

Attachment 8 Water Quality and Other Expected Benefits

Following are the Water Quality and Other Expected Benefits for the projects included in the Proposal.

ATTACHMENT 8
WATER QUALITY AND OTHER EXPECTED BENEFITS
UPPER SANTA MARGARITA WATERSHED PLANNING REGION
IRWM PROP 84 ROUND 1 IMPLEMENTATION PROPOSAL

Introduction

The Upper Santa Margarita Watershed Planning Region IRWM Implementation Proposal includes a suite of five projects that, when implemented both individually and collectively, will provide water supply benefits, water quality benefits, and a variety of other expected benefits. Water supply benefits are included in Attachment 7.

Water Quality and Other Expected Benefits the Proposal is anticipated to provide are listed below, quantified in Table 16, and followed with narratives of the benefits.

Quantified Benefits Using Table 16	
Benefits	Project (number and name)
Water Quality	
Ecosystem Restoration	
Recreation and Public Access	
Power Cost Savings and Production	3. Agricultural Irrigation Efficiency Program 4. WR-34 Hydroelectric Power Generation Project
Other	

Qualitative Benefits	
Benefits	Project
Water Quality	2. Agricultural Irrigation Efficiency Program 4. Water Quality Enhancements in Riverside County-Phase I 5. Implementing Nutrient Management in the Santa Margarita River Watershed
Ecosystem Restoration	1. Vail Lake Stabilization and Conjunctive Use Project 2. Agricultural Irrigation Efficiency Program 3. WR-34 Hydroelectric Power Generation Project 4. Water Quality Enhancements in Riverside County-Phase I 5. Implementing Nutrient Management in the Santa Margarita River Watershed
Recreation and Public Access	1. Vail Lake Stabilization and Conjunctive Use Project 2. Implementing Nutrient Management in the Santa Margarita River Watershed
Power Cost Savings	2. Agricultural Irrigation Efficiency Program 3. WR-34 Hydroelectric Power Generation Plant
Avoided Costs of Regulatory Compliance	5. Implementing Nutrient Management in the Santa Margarita River Watershed
Other	<ul style="list-style-type: none"> • Serving Disadvantaged Communities: All five projects. • Educational Opportunities: 4. Water Quality Enhancements in Riverside County

1. Quantified Estimates of Physical and Economic Water Quality and Other Expected Benefits

Table 16 quantifies benefits in the form of regional and incidental economic value with implementation of the Proposal.

» Total Water Quality and Other Expected Benefits

The Total Net Present Value (NPV) benefit of \$3,686,251 is estimated due to the Agricultural Irrigation Efficiency Program (\$1,978,202) and the WR-34 Hydroelectric Power Generation Project (\$1,708,049). Table 16 estimates are shown in the attached document entitled “Att8_IG1_WQOther Ben_2of2”.

2. Estimates WITH-PROJECT Physical Conditions

» Water Quality

Agricultural Irrigation Efficiency Program: Implementation of the Agricultural Irrigation Efficiency Program (Program) will result in the following water quality benefits:

- Reduction of irrigation runoff through maximization of irrigation water infiltration;
- Reduction in non-point source pollution loads; and
- Improvements in surface and groundwater quality in the Santa Margarita Watershed.

If implemented, the proposed Program will benefit regional water quality through on-farm irrigation system retrofits. These irrigation system retrofits will lead to water quality improvements by minimizing deposition of potential pollutants such as pesticides and fertilizers into regional water supplies through runoff and deep percolation. More specifically, these system retrofits will lead to enhanced levels of irrigation efficiency in terms of properly specified sprinkler precipitation rates, increased distribution uniformity, and enhanced efficiency of timing of irrigation water applications.

In urban settings it is not uncommon to find existing irrigation systems that incorporate sprinklers with high precipitation rates, which exceed the infiltration capabilities of local soil. The same type of situation can be found in agricultural settings when irrigation systems are in disrepair, improperly designed, or when a system is old and has not been updated with the latest low-precipitation rate sprinkler technologies. In either case, what results is runoff and associated deposition of pesticides and/or fertilizer into surface waters. Retrofits completed as a part of the proposed Program will address issues associated with the incompatibility of sprinkler equipment with soil characteristics.

In addition to resolving the problems described above, retrofits will increase the distribution uniformity (i.e. hydraulic efficiency) of the irrigation systems. Increased distribution uniformity, by definition, ensures that water is distributed uniformly throughout an irrigated area. This reduces the need to over-water areas with average pressure and flow characteristics to compensate for adjacent areas that may show lower than average pressure and flow characteristics. Increasing distribution uniformity decreases the potential for water lost to deep percolation, and thereby minimizes the potential for groundwater pollution.

Beyond providing water quality benefits through retrofits of irrigation system *hardware*, the Program is anticipated to improve water quality through implementation of the latest irrigation system *software*. This software comes in the form of irrigation scheduling technologies such as weather based irrigation

controllers, soil-moisture and salinity sensing technologies, weather stations and associated wireless telemetry systems, all of which have been proven to increase irrigation efficiency. In urban settings, pilot testing of weather based irrigation controllers showed that this type of equipment led to a 50% reduction in runoff with resulting reductions in pollution reaching water bodies of the region. The degree of pollution reduction has not been pilot tested for these types of technologies in agricultural settings; however, the fundamental principles of irrigation efficiency supported by these technologies apply to and have benefited both landscape and agricultural irrigation. Therefore, implementation of these technologies in agricultural will result in a benefit to water quality.

Through Program implementation, runoff and non-beneficial uses of applied irrigation water will be avoided by matching precipitation rates to soil characteristics, reducing the need to over-water due to lack of distribution uniformity, and ensuring irrigation events are scheduled efficiently. Moreover, as these non-beneficial uses are mitigated, it is anticipated that less water, and constituent compounds such as nitrogen fertilizer and pesticides, will be deposited into regional ground and surface water supplies including the Temecula and Murrieta Creeks of the Santa Margarita Watershed.

Water Quality Enhancements in Riverside County – Phase I: The primary goal of the plans (hydromodification management plan and retrofit guidance/study) is to promote low impact development BMPs to effectively manage runoff. Since runoff will be reduced to the natural streams, contaminants will also be reduced. In addition, negative hydromodification impacts resulting from new development projects, including increased runoff and concentrated flows, will be mitigated to the pre-developed condition and management of existing hydromodification problems will be identified and highlighted as potential retrofit areas, thus minimizing hydromodification within the watershed.

Implementing Nutrient Management in the Santa Margarita River Watershed: The *Implementing Nutrient Management in the Santa Margarita River Watershed* project will protect beneficial uses. This will be done through the establishment of water quality objectives (WQOs) which will be based on the level of nutrients in the Santa Margarita River and will determine what additional nutrients the watershed can sustainably assimilate. The project will include data collection that will support modeling in the estuary and watershed in order to develop and implement nutrient reduction and water conservation best management practices (BMPs) that will be required to achieve the TMDL for nutrients that will be issued by the San Diego RWQCB. Implementation of the proposed project is anticipated to impart economic water quality benefits, because it will take place in a manner that improves water quality in the Santa Margarita River watershed and that is protective of the beneficial uses provided by these water bodies. Additionally, the project will improve impaired water bodies and sensitive habitat, and potentially increase in-stream flows. The water quality benefits that protect beneficial uses were not quantified and/or monetized.

» **Ecosystem Restoration**

Vail Lake Stabilization and Conjunctive Use Project: Specifically, the Vail Lake Stabilization and Conjunctive Use Project provides restorative benefits to the ecosystem through increased water supply in the lake, beneficial groundwater impacts, and sustainable vegetation that provides a sustainable habitat for the local wildlife population.

Agricultural Irrigation Efficiency Program: The Program shows that pilot testing of irrigation scheduling technologies such as weather-based irrigation controllers, soil-moisture and salinity sensing technologies, weather stations and associated wireless telemetry systems, all of which have been proven to increase irrigation efficiency. Pilot testing in urban settings, *The Residential Runoff Reduction Study*, of weather based irrigation controllers showed that runoff was reduced by 50% in the study area without an increase in non-point source pollutant concentrations, thereby translating to an estimated 50% reduction in pollutants. Similar runoff reductions anticipated will result from the implementation of the Program. Since the Program will be implemented throughout the USM Watershed Planning region, runoff reductions will occur region wide resulting in improved ecosystem health in local creeks and waters.

WR-34 Hydroelectric Power Generation Project: The WR-34 Hydroelectric Power Generation Project provides the ability to maintain a flow of water into the Santa Margarita River ensuring sustained ecological benefits throughout the river corridor, including a sustainable habitat for the local wildlife population. The energy revenue provides stability in water rates and reliability in water supply, thereby maintaining the flow of water required in the River.

Water Quality Enhancements in Riverside County –Phase I: Hydromodification management and retrofitted sites will reduce runoff and contaminants to downstream natural channels therefore adding another level of protection and preservation of existing habitat. Because infiltration will be used extensively to manage hydromodification, groundwater recharge sites will be utilized.

Implementing Nutrient Management in the Santa Margarita River Watershed: The establishment of WQOs could potentially find that a broader range of water sources, such as recycled water, could be naturally sustained by the Santa Margarita River watershed. If this project finds that recycled water can be delivered to the Santa Margarita River, then other water purveyors in addition to RCWD may choose to augment river flows in this manner. Currently, some water purveyors within the project area divert their recycled water flows to the Santa Ana River watershed, because they are not permitted to deliver recycled water to Santa Margarita River watershed. If this was to change, it would substantially increase in-stream flows within the Santa Margarita River watershed. These ecosystem benefits were not quantified and/or monetized.

Additionally, Increases in in-stream flows to the Santa Margarita River watershed, as described previously, could potentially be a result of the *Implementing Nutrient Management in the Santa Margarita River Watershed* project. Increased river flows within the project area would enhance the habitat for fish and wildlife within the region, including the southern steelhead trout, which is a listed species pursuant to the Endangered Species Act. These ecosystem benefits were not quantified and/or monetized.

» **Recreation and Public Access (not quantified)**

Vail Lake Stabilization and Conjunctive Use Project: Vail Lake beneficial uses will be improved as a result of the entire Proposal, particularly to Vail Lake and the region's creeks for their continued recreational use. Riverside County residents of all socio-economic backgrounds find continual enjoyment in recreational activities in and around Vail Lake and the creeks in their healthy and natural state. Each of these areas provide a diverse range of recreational opportunities including such things as walking, hiking, bird watching, fishing, mountain biking, horseback riding, camping, boating, and swimming.

Vail Lake reservoir is located in western Riverside County on the Temecula Creek and Santa Margarita River watershed approximately 10 miles from Old Town Temecula. The convenient location is a popular recreational destination to more than 425 boats monthly on an annual average. The lake is operational year-round, with the heaviest use in the summer months with more than 700 boats monthly. This equates to more than 1,700 users monthly on an annual average and nearly 3,000 monthly users in the summer months. The lake was created in 1948 by the owners of Vail Ranch and owned and operated by the RCWD since 1978. The 11,000+ acre property surrounding Vail Lake is privately owned, providing recreational opportunities with over 9,000 acres of ancient, shady oaks in a natural California chaparral setting. The Vail Lake Transmission Main and Pump Station will provide the much needed water for storage in Vail Lake, which will increase the water levels in the lake, improving the use of the boat docks, and therefore, enhancing recreational beneficial use. Additionally, controlling the Quagga Mussel population and improving the natural vegetation will ensure continued use and operation of the lake, limiting closure days and further enhancing the recreational beneficial uses of the lake.

Implementing Nutrient Management in the Santa Margarita River Watershed: The *Implementing Nutrient Management in the Santa Margarita River Watershed* project will involve the establishment of water quality objectives (WQOs), which will be based on the level of nutrients in the Santa Margarita River and will determine what additional nutrients the watershed can sustainably assimilate. The project will include data collection that will support modeling in the estuary and watershed in order to develop and implement nutrient reduction and water conservation best management practices (BMPs) that will be required to achieve the TMDL for nutrients that will be issued by the San Diego RWQCB. Implementation of the proposed project is anticipated to impart economic water quality benefits, because it will take place in a manner that improves water quality in the Santa Margarita River watershed and that is protective of the beneficial uses provided by these water bodies, including recreation. The water quality benefits that protect beneficial uses were not quantified and/or monetized.

» **Power Costs Savings**

The Proposal will result in both energy savings from reduced water pumping, either from imported water turnouts or groundwater wells and a reliable municipal electric generation facility that will produce a new energy source from existing water infrastructure, clean electrical energy for the community, renewable electric energy without adding atmospheric carbon load, and a reliable energy source powered by a predictable water flow.

Agricultural Irrigation Efficiency Program: The Program will result in energy savings as shown in Table 16. Energy savings will result in approximately 1,500 kilowatt hours (kWh) per acre foot of water pumped. At an average rate per kWh of \$0.09, more than \$95,000 per year in savings in the first three years will be realized, and more than \$285,000 per year in savings for the next 11 years will be realized. To determine the estimate of energy savings benefits, energy requirements in kWh for pumping an acre foot of water were applied to estimated acre feet of water supply benefits. RCWD currently uses an average rate per kWh of \$0.09 for all power projections. Energy savings are calculated at 1,500 kWh per acre foot of water pumped. The Program will realize approximately 705 AFY in the first three years, 2,115 AFY in the next 11 years, and 705AFY for the final two years for a total of nearly 27,000 AF of avoided water

purchases over the life of the project as shown in Attachment 7, Water Supply Benefits, also resulting in energy savings.

WR-34 Hydroelectric Power Generation Project: The WR-34 Hydroelectric Power Generation Project will result in produced electrical power that will be sold to Southern California Edison (SCE). The hydroelectric turbine-generator will be directly connected to the SCE electrical grid. This type of connection is authorized under State law and SCE has an existing annual payment program for the power. The Project will generate average annual energy revenues of \$166,000. This revenue produces financial, legal, and environmental benefits, resulting in stable water rates, sustainable water rates for agricultural users, reliability in meeting the water supply requirements in the Santa Margarita River, environmental benefits of sustainable water supply to the river, and ability to meet Statewide objectives of alternative power facilities, National objectives to reduce atmospheric carbon dioxide, and National objectives of the Hydropower Improvement Act of 2010.

» **Avoided Costs of Regulatory Compliance**

Water Quality Enhancements in Riverside County: The cost of not implementing this project include costs of fines from the San Diego Regional Water Quality Control Board, costs of TMDLs and other regional treatment projects, costs to restore habitat otherwise preserved by reducing the negative impacts on hydromodification, costs to import water that would otherwise infiltrate into the groundwater through infiltration BMPs, and costs to import waters that would otherwise have been reused through the use of cisterns and rainbarrels.

To estimate the cost of achieving WQOs in the San Diego region, the Water Quality Working Group (WQWG) was organized by the County of San Diego under the Quality of Life Initiative 1. The WQWG developed a cost estimation for a pilot watershed, the San Diego River watershed. Assuming that only urban and agricultural land uses contribute to pollution in storm water and urban runoff, each local watershed was classified by similar land uses, water quality issues, and BMP needs. A normalized cost value was determined for each watershed class (i.e., millions of dollars per developed square mile).

In the San Luis Rey Class, the normalized cost for the pilot watershed can be extrapolated to the Santa Margarita River watershed based on the developed area (i.e., multiplying \$16.3 million by 31.3 miles² equals \$508 million). The total 40-year cost of water quality programs for the Santa Margarita River watershed would be \$477.5 million (\$2009) to achieve compliance with the current WQOs. However, this value was not used in the economic analysis because it would override all other proposal benefits due to its sheer size.

Implementing Nutrient Management in the Santa Margarita River Watershed: The *Implementing Nutrient Management in the Santa Margarita River Watershed* project will involve the establishment of WQOs, which will be based on the level of nutrients in the Santa Margarita River and will determine what additional nutrients the watershed can sustainably assimilate. The establishment of new WQOs based on sound science will allow a broader array of water management strategies to be employed within the watershed. For example, the WQOs may be updated to reflect current watershed conditions and therefore allow delivery of recycled water to the Santa Margarita River to augment streamflow.

¹ County of San Diego. 2010. Quality of Life Funding Strategy, San Diego Region. Needs Assessment and Cost Estimate for the Water Quality Enhancement Element. Draft.

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» **Other**

○ **Serving Disadvantaged Communities (Not Quantified)**

These projects will benefit DACs in the following ways:

- **Vail Lake Stabilization and Conjunctive Use Project:** The project will provide primarily water supply benefits to the DACs within the RCWD service area. This project will take advantage of additional imported water during wet years for storage and use during dry years. While the source of water for Vail Lake has been natural runoff, construction of a pipeline from an imported water turnout to the lake would allow for seasonal storage and conjunctive use storage. Water could be temporarily be stored in Vail Lake for future delivery to agricultural users or piped to the Pauba Groundwater Basin for recharge.

Project construction also includes Quagga Mussel Control Facilities since MWD raw water supply contains quagga mussels and Vail Lake is currently free of quagga mussels. The Project also includes native vegetation restoration.

- **Agricultural Irrigation Efficiency Program:** Also producing water supply benefits to DACs within the RCWD service area, this project will aid in sustaining regional agriculture by reducing agricultural water requirements for 2,000 acres of irrigated agriculture land by 2,115 acre-feet per year (AFY) through implementation of on-farm water use efficiency strategies.

This project involves developing accurate water budgets for 1,724 agricultural operations and comparing them to historical water consumption to identify 200 agricultural operations or 2,000 irrigated acres that show the greatest need for water use efficiency improvements. The project will also audit the sites and identify ways to increase water use efficiency as well as providing financial incentives (50% of equipment cost). The sites will be re-evaluated and water supply benefits will be quantified.

- **WR-34 Hydroelectric Power Generation Project:** The benefits of this project extend throughout the entire RCWD service area, which includes DACs. The project construction area is shown in Figure 1.

Water supply in the Santa Margarita Watershed is governed by a settlement agreement, “Cooperative Water Resource Management Agreement between Camp Pendleton and Rancho California Water District”, defining Rancho

California Water District's (RCWD) Gorge flow requirements to the Santa Margarita River system to be 2,500 acre-feet per year. Maintaining base flows and other physical, hydrological, and biological processes and conditions is critical to maintaining the high resource values of the system. In addition to critical water supply needs, endangered and sensitive species as well as critical habitat areas rely on these Santa Margarita River base flows in order to sustain ecosystem function and values. The Santa Margarita River Outfall Project (WR-34 Turnout) was constructed by RCWD to provide imported water in order to help maintain required base flows to the Santa Margarita River. RCWD has invested \$1.4 million to date to construct this turnout project, along with annual imported water purchases from the Metropolitan Water District of Southern California. Construction of the subject WR-34 Hydroelectric Power Generation Project will strengthen RCWD's ability to continue to replenish the Santa Margarita River base flows required by the settlement agreement with the Federal government by enhancing management of existing water management facilities and using available hydraulic flows to provide green energy in order to reduce costs associated with replenishment of Santa Margarita base flows. Since RCWD must use imported water to help meet this settlement agreement, more energy is being consumed to bring down this water from northern California, hundreds of miles. The subject hydropower project is a direct offset of energy for a water supply project. This will provide ecologically sound secondary benefits to water and power customers in the RCWD service area, including DACs.

- Water Quality Enhancement in Riverside County: This project will benefit the DACs within Riverside County. The project aims to reduce impacts from hydromodification, promote low impact development (LID), support riparian and aquatic habitat restoration, and reduce the discharges of storm water pollutants and improve water quality.

The project involves identification of retrofit opportunities in the Santa Margarita Watershed, which includes researching, inventorying and prioritizing areas of existing development (i.e. municipal, industrial, commercial, residential) as candidates for targeted retrofit projects that would reduce the impacts of existing development on the watershed.

Specific outreach will occur through the education of homeowner associations (HOAs), which will serve to identify the need and benefits to retrofit existing common landscaped areas.

The project also involves hydromodification management, which will guide and support the planning, design and construction of priority new and significant predevelopment projects (PDPs) within the Upper Santa Margarita Watershed to manage increases in runoff discharge rates and durations.

- Implementing Nutrient Management in the Santa Margarita River Watershed: To address nutrients in the watershed, the project will serve to identify water quality objectives (WQOs). This project will identify WQOs throughout the entire Santa Margarita River watershed, which includes areas of DACs.

The approach for developing nutrient WQOs for the Santa Margarita River (SMR) estuary leverages two major activities: 1) data collection to support modeling in the estuary and watershed to develop TMDLs and 2) ongoing research to develop the estuarine Nutrient Numeric Endpoints (NNE)

framework, based on dissolved oxygen and macroalgae as endpoints. A stakeholder advisory group (which will be identified as part of the project) will guide project activities, review technical work products, and achieve consensus.

The project involves conducting monitoring and special studies to address data gaps. Pending the analysis of data gaps, potential studies will include core field data collection and special studies.

The goal of core field data collection will be to measure ambient nutrient concentrations and conduct algal bioassessment studies.

The special studies will include a characterization of the “natural background” conditions of nutrient concentrations and algal growth which will help characterize the variability in numeric targets.

○ **Educational Opportunities (not quantified)**

The USM Watershed IRWM Proposal provides for educational opportunities most directly through the Water Quality Enhancements in Riverside County project while the other proposed projects may have incidental educational components. This project includes education and outreach through two components:

- Preparation of presentations, development of handout materials, and developing a post presentation survey; and
- Conducting 40 workshops, printing distribution handout materials, and conducting post-presentation survey.

The goal of the education component of the project is to educate homeowners on the need and benefits associated with retrofitting existing common landscaped areas to include features that reduce the use of potable water and promote infiltrations. While it is difficult to quantify the benefits of education, it has been proven that education in many forms and communication methods reaches the variety of communities we serve and results in action at some level, either immediately or in the future. The survey will be developed in an attempt to characterize the behavioral and retrofit changes that were implemented at the site following the presentation.

3. Estimates WITHOUT-PROJECT Physical Conditions

» **Water Quality**

Agricultural Irrigation Efficiency Program: Without implementation of the Agricultural Irrigation Efficiency Program, the region would not benefit from any of the resulting water supply benefits: avoided water supply purchases of nearly 27,000 AF, avoided water supply projects, and avoided water shortage costs. From a water quality perspective, the following would not occur:

- Surface and groundwater quality would not improve and may deteriorate, resulting in the scheduling of additional TMDL implementation;
- Water quality improvements in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (Bay-Delta) would not occur since imported water demands would not be reduced;
- The USM Watershed region would be unable to assist local farmers in meeting the requirements of the San Diego Regional Water Quality Control Board’s

(SDRWQCB) Revised Agricultural Discharge Waiver, which requires farmers to implement BMP's for mitigating runoff; and

- The USM Watershed region would be unable to work toward meeting the policy of the SDRWQCB, which states “in stream beneficial uses shall be maintained, and when practical, enhanced.”

Water Quality Enhancements in Riverside County –Phase I: Without implementation of the project, the current rate of redevelopment in the project area will not address water quality problems resulting from existing development in a timely manner, therefore, there is a need to identify retrofit projects for existing developments causing or contributing to pollution to the receiving waters. BMPs are not as effective in preventing negative hydromodification impacts to receiving waters including downstream erosion, impaired stream habitat in natural drainages and impaired beneficial uses. Without this project, critical water quality problems will not be identified, programs to efficiently manage runoff will not be developed and implemented, and the hydrologic character of the area would continue to increasingly deviate from a natural hydrologic cycle.

Implementing Nutrient Management in the Santa Margarita River Watershed: If this project were not implemented, the Rancho California Water District (RCWD) would continue to deliver an average of 4,000 acre feet per year (AFY) of imported water from the Metropolitan Water District of Southern California (MWD) to the Santa Margarita River watershed in order to augment flows in accordance with an agreement between RCWD and the Santa Margarita Watermaster.

If this project were not implemented, the Santa Margarita River estuary would continue to be impaired by eutrophication and portions of the Santa Margarita River and its tributaries would remain on the 303(d) list of impaired water bodies due to elevated levels of nutrients within the watershed. In addition, without this project, there would continue to be a lack of data in the Nutrient Numeric Endpoint (NNE) framework, which prevents the San Diego RWQCB from establishing total maximum daily loads (TMDLs) for the Santa Margarita River and the watershed.

» **Ecosystem Restoration**

The ecological health of the watershed plays a direct role in the quality and quantity of its water. Conservation and enhancement of habitat and biodiversity, and protection and restoration of the natural functioning of water system are integral to maintaining the environmental processes that support healthy ecosystems and enable beneficial human uses of the watershed.

Although largely undisturbed, aquatic resources in the Watershed are threatened by habitat loss, impaired water quality, and invasive species. Impaired water bodies within the watershed, as listed by the SWRCB in accordance with section 303(d) of the Clean Water Act, include Murrieta Creek, Temecula Creek, and the Santa Margarita River. Areas of degraded habitat along the reaches of the Santa Margarita River have enabled establishment of several invasive species, including tamarisk and giant reed (*Arundo*), which have an adverse affect on the hydrology, habitat diversity and ecological function of the River.

Without the proposed projects, the continued degradation of the Watershed would go on unmitigated.

» **Recreation and Public Access (not quantified)**

Local creeks provide a range of unique environmental resources and recreation experiences in an increasingly developed region. Without the projects, degraded water quality and channel instability may cause the periodic closure of creeks to public use due to public health and safety risks associated with water quality and threatened/damaged roads, paths and trails. Major tributaries via Vail Lake include Temecula Creek, Pechanga Creek, and Wilson Creek.

Beneficial uses of Vail Lake would continue to degrade due to drought, potentially limiting the number of use days when water may be higher in the winter months, although not typically the time of year when the majority of boaters will use the lake. In addition, less water results in degraded environmental benefits leading to the enjoyment of more passive activities such as walking, hiking, and bird watching.

Further, it is anticipated without the Quagga Mussel Control Facilities, an element of the Vail Lake Stabilization and Conjunctive Use Project, introduction of the raw water from MWD into Vail Lake would cause an infestation of Quagga Mussels. This would result in a quantitative economic impact to Vail Lake, including lost recreational use, high cost of operation and maintenance activities – approximately \$200,000 annually, as discussed in Attachment 7, Economic Analysis, Avoided O&M Costs.

» **Power Costs and Production**

Without the proposed Projects, energy savings from reduced water pumping, either from imported water turnouts or groundwater wells, would not be realized. Pumping would continue at the current rate and power costs are anticipated to escalate. Table 16 shows the energy savings of approximately 1,500 kWh per acre foot of water pumped, totaling more than \$95,000 per year in savings in the first three years will be realized, and more than \$285,000 per year in savings for the next 11 years. This energy savings is important to maintain a reasonable cost of water, to develop sustainable water rates, and to enhance a reliable water supply.

Further, without the WR-34 Hydroelectric Power Generation facility, a reliable new, clean energy source from existing water infrastructure, that produces renewable electric energy without adding atmospheric carbon local, would not be realized. The loss of the revenue generated from the sale of this electrical power - approximately \$166,000 annually – combined with the energy savings in the other Proposal projects could lead to instability in water rates, particularly impacting agricultural water users, which results in economic deterioration in the region, no assistance to meet objectives to reduce atmospheric carbon dioxide or hydropower improvements, and the potential for unreliability of water to meet the requirements of the agreement with the United States in the Santa Margarita River.

» **Other**

○ **Serving Disadvantaged Communities (Not Quantified)**

Without implementation of this project, Disadvantaged Communities (DACs) within the watershed would continue to receive no relief from their water quantity and quality shortages. Education teaching the conservation and minimization of potable water reuse, as well as techniques to increase recharge is of especially important in the Anza-Aguanga communities. These areas are upstream of the Santa Margarita River and have no access to imported water.

Additionally, any proposed development would not benefit from water quality problems resulting in existing development. Without these projects, critical water

quality problems will not be identified, programs to efficiently manage runoff will not be developed and implemented, and the hydrologic character of the area would continue to increasingly deviate from a natural hydrologic cycle.

Finally, this area is currently involved in active adjudication/allocation efforts. The inclusion of hydromodification management techniques developed by the proposed projects would not benefit this process.

- **Educational Opportunities**

As stated previously, it has been proven that education in many forms and communication methods reaches the variety of communities we serve and results in action at some level, either immediately or in the future. Without the Proposal projects there is little opportunity to educate targeting populations, including instructional classes for homeowner associations, the public, and media materials in a variety of forms, about the projects and programs greatly needed to enhance local water quality.

It can also be concluded that without a change in educational opportunities, both individual and collective behaviors will not change. This will result in continued degradation of water quantity and quality, ecosystem function, and general water resource sustainability.

4. Distribution of Project Benefits and Identification of Beneficiaries of the Proposed Projects

The beneficiaries of the proposal include the entire funding region. The benefits of the Vail Lake Stabilization and Conjunctive Use Project, Agricultural Irrigation Efficiency Program and the WR-34 Hydroelectric Power Generation Project will directly benefit the entire RCWD service area. The direct beneficiaries of the Water Quality Enhancements in Riverside County – Phase I and the Implementing Nutrient Management in the Santa Margarita River Watershed projects will directly benefit all residents of Riverside County.

The suite of projects proposed will benefit stakeholders at the local, regional, and statewide levels. Local and regional residents would benefit from less agency spending on regulatory compliance when not founded on scientific analysis, from improvements in the quantity and quality of available groundwater resources, and from reductions in water delivery costs. Local water users, regional residents, and statewide residents will also benefit due to general ecosystem improvements, which benefit society as a whole.

5. Timing of Benefits Received

The Water Quality and Other Expected Benefits of the Proposal will begin early during implementation in 2011, vary depending on the individual project, although coincide with the timing of water supply benefits. All Water Quality and Other Expected Benefits will be realized by 2012 and extend the full life of each project and the Proposal to 2060 and beyond.

The Vail Lake Stabilization and Conjunctive Use Project is already beginning to see benefits since the project was substantially complete in November 2010. The Agricultural Irrigation Efficiency Program will coincide with the timing water supply benefits and begin during implementation in early 2012, and extend the full 15-year project life to 2027. Water quality benefits will reach their full potential in late 2014 and last through the full life of the Program. The WR-34 Hydroelectric Power Generation Project will realize benefits beginning in mid-2013 upon completion of construction coinciding with the revenues received from the sale of the new power to SCE.

The Water Quality Enhancements in Riverside County – Phase I and Implementing Nutrient Management in the Santa Margarita River Watershed project would provide water quality and other expected benefits, but because these benefits are qualitative, they would not be accrued during a specific timeframe.

6. Uncertainty Associated with Benefits

There is no uncertainty of the Water Quality and Other Expected Benefits aside from the Implementing Nutrient Management in the Santa Margarita River Watershed project. Each of the other proposed projects within this Proposal has been studied, examined, estimated and proven to provide each of the benefits stated.

Uncertainties related to the Implementing Nutrient Management in the Santa Margarita River Watershed project are summarized in Table 2. Uncertainties exist regarding the potential water quality benefits of protecting beneficial uses and improving impaired water bodies and sensitive habitat, and uncertainties exist relating to the potential other benefits of increasing in-stream flows and creating fish and wildlife enhancements. All of the uncertainties regarding the potential water quality and other benefits of this Project are either negligible or unknown. These uncertainties are all based on the fact that benefits were estimated under the premise that Phase II of the Project gets completed and results in the establishment of TDMLs, and that the TDMLs allow water purveyors to deliver recycled water to the Santa Margarita River.

Omissions, Biases, and Uncertainties and their Effect on the Project

Benefit or cost category	Likely impact on net benefits	Comment
Avoided Costs of Regulatory Compliance	++	Benefits based on the Quality of Life Initiative’s Needs Assessment resulted in extremely high cost (\$477.5 million (\$2009)) to achieve compliance with the current WQOs.
Water Quality: Protection of Beneficial Uses	+/-	Benefits were estimated with the assumption that Phase II gets completed and results in the establishment of TDMLs, and that the TDMLs allow water purveyors to deliver recycled water to the Santa Margarita River.
Water Quality: Improve Impaired Water Bodies and Sensitive Habitats	+/-	Benefits were estimated with the assumption that Phase II gets completed and results in the establishment of TDMLs, and that the TDMLs allow water purveyors to deliver recycled water to the Santa Margarita River.
Increase In-Stream Flow	+/-	Benefits were estimated with the assumption that Phase II gets completed and results in the establishment of TDMLs, and that the TDMLs allow water purveyors to deliver recycled water to the Santa Margarita River.
Fish and Wildlife Enhancements	+/-	Benefits were estimated with the assumption that Phase II gets completed and results in the establishment of TDMLs, and that the TDMLs allow water purveyors to deliver recycled water to the Santa Margarita River.

* Magnitude of effect on net benefits

+/- (negligible or unknown); + (moderate positive); ++ (significant positive); - (moderate negative); -- (significant negative)

7. Adverse Effects

There are no known adverse effects from implementation of the Proposal and resulting Water Quality and Other Expected Benefits. Any potential short-term impacts associated with project construction will be mitigated through the appropriate compliance process.

**Table 16 - Water Quality and Other Expected Benefits
Project: Agricultural Irrigation Efficiency Program**

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit	Without Project	With Project	Change Resulting from Project	Unit \$ Value	Annual value	Discount Factor	Discounted Benefits
2009	Energy Savings	kWh	0	0	0	\$ 0.09	\$ -	1.000	\$ -
2010	Energy Savings	kWh	0	0	0	\$ 0.09	\$ -	0.943	\$ -
2011	Energy Savings	kWh	0	0	0	\$ 0.09	\$ -	0.890	\$ -
2012	Energy Savings	kWh	0	1057800	1057800	\$ 0.09	\$ 95,202.00	0.840	\$ 79,969.68
2013	Energy Savings	kWh	0	1057800	1057800	\$ 0.09	\$ 95,202.00	0.792	\$ 75,399.98
2014	Energy Savings	kWh	0	1057800	1057800	\$ 0.09	\$ 95,202.00	0.747	\$ 71,115.89
2015	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.705	\$ 201,352.23
2016	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.665	\$ 189,927.99
2017	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.627	\$ 179,074.96
2018	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.592	\$ 169,078.75
2019	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.558	\$ 159,368.15
2020	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.527	\$ 150,514.36
2021	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.497	\$ 141,946.18
2022	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.469	\$ 133,949.21
2023	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.442	\$ 126,237.85
2024	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.417	\$ 119,097.70
2025	Energy Savings	kWh	0	3173400	3173400	\$ 0.09	\$ 285,606.00	0.394	\$ 112,528.76
2026	Energy Savings	kWh	0	1057800	1057800	\$ 0.09	\$ 95,202.00	0.371	\$ 35,319.94
2027	Energy Savings	kWh	0	1057800	1057800	\$ 0.09	\$ 95,202.00	0.350	\$ 33,320.70
Total Present Value of Discounted Benefits Based on Unit Value									\$ 1,978,202.36
Comments: Energy savings bear a direct relationship to water savings benefits and result from avoided pumping costs. Energy savings were calculated at 1500 kWh per avoided acre foot of water pumped.									

**Table 16 - Water Quality and Other Expected Benefits
Project: WR-34 Hydroelectric Power Generation Project**

(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)
Year	Type of Benefit	Measure of Benefit	Without Project	With Project	Change Resulting from Project	Unit \$ Value	Annual value	Discount Factor	Discounted Benefits
2009	Energy Production	MWh	0	0	0		\$ -	1.000	\$ -
2010	Energy Production	MWh	0	0	0		\$ -	0.943	\$ -
2011	Energy Production	MWh	0	0	0		\$ -	0.890	\$ -
2012	Energy Production	MWh	0	0	0		\$ -	0.840	\$ -
2013	Energy Production	MWh	0	640.5	640.5	\$ 125.68	\$ 80,500.00	0.792	\$ 63,756.00
2014	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.747	\$ 120,267.00
2015	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.705	\$ 113,505.00
2016	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.665	\$ 107,065.00
2017	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.627	\$ 100,947.00
2018	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.592	\$ 95,312.00
2019	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.558	\$ 89,838.00
2020	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.527	\$ 84,847.00
2021	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.497	\$ 80,017.00
2022	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.469	\$ 75,509.00
2023	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.442	\$ 71,162.00
2024	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.417	\$ 67,137.00
2025	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.394	\$ 63,434.00
2026	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.371	\$ 59,731.00
2027	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.350	\$ 56,350.00
2028	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.331	\$ 53,291.00
2029	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.312	\$ 50,232.00
2030	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.294	\$ 47,334.00
2031	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.278	\$ 44,758.00
2032	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.262	\$ 42,182.00
2033	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.247	\$ 39,767.00
2034	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.233	\$ 37,513.00
2035	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.220	\$ 35,420.00
2036	Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.207	\$ 33,327.00
2037	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.196	\$ 31,556.00
2038	Energy Production	MWh	0	1281	1281	\$ 125.68	\$ 161,000.00	0.185	\$ 29,785.00
2039	Energy Production	MWh	0	640.5	640.5	\$ 125.68	\$ 80,500.00	0.174	\$ 14,007.00
Total Present Value of Discounted Benefits Based on Unit Value									\$ 1,708,049.00

Comments: For purposes of this analysis, the applicable energy rates were based on the Time of Use (TOU) Periods and assuming a contract period with SCE of 25 years at the 2012 Market-Price-Referent (MPR) of 0.10507 \$/kWh. Additionally, an availability factor of 0.98 was used to account for scheduled and forced outages. Total value per MWh [1 MWh = 1,000