Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)

Introduction

This attachment presents the technical justification for the Santa Clarita Valley (SCV) Water Use Efficiency (WUE) Strategic Plan (SP) Programs Project (CLWA-3). A project abstract and general discussion of the without-project baseline are followed by a discussion of each physically quantified benefit, and a summary of physically quantified benefits claimed.

Project Abstract

The SCV WUE SP identifies several programs to achieve WUE goals for the Region. The proposed CLWA-3 Project focuses on the following five water conservation programs, four of which are currently being implemented and have been partially funded through a Round 1 Implementation Grant from DWR:

- Santa Clarita Valley Large Landscape Audit and Incentive Program

  This program offers $25 rebates to large dedicated irrigation sites for weather-based irrigation controllers (WBICs) at active sites, as well as $300 per acre-foot saved rebates for water-saving landscape modifications.

- Santa Clarita Valley Commercial, Industrial, and Institutional (CII) Audit and Customized Incentive Program

  This program offers WBIC and landscape modification rebates identical to those in the Large Landscape Audit and Incentive Program to CII customers within the SCV.

- Santa Clarita Valley Landscape Contractor Certification and Weather-based Irrigation Controller Program

  This program offers training workshops in classrooms, online, and in the field to both residents and landscape contractors in the valley. Recipients of the program learn about WUE, installing WBICs, hydrozoning, and high distribution uniformity. Recipients are also eligible for free WBICs, as well as free inspections after self-installation. This program has been modified from previous versions to include cheaper, more accessible online educational classes, and it focuses primarily on residential customers.

- High-Efficiency Clothes Washer (HECW) Machine Program

  This program offers $100 rebates to single- and multi-family residences for HECWs, with an additional $100 rebate per household available through retailers.

- Cash-for-Grass (C4G) Rebate Program

  This is a new program that uses Long Beach Water Department's "Lawn to Garden" program as a model. It creates an online application and online class during which residents are able to apply for turf-replacement funds and train in water-saving landscaping practices.

Each of these programs is currently being implemented, except for the C4G Rebate Program. Grant funding would cover a portion of implementation cost of all individual programs from October 1, 2013 to September 30, 2015.

Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)

Without-Project Baseline Conditions

The SCV is the fastest growing area in Northwest Los Angeles County because of an influx of both residential and commercial customers. Since 1980, water wholesalers have relied on additional imported water from the State Water Project (SWP) and other sources to supplement local groundwater supplies and recycled water (Kennedy/Jenks Consultants et al., 2011).

The Castaic Lake Water Agency (CLWA), the region's imported water wholesale, provides over half of the total potable water supply for Santa Clarita, in part by importing SWP water from the Sacramento-San Joaquin Delta (the Delta) and other sources. CLWA provides water to four retail suppliers in the SCV: Los Angeles County Waterworks #36, Newhall County Water District, Santa Clarita Water Division, and the Valencia Water Company. CLWA imports SWP water from the Delta to Castaic Lake through SWP facilities.

CLWA has a contractual SWP Table A amount of 95,200 acre-feet per year (AFY). However, the marginal source of SWP water for CLWA is the water purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. CLWA typically receives part of Buena Vista's Kern River entitlements through exchange of BV/RRB's SWP supplies (Kennedy/Jenks Consultants et al., 2011).

Without the water conservation programs, CLWA will continue to import roughly 3,960 acre-feet (AF) of water over 14 years (total water savings achieved over the expected benefits lifetime of this project) to meet the water demands to be eliminated by this project. Without this project, the four retail water providers would continue to supply imported water to meet irrigation demands at approximately 1,700 residential landscaping sites proposed for irrigation efficiency hardware improvements and 300,000 ft^2 of residential turf slated for landscape modification. Eighty large landscaping sites and 20 CII sites projected for irrigation hardware and turf modification would also continue to use imported water from the retailers. In addition, retailers would continue to provide imported water to approximately 5,000 homes for use in non-HECWs.

Without this project, irrigation in excess of actual water requirements will continue. Runoff from inefficient urban irrigation systems increases the flow of pollutants such as pesticides, fertilizers, and bacteria through storm drains that eventually drain into the Santa Clara River. Additionally, water imports to meet current demand introduce additional chlorides into the watershed with import of SWP water.

Relationship of Project to Other Projects Included in the Proposal

There are two water conservation projects included in the Upper Santa Clara River grant proposal: this project (CLWA-3), based on the SCV WUE SP, is being implemented by CLWA, while another project (SCWD-2), based on the Santa Clarita Water Division's WUE SP, is being implemented by the Santa Clarita Water Division. The CLWA-3 and SCWD-2 are independent of each other in that neither program depends on the other to achieve water conservation benefits. However, the programs outlined in the CLWA-3 project are closely aligned with those identified in SCWD-2. Many of the programs share the same basic plan and are designed to achieve regional water goals.

Description of Expected Physical Benefits

- Water Supply

  Annual water savings of 380 AFY are expected as a result of the project, once peak annual benefits are achieved. This means that total water savings of 3,960 AF due to increased efficiency enables an equivalent reduction in imported water over the 14-year span during which this project achieves water savings benefits.

Annual sanitation treatment reductions of 82 AF are expected from indoor water use savings with the HECW rebate program. In total, the project will avoid wastewater treatment costs associated with approximately 990 AF wastewater influent to the Valencia and Saugus Water Reclamation Plants (WRPs).

- Water Quality

  Annual avoided chloride imports of 37 metric tons (MT) per year are expected as a result of the imported water savings from the project once the water conservation actions are fully implemented. The CLWA-3 project will prevent the introduction of a total of 384 MT of chlorides imported from outside the Region over the 14-year lifespan during which this project produces water quality benefits.

- Greenhouse Gas Reduction

  Annual carbon emission reductions of 179 MT and 31 MT are expected during peak benefit years from avoided SWP imports and HECW energy savings, respectively. These savings will prevent the release of 1,872 MT of carbon dioxide (CO_2) emissions from SWP water transportation and 377 MT of CO_2 emissions from outdated clothes washers over the lifespan of the program's benefits.

Each benefit is discussed in further detail below.

Benefit: Water Conservation Totaling 380 AFY

Water conservation incentivized through the CLWA-3 programs will save approximately 3,960 AF of water over the benefits lifetime of the project. This will allow CLWA to avoid importing an equivalent amount SWP water from the Delta. Because water efficiency benefits are realized as soon as controllers are installed, landscape is modified, and clothes washers are replaced, project benefits will accrue to beneficiaries beginning with project implementation (October 1, 2013 to September 30, 2015).

The Large Landscape and CII Incentive Programs both have expected benefits lifetimes of 10 years based on the lives of irrigation controllers (A&N Technical Services, 2008). The Landscape and Residential WBIC Program's benefits lifetime is similarly constrained by the 10-year lifespan of hardware (MWDOC, 2011). The C4G Program has an estimated water savings lifespan of 10 years based on the lives of the drought-resistant plants replacing turf (A&N Technical Services, 2008). Because benefits are phased in during the beginning of project implementation and benefits phase out at the end of the program lifetime, some benefits will accrue over a 12-year span for all of the above programs. Similarly, since HECWs have an estimated life of 12 years, benefits of this overall project will extend over 14 years, into 2026 (A&N Technical Services, 2008).

Project implementation costs are expected to be distributed evenly over the two-year project implementation period. Since project implementation will begin in the last quarter of 2013, some benefits will start to be realized that year. The following calendar year will include a full year of project implementation, resulting in additional benefits phasing in. The final calendar year of implementation, 2015, will see water conservation benefits reach the full annual amount as all programs are fully phased in.

The Large Landscape and CII Incentive Programs both have expected benefits lifetimes of 10 years based on the lives of irrigation controllers (A&N Technical Services, 2008). The Landscape and Residential WBIC Program's benefits lifetime is similarly constrained by the 10-year lifespan of hardware (MWDOC, 2011). The C4G Program has an estimated water savings lifespan of 10 years based on the lives of the drought-resistant plants replacing turf (A&N Technical Services, 2008). Because benefits are phased in during the beginning of project implementation and benefits phase out at the end of the program lifetime, some benefits will accrue over a 12-year span for all of the above programs. Similarly, since HECWs have an estimated life

of 12 years, benefits of this overall project will extend over 14 years, into 2026 (A&N Technical Services, 2008).

Background and Historical Conditions

According to 2006 customer profiles provided by all of the major water suppliers, single- and multi-family residences account for nearly two-thirds of all water use in Santa Clarita Valley, while dedicated landscape and CII sites comprise approximately 14% and 19% of water use respectively (A&N Technical Services, 2008). Residential and business outdoor water use combined makes up nearly 70% of all water use in the SCV.

Without-project Baseline Conditions

The four retail water suppliers compiled water use statistics between January 2007 and August 2012 for dedicated irrigation sites (both large landscape and CII sites) as well as single family residences. Large landscape and CII sites eligible for the project averaged approximately 6.1 AFY of water use per site, providing a total baseline water use of approximately 605 AFY (CLWA, 2013), which is projected to continue without water conservation incentivized through the CLWA-3 program. Without this project, 1,332 AF of water will continue to be used inefficiently at large landscape sites, and 33 AF of water will not be conserved at CII sites over the 12-year benefits lifespans of those specific programs.

Single-family residential water use data between 2007 and 2012 suggest that sites eligible for the Landscape Contractor Certification and WBIC Program will continue to use an average 1,088 AF annually without project implementation, and approximately 1,023 AF of water will not be conserved (CLWA, 2013).

The 300,000 ft^2 of residential turf eligible for replacement has a baseline water use of 40 AFY, and based on 2011–2012 non-HECW commercial data, households eligible for HECW rebates have an annual baseline water demand of approximately 162 AFY (CLWA, 2013). Baseline water use for both of these programs is projected to continue if WUE is not incentivized through the CLWA-3 project. Approximately 990 AF of water will not be conserved if the HECW program is not implemented, and 283 AF of water will not be saved if the C4G program is not instituted.

Methods Used to Estimate Benefits

Large Landscape and CII Audit and Incentive Programs

The SCV Large Landscape Audit and Incentive and CII Audit and Customized Incentive Programs will provide 40 rebates per year and 10 rebates per year, respectively, for WBIC installation and turf replacement over the two-year implementation period. Modifications require both a pre-inspection of existing controllers and an inspection of newly-installed WBICs, as well as an educational component to train recipients on use and expectations of WBICs.

According to an evaluation of Smart Timer rebates conducted by the Metropolitan Water District of Orange County, WBICs provide approximately 27.5% water savings over previous systems at dedicated irrigation sites (MWDOC, 2011). Based on customer data between January 2007 and August 2012, dedicated irrigation sites average 6.05 AFY of water use per site. Large landscape sites will therefore save approximately 16.6 AFY in 2013 and 83.2 AFY in 2014, and achieve maximum water savings of 133 AFY by 2015 (80 sites x 6.05 AFY per site x 27.5% savings). WBIC installation and turf replacement at large landscape sites will save approximately 1,332 AF of water over the assumed 12-year lifetime of the installations.

CII customers who install WBICs are expected to receive the same 27.5% reduction in water use that large landscape customers will achieve. CII sites will realize 4.2 AFY in total water savings in 2013 and 21 AFY in

2014, and achieve the maximum annual water savings benefit of 33 AFY by the end of project implementation in 2015 (20 sites x 6.05 AFY per site x 27.5% savings). This project will result in approximately 333 AF of water savings for CII customers over the entire assumed 10 years that the program produces benefits.

Landscape Contractor and Residential WBIC Program

The SCV Landscape Contractor Certification and WBIC Program will provide 850 free WBICs per year over two years to landscapers and (primarily) residents of the SCV who take classes on WBICs and general WUE principles. The program includes an inspection of newly installed WBICs and an opportunity for residents to ask further questions about the controllers and efficient irrigation practices.

Based on previous evaluation of smart controllers installed at residential sites, residents will see an approximate water savings of 9.4% per year (MWDOC, 2011). Residential customer data between January 2007 and August 2012 shows that average baseline water use is 0.64 AFY per household. WBICs will produce 13 AFY in water savings for all residential sites in 2013 and 64 AFY in 2014, and achieve the full water savings benefit of 102 AFY by 2015 (1,700 rebates x .64 AFY per site x 9.4% savings). The residential WBIC program will save approximately 1,023 AF of potable water over the assumed 10 years that the 1700 controllers incentivized through this program produce benefits.

High-efficiency Clothes Washer Program

The HECW Program will provide 2,500 $100 rebates per year of project implementation to single- and multi-family households who replace old washers with high-efficiency machines that have a water factor of 4.0 or less (that is, the ratio of gallons used to cubic feet of laundry is 4:1 or smaller). The SCWD retailer will provide an additional $100 rebate, for a total savings of $200 per household.

High-efficiency machines rebated in a similar 2012 HECW program averaged approximately 13.3 gallons per load (CLWA, 2013). According to clothes washer statistics analyzed by Vickers, non-high-efficiency machines use 27 gallons/load, and households average approximately 392 loads per household per year (Vickers, 2001). Based on these figures, installing high-efficiency machines will save approximately 5,375 gallons per household per year [(27 gallons per load – 13.3 gallons per load) x 392 loads per year]. This program will achieve approximately 10.3 AFY in water savings in 2013 and 52 AFY in savings in 2014, and achieve the maximum annual water savings benefit of 82.5 AFY by 2015 (5,000 machines x 5,375 gallons per year / 325,851 gallons per acre-foot). Replacing 5,000 clothes washers with high-efficiency machines will result in approximately 990 AF of water savings over the assumed 12-year total benefits lifetime of the HECWs.

Cash-for-Grass Rebate Program

The C4G Rebate Program will provide rebates of $1.50/ft^2 for replacement of 300,000 ft^2 of residential turf with water-saving plants. The program uses an online class and online application process to train residents in basic water-saving practices and receive funds for replanting their landscapes.

This project assumes that rebates will incentivize residents to replace a mix of cool- and warm-season species turfgrass with low-water-use plants. Assuming a 71% irrigation efficiency from the AB 1881 Model Ordinance, and a crop coefficient of 0.7 for mixed turf from the AB 1881 Model Ordinance, results in approximately 12,898,732 gallons used to irrigate 300,000 ft^2 of turf (University of California Cooperative Extension, 2000). Replacing turf with low-water-use plants reduces the crop coefficient to 0.2 (University of California Cooperative Extension, 2000), requiring only 3,685,352 gallons to irrigate the same area. Replacing 300,000 ft^2 of mixed turf with low-water-use plants will provide approximately 3.5 AFY in water savings in 2013 and 17.7 AFY in 2014, and will achieve the maximum annual water savings benefit of

28.3 AFY by 2015. This rebate program will provide a total of approximately 283 AF in water savings over the assumed 10-year lifetime of the low-water-use plants.

Avoided Wastewater Treatment

Water savings achieved through the HECW rebate program are the only savings attributable to indoor water use. In addition to reducing imported water by 990 AF, HECWs installed through this program will prevent the equivalent amount of water from passing through the Santa Clarita Valley Sanitation District, where it would be treated and then discharged into the Santa Clara River.

Benefit Uncertainty

Actual savings over the life of the Large Landscape and CII WBICs and landscape modifications will likely be higher, as this estimate does not factor in water savings from the latter aspect of the program. Similarly, the estimate of benefits resulting from the Landscape Contractor and Residential WBIC Program are based solely on water savings from single-family residential WBICs, and do not include the potential benefits from landscaping contractors improving their WUE.

Landscape modifications rebated under the C4G program have an estimated benefits lifespan of 10 years. This appears to be a conservative estimate for the lifespan of native drought-resistant plants, in that some studies have assumed 15- to 20-year lifespans (e.g., Gregg et al., 1994; Addink, 2005), and savings will likely accrue to residents over a period longer than the 10 years assumed for this analysis.

New Facilities Required to Achieve Benefits

No new facilities or any expansion of current facilities are required in order to achieve water supply benefits for any of the CLWA-3 programs.

Potential Adverse Physical Effects

Approximately 733 acres of agriculture classified as irrigated cropland and improved pasture land are located along the Santa Clara River from Saugus WRP to the Los Angeles/Ventura County line (Southern California Association of Governments, 2008). The Saugus and Valencia WRPs contribute to flow in the Santa Clara River, which is a *supplemental* water source for this agricultural use. The Santa Clara River is ephemeral downstream of the treatment plants, until an upwelling far downstream in Ventura County forces groundwater to the surface (United Water Conservation District, 2012). The Santa Clara River downstream of the treatment plants is dry or nearly dry during most of the irrigation season. Therefore, surface water use is not counted on as a main source for agriculture.

Even if the water was being counted on as a main agricultural source, most of the decrease in effluent from the WRPs would be offset by the projected increase in influent volume to the plants that is projected into the future, leaving the net effluent volume similar to what it is projected under the without-project condition. Without the project, WRP discharge is projected to grow from 19.6 million gallons per day (mgd) in 2010 to 22.6 mgd in 2020 and 27.8 mgd in 2035 (Santa Clarita Valley Sanitation District, 2013). This growth in wastewater flow from 2010 to 2020 is 3 mgd, or approximately 3,300 AF total, or 330 AF per year, and is expected to continue at the same rate indefinitely. The water saved from CLWA-3 and SCWD-2 combined is 476 AF per year over an approximately 10-year period (380 AF per year from CLWA-3 and 88 AF per year from SCWD-2).

Considering that downstream agriculture takes only a small fraction of its total water use from surface flows, and that most of the reduction in effluent from both water conservation projects in this proposal will be offset

by the growth in influent volume projected over time, it is estimated that no harm to agricultural production downstream is likely, due to water conservation savings expected from these projects.

Summary of Benefit

Through five WUE programs, the SCV will reduce potable water consumption, and therefore imports of SWP water, by approximately 3,960 AF over the 14 years during which savings will be realized from this project. The Large Landscape and CII programs will provide 1,332 AF and 33 AF of this savings, respectively; the Landscape Contractor and Residential WBIC program will achieve 1,023 AF of this benefit; HECW rebates will provide 990 AF of savings, as well as the same amount in avoided wastewater treatment; and residential turf replacements through the C4G program will provide the remaining 283 AF of water savings. Total water savings is summarized in Table 7-1. Savings of AF of wastewater treatment from indoor water use conservation savings is shown in Table 7-2.

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)
Type of Benefit Claimed: Avoided SWP Water Imports
Measure of Benefit Claimed (Name of Units): Acre-Feet

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	0	47	47
2014	0	237	237
2015	0	380	380
2016	0	380	380
2017	0	380	380
2018	0	380	380
2019	0	380	380
2020	0	380	380
2021	0	380	380
2022	0	380	380
2023	0	342	342
2024	0	194	194
2025	0	72	72
2026	0	31	31
Comments:			

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)
Type of Benefit Claimed: Avoided Sanitation Treatment
Measure of Benefit Claimed (Name of Units): Acre-Feet
Additional Information About this Measure: savings due to indoor water conservation from high efficiency clothes washers

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	-	10	10
2014	-	52	52
2015	-	82	82
2016	-	82	82
2017	-	82	82
2018	-	82	82
2019	-	82	82
2020	-	82	82
2021	-	82	82
2022	-	82	82
2023	-	82	82
2024	-	82	82
2025	-	72	72
2026	-	31	31
Comments:			

Benefit: Avoided Import of 37 MT per Year of Chlorides into the Watershed

Water conservation incentivized through the CLWA-3 programs will save approximately 3,960 AF of SWP imports over the 14-year benefits lifetime of the project. All of these savings will directly offset imported water, which is supplied through the SWP from the Delta. This reduction in nonlocal water will also reduce the introduction of approximately 385 MT of salts into the watershed over that same period..

Background and Historical Conditions

Some of the soils, surface water, and groundwater in the Upper Santa Clara River Watershed contain high levels of chloride. Primary sources of chlorides in surface water and groundwater include soil salinity, imported surface water (i.e., SWP supplies) and discharges from wastewater plants (i.e., Valencia and Saugus WRPs). Since the 1970s, growth in the SCV has increased the demand for water and led to chloride levels in treated effluent that exceeded the water quality objectives (WQOs) for chloride, and impair beneficial uses for agricultural supply, as well as groundwater recharge. To help address these factors, a total maximum daily load (TMDL) for chlorides has been established for the watershed.

Without-Project Conditions

Imported SWP water will contribute to the level of total dissolved solids, specifically chlorides, in the watershed. If the CLWA-3 project is not implemented, 3,960 AF of imported water containing will continue

to be imported over the 14-year span of benefits estimated for this project, as will approximately 384 MT of chlorides.

Methods Used to Estimate Benefits

A 2009 water quality table developed by the Metropolitan Water District of Southern California (Metropolitan, 2010) estimates that SWP water contains an average chloride concentration of 79 mg/L, or 0.097 MT/AFY.1, 2 This project avoids 380 AF of imported water use per year, and therefore avoids 37 MT of chloride imports per year (380 AFY * 0.097 MT/AFY). Because 3,960 AF of imported water will, through this project, be prevented from entering the watershed through irrigation, runoff, or wastewater discharge, the avoided imports will also prevent 384 MT of chlorides from entering the basin over the project lifetime.

Benefit Uncertainty

Chloride concentrations in SWP water vary both by year and by time of year. The chloride concentration in SWP water used for calculating avoided chloride imports is an average value. Actual chloride concentrations in any one year could be higher or lower than this value.

New Facilities Required to Achieve Benefits

No new facilities or any expansion of current facilities are required to achieve water quality benefits for any of the CLWA-3 programs.

Potential Adverse Physical Effects

There are no adverse physical effects that could potentially arise from the proposed project.

Summary of Benefit

Increasing WUE through the five programs will reduce the amount of salts and other undesirable nutrients that brought into the watershed, because the project will reduce water imports containing these substances. As is shown in Table 7-3, reducing the SWP imports by approximately 3,960 AF over the benefits lifespan of this project will prevent the introduction of roughly 384 MT of additional chlorides.

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)			
Type of Benefit Claimed: Avoided Chloride Imports			
Measure of Benefit Claimed (Name of Units): Metric Tons			
Additional Information About this Measure: Avoided SWP chloride imports			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	-	5	5
2014	-	23	23
2015	-	37	37

[1]. 1 acre-foot = 1,233,482 liters; 79 mg/L = 97,445,078 mg per acre-foot 0.097 MT per acre-foot.
[2]. This is the highest rolling average value at Metropolitan Water District of Southern California's Jensen Filtration Plant, which is the closest measurement point to CLWA for which data were available. Chloride concentrations in SWP water have ranged from about 28 mg/L to 128 mg/L over the past 30 years (LARWQCB, 2008).

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)			
Type of Benefit Claimed: Avoided Chloride Imports			
Measure of Benefit Claimed (Name of Units): Metric Tons			
Additional Information About this Measure: Avoided SWP chloride imports			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2016	-	37	37
2017	-	37	37
2018	-	37	37
2019	-	37	37
2020	-	37	37
2021	-	37	37
2022	-	37	37
2023	-	33	33
2024	-	19	19
2025	-	7	7
2026	-	3	3
Comments:			

Benefit: Avoided Annual CO_2 Emissions of 179 MT due to Avoided SWP Imports, and Avoided Annual CO_2 Emissions of 31 MT due to HECW Energy Savings

The CLWA-3 project will reduce energy consumption through reduced imports, and reduce residential energy demand for hot water in clothes washers. Switching from standard clothes washers to high-efficiency machines provides water savings, as well as the benefit of avoiding energy costs associated with heating the equivalent amount of saved water. The HECW program is the only program in CLWA-3 that provides reduced energy consumption through avoided water heating.

In addition to electricity saved directly through more efficient clothes washers, avoided water imports will save additional energy used to transport and treat water from the Delta.

Abating energy production associated with the transportation of imported water has the benefit of reducing CO_2 emissions. Similarly, energy saved through HECWs prevents the carbon emissions associated with unnecessary energy production.

Background and Historical Conditions

California depends on a variety of energy production sources, both in and out of state, to meet electricity demand. The SCV WUE SP outlines reducing water-related energy demand as a major regional goal, stating that it currently requires a “tremendous” amount of energy to produce and deliver enough water to meet demand (A&N Technical Services, 2008). The SCV WUE SP identifies reducing water-related energy demand as a major goal because of the large carbon footprint that the energy production creates.

Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)

Without-project Conditions

Without WUE improvements that could be achieved through the CLWA-3 project, approximately 5,762.1 megawatt hours (MWh) of electricity will be produced to transport 3,960 AF of SWP water to Castaic Lake, where it is stored for wholesale distribution. Additionally, residents will continue to use approximately 1,160.9 MWh of electricity to heat additional water for use in non-HECWs.

Without project implementation, approximately 1,873 MT of CO_2 will continue to be emitted through the energy produced for supplying and conveying SWP water to Castaic Lake over the benefits lifetime of the project. Over the same span, 377 MT of CO_2 emissions will be produced to heat water for use in non-HECWs if the HECW Rebate program is not employed.

Methods Used to Estimate Benefits

The Alliance for Water Efficiency estimates that switching to a HECW saves 0.0036 kilowatt hour (kWh)/gallon in electricity use (Alliance for Water Efficiency, 2011). Over the 12-year assumed lifetimes of residential HECWs rebated through this project, the HECW program will result in approximately 989.7 AF of water savings, providing approximately 1,160.9 MWh of total electricity savings for HECWs.

The California Energy Commission (CEC) estimates that transporting one acre-foot of water from the Delta to Castaic Lake requires 1.17 MWh of electricity (CEC, 2010), while CLWA estimates that an additional 0.285 MWh per acre-foot is required for treatment, for a total energy expenditure of 1.455 MWh per acre-foot for imported water. With approximately 3,960 AF of expected water savings, the equivalent reduction in SWP imports will save approximately 5,762 MWh of electricity over the 14-year benefit lifetime of the project.

Energy used to transport SWP water to Castaic Lake, where it is stored for wholesale purposes, comes from a variety of sources internal and external to the State of California, including coal-fired power plants and natural-gas plants. Based on 2011 CEC data (CEC, 2011), approximately 70% of electricity generation was produced by California power sources, while 10% was imported from the Pacific Northwest and 20% was imported form the Desert Southwest. Given emissions rates of 858.68 lbs/MWh, 819.21 lbs/MWh, and 1,191.35 lbs/MWh, respectively, for the electricity sources above (U.S. EPA, 2012), we use a weighted emissions rate of 780.513 lbs/MWh, or 0.35 MT per MWh. With 1.455 MWh of electricity required for transporting and treating 1 acre-foot of SWP water, roughly 0.509 MT of CO_2 is produced for every acre-foot of water that is transported from the Delta to Castaic Lake and subsequently treated. With an estimated water savings of 3,960 AF for the entire project, avoiding the equivalent amount of imported water will prevent approximately 1,873 MT of CO_2 emissions.

Reduced greenhouse emissions result from the HECW program as well. With approximately 1,161 MWh of electricity savings due to this particular program, and applying the U.S. Environmental Protection Agency (EPA) emissions rate identified above, roughly 377 MT of corresponding CO_2 emissions are also avoided.

Benefits Uncertainty

Energy required to heat water for residential washing machines varies depending on the number of loads per household, the type of high-efficiency washing machine purchased, and the individual machine settings used for each household. The estimate for energy consumption per gallon is based on participants' energy use from previous conservation programs (Alliance for Water Efficiency, 2011), which were subject to these same uncertainties, and is a standard estimate of household energy use that can be applied to the CLWA-3 project.

The projected carbon emissions benefit resulting from avoided water imports is subject to the same uncertainty as energy savings estimates. Any variation in the energy savings from avoided imports based on SWP water sources would have a direct impact on the amount of avoided carbon emissions.

New Facilities Required to Achieve Benefits

No new facilities or any expansion of current facilities are required to achieve energy conservation benefits for any of the CLWA-3 programs.

Potential Adverse Physical Effects

No adverse physical effects are expected to arise from the project.

Summary of Benefit

Energy conservation will save a total of 2,250 MT of CO_2 emissions over the 14-year benefits lifespan of the CLWA-3 project. As is shown in Table 7-4, the 5,762 MWh of energy saved through the avoided transportation of imported water will prevent approximately 1,873 MT of CO_2 emissions. Table 7-5 shows that 1,161 MWh of energy conserved by reducing hot water used by clothes washers will avoid another 377 MT of CO_2 emissions.

TABLE 7-4: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)			
Type of Benefit Claimed: Avoided CO_2 Emissions			
Measure of Benefit Claimed (Name of Units): Metric Tons			
Additional Information About this Measure: Avoided SWP water transportation emissions			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (b) – (c)**
2013	0	24	24
2014	0	121	121
2015	0	193	193
2016	0	193	193
2017	0	193	193
2018	0	193	193
2019	0	193	193
2020	0	193	193
2021	0	193	193
2022	0	193	193
2023	0	174	174
2024	0	99	99
2025	0	37	37
2026	0	16	16
Comments:			

TABLE 7-5: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Valley Water Use Efficiency Strategic Plan Program (CLWA-3)			
Type of Benefit Claimed: Avoided CO_2 Emissions			
Measure of Benefit Claimed (Name of Units): Metric Tons			
Additional Information About this Measure: Avoided emissions from hot water use by clothes washers			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	-	4	4
2014	-	21	21
2015	-	34	34
2016	-	34	34
2017	-	34	34
2018	-	34	34
2019	-	34	34
2020	-	34	34
2021	-	34	34
2022	-	34	34
2023	-	34	34
2024	-	34	34
2025	-	30	30
2026	-	13	13
Comments:			

Summary of Annual Project Physical Benefits

Full project benefits will accrue beginning in 2015. At this time, water conservation resulting from the five programs will yield avoided SWP imports of 380 AFY and avoided wastewater treatment of 82 AF of water per year. Avoided water imports will result in 552 MWh/year in energy savings, and reduction in hot water demand due to HECWs will save 96,744 kWh/year. Energy savings from avoided transportation of imported water will prevent roughly 179 MT of carbons emissions each year, and avoided energy production due to HECW water savings will save approximately 31 MT of CO_2 emissions per year. Finally, avoiding 380 AFY of SWP imports will also prevent 37 MT of salts from infiltrating the Upper Santa Clarita River Watershed annually.

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Santa Clarita Water Division (SCWD) WUE Programs (SCWD-2)

Introduction

This attachment presents the technical justification for the Santa Clarita Water Division (SCWD) Water Use Efficiency (WUE) Programs Project (SCWD-2). A project abstract and general discussion of the without-project baseline are followed by a discussion of each physically quantified benefit, and a summary of physically quantified benefits claimed.

Project Abstract

The SCWD WUE SP identifies 10 programs to achieve WUE goals for the SCWD's service area within Santa Clarita Valley (SCV). The proposed SCWD-2 Project focuses on the following three water conservation programs, two of which are currently being implemented:

- High-Efficiency Irrigation Nozzle Distribution

  This program will expand the existing FreeSprinklernozzles.com distribution website to offer a greater variety of high-efficiency irrigation nozzles to residential, commercial, industrial, and institutional (CII) customers.

- High-Efficiency Washing Machine Rebate Residential and Commercial Rebate Program, (the high-efficiency washing machine rebate portion only, due to SCWD staffing limitations)

  SCWD will expand an existing program, which incentivizes high-efficiency toilets and weather-based irrigation controllers, to include rebates for high-efficiency clothes washers (HECWs). Two other sub-programs incentivizing ultra-low flow and zero-water urinals have not been implemented previously, nor are they part of this expansion, due to staffing and monetary restrictions.

- Large Landscape Water Budgets

This is a new program that targets large landscaping sites with dedicated irrigation meters. The SCWD will educate customers and encourage water-saving practices specific to their landscaping sites.

Without-Project Baseline

SCWD is one of four water retailers in the SCV, providing 41% of all water supply to the SCV. The SCV is the fastest growing area in Northwest Los Angeles County because of an influx of both residential and commercial customers. Since 1980, water wholesalers have relied on additional imported water from the State Water Project (SWP) and other sources to supplement local groundwater supplies (Kennedy/Jenks Consultants et al., 2011). The Castaic Lake Water Agency (CLWA), a wholesale water agency, provides over half of the total potable water supply for Santa Clarita (including SCWD's service area), in part by importing SWP water from the Sacramento-San Joaquin Delta (the Delta) and other sources. CLWA imports SWP water from the Delta to Castaic Lake through SWP facilities.

CLWA has a contractual SWP Table A amount of 95,200 AFY. However, the marginal source of SWP water for CLWA is the water purchased from the Buena Vista-Rosedale Rio-Bravo Water Districts (BV/RRB) in Kern County. CLWA typically receives part of Buena Vista's Kern River entitlements through exchange of BV/RRB's SWP supplies (Kennedy/Jenks Consultants et al., 2011).

Without the SCWD-2 project, customers will continue to use 1,064 AF of potable water through inefficient landscape practices, irrigation nozzles, and clothes washers over the 14 years that these programs will realize water supply benefits. SCWD customers will therefore continue to import the same amount of water from the SWP through CLWA.

Without this project, SCWD will keep supplying imported water to meet irrigation demands at approximately 20 dedicated irrigation sites designated for landscape budgets and residential, CII parcels containing 30,000 inefficient nozzles. SCWD will also continue to provide imported water to 1,000 inefficient clothes washers, and the Santa Clarita Valley Sanitation District (SCVSD) will subsequently have to treat that water.

In addition to the water conservation that would not happen without the SCWD-2 programs, the continued import of SWP water will result in higher levels of energy production and carbon dioxide emissions.

Without this project, over-irrigation at residential and commercial sites will continue. Runoff from inefficient urban irrigation systems will continue to increase the flow of pollutants such as pesticides, fertilizers, and bacteria through storm drains that eventually drain into the Santa Clara River. Additionally, water imports to meet current demand introduce additional chlorides into the watershed.

Relationship of Project to Other Projects Included in the Proposal

There are two water conservation projects included in the Upper Santa Clara River grant proposal: this project (SCWD-2) based on the SCWD WUE Strategic Plan (SP) is being implemented by the SCWD, while another project (CLWA-3) based on the SCV WUE SP is being implemented by the Region's wholesaler, CLWA. The SCWD-2 and CLWA-3 projects are independent of each other in that neither program depends on the other to achieve water conservation benefits. However, the programs outlined in the SCWD-2 project are closely aligned with programs identified in CLWA-3. Many of the programs share the same basic plan and are designed to achieve regional water goals. Also, some of the programs build on each other so the consumer gets to take advantage of more incentives to conserve water. A good example is the high-efficiency washing machines programs, where both programs are contributing to the rebate program so the consumer gets a $200 rebate instead of a $100 rebate.

Description of Expected Physical Benefits

The following (quantifiable) physical benefits are expected from this project:

- Water Supply

  Annual water savings of 156 AFY[3] are expected as a result of this project, once benefits all programs are fully phased-in. This means that total water savings of 1,064 AF due to increased efficiency enables an equivalent reduction in imported water over the 14-year life of the programs' benefits.

  Annual wastewater treatment savings of 22 AF are expected from indoor water use savings from high-efficiency washing machines, once benefits from that program have been fully phased-in. Costs associated with approximately 264 AF of wastewater treatment will be avoided in SCVSD's facilities over the 14-year span of project benefits.

- Water Quality

  Annual avoided chloride imports of 15 metric tons (MT) per year are expected as a result of the imported water savings from the project once the water conservation measures are fully implemented. This will result in a reduction of 103 MT of chlorides imported from outside the Region over the 14-year lifespan of the programs' benefits.

- Greenhouse Gas Reduction

[3] Peak water savings, change in chloride loading avoided, and GHG reduction benefits are achieved from 2015 to 2017. Annual benefits are less in subsequent years, and vary depending on the lifetimes of projects and projected savings.

Annual reductions of 88 MT of carbon dioxide emissions are expected due to energy savings from avoided water imports and HECWs, once project benefits are fully implemented. Over the 14-year benefits lifespan, this project will avoid 542 MT of CO_2 emissions from SWP water transportation and 108 MT of CO_2 emissions from hot water use associated with clothes washers.

Each benefit is discussed in further detail below.

Benefit: Annual Water Conservation Savings of 156 AFY

Water conservation incentivized through the SCWD-2 programs will save approximately 1,064 AF of water over the benefits lifetime of the project. This will allow CLWA to avoid importing an equivalent amount of SWP water from the Delta.

The High-Efficiency Nozzle and HECW Programs will be implemented over a two-year period from October 2013 to September 2015, while the Large Landscape Water Budget Program will be implemented over a one-year period from October 2014 to September 2015. Since project implementation will begin in 2013 for the High-Efficiency Nozzle and HECW programs, benefits for those programs will start in that initial calendar year. Project benefits will continue to phase-in during the following calendar year for the High-Efficiency Nozzle and HECW Programs, and as the Large Landscape Water Budget program begins. Full annual project benefits are reached in 2015 as all programs have been fully implemented.

Large landscape budgets have an estimated water savings lifespan of 10 years (Kennedy/Jenks Consultants, 2012). Because benefits phase in during one year at the beginning of project implementation and phase out at the end of the program lifetime, benefits will accrue over 11-year span in total. High-efficiency nozzles last approximately five years (Kennedy/Jenks Consultants, 2012), but their benefits extend over a seven-year period because project benefits phase in over two years of project implementation. Likewise, HECWs have an estimated life of 12 years (Kennedy/Jenks Consultants, 2012), so benefits of this project will extend over 14 years, into 2026.

Background and Historical Conditions

Residential water use currently accounts for 70% of total water demand within the project area. Of all single-family residential water demand, an estimated 69% comes from outdoor landscape irrigation (Kennedy/Jenks Consultants, 2012). Residential water use trends show a much higher consumption rate in hot summer months, when outdoor plants have a high evapotranspiration rate. Based on previous programs implemented to achieve water conservation goals, there are over 430,000 single-family residential irrigation nozzles and 174,000 dedicated irrigation nozzles available to be retrofitted with high-efficiency varieties.

Dedicated irrigation sites at large landscape areas, which account for 17% of water demand in the project area, have concentrated water usage among a relatively small number of locations. With regard to multi-family residences with dedicated irrigation sites, the 10 biggest sites comprise nearly 40% of total multi-family landscape water demand.

Without-Project Conditions

Without implementing the SCWD-2 WUE programs, dedicated irrigation sites will continue to use 260 AF of water over a 11-year period. Dedicated irrigation sites averaged 6 AFY per meter in 2012, according to customer data compiled by SCWD.

Residential and commercial customers will continue to use 540 AF of water over a seven-year period because of inefficient nozzles. Commercial customers in particular are likely to continue a baseline water usage of 1.29 AFY per meter, as current nozzle programs do not offer the variety of nozzle types required for CII customers.

Residential customers use an average of 0.74 AFY per meter, based on data compiled by SCWD (SCWD, 2013). If the HECW program is not implemented, those customers will continue to use 264 AF of water over a 14-year span, which will also need to be treated by the SCVSD.

Without conservation measures incentivized through high-efficiency nozzle, HECW, and large landscape budget programs, SCWD will continue to import 1,064 AF of water over 14 years.

Methods Used to Estimate Benefits

Sub-Task 10.1 Large Landscape Budgets

The Santa Clarita Water District WUE SP estimates that landscape budgets for dedicated irrigation sites produce roughly 15% water savings (Kennedy/Jenks Consultants et al., 2011). Based on 2011 billing data, this results in a per-budget savings of 1.3 AFY. The Large Landscape Budget Program aims to develop 20 landscape budgets, yielding a maximum annual savings of 26 AFY (20 landscapes x 1.3 AFY per landscape) and a total water savings of approximately 260 AF over the 10-years that the program produces benefits.

Sub-Task 10.2 High-Efficiency Nozzles

According to the SCWD WUE SP, 266,400 nozzles distributed over nine years would yield approximately 4,791 AF of total water savings. High-efficiency nozzles last for five years, so each device saves, on average, approximately 0.00359 AFY (Kennedy/Jenks Consultants et al., 2011). Given that the budget allows for distribution of 30,000 high-efficiency nozzles, this program will yield water savings of approximately 108 AFY (0.00359 AFY * 30,000 high-efficiency nozzles), and 540 AF over the 5 years that the program produces benefits.

Sub-Task 10.3 High-Efficiency Clothes Washers

Water savings from high-efficiency washing machines vary depending on single-family residential, multi-family residential, and commercial usage. While HECWs can achieve at least 0.08 AFY of water savings when replacing standard washers in multi-family residences or commercial entities, single-family residential HECWs conserve roughly 0.02 AFY (Kennedy/Jenks Consultants, 2012). HECWs last approximately 12 years, so 1,000 machines rebated through this program will achieve an annual water savings of approximately 22 AFY and a total water savings of 264 AF over the 12 years that the program produces benefits.

Water savings achieved through the HECW rebate program are the only indoor water savings for the project. In addition to reducing imported water by 264 AF , HECWs installed through this program will prevent the equivalent amount of water from needing wastewater treatment by the SCVSD, where it would be treated and then discharged into the Santa Clara River.

Benefit Uncertainty

Water savings stemming from large landscape budgets vary depending on the individual site's current water usage and potential for improvements. The Metropolitan Water District of Orange County estimates even higher water savings from water budgets, at 20% of total consumption (MWDOC, 2011). The amount of water savings per site provided in this attachment is based on recent billing data, and is likely to be a conservative estimate because the program targets dedicated irrigation sites with the greatest potential for water conservation improvements. Additionally, the lifetime expectancy of 10 years is a lower-bound estimate – if SCWD continues to calculate water budgets annually and continues to implement the program, the effect can last longer than 10 years.

While multi-family and commercial machines average shorter lifetime (about 2/3 of single-family machines), they still produce more water savings over the entire benefits lifetime. The HECW aspect of the Residential &

Commercial Rebate Program focuses primarily on single-family households, but any additional water savings due to multi-family residential HECW rebates are not factored into this water savings estimate. Despite the shorter benefits lifetime, the multi-family HECWs still provide additional overall savings compared to the savings being accounted for in this estimate.

New Facilities Required to Achieve Benefit

No new facilities or expansion of current facilities are required to achieve water supply benefits for any of the SCWD-2 programs.

Potential Adverse Physical Effects

Approximately 733 acres of agriculture classified as irrigated cropland and improved pasture land are located along the Santa Clara River from the Saugus Water Reclamation Plant (WRP) to the Los Angeles/Ventura County line (Southern California Association of Governments, 2008). The Saugus and Valencia WRPs contribute to flow in the Santa Clara River, which is sometimes used as a *supplemental* water source to local groundwater used for agriculture. The Santa Clara River is ephemeral downstream of the treatment plants until an upwelling far downstream in Ventura County forces groundwater to the surface. Because the Santa Clara River downstream of the treatment plants is dry or nearly dry during most of the irrigation season, the surface water is not counted on as a main water source for agriculture.

Even if the water were being counted on as a main agricultural source, most of the decrease in effluent from the WRPs would be offset by the projected increase in influent volume to the plants that is projected into the future, leaving the net effluent volume similar to what is projected under the without-project condition. Without the project, WRP discharge is projected to grow from 19.6 million gallons per day (mgd) in 2010 to 22.6 mgd in 2020 and 27.8 mgd in 2035 (SCVSD, 2013). This growth in wastewater flow from 2010 to 2020 is 3 mgd, or approximately 3,300 AF total, or 330 AF per year, and this is expected to continue at the same rate into the future. The water saved from CLWA-3 and SCWD-2 combined is 476 AF per year over an approximately 10-year period (380 AF per year from CLWA-3 and 88 AF per year from SCWD-2).

Downstream agriculture takes only a small fraction of its total water from surface flows, and most of the reduction in effluent from both water conservation projects in this proposal will be offset by the growth in influent volume projected over time. Thus it is estimated that no harm to agricultural production downstream is likely due to the water conservation savings expected from these projects.

Summary of Benefit

The SCWD-2 WUE programs will conserve a total of 1,064 AF of water over a 14-year span between 2013 and 2026, and consequently avoid importing the equivalent amount of water from the SWP, the marginal source of water for SCWD. Large landscape budgets will save approximately 260 AF of water over 11 years, high-efficiency nozzles will conserve roughly 540 AF of water over seven years, and HECWs will save about 264 AF of water (and save the same amount of water from being treated as wastewater) over 14 years. Total water savings is summarized in Table 7-1. Savings of acre-feet of wastewater treatment from indoor water use conservation savings is shown in Table 7-2.

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Water Division Water Use Efficiency Programs (SCWD-2)			
Type of Benefit Claimed: Avoided SWP Imports			
Measure of Benefit Claimed (Name of Units): Acre-Feet			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	0	16.25	16.25
2014	0	87.75	87.75
2015	0	156	156
2016	0	156	156
2017	0	156	156
2018	0	142.5	142.5
2019	0	88.5	88.5
2020	0	48	48
2021	0	48	48
2022	0	48	48
2023	0	48	48
2024	0	41.5	41.5
2025	0	19.25	19.25
2026	0	8.25	8.25
Comments:			

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Water Division Water Use Efficiency Programs (SCWD-2)			
Type of Benefit Claimed: Avoided Wastewater Treatment From HECW Water Savings			
Measure of Benefit Claimed (Name of Units): Acre-Feet			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	0	2.75	2.75
2014	0	13.75	13.75
2015	0	22	22
2016	0	22	22
2017	0	22	22
2018	0	22	22
2019	0	22	22
2020	0	22	22
2021	0	22	22
2022	0	22	22
2023	0	22	22
2024	0	22	22
2025	0	19.25	19.25
2026	0	8.25	8.25
Comments:			

Benefit: Avoided Imports of 15 MT of Chlorides into the Watershed Annually

WUE measures promoted by the SCWD-2 project will yield approximately 1,064 in water savings over a 14-year span. All of these savings will directly offset imported water, which is supplied through the SWP from the Delta. Because of the higher salinity levels present in this marginal supply source, avoiding 1,064 AF of water prevents approximately 103 MT of chlorides from infiltrating the watershed over that same period.

Background and Historical Conditions

Some of the soils, surface water, and groundwater in the Upper Santa Clara River Watershed contain high levels of chloride. Primary sources of chlorides in surface water and groundwater include soil salinity, imported surface water (i.e., SWP supplies) and discharges from wastewater plants (i.e., Valencia and Saugus WRPs). Since the 1970s, growth in the SCV has increased the demand for water. Also, chloride levels in the USCR treated effluent and in nearby groundwater basins have varied significantly based on hydrologic conditions and have at times exceeded the water quality objectives (WQOs) for chloride, and impair beneficial uses for agricultural supply as well as groundwater recharge. As a result of these factors, a total maximum daily load (TMDL) for chlorides has been established for the watershed.

Without-Project Conditions

If the SCWD-2 project is not implemented, the area will continue to meet demand through SWP imports. The 1,064 AF of water that would have been conserved with the project will be imported, along with approximately 103.2 MT of chlorides.

Methods Used to Estimate Benefits

A 2009 water quality table developed by the Metropolitan Water District of Southern California (Metropolitan) estimates that SWP water contains an average chloride concentration of 79 mg/L, or 0.097 MT/acre-foot.[4,5] Because all water conserved through this program will eventually enter the watershed through landscape infiltration, runoff, or wastewater discharge, avoiding 1,064 AF of water imports will prevent approximately 103 MT of chlorides from entering the basin during the project lifetime.

Benefit Uncertainty

Chloride concentrations in SWP water vary by both year and time of year. The chloride concentration in SWP water used for calculating avoided chloride imports is an average value. Actual chloride concentrations in any one year could be higher or lower than this value.

New Facilities Required to Achieve Benefit

No new facilities or expansion of current facilities are required to achieve water quality benefits for any of the SCWD-2 programs.

Potential Adverse Physical Effects

No adverse physical effects are expected as a result of the project.

[4]. 1 acre-foot = 1,233,482 liters; 79 mg/L = 97,445,078 mg per acre-foot = 0.097 MT per acre-foot.
[5]. This is the highest rolling average value at Metropolitan Water District of Southern California's Jensen Filtration Plant, which is the closest measurement point to CLWA for which data were available. Chloride concentrations in SWP water have ranged from about 28 mg/L to 128 mg/L over the past 30 years (LARWQCB, 2008).

Summary of Benefit

Water conservation achieved through the SCWD-2 program has an additional benefit of increasing water quality in the Upper Santa Clarita River Watershed. As is shown in Table 7-3, by reducing water demand by 1,064 AF over a 14-year period, SCWD is able to avoid importing the equivalent amount of water, as well as avoid introducing approximately 103.2 MT of chlorides into the watershed.

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Water Division Water Use Efficiency Programs (SCWD-2)			
Type of Benefit Claimed: Avoided Chloride Imports From Avoided SWP Imports			
Measure of Benefit Claimed (Name of Units): Metric Tons			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	0	1.58	1.58
2014	0	8.51	8.51
2015	0	15.13	15.13
2016	0	15.13	15.13
2017	0	15.13	15.13
2018	0	13.82	13.82
2019	0	8.58	8.58
2020	0	4.66	4.66
2021	0	4.66	4.66
2022	0	4.66	4.66
2023	0	4.66	4.66
2024	0	4.03	4.03
2025	0	1.87	1.87
2026	0	0.80	0.80
Comments:			

Benefit: Avoided Annual CO_2 Emissions of 79 MT from Avoided Water Imports, and 9 MT from High-efficiency Washing Machine Energy Savings

The SCWD-2 programs will promote energy conservation through reduced imports and reduced residential energy demand. Switching from standard clothes washers to HECWs provides water savings, as well as the benefit of avoiding energy costs associated with heating the equivalent amount of saved water.

In addition to the electricity saved directly through more efficient clothes washers, avoided water imports will save the additional energy used to transport and treat water from the Delta.

The SCWD-2 project will reduce carbon dioxide emissions through reducing water imports from the SWP and avoiding the energy used to pump this water from northern California and treat it. In addition, SCWD-2 will also avoid energy use to heat water and associated CO_2 emissions through the HECW machine program.

Background and Historical Conditions

The SCWD-2 programs will promote energy conservation through reduced imports and reduced residential energy demand. Reducing water-related energy consumption and greenhouse gas emissions are long-term

goals of both the state and SCV. The SCWD WUE SP describes previous water conservation measures in the context of electricity savings that are in part due to benefits from reduced carbon dioxide emissions.

Without-Project Conditions

Without WUE improvements achieved through the SCWD-2 project, approximately 1,548.1 megawatt hours (MWh) of electricity will be produced to transport 1,064 AF of SWP water to Castaic Lake, where it is stored and eventually transported to SCWD and other retailers for distribution. Additionally, residents will continue to use approximately 310 MWh of electricity to heat additional water for use in non-HECWs.

If the SCWD-2 programs are not implemented, 650 MT of CO_2, will continue to be created because of water-related energy demand. 542 MT of CO_2 emissions will continue to be produced in order to transport and treat 1,064 AF of SWP imports, and 108 MT of CO_2 will be emitted due to water use in non-HECWs.

Methods Used to Estimate Benefits

The Alliance for Water Efficiency estimates that switching to a HECW saves 0.0036 kilowatt hour (kWh)/gallon in electricity use (Alliance for Water Efficiency, 2011). Over the 12-year assumed lifetime of high-efficiency machines rebated through this project, the HECW program will result in approximately 264 AF of water savings, providing approximately 310 MWh of total electricity savings for HECWs.

The California Energy Commission (CEC) estimates that transporting one acre-foot of water from the Delta to Castaic Lake requires 1.17 MWh, while CLWA estimates that an additional 0.285 MWh/acre-foot is required for treatment, for a total energy expenditure of 1.455 MWh/acre-foot for imported water (CEC, 2010). With approximately 1,064 AF of expected water savings, the equivalent reduction in SWP imports will save approximately 1,548 MWh of electricity over the 14-year benefits lifetime of the project.

Energy used to transport SWP water to Castaic Lake comes from a variety of sources internal and external to the State of California, including coal-fired power plants and natural-gas plants. Based on 2011 CEC data (CEC, 2011), approximately 70% of electricity generation was produced by California power sources, while 10% was imported from the Pacific Northwest and 20% was imported from the Desert Southwest. Given emissions rates of 858.68 lbs/MWh, 819.21 lbs/MWh, and 1,191.35 lbs/MWh, respectively, for the electricity sources above (U.S. EPA, 2009), we use a weighted emissions rate of 780.513 lbs/MWh, or 0.35 MT per MWh. With 1.455 MWh of electricity required for transporting and treating 1 acre-foot of SWP water, roughly 0.472 MT of CO_2 is produced for every acre-foot of water that is transported from the Delta to Castaic Lake and subsequently treated. With an estimated water savings of 1,064 AF for the entire project, avoiding the equivalent amount of imported water will prevent approximately 542 MT of CO_2 emissions.

Reduced greenhouse gases can be calculated for energy savings stemming from the HECW program as well, using the EPA emissions estimate listed above. With approximately 310 MWh of electricity savings due to this particular program, roughly 108 MT of corresponding CO_2 emissions are also avoided.

Benefit Uncertainty

The energy required to heat water for residential washing machines varies depending on the number of loads per household, the type of high-efficiency machine purchased, and the individual machine settings used for each household. The estimate for energy consumption per gallon is based on participants' energy use from previous conservation programs, which were subject to these same uncertainties, and is a standard estimate of household energy use for the SCWD-2 project. Commercial machines are expected to see much higher use, and higher energy consumption as a result. Actual energy savings will therefore be higher if any of the rebated machines are used in a commercial setting.

The estimate of avoided energy use through reduced use of SWP supplies does not include energy required to transport water from Castaic Lake to SCWD for retail distribution, so the energy associated with imports is a conservative estimate.

The projected carbon emissions benefit resulting from avoided water imports is subject to the same uncertainty as the energy savings estimates. Any variation in the energy savings from avoided imports based on SWP water sources would have a direct impact on the amount of avoided carbon emissions.

Similarly, HECW energy savings are dependent upon user variability. Given that data exist for both baseline water use and savings from previous HECW programs, actual benefits will likely be very close to the estimate used in this analysis.

New Facilities Required to Achieve Benefit

No new facilities or expansion of current facilities are required to achieve water quality benefits for any of the SCWD-2 programs.

Potential Adverse Physical Effects

No adverse physical effects are expected from the project.

Summary of Benefit

Avoided energy use will save a total of 650 MT of CO_2 emissions over the 14-year benefits lifespan of the SCWD-2 project. As is shown in Table 7-4, 1,548 MWh of energy saved through avoided transportation of imported water will avoid approximately 542 MT of CO_2 emissions. Table 7-5 shows that 310 MWh of energy conserved by reducing hot water used by clothes washers will avoid another 108 MT of CO_2 emissions.

TABLE 7-4: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Water Division Water Use Efficiency Programs (SCWD-2)			
Type of Benefit Claimed: Reduced Carbon Dioxide Emissions From Avoided SWP Imports			
Measure of Benefit Claimed (Name of Units): Metric Tons			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	0	8.28	8.28
2014	0	44.69	44.69
2015	0	79.44	79.44
2016	0	79.44	79.44
2017	0	79.44	79.44
2018	0	72.57	72.57
2019	0	45.07	45.07
2020	0	24.44	24.44
2021	0	24.44	24.44
2022	0	24.44	24.44
2023	0	24.44	24.44
2024	0	21.13	21.13
2025	0	9.80	9.80
2026	0	4.20	4.20

Comments:

TABLE 7-5: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Santa Clarita Water Division Water Use Efficiency Programs (SCWD-2)			
Type of Benefit Claimed: Reduced Carbon Dioxide Emissions From HECW Energy Savings			
Measure of Benefit Claimed (Name of Units): Metric Tons			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2013	0	1.13	1.13
2014	0	5.65	5.65
2015	0	9.03	9.03
2016	0	9.03	9.03
2017	0	9.03	9.03
2018	0	9.03	9.03
2019	0	9.03	9.03
2020	0	9.03	9.03
2021	0	9.03	9.03
2022	0	9.03	9.03
2023	0	9.03	9.03
2024	0	9.03	9.03
2025	0	7.90	7.90
2026	0	3.39	3.39
Comments:			

Summary of Annual Project Physical Benefits

Full project benefits will accrue beginning in 2015. At this time, water conservation resulting from the three programs will yield avoided SWP imports of 156 AFY and avoided wastewater treatment of 22 AF of water per year. Avoided water imports will result in 227 MWh/year in energy savings, and reduction in hot water demand due to HECWs will save 26 MWh/year. Energy savings from avoided transportation of imported water will prevent roughly 79 MT of carbons emissions each year, and avoided energy production due to HECW water savings will avoid approximately 9 MT of CO_2 emissions per year. Finally, avoiding 156 AF/year of SWP imports will also prevent 15 MT of chlorides from entering the Upper Santa Clarita River Watershed annually.

References

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Foothill Feeder Connection (CLWA-8)

Introduction

This attachment presents the technical justification for the Foothill Feeder Connection Project. A project abstract and general discussion of the without project baseline are followed by a discussion of the physically quantified benefit, and a summary of the physically quantified benefit claimed.

Project Abstract

The purpose of this project is to increase the amount of imported water that the Castaic Lake Water Agency (CLWA) can process through its recently expanded Rio Vista Water Treatment Plant (RVWTP). Before it is used by CLWA, the imported water moves through Castaic Lake to the Metropolitan Water District of Southern California's Foothill Feeder Pipeline. Water taken by CLWA from the Foothill Feeder is sent to CLWA's 102-inch raw water pipeline that feeds CLWA's Rio Vista Water Treatment Plant. This connection was intended to be a temporary structure. Construction of this permanent Foothill Feeder connection will include installation of approximately 200 feet, 48-inch diameter pipeline; a 140 cubic feet per second (cfs)/90 MGD turnout structure, valve vault, and meter vault; and installation of electrical and supervisory control and data acquisition (SCADA) equipment.

The current water connection that conveys water from the Foothill Feeder to the RVWTP can only supply 60 million gallons per day (MGD), even though, after a recent expansion, the RVWTP is capable of treating 66 MGD (Kennedy/Jenks Consultants, 2012). Moreover, the 60 MGD connection, built in 1996, was meant to be temporary. This project will create a new, permanent connection to the RVWTP so that the plant can obtain its capacity of 66 MGD, an increase of 6 MGD, or 6,720 AFY, over its current capacity.[6] The new connection will have a maximum capacity of 90 MGD, so that it can accommodate planned expansions of the RVWTP. The new connection will have a design life of 50 years.

Without Project Baseline

Without the project, the RVWTP can only process 60 MGD as that is the capacity of the connection that moves water flowing through the Foothill Feeder to the RVWTP. Thus, when demand is greater than 60 MGD, groundwater, CLWA's other main water source, must be pumped at a higher rate than normal to meet users' needs. Currently, demand is only greater than 60 MGD on the highest use days. On a short-term basis, pumping groundwater at a higher rate than normal is feasible. On days when demand is lower than 60 MGD, groundwater pumping can be relaxed and the RVWTP can process more water, allowing the total amount of groundwater pumped over a time period to remain constant.

However, as the water demand CLWA increases over time (due to population increases), there will be more days when demand is above 60 MGD, forcing more groundwater pumping. Over the long-term, pumping groundwater at a higher rate than normal is not feasible. Prolonged pumping of groundwater above natural recharge rates is not sustainable as it will lead to long-term groundwater level declines, resulting in increased pumping costs and decreased groundwater quality.

When CLWA reaches this juncture, it will rely on the marginal sources of the alternative supplies it has identified to obtain water, namely recycled water and water conservation (A&N Technical Services, 2008). In this analysis, it is assumed that each of these methods would contribute half towards CLWA's water needs in the without-project condition. Thus, of the additional 2,240 AFY of water that the RVWTP would process with the project, without the project this water would come from transmitting and distributing an additional 1,120 AFY of recycled water and reducing demand by an additional 1,120 AFY through water conservation measures.

[6] One MGD is approximately 1,120 acre-feet per year.

Recycled water can be used for needs that do not require water to meet potable water standards. By using recycled water for needs such as irrigation that do not require potable water, CLWA can use the potable water that its customers had previously been using for irrigation for needs that actually require water to meet potable water standards. CLWA currently projects expansion of recycled water use by its retailers to grow by 7,775 AF by 2030 and by 20,975 AF by 2050 over current recycled water use (Kennedy/Jenks et al., 2011).

Without the project, CLWA will need to construct a pump station, reservoir, and transmission and distribution pipelines in order to obtain an additional 1,120 AFY of recycled water. This infrastructure would need to be operational by approximately 2020, the first year that CLWA projects in current planning discussions that demand would be too great to simply pump more groundwater to cover peaks in demand.

Likewise, the water conservation measures that would reduce demand by 1,120 AFY would need to be in place by 2020. Water conservation measures that CLWA could implement in its service area include new standards for plumbing fixtures, landscape irrigation, and buildings. During an average water year, CLWA projects that water conservation measures will reduce water demand by 39,518 AF by 2030 and 46,149 AF by 2050 that would otherwise be demanded (Kennedy/Jenks et al., 2011).

Relationship of Project to Other Projects Included in the Proposal

This project is not directly related to any of the other projects in the proposal for the Upper Santa Clara River region.

Description of Expected Physical Benefits

The following (quantifiable) physical benefit is expected from this project:

- Due to an increase in the capacity enabled by the Foothill Feeder Connection, the RVWTP will be able to treat 66 MGD instead of the 60 MGD it currently can, an increase of 6 MGD.

This benefit is discussed in further detail below.

Benefit: the RVWTP will be able to treat 66 MGD instead of the 60 MGD it currently can when the Foothill Feeder Connection is expanded

With the project, the capacity of the Foothill Feeder Connection will increase, allowing the RVWTP to process an additional 6 MGD. The additional 6 MGD of water that can be processed by the RVWTP will eliminate the need to construct additional facilities for recycled water and implement additional water conservation measures.

Background and Historical Conditions

In 2010, the RVWTP expanded from 30 MGD to 66 MGD. However, the connection off of the Foothill Feeder leading to the plant continues to have a capacity of 60 MGD. As the size of the connection is smaller than the operating capacity of the RVWTP, the RVWTP cannot currently operate at full capacity. The new Foothill Feeder connection will have a maximum capacity of 90 MGD, so that it can accommodate planned expansions of the RVWTP.

Without-Project Condition

Without the project, the RVWTP will only be able to process 60 MGD due to the capacity of the Foothill Feeder Connection. As the demand for water increases over time with population growth, by 2020, CLWA projects that it will not be able to meet this demand with the amount of imported water and groundwater sources it currently can process.

In order to meet demand, without the project CLWA will need to construct a pump station, reservoir, and transmission and distribution pipelines in order to obtain an additional 1,120 AFY of recycled water. The recycled water will be able to be used for activities that do not require the water to meet potable standards. By using the recycled water for certain activities, the water meeting potable standards can be used for activities that require higher water quality standards.

In addition, CLWA will need to implement water conservation measures that will reduce water demand by 1,120 AFY. Water conservation measures could include new standards for plumbing fixtures, landscape irrigation, and buildings.

Methods Used to Estimate Benefits

The increased size of the Foothill Feeder Connection, allowing for the RVWTP to process an additional 6 MGD of water (Kennedy/Jenks Consultants, 2012), will eliminate the need for CLWA to construct recycled water infrastructure and implement water conservation measures. Attachment 8 states the cost for the recycled water infrastructure and water conservation measures.

Benefit Uncertainty

With the project, there is no uncertainty about the increase in the size of the Foothill Feeder Connection. The capacity of the connection will increase, allowing the RVWTP to process an additional 6 MGD of water. The size of the connection itself will actually increase from 60 MGD to 90 MGD, not just to 66 MGD.

The future year in which CLWA will need additional imported water supplied by the Foothill Feeder is uncertain. CLWA currently projects in planning discussions that this point will be reached 5 to 10 years into the future. We have assumed this point will be reached by the year 2020, assuming a relative midpoint between 5 and 10 years.

New Facilities Required to Achieve Benefits

The connection itself is the only new facility needed to achieve this benefit. However, the expansion of the RVWTP in 2010 made this project possible, as without a larger water treatment plant there would be no benefit from increasing the capacity of the connection.

Potential Adverse Physical Effects

There are no potential adverse physical effects from increasing the size of the Foothill Feeder Connection.

Summary of Benefits

This project will increase the size of the Foothill Feeder Connection, allowing the RVWTP to process an additional 6 MGD of water. The additional water processed will prevent the need for CLWA to construct recycled water infrastructure and implement water conservation measures. The physical benefit associated with increasing the capacity of the Foothill Feeder Connection by 6 MGD claimed for the project is shown in Table 7-1.

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Foothill Feeder Connection Project			
Type of Benefit Claimed: Water processed through the Rio Vista Water Treatment Plant			
Measure of Benefit Claimed (Name of Units): Million Gallons per Day			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012			
2013			
2014			
2015	60	66	6
2016	60	66	6
2017	60	66	6
2018	60	66	6
2019	60	66	6
2020	60	66	6
2021	60	66	6
2022	60	66	6
2023	60	66	6
2024	60	66	6
2025	60	66	6
2026	60	66	6
2027	60	66	6
2028	60	66	6
2029	60	66	6
2030	60	66	6
2031	60	66	6
2032	60	66	6
2033	60	66	6
2034	60	66	6
2035	60	66	6
2036	60	66	6
2037	60	66	6
2038	60	66	6
2039	60	66	6
2040	60	66	6
2041	60	66	6
2042	60	66	6
2043	60	66	6
2044	60	66	6
2045	60	66	6

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Foothill Feeder Connection Project			
Type of Benefit Claimed: Water processed through the Rio Vista Water Treatment Plant			
Measure of Benefit Claimed (Name of Units): Million Gallons per Day			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2046	60	66	6
2047	60	66	6
2048	60	66	6
2049	60	66	6
2050	60	66	6
2051	60	66	6
2052	60	66	6
2053	60	66	6
2054	60	66	6
2055	60	66	6
2056	60	66	6
2057	60	66	6
2058	60	66	6
2059	60	66	6
2060	60	66	6
2061	60	66	6
2062	60	66	6
2063	60	66	6
2064	60	66	6

Comments: With the project, the new Foothill Feeder Connection will allow the Rio Vista Water Treatment Plant to process 66 million gallons per day of water. Without the project, the Rio Vista Water Treatment Plant would only be able to process 60 million gallons per day, the maximum capacity of the current connection.

The new connection has an expected life of 50 years, from 2015 to 2054.

Summary of Annual Project Physical Benefits

The physical benefit claimed for this project is the increased capacity of the RVWTP to process an additional 6 MGD of water due to an increase in the capacity of the Foothill Feeder Connection.

References

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Pellet Water Softening Treatment Plant - Phase 1 (NCWD-2)

Introduction

This attachment presents the technical justification for Newhall County Water District's Pellet Water Softening Treatment Plant – Phase 1. A project abstract and general discussion of the without project baseline are followed by a discussion of each physically quantified benefit, and a summary of physically quantified benefits claimed.

Project Abstract

This project is Phase 1 of a proposal by the Newhall County Water District (NCWD) to build a pellet water softening treatment plant. The purpose of this plant would be to improve drinking water quality for 3,800 of NCWD's connections by an estimated 182 mg/L reduction in hardness in drinking water. Phase 1 of the project involves three studies. First, a water quality analysis is necessary to determine the area's suitability for a pellet softener treatment plant. Next, these results will be incorporated into a conceptual design, which will determine appropriate sizing, chemical and input needs, land requirements and capital, and operations and maintenance (O&M) costs. Finally, a rate study and consumer demand analysis is needed to determine consumers' reaction to potential rate increases involved with the project.

Because the benefits of this project will not be realized until construction of the plant is completed under a later phase of the overall project, benefits for this portion of the project have been apportioned using ratios of cost estimates. The present value of the Phase 1 budget is $177,620, and it is estimated that the entire plant would cost roughly $5.9 million for construction and O&M costs over the project lifetime. Therefore, expected benefits assigned to this portion of the project are $177,620 / $5,918,812 = 3% of the total benefits from the completion of the plant.

Without Project Baseline

NCWD is one of four water retail water purveyors in the Santa Clarita Valley. Local groundwater produced in the Santa Clarita Valley contains high concentrations of naturally occurring minerals such as calcium and magnesium – two ions that when in water are commonly referred to as "hardness". The hardness of water delivered by NWCD is currently 355 mg/L, and is generally considered hard to very hard according to standard rating scales [e.g. Sawyer and McCarty (1967) as presented in Bookman Edmonston Engineering, 1999]. Customers have addressed these problems by installing in-home water softening devices at their own expense. Many people find hard water unpleasant. Excessive hardness causes scale formation, which can shorten the useful lives of water heaters, pipes and other water using appliances, and reacts with soap to form a scum which prohibits lathering and leaves spots and grime on glass dishes (Bookman Edmonston Engineering Inc., 1999).

One type of water softener commonly installed by residents is the Automatic Water Softeners (AWS), which automatically regenerates the unit, and discharges salts to the wastewater system. These salts end up in the collection system for the Santa Clarita Valley Sanitation District (Sanitation District), and in the effluent of the Valencia and Saugus Water Reclamation Plants (WRPs). The other option is a canister-based softening system, which does not discharge chlorides, but is more expensive for the customer to own because they must hire a service to replace the canisters.

One of the salts discharged by AWS is chloride. These chlorides end up in effluent of the WRPs and are discharged to the Santa Clara River. The river then percolates into groundwater or flows downstream occasionally during high flow events. Groundwater, and water from the river as a supplemental source, are used to irrigate downstream crops, including avocados and strawberries, which are both highly chloride sensitive.

These discharges are a serious environmental concern and salt-based in-home self-regenerating water softening devices are one of the largest sources of chlorides discharged to the river. As a result, the Los

Angeles Regional Water Quality Control Board (LARWQCB) established Total Maximum Daily Loads (TMDLs) for discharge of chlorides to the Santa Clara River. A Total Maximum Daily Load (TMDL) for chloride in the Upper Santa Clara River (USCR) (Reaches 5 and 6) was adopted by the LARWQCB and became effective on May 5, 2005. The Basin Plan Amendment for the chloride TMDL in the USCR was unanimously adopted by the LARWQCB on December 11, 2008 (LARWQCB, 2008). The TMDL established waste load allocations of 100 milligrams/liter (mg/L) for the WRPs.

To help meet the goal of reducing chloride loads in the Santa Clara River, the Sanitation District passed an ordinance in 2003 banning the installation of all new AWS. Passage of this Ordinance gave the Sanitation District authority to remove all AWSs remaining in the Santa Clarita Valley that were installed prior to 2003 (Sanitation Districts of Los Angeles County, 2012).

This Pellet Water Softening Treatment Plant - Phase 1 Project, when all phases are completed, will provide residents with a central treatment option for dealing with the effects of hardness in drinking water. In the absence of the proposed pellet based water softening plant, residents can either accept hard water and its effects— including reduced water using appliance lifetime, staining, and residue on glassware—or they can use a personal, point-of-use water softener that is not self-regenerating.

Relationship of Project to Other Projects Included in the Proposal

This project is related to the AWS Rebate Program being conducted by the Sanitation District. That project aims to remove an estimated 500 automatic water softeners among the Sanitation District's 70,000 customers. The proposed NCWD pellet water softening treatment plant will provide a water softening alternative to some of the customers in the Santa Clarita Valley and help dampen the impacts of the AWS removal for homes affected. NCWD's 3,800 customers are about 5% of the customers served by the Sanitation District.

Description of Expected Physical Benefits

The following (quantifiable) physical benefits are expected from this phase of the project:

- When operational, the pellet water softening treatment plant will reduce water hardness by approximately 50%, from approximately 355 mg /L to approximately 173 mg/L, for a total reduction of approximately 182 mg/L. Apportioning this quantity component costs, Phase 1 is responsible for 5.46 mg/L of this reduction.
- The plant's byproducts take the form of crystallized sand-calcium carbonate "pellets", which can be beneficially reused in a variety of applications. When running, the plant will produce an estimated 4.5 cubic yards of pellets per day. When apportioning the pellets produced by operation of the treatment plant using the ratio of cost of Phase 1 of the project to the full treatment plant, Phase 1 accounts for 0.135 cubic yards a day, or about 49 cubic yards annually.

Each benefit is discussed in further detail below.

Benefit: Reduced Hardness in Drinking Water

The primary benefit of the NWCD pellet water softening treatment plant will be to decrease water hardness by approximately 50%, from the range of 355 mg/L to the range of 173 mg/L for 3,800 homes.

Background and Historical Conditions

NCWD is one of four retail water purveyors in the Santa Clarita Valley. Local groundwater produced in the Santa Clarita Valley contains high concentrations of naturally occurring minerals such as calcium and magnesium – the two ions that are referred to as "hardness". The hardness of water delivered by NCWD is

currently in the range of 355 mg/L and is generally considered hard to very hard. Customers have addressed these problems by installing in-home water softening devices at their own expense. Many people find hard water unpleasant. Excessive hardness causes scale formation which can shorten the useful lives of water heaters, pipes and other water using appliances, and reacts with soap to form a scum which prohibits lathering and leaves spots and grime on glass dishes (Bookman Edmonston Engineering Inc., 1999).

Without-Project Conditions

Historically, residents have dealt with the hard water in part by installing Automatic Water Softeners in their homes. However, the high-chloride effluent produced by the WRPs put the Sanitation District in violation of the 100 mg/L limit set by the LARWQCB and AWS were banned in 2003. Since then, law-abiding residents of NCWD have been forced either to deal with the consequences of hard water or install an ion exchange system involving canisters that must be replaced every month. The Sanitation District estimates that approximately 500 AWS remain in the Santa Clarita Valley.

Without the project, customers of NWCD would not have a central treatment alternative to deal with effects of hardness in water served to them. Because AWSs are banned, their alternatives are to pay for non-self regenerating water softeners or to accept the effects of hard water.

Methods Used to Estimate Benefits

Estimates of hardness concentration reductions come from a similar plant constructed at the Valencia Water Company (VWC), as well as the typical experience in the Netherlands, where pellet based softening plants are more common. Once the plant is operational after construction in Phase 3, total hardness is expected to be 182 mg/L, which is a reduction of 173 mg/L from current hardness of hardness range of 355 mg/L. This is based on water quality results from NCWD. Phase 1 costs are estimated at $178,000, which is 3% of the present value estimated $5.9 million in costs for all three phases of the treatment plant combined. Therefore, the benefit claimed for this project is a reduction in hardness of 5.46 mg/L as calcium carbonate (3% of 182 mg/L).

Benefit Uncertainty

Estimating a reduction in hardness involves some uncertainty, although much of it will be resolved once the water quality portion of Phase 1 is complete. Much of the experience with these plants comes from projects built in the Netherlands, which faces a potentially different set of hydrological conditions. The VWC – whose service area is adjacent to NCWD's – built a similar pellet treatment demonstration plant nearby, although these plants differ somewhat, particularly in terms of capacity. This uncertainty is partly mitigated by the fact current NCWD staff has experience working on the VWC demonstration plant, and a detailed understanding of how these two projects differ. In addition, much of this uncertainty will be resolved in Phase 1 after the groundwater study provides a more precise estimate of changes.

New Facilities Required to Achieve Benefits

Ultimately, the overall project involves constructing a pellet-based water softening treatment plant. No facilities are constructed in the phase under current consideration.

Potential Adverse Physical Effects

No adverse physical effects are anticipated.

Pellet Water Softening Treatment Plant - Phase 1 (NCWD-2)

Summary of Benefit

As is shown in Table 7-1, completion of the pellet treatment plant will result in an estimated 173 mg/L reduction in total hardness, primarily through reductions in calcium. NCWD residents without existing personal water softening systems will see their hardness levels go from a range of 355 mg/L to an estimated range of 182 mg/L. Residents with existing ion-replacement canister systems will no longer have to spend their time or money maintaining their systems and changing the canisters. In addition, they may see a slight increase in hardness levels that may be preferable (e.g., less slimy).

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Pellet Water Softening Treatment Plant (NCWD-2)			
Type of Benefit Claimed: Reduction in Hardness of Drinking Water Due to Pellet Treatment Plant			
Measure of Benefit Claimed (Name of Units): milligrams per liter (mg/L)			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012			
2013			
2014			
2015			
2016			
2017			
2018	355	173	182
2019	355	173	182
2020	355	173	182
2021	355	173	182
2022	355	173	182
2023	355	173	182
2024	355	173	182
2025	355	173	182
2026	355	173	182
2027	355	173	182
2028	355	173	182
2029	355	173	182
2030	355	173	182
2031	355	173	182
2032	355	173	182
2033	355	173	182
2034	355	173	182
2035	355	173	182
2036	355	173	182
2037	355	173	182
2038	355	173	182

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Pellet Water Softening Treatment Plant (NCWD-2)			
Type of Benefit Claimed: Reduction in Hardness of Drinking Water Due to Pellet Treatment Plant			
Measure of Benefit Claimed (Name of Units): milligrams per liter (mg/L)			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2039	355	173	182
2040	355	173	182
2041	355	173	182
2042	355	173	182
2043	355	173	182
2044	355	173	182
2045	355	173	182
2046	355	173	182
2047	355	173	182
2048	355	173	182
2049	355	173	182
2050	355	173	182
2051	355	173	182
2052	355	173	182
2053	355	173	182
2054	355	173	182
2055	355	173	182
2056	355	173	182
2057	355	173	182
2058	355	173	182
2059	355	173	182
2060	355	173	182
2061	355	173	182
2062	355	173	182
2063	355	173	182
2064	355	173	182
2065	355	173	182
2066	355	173	182
2067	355	173	182
Comments:			

Pellet Water Softening Treatment Plant - Phase 1 (NCWD-2)

Benefit: Production of 49 cubic yards per year of sand-calcium carbonate pellets

Background and Historical Conditions

The pellet softening process utilizes chemical precipitation methods for removing calcium hardness. The calcium removed through a pellet softener treatment plant ends up crystallizing with grains of sand to form calcium carbonate "pellets", which are easily removed. When the pellets are removed, they are typically 1 mm in size and are easy to dewater. The dewatered pellets are the only waste stream from the pellet softener treatment plant. These pellets can be beneficially used as a soil amendment, as construction fill, in agriculture as an animal feed additive, manufacturing of textiles, and for industrial uses including steel making. If no beneficial users are found, the pellets can also be sent to landfill. (Kennedy/Jenks Consultants, 2009). Pellets from the nearby VWC demonstration plant were used by construction materials firms, but those entities did not pay for them other than trucking costs.

Without-Project Conditions

Without the project, residents that are interested in softening their water would need to purchase softeners that do not automatically regenerate the unit. Without the pellet softening plant, calcium carbonate pellets will not be produced.

Methods Used to Estimate Benefits

Estimates of the amount of pellets produced as a byproduct of the pellet softening process come from experience with similar plants, both in the Netherlands as well as in Valencia. Once the plant is up and running, operators expect 1,642.5 cubic yards of pellets to be produced annually (Kennedy/Jenks Consultants, 2009). After apportioning the amount of pellets to be produced by the full plant based on the ratio of cost for Phase 1 compared to cost to make the full treatment plant operational, the physical benefit claimed is 49.28 cubic yards annually (1,642.5 cubic yards multiplied by 3%).

Benefit Uncertainty

The estimate of cubic yards of pellets produced is based on the experience of softener treatment plants potentially facing different sets of water quality and other conditions, which could be a source of uncertainty. This is partly mitigated by the fact current NCWD staff has experience working on the VWC plant and a detailed understanding of how these two projects differ. In addition, much of this uncertainty will be resolved partway through this project after the groundwater study gives management a more precise estimate of changes.

New Facilities Required to Achieve Benefits

Ultimately, the full project involves constructing a pellet-based water softening treatment plant. No facilities are constructed in the project phase under current consideration.

Potential Adverse Physical Effects

No adverse physical effects anticipated.

Summary of Benefit

Unlike point-of-use alternatives, pellet water softener plants produce by-products can be used in many different uses including the production of textiles, blasting for steel manufacturing and agriculture. As is

shown in Table 7-2, the portion of calcium carbonate pellets claimed in this portion of the project is 49 cubic yards annually for 2018 - 2067.

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Pellet Water Softening Treatment Plant (NCWD-2)			
Type of Benefit Claimed: Amount of Pellets Produced Per Year That Can Be Beneficially Reused			
Measure of Benefit Claimed (Name of Units): Cubic Yards			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012			
2013			
2014			
2015			
2016			
2017			
2018	0	49	49
2019	0	49	49
2020	0	49	49
2021	0	49	49
2022	0	49	49
2023	0	49	49
2024	0	49	49
2025	0	49	49
2026	0	49	49
2027	0	49	49
2028	0	49	49
2029	0	49	49
2030	0	49	49
2031	0	49	49
2032	0	49	49
2033	0	49	49
2034	0	49	49
2035	0	49	49
2036	0	49	49
2037	0	49	49
2038	0	49	49
2039	0	49	49
2040	0	49	49
2041	0	49	49
2042	0	49	49
2043	0	49	49

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Pellet Water Softening Treatment Plant (NCWD-2)			
Type of Benefit Claimed: Amount of Pellets Produced Per Year That Can Be Beneficially Reused			
Measure of Benefit Claimed (Name of Units): Cubic Yards			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2044	0	49	49
2045	0	49	49
2046	0	49	49
2047	0	49	49
2048	0	49	49
2049	0	49	49
2050	0	49	49
2051	0	49	49
2052	0	49	49
2053	0	49	49
2054	0	49	49
2055	0	49	49
2056	0	49	49
2057	0	49	49
2058	0	49	49
2059	0	49	49
2060	0	49	49
2061	0	49	49
2062	0	49	49
2063	0	49	49
2064	0	49	49
2065	0	49	49
2066	0	49	49
2067	0	49	49

Comments:

Based on VWC's demonstration project, approximately 1 cubic yard of pellets was generated for every million gallons of water treated.

Summary of Annual Project Physical Benefits

The physical benefits claimed for this project include 182 mg/L reduction in total hardness and 49 cubic yards/year of calcium-carbonate pellets.

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Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

Introduction

This attachment presents the technical justification for Santa Clarita Valley Sanitation District's (Sanitation District's) Automatic Water Softener Rebate and Public Outreach Program. A project abstract and general discussion of the without project baseline are followed by a discussion of each physically quantified benefit, and a summary of physically quantified benefits claimed.

Project Abstract

The Sanitation District operates two water reclamation plants (WRPs) in the Santa Clarita Valley, the Saugus and Valencia WRPs. The Saugus and Valencia WRPs discharge treated wastewater into the Upper Santa Clara River, which contains chloride in excess of the water quality objective for the Upper Santa Clara River of 100 mg/L. Because residential automatic water softeners (AWS) have been the largest controllable source of chloride, the source control efforts have focused on the removal of these units. To help reduce contributions from this source, the Sanitation District has been implementing an Automatic Water Softener Public Outreach Program since February 2003. Phases I and II of this program have removed 7,900 AWS, reducing chloride concentrations by more than 50 mg/L. Despite these gains, chloride concentrations in 2011 were about 18 mg/L over the 100 mg/L water quality objective, in part due to an estimated 500 remaining active AWS. This project will implement the final phase of the Automatic Water Softener Rebate and Public Outreach Program, which will remove the remaining AWS. The program will consist of home inspections, issuing Notices of Violations to residents that still have their AWS, issuing rebates to residents that remove their AWS, chloride monitoring, and public outreach. The Sanitation District estimates removing these remaining AWS will reduce chloride concentrations by approximately 5 mg/L.

Without Project Baseline

In 2011, the flow-weighted average chloride concentration in the final effluent discharged from the Saugus and Valencia WRPs was 118 mg/L (Sanitation Districts of Los Angeles County, 2012). In the absence of this project, the Sanitation District estimates 500 AWS may remain active. In 2011, these AWS were estimated to be responsible for 5 mg/L of the 18 mg/L of the remainder over the chloride concentration limit. The Sanitation District has discussed with the Los Angeles Regional Water Quality Control Board the options for achieving required chloride concentration reductions. These discussions have indicated that, whether the remaining rebate program goes into effect or not, the Sanitation District will likely need to build a microfiltration / reverse osmosis (MF/RO) plant to reach the chloride limits. The rebate program will allow the Sanitation District to reduce the size of the advanced wastewater treatment (MF/RO) processes required to remove chloride. The additional MF/RO treatment required without the project would use more energy, emitting more greenhouse gases. In addition, because each automatic water softener consumes on average more than 4,400 gallons of water per year when it regenerates the softener, water use without the project will be higher than it will be with the project.

Relationship of Project to Other Projects Included in the Proposal

This project is one of two projects in the Upper Santa Clara River region proposal that directly are related to high levels of different salts in drinking water in the Santa Clarita Valley. This project addresses the remaining AWS, which are used to lower hardness in drinking water, with the aim of eliminating their contribution to chloride loading in effluent from the Valencia and Saugus WRPs. The other related project is the Newhall County Water District's (NCWD's) proposed Pellet Water Softening Treatment Plant – Phase 1. The Sanitation District as a whole serves about 83,000 households; the proposed NCWD treatment plant would provide about 3,800 (or about 5%) of these customers with an alternative to water softening/conditioning. Although these projects are related, neither project depends on the other in order to generate benefits.

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

Description of Expected Physical Benefits

The following (quantifiable) physical benefits are expected from this phase of project:

- Reduce chloride concentrations in the Upper Santa Clara River by approximately 5 mg/L
- Reduce potable water demand by approximately 6.78 acre feet/year (AFY)
- Avoid approximately 994 MT CO_2 equivalent emissions annually through reduction in size of future chloride treatment plant

Each benefit is discussed in further detail below.

Benefit: Reduce chloride concentrations in the Upper Santa Clara River by 5 mg/L

The Sanitation District estimates about 500 remaining AWS are actively discharging chlorides that ultimately are discharged to the Santa Clara River. The removal of these as part of this project will reduce chloride concentrations in Saugus and Valencia WRP effluent by approximately 5 mg/L.

Background and Historical Conditions

Most of the soils, surface water, and groundwater in the Upper Santa Clara River Watershed contain high levels of chloride. Primary sources of chlorides in surface water and groundwater include imported surface water (i.e., SWP supplies) and discharges from wastewater plants (i.e., Valencia and Saugus WRPs). Since the 1970s, growth in the SCV has increased the demand for imported water. Also, chloride levels in the USCR and in nearby groundwater basins have varied significantly based on hydrologic conditions and have at times exceeded the water quality objectives (WQOs) for chloride, and may impair beneficial uses for agricultural supply as well as groundwater recharge. As a result of these factors, a total maximum daily load (TMDL) for chlorides has been established for the Santa Clara River.

In order to help meet chloride concentration reduction goals, the Sanitation District adopted the Santa Clara River Chloride Reduction Ordinance of 2008, which required the removal and disposal by June 30, 2009 of all existing AWS installed in the Sanitation District's service area. Prior to their ban, residential AWS were the single largest controllable source of chloride that entered the Santa Clara River. Since the Sanitation District implemented the Automatic Water Softener Rebate and Outreach Program in 2003, it has removed more than 7,900 AWS, reducing chloride concentrations by more than 50 mg/L (Sanitation Districts of Los Angeles County, 2012). Despite these gains, the chloride concentration in effluent from the treatment plants is still higher than the state mandated limit of 100 mg/L. In order to meet the 100 mg/L limit, it will most likely be necessary to build a MF/RO plant. By removing approximately 5 mg/L of chloride concentration attributed to the remaining discharging AWS, the rebate program allows the Sanitation District to build a relatively smaller (and less expensive) MF/RO plant.

Without-Project Conditions

Without the final phase of the Automatic Water Softener Rebate Program, the Sanitation District estimates 500 AWS may remain operational. In 2011, these AWS were responsible for an estimated 5 mg/L of the 118 mg/L chloride concentration in final effluent from the Saugus and Valencia WRPs. The Sanitation District needs to reduce the chloride concentration in treatment plant effluent to 100 mg/L, and will likely do so through construction of a MF/RO treatment plant. Thus without this program, the advanced wastewater treatment processes for chloride removal required to meet this mandate will need to be larger.

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

Methods Used to Estimate Benefits

The 2012 Chloride Source Identification/Reduction, Pollution Prevention, and Public Outreach Plan estimated that approximately 6 mg/L was discharged during 2011 from residential AWS (Sanitation Districts of Los Angeles County, 2012). The chloride loading contributed from residential AWS was estimated using a differential method, whereby all other chloride loadings were subtracted from the total chloride loading and the difference was assumed to be contributed by residential AWS. The other sources of chloride estimated in the analysis included potable water supply, non-residential AWS, disinfection at the WRPs, the industrial sector, the commercial sector, and hauled waste.

While the method provides a good estimate of the contribution from remaining residential AWS, the Sanitation District has rounded the 6 mg/L estimate from the 2012 Chloride Report to 5 mg/L in order to recognize the uncertainty associated with this estimate. Please also note that the chloride data per source in 2012 Chloride Report are estimates based on numerous assumptions and best professional judgment. Many inputs are difficult to quantify and the analysis represents the best available information at this time.

Benefit Uncertainty

The Sanitation District reports that there is significant uncertainty in the data used for the calculations of the chloride contribution from the remaining residential AWS. The results of sampling vary over time and therefore the result of the calculations changes over time. Chloride contributions from AWS are expected to vary over time due to changes in household water use, changes in source water quality over time and changes in the water quality of those sources, and other factors. To reflect that uncertainty associated with this estimate, the Sanitation District has rounded the 6 mg/L estimate from the 2012 Chloride Report to 5 mg/L.

New Facilities Required to Achieve Benefits

No new facilities are needed to achieve this benefit.

Potential Adverse Physical Effects

No adverse physical effects anticipated due to reduction in chloride concentrations water demand.

Summary of Benefit

Despite their substantial reduction in numbers as a result of Phases I and II of the Automatic Water Softener Rebate and Public Outreach Program, residential AWS remain a significant issue for the Sanitation District as it attempts to meet the state chloride mandate of 100 mg/L. As is shown in Table 7-1, by removing the remaining 500 operational AWS, the Sanitation District estimates it will be able to reduce chloride concentrations in Valencia and Saugus WRP effluent by approximately 5 mg/L.

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)			
Type of Benefit Claimed: Reduction in Chloride Concentration in Water Reclamation Plant Effluent Due to AWS Removal			
Measure of Benefit Claimed (Name of Units): milligrams per liter (mg/L)			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012			
2013			
2014			
2015			
2016			
2017	0	5	5
2018	0	5	5
2019	0	5	5
2020	0	5	5
2021	0	5	5
2022	0	5	5
2023	0	5	5
2024	0	5	5
2025	0	5	5
2026	0	5	5
2027	0	5	5
2028	0	5	5
2029	0	5	5
2030	0	5	5
2031	0	5	5
2032	0	5	5
2033	0	5	5
2034	0	5	5
2035	0	5	5
2036	0	5	5
2037	0	5	5
2038	0	5	5
2039	0	5	5
2040	0	5	5
2041	0	5	5
Comments:			

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

Benefit: Reduce potable water demand by 6.78 AFY

A single automatic water softener uses approximately 50 gallons of water per 4.13 day regeneration cycle, or more than 4,400 gallons per year. Assuming the Sanitation District removes 500 operational AWS, this will save a total of more than 6.78 AFY.

Background and Historical Conditions

AWS soften water through ion exchange, which involves replacing the hard elements of water, calcium and magnesium ions, with sodium or potassium ions. These sodium or potassium ions are replenished in a process known as regeneration, which consumes significant amounts of water – 50 gallons every 4.13 days on average.

Water savings will accrue to water retailers served by the Castaic Lake Water Agency (CLWA) which is a wholesale water provider in the Santa Clarita Valley. CLWA imports State Water Project (SWP) water from the Sacramento-San Joaquin Delta to Castaic Lake through SWP facilities. CLWA currently provides about 43,000 AFY of SWP water (imported via CLWA) to four water purveyors within the watershed (Kennedy/Jenks et al., 2011). This amounts to roughly one-half of total service area potable water demands. The balance of potable demand within the service area is met through local groundwater sources.

Without-Project Conditions

Without the project, 500 AWS may remain operational. In 2011, these AWS were responsible for an estimated 5 mg/L of the 118 mg/L concentrations of chloride in the Santa Clara River. The Sanitation District needs to reduce chloride concentrations in wastewater plant effluent to 100 mg/L. Thus without this program, the chloride treatment plant required to meet this mandate will be larger; it will need to be able to reduce concentrations by up to an additional 5 mg/L.

Methods Used to Estimate Benefits

According to the Santa Clarita Valley Joint Sewerage System Chloride Source Report, an AWS regenerates every 4.13 days on average (Sanitation Districts of Los Angeles County, 2002). Bruursema (2002) finds that the average regeneration cycle uses 50 gallons for a typical three-bedroom single family home. Therefore, it is estimated that the 500 actively discharging AWS waste 2.2 million gallons annually (500 AWS*50 gallons*365 days/4.13 day regeneration cycle = 2.2 million gallons annually). This quantity divided by 325,851 gallons per acre foot gives a total of 6.78 AFY.

Benefit Uncertainty

The 6.78 AFY reduction involves some uncertainty. First, although the Sanitation District has estimated 500 actively discharging AWS remaining, it is not known for sure exactly how many AWS remain in operation. Second, quantities of water consumed by an AWS can vary with household water use, pre-treated water quality, AWS model, and other factors. It is also possible that customers replace their confiscated AWS with water consuming alternatives. Finally, it is also possible that as water hardness increases once their AWS are removed, households may change their water use habitats. For example, residents may use less water if they perceive their newfound hard water as inferior to their formerly treated soft water, making the water savings greater than 6.78 AFY.

New Facilities Required to Achieve Benefits

No new facilities are needed to achieve this benefit.

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

Potential Adverse Physical Effects

No adverse physical effects anticipated due to reduction in potable water demand.

Summary of Benefit

Residential AWS are regenerated about every four days on average and consume significant amounts of water. As is shown in Table 7-2, by removing the remaining 500 operational AWS, the Sanitation District estimates it will be able to reduce potable water demand by 6.78 AFY.

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)			
Type of Benefit Claimed: Reduced Water Loss From AWS Regeneration			
Measure of Benefit Claimed (Name of Units): Acre-Feet			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012			
2013			
2014			
2015			
2016			
2017	6.78	0	6.78
2018	6.78	0	6.78
2019	6.78	0	6.78
2020	6.78	0	6.78
2021	6.78	0	6.78
2022	6.78	0	6.78
2023	6.78	0	6.78
2024	6.78	0	6.78
2025	6.78	0	6.78
2026	6.78	0	6.78
2027	6.78	0	6.78
2028	6.78	0	6.78
2029	6.78	0	6.78
2030	6.78	0	6.78
2031	6.78	0	6.78
2032	6.78	0	6.78
2033	6.78	0	6.78
2034	6.78	0	6.78
2035	6.78	0	6.78
2036	6.78	0	6.78

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)			
Type of Benefit Claimed: Reduced Water Loss From AWS Regeneration			
Measure of Benefit Claimed (Name of Units): Acre-Feet			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2037	6.78	0	6.78
2038	6.78	0	6.78
2039	6.78	0	6.78
2040	6.78	0	6.78
2041	6.78	0	6.78
Comments:			

Benefit: Avoid 994 MT CO_2 equivalent greenhouse gas emissions annually by reducing size of future chloride treatment plant.

The Sanitation District anticipates an approximate 5 mg/L reduction in chloride concentrations from this portion of the rebate program, which will allow them to build their eventual MF/RO treatment plant smaller. Removing chloride via the MF/RO plant is an energy intensive endeavor, and the reduction in plant size is estimated to save the equivalent of 994 MT CO_2 per year.

Background and Historical Conditions

The Sanitation District will likely need to build a MF/RO plant to reach the chloride limits. Current desalination technologies are energy intensive. In the RO process, water from a pressurized saline solution is separated from the dissolved salts by flowing through a water-permeable membrane. The major energy requirement is for the initial pressurization of the feed water. Use of fossil fuels to generate the electricity needed to power the plant can result in emissions of carbon dioxide and other greenhouse gases, along with local air pollution where the energy is generated.

Without-Project Conditions

Without the approximate 5 mg/L reduction in chloride associated with this rebate project, the Sanitation District will need to build and operate a larger sized MF/RO facility to handle the increased treatment. This excess energy results in an equivalent of 994 MT CO_2 equivalent emissions each year.

Methods Used to Estimate Benefits

Although exact sizing of the MF/RO plant is uncertain at this point, the Sanitation District estimates that energy use by the plant without the project will be 13.4 million kWh per year, and the energy use without the project is expected to be reduced 2.2 million kWh per year, to 11.2 million kWh per year (Santa Clarita Valley Sanitation Districts, 2013). Energy use is estimated based on typical energy usage for the size of plant projected.

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

The Sanitation District estimates that reducing energy use at the plant by 2.2 million kWh per year will save 994 MT of CO_2 equivalent emission per year. Emission rates are taken from the 2012 eGRID database for the WECC California subregion (USEPA, 2012). In addition to CO_2, methane and nitrous oxide emissions are included, and converted to CO_2 equivalent using their global warming potentials. Thus $2.2*10^3$ MWh of energy savings is multiplied by [993.89 lb CO_2/MWhr + 33.52 lb CH_4/GWhr*21/1000 + 4.07 lb N_2O/GWhr*310/1000]*4.536*10-4MT/lb to give 994 MT of CO_2 equivalent.

Benefit Uncertainty

There are several uncertainties associated with the projected reduction in energy emissions. First the sizing of the plant and thus the reduction in energy use due to the 5 mg/L reduction in chloride concentrations from AWS could ultimately be different than currently estimated. Second, the emission rates used were from 2009. Use of a different year and version of the eGRID database would likely mean use of slightly different emission rates. These emission rates are assumed to hold for future years, but this is unlikely to remain the same over time (e.g. the ratio of kWh to CO_2 could go down with the development of cleaner, less greenhouse gas intensive energy sources).

New Facilities Required to Achieve Benefits

Construction of the MF/RO plant is needed in order to achieve the CO_2 equivalent emissions reduction. However, this facility is expected to be constructed with or without the project.

Potential Adverse Physical Effects

No adverse physical effects anticipated due to reduction in greenhouse gas emissions.

Summary of Benefit

Implementing the rest of this rebate program will allow the Sanitation District to build a MF/RO plant that uses approximately 2.2 million kWh per year less energy than it would otherwise. As shown in Table 7-3, this results in a savings of 994 MT CO_2 equivalent emissions per year.

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)			
Type of Benefit Claimed: Reduced Carbon Dioxide Equivalent Emissions Due to Reduced Size of MF/RO Plant Due to Project			
Measure of Benefit Claimed (Name of Units): Metric Tons of CO_2 Equivalent			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (b) – (c)**
2012			
2013			
2014			
2015			
2016			
2017	0	994	994
2018	0	994	994

Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Automatic Water Softener Rebate and Public Outreach Program (SCVSD-1)			
Type of Benefit Claimed: Reduced Carbon Dioxide Equivalent Emissions Due to Reduced Size of MF/RO Plant Due to Project			
Measure of Benefit Claimed (Name of Units): Metric Tons of CO_2 Equivalent			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2019	0	994	994
2020	0	994	994
2021	0	994	994
2022	0	994	994
2023	0	994	994
2024	0	994	994
2025	0	994	994
2026	0	994	994
2027	0	994	994
2028	0	994	994
2029	0	994	994
2030	0	994	994
2031	0	994	994
2032	0	994	994
2033	0	994	994
2034	0	994	994
2035	0	994	994
2036	0	994	994
2037	0	994	994
2038	0	994	994
2039	0	994	994
2040	0	994	994
2041	0	994	994
Comments:			

Summary of Annual Project Physical Benefits

The physical benefits claimed for this project include reducing chloride concentrations by approximately 5 mg/L in the Upper Santa Clara River, reducing potable water demand by approximately 6.78 AFY, and avoiding approximately 994 MT CO_2 equivalent greenhouse gas emissions annually through reducing the size of a future MF/RO plant.

References

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USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

Introduction

This attachment presents the technical justification for the Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation Project. A project abstract and general discussion of the without project baseline are followed by a discussion of each physically quantified benefit, and a summary of physically quantified benefits claimed.

Project Abstract

This project proposes an invasive weed control (especially Arundo donax, or arundo) and habitat restoration program in the Upper Santa Clara River watershed in two locations. One is near the City of Santa Clarita at the confluences of San Francisquito Creek and Bouquet Canyon Creek with the Santa Clara River (project SC-1). The second project site is on private land owned by a group of homeowners along the upper reaches of Bouquet Canyon Creek (project BCN-1). Two other invasive plant species – tamarisk and tree tobacco – will be controlled along with arundo when the plants are co-located. The Santa Clara River and its upper watersheds are some of the last watershed in Southern California in a relatively natural state. These riparian areas have one of the most extensive and diverse riparian habitats in the area and are critical wildlife migration corridors for the region. Arundo is the most problematic weed in southern California coastal rivers where it causes extensive flood damage, increases fire risk, and uses substantially more water than native vegetation.

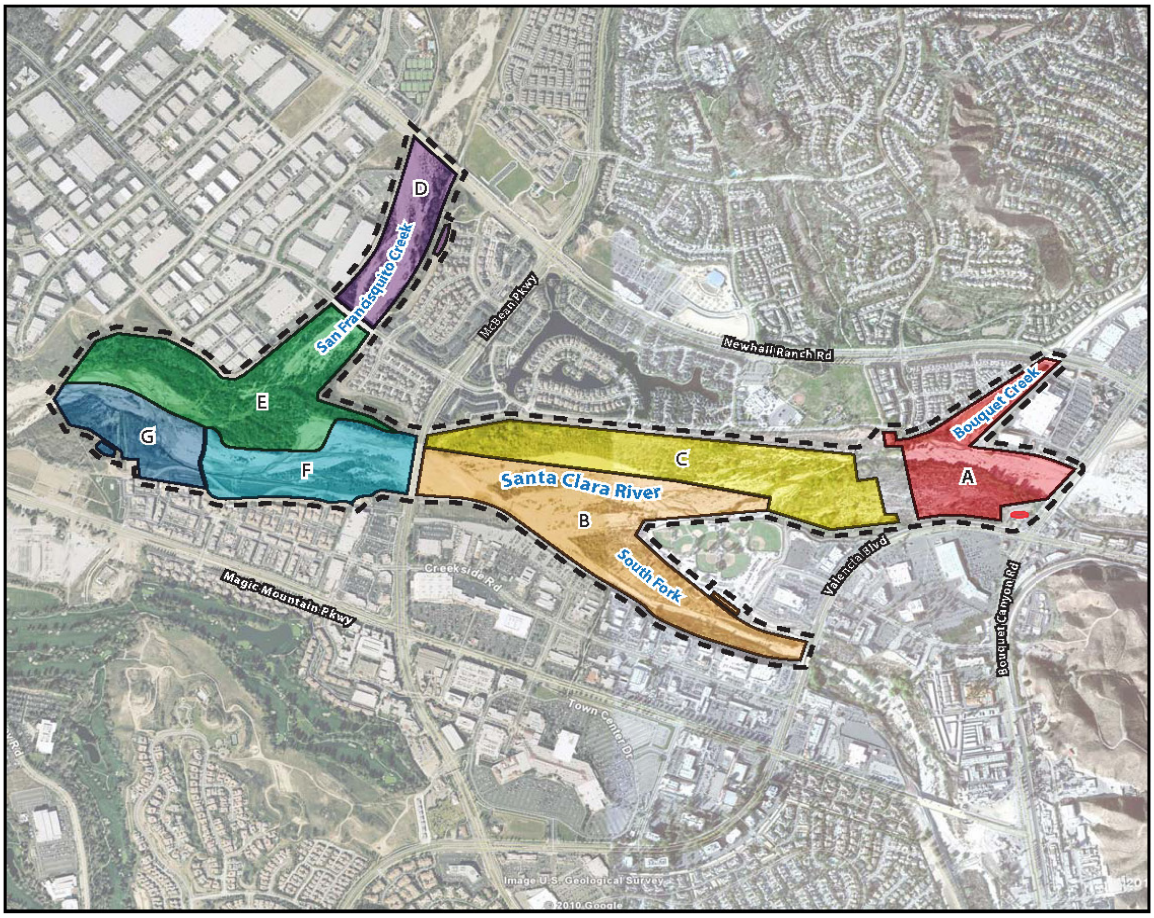
This project expands off the Santa Clara River Arundo and Tamarisk Removal Program (SCARP). SCARP is a long-term eradication, monitoring, and maintenance plan to guide and facilitate the implementation of arundo and/or tamarisk removal projects within the upper Santa Clara River watershed. The SCARP Site Specific Plan is shown in Figure 1 and is a 297-acre site along the main stem of the Santa Clara River centered under the McBean Parkway Bridge, and includes a portion of two major tributaries: the South Fork and San Francisquito Creek. This program has consisted of demonstration projects, permitting, and educational programs as well as low impact removal. An EIR prepared in 2006 showed the impacts of removal of arundo and tamarisk to the Santa Clara River and its tributaries (VCRCD, 2006a). The findings showed that without removal, the plants would continue to spread and decrease the current water resources and cause a decline in native habitats. The project found that herbicide application with the proposed approach will not impact groundwater quality. Education programs for landowners and stakeholders further expanded the efforts to remove these species. Portions of the SCARP Site Specific Plan were funded with a Department of Water Resources Round 1 Implementation Grant. The Round 1 Implementation Grant included removal of the invasive plants in Areas D, E, F, and G (as shown in Figure 1) in its request for funding.

This project expands beyond the SCARP Site Specific Plan boundaries further into the USCR as the Long-Term Implementation Plan for SCARP had planned.

Without-Project Baseline

The San Francisquito Creek sub-watershed, outside of the Angeles National Forest, is approximately 21.7 miles long and 1,464 acres. A previous grant funded arundo and tamarisk removal for the City of Santa Clarita for approximately 150 acres at the confluence of San Francisquito Creek and the Santa Clara River (sites D, E, F, and G in Figure 1 below). The project will extend this work to the 100 acres of currently infested areas along the upper San Francisquito Creek (as shown on Figure 2) and the Bouquet Canyon Creek/Santa Clara River confluence (a portion of site A as shown on Figure 2).

FIGURE 1: SANTA CLARA RIVER, SAN FRANCISQUITO CREEK ARUNDO & TAMARISK REMOVAL PROJECT AREA



LEGEND:

- Project & Staging Area A
- Project & Staging Area B
- Project & Staging Area C
- Project & Staging Area D
- Project & Staging Area E
- Project & Staging Area F
- Project & Staging Area G

N

Sources:
1. Upper Santa Clara River Watershed Arundo and Tamarisk Removal Project (SCARP), Site-Specific Implementation Project (SSIP) Area, Wildscape Restoration, November 2008
2. Google Earth - Image U.S. Geological Survey

FIGURE 1 OF SC-1/BCN-1
Santa Clara River, San Francisquito Creek Arundo & Tamarisk Removal Project .

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

The Bouquet Canyon Creek watershed is approximately 25 miles long and 885 acres. In conjunction with the City of Santa Clarita, a group of homeowners along Bouquet Canyon Creek have decided to engage in an arundo eradication project on their private land, which intermingles with county, city, and USFS land. This 3.5 mile section of upper Bouquet Canyon Creek is only treatable because of the initiative of local homeowners and their partnership with the City. This area is currently infested by arundo and tree tobacco, and this BCN-1 portion of the overall project will treat 5 infested acres. Because both SC-1 and BCN-1 are elements of SCARP implementation, they have been combined into a single implementation project SC-1/BCN-1.

As previously stated, the Santa Clara River is the largest river system in Southern California that is still in a relatively natural state. The river originates on the northern slope of the San Gabriel Mountains in Los Angeles County, traverses Ventura County, and flows into the Pacific Ocean between the cities of San Buenaventura (Ventura) and Oxnard. Municipalities within the Watershed include Santa Clarita, Newhall, Fillmore, Santa Paula, and Ventura (LARWQCB, 2006).

Extensive patches of high-quality riparian habitat exist along the length of the river and its tributaries. Two endangered fish, the unarmored stickleback and the steelhead trout, are resident in the river (LARWQCB, 2006). One of the Santa Clara River's largest tributaries, Sespe Creek, is designated a Wild Trout Stream by the State of California and a Wild and Scenic River by the U.S. Forest Service. Piru and Santa Paula Creeks, tributaries to the Santa Clara River, also support steelhead habitat. In addition, the river serves as an important wildlife corridor. The Santa Clara River drains to the Pacific Ocean through a lagoon that supports a large variety of wildlife.

Since the 1970s, growth in the SCV has increased the demand for imported water. Also, chloride levels in the USCR and in nearby groundwater basins have varied significantly based on hydrologic conditions and have at times exceeded the water quality objectives (WQOs) for chloride, and impaired beneficial uses for agricultural supply as well as groundwater recharge.

A total maximum daily load (TMDL) for chlorides has been established for the Watershed. In 2004, the reach of the river affected by this project was also listed for nutrient impairment. Algae problems resulting from excess nutrients have been documented throughout the watershed. Segments of Santa Clara River and its tributaries are also impaired by ammonia, nitrate and nitrite and are included on the California 2002 303(d) list of water quality limited segments. Additionally, one segment of the Santa Clara River is included on the State Monitoring List for organic enrichment/low dissolved oxygen. Two segments of the Santa Clara River are included on the State Enforceable Programs list for ammonia with one of those segments also listed for nitrite as nitrogen (LARWQCB, 2003).

Estimates for the broader Santa Clarita Site Specific Plan (SSP) project area indicate that infestation by arundo, and to a lesser extent tamarisk and tree tobacco, is pervasive, extending throughout the site. Arundo infestations are particularly dense in the site's western (downstream) and central reaches, where large areas of the main stem exhibit historic infestation levels of 51 to 75% cover. While arundo historically tends to exhibit lower density infestation levels in the site's upstream areas, large areas are still infested, with significant areas of 26 percent to 50 percent arundo cover. Tamarisk infestations are concentrated in the east (upstream) portions of the SSP project area. These infestations typically range from 1 percent to 50 percent cover. The SC-1 project is located within the western portion of the SSP project area. Arundo and tamarisk consume large amounts of water, which negatively affects both instream and groundwater availability.

Reduced water availability also adversely affects water-dependent plants and wildlife, and reduces the water available for beneficial municipal and agricultural uses. Although native riparian plants have similar transpiration rates per unit of surface area to arundo and tamarisk, arundo and tamarisk have approximately two or more times greater leaf surface area. Therefore, they transpire more water than native plants (Kelly

2003). Water consumption by these species is so high that dense infestations can desiccate riparian areas (seeps, springs, rivers) in arid habitats (VCRCD 2006b from Egan and Walker 2000; Dudley 2000).

The Castaic Lake Water Agency (CLWA) is a wholesale water provider in the watershed. CLWA imports State Water Project (SWP) water from the Sacramento-San Joaquin Delta to Castaic Lake through SWP facilities. CLWA currently provides about 30,850 AFY of SWP water (imported via CLWA) to four water purveyors within the watershed (Ludhorff & Scalmanini, 2012). This amounts to roughly one-half of total service area potable water demands. The balance of potable demand within the service area is met through local groundwater sources.

The availability of imported water is subject to a number of natural and human forces, ranging from increased population growth (and accompanying increased demands on the SWP system), to drought and earthquakes, to environmental regulations and water rights determinations. Reduced demand for imported water will improve water supply reliability within the CLWA service area.

Furthermore, frequent flooding of the roadway along Bouquet Canyon Creek has been a consistent problem. Unlike native willows, which lay down flat during a flood, arundo remains standing, forming bottlenecks that cause overflow of the creek bed and flooding of the roadway. The 2005 El Nino season is a case in point. Statements from road maintenance responders during the 2005 El Nino season flooding state, " large amounts of water and debris on roadway caused pavement wash out and damage, …, culverts clogged , trees killed and downed. Culvert completed clogged forcing stream onto road." While flooding events on Bouquet Canyon Road are not wholly attributable to invasive weed "bottlenecks" they have contributed to road damages exceeding $2,047,000 (Los Angeles County Department of Public Works, 2013).

Arundo also presents a significant fire hazard. Arundo is very tall – facilitating the spread of fire, and it burns green, reducing the ability to use the river as a firebreak even during the wet season. For example, the near-by 2007 Ranch Fire burned 58,000 acres, destroyed one home and nine outbuildings at a cost of $9 million (CalFire, 2007a). It was reported that firefighters pushed the fire towards the Santa Clara River, anticipating using the river as a fire break. Unfortunately, due to arundo infestations, the fire spread quickly along the river, which acted as a vector to spread the fire much more quickly than anticipated. Similar problems exist along Bouquet Canyon Creek, where the 2007 Buckweed fire burned 38,000 acres, destroyed 63 structures, and damaged an additional 30 structures at a cost of $7.4 million (CalFire, 2007b). Again, arundo played an important role in allowing the fire to spread quickly.

Without the project, arundo, tamarisk, and tree tobacco will continue to spread, covering a greater percentage of the watershed – including the possibility of re-infesting areas treated under Phase 1 of SCARP. Due to their high rate of water consumption and transpiration, the expansion of these species will have a negative impact on groundwater supply and surface water flows downstream. Thus, if the project is not implemented, reliance on imported SWP water will not decrease.

Relationship of Project to Other Projects Included in the Proposal

The proposed work is not dependent on any other projects in the proposal for the Upper Santa Clara River region.

Description of Expected Physical Benefits

The following (quantifiable) physical benefits are expected from this project:

- Reduced groundwater losses by replacing arundo with native vegetation: By replacing arundo and tamarisk, which consume large amounts of water, with native vegetation, more stream water will

recharge local groundwater aquifers. CLWA purveyors will use the groundwater made available by this project in lieu of imported SWP water, which will save substantial monetary resources.

- Avoided introduction of additional chlorides into the watershed via imported SWP water. The avoided introduction of chlorides into the Watershed will improve water quality for beneficial uses.
- Avoided CO_2 emissions: By offsetting imported water demands with groundwater use, the project will avoid emissions of CO_2 (a greenhouse gas) generated by the production of energy required to transport SWP water to the CLWA service area.

Each benefit is discussed in further detail below.

Benefit: Water Savings of 840 AFY from Arundo Removal

By replacing arundo and tamarisk, which consume large amounts of water, with native vegetation, more stream water will recharge local groundwater aquifers. CLWA purveyors will use some of the groundwater made available by this project in lieu of imported SWP water, which will save substantial monetary resources.

Background and Historical Conditions

Arundo donax (arundo) has successfully invaded many rivers in Southern California, including the Santa Clara, forming extensive monocultures and altering physical and biological processes (Coffman, 2007). In California, infestations of arundo are known to increase risks of flooding, create unnatural fire hazards, outcompeting indigenous riparian species for scarce water resources, and reduce the value of riparian habitat for most wildlife (Bell 1997, DiTomaso 1998, Dudley, 2000).

Estimates for the broader Santa Clarita Site Specific Plan (SSP) project area indicate that infestation by arundo, and to a lesser extent tamarisk and tree tobacco, is pervasive, extending throughout the site. As was indicated in the Without-Project Baseline section above, arundo infestations in western and central reaches of the SSP are at 51 to 75% cover. In areas further upstream, arundo cover is approximately 26 to 50%. Tamarisk infestations are concentrated in the east (upstream) portions of the SSP project area. These infestations typically range from 1 to 50% cover. The SC-1 project is located within the western portion of the SSP project area, while the BCN-1 project is located within the eastern portion of the SSP project area and north of that as well.

Arundo, tamarisk, and tree tobacco consume large amounts of water, which negatively affects both instream and groundwater availability. Reduced water availability also adversely affects water-dependent plants and wildlife, and reduces the water available for beneficial municipal and agricultural uses. Although native riparian plants have similar transpiration rates per unit of surface area to arundo and tamarisk, arundo and tamarisk have approximately two or more times greater leaf surface area. Therefore, they transpire more water than native plants (VCRCD 2006b from Kelly 2003). Water consumption by these species is so high that dense infestations can desiccate riparian areas (seeps, springs, rivers) in arid habitats (VCRCD 2006b from Egan and Walker 2000; Dudley 2000).

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

FIGURE 2: ARUNDO REMOVAL

Photo Credit: Arundo Distribution and Impact Report.

Without-Project Conditions

An EIR prepared in 2006 showed the impacts of removal of arundo and tamarisk to the Santa Clara River and its tributaries. The findings showed that without removal, the plants would continue to spread and decrease the current water resources and cause a decline in native habitats. Reliance of SWP water would likely increase as arundo desiccated local surface and groundwater sources. Consequently costs for water supply would increase with increasing reliance on imported SWP water. Specifically, without this project approximately 100 acres of riparian zone in the Upper Santa Clara watershed will not be treated for arundo removal.

Methods Used to Estimate Benefits

This project will treat a total of 100 acres for arundo in the SC-l project area. The density of arundo coverage ranges from 25% to 50% in this area (Resource Conservation District of Ventura County, 2005). Assuming the midpoint density of 37.5 % coverage, there will be 37.5 acres of arundo removal in SC-1 (100 acres containing arundo * 37.5% density of coverage). Tamarisk coverage is assumed to be 2%, and so it is assumed that 2 acres of tamarisk will be removed by SC-1.

The treatment area includes 5 acres from the BCN-1 project. About 90% of the BCN-1 acres are infested with arundo, or 4.5 acres (Resource Conservation District of Ventura County, 2005). The other 0.5 acres are infested with tree tobacco. Because tamarisk and tree tobacco acreage and water savings are much less than that for arundo, we include water supply benefits only from arundo removal here. Total arundo removal is expected to be 42 acres (37.5 acres in SC-1 and 4.5 acres in BCN-1).

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

The study *Arundo Distribution and Impact Report*, conducted by the California Invasive Plant Council (California Invasive Plant Council, 2011), which reviews recent studies and literature, as well as regional field data, was conducted to develop a geographically specific value for the water loss resulting from arundo invasion. One of the research sites was the Santa Clara River watershed.

In the Executive Summary of the Arundo Distribution and Impact Report, the authors conclude:

Removing Arundo from one acre would result in a net gain of 20 ac/ft per year of water. This estimate includes adjustments for replacement vegetation, as well as a reduction of Arundo water use to bring it into alignment with other forms of vegetation that consume large amounts of water. This is a large potential water use reduction that could have significant implications for both the ecosystem and human water use. Spatial data, used in conjunction with stand leaf area measurements and published leaf transpiration rates, generated an Arundo stand-based water use value that was extremely high (40 mm/day) compared to most other plants.

In order to be conservative, the researchers assumed that the arundo stand-based water use value was 20 mm/day, instead of 40 mm/day. The researchers concluded that removing arundo from one acre will result in a net gain of 20 AF per year of water compared to water use by native vegetation. Arundo was estimated use 24 AF per year per acre, while native vegetation was estimated to use 4 AF per year per acre (California Invasive Plant Council, 2011).

Using the estimated amount net gain of arundo control of 20 AFY/acre, we calculate average savings of 840 AFY for the collective treatment of SC-1 and BCN-1. It is estimated that on average about 50% of the water saved as a result of this project will be recovered from the regional groundwater aquifer. The remaining water will be available as surface flows downstream. CLWA purveyors will use the groundwater made available by this project in lieu of imported SWP water, because groundwater is a much less expensive source of supply. Therefore, 420 AFY of imported SWP water can be avoided with the implementation of this project.

Benefit Uncertainty

There are some uncertainties in this calculation, which come mainly from the following assumptions:

1. The exact number of acres that will be treated will not be finalized until the GIS assessment is complete. This estimate is based on work completed as part of a previous DWR Prop 84 Round 1 Implementation grant for certain areas within the SCARP SSP.

2. The net water supply gain from arundo control is 20 AFY/acre. This assumption is a very conservative estimate from the March 2011 *Arundo Distribution and Impact Report*, and likely understates the benefits of arundo control.

3. Other invasive species to be removed by the project include tamarisk, tree tobacco, and other species. By not calculating any water savings from removal of these species, we are again making a conservative estimate of total water savings per acre treated.

New Facilities Required to Achieve Benefit

No new facilities are required.

Potential Adverse Physical Effects

No adverse physical effects from this project are anticipated. An EIR prepared in 2006 showed the impacts of using herbicide for arundo control would not impact ground water quality (VCRCD, 2006a). Further precautions are taken about the timing and methods of herbicide application to minimize any potential adverse environmental impacts.

Summary of Benefit

As is summarized in Table 7-1, the project will reduce the uptake of valuable groundwater resources from non-native species by 840 AFY, or a total of 42,000 AF over the 50-year project lifetime. Half of this water savings will be withdrawn by retail water utilities in the area, and will reduce use of more expensive SWP imports.

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)			
Type of Benefit Claimed: Water Savings from Arundo Removal Compared to Native Vegetation Water Use			
Measure of Benefit Claimed (Name of Units): AFY			
Additional Information About this Measure: Total water savings from arundo removal is shown. Savings per acre was determined to be 20 AF/acre of arundo removal, and there are a total of 42 acres of arundo removal in the project.			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (b) – (c)**
2012	0	0	0
2013	0	0	0
2014	0	592	592
2015	0	810	810
2016	0	840	840
2017	0	840	840
2018	0	840	840
2019	0	840	840
2020	0	840	840
2021	0	840	840
2022	0	840	840
2023	0	840	840
2024	0	840	840
2025	0	840	840
2026	0	840	840
2027	0	840	840
2028	0	840	840
2029	0	840	840
2030	0	840	840

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

Type of Benefit Claimed: Water Savings from Arundo Removal Compared to Native Vegetation Water Use

Measure of Benefit Claimed (Name of Units): AFY

Additional Information About this Measure: Total water savings from arundo removal is shown. Savings per acre was determined to be 20 AF/acre of arundo removal, and there are a total of 42 acres of arundo removal in the project.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2031	0	840	840
2032	0	840	840
2033	0	840	840
2034	0	840	840
2035	0	840	840
2036	0	840	840
2037	0	840	840
2038	0	840	840
2039	0	840	840
2040	0	840	840
2041	0	840	840
2042	0	840	840
2043	0	840	840
2044	0	840	840
2045	0	840	840
2046	0	840	840
2047	0	840	840
2048	0	840	840
2049	0	840	840
2050	0	840	840
2051	0	840	840
2052	0	840	840
2053	0	840	840
2054	0	840	840
2055	0	840	840
2056	0	840	840
2057	0	840	840
2058	0	840	840
2059	0	840	840
2060	0	840	840

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

TABLE 7-1: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)			
Type of Benefit Claimed: Water Savings from Arundo Removal Compared to Native Vegetation Water Use			
Measure of Benefit Claimed (Name of Units): AFY			
Additional Information About this Measure: Total water savings from arundo removal is shown. Savings per acre was determined to be 20 AF/acre of arundo removal, and there are a total of 42 acres of arundo removal in the project.			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (b) – (c)**
2061	0	840	840
2062	0	840	840
2063	0	840	840
2064	0	248	248
2065	0	30	30
Comments:			

Benefit: Avoided Introduction of 41 MT of Chlorides into the Watershed per Year

Imported SWP water brings along with it significant amounts of chlorides. The avoided introduction of chlorides into the Watershed will help improve water quality for beneficial uses.

Background and Historical Conditions

Since the 1970s, growth in the SCV has increased the demand for imported water. Also, chloride levels in the USCR and in nearby groundwater basins have varied significantly based on hydrologic conditions and have at times exceeded the water quality objectives (WQOs) for chloride, and impaired beneficial uses for agricultural supply as well as groundwater recharge.

As a result of these factors, a total maximum daily load (TMDL) for chlorides has been established for the Watershed. In 2004, the reach of the river affected by this project was also listed for nutrient impairment. Algae problems resulting from excess nutrients have been documented throughout the watershed. Segments of Santa Clara River and its tributaries are also impaired by ammonia, nitrate and nitrite and are included on the California 2002 303(d) list of water quality limited segments. Additionally, one segment of the Santa Clara River is included on the State Monitoring List for organic enrichment/low dissolved oxygen. Two segments of the Santa Clara River are included on the State Enforceable Programs list for ammonia with one of those segments also listed for nitrite as nitrogen (LARWQCB 2003).

Many millions of dollars have been spent to reduce the chloride level in the Santa Clara River so far. Any additional chloride salts in the river will need to be offset by additional mechanical removal at the sewage treatment plants, including cost to build and operate a reverse osmosis plant to remove chlorides. The community has also spent many millions of dollars removing water softeners that were adding chlorides to the sewage treatment plants' recycled water quality effluent (Sanitation Districts of Los Angeles County, 2012).

In addition, removal of tamarisk will also contribute to salt removal in the watershed. Tamarisk deposits concentrated salt from its leaves to the soil. This salt originates from the soil and from deeper aquifers, as its taproot can bring up water from 100 feet deep. When these leaves drop, increased soil salinity and salts are deposited into adjacent creeks due to salt transport during runoff. Native plant species are further impacted because they generally cannot tolerate tamarisk's contribution to soil salinity, while arundo can. While the amount of salt content is small from individual tamarisk trees, adding even small amounts of salt is compounding an already difficult situation.

Without-Project Conditions

Without the project, CLWA will continue to import 420 AFY of SWP water that will contribute to the level of total dissolved solids, and specifically chlorides, in the watershed. Thus, without the project an additional 2,037 MT of chloride importation will accumulate over the assumed 50-year lifetime of the project.

Methods Used to Estimate Benefits

A 2009 water quality table developed by the Metropolitan Water District of Southern California (Metropolitan, 2010) estimates that SWP water contains an average chloride concentration of 79 mg/L, or 0.097 MT/AFY.[7, 8] This project avoids 420 AF of imported water use per year, and therefore avoids 41 MT of chloride imports per year (420 AFY * 0.097 MT/AFY). The project will avoid a total of 21,000 AF of SWP water imports over the assumed 50-year project lifetime. As a result 2,037 MT of chlorides will be prevented from entering the watershed through irrigation, runoff, or wastewater discharge over the project lifetime.

Benefit Uncertainty

Chloride concentrations in SWP water vary both by year and by time of year. The chloride concentration in SWP water used for calculating avoided chloride imports is an average value. Actual chloride concentrations in any one year could be higher or lower than this value.

New Facilities Required to Achieve Benefit

No new facilities are required.

Potential Adverse Physical Effects

No adverse physical effects from this project are anticipated.

Summary of Benefit

As is shown in Table 7-2, the project will avoid the introduction of about 41 MT of chlorides into the Watershed each year. Over the 50-year project life the project will reduce the introduction of 2,037 MT of chlorides.

[7]. 1 acre-foot = 1,233,482 liters; 79 mg/L = 97,445,078 mg per acre-foot 0.097 MT per acre-foot.
[8]. This is the highest rolling average value at Metropolitan Water District of Southern California's Jensen Filtration Plant, which is the closest measurement point to CLWA for which data were available. Chloride concentrations in SWP water have ranged from about 28 mg/L to 128 mg/L over the past 30 years (LARWQCB, 2008).

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

Type of Benefit Claimed: Reduction in Chloride Loadings from Imported SWP water

Measure of Benefit Claimed (Name of Units): Metric Tons (MT) per year

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2012	0	0	0
2013	0	0	0
2014	0	29	29
2015	0	39	39
2016	0	41	41
2017	0	41	41
2018	0	41	41
2019	0	41	41
2020	0	41	41
2021	0	41	41
2022	0	41	41
2023	0	41	41
2024	0	41	41
2025	0	41	41
2026	0	41	41
2027	0	41	41
2028	0	41	41
2029	0	41	41
2030	0	41	41
2031	0	41	41
2032	0	41	41
2033	0	41	41
2034	0	41	41
2035	0	41	41
2036	0	41	41
2037	0	41	41
2038	0	41	41
2039	0	41	41
2040	0	41	41
2041	0	41	41
2042	0	41	41
2043	0	41	41
2044	0	41	41

TABLE 7-2: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)			
Type of Benefit Claimed: Reduction in Chloride Loadings from Imported SWP water			
Measure of Benefit Claimed (Name of Units): Metric Tons (MT) per year			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2045	0	41	41
2046	0	41	41
2047	0	41	41
2048	0	41	41
2049	0	41	41
2050	0	41	41
2051	0	41	41
2052	0	41	41
2053	0	41	41
2054	0	41	41
2055	0	41	41
2056	0	41	41
2057	0	41	41
2058	0	41	41
2059	0	41	41
2060	0	41	41
2061	0	41	41
2062	0	41	41
2063	0	41	41
2064	0	12	12
2065	0	1	1
Comments:			

Benefit: Reduced CO_2 Emissions of 214 MT Per Year

By offsetting imported water demands with use of local groundwater, the project will avoid emissions of CO_2 (a greenhouse gas) generated by the production of energy required to transport SWP water to the CLWA service area.

Background and Historical Conditions

The SWP was constructed to transport water from Northern California to arid areas, both agricultural and urban, in central and southern California. A significant amount of energy is used to pump SWP over mountain ranges on its way to southern California. Locally supplied or saved water that avoids SWP water imports can avoid a significant amount of energy associated with SWP pumping.

Without-Project Conditions

Without reduction in SWP water imports as a result of the project, approximately 30,555 megawatt hours (MWh) of electricity will be produced to transport 3,960 AF of SWP water to Castaic Lake, where it is stored for wholesale distribution. As a result, approximately 10,689 MT of CO_2 will continue to be emitted through the energy produced for supplying and conveying SWP water to Castaic Lake over the benefits lifetime of the project.

Methods Used to Estimate Benefits

To calculate energy savings associated with the project, we first identify the amount of energy required to transport and treat 1 acre-foot of imported water by the amount of imported water that will be avoided as a result of the project. The California Energy Commission estimates that the electricity required for the conveyance of 1 AF of SWP water imported to Castaic Lake is 1.17 MWh (CEC, 2010). CLWA estimates energy requirements for treatment to be 0.285 MWh/AF. When energy requirements for treatment are taken into account, the total amount of energy required for every AF of water delivered to CLWA amounts to 1.455 MWh.[9]

Energy used to transport SWP water to Castaic Lake, where it is stored for wholesale purposes, comes from a variety of sources internal and external to the State of California, including coal-fired power plants and natural-gas plants. Based on 2011 CEC data (CEC, 2011), approximately 70% of electricity generation was produced by California power sources, while 10% was imported from the Pacific Northwest and 20% was imported form the Desert Southwest. Given emissions rates of 858.68 pounds/MWh, 819.21 pounds/MWh, and 1,191.35 pounds/MWh, respectively, for the electricity sources above (U.S. EPA, 2012), we use a weighted emissions rate of 780.513 pounds/MWh, or 0.35 MT per MWh. With 1.455 MWh of electricity required for transporting and treating 1 acre-foot of SWP water, roughly 0.509 MT of CO_2 is produced for every acre-foot of water that is transported from the Delta to Castaic Lake and subsequently treated. With 420 AFY of SWP imports saved as result of the project, this means that approximately 214 MT of CO_2 emissions will be offset per year. With an estimated avoided imported water use of 21,000 AF for the entire project, project will prevent approximately 10,689 MT of CO_2 emissions.

Benefit Uncertainty

Avoided CO_2 emissions will be offset to a small extent by CO_2 emissions from pumping newly available groundwater within the project area. The energy required to pump groundwater is unknown, thus, net avoided emissions cannot be calculated. However, due to the high energy requirements associated with importing water, the project will result in substantial net avoided emissions of CO_2.

The energy mix and emissions rates associated with energy needed to transport SWP water will change over time. The energy mix and emission rates used in this analysis are historical averages.

New Facilities Required to Achieve Benefit

No new facilities are required.

Potential Adverse Physical Effects

No adverse physical effects from this project are anticipated.

[9]. Energy required to transmit treated water from CLWA treatment plants to CLWA retail water purveyors is not included in this analysis due to unavailable data.

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

Summary of Benefit

As is shown in Table 7-3, by reducing the need to import 420 AFY from the SWP the project reduces net emissions of CO_2 from the energy required to transport the water by 214 MT per year. Over the 50-year project lifetime CO_2 emissions will be reduced by 10,689 MT.

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)			
Type of Benefit Claimed: Reduction CO_2 emission from transport of imported SWP water			
Measure of Benefit Claimed (Name of Units): Metric Tons (MT) per year			
(a)	**(b)**	**(c)**	**(d)**
	Physical Benefits		
Year	**Without Project**	**With Project**	**Change Resulting from Project (b) – (c)**
2012	0	0	0
2013	0	0	0
2014	0	151	151
2015	0	206	206
2016	0	214	214
2017	0	214	214
2018	0	214	214
2019	0	214	214
2020	0	214	214
2021	0	214	214
2022	0	214	214
2023	0	214	214
2024	0	214	214
2025	0	214	214
2026	0	214	214
2027	0	214	214
2028	0	214	214
2029	0	214	214
2030	0	214	214
2031	0	214	214
2032	0	214	214
2033	0	214	214
2034	0	214	214
2035	0	214	214
2036	0	214	214
2037	0	214	214
2038	0	214	214
2039	0	214	214

USCR Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)

TABLE 7-3: ANNUAL PROJECT PHYSICAL BENEFITS

Project Name: Upper Santa Clara River Arundo/Tamarisk Removal Program (SCARP) Implementation (SC-1/BCN-1)			
Type of Benefit Claimed: Reduction CO_2 emission from transport of imported SWP water			
Measure of Benefit Claimed (Name of Units): Metric Tons (MT) per year			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2040	0	214	214
2041	0	214	214
2042	0	214	214
2043	0	214	214
2044	0	214	214
2045	0	214	214
2046	0	214	214
2047	0	214	214
2048	0	214	214
2049	0	214	214
2050	0	214	214
2051	0	214	214
2052	0	214	214
2053	0	214	214
2054	0	214	214
2055	0	214	214
2056	0	214	214
2057	0	214	214
2058	0	214	214
2059	0	214	214
2060	0	214	214
2061	0	214	214
2062	0	214	214
2063	0	214	214
2064	0	63	63
2065	0	8	8
Comments:			

Summary of Annual Project Physical Benefits

By reducing the use of water by non-native plants the project will create a water savings of 840 AFY. Assuming 50% of water savings are available to off-set imported water needs from the SWP, this project will result in a total imported water savings of 420 AFY and 21,000 AF over the 50-year project life.

A reduction in the need for imported water from the SWP will reduce imported chloride loadings in the region by 41 MT per year and 2,037 MT over the 50-year project life and improve local water quality for beneficial uses.

By reducing the need to import 420 AFY from the SWP, the project reduces emissions of CO_2 from the energy required to transport the water by 214 of CO_2 per year. Over the 50 year project life the project will reduce emissions by 10,689 MT.

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