ATTACHMENT 3. PROJECT JUSTIFICATION

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ATTACHMENT 3. PROJECT JUSTIFICATION

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PROJECT SUMMARY TABLE

Table 4 - Project Summary Table

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

PROJECT DESCRIPTION

Project 1	
Brief Project Description	**City of Stockton Water Consumption Reporting and Customer Engagement Software**: Deploy software to show customers' individual water use and recommend water conservation actions.
How Project will help alleviate drought impacts described in Attachment 2	The City is requesting funding for the Water Consumption Reporting and Customer Engagement WaterSmart Software.[6] The software package is $110,933 for 10,000 homes; 25% of the City's residential connections. The software will help implement the residential conservation measures described in the City's 2010 Urban Water Management Plan by providing Home Water Reports to consumers. These personalized reports are sent by the City to households every billing period and use social norms-based messaging to persuade customers to engage in water-saving behaviors. The experiences of other water utilities using this software[7] show a 5 percent reduction in water use from deployment of this system. City customers are currently under Stage 2 water conservation requirements, which require a minimum of 10% reduction. If the current drought continues in to 2015 and wholesaler Stockton East has its allotment curtailed, the City would move to Stage 3 which would require the customers to reduce by 20 – 30% of normal supply. Implementing this program would save an estimated 924 acre-feet per year for 20 years. Conserving this supply will decrease the risk of not meeting existing drinking water demands and reduce groundwater basin overdraft by an equivalent amount. Reducing groundwater production in southwestern Stockton will also decrease the risk of saline water migration in this area of deep connate saline water.
How the Project can be considered as one or more of the eligible drought project types	Studies of effectiveness[7] of this customer engagement software show average water demand reductions of 5 percent within six months of deployment. Additional results show that households receiving the Reports were 2.3 times more likely to participate in water conservation programs and 6 times more likely to request a home water survey than households not receiving Reports. This will provide immediate regional drought preparedness and increase local water supply reliability and the delivery of safe drinking water by reducing demand on the potable water system, and reducing the need for groundwater extractions in a historically overdrafted basin.
Why expedited funding is required	The system will enable the City to target and cost-effectively deliver conservation information and services to more customers. The program is not currently being implemented due to critically stressed finances within the City of Stockton.

[6] http://www.watersmartsoftware.com/
[7] See ATTACHMENT C – EBMUD WaterSmart Evaluation

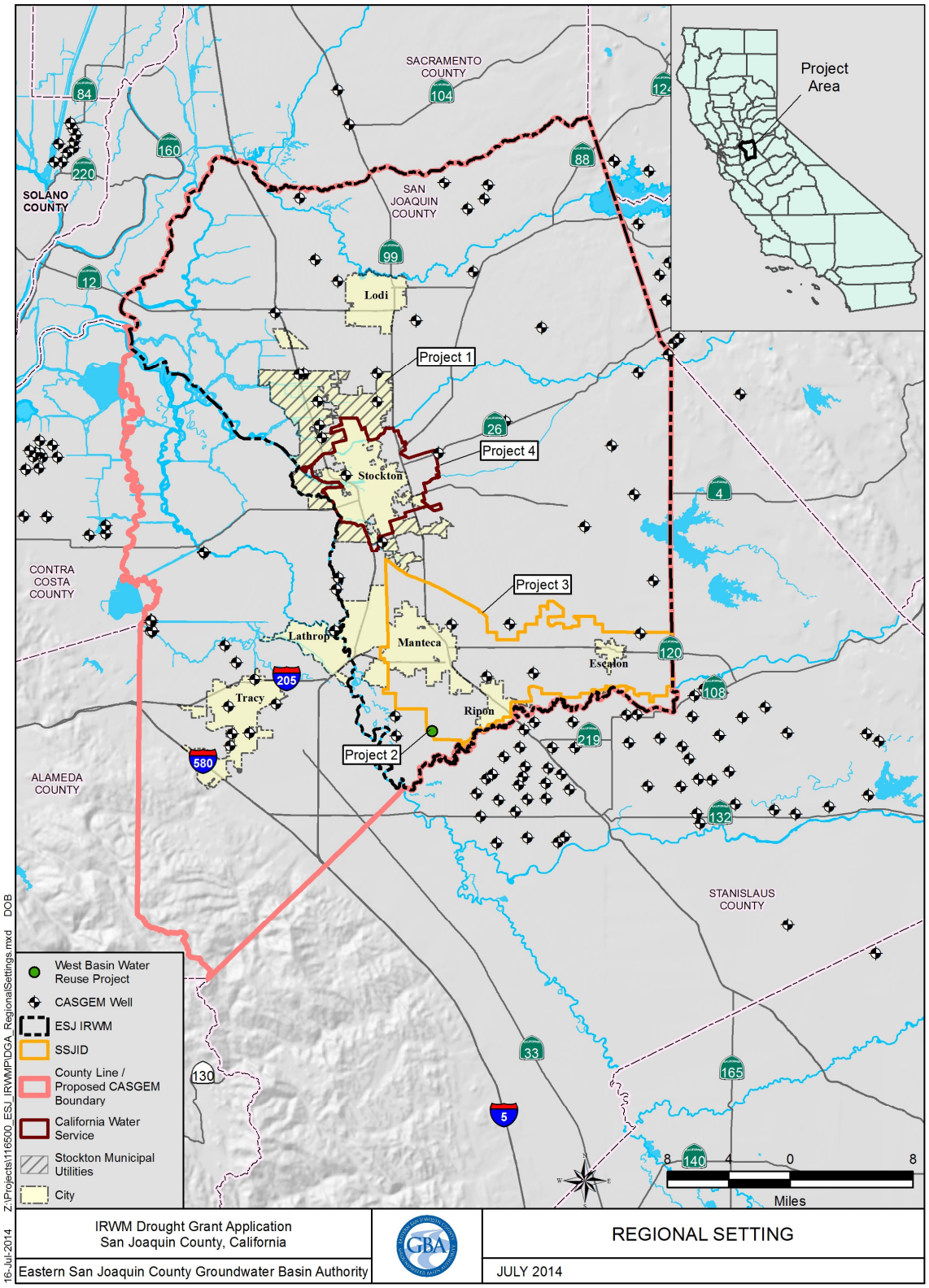
Project 2	
Brief Project Description	**South San Joaquin Irrigation District West Basin Water Reuse Project**: Infrastructure improvements to capture stormwater and tail water flows for farming reuse.
How Project will help alleviate drought impacts described in Attachment 2	The West Basin Water Reuse Project consists of infrastructure improvements to capture stormwater and tail water flows from flood irrigation activities and direct these flows to a 37.5 acre-foot storage reservoir containing a 14,500 gpm capacity pump station. The basin will provide the aquifer with groundwater recharge and the pump station will return 10,000 acre-feet of tail water back into a pressurized irrigation system for water application on 3,000 acres of farmland via drip, micro, and solid state sprinkler systems. The purpose of this project is to increase the drought resiliency of the SSJID by maximizing the beneficial use of the District's water use in a long term, sustainable manner thereby reducing the risk of not meeting existing drinking water demands and the risk of not meeting existing agricultural water demands. Stormwater flows will also be directed to the project's basin for recharge of the groundwater aquifer. The project will supply a pressure irrigation system that reduces water use by 10 inches per acre of irrigated land. The tail water recovery system will reduce farm runoff to rivers and increase groundwater recharge to the aquifer. This project will increase water supply to the pressure irrigation system which reduces private groundwater pumping as growers use more District surface water reducing groundwater basin overdraft and the potential for saline water migration, meeting increased crop water demands, and providing water to lands that would not otherwise received water due to surface water curtailments.
How the Project can be considered as one or more of the eligible drought project types	The project will make greater use of supplies available under drought conditions, incentivize surface water use, and promote groundwater recharge. This will provide immediate regional drought preparedness by reducing demand on the potable water system, and reducing the need for groundwater extractions in a historically overdrafted basin.
Why expedited funding is required	This high-yield project cannot be currently implemented due to decreased District revenues caused by reduced water sales and decreased hydropower revenues.

Project 3	
Brief Project Description	**South San Joaquin Irrigation District On-Farm Water Conservation Program**: Provides financial incentives to improve existing distribution systems and measure water usage.
How Project will help alleviate drought impacts described in Attachment 2	SSJID developed the On-Farm Water Conservation Program to promote and incentivize on-farm physical improvements, irrigation management practices and water measurement that promote water conservation. This is a successful existing program that lacks only funding for its further implementation. The program incentivizes use of less water to accomplish the same purpose by encouraging the efficient use of District surface water to meet crop water requirements. The Project includes conservation measures for the installation of delivery measurement devices for pumps, conversion from flood to sprinkler or drip/ micro irrigation, tailwater recovery systems to prevent runoff, scientific irrigation scheduling, and soil moisture monitoring. The South San Joaquin Irrigation District's system was built in the early 1900s for flood irrigation. Over the years, practices have changed as growers work to conserve water and to improve crop yields with the installation of more efficient irrigation systems and implementation of advanced farming practices. SSJID provides financial incentives to accelerate improvements to the existing distribution system, enhance farm irrigation practices and provide for measurement of water usage while engaging as many growers as possible. Due to budgetary reasons, the 2014 Program was suspended February 11, 2014; in order to achieve the water management goals of the growers and the District, it is important that the Program continue in this year of severe drought. The District's urban wholesale customers have been compelled to implement significant water conservation measures. Each acre-foot of water conserved reduces the risk of not meeting existing drinking water demands. Stretching available supplies to irrigate additional lands reduces the risk of not meeting existing agricultural water demands and helps meet increased crop water demands while adapting to surface water curtailments. This project will incentivize more efficient use of available surface water supplies which reduces private groundwater pumping as growers use more District surface water reducing groundwater basin overdraft and the potential for saline water migration.
How the Project can be considered as one or more of the eligible drought project types	The project will make greater use of supplies available under drought conditions, incentivize surface water use, and promote groundwater recharge. This will provide immediate regional drought preparedness by reducing demand on the potable water system, and reducing the need for groundwater extractions in a historically overdrafted basin.
Why expedited funding is required	This high-yield project cannot be currently implemented due to decreased District revenues caused by reduced water sales and decreased hydropower revenues.

Project 4	
Brief Project Description	**California Water Service Co. Comprehensive Conservation Program**: Implement a suite of not locally cost-effective conservation programs to provide immediate drought relief.
How Project will help alleviate drought impacts described in Attachment 2	Cal Water is making a grant request to fund a combination of residential and non-residential conservation measures, and will provide a 54% cost match. This funding will enable Cal Water to accelerate the implementation of its 20x2020 compliance plan in order to provide drought relief to customers within Cal Water's Stockton service area. The grant funds will be used to augment the existing water conservation program and allow Cal Water to extend to more customers those measures most capable of providing immediate drought relief. The following programs will be funded under this grant request: residential and non-residential high water use audits/customer assistance, large landscape water use reports, large landscape water use audits/customer assistance, residential and non-residential irrigation smart controller rebates, non-residential commercial irrigation system rebates, residential and non-residential turf replacement rebates, residential conservation kit distribution, ultra high-efficiency toilet and urinal rebates, and high-efficiency clothes washer rebates. Approximately 70% of the grant funding and cost match will be directed to programs reducing landscape water uses. Programs funded under this grant are expected to reduce urban water demands in Cal Water's Stockton service district by 414 acre-feet between 2015 and 2021. Conserving this supply will decrease the risk of not meeting existing drinking water demands and reduce groundwater basin overdraft by an equivalent amount. Reducing groundwater production in southwestern Stockton will also decrease the risk of saline water migration in this area of deep connate saline water.
How the Project can be considered as one or more of the eligible drought project types	Cal Water has developed detailed water savings and benefit-cost assessments of the measures included in this request. These assessments are thoroughly documented in the district's current Conservation Master Plan and most recent General Rate Case Filing with the California Public Utilities Commission. The economic and water savings analyses prepared by Cal Water have been independently evaluated by the California Public Utilities Commission Division of Ratepayer Advocates. Implementing these programs will provide immediate regional drought preparedness and increase local water supply reliability and the delivery of safe drinking water by reducing demand on the potable water system, and reducing the need for groundwater extractions in a historically overdrafted basin, and will assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective.
Why expedited funding is required	Cal Water is a regulated utility that must have its programs approved by the California Public Utilities Commission. The current rate base is not fully adequate to implement these non-locally-cost-effective measures.

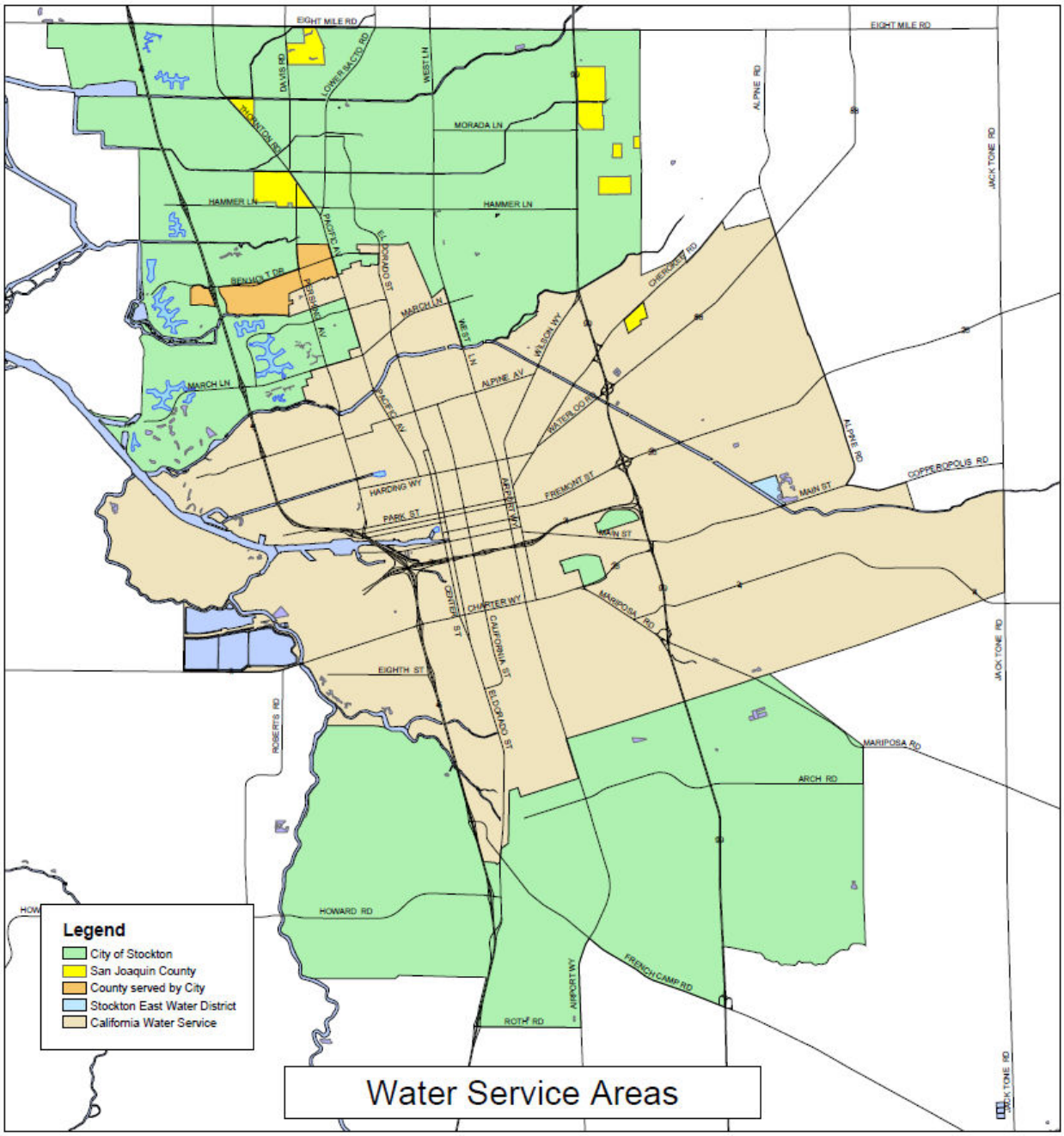
REGIONAL AND PROJECT MAPS

Figure 20 - Map of Eastern San Joaquin IRWM Region



Project 1 - Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software

Figure 21 – City of Stockton Water Service Area



Project 2 - SSJID West Basin Water Reuse Project

An overview map of the SSJID service area, major divisions, and water distribution facilities is presented as Figure 22. A map highlighting the West Basin location is presented as Figure 23.

Figure 22 – Projects 2 and 3 South San Joaquin Irrigation District Map

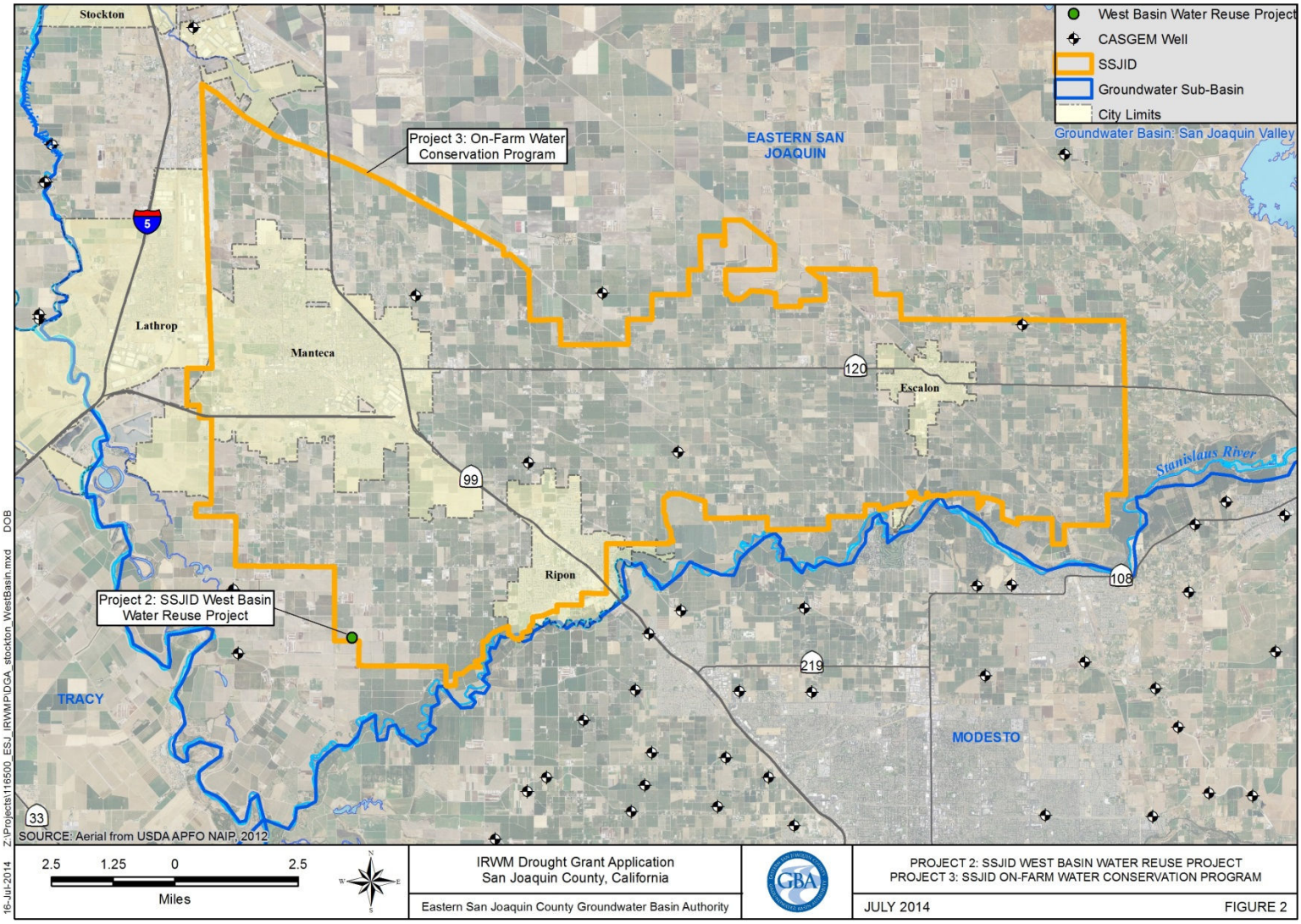
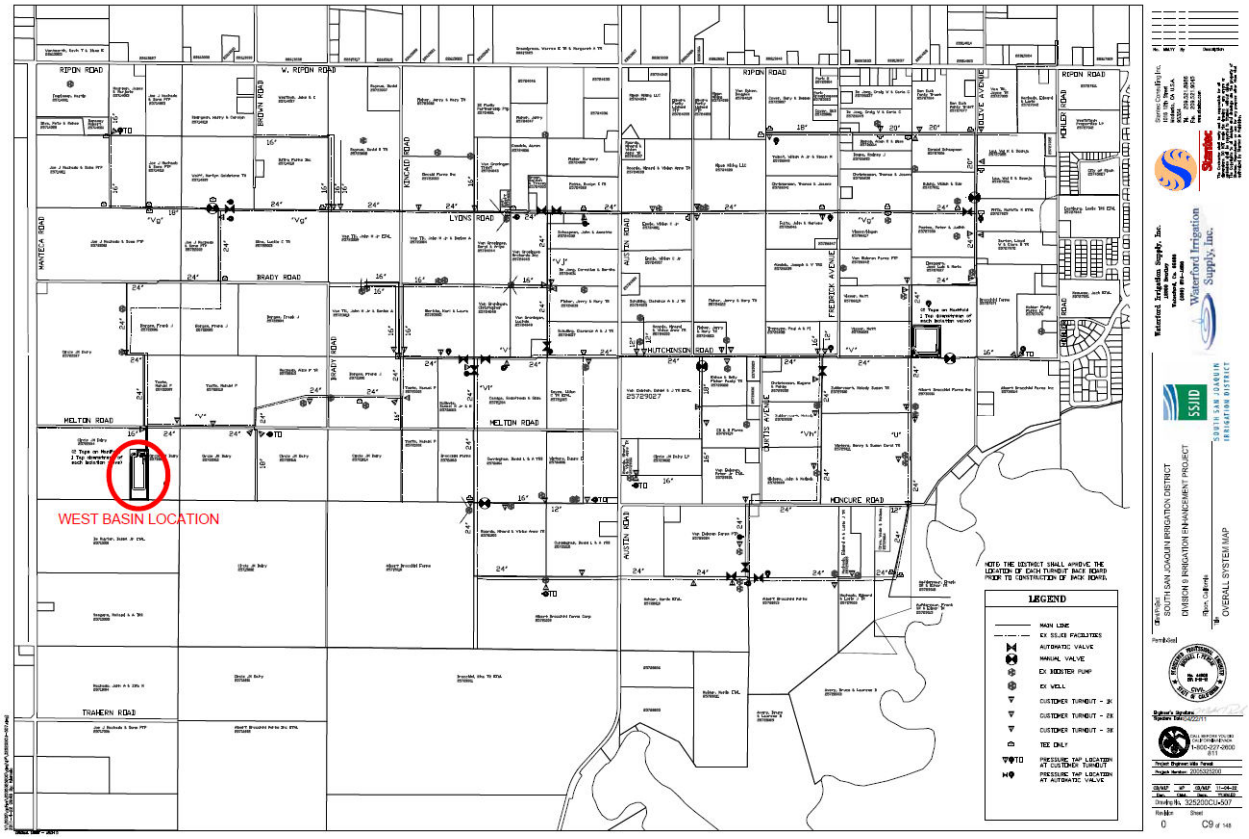


Figure 23 – Project 2 SSJID West Basin Project Map



Project 3 - SSJID On-Farm Water Conservation Program

An overview map of the SSJID service area, major divisions, and water distribution facilities is presented above as Figure 22. Figure 24 presents a map of the On-Farm Water Conservation Program showing all of the parcels enhanced through this existing Program in the years 2011 through 2013. All parcels within the District have potential to be enhanced through the Program. A larger version of this map is presented as ATTACHMENT F – SSJID On-Farm Water Conservation Program Map (Att3_DG_ProJust_5of8).

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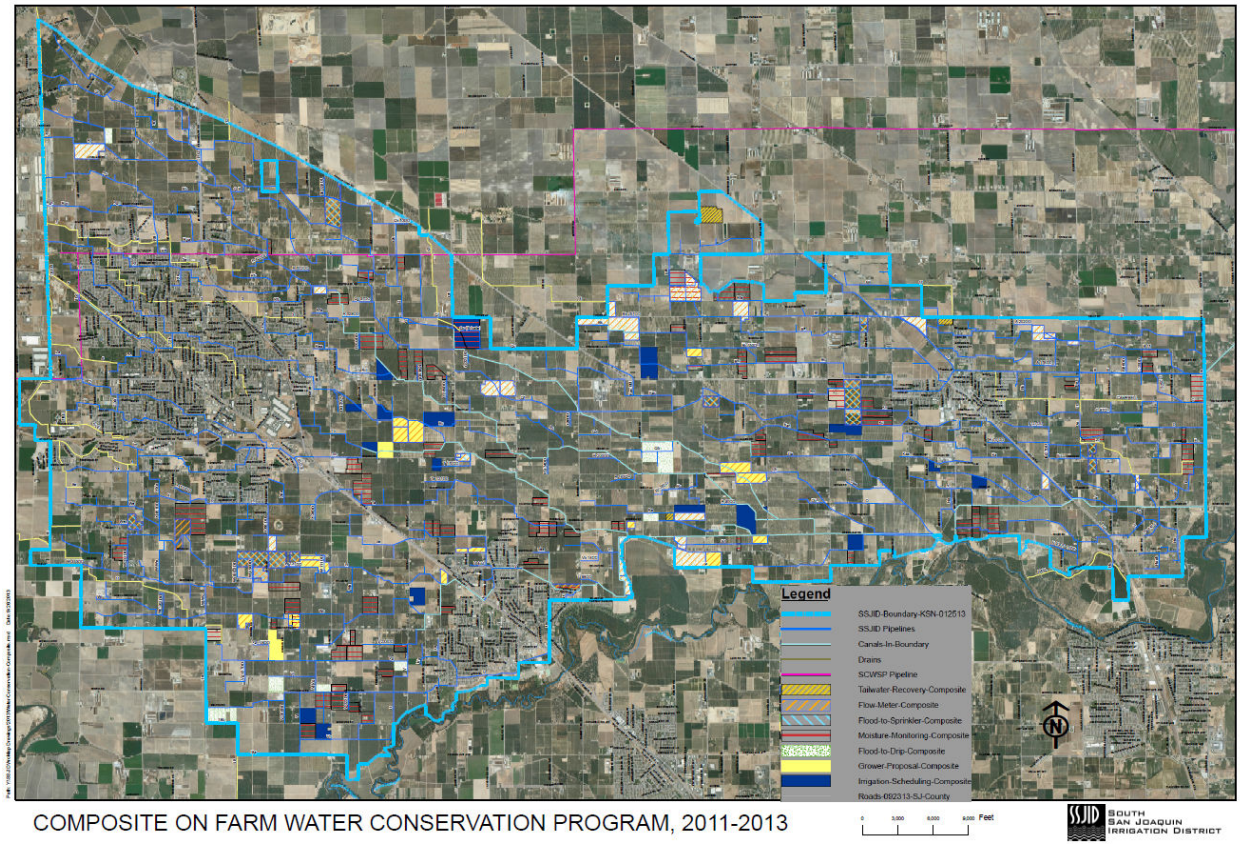
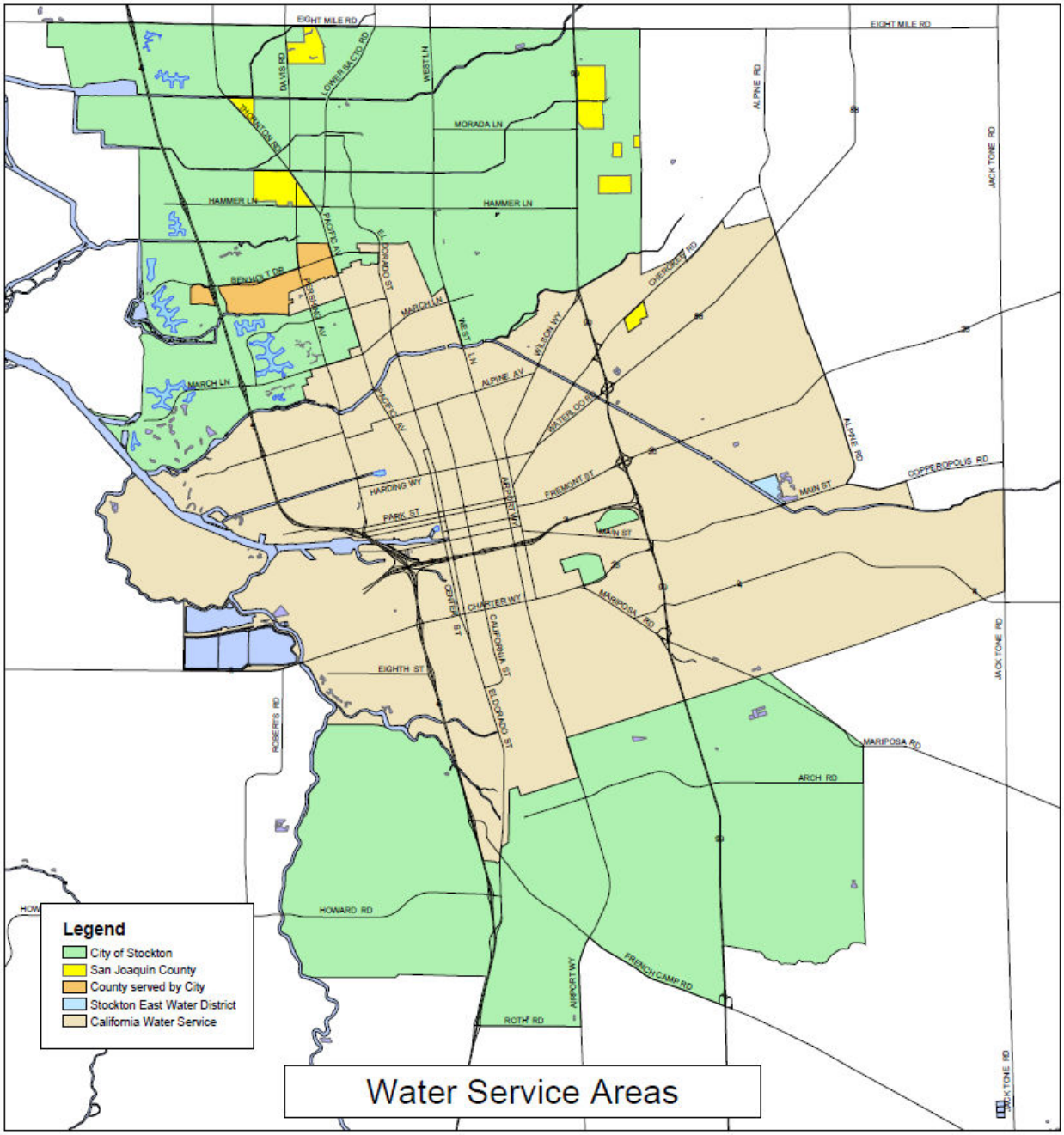
Figure 24 – Project 3 - SSJID On-Farm Water Conservation Program Map



Project 4 - Cal Water Comprehensive Conservation Program

Figure 25 – Cal Water Service Area



PROJECT PHYSICAL BENEFITS and TECHNICAL ANALYSIS

Project 1 - Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software

Water Consumption Reporting and Customer Engagement uses software and web-based information and communication technology services to deliver personalized water use information to customers. The system delivers individualized water consumption reports to retail water agency customers showing comparisons of household water use to similar homes and customized messaging and recommendations for taking water conservation actions. Targeted customers are directed to an interactive online portal where they are provided with detailed personalized information that is updated based on user-provided household attributes and conservation action history. Communications promote water conservation awareness and participation in other water conservation education and incentive programs. The system will enable the water retailers to target and cost-effectively deliver conservation information and services to more customers.

Studies of effectiveness[8] of this customer engagement software show average water demand reductions of 5 percent within six months of deployment. Additional results show that households receiving the Reports were 2.3 times more likely to participate in water conservation programs and 6 times more likely to request a home water survey than households not receiving Reports.

The City of Stockton (City) has a very active conservation outreach effort and has for several years; this is not a new concept due to the drought. Current conservation projects that the City is funding are:

a.) direct install High Efficiency Toilets (HET) for Commercial, Industrial and Institutional (CII) use;

b.) consistent grassroots outreach to their consumers at a variety of venues

c.) CII field surveys (water audits); and

d.) residential conservation kits.

The City is requesting funding for the Water Consumption Reporting and Customer Engagement WaterSmart Software. The software package is $110,933 for 10,000 homes; about 25% of the City's service area. The software will help implement the residential conservation measures described in the City's 2010 Urban Water Management Plan by providing Home Water Reports to the consumers. These reports are personalized reports sent by the City to households every billing period that use social norms-based messaging to persuade customers to engage in water-saving behaviors.

As described in ATTACHMENT C – EBMUD Water Smart Evaluation (Att3_DG_ProJust_2of8) this approach has been verified[9] to result in an average water use reduction of 5% within six months. The Water Consumption Reporting and Customer Engagement software uses web-based information and communication technology to deliver personalized water use information to customers.

Primary Benefit: Water Conserved – 924 acre-feet per year, based on 2013 consumption, 25 percent program penetration, and 5 percent expected savings.

[8] See ATTACHMENT C – EBMUD WaterSmart Evaluation (Att3_DG_ProJust_2of8)

[9] http://californiawaterfoundation.org/uploads/1389391749-Watersmart_evaluation_report_FINAL_12-12-13%2800238356%29.pdf

Table 5.1a – Annual Project Physical Benefits Project Name: Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software Type of Benefit Claimed: Water Conserved Units of the Benefit Claimed: Acre-feet per year Additional Information About this Benefit			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	73,886	73,886	924
2016	73,886	73,886	924
2017	73,886	73,886	924
2018	73,886	73,886	924
2019	73,886	73,886	924
2020	73,886	73,886	924
2021	73,886	73,886	924
2022	73,886	73,886	924
2023	73,886	73,886	924
2024	73,886	73,886	924
2025	73,886	73,886	924
2026	73,886	73,886	924
2027	73,886	73,886	924
2028	73,886	73,886	924
2029	73,886	73,886	924
2030	73,886	73,886	924
2031	73,886	73,886	924
2032	73,886	73,886	924
2033	73,886	73,886	924
2034	73,886	73,886	924
Comments: Benefit based on 2013 consumption with 5% savings in 25% of households.			

Secondary Benefits:

- Decreased groundwater pumping or reduced surface water purchases
- Decreased energy use for water production, distribution and collection
- Decreased potential for mobilizing connate saline water
- Reduction in water production costs (energy, chemical, etc.)
- Reduction in greenhouse gas production due to decreased energy use

Reduced Surface Water Purchases or Decreased Groundwater Pumping

The cost of surface water purchased from Stockton East Water District (SEWD) is based on prior year consumption. The cost for 2014/15 is $336 per acre-foot. Every acre-foot conserved will result in an acre-foot reduction in surface water purchases.

When surface water is not available, the City of Stockton uses its wells to meet customer demands. Water is lifted approximately 300 feet (static depth to water, plus well drawdown, plus pumping to elevated water tanks, 70 psi). At an average 70 percent pump efficiency, approximately 438 kWh of energy are required for each acre-

foot pumped. Total energy savings from the water conservation program would be (924 af/yr x 438 kWh/af =) 405,000 kWh/yr. These benefits are quantified in Table 5.1b.

Table 5.1b – Annual Project Physical Benefits

Project Name: Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software
Type of Benefit Claimed: Energy Savings
Units of the Benefit Claimed: KiloWatt-hours per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	0	(405,000)	405,000
2016	0	(405,000)	405,000
2017	0	(405,000)	405,000
2018	0	(405,000)	405,000
2019	0	(405,000)	405,000
2020	0	(405,000)	405,000
2021	0	(405,000)	405,000
2022	0	(405,000)	405,000
2023	0	(405,000)	405,000
2024	0	(405,000)	405,000
2025	0	(405,000)	405,000
2026	0	(405,000)	405,000
2027	0	(405,000)	405,000
2028	0	(405,000)	405,000
2029	0	(405,000)	405,000
2030	0	(405,000)	405,000
2031	0	(405,000)	405,000
2032	0	(405,000)	405,000
2033	0	(405,000)	405,000
2034	0	(405,000)	405,000

Comments: Benefit based on 2013 consumption with 5% savings in 25% of households, 300 ft. total pump lift (depth to water + well drawdown + lift to elevated tank), and 70% average pump efficiency

Table 5.1c – Annual Project Physical Benefits

Project Name: Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software
Type of Benefit Claimed: Greenhouse Gas Reduction
Units of the Benefit Claimed: Pounds of CO2 equivalents per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	0	(212,000)	212,000
2016	0	(212,000)	212,000
2017	0	(212,000)	212,000
2018	0	(212,000)	212,000
2019	0	(212,000)	212,000
2020	0	(212,000)	212,000
2021	0	(212,000)	212,000
2022	0	(212,000)	212,000
2023	0	(212,000)	212,000
2024	0	(212,000)	212,000
2025	0	(212,000)	212,000
2026	0	(212,000)	212,000
2027	0	(212,000)	212,000
2028	0	(212,000)	212,000
2029	0	(212,000)	212,000
2030	0	(212,000)	212,000
2031	0	(212,000)	212,000
2032	0	(212,000)	212,000
2033	0	(212,000)	212,000
2034	0	(212,000)	212,000

Comments: Benefit based on 2013 consumption with 5% savings in 25% of households, 300 ft. total pump lift (depth to water + well drawdown + lift to elevated tank), 70% average pump efficiency, and 524 pounds of CO2 equivalents per megawatt-hour

Reduction in greenhouse gas production due to decreased energy use

Greenhouse gas (GHG) emissions have been identified as direct contributors to global climate change. Based on the current mix of PG&E electric generation facilities, 524 pounds of carbon dioxide equivalents (carbon dioxide, nitrous oxide, and methane) is produced for each megawatt-hour of energy generated.[10] The electricity provided by PG&E is comprised of a combination of natural gas fired power plants, hydropower, a nuclear plant, biomass fired power plants, wind turbines, and wind turbines, solar energy, and geothermal sources.[11] Each acre-foot conserved will result in less energy consumption and thus less GHG production. The benefit based on the energy savings in Table 5.1b are presented in Table 5.1c.

Decreased potential for mobilizing connate saline water

Historical groundwater originally flowed from east to west. However, with increased development in the Stockton area groundwater levels were pulled down below sea level, and migration of connate saline water began moving into the production aquifers beneath the city. The eastward flow of groundwater from the Delta area is significant, because of the typically poorer water quality and the migration of saline groundwater with high chloride and TDS concentrations.

[10] GEI Consultants, August 2011, "San Joaquin County Freeport Element of the American River Use Strategy, Phase I, Volume 1", p.7-15
[11] PG&E, 2009

Importation of surface water from Stockton East Water District and from the Stockton Delta Water Supply Project have raised water levels and stopped or slowed the saline water movement. Each acre-foot reduction in groundwater pumping will help maintain higher water levels and restrain saline water movement. This benefit has not been quantified.

Project 2 - SSJID West Basin Water Reuse Project

The West Basin Water Reuse Project consists of infrastructure improvements to capture spill water, storm water drainage and tail water flows from flood irrigation activities and direct these flows to a 37.5 acre-foot storage reservoir containing a 14,500 gpm capacity pump station. The project will connect to the existing the existing Division 9 pressure irrigation distribution system (a pilot project, now in its third year of operation) and expand the benefits achieved from that project as described below.

The purpose of this project is to increase the drought resiliency of the South San Joaquin Irrigation District (SSJID) by maximizing the long-term beneficial use of the District's water use in a sustainable manner. The goals and objectives of this project are to increase: local water supply, energy efficiency, groundwater recharge, use of pressurized irrigation systems, crop yield, crop quality, delivery measurement, air quality, land values, conservation of groundwater supplies, water management information, irrigation flexibility, water administration, and compliance with State volumetric billing requirements.

Based upon statistical analysis of data compiled from the Division 9 project for the past two years[12], it is anticipated that the project will provide the aquifer with groundwater recharge and the pump station will return approximately 10,000 acre-feet of tail water back into a pressurized irrigation system for water application on farmland via drip, micro, and solid state sprinkler systems. As determined results achieved from the existing Division 9 system,[12] the project expects to decrease: crop production inputs (water, fertilizer, pump energy, maintenance), farm management costs, farm labor costs, on-farm groundwater pumping, farm run-off, water requirements, spillage, overall energy use, air emissions, District operational costs (labor, fleet mileage, air emissions, dust), and leaching of fertilizers.

Storm water flows will also be directed to the project's basin for recharge of the groundwater aquifer. The on-demand pressurized irrigation system eliminates water waste by providing water service at the exact duration, flow rate, frequency, and pressure. In addition, farmers will be equipped with a web interface that displays real-time field moisture conditions so growers only order water when their crops need it. Through the first two years of the pilot pressure irrigation project, one of the realized benefits has been a 30% reduction in water demand per acre.

Primary Benefit: Water Conserved – 10,000 acre-feet per year

The project will supply a pressurized irrigation system that reduces water use by 10 inches per acre of irrigated land.

In 2011 the District was awarded a WaterSmart Grant for the similar Division 9 Irrigation Enhancement Project. The same physical benefits for this Project are expected the West Basin Water Reuse Project. A copy of the Grant Application and the Final Project Report in the attachments[12]. A copy of a technical memorandum prepared regarding the Division 9 Irrigation Enhancement Project is included as ATTACHMENT E – Division 9 Irrigation Enhancement Project Final Report (Att3_DG_ProJust_4of8)**.** SSJID estimates a water savings of 10,000 acre feet per year, based on demonstrated results from the existing Division 9 system. The West Basin Water Reuse Project is an extension of the Division 9 system.

This benefit is quantified in Table 5.2a.

Secondary Benefits:

- Decreased groundwater pumping
- Decreased energy use for water production and distribution

[12] See ATTACHMENT D – Division 9 Project Application Submittal Package (*Att3_DG_ProJust_3of8)*

Decreased groundwater pumping/Decreased energy use for water production and distribution

Surface water is supplemented by groundwater pumping to meet both agricultural and urban customer demands. Water is lifted approximately 160 feet (static depth to water[13], plus well drawdown[14]). At an average 70 percent pump efficiency, approximately 234 kWh of energy is required for each acre-foot pumped. Total energy savings from the water reused in the project would be (10,000 af/yr x 234 kWh/af =) 2,340,000 kWh/yr.

This benefit is quantified in Table 5.2b.

Unquantified Benefits:

- The tailwater recovery system will reduce farm runoff to rivers and increase groundwater recharge to the aquifer.
- This project will increase water supply to the pressure irrigation system which reduces private groundwater pumping as growers use more District surface water, reduce air emissions due to the retirement of diesel driven pumps
- The project will induce greater conversion of farmers from flood irrigation to sprinkler application reducing the deep percolation of soil amendments (notably nitrate) into the groundwater aquifer.
- The Project's water supply will feed a pressure irrigation distribution system powered by renewable energy though solar powered customer connections consisting of a flow control valve, magnetic flow meter, moisture sensors, pressure transmitter, radio communications, and a process logic controller.
- The project will provide incidental groundwater recharge from the storage reservoir.
- The project will increase local water supply reliability and the delivery of safe drinking water
- Result in climate change response actions:
    - advance and expand conjunctive management of multiple water supply sources,
    - use and reuse water more efficiently,
    - reduce greenhouse emissions,
    - reduce energy consumption,
    - use cleaner energy sources to move and treat water,
    - increase water use efficiency, water recycling, and water system energy efficiency
- Provides water supply enhancement and facilities:
    - water supply pipelines and water systems,
    - additional water system tie-ins/interconnections,
    - conjunctive water management,
    - new water storage facilities
- Water quality improvement - captures storm water runoff
- Groundwater improvements:
    - enhance conjunctive management and groundwater storage,
    - capture and recharge storm water

[13] Estimated from water level maps in ATTACHMENT A – Eastern San Joaquin 2014 IRWMP Update (Att1_DG_Eligible_2of14)

[14] Water will need to be re-pumped for the West Basin project, so pumping to distribution system pressure is not included in this calculation.

Table 5.2a – Annual Project Physical Benefits

Project Name: SSJID West Basin Water Reuse Project
Type of Benefit Claimed: Water Conserved
Units of the Benefit Claimed: Acre-feet per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project | (b) – (c) |
2014	0	0	0
2015	0	0	0
2016	0	10,000	10,000
2017	0	10,000	10,000
2018	0	10,000	10,000
2019	0	10,000	10,000
2020	0	10,000	10,000
2021	0	10,000	10,000
2022	0	10,000	10,000
2023	0	10,000	10,000
2024	0	10,000	10,000
2025	0	10,000	10,000
2026	0	10,000	10,000
2027	0	10,000	10,000
2028	0	10,000	10,000
2029	0	10,000	10,000
2030	0	10,000	10,000
2031	0	10,000	10,000
2032	0	10,000	10,000
2033	0	10,000	10,000
2034	0	10,000	10,000
2035	0	10,000	10,000
2036	0	10,000	10,000
2037	0	10,000	10,000
2038	0	10,000	10,000
2039	0	10,000	10,000
2040	0	10,000	10,000
2041	0	10,000	10,000
2042	0	10,000	10,000
2043	0	10,000	10,000
2044	0	10,000	10,000
2045	0	10,000	10,000
2046	0	10,000	10,000
2047	0	10,000	10,000
2048	0	10,000	10,000
2049	0	10,000	10,000
2050	0	10,000	10,000
2051	0	10,000	10,000
2052	0	10,000	10,000
2053	0	10,000	10,000
2054	0	10,000	10,000
2055	0	10,000	10,000
2056	0	10,000	10,000
2057	0	10,000	10,000
2058	0	10,000	10,000
2059	0	10,000	10,000
2060	0	10,000	10,000
2061	0	10,000	10,000
2062	0	10,000	10,000
2063	0	10,000	10,000
2064	0	10,000	10,000
2065	0	10,000	10,000
Last Year of Project Life			0

Comments:

Table 5.2b – Annual Project Physical Benefits

Project Name: SSJID West Basin Water Reuse Project
Type of Benefit Claimed: Energy Savings
Units of the Benefit Claimed: KiloWatt-hours per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project | (b) – (c) |
2014	0	0	0
2015	0	0	0
2016	0	2,340,000	2,340,000
2017	0	2,340,000	2,340,000
2018	0	2,340,000	2,340,000
2019	0	2,340,000	2,340,000
2020	0	2,340,000	2,340,000
2021	0	2,340,000	2,340,000
2022	0	2,340,000	2,340,000
2023	0	2,340,000	2,340,000
2024	0	2,340,000	2,340,000
2025	0	2,340,000	2,340,000
2026	0	2,340,000	2,340,000
2027	0	2,340,000	2,340,000
2028	0	2,340,000	2,340,000
2029	0	2,340,000	2,340,000
2030	0	2,340,000	2,340,000
2031	0	2,340,000	2,340,000
2032	0	2,340,000	2,340,000
2033	0	2,340,000	2,340,000
2034	0	2,340,000	2,340,000
2035	0	2,340,000	2,340,000
2036	0	2,340,000	2,340,000
2037	0	2,340,000	2,340,000
2038	0	2,340,000	2,340,000
2039	0	2,340,000	2,340,000
2040	0	2,340,000	2,340,000
2041	0	2,340,000	2,340,000
2042	0	2,340,000	2,340,000
2043	0	2,340,000	2,340,000
2044	0	2,340,000	2,340,000
2045	0	2,340,000	2,340,000
2046	0	2,340,000	2,340,000
2047	0	2,340,000	2,340,000
2048	0	2,340,000	2,340,000
2049	0	2,340,000	2,340,000
2050	0	2,340,000	2,340,000
2051	0	2,340,000	2,340,000
2052	0	2,340,000	2,340,000
2053	0	2,340,000	2,340,000
2054	0	2,340,000	2,340,000
2055	0	2,340,000	2,340,000
2056	0	2,340,000	2,340,000
2057	0	2,340,000	2,340,000
2058	0	2,340,000	2,340,000
2059	0	2,340,000	2,340,000
2060	0	2,340,000	2,340,000
2061	0	2,340,000	2,340,000
2062	0	2,340,000	2,340,000
2063	0	2,340,000	2,340,000
2064	0	2,340,000	2,340,000
2065	0	2,340,000	2,340,000
Last Year of Project Life			0

Comments: Benefit based on water reclaimed (Table 5.2a), 160 ft. pump lift (depth to water + well drawdown (excludes lift to distribution system pressure), and 70% average pump efficiency

Project 3 - SSJID On-Farm Water Conservation Program

SSJID developed the On-Farm Water Conservation Program to promote and incentivize on-farm physical improvements, irrigation management practices and water measurement that promote water conservation. This is a successful existing program that lacks only funding for its further implementation. The program incentivizes use of less water to accomplish the same purpose by encouraging the efficient use of District surface water to meet crop water requirements. The measures include installation of delivery measurement for pumped deliveries, conversion from flood to sprinkler or drip/micro irrigation, tailwater recovery systems to prevent runoff, scientific irrigation scheduling, and soil moisture monitoring.

The Project includes conservation measures for the installation of delivery measurement devices for pumps, conversion from flood to sprinkler or drip/ micro irrigation, tailwater recovery systems to prevent runoff, scientific irrigation scheduling, and soil moisture monitoring.

Primary Benefit: Water Conserved – 3,000 acre-feet per year

> Initially, a grower survey was sent out and the responses were recorded to determine how best to structure the program; to be sure the growers' needs were met. The survey is attached and response worksheet is included as ATTACHMENT G – South San Joaquin Irrigation District Grower Survey (Att3_DG_ProJust_6of8). A technical memorandum that evaluated the grower survey and responses is also attached. An additional technical memorandum is attached that evaluated the first years' Program (ATTACHMENT H – Initial Evaluation of On-Farm Conservation Program (Att3_DG_ProJust_7of8)) provides the basis for the expected savings. ATTACHMENT I – SSJID On-Farm Conservation Program Administration Tools from 2011-2014 Seasons (Att3_DG_ProJust_8of8) illustrates the tools used to track the program over its lifetime, reinforcing the expected savings estimate.
>
> This benefit is quantifiied in Table 5.3a.

Secondary Benefits:

- Decreased groundwater pumping
- Decreased potential for mobilizing connate saline water
- Decreased energy use for water production, distribution and collection

Decreased groundwater pumping/Decreased energy use for water production and distribution

Surface water is supplemented by groundwater pumping to meet both agricultural and urban customer demands. Water is lifted approximately 160 feet (static depth to water, plus well drawdown and lift to 35 psi distribution system pressure). At an average 70 percent pump efficiency, approximately 234 kWh of energy is required for each acre-foot pumped. Total energy savings from the water reused in the project would be (3,000 af/yr x 351 kWh/af =) 1,053,000 kWh/yr.

This benefit is quantified in Table 5.3b.

<u>Unquantified benefits</u>

Decreased potential for mobilizing connate saline water

Historical groundwater originally flowed from east to west. However, with increased development in the Stockton area groundwater levels were pulled down below sea level, and migration of connate saline water began moving into the production aquifers beneath the city. The eastward flow of groundwater from the Delta area is significant, because of the typically poorer water quality and the migration of saline groundwater with high chloride and TDS concentrations.

Each acre-foot reduction in groundwater pumping will help maintain higher water levels and restrain saline water movement. This benefit has not been quantified.

Table 5.3a – Annual Project Physical Benefits

Project Name: SSJID On-Farm Water Conservation Program
Type of Benefit Claimed: Water Conserved
Units of the Benefit Claimed: Acre-feet per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	0	0	0
2016	0	(3,000)	3,000
2017	0	(3,000)	3,000
2018	0	(3,000)	3,000
2019	0	(3,000)	3,000
2020	0	(3,000)	3,000
2021	0	(3,000)	3,000
2022	0	(3,000)	3,000
2023	0	(3,000)	3,000
2024	0	(3,000)	3,000
2025	0	(3,000)	3,000
2026	0	(3,000)	3,000
2027	0	(3,000)	3,000
2028	0	(3,000)	3,000
2029	0	(3,000)	3,000
2030	0	(3,000)	3,000
2031	0	(3,000)	3,000
2032	0	(3,000)	3,000
2033	0	(3,000)	3,000
2034	0	(3,000)	3,000
2035	0	(3,000)	3,000
2036	0	(3,000)	3,000
2037	0	(3,000)	3,000
2038	0	(3,000)	3,000
2039	0	(3,000)	3,000
2040	0	(3,000)	3,000
2041	0	(3,000)	3,000
2042	0	(3,000)	3,000
2043	0	(3,000)	3,000
2044	0	(3,000)	3,000
2045	0	(3,000)	3,000
Last Year of Project Life			0
Comments:			

Table 5.3b – Annual Project Physical Benefits

Project Name: SSJID On-Farm Water Conservation Program
Type of Benefit Claimed: Energy Savings
Units of the Benefit Claimed: KiloWatt-hours per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	0	0	0
2016	0	(1,053,000)	1,053,000
2017	0	(1,053,000)	1,053,000
2018	0	(1,053,000)	1,053,000
2019	0	(1,053,000)	1,053,000
2020	0	(1,053,000)	1,053,000
2021	0	(1,053,000)	1,053,000
2022	0	(1,053,000)	1,053,000
2023	0	(1,053,000)	1,053,000
2024	0	(1,053,000)	1,053,000
2025	0	(1,053,000)	1,053,000
2026	0	(1,053,000)	1,053,000
2027	0	(1,053,000)	1,053,000
2028	0	(1,053,000)	1,053,000
2029	0	(1,053,000)	1,053,000
2030	0	(1,053,000)	1,053,000
2031	0	(1,053,000)	1,053,000
2032	0	(1,053,000)	1,053,000
2033	0	(1,053,000)	1,053,000
2034	0	(1,053,000)	1,053,000
2035	0	(1,053,000)	1,053,000
2036	0	(1,053,000)	1,053,000
2037	0	(1,053,000)	1,053,000
2038	0	(1,053,000)	1,053,000
2039	0	(1,053,000)	1,053,000
2040	0	(1,053,000)	1,053,000
2041	0	(1,053,000)	1,053,000
2042	0	(1,053,000)	1,053,000
2043	0	(1,053,000)	1,053,000
2044	0	(1,053,000)	1,053,000
2045	0	(1,053,000)	1,053,000
Last Year of Project Life			0

Comments: Benefit based on water conserved (Table 5.3a), 240 ft. pump lift (depth to water + well drawdown (excludes lift to distribution system pressure), and 70% average pump efficiency

Project 4 - Cal Water Comprehensive Conservation Program

Primary Project Benefit:

Water Conserved (acre-feet)

Table 5.4a summarizes the primary physical benefits of the project.

Table 5.4a – Annual Project Physical Benefits Project Name: CalWater Comprehensive Conservation Program Type of Benefit Claimed: Potable Water Savings Units of the Benefit Claimed: Acre-feet per year Additional Information About this Benefit			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2015	0	30	30
2016	0	55	55
2017	0	79	79
2018	0	72	72
2019	0	69	69
2020	0	60	60
2021	0	52	52
2022	0	45	45
2023	0	44	44
2024	0	43	43
2025	0	33	33
2026	0	24	24
2027	0	14	14
2028	0	13	13
2029	0	12	12
2030	0	11	11
2031	0	11	11
2032	0	11	11
2033	0	10	10
2034	0	10	10
2035	0	10	10
2036	0	9	9
2037	0	9	9
2038	0	9	9
2039	0	9	9
2040	0	6	6
2041	0	3	3
Comments: Total cumulative savings through 2040 approximately 750 AF.			

The water savings in Table 5.4a are calculated as the sum of savings from each of the program elements. Following are brief descriptions of the manner in which these savings are calculated and the sources of the underlying assumptions.

Toilet Replacements: Single Family

Unit savings are derived from Ultra-Low-Flush Toilet (ULFT) savings equations published by CUWCC (California

Urban Water Conservation Council, 2004).[15] The reduced form equations are derived from empirical studies of ULFT savings prepared by A&N Technical Services and relate per toilet water savings to persons per household (PPH). The reduced form estimate of ULFT savings (in gallons per day) for single family toilets is:

$$S_{ULFT} = 6.693 \times PPH - 0.529 \times PPH^2 + 7.826$$

A scaling factor was then applied to each unit savings estimate to adjust the estimate to account for the fact that High Efficiency Toilets (HETs) would be expected to save about 13% more water per flush and Ultra High Efficiency Toilets (UHETs) 25% more per flush than ULFTs due to the lower flush volumes. A second scaling factor was then applied to account for the fact that the average flush volume of toilets the program will replace is expected to be lower than the average flush volume of replaced toilets at the time the ULFT savings studies were completed.

Based on this methodology, the annual savings is estimated to be 6,938 gallons for HETs and 8,220 gallons for UHETs. The duration of these savings is assumed to be 25 years. Each year, the savings credited to the program (the "active" savings) is reduced by 4% to account for expected natural replacement of inefficient toilets. For HETs, the savings are further reduced by 50% to account for free riders (customers who would have replaced the toilet in the absence of the utility rebate).

Clothes washer Replacements: Single Family

Unit savings (in gallons per year) are based on the difference between average water use for new washers, as forecasted by the United States Department of Energy, and Tier 3 washers with an average water factor of 3.5. Unit savings are calculated as:

$$S = \left(WF_{avg} - WF_{T3}\right) \times CU \times Cycles$$

where WFavg is the average water factor of new washers, WFT3 is the water factor for Tier 3 washers, CU is the average capacity of new washers, and Cycles is the average number of washer cycles per single-family residence.

Average number of washer cycles per year is taken from EPA's Clothes washer Savings Calculator (U.S. Environmental Protection Agency, 2012).

The average water factor of new washers is derived from Department of Energy clothes washer market forecasts for top and front load clothes washers (U.S. Department of Energy, 2010).

Based on this methodology, the annual savings per replaced washer is assumed to be 4,037 gallons, with a 12-year savings life. The savings credited to the program is reduced by 10% to account for free riders.

Showerhead/Aerator/Tablet Kit Distribution: Single Family

Unit savings are based on the difference in flow rates between plumbing fixtures included in the kit (showerheads and aerators) and the average flow rate of plumbing fixtures (showerheads and aerators) replaced by Cal Water during home water surveys. The annual savings is 4,400 gallons with a 5-year savings life.

Audits and Surveys: Single Family

The source for the estimate is Chesnutt, et al (Chesnutt, McSpadden, & Pekelney, 1995). The Chesnutt et al. estimate was reduced by 25% to account for the increase in the average water efficiency of homes receiving surveys since the time of the study. This approach results in an assumed annual savings of 8,815 gallons, with a 5-year savings life.

Smart Controllers: Single Family

Smart Controller water savings are set to the maximum derived from two alternative methods. The first method used a customized landscape water savings model to calculate water savings. The second method relied on empirical studies indicating Smart Controllers can potentially reduce outdoor water usage by as much as 20% (Western Policy Research, 1996; Western Policy Research, 1997; California Urban Water Conservation Council,

[15] See page 2-58.

2004). It was assumed up to 75% of this savings potential would be realized by the program. Thus, under the second method, Smart Controllers were assumed to reduce outdoor water use by 15% (75% of 20%). Outdoor water use was set to the five-year average of outdoor water use for the period 2005-2009. Average annual indoor and outdoor water use per account came from the district UWMP data.

Under Method 1 water savings were calculated using a landscape water requirements model developed by USEPA's Waterwise program. Landscape water requirements are determined by assumed irrigation efficiency, evapotranspiration, landscape coefficient, landscape area, and effective rainfall for the Stockton district. Smart controllers are assumed to improve irrigation efficiency by about 8% and reduce average evapotranspiration by 3.2%. The average irrigated area is assumed to be 4,000 sq. ft for single family accounts.

Based on this methodology, the annual savings is estimated to be 8,829 gallons, with a 10-year savings life.

Turf Replacement Rebates: Single Family, Multi-Family, Commercial

The savings from turf replacement are derived from the USEPA model described above. Turf replacement is assumed to improve irrigation efficiency by about 40% and cut the landscape coefficient in half. This results in a savings of 34 gallons per square foot of turf replaced, with a 10-year savings life. Savings attributed to the program are reduced by 25% to account for free riders. Note that the square footage estimates in Table CW-1 may vary for each customer classification depending on customer response.

Toilet Replacements: Multi-Family

The source and methodology for estimating multi-family savings from toilet replacements are identical to those used for single-family savings as described above. The formula for multi-family customer savings is:

$$S_{ULFT} = 19.138 \times PPH - 0.942 \times PPH^2 + 2.181$$

The two scaling factors differ slightly from the single family factors. The annual savings is estimated to be 8,455 gallons for HETs and 11,046 gallons for UHETs. The duration of these savings is assumed to be 25 years. Each year, the savings credited to the program (the "active" savings) is reduced by 4% to account for natural replacement.

Common Area Clothes washers: Multi-Family

Single and multi-family clothes washer savings were drawn from the Alliance for Water Efficiency's Water Conservation Tracking Tool Program Library (Alliance for Water Efficiency, 2011). AWE's estimates are based on older empirical estimates that reflect lower average water efficiency of replaced washers. Single-family savings were re-estimated using the DOE market data described for Activity 6 (single family washer rebates) to account for the significant changes in clothes washer efficiency that have occurred in recent years. The ratio of the re-estimated single-family savings to the original AWE estimate was then used to re-scale the AWE multi-family estimate. The re-scaled savings estimate is approximately 56% of the original AWE estimate.

This method resulted in an annual savings estimate of 14,434 gallons over an 8-year savings life.

In-Unit Clothes washers: Multi-Family

In-unit multi-family clothes washer savings were drawn from the CUWCC's BMP Cost and Savings Study (California Urban Water Conservation Council, 2004). The CUWCC estimate is based on older empirical estimates that reflect lower average water efficiency of replaced washers. Single-family savings were re-estimated using the DOE market data as described for Activity 6 (single family washer rebates) to account for the significant changes in clothes washer efficiency that have occurred in recent years. The ratio of the re-estimated single-family savings to the original AWE estimate was then used to re-scale the in-unit multi-family estimate. The re-scaled savings estimate is approximately 56% of the original CUWCC estimate for in-unit multifamily washers.

This method resulted in an annual savings estimate of 2,990 gallons over a 12-year savings life.

Audits and Surveys: Multi-Family

Unit savings are set to 5% of average multi-family account use. The percentage reduction in use is based on

indoor water savings from residential surveys reported in CUWCC's BMP Cost and Savings Study (California Urban Water Conservation Council, 2004). The resulting annual savings estimate is 93,598 gallons over a 5-year savings life. The savings are assumed to decay at a 10% annual rate.

Rotating Sprinkler Nozzle Rebate: Multi-Family and Commercial

The source for the annual savings estimate is Metropolitan Water District of Southern California's Save Water Save A Buck program assumption. The MWD estimate is reduced by 20% to account for distributed pop-up nozzles that do not get installed. The resulting annual savings assumption is 1,042 gallons per nozzle, with a 10-year savings life.

Spray Body Integrated Pressure Regulation & Check Valve Rebate: Multi-Family and Commercial

Savings in this program are achieved through proper pressure management and through limiting low-head drainage water loss. The annual per-nozzle savings of 835 gallons for pressure regulation are based on a calculator provided by Rain Bird.[16] The 150 gallon annual savings associated with limiting low-head drainage water loss is estimated based on an assumed distribution of 1" PVC pipe length across sites and an assumed 25% of total irrigated area being flat/marginal. Total annual per-nozzle savings is 985 gallons.

Smart Controllers: Multi-Family

The approach used to estimate savings is similar to that used for single-family customers, with a larger irrigated area. The annual savings is 72,882 gallons over a 10-year savings life.

Toilet Replacement: Commercial

Unit savings are derived from commercial ULF toilet savings estimates published by CUWCC (California Urban Water Conservation Council, 1997) and zip-code level counts of pre-1992 toilets by commercial sector, also published by CUWCC (California Urban Water Conservation Council, 1998).

The ULFT unit savings estimate is a weighted average of the unit savings estimated for 10 commercial sectors by CUWCC. Weights are calculated using zip-code level counts of pre-1992 toilets in each of the 10 commercial sectors.

$$S_{ULFT} = \sum_{i=1}^{10} w_i S_i$$

where wi is the weight applied to commercial sector i and Si is the unit savings estimated for commercial sector i.

Scaling factors similar to those for the single family and multi-family programs are then applied. The annual HET savings is estimated to be 6,153 gallons. The duration of these savings is assumed to be 25 years. Each year, the savings credited to the program (the "active" savings) are reduced by 4% to account for natural replacement.

Urinal Replacement: Commercial

Unit savings for 0.5 gpf urinals are taken from the Alliance for Water Efficiency's Water Conservation Tracking Tool Program Library (Alliance for Water Efficiency, 2011). This estimate is increased by 50% to estimate unit savings for the 0.25 gpf urinals that this program provides. The Tracking Tool Program Library estimate for 0.5 gpf urinals comes from a 2005 study by the California Urban Water Conservation Council (Koeller & Company, Inc., 2005).

Based on this methodology, the annual savings is estimated to be 6,207 gallons with a 25-year savings life.

Coin-Op Clothes washers: Commercial

Coin-Op clothes washer savings were drawn from the Alliance for Water Efficiency's Water Conservation Tracking Tool Program Library (Alliance for Water Efficiency, 2011). AWE's estimates are based on older

[16] See http://www.rainbird.com/landscape/resources/calculators/1800prs_5-steps.htm.

empirical estimates that reflect lower average water efficiency of replaced washers. Single-family savings were re-estimated using the DOE market data described for single family washer rebates to account for the significant changes in clothes washer efficiency that have occurred in recent years. The ratio of the re-estimated single-family savings to the original AWE estimate was then used to re-scale the AWE coin-op estimate. The re-scaled savings estimate is approximately 56% of the original AWE estimate.

This approach results in annual savings of 17,927 gallons over an 8-year savings life.

Audits and Surveys: Commercial

Unit savings are set to 7.5% of average commercial account use. The AWWARF report Water Use Efficiency in Integrated Water Management (A&N Technical Services, 2007) provides the basis for the estimate, which reports typical commercial audit/survey savings potential of 15%. The unit savings estimate makes the assumption that on average half of recommended actions will be implemented, yielding a savings percentage of 7.5%. The resulting annual savings is 40,257 gallons over a 5-year life with a 10% annual decay rate.

Smart Controllers: Commercial

The approach used to estimate savings is similar to that used for single-family customers, with a larger irrigated area. The annual savings are 26,325 gallons over a 10-year savings life.

Large Landscape Water Use Reports

The savings associated with these reports are calculated using the EPA Waterwise landscape water requirements model described above. The water use reports are assumed to increase irrigation efficiency by approximately 3%. Irrigated area is assumed to be 1 acre. The resulting one-year savings of these annual reports is 35,396 gallons.

Large Landscape Surveys

The savings associated with these surveys are also calculated using the EPA Waterwise landscape water requirements model. The surveys are assumed to increase irrigation efficiency by an additional 13%. With an assumed irrigated area of 1 acre, the resulting annual savings is 91,233 gallons; the savings life is 5 years.

Secondary Project Benefits:
As described above, the water savings will help buttress water supply reliability during the current drought. These savings also result in key secondary benefits; in the case of Stockton, the most prominent of these are:

- Reduced pumping from an over-drafted groundwater basin
- Reduced energy usage
- Reduction in greenhouse gas emmissions
- Decreased potential for mobilizing connate saline water

Reductions in Groundwater Pumping

The marginal supply for Cal Water's Stockton district is groundwater pumped from the San Joaquin Valley Basin. Every gallon of conservation savings will result in a gallon less production from this source. Groundwater overdraft conditions have existed in this basin since the 1920s. Such an ongoing overdraft can result in significant environmental damage as well as a marked reduction in available groundwater supplies. This could result in additional costs in terms of both well construction, and operation and maintenance costs generated by the needed effort to seek groundwater at greater and greater depths.

Conservation programs such as those being proposed in this application, along with other actions being undertaken by Cal Water, help protect the basin.

Reduced Energy Usage

Table 5.4b estimates the reduced energy consumption as a result of the water savings shown in Table 5.4a. These estimates are based on power usage as estimated by the U.S. Department of Energy (U.S. Department of

Energy, 2006).[17] The figures in Table 5.4b include, for all water savings, the energy savings associated with groundwater pumping (based on the approximate current static level of the San Joaquin Valley Basin) and distribution, as well as energy usage reductions associated with wastewater collection, treatment and discharge for the indoor portion of the water savings.

Reduction in greenhouse gas production due to decreased energy use

Greenhouse gas (GHG) emissions have been identified as direct contributors to global climate change. Based on the current mix of PG&E electric generation facilities, 524 pounds of carbon dioxide equivalents (carbon dioxide, nitrous oxide, and methane) is produced for each megawatt-hour of energy generated.[18] The electricity provided by PG&E is comprised of a combination of natural gas fired power plants, hydropower, a nuclear plant, biomass fired power plants, wind turbines, and wind turbines, solar energy, and geothermal sources.[19] Each acre-foot conserved will result in less energy consumption and thus less GHG production. The benefit based on the energy savings in Table 5.4b are presented in Table 5.4c.

Decreased potential for mobilizing connate saline water

Historical groundwater originally flowed from east to west. However, with increased development in the Stockton area groundwater levels were pulled down below sea level, and migration of connate saline water began moving into the production aquifers beneath the city. The eastward flow of groundwater from the Delta area is significant, because of the typically poorer water quality and the migration of saline groundwater with high chloride and TDS concentrations.

Importation of surface water from Stockton East Water District and from the Stockton Delta Water Supply Project have raised water levels and stopped or slowed the saline water movement. Each acre-foot reduction in groundwater pumping will help maintain higher water levels and restrain saline water movement. This benefit has not been quantified.

[17] The assumed energy savings is based on 540 kWh per million gallons for groundwater pumping plus the average of the low and high cases for distribution shown in Table III-1 of the USDOE report for all water saved. In addition, for indoor water savings, the energy usage reductions also include the average of the low and high cases for wastewater collection, treatment and discharge.

[18] GEI Consultants, August 2011, "San Joaquin County Freeport Element of the American River Use Strategy, Phase I, Volume 1", p.7-15

[19] PG&E, 2009

Table 5.4b – Annual Project Physical Benefits

Project Name: CalWater Comprehensive Conservation Program
Type of Benefit Claimed: Energy Savings
Units of the Benefit Claimed: KiloWatt-hours per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2015	0	20,407	20,407
2016	0	38,589	38,589
2017	0	56,007	56,007
2018	0	52,320	52,320
2019	0	50,217	50,217
2020	0	45,155	45,155
2021	0	40,576	40,576
2022	0	36,430	36,430
2023	0	34,671	34,671
2024	0	32,935	32,935
2025	0	27,902	27,902
2026	0	24,031	24,031
2027	0	19,073	19,073
2028	0	17,458	17,458
2029	0	15,864	15,864
2030	0	15,397	15,397
2031	0	14,950	14,950
2032	0	14,520	14,520
2033	0	14,108	14,108
2034	0	13,712	13,712
2035	0	13,331	13,331
2036	0	12,966	12,966
2037	0	12,616	12,616
2038	0	12,280	12,280
2039	0	11,957	11,957
2040	0	7,865	7,865
2041	0	3,881	3,881

Comment: Total cumulative energy usage reductions through 2041 are approximately 660,000 kWh.

Table 5.4c – Annual Project Physical Benefits

Project Name: CalWater Comprehensive Conservation Program
Type of Benefit Claimed: Greenhouse Gas Reduction
Units of the Benefit Claimed: Pounds of CO2 equivalents per year
Additional Information About this Benefit

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2015	0	10,700	10,700
2016	0	20,200	20,200
2017	0	29,300	29,300
2018	0	27,400	27,400
2019	0	26,300	26,300
2020	0	23,700	23,700
2021	0	21,300	21,300
2022	0	19,100	19,100
2023	0	18,200	18,200
2024	0	17,300	17,300
2025	0	14,600	14,600
2026	0	12,600	12,600
2027	0	10,000	10,000
2028	0	9,100	9,100
2029	0	8,300	8,300
2030	0	8,100	8,100
2031	0	7,800	7,800
2032	0	7,600	7,600
2033	0	7,400	7,400
2034	0	7,200	7,200
2035	0	7,000	7,000
2036	0	6,800	6,800
2037	0	6,600	6,600
2038	0	6,400	6,400
2039	0	6,300	6,300
2040	0	4,100	4,100
2041	0	2,000	2,000

Comments: Benefit based on Table 5.4b energy use reduction and 524 pounds of CO2 equivalents per megawatt-hour

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COST EFFECTIVNESS ANALYSIS

Project 1 - Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software

Table 6.1 – Cost Effective Analysis Project 1: Stockton Water Consumption Reporting and Customer Engagement WaterSmart Software		
Question 1	Types of benefits provided as shown in Tables 5.1	Water Conserved, Energy Savings, Greenhouse Gas Reduction
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	The City of Stockton has had a very active conservation effort for many years and has considered and evaluated a wide range of conservation programs.
	If no, why? If yes, list the methods (including the proposed project) and estimated costs.	A number of programs have been developed and the most practicable selected. Current projects funded by the City include a) direct install High Efficiency Toilets (HET) for Commercial, Industrial and Institutioal (CII) use; b) CII water audits (field surveys); and c) residential conservation kits. The Water Consumption Reporting and Customer Engagement Software has been determined to be the most cost-effective next step program.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	The Water Consumption Reporting and Customer Engagement WaterSmart Software offers the opportunity to achieve relatively large water savings (5 percent) and targeted market penetration (25 percent of connections) at a very affordable price.
Comments:		

Project 2 - SSJID West Basin Water Reuse Project

Benefits that have been realized in similar SSJID projects[20] include lower energy cost, better crop yield, less water spills, More uniform water application rates, improved air quality, more efficient flood irrigation (flood irrigators are able to use flood system independently from the pressure system which allows them to complete their irrigations quicker and with less waste), improved delivery measurement and water management information, reduced production inputs (including water, fertilizer, pump energy and maintenance), irrigation scheduling flexibility, increased land values, reduced water requirements due to high application efficiency, leading to increased drought year resiliency, reduced farm runoff and related improved ability to comply with water quality regulations.

The exiting SSJID gravity system consists of long laterals that consist of non-reinforced pipelines that are not capable of sustaining pressure for long durations. The system requires that farmers be put on a scheduled rotation that is inconsistent with their needs. As such, water applications are higher than they would be for an on-demand system. Also, the current system does not provide for an accurate method to measure and bill volumetrically.

Maintaining the current system is more costly in the long run due to the fact that customers are moving away from prefer are converting to more efficient system that use groundwater as the supply source when they actually prefer the better quality obtained from surface water. The lack of flexibility of the SSJID system has been a deterrent over the years. It doesn't make financial sense to continue to improve pipelines that farmers will not want to use in the long run.

Table 6.2 – Cost Effective Analysis **Project 2: SSJID West Basin Water Reuse Project**		
Question 1	Types of benefits provided as shown in Tables 5.2	Water Conserved, Energy Savings
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	The West Basin was originally part of the plans for the existing Division 9 Project. Due to the success and high yield of the existing Division 9 system, alternative methods have not been considered.
	If no, why? If yes, list the methods (including the proposed project) and estimated costs.	The West Basin is expected to perform similarly to the Division 9 Project and recapture and reuse 10,000 acre feet per year.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	Based upon statistical analysis of data compiled from the Division 9 project for the past two years, it is anticipated that the project will provide the aquifer with groundwater recharge and the pump station will return approximately 10,000 acre-feet of tail water back into a pressurized irrigation system for water application on farmland via drip, micro, and solid state sprinkler systems. Due to the success and high yield of the existing Division 9 system, alternative methods have not been considered.
Comments:		

[20] See ATTACHMENT E – Division 9 Irrigation Enhancement Project Final Report (Att3_DG_ProJust_4of8)

Project 3 - SSJID On-Farm Water Conservation Program

When creating the Program, SSJID wanted to partner with growers with an assistance program to help install measures on-farm that would result in the most beneficial use of water. The cost-share amounts were determined in a way that would benefit a large number of growers throughout the District. This is one of the reasons there were maximum payout amounts for each measure. The Program Descriptions and the Administrative Guidelines (an internal guide) for each of the Program years (2011 through 2014) are included as ATTACHMENT I – SSJID On-Farm Conservation Program Administration Tools from 2011-2014 Seasons (Att3_DG_ProJust_8of8).

Table 6.3 – Cost Effective Analysis **Project 3: SSJID On-Farm Water Conservation Program**		
Question 1	Types of benefits provided as shown in Tables 5.3	Water Conserved, Energy Savings
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	Alternative methods have not been considered due to the success and high yield of the past years' programs.
	If no, why?	This program extends a very successful conservation program that has been in effect since 2011, but suspended in February 2014 due to drought-induced revenue shortfalls. The program is expected to save 3,000 acre-feet per year based on documented past performance.
	If yes, list the methods (including the proposed project) and estimated costs.	
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	This program has proven to be cost effective. Both the District and the growers receive benefits. In most cases, the incentives provided by this program encourage grower expense far in excess of excess of the cost-share provided by SSJID.
Comments:		

Project 4 - Cal Water Comprehensive Conservation Program

Table 6.4 – Cost Effective Analysis Project 4: Cal Water Comprehensive Conservation Program		
Question 1	Types of benefits provided as shown in Tables 5.4	Water Conserved - The primary benefits of the water savings shown in Table 5.4a are water supply benefits. The savings enable Cal Water to reduce its water production costs. During periods of drought, the savings increase water supply reliability. - Secondary benefits associated with these water savings include protection of an overdrafted groundwater basin and reductions in the energy and associated greenhouse gas emissionsused to produce and distribute water and collect, treat, and discharge wastewater.
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified?	Yes.
	If no, why? If yes, list the methods (including the proposed project) and estimated costs.	In 2010-2011, Cal Water undertook a comprehensive conservation master planning process . As part of that process, an exhaustive search of the literature and experience of other water utilities was conducted to develop a universe of all possible approaches to conserving water. This universe was subjected to several layers of screening to end up with the most appropriate and cost-effective portfolio of programs for each Cal Water district. The conservation program elements that are included in this application are the portion of the Stockton portfolio that is deemed most applicable for immediate drought relief.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods.	With the exception of the turf replacement program, the proposed conservation programs that comprise this project were developed by Cal Water to comply with the state's 20x2020 requirements at least possible cost. As part of the 20x2020 analysis a broader suite of programs was evaluated and programs were selected for implementation on the basis of savings potential, technical and administrative feasibility, and cost effectiveness. (M.Cubed, 2012) The programs for which grant funding is being requested are from the subset of programs included in the least-cost set of conservation measures that are not locally cost-effective to implement, though nonetheless needed to meet the 2020 gpcd reduction target. Thus this grant will assist Cal Water and the region to implement conservation programs and measures that are not locally cost-effective but needed for drought relief and longer term compliance with the state's 2009 conservation law. The turf replacement program was not originally part of the least cost set of conservation measures selected for 20x2020 compliance. It has been added as a drought relief measure because it provides immediate and lasting reductions in water use, has significant public relations value, and in response to increased public demand for this program during the drought.