to continue the previous work completed in Phase 1 and Phase 2 of the Phoenix Lake Preservation and Restoration project. Phase 3 of the PLPR will do the following:

- Purchase land and construct a sediment forebay along Sullivan Creek at the lake inlet.
- Excavation of connector channels through the submerged ridge allowing access to approximately 80 ac-ft of water that is currently inaccessible.
- Dredging of the East Pool Unit, removing approximately 146,500 cy of sediment restoring 90 ac-ft of storage volume.

Drought Impact Alleviation

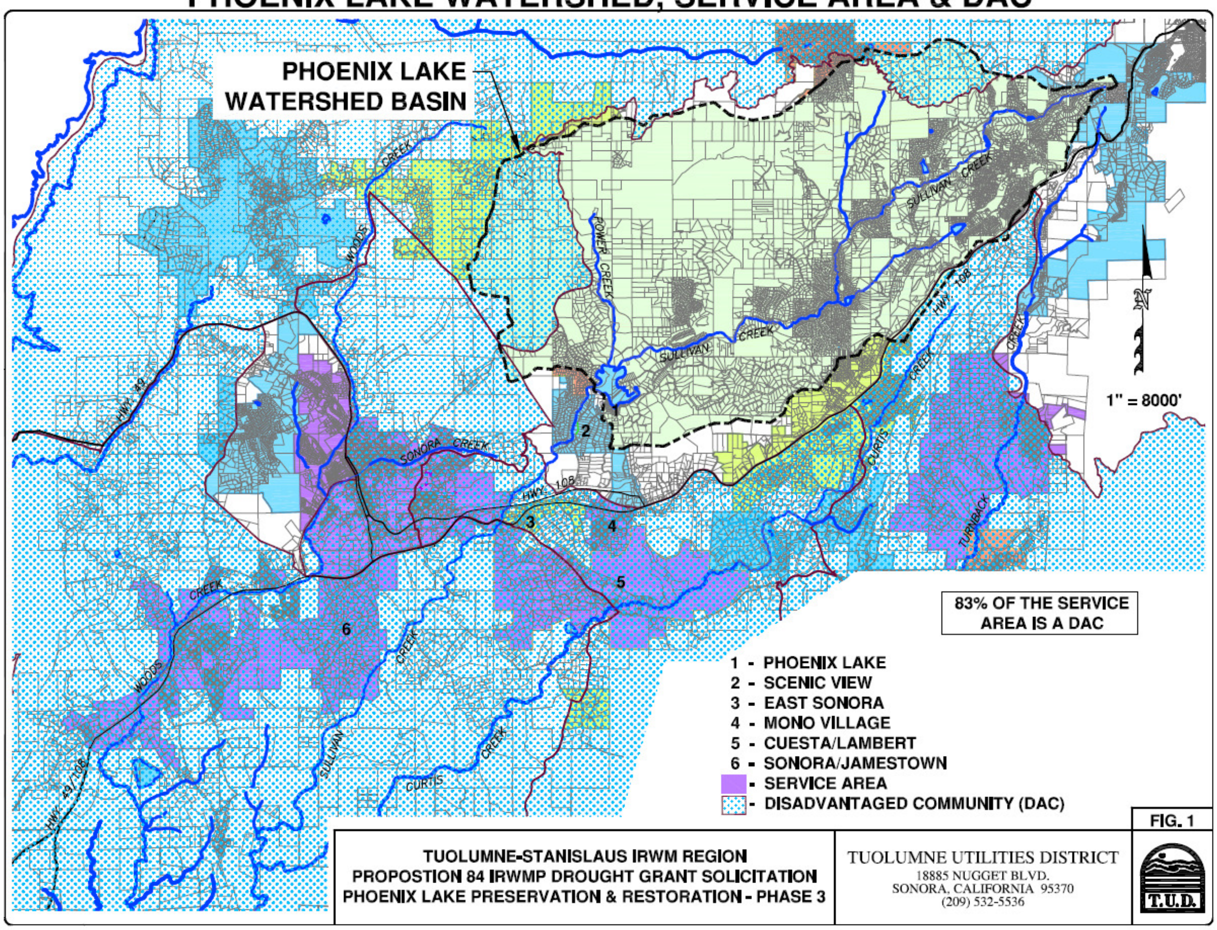
TUD relies on raw water storage to serve its customers (residential, commercial, and agricultural) for approximately five months a year for every year. The ability to provide water for five months is directly related to demands and the volume of storage. Since TUD is reliant on surface water (snow pack runoff) the more storage available equates to having more water available for consumption. As of June 24th, 2014, the National Drought Mitigation Center shows Tuolumne County as being in extreme to exceptional drought conditions. TUD is at risk of not meeting existing drinking water demands due to the drought. On January 28th TUD implemented Phase III water conservation measures to help ensure that clean and safe drinking water is provided to all treated water customers in the District. Phase III Water Conservation called for 50% water reduction and significant reductions in irrigation water deliveries and water treatment plant operations. The ditch system was turned off at the last water treatment plant on each ditch. This ceased end losses at the ends of the ditches. The backwash time and frequency at the water treatment plants were decreased and wells were brought online to help alleviate the water supply shortage.

Project Eligibility and Funding Timing

The Phoenix Lake Preservation and Restoration (PLPR) - Phase 3 project is designed to improve the water quality and restore storage capacity in Phoenix Lake and the Phoenix Lake watershed. The implementation of this project will increase the water supply reliability and improve water quality for TUD's largest water system, serving more than 10,000 people, as well as commercial and agricultural users. The project will be ready to proceed with implementation to meet current as well as long-term water demands effected by the current drought and potential future droughts.

III. Project Map

PHOENIX LAKE WATERSHED, SERVICE AREA & DAC



IV. Project Physical Benefits

Table 5 – Annual Project Physical Benefits

Project Name: Phoenix Lake Preservation and Restoration – Phase 3
Type of Primary Benefit Claimed: Raw Water Storage
Units of the Benefit Claimed : Acre-Feet (ac-ft)
Additional Information About this Benefit______________________________

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)

2014	517	517	0
2015	517	517	0
2016	517	607	90
2017	517	687	170
Last Year of Project Life			
Comments: Volumes of storage restored are from the *Phoenix Lake Preservation and Restoration Plan*, (Tuolumne Utilities District/Horizon Water and Environment, p.3.2-3)			

V. Technical Analysis of Physical

Technical basis for project:
The technical basis for the Phoenix Lake Preservation and Restoration – Phase 3 project is fully explained in the *Phoenix Lake Preservation and Restoration Plan (PLPRP), TUD and Horizon Water & Environment, July 2012* (Plan). The main purpose of the Plan is to provide Tuolumne Utilities District with a roadmap for restoring and preserving the functions and values of Phoenix Lake. Critical functions and values of the lake include water supply, water quality, wildlife habitat, recreation, and aesthetics. Additional objectives of the PLPRP include investigating opportunities for public access; outreach to local landowners and residents on Best Management Practices (BMPs) to protect the lake; and developing prefire management strategies.

Recent and historical conditions that provide background for benefits to be claimed:
The current drought has created a need for additional water supply storage, and improved water quality. The Phoenix Lake Preservation and Restoration – Phase 3 will provide access to approximately 170 ac-ft of water that currently does not exist. The construction of the sediment forebay will remove a majority of the sediments transported to the lake via the Sullivan Creek watershed. Sediment removal is key for improving water quality conditions in the lake. As water quality improves with the addition of the sediment forebay and the greater depths and volume of the lake the ecological habitat will improve, and treatment requirements and energy expenses will decrease. Implementation of the project will create both an immediate aid to surviving the drought, but will also provide long-term solutions for future droughts.

Estimates of with-out project conditions:
If the project is not constructed the impacts of the drought and subsequent droughts will limit TUD's ability to meet all water demands, domestic and agricultural. The Phoenix Lake Preservation and Restoration – Phase 3 provides much needed water quality improvements, storage expansion, and reliability for meeting water demands.

Description of methods used to estimate physical benefits:
The physical benefit described in Table 5 will be measured by volume of sediment removed from the lake in cubic yards (cy). There is a direct correlation between volume of sediment removed and volume of storage created.

Identification of all new facilities, policies, and actions required to obtain the physical benefits:

There are no new facilities or policies required to achieve the volume of storage estimated in the physical benefit table listed above.

Description of any potential adverse physical effects:
There are no known potential adverse physical effects.

VI. Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project name: Phoenix Lake Preservation and Restoration – Phase 3**	
Question 1	Volume of raw water storage in acre-feet (ac-ft)
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? No.
	If no, why? Creation of raw water storage of a volume greater than 50 ac-ft requires approval and permitting from the CA Division of Dam Safety. This process can be a rather time consuming and expensive endeavor to complete. In general the most cost effective method of creating raw water storage is to enlarge or restore an existing reservoir by removing accumulated sediments.
	If yes, list the methods (including the proposed project) and estimated costs.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The project is the most cost effective alternative for achieving the physical benefit of increased raw water storage.
Comments: N/A	

Twain Harte Community Services District Shadybrook Well (TS IRWM Project No. 40)

I. Project Summary Tables

Table 4 – 2014 IRWM Drought Solicitation Project Summary Table		
Drought Project Element		Shadybrook Well Project
D.1	Provide immediate regional drought preparedness	Yes
D.2	Increase local water supply reliability and the delivery of safe drinking water	Yes
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective	
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	Yes
IRWM Project Element		
IR.1	Water supply reliability, water conservation, and water use efficiency	Yes
IR.2	Stormwater capture, storage, clean-up, treatment, and management	
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	
IR.4	Non-point source pollution reduction, management, and monitoring	
IR.5	Groundwater recharge and management projects	
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution	
IR.7	Water banking, exchange, reclamation, and improvement of water quality	Yes
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.1	Drinking water treatment and distribution	Yes
IR.1	Ecosystem and fisheries restoration and protection	Yes

II. Project Description

Twain Harte Community Service District plans to construct a new well to diversify/increase water supply, provide reliability and mitigate current and future water shortages.

Project Description Discussion

The Shadybrook Well Project, undertaken by Twain Harte Community Services District (THCSD), generally consists of the following:

- Drilling, sealing and testing an 8" diameter well, approximately 500 feet deep
- Installation of a pump, motor, control panel and electrical improvements.
- Installation of a green sand filter to meet secondary MCL's for anticipated iron and manganese.
- Installation of controls and monitoring equipment to provide for automatic well operation.
- Installation of approximately 100 feet of 4-inch PVC piping to connect the well to an existing wet well used to pump raw water from Shadybrook Reservoir to THCSD's water treatment plant.
- Installation of 100 feet of 6-inch PVC piping and connection to the existing Shadybrook sewer lift station to provide for disposal of filter backwash water.
- Construction of a small well house to provide a secure enclosure for the well, filter and control panel.

The Shadybrook Well will be located adjacent to Shadybrook Reservoir, an approximate 10 acre-foot reserve storage reservoir, on Shadybrook Drive in Twain Harte, CA. Once completed, it is anticipated to produce flows of approximately 100 gallons per minute. If it is run 50% of the year, it will produce approximately 80 acre-feet of new water supply each year, about 25% of THCSD's annual water use. The new raw water supply will either be pumped to THCSD's water treatment plant via existing facilities for immediate treatment and consumption or will be banked in Shadybrook Reservoir for future use. Shadybrook Reservoir is used to supply both THCSD and Tuolumne Utilities District (TUD) with water during water shortages and outages.

Drought Impact Alleviation

The Shadybrook Well Project is critical to alleviating current and future drought impacts. Currently, due to the severe surface water supply shortage (THCSD's only water source), lack of storage and minimal snowpack, THCSD is forced to implement 50% mandatory conservation measures to provide enough water to meet basic water needs – health, sanitation and fire suppression. The community of Twain Harte has minimal outdoor watering and a 50% reduction threatens health and safety. The Shadybrook Well Project is anticipated to provide approximately 40 acre-feet of new, non-surface water supply in 2015 to alleviate the present water shortage and approximately 80 acre-feet each additional year to alleviate future water shortages. With an additional 40 acre-feet in 2015, THCSD could better insure that the basic water demands of the Twain Harte community are met. This benefit would also extend to a large portion of Tuolumne County that also relies primarily on the surface water source provided by TUD.

The additional water produced by the project will also enable THCSD to keep Shadybrook Reservoir full, eliminating ecosystem impacts when the reservoir will need to be drawn down to account for diminishing surface water supply. The new water supply will also produce higher water system flows, which will significantly reduce Trihalomethane (THM) and Haloacetic Acid (HAA5) levels in THCSD's water system.

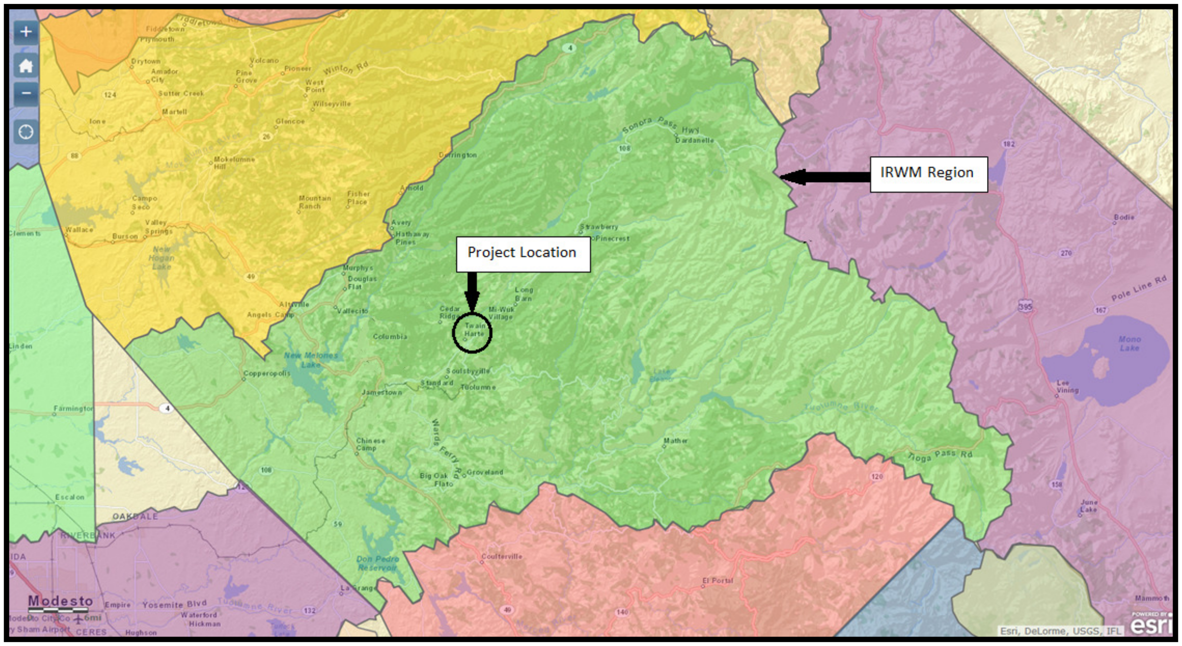
Project Eligibility & Funding Timing

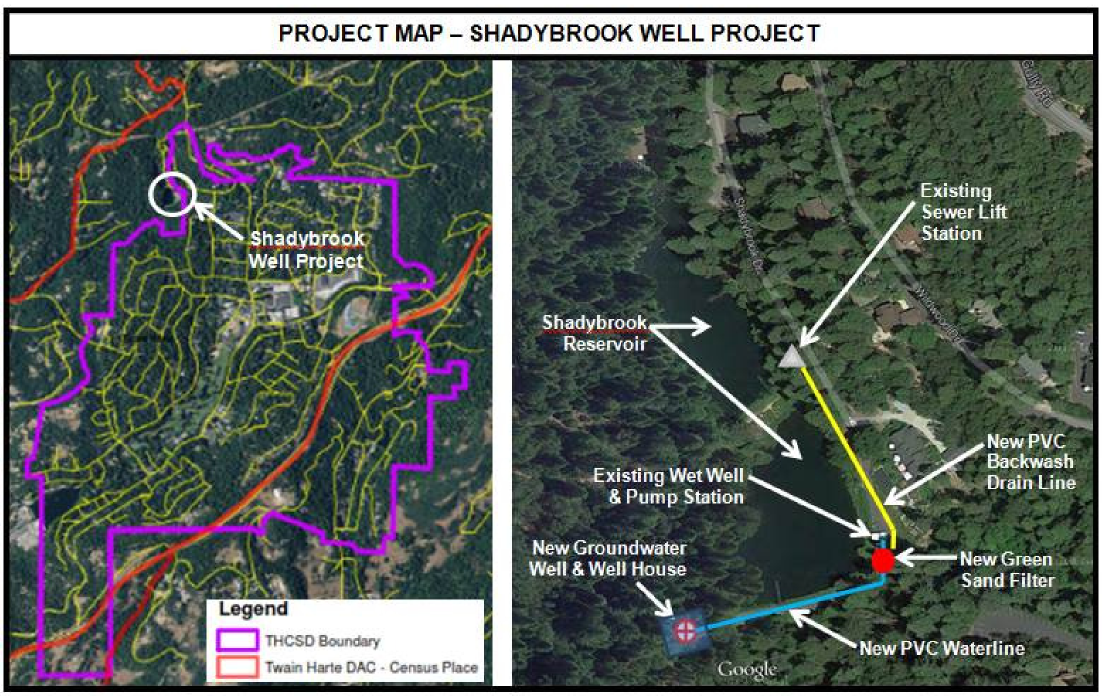
The Shadybrook Well Project is an eligible drought project since it will result in:

- Immediate regional drought preparedness by adding an immediate reliable water supply to alleviate water shortage impacts in current and future droughts for THCSD and TUD customers
- Increased local water supply reliability and delivery of safe drinking water by adding an alternative water supply source.
- Reduced water quality conflicts caused by extreme water conservation measures and resulting low system flows.

Expedited funding is needed so that this project can alleviate the impacts of the current drought, especially if it extends into 2015.

III. Project Map





IV. Project Physical Benefits

Primary Physical Benefit – Supplemental Water Supply

Table 5.1 presents the primary measurable physical benefit – supplemental water supply. THCSD currently relies solely on one surface water source to supply water to a population of approximately 2,500. The quantity of this source is limited during drought conditions and is completely cut off during emergencies and scheduled outages. The surface water source is also greatly dependent on snowpack to provide water throughout the summer months. The Shadybrook Well Project provides an immediate measurable amount of new, non-surface water supply, which will provide the following immeasurable benefits in the present drought and into the future:

- Water Supply Reliability (Immediate & Longterm): Shadybrook Well Project will provide a new groundwater supply source that is more reliable than surface water during droughts, wildfires and other emergencies causing an outage of the surface water supply.
- Regional Drought Preparedness: The Shadybrook Well Project will make more water supply available to THCSD and TUD (via a water system intertie) during this drought and future droughts.
- Climate Change Adaptation: The Shadybrook Well Project will reduce THCSD's and TUD's reliance on annual snowpack to supply water throughout the summer months.
- Human Right to Water: By increasing the quantity of water supply, THCSD will be able to insure that minimum human needs are met, even in the most severe droughts and water outages.

Table 5.1 – Annual Project Physical Benefits Project Name: Shadybrook Well Project Type of Benefit Claimed: Supplemental Water Supply Units of the Benefit Claimed : Acre-Feet per Year (AFY) Additional Information About this Benefit: Assumes well is only used 50% of the year			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2014	0 AFY	0 AFY	0 AFY
2015	0 AFY	40 AFY	40 AFY
2016	0 AFY	80 AFY	80 AFY

Project Life Duration	0 AFY	80 AFY	80 AFY
Comments: Project life is anticipated to be 100 years and is expected to produce the same additional water supply every year after it is placed into service.			

Secondary Physical Benefit – Ecosystem Habitat Protection

Table 5.2 presents the secondary measurable physical benefit – ecosystem habitat protection. Shadybrook Reservoir consists of two small ponds in a riparian area that support plant, fish, fowl, frog and other wildlife habitat. The surface area of the ponds is approximately 4.4 acres when full. Shadybrook Reservoir is primarily used as reserve storage and is used every year to supply water to both THCSD and a portion of TUD during annual ditch outages. This process significantly lowers water levels in the reservoir. In addition to reducing water surface area and water quantity for habitat, this causes water temperatures to rise and algal growth to occur. As the algal growth begins to die, oxygen levels in the reservoir are depleted and, if water is not replenished, fish deaths cannot occur.

During normal and wet years, the reservoir is only in this state for 3-4 weeks until levels can be replenished. In the present drought (and future droughts), there is not enough water to replenish the reservoir quickly (or at all) and habitat will be significantly impacted. The Shadybrook Well Project will provide a source of water to keep the reservoir full when it needs to be utilized. This will protect the ecosystem habitat supported by the reservoir from experiencing significant impacts during this drought and future droughts as well as protecting it during annual outages.

Table 5.2 – Annual Project Physical Benefits

Project Name: Shadybrook Well Project

Type of Benefit Claimed: Protected Ecosystem Habitat

Units of the Benefit Claimed : Acres

Additional Information About this Benefit: Assumes well is only used 50% of the year

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (c) – (b)**
2014	0 Acres	0 Acres	0 Acres

2015	0 Acres	4.4 Acres	4.4 Acres
Project Life Duration	0 Acres	4.4 Acres	4.4 Acres
Comments: Project life is anticipated to be 100 years and is expected to protect the same amount of habitat every year after it is placed into service.			

V. Technical Analysis of Physical Benefits Claimed

<u>Primary Physical Benefit – Supplemental Water Supply</u>
The Shadybrook Well Project's primary physical benefit has been analyzed, estimated and supported as follows:

- <u>Technical Basis:</u> There are no formal studies that identify this project or its specific benefits; however, Dennis Tanko, a local well expert, identified the Shadybrook Well location in a recent field survey as the most viable location to drill a well on all the property owned by THCSD. The result of the field survey was based on: the topography, which is located within a natural drainage basin that has supported a waterway for centuries; the geology, which revealed shallow bedrock with sizeable fractures; and dowsing, which identified the location that would produce the most water.
- <u>Recent and Historical Conditions:</u> The quantity of water supply is supported by historical drilling reports from the only two major local wells in the general topography as the proposed well (only one well is still in service and is used as a back-up well). Drilling reports show that one well produced over 100 gallons/minute and one well produced over 450 gallons/minute. These historical conditions provide support for the estimated quantity of additional water supply.
- <u>Estimating Methods (with and without project):</u> The quantity of supplemental water supply is based on a well that produces 100 gallons/minute. This value was assumed based on the lower of the similar wells drilled in the area. The total annual quantity of supplemental supply is based on running the well at 100 gallons/minute for half the year every year from the time it is online. This is a conservative estimate, not based on full-time pumping, to account for pump cycles, maintenance, groundwater recharge and energy conservation. Without the project, THCSD has no other source to supplement the surface water supply purchased from TUD and the current benefit is therefore zero. THCSD is currently in the process of undertaking another well project, but did not include that benefit because actual well production has not yet been determined.

<u>Secondary Physical Benefit – Ecosystem Habitat Protection</u>
The Shadybrook Well Project's secondary physical benefit has been analyzed, estimated and supported as follows:

- <u>Technical Basis:</u> The habitat of the Shadybrook Reservoir has been observed by operators and adjacent residents for years. Observation includes a variety of fish, riparian plants, water fowl, frogs and other wildlife.

- Recent and Historical Conditions: Each year when Shadybrook Reservoir is used to supply water, operators observe ecosystem impacts when water levels are significantly drawn down: water quality deteriorates (turbidities rise and taste and odor issues occur due to lack of oxygen), water surface area decreases, wildlife access is blocked due to steep muddy banks and algal blooms occur requiring treatment to maintain water quality. These conditions result from the normal 3-4 weeks of low reservoir levels and will likely be much worse if low reservoir levels are extended due to severe water shortages that currently exist.
- Estimating Methods (with and without project): The quantity of habitat protected is based on the high water surface area of the reservoir, as determined by standard professional survey. Without the project, the entire reservoir goes unprotected.

Identification of all New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

The project will require the following new facilities to obtain physical benefits (no policies or actions will be required):

- 8" diameter well, approximately 500 feet deep
- Pump, motor, control panel and electrical improvements
- Green sand filter
- Controls and monitoring equipment, including flowmeter
- PVC waterline and backwash drainage line
- Well house

Potential Adverse Physical Effects

The only potential adverse physical effect caused by the project is an increase in electrical power needed to pump groundwater (THCSD's primary surface water source is mainly gravity fed).

VI. Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis **Project name: Shadybrook Well Project**	
Question 1	The physical benefits shown in Table 5 include supplemental water supply (water supply reliability, drought preparedness, climate change adaptation, human right to water) and ecosystem habitat protection
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? YES
	If no, why? N/A
	If yes, list the methods (including the proposed project) and estimated costs.

	1. Drill a well on another District property (currently undertaking project) - $445,000 2. Purchase and develop existing wells within District (not pursued - wells only produced combined 30 gallons/minute) - $400,000 3. Purchase property near District with favorable topography, drill new well and pipe to THCSD water system (not pursued – too costly and no immediate results) – $750,000
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The Shadybrook Well Project is more costly than purchasing and developing existing wells, but will produce 56 acre-feet more water per year.
Comments: None.	

Tuolumne Utilities District Matelot Reservoir (TS IRWM Project No. 41)

I. Project Summary Table

Table 4 – 2014 IRWM Drought Solicitation Project Summary Table		
Drought Project Element		**Matelot Reservoir Enlargement Project**
D.1	Provide immediate regional drought preparedness	Yes
D.2	Increase local water supply reliability and the delivery of safe drinking water	Yes
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective	
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	
IRWM Project Element		
IR.1	Water supply reliability, water conservation, and water use efficiency	Yes
IR.2	Stormwater capture, storage, clean-up, treatment, and management	
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands	Yes
IR.4	Non-point source pollution reduction, management, and monitoring	Yes
IR.5	Groundwater recharge and management projects	
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	
IR.7	Water banking, exchange, reclamation, and improvement of water quality	Yes
IR.8	Planning and implementation of multipurpose flood management programs	
IR.9	Watershed protection and management	
IR.10	Drinking water treatment and distribution	Yes
IR.11	Ecosystem and fisheries restoration and protection	Yes

II. Project Description

Enlargement of a local water supply reservoir to increase storage capacity which is expected to be unavailable this year due to drought conditions. Tuolumne Utilities District.

Project Description Discussion

The Matelot Reservoir (reservoir) is located in Columbia, CA and is fed by the Tuolumne Utilities District's (TUD) Lower Columbia Ditch. TUD receives water through a contract with Pacific Gas & Electric (PG&E). The water is delivered from the South Fork of the Stanislaus River via the Tuolumne Main Canal. From the Main Canal, water is diverted to the Columbia Ditch which conveys water to the Matelot Reservoir. The water is then transported from the Matelot Reservoir via the Matelot Ditch to the Columbia Water Treatment Plant (WTP) and irrigation customers. The Columbia WTP is about 1,800 feet downstream of the Matelot Reservoir.

During the middle of October, PG&E turns off the water supply to TUD for one week to perform necessary repairs and maintenance on the PG&E Main Canal. Historically, during this one week water supply interruption (ditch outage), TUD relies on water pumped from the New Melones Reservoir to supply the Columbia WTP and ditch customers on the Matelot Ditch. TUD owns and operates the New Melones Pump station. The pump intakes are located at elevation 870 feet. New Melones Reservoir elevation has been above the 870 feet elevation for most of the life of the reservoir since it's filling in 1983. The Bureau of Reclamation (BOR) Central Valley Operations provides reports of the monthly reservoir elevation for the year. The forecasted reservoir elevation at New Melones Reservoir this year however is expected to fall below pump intake elevation of 870 feet. The most recent report for May, 2014 indicates that New Melones will reach 870 feet in elevation by the end of July, 2014. Currently, New Melones Reservoir level is at 897 feet and is dropping quickly. As a result, TUD will not be able to supply water to over 1,400 residential and over 100 commercial and industrial connections in the Columbia System. These connections serve a population of over 3,300 people, including the Cal Fire Columbia Air Attack Base. In order to meet the demands of the Columbia Water System during the annual ditch outage, especially during the 2014 drought, TUD has expanded the Matelot Reservoir from 6 ac-ft to about 26 ac-ft. The increased storage volume created by the project will safeguard a water supply for the Columbia Water System and will allow TUD to meet all of the these demands during the ditch outage without pumping water from New Melones Reservoir.

Drought Impact Alleviation

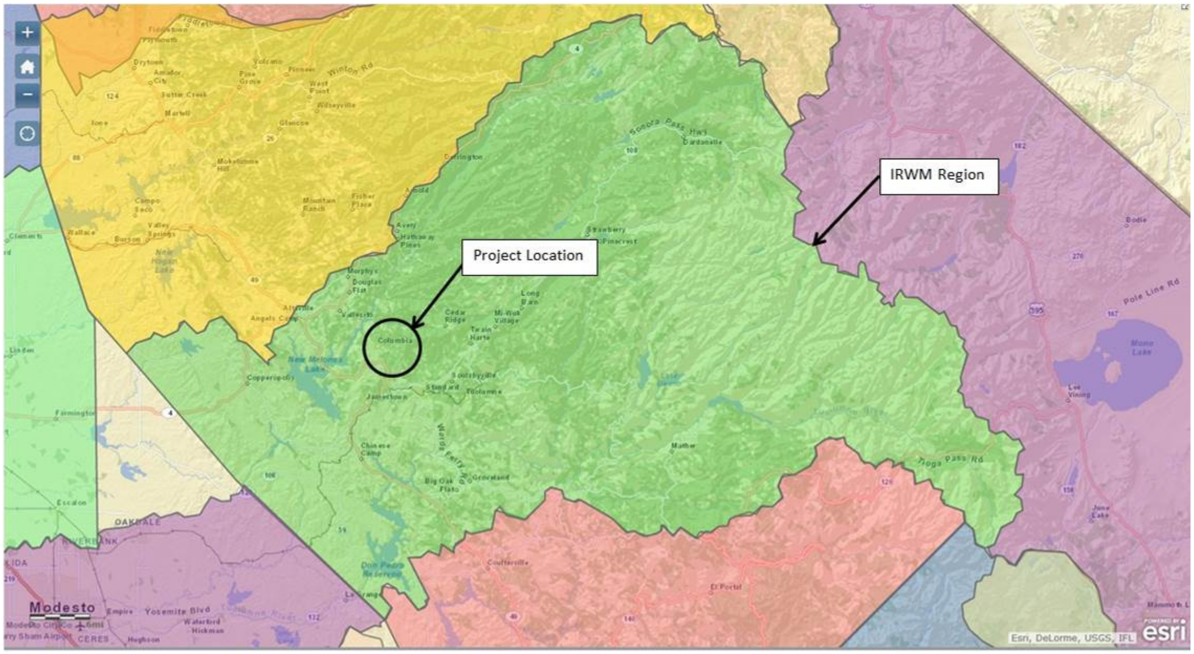
The Matelot Reservoir Enlargement Project alleviates a specific local drought impact by creating additional water storage for the TUD Columbia Water System thus eliminating reliance on New Melones Reservoir for scheduled or emergency ditch outages. Drought conditions will render New Melones Reservoir unavailable to the Columbia Water System as the New Melones Reservoir elevation is expected to fall below 870 feet by July of this year (2014). 870 feet is the elevation of the pump intakes at the New Melones Reservoir that can provide water to the Columbia Water System and Matelot Reservoir. The Matelot Enlargement Project will also help delivery of safe drinking water by improving water quality. The new configuration of the larger Matelot Reservoir will accommodate better sediment control and longer settling times due to improving the routing of the water by relocating the reservoir inlet further away from the outlet and by installing barriers to protect the raw water storage reservoir from grazing animal access.

Project Eligibility and Funding Timing

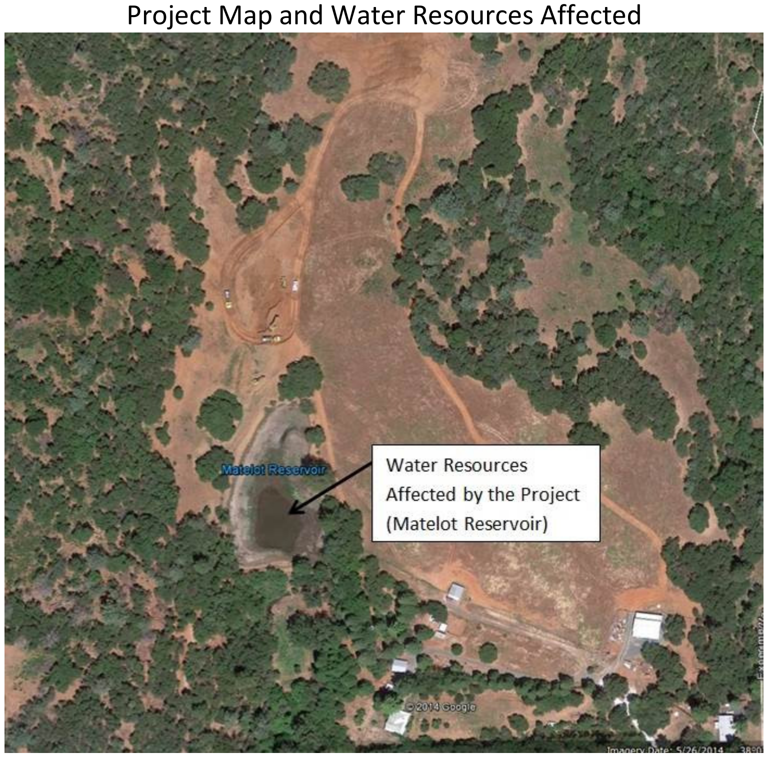
This project type is considered eligible as it will increase the water supply reliability to the Columbia Water System and secure delivery of safe drinking water for approximately 3,300 people and the Cal Fire Columbia Air Attack Base. Expedited funding is needed as the additional reservoir capacity will need to be available in October of 2014.

III. Project Map

IRWM Region and Project Location



Project Map and Water Resources Affected



IV. Project Physical Benefits

Table 5 – Annual Project Physical Benefits

Project Name: Matelot Reservoir Enlargement Project

Type of Benefit Claimed: Water Supply Storage, Reliability, Water Quality, Increase Environmental Habitat

Units of the Benefit Claimed : Acre-Feet

Additional Information About this Benefit:

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2014	6 ac. ft.	26 ac. ft.	Add approximately 20 ac. ft. storage

Comments: Once storage is expanded, it will be available for the life of the reservoir. The reservoir may require dredging in an estimated 50 years.

V. Technical Analysis of Physical Benefits Claimed

Technical Basis for Project

The technical basis of the primary benefit for the project is the additional Matelot Reservoir storage volume. The volume will be increased enough to support the Columbia Water System through a general ditch outage whether emergency or scheduled. The normal water demand for the Columbia WTP is approximately 13 acre-feet for one week. This figure is derived by evaluating the daily WTP production figures for the Columbia WTP reported by the TUD water treatment plant operators. The daily production in the past five years in October is approximately 0.61 MG per day. This amounts to about 13 acre-feet for one week. The additional volume of the enlarged reservoir will accommodate this demand.

The technical basis of the secondary benefit is that the new additional Matelot Reservoir storage will allow better routing of ditch water through the reservoir. The open ditch system experiences high turbidity periodically and a longer routing distance between the inlet and outlet allows more settling time and lowers the turbidity and thus the levels of sediments.

Recent and Historical Conditions that Provide Background for Benefits

Based on current drought conditions and reports provided by the Bureau of Reclamation, the pending low New Melones Lake elevations demonstrate that the New Melones Reservoir will not be available to pump from this year and a larger Matelot reservoir will provide the benefits claimed.

Estimates of Without Project Conditions

Based on known water demand for the Columbia Water System and the demand for the Columbia CAL Fire Air Attack Base, it is known that water supply cannot be met while the ditch is taken down for mandatory maintenance and repairs. Without the Matelot Reservoir Enlargement Project, the Columbia Water System demands will not be met this year due to the drought causing low New Melones Reservoir elevations. The water elevation in New Melones will be lower than the pump intakes at the New Melones Pump station resulting in the Columbia Water System to be out of water. The Columbia Water System uses 13 acre-feet of water in one week. The existing Matelot Reservoir stores 6 acre-feet.

Descriptions of Methods Used to Estimate Physical Benefits

The methods used to estimate the physical benefits of this project are through using standard professional measurement techniques to determine the water demand (water treatment plant production) volume and the new enlarged reservoir volume needed to accommodate the demand. Water treatment plant production volumes are recorded and tracked in the TUD Supervisory Control and Data Acquisition (SCADA) system. Daily WTP production volumes are queried and totalized in the SCADA and used to determine approximate demands.

The normal water production for the Columbia WTP for October is between 18 and 23 million gallons (MG). The production for one week during the ditch outage is about 5.0 MG which is about 15 acre-feet of volume.

Measurements of final volumes of the pre and post construction of the new reservoir volumes are obtained through standard professional survey measurements and standard engineering techniques for volume determination. Final design for enlargement of the reservoir including removal of deposited sediment will exceed a total of 15 acre-feet of volume for the reservoir.

Identification of all New Facilities, Policies, and Actions Required to Obtain the Physical Benefits

All new facilities are identified below:

1. New enlarged reservoir.
2. New rerouted ditch inlet. Pre project inlet short circuits to the outlet in a short distance. The new routing will route the inlet water further around the reservoir creating a longer distance between the inlet and outlet allowing greater settling of turbidity prior to reaching the outlet.

Description of Potential Adverse Physical Effects

Although very unlikely, a potential adverse physical effect of this project could occur as a result of an intense precipitation event. This type of condition would be true for any earthwork project in the area. TUD has developed an erosion protection plan. This erosion protection plan will be part of any grading plan and grading permit with Tuolumne County. To mitigate any adverse effects from such erosion, TUD will be strictly following the erosion protection grading plan for this project which TUD has put in place. As TUD maintains a fully functional operation and construction crew, TUD is equipped to mobilize and address any erosion issues arising as a result of such intense storm.

VI. Cost Effectiveness Analysis

Table 6 – Cost Effective Analysis

Project name: Matelot Reservoir Enlargement Project	
Question 1	The Types of benefits provided as shown in Table 5 include Water supply reliability, water conservation, and water use efficiency
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? YES
	If no, why?
	If yes, list the methods (including the proposed project) and estimated costs. 4. Coffer Dam in the South Fork Stanislaus River to submerge the pump intake. $500,000 plus. 5. Build water gallery sump upstream of current intake and piping structure to deliver water to current intake. $500,000 plus 6. Other reservoir location. Unavailable or unfeasible.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. The accomplishments of the proposed project that are different from the alternative projects are listed below: 1. The alternatives to modify the infrastructure in the old river bed or thalweg will not offset pumping of the water. 2. The enlarged Matelot Reservoir will provide an immediate and long term solution to water reliability for the Columbia Water System.
Comments: Alternative projects were analyzed however there are several technical and permitting constraints that will drive up the costs well beyond the Matelot Enlargement project. 1. Building a Coffer Dam in order to impound water around the pump intakes. 2. Building a water diversion gallery in the old river channel or thalweg in order to divert water via pipeline to the intake structure.	