Attachment 3

Coachella Valley Integrated Regional Water Management

2014 IRWM Drought Solicitation Implementation Grant Proposal

Project Justification

Attachment 3 consists of the following items:

- ✓ **Project Justification.** This attachment includes a summary of the proposed projects, including the purpose and how each project meets the needs created by the drought, which are explained in Attachment 2. This attachment also includes a technical justification of each project, describes how each project can achieve the claimed level of benefits, explains how the benefits will be attained through the least cost alternative, and identifies a plan to monitor project performance.

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Project Summary Table

Table 3-1 demonstrates how each project included in the proposal meet the applicable Drought Project Elements and IRWM Project Elements in accordance with Table 4 of the PSP.

Table 3-1: Project Summary Table

Drought Project Element		IWA Recycled Water Project	Regional Turf Reduction Program	DAC Onsite Plumbing Retrofit Program
D.1	Provide immediate regional drought preparedness	✓	✓	✓
D.2	Increase local water supply reliability and the delivery of safe drinking water			✓
D.3	Assist water suppliers and regions to implement conservation programs and measures that are not locally cost-effective			
D.4	Reduce water quality conflicts or ecosystem conflicts created by the drought	✓	✓	✓
IRWM Project Element		**IWA Recycled Water Project**	**Regional Turf Reduction Program**	**DAC Onsite Plumbing Retrofit Program**
IR.1	Water supply reliability, water conservation, and water use efficiency	✓	✓	✓
IR.2	Stormwater capture, storage, clean-up, treatment, and management			
IR.3	Removal of invasive non-native species, the creation and enhancement of wetlands, and the acquisition, protection, and restoration of open space and watershed lands			
IR.4	Non-point source pollution reduction, management, and monitoring	✓	✓	✓
IR.5	Groundwater recharge and management projects	✓	✓	✓
IR.6	Contaminant and salt removal through reclamation, desalting, and other treatment technologies and conveyance of reclaimed water for distribution to users	✓		
IR.7	Water banking, exchange, reclamation, and improvement of water quality	✓	✓	✓
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			

Regional Map

Figure 3-1 includes the IRWM regional boundary and a marker identifying the location of each project contained in the proposals. **Figures 3-2**, **3-8, and 3-9** included in the project-specific sections below include the project maps as required by DWR in the PSP.

Coachella Valley IRWM
Drought Solicitation
Implementation Grant Proposal
Regional Project Map
Figure 3-1

Division between West and East Valley
Colorado River Aqueduct
Coachella and All American
Whitewater River Storm Water Channel
Coachella Valley Storm Water Channel
Highways
Water Bodies
Coachella Valley IRWM Region
Colorado River Funding

Local Project Sponsors

Indio Water Authority
Coachella Valley Water District

Proposal Funding Package

Project 1: IWA Recylced Water Project
Project 2: Regional Turf Reduction Program
Project 3: DAC Onsite Plumbing Retrofit Program
7-X DWR Bulletin 118 Groundwater Basins

Project Coordinates

Project 1: Regional Project
Project 2: LAT 33.744869, LONG -116.201959
Project 3: Regional Project

Source: DWR Bulletin 118 & 2014 Coachella Valley IRWM Plan

N S W E
0 2.5 5 10
Miles

COACHELLA VALLEY IRWMP

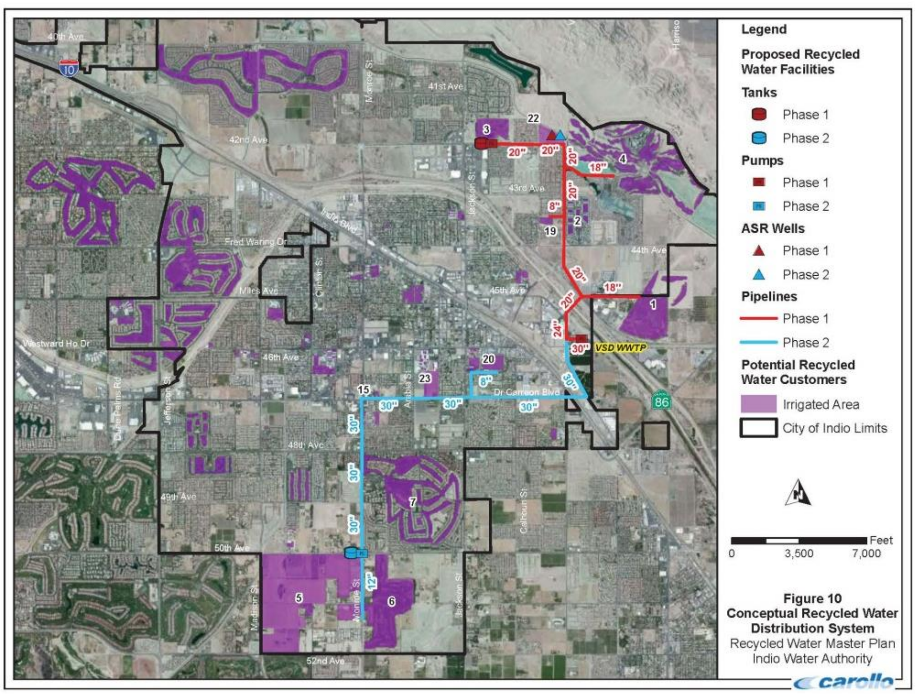
File Name: Fig 3-1_Regional Project Map.mxd
File Location:N:\Projects\0574-002 Coachella IRWM Plan Update \03_GIS\MXD\Round 3\
Date Updated: July 7, 2014
Department: RMC Water & Environment

Project 1: Indio Water Authority Recycled Water Project

Local Project Sponsor: Indio Water Authority (IWA)
Partner: Valley Sanitary District (VSD)

Information in the following sections pertains to the *Indio Water Authority (IWA) Recycled Water Project*, and includes the following sub-sections indicated in the PSP:

1. Project Description
2. Project Map
3. Project Physical Benefits
4. Technical Analysis of Physical Benefits Claimed, which includes the following sub-sections:
    - Technical Basis of the Project
    - Background for Benefits Claimed (Recent and Historical Conditions)
    - Without-Project Baseline (Estimates of Without-Project Conditions)
    - Methods Used to Estimate Physical Benefits
    - New Facilities, Policies, and Actions Required to Obtain Physical Benefits
    - Potential Physical Effects of the Project
5. Cost Effectiveness Analysis

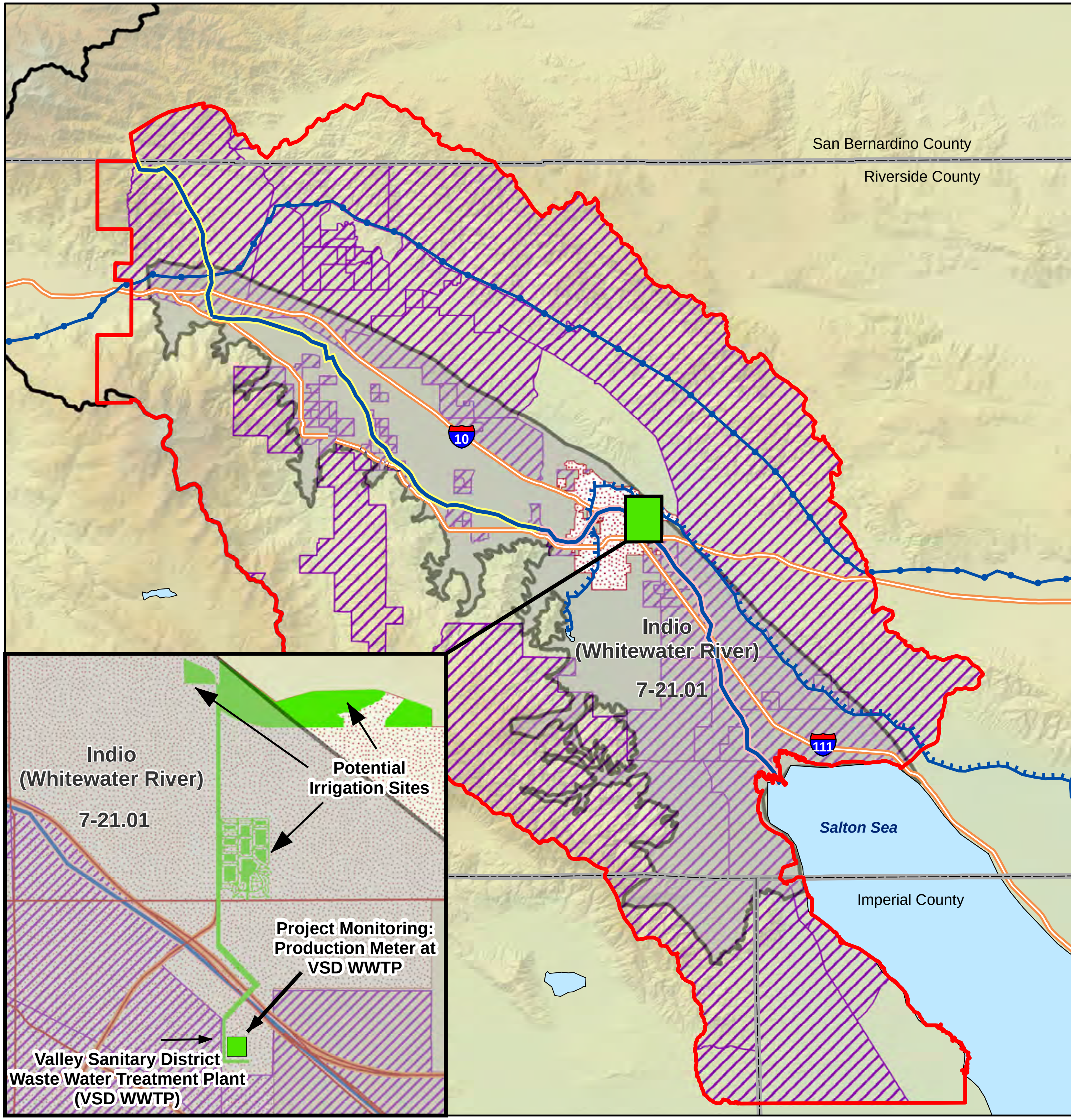


Long-Term Planned Recycled Water Distribution System for Indio Water Authority

Project Map – Indio Water Authority Recycled Water Project

Figure 3-2 includes a map of the *IWA Recycled Water Project*, which shows the project's geographical location and the surrounding work boundaries, facilities of the project, the water resources that will be affected by the project, disadvantaged communities (DACs) within the project service area, and proposed monitoring locations associated with the project.

Project Map
Indio Water Authority Recycled Water Project
Figure 3-2



Colorado River Aqueduct
Coachella and All American
Whitewater River Storm Water Channel
Coachella Valley Storm Water Channel
Highways
Water Bodies
Coachella Valley IRWM Region
Colorado River Funding

Local Project Sponsor

Indio Water Authority
Project 1: IWA Recylced Water Project
7-X Affected Groundwater Basins
Disadvantaged Communities (DACs)

Source: DWR Bulletin 118 & 2014 Coachella Valley IRWM Plan

Disadvantaged communities are considered those who earned less than $48,706 (80% Statewide MHI)

N W E S

0 2.5 5 10
Miles

COACHELLA VALLEY IRWMP

File Name: Fig 3-2_Project Map_Project 1.mxd
File Location:N:\Projects\0574-002 Coachella IRWM Plan Update \03_GIS\MXD\Round 3\
Date Updated: July 7, 2014
Department: RMC Water & Environment

Project Description – Indio Water Authority Recycled Water Project

Increase recycled water use for irrigation and groundwater recharge through wastewater reclamation, treatment, and distribution to reduce demands for potable groundwater resources and imported water.

Project Nexus to Drought Impacts:

The *IWA Recycled Water Project* meets two of the Drought Project Elements defined by DWR: the project will provide regional drought preparedness and reduce water quality conflicts or ecosystem conflicts created by the drought by increasing recycled water production and use and offsetting localized groundwater pumping (in lieu groundwater replenishment), thereby helping to improve groundwater basin management and reduce groundwater overdraft.

As described in Attachment 2, the Coachella Valley IRWM Region's groundwater basin is overdraft; however, regional efforts to manage the Region's basins have helped this condition. One of the most substantial groundwater management efforts involves artificial replenishment with imported water from the State Water Project (SWP) and the Colorado River. Reduction of imported water supplies in times of drought has the potential to exacerbate groundwater overdraft conditions. The 2014 drought has had a direct impact on the Region as it has reduced SWP deliveries to 5% allocation, and has substantially reduced groundwater basin replenishment in the Region. The seven specific drought impacts addressed in Attachment 2 stem from groundwater overdraft in the Region, which can be attributed to the drought due to reduced availability of water for groundwater replenishment. The *IWA Recycled Water Project*, which offsets potable water deliveries and provides in lieu groundwater recharge by producing and using recycled water, will address all seven of the drought impacts identified in Attachment 2:

1. Groundwater Basin Overdraft: The project will alleviate groundwater basin overdraft by providing an additional water source (1,926 AFY of recycled water) and directly reducing groundwater pumping by irrigation users.
2. Drinking Water MCL Violations: Portions of the Region are not in compliance with the drinking water MCL for chromium-6. Groundwater basin replenishment helps reduce chromium-6 concentrations by diluting groundwater that contains the constituent. By providing in lieu groundwater replenishment, the project will help to avoid additional chromium-6 MCL violations.
3. Risk of Not Meeting Existing Drinking Water Demands: The project will help to manage concerns regarding chromium-6 that prevent some residents from drinking local water. By increasing in-lieu recharge, and therefore avoiding additional chromium-6 MCL violations, the project will help avoid an increase in the number of residents receiving water that exceeds regulatory limits.
4. Risk of Not Meeting Existing Agricultural Water Demands: The project will directly reduce local groundwater pumping, thereby leaving additional water in the groundwater basin to meet demands for other users, including agricultural water users.
5. Risk of Not Meeting Existing Ecosystem Water Demands: The project will directly reduce local groundwater pumping, thereby leaving additional water in the groundwater basin to meet ecosystem water demands.
6. Land Subsidence: Land subsidence is a serious consequence of groundwater overdraft; therefore by helping to manage overdraft, the project will help to manage subsidence.
7. Energy Demand and GHG Emissions: The project will provide in lieu recharge and therefore reduce energy demands for groundwater pumping and energy demands to import water into the Region for groundwater replenishment.

This project was selected for inclusion in this application because it is an IRWM project that has multiple benefits, addresses critical drought impacts to the Region, and is able to be implemented on an expedited timeline. Expedited funding is needed for this project because it will provide an additional local water supply that will reduce localized groundwater pumping and therefore directly address groundwater overdraft. Without grant funding, this project may not move forward due to costs associated with implementing recycled water in the Region. Expedited funding for this project is critical to ensure that the project is implemented and provides drought relief benefits to the Region in a timely manner.

Project Physical Benefits – Indio Water Authority Recycled Water Project

The *IWA Recycled Water Project* provides a number of physical benefits. The primary physical benefit of the project is reduced demand for potable water through increased recycled water use. This primary benefit results in a number of secondary benefits, as summarized in **Table 3-2**. The project life is anticipated to be 30 years, as explained in the Technical Justification section, below. The benefits will be phased in (and subsequently out) over the project life, as shown in **Tables 3-3** through **3-11.** Detailed explanations of how these benefits were calculated are provided in the Technical Analysis of Physical Benefits Claimed section, below, along with the context for the importance of these benefits. Further backup documentation (spreadsheets) that show how each quantifiable benefit was calculated is provided as **Appendix 3-1**.

Table 3-2: Physical Benefits Summary
IWA Recycled Water Project

Primary Physical Benefit	Physical Benefits		Quantification of Benefits (cumulative quantification of benefits)
Increase recycled water use and offset potable water demand	A	Decrease Groundwater Overdraft	1,926 AFY (57,780 AF)
	B	Avoid Additional Imported Water Supply Purchases	1,926 AFY (57,780 AF)
	C	Reduce Future Demand for Net Diversions from the Bay-Delta	1,926 AFY (57,780 AF)
	D	Increase Beneficial Use of Local Wastewater	1,926 AFY (57,780 AF)
	E	Local Supply Development to Decrease Vulnerabilities	1,926 AFY (57,780 AF)
	F	Prevent Groundwater Quality Degradation	Qualitative
	H	Reduce Net Production of Greenhouse Gases (GHGs)	1,314 MT CO2e/year (39,406 MT CO2e)
	I	Avoid Social Costs of GHGs	$32,247 ($967,416)
	J	Contribute to 20 x 2020 Goals	32%
	K	Reduce Runoff from Irrigation Flows	Qualitative
	L	Reduce Need for Fertilizer and/or Pesticide Application	Qualitative
	M	Establish Backbone for Long-Term Recycled Water System	Qualitative
	P	Decrease Water Use Costs for DACs	Qualitative

Table 3-3: Primary Physical Benefit – Increase Recycled Water Use and Offset Potable Water Demand
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Increase Recycled Water Use and Offset Potable Water Demand
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0 AF	0 AF	0 AF
2017	0 AF	963 AF	963 AF
2018	0 AF	1,926 AF	19,26 AF
2019-2046	0 AF	1,926 AFY (53,928 AF)	1,926 AFY (53,928 AF)
2047	0 AF	963 AF	963 AF
Total	**0 AF**	**57,780 AF**	**57,780 AF**

Comments: Indio Water Authority (IWA). 2014. *Technical Memorandum (TM): IWA Recycled Water (RW) Project – Phase 1A Project Definition*. July. Pg. 2-1 (2.1 Demands and Design Sizing Criteria, Table 3-1 Phase 1 Recycled Water Customers). Potable offset is assumed at 100% of recycled water deliveries because customers currently use potable groundwater for irrigation purposes and IWA does not currently produce recycled water; IWA. 2011. *2010 Urban Water Management Plan (UWMP)*. September. Pg. 1-7 (1.4.1 Indio Water Authority).

Table 3-4: Physical Benefits for A-Decrease Groundwater Overdraft
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Decrease Groundwater Overdraft
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0 AF	0 AF	0 AF
2017	0 AF	963 AF	963 AF
2018	0 AF	1,926 AF	1,926 AF
2019-2046	0 AF	1,926 AFY (53,928 AF)	1,926 AFY (53,928 AF)
2047	0 AF	963 AF	963 AF
Total	**0 AF**	**57,780 AF**	**57,780 AF**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. Decreased Groundwater Overdraft is assumed to be 100% of reduced potable demand because IWA uses 100% groundwater to meet the needs of its customers; IWA. 2011. *2010 UWMP*. September. Pg. 1-7 (1.4.1 Indio Water Authority).

Table 3-5: Physical Benefits for B-Avoid Additional Imported Water Supply Purchases
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Avoid Additional Imported Water Supply Purchases
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0 AF	0 AF	0 AF
2017	0 AF	963 AF	963 AF
2018	0 AF	1,926 AF	1,926 AF
2019-2046	0 AF	1,926 AFY (53,928 AF)	1,926 AFY (53,928 AF)
2047	0 AF	963 AF	963 AF
Total	**0 AF**	**57,780 AF**	**57,780 AF**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. CVWD and DWA conduct groundwater replenishment for the Region using imported water to offset groundwater pumping and manager overdraft; IWA. 2011. *2010 UWMP*. September. Pg. 3-8 (3.4.1 Valley-wide Program – State Water Project).

Table 3-6: Physical Benefits for C-Reduce Future Demand for Net Diversions from the Bay-Delta
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Reduce Future Demand for Net Diversions from the Bay-Delta
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0 AF	0 AF	0 AF
2017	0 AF	963 AF	963 AF
2018	0 AF	1,926 AF	1,926 AF
2019-2046	0 AF	1,926 AFY (53,928 AF)	1,926 AFY (53,928 AF)
2047	0 AF	963 AF	963 AF
Total	**0 AF**	**57,780 AF**	**57,780 AF**

Comments: Based on Physical Benefits B-Avoid Additional Imported Water Supply Purchases. Under the 2002 Coachella Valley Water Management Plan, sources of additional imported water supplies included the Colorado River and the State Water Project (SWP) (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-3 (2.2.2 Additional Water Supplies)). In October 2003, CVWD agreed on a formal Quantification Settlement Agreement (QSA) regarding Colorado River Water which created a finite allocation for CVWD from the Colorado River (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-3 (Colorado River Water)). Any additional imported water would be purchased through SWP contractors to fulfill additional needs (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-4 (Additional Water Purchases)). Therefore, 100% of future additional water supply purchases would be conducted through SWP Contractors and thus rely upon diversions from the Bay-Delta.

Table 3-7: Physical Benefits for D-Increase Beneficial Use of Local Wastewater
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Increase Beneficial use of Local Wastewater
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0 AF	0 AF	0 AF
2017	0 AF	963 AF	963 AF
2018	0 AF	1,926 AF	1,926 AF
2019-2046	0 AF	1,926 AFY (53,928 AF)	1,926 AFY (53,928 AF)
2047	0 AF	963 AF	963 AF
Total	**0 AF**	**57,780 AF**	**57,780 AF**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. IWA. 2011. *2010 UWMP*. September. Pg. 4-1 (4.3.1 Existing Wastewater Treatment Facilities), pg. 4-3 (Table 4-1 Wastewater Collection & Treatment by VSD – AFY).

Table 3-8: Physical Benefits for E-Local Supply Development to Decrease Vulnerabilities
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Local Supply Development to Decrease Vulnerabilities
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0 AF	0 AF	0 AF
2017	0 AF	963 AF	963 AF
2018	0 AF	1,926 AF	1,926 AF
2019-2046	0 AF	1,926 AFY (53,928 AF)	1,926 AFY (53,928 AF)
2047	0 AF	963 AF	963 AF
Total	**0 AF**	**57,780 AF**	**57,780 AF**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-33 (Existing Water Supplies, 4.9, Summary), pg. 7-10 (Water Supply Evaluation, 7.2.2.4 Reliability).

Table 3-9: Physical Benefits for H-Reduce Net Production of GHGs
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Reduce Net Production of GHGs
Units of the Benefit Claimed: MT CO2e

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	0	0 MT CO2e	0 MT CO2e
2017	0	657 MT CO2e	657 MT CO2e
2018	0	1,314 MT CO2e	1,314 MT CO2e
2019-2046	0	1,314 MT CO2e/year (36,779 MT CO2e)	1,314 MT CO2e/year (36,779 MT CO2e)
2047	0	657 MT CO2e	657 MT CO2e
Total	**0**	**39,406 MT CO2e**	**39,406 MT CO2e**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. Energy per AF of groundwater pumped and imported was calculated using California water and energy information: California Energy Commission (CEC), 2005, *Water-Energy Relationship*, June, Pg. 22 (Table 1). Equinox, 2010, *San Diego's Water Sources: Assessing the Options*, July, Pg. 10 (Table 1a). GHG production per energy use reported in carbon dioxide equivalency or CO2e was then calculated: CEC, 2014, *California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours)*, April, available at: http://energyalmanac.ca.gov/electricity/electricity_generation.html. U.S. Environmental Protection Agency. 2014, eGRID 9th edition Version 1.0 Year 2010 Summary Tables, February, available at: http://www.epa.gov/cleanenergy/energy-resources/egrid/.

Table 3-10: Physical Benefits for I-Avoid Social Costs of GHGs
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project*
Type of Benefit Claimed: Avoid Social Costs of GHGs
Units of the Benefit Claimed: $

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2016	$0	$0	$0
2017	$0	$16,124	$16,124
2018	$0	$32,247	$32,247
2019-2046	$0	$32,247/year ($902,922)	$32,247/year ($902,922)
2047	$0	$16,124	$16,124
Total	**$0**	**$967,416**	**$967,416**

Comments: Calculation based on GHG reduction from project, described under Benefit H – Reduce Net Production of Greenhouse Gases. Social cost of carbon source: Interagency Working Group on Social Cost of Carbon, 2010, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, February, pg. 28 (Table 4). Costs reported in this document were in 2007 dollars. Converted to 2014 dollars using Consumer Price Index (CPI) Inflation Calculator, available: http://www.bls.gov/data/inflation_calculator.htm

Table 3-11: Physical Benefits for J-Contribute to 20x2020 Goals
IWA Recycled Water Project

Project Name: *Indio Water Authority Recycled Water Project* **Type of Benefit Claimed:** Contribute to 20x2020 Goals **Units of the Benefit Claimed:** %			
(a)	**(b)**	**(c)**	**(d)**
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2020	0%	32%	32%
Comments: Contribution to 20x2020 goals was calculated based on the IWA 20x2020 baseline of 296 gallons per capita per day (gpcd) and the target of 236 (gpcd); IWA, 2011, *2010 UWMP,* September, pg. 2-7 (Table 2-7). Primary Physical Benefit – Reduce Potable Demand was then divided by the IWA service area population estimates for 2020; IWA, 2011, *2010 UWMP*, pg. 1-15 (Table 1-3).			

Technical Analysis of Physical Benefits Claimed – Indio Water Authority Recycled Water Project

The primary physical benefit of the *IWA Recycled Water Project* is to increase recycled water production and use, thereby decreasing potable water demand and providing in lieu groundwater basin replenishment of the local aquifer. This overarching benefit is gained from the development and construction of a recycled water distribution system to deliver recycled water to existing customers in the vicinity of the VSD wastewater treatment plant (WWTP). The project will also involve upgrading the VSD WWTP for tertiary treatment to produce recycled water that meets standards for uses set in Title 22 of the California Code of Regulations.

The *IWA Recycled Water* Project constitutes Phase 1A of a larger two-phase recycled water project that will consist of Phase 1 Near-Term and Phase 2 Build-Out. The smaller Phase 1A project includes construction of recycled water treatment facilities and development of the backbone recycled water distribution system to serve nearby customers, including an essential pipeline that will deliver recycled water to future injection wells for groundwater replenishment. The *Indio Water Authority Recycled Water Project – Phase 1A Project Definition Technical Memorandum*, **Appendix 3-2**, estimates that the Phase 1A components will produce and convey recycled water for roadway medians, home owners associations (HOAs), golf courses, and park facilities.[1] The *IWA Recycled Water Master Plan* produced in 2011 shows that there is a total potential recycled water demand of approximately 16,000 AFY within the IWA service area.[2] The total volume of recycled water delivered by the Phase 1A project is 1,926 acre-feet per year (AFY). Future phases will include expansion of treatment facilities and branches off of the backbone distribution system to connect the remainder of customers and facilitate groundwater replenishment. The Phase 1A project has an estimated 30-year life[3] and is expected to deliver 57,780 AF over the course of its life.

IWA currently pumps groundwater to meet the demands of its current customer population and does not currently produce or deliver recycled water;[4] therefore, no recycled water will be delivered within IWA's service area until the Phase 1A project is completed. As shown in Attachment 6, recycled water deliveries will begin July 2017 upon completion of performance testing and demobilization activities. The primary physical benefit of increased recycled water use and reduced potable water demand is shown over the course of the project life in **Table 3-3**. There are a number of other benefits that will be realized as a result of this primary benefit. The quantitative and qualitative physical benefits that were calculated for the project are summarized in **Table 3-2**, and presented in greater detail in **Tables 3-3** through **3-11**. Methods for determination of the quantitative physical benefits that were calculated and further detail of the qualitative physical benefits that were not calculated are described in the Methods Used to Estimate the Physical Benefits section below.

Background for Benefits Claimed

As described previously and shown in **Table 3-3**, the primary benefit associated with the *IWA Recycled Water Project* of increasing recycled water use to offset potable water demand results in a number of additional benefits. The information presented below provides the background and context for the project, the Region, and the basis for each of the benefits that will accrue as a result of the project. Additional details about how each benefit was calculated are included in the Methods Used to Estimate the Physical Benefits section, below.

[1] Indio Water Authority (IWA). 2014. *IWA Recycled Water (RW) Project – Phase 1A Project Definition Technical Memorandum (TM)*. July. Pg. 2-1 (2.1 Demands and Design Sizing Criteria, Table 3-1 Phase 1 Recycled Water Customers).
[2] IWA. 2011. *IWA Recycled Water Master Plan (RWMP)*. December. Pg. 12 (2.4 Potential Recycled Water Demand Summary).
[3] IWA. 2014. *IWA RW Project – Phase 1A Project Definition TM*. July. Pg. 4-7 (3 Estimated Cost).
[4] IWA. 2011. *2010 Urban Water Management Plan (UWMP)*. September. Pg. 1-7 (1.4.1 Indio Water Authority).

Primary Physical Benefit - Increase Recycled Water Use and Offset Potable Water Demand

The Indio Water Authority provides water services to the City of Indio, and currently relies on groundwater as its sole supply source. Indio Water Authority has a variety of plans to improve water supply reliability through water supply diversification, including producing and distributing recycled water within its service area. The City of Indio is served by two WWTPs: one owned by VSD and the other by Coachella Valley Water District (CVWD). The CVWD WWTP is a tertiary treatment facility that provides the effluent produced as recycled water for non-potable uses to CVWD customers. The CVWD WWTP only provides wastewater treatment for approximately 2% of the IWA service area. The other 98% of the population of the City of Indio is served by the VSD WWTP.

The VSD WWTP has a current capacity of 11.0 million gallons per day (MGD) and VSD plans to expand capacity to 17.2 MGD by 2020. Within the 17.2 MGD capacity, it is anticipated that 15.5 MGD would be available for recycled water use after accounting for existing uses (see below for more information). The WWTP currently provides secondary wastewater treatment using three parallel treatment processes: activated sludge treatment, an oxidation pond, and a constructed wetland treatment process.[5] The plant treats an average of 7,050 AFY of effluent, approximately 272 AFY of which is delivered to tribal lands for irrigation, and the remainder of which is discharged to the Coachella Valley Stormwater Channel (CVSC). The *Recycled Water Master Plan* estimates that 6,722 AFY is currently available for recycled water production after flows to the constructed wetland and minimum discharge flows to CVSC are accounted for. This figure would ultimately rise to 17,365 AFY after build out of the VSD WWTP and expansion to the planned 17.2 MGD capacity.[6]

IWA performed a customer market assessment in January 2010 to determine potential recycled water demand within its service area. A total of 39 potential landscape irrigation customers were identified through this assessment. These customers include golf courses, parks, schools, and homeowners associations.[7] The study also included an evaluation of potential for future indirect potable reuse by groundwater replenishment at either Posse Park or Indio Municipal Golf Course, through surface spreading or injection wells. It was determined that injection wells may be necessary due to local aquifer conditions, which is explained further in the background section for *F-Prevent Groundwater Quality Degradation*.[8]

Based on the customer market assessment, total average annual demand for recycled water in the IWA service area is estimated to be 15,974 AFY.[9] While the average annual demand for recycled water is well within the available recycled water supply, the projected recycled water maximum daily demand (28.5 MGD) is well above the projected ultimate recycled water production capacity (15.5 MGD) due to increasing demands in the summer months as a result of the Region's climate.

The proposed recycled water system proposed in the *Recycled Water Master Plan* is configured to deliver recycled water to the most feasible customers where feasibility is based on the customer's location relative to the WWTP and the daily amount of recycled water production capacity compared to the customer's maximum daily demand. Customers were prioritized for connection to the recycled water system such that the maximum monthly demand during the most water intensive month (October) would match the available recycled water supply. On a long-term planning basis, the *Recycled Water Master Plan* proposes that recycled water in excess of irrigation demand during low demand months could be used for groundwater basin replenishment to counteract groundwater overdraft. Based on the demand balance presented in the *Recycled Water Master Plan*, it is estimated that approximately 8,150 AFY of recycled water could be available for future groundwater basin replenishment into the Whitewater River (Indio) Sub-basin.[10]

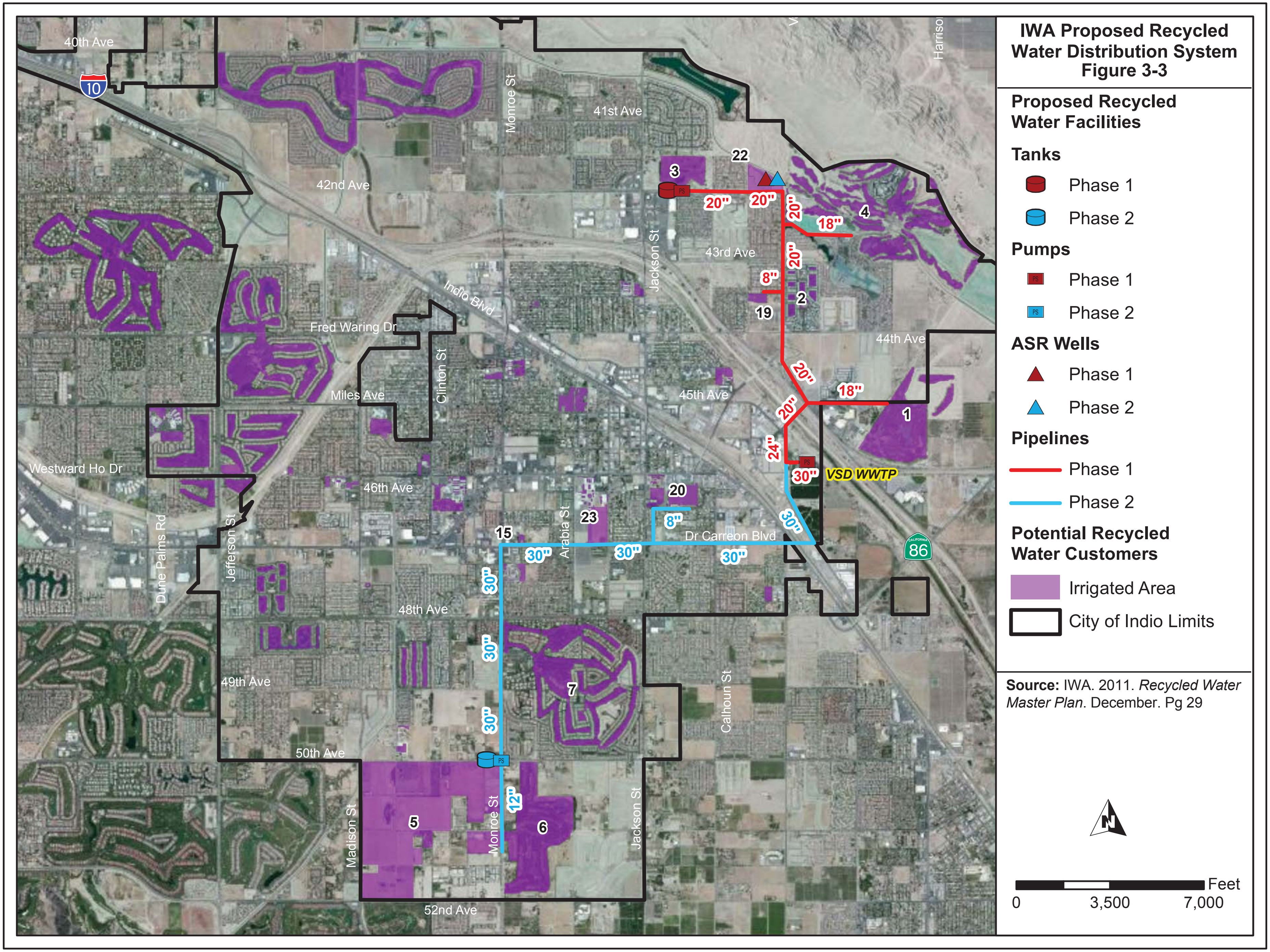
[5] IWA. 2011. *2010 UWMP*. September. Pg. 4-1 – 4-2 (4.3.1 Existing Treatment Facilities).
[6] IWA. 2011. *IWA RWMP*. December. Pg. 20 (Table 4 Recycled Water Supply Compared with Potential Demand).
[7] IWA. 2011. *IWA RWMP*. December. Pg. 7 (2.1 Customer Market Assessment).
[8] IWA. 2011. *IWA RWMP*. December. Pg. 8 (2.1.4 Potential for Indirect Potable Reuse).
[9] IWA. 2011. *IWA RWMP*. December. Pg. 13 (Table 2 Recycled Water Demand Estimates).
[10] IWA. 2011. *IWA RWMP*. December. Pg. 21 (3.4 Supply and Demand Balance).

The proposed distribution system and treatment facilities for all phases of IWA's proposed recycled water distribution system are shown in **Figure 3-3** below. Based on the proposed facilities, the program was broken up into Phase 1 Near-Term, which would serve irrigation customers and groundwater replenishment, and Phase 2 Build Out, which would continue to grow the irrigation customer base.[11] Using the proposed recycled water system layout, three options within the possible Phase 1 customers and pipelines were then evaluated for Phase 1A, which is this *IWA Recycled Water Project*. The options were evaluated based on a combination of capital cost, likelihood of customer participation, recycled water yield (AFY), and ability to provide for future recycled water system expansion. Option 2 was chosen for the Phase 1A project. This option would involve delivering 1,926 AFY of recycled water to three users that are within IWA's service area and currently receive potable water (groundwater) supplied by IWA for irrigation purposes. The three users that would be served by the project have a cumulative average annual demand of 1,926 AFY and include Posse Park, Terra Lago Golf Course, and Rancho Casa Blanco (see **Appendix 3-2**).[12] A break-down of the use for each site is shown below in **Table 3-12.**

Table 3-12: Customers Served by the Phase 1A Project
IWA Recycled Water Project

Customer	Irrigable Area (Acres)	Average Annual Demand (AFY)
Posse Park	14	117
Terra Lago Golf Course	192	1,728
Rancho Casa Blanca Country Club and HOA	15	81
TOTAL	**221**	**1,926**

[11] IWA. 2011. *IWA RWMP*. December. Pg. 31 (5.2.3 Feasibility Summary).
[12] IWA. 2014. *IWA RW Project – Phase 1A Project Definition TM*. July. Pg. 4-7 (3 Estimated Cost).


IWA Proposed Recycled Water Distribution System
Figure 3-3
Proposed Recycled Water Facilities
Tanks
Phase 1
Phase 2
Pumps
Phase 1
Phase 2
ASR Wells
Phase 1
Phase 2
Pipelines
Phase 1
Phase 2
Potential Recycled Water Customers
Irrigated Area
City of Indio Limits
Source: IWA. 2011. Recycled Water Master Plan. December. Pg 29
N
Feet
0
3,500
7,000
40th Ave
10
41st Ave
42nd Ave
43rd Ave
44th Ave
45th Ave
46th Ave
48th Ave
49th Ave
50th Ave
52nd Ave
Monroe St
Jackson St
Harrison
Indio Blvd
Fred Waring Dr
Miles Ave
Clinton St
Westward Ho Dr
Dune Palms Rd
Jefferson St
Arabia St
Dr Carreon Blvd
Calhoun St
Madison St
VSD WWTP
86
1
2
3
4
5
6
7
15
19
20
22
23
20"
18"
8"
24"
30"
12"

A-Decrease Groundwater Overdraft

The IWA service area overlays one of the Region's groundwater sub-basins shown in **Figure 3-2** above: the Whitewater River Sub-basin (referred to as the Indio Sub-basin in DWR Bulletin 118). The Whitewater River Sub-basin has an estimated storage capacity of 30 million AF of water. Prior to 1949, groundwater levels steadily declined in this sub-basin due to agricultural pumping, after which the Region began to implement artificial groundwater basin replenishment and groundwater management programs. Today groundwater basin inflows consist of natural runoff, returns from groundwater and imported water use, and artificial groundwater replenishment with imported water. Total inflows into the Whitewater River Sub-basin are estimated to be approximately 331,000 AFY. Outflows from the basin consist of pumping, flows to the agricultural drainage system, evapotranspiration by vegetation, and subsurface outflow to the Salton Sea. Total basin outflows are estimated to be 441,000 AFY.[13]

In 2009, which was a wet year in the Region, CVWD estimated the decrease in groundwater storage capacity in the Whitewater River Sub-basin to be 72,051 AF, which is lower than historical loss due to higher SWP Exchange water deliveries and Canal water recharge that took place in 2009. The groundwater overdraft ten-year average for the period of 2000 to 2009 was 110,000 AFY or a total of over 1 million AF in cumulative groundwater overdraft for that period.[14] As stated in Attachment 2, SWP Exchange Allocations for Coachella Valley for 2014 are only 5% of the allotted water supplies from the state due to drought conditions, which is expected to increase groundwater overdraft further.[15] The *Coachella Valley Water Management Plan (CVWMP) 2010 Update* identifies eliminating long-term groundwater overdraft as a priority objective.[16] The plan recommends source substitution (in lieu recharge), which would be provided by the *IWA Recycled Water Project*, as one of the primary tools to address the Coachella Valley's overdraft issue, and specifically sets forth maximizing use of local sources of non-potable water for irrigation as a strategy for managing overdraft.[17]

B-Avoid Additional Imported Water Supply Purchases

The Whitewater River Sub-basin provides the majority of the groundwater needs for IWA and is artificially replenished by CVWD and Desert Water Agency with imported water sources. Groundwater within the Whitewater River Sub-basin is supplemented by artificial groundwater replenishment with imported SWP Exchange water and Colorado River water that is obtained from the Coachella Canal (Canal water). The SWP Exchange water refers to Colorado River water allocated to Metropolitan Water District of Southern California's (MWD) which Desert Water Agency (DWA) and CVWD receive in exchange for SWP water allocations that DWA and CVWD hold. This exchange is necessary because while the MWD service area has physical connections to SWP infrastructure, CVWD and DWA cannot access SWP water directly because of lack of physical connections to the system.[18] These imported water supply systems are shown in **Figure 3-4** below. The *CVWMP 2010 Update* demonstrates that the Region already uses its full SWP Exchange and Canal water allocations and purchases additional SWP transfers for additional groundwater basin replenishment as this water is available.[19] IWA does not directly participate in groundwater replenishment, but currently pays the Replenishment Assessment Charge (RAC) to CVWD and plans to purchase surface water from imported water sources to meet future water needs and begin a groundwater replenishment program.[20] As such, it is reasonable to assume that non-potable water provided by the *IWA Recycled Water Project* would directly offset the need to purchase additional imported water sources within the IWA service area, because the project would provide non-potable water for source substitution (in lieu of groundwater recharge).

[13] *Coachella Valley Water District (*CVWD). 2010. *Coachella Valley Water Management Plan (CVWMP) 2010 Update*. December. Pg. 4-11 (4.1.6 Overdraft Status).
[14] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-11 (4.1.6 Overdraft Status).
[15] CVWD. 2014. *State Increases State Water Project Allocation*. April. Available at: http://www.cvwd.org/news/news232.php.
[16] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-3 (1.1 Need for Water Management Plan Update).
[17] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 6-24 (6.5 Source Substitution).
[18] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 4-11 (4.1.6 Overdraft Status).
[19] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 4-15 (4.3 State Water Project).
[20] IWA. 2011. *2010 UWMP*. September. Pg. 3-8 (3.4.2 IWA Program).

Statewide Imported Water Systems

Figure 3-4

- Aqueducts
- Coachella and All American Canals
- Water Bodies
- Coachella Valley IRWM Region
- Colorado River Funding Area

Source: National Atlas of the United States and the USGS, 2005

N
W E
S

0 25 50 100
Miles

File Name: Fig 2-3_StatewideAqueducts_10312013.mxd
File Location: N:\Projects\0574-002 Coachella IRWM Plan Update\03_GIS\MXD\Figure Updates_Public Draft
Date Updated: October 31, 2013
Department: RMC Water & Environment

C-Reduce Future Demand for Net Diversions from the Bay-Delta

Approximately two-thirds of California residents and millions of acres of irrigated farmland rely on the Sacramento-San Joaquin Bay Delta (Bay-Delta) for water from the SWP and federal Central Valley Project.[21] The SWP is managed by DWR, which has contracts to deliver 4.172 million AFY to 29 contracting agencies. DWA and CVWD initially contracted for water from the SWP in 1962 and 1963, respectively. CVWD's original SWP water allocation (Table A Amount) was 23,100 AFY and DWA's original SWP Table A Amount was 38,100 AFY for a combined Table A Amount of 61,200 AFY. Each year, DWR determines the amount of water available for delivery to SWP contractors based on hydrology, reservoir storage, the requirements of water rights licenses and permits, water quality, and environmental requirements for protected species in the Bay-Delta. The available supply is then allocated according to each SWP contractor's Table A Amount. Currently, no infrastructure exists to deliver SWP water directly to the Coachella Valley. CVWD and DWA exchange their SWP entitlement, when available, with the Metropolitan Water District (MWD) for an equal amount of MWD's Colorado River water.

Based upon the water balance information provided in the *CVWMP 2010 Update*, the Region already uses its full imported water allocations from its Colorado River and SWP agreements and purchases additional SWP transfers when available from other agencies for additional groundwater replenishment. CVWD implemented a RAC on pumping for the lower portion of the Whitewater River Sub-basin (where IWA is located), which collects funds from groundwater users to pay for groundwater replenishment activities.[22] As such, it is reasonable to assume that additional water sources, including the recycled water provided by the *IWA Recycled Water Project*, would directly offset future demands for additional net diversions from the Bay-Delta to recharge the groundwater basin.

D-Increase Beneficial Use of Local Wastewater

Ninety-eight percent of the wastewater produced by IWA is treated by VSD, while the remainder is treated by CVWD. The VSD WWTP treats the wastewater it receives to secondary treatment levels, providing a small percentage to tribal lands for irrigation and discharging the remaining 96% to the lined CVSC.[23] The average wastewater discharge to the CVSC from the VSD WWTP is 6.5 million gallons per day (MGD) and is projected to increase to approximately 17.2 MGD by 2020.[24] While the CVSC requires a minimum discharge of 0.5 MGD to maintain the existing habitat, the remaining 6 MGD (6,722 AFY) that is currently discharged to the CVSC is wasted because it cannot percolate through the lined channel to the groundwater nor be used for other purposes. This amount is anticipated to increase to 15,387 AFY in 2020 when the VSD WWTP reaches total projected capacity.[25]

E-Local Supply Development to Decrease Vulnerabilities

The *CVWMP 2010 Update* acknowledges that the currently available supplies, including Canal water, SWP Exchange water, groundwater, recycled water, and water conservation face various vulnerabilities, some of which are anticipated to worsen over time. Due to the potential vulnerability of these supplies, the *CVWMP 2010 Update* plans for additional water supplies that will provide a 10% water supply buffer (equal to 974,000 AFY) by 2045 to meet increasing demands even during times when the existing supplies are not available.[26]

Per the *CVWMP 2010 Update*, a supply is considered to have high reliability if it can provide water on a more-or-less continuous basis; that is, average supply is greater than 90% of the maximum supply.[27]

[21] California Department of Water Resources (DWR). 2014. *Where Rivers Meet – The Sacramento-San Joaquin Delta*. Available at: http://www.water.ca.gov/swp/delta.cfm.
[22] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-1 (2002 Water Management Plan).
[23] IWA. 2011. *2010 UWMP*. September. Pg. 4-1 (4.3.1 Existing Wastewater Treatment Facilities), Pg. 4-3 (Table 4-1 Wastewater Collection & Treatment by VSD – AFY).
[24] IWA. 2011. *2010 UWMP*. September. Pg. 4-1 (4.3.1 Existing Wastewater Treatment Facilities), Pg. 4-3 (Table 4-1 Wastewater Collection & Treatment by VSD – AFY).
[25] IWA. 2011. *IWA RW Master Plan*. December. Pp.19 – 20 (3.2.3 Recycled Water from VSD).
[26] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (7.2 Water Supply Evaluation).
[27] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (Evaluation Approach, 7.1.1.4 Reliability).

Recycled water is considered a highly dependable and reliable local source of water and is named within the *CVWMP 2010 Update* as a water source that will increase the reliability of supplies to the Coachella Valley given that it can contribute to providing the 10% water supply buffer and is also highly reliable.[28]

F-Prevent Groundwater Quality Degradation

The Coachella Valley is geographically divided into the East Valley and the West Valley, with the boundary shown in **Figure 3-1**.[29] The geology of the Whitewater River Sub-basin varies from the West Valley to the East Valley both in composition of sediments and structure of the aquifer. Water placed on the ground surface in the West Valley will percolate through the sands and gravels directly into the Lower Aquifer, see **Figure 3-5** below. However, in the East Valley, several impervious clay layers lie between the Upper Aquifer and the Lower Aquifer as shown in **Figure 3-5**. Water applied to the surface in the East Valley does not easily reach the Lower Aquifers due to these impervious clay layers. The only outlet for groundwater in the Whitewater River Sub-basin is through natural subsurface outflow to the Salton Sea or through collection in drains and transport to the Salton Sea via the CVSC.[30]

Throughout much of the East Valley, agricultural drains were installed to drain shallow groundwater perched on the Upper Aquifer into the CVSC, which is a concrete-lined channel that also impedes groundwater percolation. Adequate drain flows are needed to export salt from the basin, these drain flows depend upon water levels in the underlying aquifers and the quantities of applied irrigation water. From the 1960s to the early 1980s when groundwater levels were at their highest, groundwater levels in the confined Lower Aquifer were above those in the Upper Aquifer, creating an upward hydraulic gradient. This upward gradient tended to flush the more saline water in the Upper and Semi-perched aquifers into the drain system. Since that time, both water levels and drain flows have declined and Lower Aquifer groundwater levels have declined creating a downward vertical gradient. Because the quality of the return flows is generally poor, an increasing amount of poor quality water recharges the basin when drain flows are low, leading to water quality degradation. While this degradation may initially occur in the Upper and Semi-Perched aquifers, it may eventually contribute to degradation in the Lower Aquifer.[31]

Nitrate is a nitrogen compound that is a nutrient and can have public health implications when found in drinking water. The primary drinking water standard (maximum contaminant level or MCL) for nitrate is 10 milligrams per liter (mg/L) as nitrogen, though higher concentrations of nitrate, up to 40 mg/L as nitrogen, exist in some of the shallower portions of the Coachella Valley Groundwater Basin. Generally, nitrates are found in the unsaturated and shallow aquifer zones above 300 to 400 feet, the Upper Aquifer, and have not been observed in the deeper aquifer zones below 500 feet, the Lower Aquifer.[32] The *CVWMP 2010 Update* indicates that groundwater pumping in some areas can cause water quality issues associated with nitrates, as pumping may cause nitrates to leach into higher quality groundwater due to pressure changes in the basin.

Additionally, mapping of chromium-6 occurrence in groundwater in the Coachella Valley, **Figure 3-6** below, demonstrates that chromium-6 levels are highest along fault lines and in areas that are located at away from the Coachella Valley recharge facilities where there is less mixing between recharge water and native groundwater.[33] Currently, approximately half of the groundwater supply in Coachella Valley is above MCL limits for chromium-6, but with decreasing groundwater recharge due to the drought, chromium-6 concentrations are likely to rise.

[28] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 5-17 (5.2.4 Conclusion).
[29] CVRWMG. 2014. *2014 Coachella Valley Integrated Regional Water Management (CVIRWM) Plan: Volume I*. February. Pg. 2-1 (2 Region Description).
[30] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-5 (1-2 Study Area Description).
[31] CVWD 2010. *CVWMP 2010 Update.* December. Pg. 7-21 – 7-22 (7.4.1.1 Drain Flows).
[32] CVWD 2010. *CVWMP 2010 Update.* December. Pg. 5-13 (5.1.3.5 Nitrate).
[33] CVWD. 2014. *Coachella Valley Groundwater Chromium-6 Occurrence*. June. Available at: http://www.cvwd.org/about/docs/chromium_6_levels_map.pdf.

Figure 3-5: Whitewater River Sub-basin Aquifer Structure

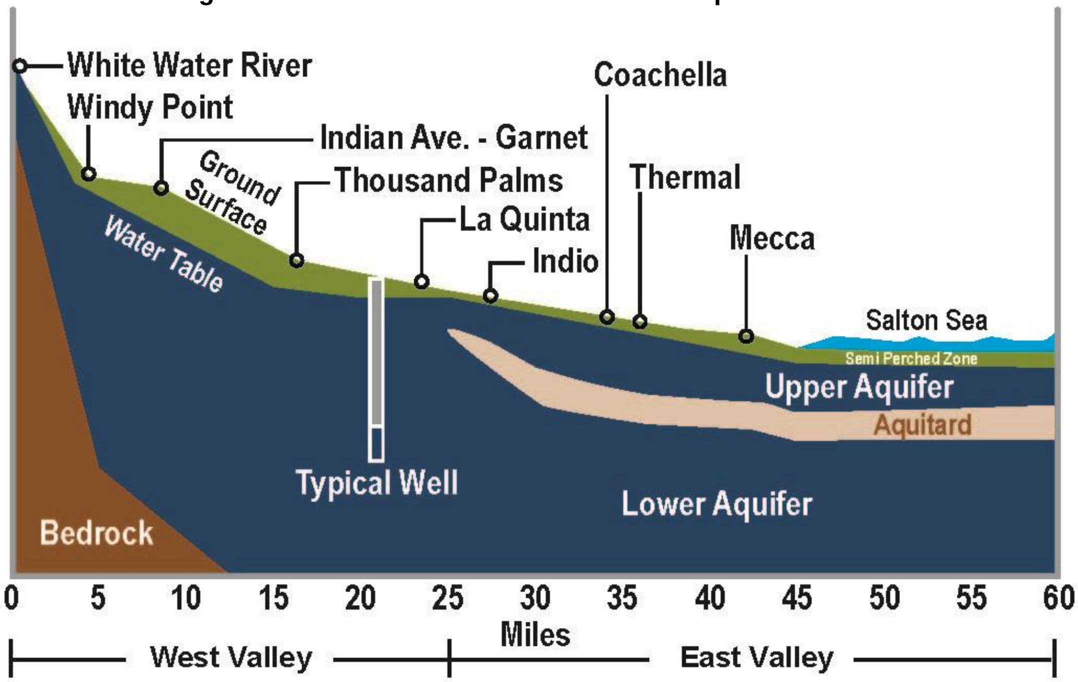
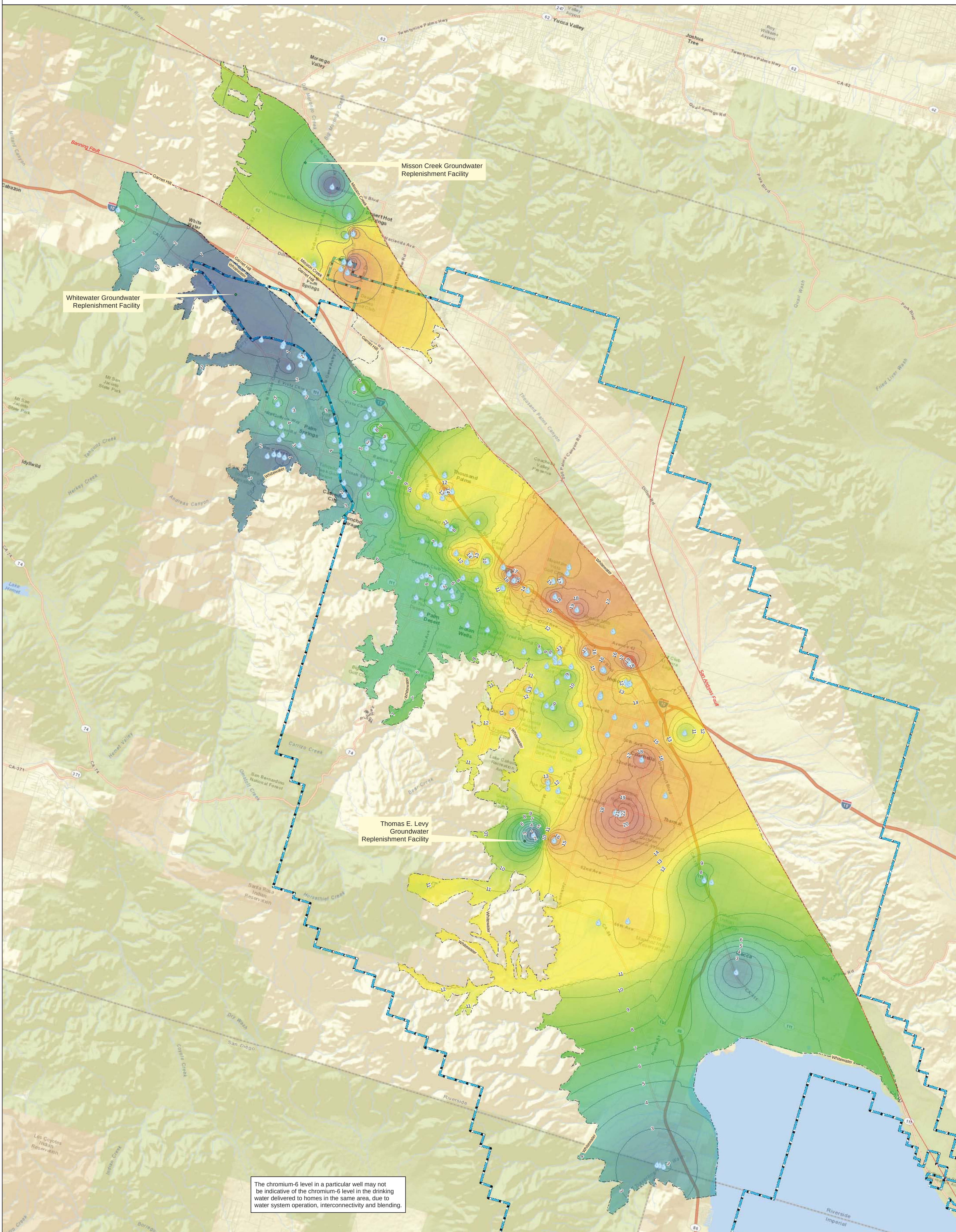
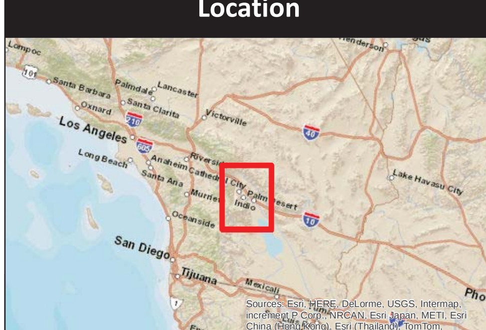


Figure 3-6: Chromium-6 Occurrence in the Coachella Valley



Location



Legend

Chromium-6 Levels

Value

High : 23.6675

Low : 0.0003776

Domestic Water Well

Contours

Fault Lines

CVWD Boundary

Subbasin Boundary

Coachella Valley Water District

75515 Hovley Lane East
Palm Desert, CA 92211
www.cvwd.org
Ph. (760) 398-2661
Fx. (760) 568-1789

Miles

0 0.75 1.5 3 4.5 6 7.5

File Name: GroundwaterChromium6Levels_24x36_June03_2014.mxd
File Location: N:\GIS\Projects\ChromiumMapping\Mxd\
Date Updated: Tuesday, June 03, 2014 @ 2:18:46 PM
Updated By: TH1209
Department: CVWD Engineering - GIS/CAD

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H-Reduce Net Production of GHGs and I-Avoid Social Costs of GHGs

As explained in Attachment 2, the energy intensity required to pump groundwater is anticipated to increases as groundwater overdraft increases due to current drought conditions. In addition, imported water is known to be an energy intensive supply of water, as explained below under Benefit H. The energy required to pump groundwater and move and treat imported water supplies results in greenhouse gas (GHG) emissions, which can contribute to climate change. The *2014 Coachella Valley IRWM Plan* anticipates a statewide increase in temperature of 0.13ºC as a result of global increases in GHGs, which would likely modify rainfall and runoff.[34] These effects are expected to have impacts on imported water sources from the SWP and the Colorado River which are dependent on snowpack and precipitation. While groundwater sources in the Coachella Valley are not expected to be immediately impacted by climate change, long term drought caused by climate change is anticipated to exacerbate groundwater overdraft and groundwater quality degradation. There are social costs associated with increased GHG emissions related to air quality impacts and ancillary impacts of climate change. The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present.[35] Such costs include, but are not limited to, impacts to agricultural productivity, human health, increased flood risk and associated damages, and ecosystem services and their values.[36]

J-Contribute to 20x2020 Goals

The threat of water deficiency and overdraft, water needs of the environment, a growing population, and the unknown impact of climate change on water supplies, requires California to act more effectively regarding water conservation. As a result, Senate Bill (SB) X7-7, also known as 20x2020, was passed in 2009 requiring urban water suppliers to reduce their daily per capita water use by 20% by 2020. IWA's 20x2020 goal is reported in its *2010 Urban Water Management Plan* (*UWMP*) as 236 gallons per capita per day (gpcd).[37] This 20% reduction in per capita water use, which would translate to a reduction of 57 gpcd, was determined using the 10 year baseline of 285 gpcd for the period of 2001 through 2010. State legislation allows agencies to use recycled water offsets of potable water use as a contribution to 20x2020 goals, because recycled water is not considered to be a new water supply.[38]

K-Reduce Runoff from Irrigation Flows

The *IWA Recycled Water Master Plan* recognizes the requirements of the following regulatory agencies regarding recycled water treatment and use: the California Water Code Regulations (Title 22), the Colorado River Regional Water Quality Control Board (RWQCB) Region 7, the State Water Resources Control Board (SWRCB), and the California Department of Public Health (CDPH). *"The Purple Book"*, which includes excerpts from the Health and Safety Code, Water Code, and Titles 22 and 17 of the California Code of Regulations, defers regulatory measures to local regulatory agencies when the runoff does not pose a public health threat, which tertiary treated water does not.[39] In Article 7 of the SWRCB Policy for Water Quality Control for Recycled Water (Recycled Water Policy), *Landscape Irrigation Projects*, SWRCB regulates the control of incidental runoff, requiring that incidental runoff from recycled water landscape irrigation projects be regulated by waste discharge requirements or National Pollutant

[34] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-61 – 2-62 (2.8.2 Implications of Effects of Climate Change).
[35] International Panel on Climate Change (IPCC). 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability*. April. Pp. 17 (Summary for policymakers).
[36] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 2 (I. Monetizing Carbon Dioxide Emissions).
[37] IWA. 2011. *2010 UWMP*. September. Pg. 2-7 (2.6.2 Target Water Use, Table 2-7 Urban Water Use Targets).
[38] DWR, et.al. 2010. *20x2020 Water Conservation Plan*. February. Pg. 13 (Chapter 2 Establishing a Baseline and Targets, Supply and Demand Data).
[39] California Department of Public Health. 2014. *Regulations Related to Recycled Water*. June. Pg. 26 (Article 4(e)(1) Use Area Requirements).

Discharge Elimination System (NPDES) permits.[40] The Colorado River RWQCB requires that irrigated areas shall be properly managed to minimize ponding.[41]

L-Reduce Need for Fertilizer and/or Pesticide Application

In the Region, both DWA and CVWD have implemented successful recycled water programs, providing 4,500 AFY and 8,773 AFY of recycled water for landscape irrigation respectively. In addition to the water recycling plants CVWD has constructed, CVWD also provides recycled water users with *Guidelines for the Use of Recycled Water*, which provides resources and instruction for day-to-day operation and control of recycled water systems. CVWD notes that recycled water generally contains higher nutrient levels than potable water such as nitrogen, phosphorous and potassium, which are essential components for plant growth. Thus, the use of recycled water for irrigation could reduce fertilizer costs for customers that apply recycled water for irrigation in place of groundwater. Recycled water users in the nearby CVWD service area have reported that their grass grows more quickly and is greener than before recycled water application began.[42] This Project would provide the same benefit.

M-Establish Backbone for Long-Term Recycled Water System

IWA does not currently have water recycling infrastructure or services for its service area. Furthermore, IWA identifies using recycled water from VSD's WWTP as one of the seven high priority alternatives for water supply diversification.[43] The 2011 *IWA Recycled Water Master Plan* evaluated wastewater supplies and presented a capital improvement plan and phasing plan for an IWA recycled water system.[44] The *IWA Recycled Water Project* represents the beginning phase, Phase 1A of IWA's larger Recycled Water Program, and therefore includes essential infrastructure to begin treating and delivering recycled water.

P-Decrease Water Use Costs for DACs

The Coachella Valley contains large portions of DACs, especially within the eastern Coachella Valley where the IWA service area is located. DACs are defined as areas having a mean household income (MHI) that is 80% or less of the statewide MHI. Severely economically disadvantaged communities are defined as those communities with a MHI that is less than 60% of the statewide MHI. A majority of the IWA service area is considered DAC or severely DAC.[45] Decreasing water use costs for DACs is considered an important aspect of the Human Right to Water Policy in that water affordability is one of the four basic components of the California Water Code policy.[46] Because DACs constitute a large portion of the IWA service area, lowering water use costs in the IWA service area can contribute to water affordability to DACs.

The *CVWMP 2010 Update* considered the potential sources of additional water supply and ranked those supplies based on anticipated cost and yield. In the ranking process, the most cost-effective supply augmentation approaches involved water conservation ($40/AF to $600/AF) followed by recycled water ($400/AF).[47] Alternatively, imported water is considered a high cost water source ranging from a low of $700 per AF to a high of $1,900 per AF. As such, water use costs for customers in Coachella Valley, including the large number of DACs in the IWA service area, are expected to decrease or increase depending on the proportion of water supply that is provided by varying water sources.

[40] State Water Resources Control Board (SWRCB). 2013. *Policy for Water Quality Control for Recycled Water (Recycled Water Policy)*. January. Pg. 9 (Article 7 Landscape Irrigation Projects).
[41] Colorado River Basin Regional Water Quality Control Board. 1997. *General Waste Discharge Requirements for Discharge of Recycled Water for Golf Course and Landscape Irrigation*. June. Pg. 7 (D(10) Health Based Provisions).
[42] CVWD. 2012. *Recycled Water Program: Guidelines for the Use of Recycled Water*. October. Pp. 42 – 43 (Nutrients).
[43] IWA. 2011. *2010 UWMP*. September. Pg. 1-5 (1.3.3 Resource Maximization).
[44] IWA. 2011. *IWA RWMP*. December. Pg. 1 (1.2 Goals and Objectives).
[45] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 4-18 (Figure 4-7 Coachella Valley Disadvantaged Communities – 2010 Census).
[46] California Water Code. 2012. *Section 106.3(a)*.
[47] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).

Without Project Baseline

Without the project, the VSD WWTP will continue to treat approximately 7,050 AFY of wastewater to secondary treatment standards and subsequently discharge 96% of that effluent to the CVSC instead of beneficially reusing the water in the Coachella Valley. Customers that would have been served recycled water by the project would continue to have irrigation demands of 1,926 AFY, which would be met by IWA using water from the potable groundwater basin that are delivered through existing potable water pipelines. This continued use of groundwater for irrigation means that none of the drought impacts discussed in Attachment 2 would be addressed and none of the physical benefits of converting from potable groundwater to recycled water would be realized.

Without the project, no additional wastewater will be treated to tertiary treatment standards for irrigation purposes and no backbone will be built for the IWA recycled water system. As addressed in Attachment 2, continued groundwater pumping will affect both groundwater quality and quantity. **Figure 3-6** shows that without the normal SWP allocations as a result of the 2014 drought, concentrations of chromimum-6 will likely increase as less groundwater replenishment water is available. Without the project, not only will groundwater continue to be pumped leading to higher chromium-6 concentrations, but also, no groundwater replenishment water will be available to dilute chromium-6 in the aquifer. As discussed in the background for *F-Prevent Groundwater Quality Degradation*, further groundwater overdraft will contribute to an unfavorable pressure gradient between the Upper and Lower Aquifer that could lead to contamination of the Lower Aquifer with the lower quality Upper Aquifer water. Additional factors that contribute to groundwater quality degradation will increase the risk of exceeding applicable drinking water standards and not meeting existing drinking water demands.

In addition to concerns of worsening groundwater quality, as groundwater levels decline, so too does the ability of current users and beneficiaries to physically reach the groundwater. While many of the agricultural users in Coachella Valley rely on Colorado River canal water for irrigation needs, there are a number of agricultural users who rely on groundwater resources from private wells. As part of the U.S. Bureau of Reclamation's Inadvertent Overrun and Payback Policy implemented in October 2002, CVWD defined the Colorado River irrigation service area as Improvement District No. 1, shown in **Figure 3-7** below.[48] Agricultural users outside of Improvement District No. 1 must rely on groundwater resources, because they are not authorized to receive water from the Colorado River (canal water). With declining groundwater resources, deeper wells and increased pumping are required, which can amount to large capital and energy costs making agricultural production economically infeasible.

As discussed in Attachment 2, increased groundwater pumping will make water less available to local ecosystems. Without the project, no recycled water will be produced to provide an alternative irrigation water source to groundwater pumping. The *Coachella Valley Multiple Species Habitat Conservation Plan* identifies monitoring groundwater pumping as a priority to protecting various habitats and species in Coachella Valley. These include habitats such as mesquite hummocks habitat and species such as the Desert Pupfish, the Crissal Thrasher, the Southern Yellow Bat, and the Coachella Valley Round-Tailed Ground Squirrel.[49] Without the project, future groundwater pumping is likely to lead to impacts on these habitats and species.

In 2009, electrical energy demand for water management in the Coachella Valley was 211,130,000 kilowatt hour per year (kWhr/yr). It is estimated that groundwater pumping attributed to 93 percent of this overall demand.[50] Without the project, there will not be additional water resources to offset irrigation uses of groundwater. Energy use from groundwater pumping will continue and likely increase due to decreasing groundwater levels and energy use from importing water for groundwater recharge. Overall,

48 CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-13 (4.2 Colorado River).

49 Coachella Valley Association of Governments. 2007. *Coachella Valley Multiple Species Habitat Conservation Plan*. September. Pg. 9-77 (9.4.1.2 Threats, Limiting Factors, and Adaptive Management), 9-158 (9.7.5.2 Threats, Limiting Factors, and Adaptive Management), 9-224 (9.8.1.4 Take Analysis), 9-236 (9.8.2.4 Take Analysis).

50 CVWD. 2011. *Draft Subsequent Program EIR: Coachella Valley WMP 2010 Update*. July. Pg. 8-42 (8.5.3.1 In Valley Energy Use).

without the project 3,852 MWh per year, 115,560 MWh over the 30-year life of the project, will be used to pump groundwater and import recharge water.

Finally, the drought impact of land subsidence is projected to worsen with decreasing groundwater levels. Land subsidence rates in Coachella Valley have increased in recent years and are likely attributable to groundwater overdraft.[51] Without the project, no recycled water will be produced to offset irrigation uses and further land subsidence is likely to occur as a result.

In addition to increasing drought impacts without the project, none of the physical benefits that would have been achieved with the project will be realized. Benefits that will not be realized without the project include reducing groundwater overdraft, offsetting imported water, reducing future pumping from the Bay-Delta, increasing beneficial use of wastewater, decreasing high reliance on imported water and alleviating associated supply vulnerabilities, preventing groundwater quality degradation, reducing GHG emissions for importing water and avoiding associated social costs, contributing to meeting 20x2020 goals, reducing runoff from irrigation flows, reducing fertilizer application, decreasing water use costs for DACs, and establishing the backbone for a long-term water recycling system.

[51] United States Geologic Survey (USGS). 2013. *Scientific Investigations Report 2007-5251, Version 2.0.* June. Pg. 1 (Abstract).

Agricultural Water Users and Irrigation Water Resources Figure 3-7

- Colorado River Aqueduct
- Coachella and All American Canals
- Whitewater River Storm Water Channel
- Coachella Valley Storm Water Channel
- Highways
- Water Bodies
- Coachella Valley IRWM Region
- Colorado River Funding Area
- Improvement District No. 1
- Agricultural Users
- City

Source: SCAG, 2010

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Date Updated: July 3, 2014
Department: RMC Water & Environment

Methods Used to Estimate the Physical Benefits

The methods used to estimate the physical benefits provided by the *IWA Recycled Water Project* are provided below. **Appendix 3-1** includes backup documentation (spreadsheets) that show the annual calculation for each quantifiable benefit.

A-Decrease Groundwater Overdraft

Groundwater overdraft has been identified as an important regional issue that is exacerbated by drought conditions. Additionally, recycled water is a form of source substitution that has been identified as a cost-effective and reliable part of the solution to address current overdraft conditions by contributing to development of a 10% water supply buffer to meet increasing demands when the existing supplies are not available.[52]. The *IWA Recycled Water Project* will provide an alternative source of recycled water supply to various customers that currently depend on local groundwater for irrigation purposes.

By achieving the primary benefit of producing and delivering recycled water as a source substitution for groundwater, this project allows more groundwater to remain in the groundwater basin, thus reducing overdraft. In total, the recycled water supplied by this program would be 1,926 AFY. Given the Without Project Baseline of no recycled water production in the IWA service area, the project would offset pumping of local groundwater by 1,926 AFY (see **Table 3-4**), thus reducing groundwater basin overdraft by the same amount. The first and last years of the project would only produce and deliver one half year of recycled water, which is shown in **Table 3-4** above. Over the 30 years of life of the project, the project would decrease groundwater overdraft by 57,780 AF.

B-Avoid Additional Imported Water Supply Purchases

One of the methods for addressing groundwater overdraft in the Coachella Valley is by artificial groundwater replenishment with imported water. Because the Region already uses its full Canal water and SWP Exchange allocations and purchases additional SWP transfers for replenishment water,[53] recycled water provided by this program would directly offset purchases of additional SWP transfer water for groundwater replenishment.

Because the project would directly offset groundwater pumping, without the project 1,926 AFY of additional water would need to be imported from SWP transfers. This would be done by acquiring rights to SWP water held by other entities, and exchanging these purchased rights with MWD for locally-available Colorado River water. It is assumed that water demands would remain consistent and that recycled water use would be directly offset by additional imported water. The project would avoid a total of 57,780 AF of imported over its expected 30-year project life; these values are presented in **Table 3-5.**

C-Reduce Future Demand for Net Diversions from the Bay-Delta

This project will supply recycled water for irrigation, offsetting the need for groundwater pumping. Reduced groundwater pumping reduces aquifer drawdown and lessens the amount of imported water needed to replenish the groundwater basin. Because the Region already receives its entire imported water entitlements (as they are available) and purchases additional SWP water from other agencies[54], additional imported water needed to balance groundwater pumping would be purchased and transferred from the SWP. Transfers or leases from north of or within the Bay-Delta could potentially affect Bay-Delta water quantity or quality. The *IWA Recycled Water Project*, however, would produce and deliver recycled water, reducing the demand for imported water. Therefore, the project would reduce net diversions from the Bay-Delta by 1,926 AFY or 57,780 AF over the 30-year life of the project. These values are presented in **Table 3-6**.

[52] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (7.2 Water Supply Evaluation).
[53] CVWD. 2010. *CVWMP Update 2010.* December. Pg. 4-15 (4.3 State Water Project).
[54] CVWD. 2011. *2010 UWMP*. July. Pg. 4-19 (4.2.3.2 Other SWP Transfers).

D-Increase Beneficial Use of Local Wastewater

A small percentage of the wastewater produced by IWA is treated and sent to tribal lands for irrigation, while the remaining 96 percent is discharged to the CVSC.[55] The average wastewater discharge to the CVSC from the VSD WWTP is 6.5 MGD and is projected to increase to approximately 17.2 MGD. While some of this discharge maintains existing habitat within the CVSC, the majority of the water is considered wasted because it is discharged to the CVSC, which is a lined channel that lies above an aquitard that impedes percolation to the aquifer. This secondary treated wastewater is therefore currently discharged without beneficial use, with expected increases in discharges as VSD reaches total projected capacity. The baseline for this project is 0 AFY of wastewater beneficially used from the current VSD discharge, which is considered the remainder after accounting for the secondary treated wastewater that is delivered for irrigation on tribal lands.

The *IWA Recycled Water Project* will treat approximately 30 percent of the current VSD discharge to tertiary treatment standards for irrigation. As Phase 1A of the proposed two-phase IWA recycled water capital improvement project, the *IWA Recycled Water Project* will construct the backbone of the recycled water system and provide beneficial use of a large portion of the current wastewater stream that is discharged without beneficial use.[56] **Table 3-7** shows the increase in beneficial use of local wastewater resulting from the project (1,926 AFY) and total increase in beneficial use of local wastewater over the 30 year lifetime of the project (57,780 AF).

E-Local Supply Development to Decrease Vulnerabilities

Imported water supplies are relatively vulnerable water supplies due to climate change, legal challenges, and other issues. IWA and other groundwater users in the Coachella Valley rely on imported water for groundwater replenishment to manage regional groundwater resources. In addition, groundwater overdraft conditions have indicated that current water supplies (local groundwater that is recharged with imported water) are vulnerable to decreased recharge and water quality concerns. Recycled water is considered a dependable and reliable local source of water.[57] Production and use of recycled water as a result of the *IWA Recycled Water Project* will develop local supplies and decrease water supply vulnerabilities in the Region by reducing demands on groundwater. The project will develop a reliable, local supply of 1,926 AFY. **Table 3-8**. The total local supply developed of the 30-year life of the project will be 57,780 AF. Without the project, no local supply would be developed.

F-Prevent Groundwater Quality Degradation

The *CVWMP 2010 Update* indicates groundwater pumping causes nitrates to leach into higher quality groundwater due to pressure changes in the basin.[58] Additionally, chromium-6 levels are located in areas away from the Coachella Valley groundwater replenishment facilities where native groundwater containing chromium-6 is not diluted by replenishment water.[59] Therefore decreasing groundwater replenishment as a result of the drought may cause chromium-6 concentrations to rise above the MCL in more locations throughout Coachella Valley.

Without the project, the use of groundwater for irrigation will continue to contribute to overdraft of the basin, resulting in further water quality degradation in the aquifer. With the project, reductions in groundwater pumping would decrease nitrate-contaminated water from coming into contact with the basin's high-quality deep aquifer. Additionally, the project would help prevent chromium-6 concentrations from increasing above MCL standards in more locations within the Region.

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[55] IWA. 2011. *2010 UWMP*. September. Pg. 4-1 (4.3.1 Existing Wastewater Treatment Facilities), pg. 4-3 (Table 4-1 Wastewater Collection & Treatment by VSD – AFY).
[56] IWA. 2011. *IWA RWMP*. December. Pg. 42 [6.4.1 Phase 1 Existing Projects (2010-2025)].
[57] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (Evaluation Approach, 7.1.1.4 Reliability).
[58] CVWD 2010. *CVWMP 2010 Update.* December. Pg. 5-13 (5.1.3.5 Nitrate).
[59] CVWD. 2014. *Coachella Valley Groundwater Chromium-6 Occurrence*. June. Available at: http://www.cvwd.org/about/docs/chromium_6_levels_map.pdf.

Currently, there is no available information on how reduced groundwater pumping in this area may benefit water quality. As such, benefits that would accrue to water quality have not been physically or economically quantified.

H-Reduce Net Production of GHGs

The *IWA Recycled Water Project* would provide recycled water for irrigation within the IWA service area. The provision and use of recycled water would offset the use of local groundwater for irrigation, as well as the conveyance of additional SWP exchange water for groundwater recharge purposes. As a result, this project would avoid energy requirements associated with groundwater pumping, as well as the energy requirements associated with transporting SWP exchange water, which is delivered in the form of Colorado River water via the Colorado River Aqueduct or the Coachella and All American Canals. This in turn would result in avoided greenhouse gases (GHGs) – namely carbon dioxide (CO_2) emissions – associated with reduced energy consumption.

For this analysis, it is assumed that energy required to deliver and use Colorado River water (including Canal water) is 2.0 mega-watt hours per acre-foot (MWh/AF) based on information from the California Energy Commission.[60] Groundwater pumping energy requirements for the Coachella Valley are not available, thus, values for similar regions were compared and the average, 0.8 MWh/AF for other regions was used.[61] Finally, energy required to deliver recycled water was estimated at 0.8 MWh/AF, again using a study for a similar region in southern California.[62] The energy savings were determined by calculating the amount of energy saved by offsetting imported water and groundwater pumping, and subtracting the amount of energy required to treat and deliver recycled water. Therefore, the energy savings per acre foot of water producing and delivering recycled water instead of pumping and replenishing groundwater with Colorado River water is 2.0 MWh/AF as shown in the bullet points below:

- Energy intensity of producing and distributing recycled water: 0.8 MWh/AF
- Energy intensity of delivering Colorado River water and pumping groundwater: 2.8 MWh/AF
- Energy savings resulting from the project: 2.0 MWh/AF

As described in the primary physical benefit, recycled water production and use, this project will provide 1,926 AFY of recycled water. Therefore, energy savings per year as a result of the project would be 3,852 MWh or 115,560 MWh over the 30-year life of the project based on 1,926 AFY of recycled water delivery.

To translate energy savings into net reduction of GHG emissions, California energy mix and associated GHG emissions were used from the California Energy Commission (CEC) and USEPA's eGRID. Per the CEC's Energy Almanac, California produces 70% of its energy and imports 10% from the Pacific Northwest, and 20% from the Pacific Southwest.[63] USEPA eGRID data provides information about the GHGs associated with each of the energy supplies (calculated as carbon dioxide equivalent units or CO2e) as 613.28 pounds of CO2e per MWH (lbs/MWh), 846.97 lbs/MWh, and 1,182 lbs/MWh, respectively.[64] Averaging each of these CO2e emissions factors shows that California energy supplies have a combined CO2e emissions factor of 750.57 lbs/MWh, or 0.341 metric tons (MT) of CO2e per MWh. Applying this number to the energy saved as a result of the project finds GHG reduction of 39,406 MT CO2e over the life of the project. These benefits are provided by year in **Table 3-9** and summarized in the bullets below:

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[60] California Energy Commission (CEC). 2005. *Water-Energy Relationship*. June. Pg. 22 (Energy Use and Production of Surface Water, Table 1 Energy Consumption for Various MWD Sources). Confirmed in Navigant 2006.
[61] Equinox. 2010. *San Diego's Water Sources: Assessing the Options*. July. Pg. 10 (Table 1a Marginal Costs and Energy Intensity of San Diego County's Water Alternatives, 2010e).
[62] Equinox. 2010. *San Diego's Water Sources: Assessing the Options*. July. Pg. 10 (Table 1a Marginal Costs and Energy Intensity of San Diego County's Water Alternatives, 2010e).
[63] CEC. 2014. California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours). April Accessed 24 June 2014. Available: http://energyalmanac.ca.gov/electricity/electricity_generation.html
[64] U.S.EPA. 2014. eGRID 9th edition Version 1.0 Year 2010 Summary Tables. February. Available: http://www.epa.gov/cleanenergy/energy-resources/egrid/

- Energy savings resulting from the project: 2.0 MWh/AF
- Average GHG in California energy grid: 0.341 MT of CO2e/MWh
- Resulting GHG reductions resulting from the project: 0.682 MT of CO2e/AF
- Annual GHG reductions resulting from the project (assuming 1,926 AFY of recycled water produced by the project): 1,314 MT/Year
- Cumulative GHG reductions over project lifetime: 39,406 MT CO2e

I-Avoid Social Costs of GHGs

Social costs associated with increased GHG emissions, include impacts to agricultural productivity, human health, increased flood risk and associated damages, and ecosystem services and their values.[65]. The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs discounted to the present.[66] The recommended mean estimate of the social cost of one metric ton (MT) of CO2 in 2014 is $24.55. For this analysis, this value was updated to current dollars ($2014) from the 2007 value of $21.40 reported by the Interagency Working Group on Social Cost of Carbon[67], using the Consumer Price Index (CPI) Inflation Calculator.[68] An estimate of the social costs of carbon avoided by the project can be calculated by applying the $24.55/MT CO2 to the emissions savings from Benefit D. **Table 3-10** shows the avoided social costs of carbon from the *IWA Recycled Water Project*, which are anticipated to total $967,416 throughout the 30-year life of the project.

J-Contribute to 20 x 2020 Goals

SBX7-7 requires urban water suppliers to reduce daily per capita water use by 20% by 2020. IWA's 20x2020 goal is reported in its *2010 UWMP* as 236 gallons per capita per day (gpcd).[69] This 20% reduction of 57 gpcd was determined using the 10 year baseline of 296 gpcd for the period of 2001 through 2010. State legislation allows agencies to use recycled water offsets of potable water use as a contribution to 20x2020 goals.[70] The *IWA Recycled Water Project* will offset potable water use with recycled water, thereby contributing to IWA's 20x2020 goals. Contribution to these 20x2020 goals was calculated by converting the recycled water used by the project (presented in AFY in Benefit A) to gpcd using the 2020 IWA service area population estimate, 93,115 people.[71] Population estimates for 2020 were used because that is when the goals must be met. The project's contribution to meeting 20x2020 goals is 18.5 gpcd once full benefits are realized and are shown as a percentage of IWA's overall gpcd reduction goal (57 gpcd), as shown in **Table 3-11**. An overview of the calculation is provided in the bullets below:

- IWA's 2020 gpcd reduction target: 57 gpcd
- Amount of water from the project that will contribute to 20x2020 goals (amount of recycled produced and delivered in 2020): 1,926 AFY or 1,718,245 gallons per day
- GPCD reduction provided by the project in 2020 (1,718,245 gallons per day/93,115 people): 18.5

[65] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 2 (I. Monetizing Carbon Dioxide Emissions).
[66] IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability.* April. Pg. 17 (Summary for policymakers)
[67] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866. February. Pg. 28 (Table 4 Social Cost of CO_2).
[68] U.S. Bureau of Labor Statistics. 2014. *Consumer Price Index (CPI) Inflation Calculator*. Available at: http://www.bls.gov/data/inflation_calculator.htm
[69] IWA. 2011. *2010 UWMP*. September. Pg. 2-7 (2.6.2 Target Water Use, Table 2-7 Urban Water Use Targets).
[70] DWR, et.al. 2010. *20x2020 Water Conservation Plan*. February. Pg. 13 (Chapter 2 Establishing a Baseline and Targets, Supply and Demand Data).
[71] IWA. 2011. *2010 UWMP*. September. Pg. 1-15 (1.7 Demographic Features, Table 1-3 Population Current and Projected).

- Percent contribution towards 20x2020 goals (18.5 gpcd/57gpcd): 32%

K-Reduce Runoff from Irrigation Flows

Various local and state regulatory measures have specific runoff requirements for recycled water use as irrigation. These regulatory measures are specific to the use of recycled water and generally not applicable to potable water customers. Therefore, the regulations regarding runoff for recycled water use for irrigation are considered more stringent compared to regulations pertaining to potable water use. This indicates that runoff from irrigation flows will decrease as a result of the implementation of the *IWA Recycled Water Project* given that the project will implement recycled water for irrigation purposes in place of potable water. The exact amount by which the project would reduce runoff is difficult to estimate, because the precise quantities of runoff from potable water use (existing conditions) are unknown. As such, neither physical nor economic estimates were determined numerically for this benefit, however, it is expected that the benefit will be proportional to the amount of groundwater use that is offset by the project.

L-Reduce Need for Fertilizer and/or Pesticide Application

Fertilizing compounds commonly present in recycled water (e.g., nitrogen, phosphorus, potassium) are typically not found in potable water at levels of significance. The use of recycled water for irrigation could reduce fertilizer needs for customers receiving recycled water as a result of the *IWA Recycled Water Project*, because their irrigation water source (recycled water) would contain higher amounts of fertilizing compounds compared to their existing irrigation water source (potable water). Recycled water users in the nearby CVWD service area have reported that their grass grows more quickly and is greener than before recycled water application began.[72] The exact offset of fertilizer use from using recycled water is difficult to predict due to daily and seasonal nutrient variations in the recycled water. Thus, this benefit has not been physically or economically quantified.

M-Establish Backbone for Long-Term Recycled Water System

The IWA service area does not currently include water recycling infrastructure and a majority of the wastewater produced in the service area is treated by VSD WWTP, which discharges approximately 96 percent of its secondary treated wastewater to the CVSC. Furthermore, IWA identifies using recycled water from VSD's WWTP as one of the seven high priority alternatives for water supply diversification.[73] The *IWA Recycled Water Project* consists of Phase 1A of the IWA recycled water Capital Improvement Plan (CIP), effectively initiating the program outlined in the *IWA Recycled Water Master Plan*.[74] The project includes recycled water treatment facilities and the backbone facilities of the recycled water distribution system, including an essential pipeline that would deliver recycled water to future injection wells for groundwater replenishment with recycled water. Future phases will include branches off of the backbone distribution system to connect additional customers and groundwater replenishment facilities. Ultimately, the IWA recycled water system would treat and distribute a total of 9,243 AFY of recycled water as a result of Phase 1 and Phase 2 of the recycled water CIP.[75] Therefore, the *IWA Recycled Water Project* will create the backbone for a total potential build-out of 9,243 AFY; however, because the full potential will not be reached through the implementation of this specific project, the physical and economic values for this benefit were not determined.

P-Decrease Water Use Costs for DACs

With water supply costs relatively low for water recycling, about $400 per AF compared to imported water sources that can cost up to $1,900 per AF, water recycling is considered a cost cutting measure

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[72] CVWD. 2012. *Recycled Water Program: Guidelines for the Use of Recycled Water*. October. Pp. 42 – 43 (Nutrients).
[73] IWA. 2011. *2010 UWMP*. September. Pg. 1-5 (1.3.3 Resource Maximization).
[74] IWA. 2011. *IWA RWMP*. December. Pg. 42 (6.4 Project Prioritization).
[75] IWA. 2014. *IWA RW Project – Phase 1A Project Definition TM*. July. Pg. 2-1 (2.1 Demands and Design Sizing Criteria, Table 3-1 Phase 1 Recycled Water Customers).

compared to groundwater pumping and groundwater replenishment with imported water.[76] Considering much of the IWA service area is designated as a DAC or severely DAC, reducing water costs in the IWA service area would decrease water costs for DACs.[77] Therefore, implementation of the *IWA Recycled Water Project* is expected to lower water costs for DACs in the IWA service area.

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

IWA will coordinate with recycled water customers to confirm recycled water user needs, including flow rate, pressure, water quality, and connection locations. A recycled water use agreement will be developed with each customer defining the responsibility of the water retailer and the user. IWA will work with customers to ensure proper onsite retrofit to prevent cross connection between potable and recycled water systems. In addition, as part of the Work Summary (see Attachment 4), IWA will develop a *Rate and Assessment District Study* for financing purposes. The results of the rate assessment will allow IWA to decide a recycled water rate that will entice customers to connect to the recycled water system. Customers receiving recycled water will complete on-site retrofits and permitting.

Potential Physical Effects of the Project

There could be temporary adverse physical effects associated with the project during construction. The project was analyzed through an Environmental Impact Report (EIR) in accordance with the California Environmental Quality Act (CEQA), and has completed CEQA-Plus documentation of possible impacts and mitigation measures. IWA will develop recycled water rules and regulations, a recycled water use manual, and recycled water program materials needed to meet CDPH requirements, including a service application, annual reporting template, and standard construction details. The WateReuse Association and other agencies have development guides and standards that can be adopted by IWA to meet CDPH requirements; therefore, potential adverse effects of construction and operation of recycled water facilities would be avoided through development of the proposed recycled water materials. Impacts associated with the project are anticipated to be short-term and mitigated to less-than-significant levels. There are no anticipated long-term, significant adverse effects.

[76] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).
[77] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I.* February. Pg. 4-18 (Figure 4-7 Coachella Valley Disadvantaged Communities – 2010 Census).

Cost Effectiveness Analysis – Indio Water Authority Recycled Water Project

The following cost effectiveness analysis was carried out for the *Indio Water Authority Recycled Water Project* to evaluate whether the physical benefits provided by the project are provided at the least possible cost. The analysis summary shown below in **Table 3-13** contains information on the types of benefits provided by the project, project alternatives, and whether or not the project is the lowest cost alternative. The analysis for this project includes a comparison between phased construction versus complete build-out construction, treatment alternatives, and customer and distribution system alternatives, which are discussed in further detail below. The project was determined to be the lowest cost alternative that provides all the physical benefits identified for this project.

Table 3-13: Project Cost Effective Analysis
Indio Water Authority Recycled Water Project

Project name: *Indio Water Authority Recycled Water Project*	
Question 1 Physical Benefits Summary	The project will provide drought relief benefits by reducing groundwater pumping through the use of recycled water. This will achieve the benefits summarized in **Table 3-2**, including: • Increase recycled water use and offset potable water demand by 1,926 AFY (57,780 AF) • Decrease groundwater overdraft by 1,926 AFY (57,780 AF) • Avoid additional imported water supply purchases by 1,926 AFY (57,780 AF) • Reduce future demand for net diversions from the Bay-Delta by 1,926 AFY (57,780 AF) • Increase beneficial use of local wastewater by 1,926 AFY (57,780 AF) • Local supply development to decrease vulnerabilities of 1,926 AFY (57,780 AF) • Prevent groundwater quality degradation • Reduce net production of GHGs by 1,314 MT CO_2/year (39,406 MT CO_2) • Avoid social costs of GHGs of $32,247/year ($967,416) • Contribute to 20 x 2020 goals by 32% of total reductions • Reduce runoff from irrigation flows • Reduce need for fertilizer and/or pesticide application • Establish backbone for long-term recycled water system • Decrease water use costs for DACs
Question 2 Alternatives Considered	Alternatives have been considered to achieve the same physical benefits as the proposed project. The following three alternatives were considered for the proposed project. The sections following this table provide a detailed explanation of estimated costs for each alternative. 1. Development Alternative: phased construction versus full build-out 2. Treatment Alternatives: tertiary treatment using standard filtration versus membrane bioreactors (MBR) 3. Customer and distribution system alternatives
Question 3 Preferred Alternative	The following provides an overview of whether or not the project is the least cost alternative compared to the three alternatives listed above: 1. The proposed project chose a phased approach, which is the least cost alternative as compared to full project build-out.[A] 2. The proposed project includes the least-cost treatment option (filtration for tertiary treatment), which will be compatible with future additional treatment options.[B] 3. Customer and distribution system alternatives are lower cost than the proposed project; however, they do not provide the same magnitude of benefits as the proposed project. The alternatives provide 560 AFY and 1,220 AFY of recycled water yield, which is less than the 1,930 AFY of yield that would be provided by the proposed project.[C]

Project name: *Indio Water Authority Recycled Water Project*
Comments: [A] IWA. 2011. *IWA RWMP*. December. Pg. 41 (Table 12 Capital Improvement Program Summary). [B] IWA. 2010. *Technical Memorandum No. 4 Recycled Water Treatment Alternatives and Delivery Corridor Options.* January. Pp. 4-1 – 4-8 (2.0 Treatment Alternatives). IWA. 2011. *IWA RWMP.* December. Pg. 19 (3.2.3 Recycled Water from VSD). [C] IWA. 2014. *IWA Recycled Water Project: Phase 1A Project Definition Technical Memorandum.* July. Appendix A and B. Full analysis and explanation of alternatives is discussed in detail below.

Alternatives Considered and Least-Cost Analysis

Phased Format versus Full Build Out

The *IWA Recycled Water Master Plan* proposes a two-phase construction program for build out of the recycled water system. Development of a recycled water distribution system will require the construction of a backbone system to serve potential existing and future customers. The implementation of these improvements will depend upon customer proximity to the WWTP, feasibility of pipelines and facilities required to deliver the water, and growth patterns within the service area. The phasing of the improvements identified in the *IWA Recycled Water Master Plan* was developed based on the *Valley Sanitary District Wastewater Treatment Plant Master Plan* and proximity to the WWTP. The two phases consist of: Phase 1 Near-Term (Years 2011 through 2025) and Phase 2 Build-Out (Years 2026 through 2040).[78]

An alternative to constructing the project in phases would be to construct the build out project, including all treatment, distribution facilities, and wells for groundwater replenishment all at once. The estimated total cost for the build out project is $74.1 million,[79] while the Phase 1A is $21.5 million (see Attachment 5 Budget Summary). The phasing approach is considered cost-effective compared to full build-out. Primarily, this approach allows IWA to recapture incurred costs by completing thoughtful development of the system in accordance with the number of potential users. This approach will allow IWA to recapture expended capital costs through recycled water usage (customer fees). If IWA were to build-out the entire system, there would be a long period between the time infrastructure is completed and when users connect, and it is possible that development will not take place as anticipated, resulting in wasted infrastructure if users never connect to the system. Therefore, by choosing to implement the program in phases, IWA is choosing the least-cost development alternative.

Treatment Alternatives

Title 22 regulations require recycled water for landscape irrigation to be produced for landscape irrigation of golf courses, parks, playgrounds, schoolyards, and other landscaped areas with similar access be treated to treated to tertiary treatment standards and disinfected.[80] Possible treatment processes to achieve Title 22 standards for landscape irrigation include tertiary filtration or membrane bioreactors (MBRs). Tertiary filtration is a proven lower cost option for the production of Title 22 irrigation water compared to the higher cost MBR alternative.[81] Within the tertiary filtration option there are various technologies including sand filters and cloth filters. The *IWA Recycled Water Project* will include tertiary microfiltration, which is the least cost alternative as compared with MBR.

The selected treatment option is not only more cost-effective compared to the alternative (MBR), but will also provide flexibility for IWA to upgrade the WWTP for future potential potable reuse options (groundwater replenishment). If IWA moves forward with plans to use advanced-treated recycled water for groundwater replenishment, IWA would need to upgrade the WWTP with advanced treatment

[78] IWA. 2011. *IWA RWMP*. December. Pg. 42 (6.4 Project Prioritization).
[79] IWA. 2011. *IWA RWMP*. December. Pg. 41 (6.3.3 Total Capital Improvement Cost, Table 13 Capital Cost Analysis).
[80] California Department of Public Health. 2014. *Regulation Related to Recycled Water*. June. Pg. 22 (Title 22 Code of Regulations, Division 4, Chapter 3, Article 3, §60304 Use of recycled water for irrigation (a)).
[81] IWA. 2010. *Technical Memorandum No. 4 Recycled Water Treatment Alternatives and Delivery Corridor Options.* Pp. 4-1 (2.1 Tertiary Filtration), 4-5 (2.2 Membrane Biodreactor).

technology.[82] As analyzed within IWA's *Recycled Water Master Plan*, the microfiltration treatment option selected for the project will provide greater flexibility for potential potable reuse, because an existing chlorine contact tank at the WWTP could be converted into a membrane tank needed for additional advanced treatment. [83]

User and Pipeline Options

A total of 39 potential landscape irrigation customers were identified in the *IWA Recycled Water Master Plan.* These customers include golf courses, parks, schools, and HOAs within IWA's service area. Two groundwater replenishment opportunities were identified at Posse Park and Indio Municipal Golf Course.[84] While the Phase 1 and Phase 2 facilities were evaluated in the *IWA Recycled Water Master Plan*, three smaller scale Phase 1 options were considered for the *Indio Water Authority Recycled Water Project (Phase IA)*. The three options considered are as follows:

- Option 1: $12,261,000
  - 560 AFY, 1 MGD treatment capacity, 16,100 feet of pipeline
  - Customers: Indio Municipal GC (Irrigated Area 3 in **Figure 3-3**), Posse Park (Irrigated Area 22 in **Figure 3-3**), and Rancho Casa Blanca (Irrigated Area 2 in **Figure 3-3**)
- Option 2: $21,500,000
  - 1,930 AFY, 3.4 MGD treatment capacity, 15,000 feet of pipeline
  - Customers: Terra Lago GC (Irrigated Area 4 in **Figure 3-3**), Posse Park, and Rancho Casa Blanca
- Option 3: $16,384,000
  - 1,220 AFY, 2.2 MGD, 10,000 feet of pipeline
  - Customers: Eagle Falls GC (Irrigated Area 1 in **Figure 3-3**) and Rancho Casa Blanca

Option 2 was selected for *the IWA Recycled Water Project* based on a combination of proximity, likelihood of customer acceptance, recycled water yield, and compatibility with future recycled water system development. Based on the parameters considered by IWA, Option 1 and Option 3 were not selected, because they do not provide the same quantity of benefits as Option 2, even though they are lower cost alternatives.

Option 1 would deliver approximately 30% less recycled water than Option 2 (560 AFY vs. 1,930 AFY), but would include the same backbone infrastructure. Similar benefits described for the *Indio Water Authority Recycled Water Project* would be provided by Option 1, but the magnitude of these benefits would be approximately 30% less than the benefits provided by the proposed project.

If Option 3 were pursued, the amount of recycled water delivered would be almost equal to the amount provided by Option 2; however, Option 3 would not be compatible with future plans for groundwater replenishment, and the backbone for long-term recycled water system benefit would be significantly diminished. Posse Park has been selected for potential future groundwater replenishment with recycled water. By extending recycled water infrastructure to Posse Park, Option 2 (the proposed project) would provide a backbone water system for future development of the IWA Recycled Water Program. Under Option 3, the benefit of establishing a backbone for long-term recycled water system (Benefit M) would not be realized. Part of IWA's motivation for pursuing groundwater replenishment with recycled water (indirect potable reuse) is to maximize use of recycled water in low irrigation demand months by replenishing the basin. During low demand months, Option 3 would require seasonal storage (which would incur additional costs) or would waste the recycled water produced during low irrigation demand months, failing to effectively reuse water resources.

[82] IWA. 2010. *Technical Memorandum No. 4 Recycled Water Treatment Alternatives and Delivery Corridor Options.* Pp. 4-1 – 4-8 (2.0 Treatment Alternatives).
[83] IWA. 2010. *Technical Memorandum No. 4 Recycled Water Treatment Alternatives and Delivery Corridor Options.* Pp. 4-1 – 4-8 (2.0 Treatment Alternatives).
[84] IWA. 2011. *IWA RWMP*. December. Pg. 7 (2.1.1 Landscape Irrigation Customers).

Preferred Alternative

The proposed project is the least cost alternative from the point of view of the build out strategy (phasing vs. full build-out) and when comparing costs of available treatment options. While the proposed project is not the least cost alternative when comparing recycled water customer and distribution system options, the alternatives would not achieve the same types and amounts of physical benefits as the proposed project, and are therefore not considered to be the preferred alternatives.

Project 2: Regional Turf Reduction Program

Local Project Sponsor: Indio Water Authority (IWA)
Partners: Coachella Valley Water District (CVWD), Coachella Water Authority (CWA), Desert Water Agency (DWA), Mission Springs Water District (MSWD)

Information in the following sections pertains to the *Regional Turf Reduction Program*, and includes the following sub-sections indicated in the PSP:

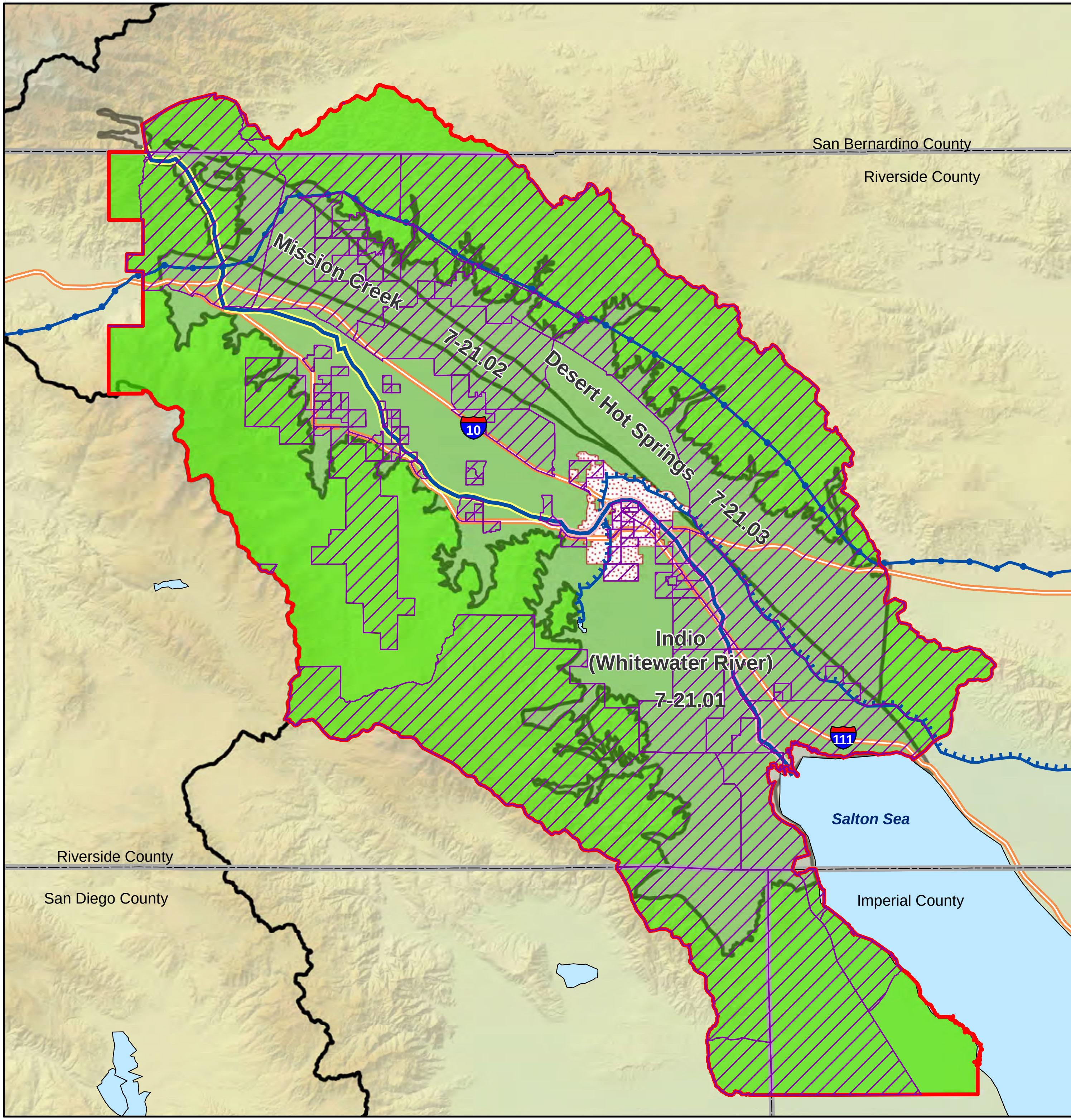
1. Project Description
2. Project Map
3. Project Physical Benefits
4. Technical Analysis of Physical Benefits Claimed, which includes the following sub-sections:
    - Technical Basis of the Project
    - Background for Benefits Claimed (Recent and Historical Conditions)
    - Without-Project Baseline (Estimates of Without-Project Conditions)
    - Methods Used to Estimate Physical Benefits
    - New Facilities, Policies, and Actions Required to Obtain Physical Benefits
    - Potential Physical Effects of the Project
5. Cost Effectiveness Analysis

Desert Water Agency Outreach Flyers for Turf Replacement and Efficient Watering Practices

Project Map – Regional Turf Reduction Program

Figure 3-8 includes a map of the *Regional Turf Reduction Program*, which shows the project's geographical location and the surrounding work boundaries, facilities of the project, water resources that would be affected by the project, DACs within the project service area, and proposed monitoring locations for the project.

Project Map
Regional Turf Reduction Program
Figure 3-8



- Colorado River Aqueduct
- Coachella and All American
- Whitewater River Storm Water Channel
- Coachella Valley Storm Water Channel
- Highways
- Water Bodies
- Coachella Valley IRWM Region
- Colorado River Funding Area

Local Project Sponsor

- Indio Water Authority
- Project 2: Regional Turf Reduction Program
- 7-X Affected Groundwater Basins
- Disadvantaged Communities (DACs)

Project Monitoring will be on site and specific to rebate participants, therefore, it is currently unknown, but within the project area.

Source: DWR Bulletin 118 & 2014 Coachella Valley IRWM Plan

Disadvantaged communities are considered those who earned less than $48,706 (80% Statewide MHI)

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File Name: Fig 3-6_Project Map_Project 2.mxd
File Location:N:\Projects\0574-002 Coachella IRWM Plan Update \03_GIS\MXD\Round 3\
Date Updated: July 7, 2014
Department: RMC Water & Environment

Project Description – Regional Turf Reduction Program

Provide turf rebates and education to reduce groundwater pumping and irrigation demands for turf grass, therefore maximizing in lieu groundwater replenishment throughout the Region.

Project Nexus to Drought Impacts:

The *Regional Turf Reduction Program* meets two of the Drought Project Elements defined by DWR: the Project will provide regional drought preparedness and reduce water quality conflicts or ecosystem conflicts created by the drought by reducing water use through turf replacement and providing groundwater management by offsetting localized groundwater pumping (in lieu groundwater replenishment).

As documented in Attachment 2, the Coachella Valley IRWM Region's groundwater basin is in overdraft; however, regional efforts to manage the basin have improved this condition. One of the most substantial groundwater management efforts involves groundwater basin replenishment with imported water from the SWP and the Colorado River. Reduction of imported water supplies in times of drought has the potential to exacerbate groundwater basin overdraft conditions. The 2014 drought, therefore, has a direct impact on the Region as it has reduced SWP deliveries to 5% across California, and has substantially reduced artificial recharge in the Region. The seven specific drought impacts addressed in Attachment 2 stem from groundwater overdraft in the Region, which can be attributed to the drought due to reduced availability of water for groundwater replenishment. The *Regional Turf Reduction Program*, which reduces potable water demand and provides in lieu groundwater replenishment by reducing water use, will address all seven drought impacts identified in Attachment 2:

1. Groundwater Basin Overdraft: The project will alleviate groundwater basin overdraft by reducing water use and directly reducing groundwater pumping by 723 AFY.
2. Drinking Water MCL Violations: Portions of the Region are not in compliance with the drinking water MCL for chromium-6. Groundwater replenishment helps reduce chromium-6 by diluting groundwater that contains the constituent. By providing in lieu groundwater replenishment, the project will help to maintain existing chromium-6 levels and avoid additional chromium-6 MCL violations.
3. Risk of Not Meeting Existing Drinking Water Demands: The project will help manage concerns regarding chromium-6 that prevent some residents from drinking local water. By increasing in-lieu groundwater replenishment, and avoiding additional chromium-6 MCL violations, the project will help avoid an increase in the number of residents receiving water that exceeds the MCL.
4. Risk of Not Meeting Existing Agricultural Water Demands: The project will reduce local groundwater pumping, leaving additional water in the groundwater basin to meet demands for other users, including agriculture.
5. Risk of Not Meeting Existing Ecosystem Water Demands: The project will reduce local groundwater pumping, leaving additional water in the groundwater basin to meet ecosystem water demands.
6. Land Subsidence: Land subsidence is a serious consequence of groundwater overdraft; therefore by helping to manage overdraft, the project will help to manage land subsidence.
7. Energy Demand and GHG Emissions: The project will provide in lieu groundwater replenishment and therefore avoid energy demands for groundwater pumping, which increase during droughts as groundwater levels decrease. The project will also provide replenishment benefits, thereby reducing energy needed for additional imported water.

This project was selected for inclusion in this application because it is an IRWM project that addresses critical drought impacts to the Region, and can be implemented on an expedited timeline. Expedited funding is needed because it will reduce localized groundwater pumping and therefore directly benefit the groundwater basin through in lieu groundwater replenishment. Without grant funding, this project may not move forward due to costs associated with turf replacement and the need for outreach to educate residents about conserving water. Therefore, expedited funding for this project is critical to ensure that the project is implemented and provides drought relief benefits to the Region in a timely manner.

Project Physical Benefits – Regional Turf Reduction Program

The *Regional Turf Reduction Program* provides several physical benefits. The primary physical benefit of the project is reduced water use and reduced groundwater pumping through turf replacement. This primary benefit results in secondary benefits, summarized in **Table 3-14.** The project life is anticipated to be 20 years, as explained in the Technical Justification section, below. The benefits will be phased in (and subsequently out) over the project life, as shown in **Tables 3-15** through **Table 3-24** – these tables are consistent with Table 5 in the Proposal Solicitation Package (PSP). As stated in Table 3-2, some of the benefits are qualitative; for these benefits, additional tables consistent with Table 5 of the PSP have not been provided. Explanations of how these benefits were calculated are provided in the Technical Analysis of Physical Benefits Claimed section, below, along with the context for the importance of these benefits. Further, backup documentation (spreadsheets) that show how each quantifiable benefit was calculated is provided as **Appendix 3-1**.

Table 3-14: Physical Benefits Summary
Regional Turf Reduction Program

Primary Physical Benefit	Physical Benefit		Quantification of Benefits (cumulative quantification of benefits)
Reduce Water Use through Turf Replacement	A	Decrease Groundwater Overdraft	723 AFY (14,452 AF)
	B	Avoid Additional Imported Water Supply Purchases	723 AFY (14,452 AF)
	C	Reduce Future Demand for Net Diversions from the Bay-Delta	723 AFY (14,452 AF)
	E	Local Supply Development to Decrease Vulnerabilities	723 AFY (14,452 AF)
	F	Prevent Groundwater Quality Degradation	Qualitative
	H	Reduce Net Production of Greenhouse Gases	690 MT CO2e/year (13,799 MT CO2e)
	I	Avoid Social Costs of GHGs	$16,938/year ($338,768)
	J	Contribute to 20 x 2020 Goals	1%
	K	Reduce Runoff from Irrigation Flows	Qualitative
	L	Reduce Need for Fertilizer and/or Pesticide Application	130 acres of application/year (2,597 acres of application)
	N	Benefit Wildlife or Habitat	Qualitative
	O	Reduce Production of Green Waste	8.9% to 13.5% per year per household
	P	Decrease Water Use Costs for DACs	Qualitative

Table 3-15: Primary Physical Benefit – Reduce Water Use through Turf Replacement
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program*
Type of Benefit Claimed: Reduce Water Use through Turf Replacement
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2014	0 AF	0 AF	0 AF
2015	0 AF	72 AF	72 AF
2016	0 AF	217 AF	217 AF
2017	0 AF	361 AF	361 AF
2018	0 AF	506 AF	506 AF
2019	0 AF	650 AF	650 AF
2020-2034	0 AF	723 AFY (10,839AF)	723 AFY (10,839AF)
2035	0 AF	650 AF	650 AF
2036	0 AF	506 AF	506 AF
2037	0 AF	36 AF	36 AF
2038	0 AF	217 AF	217 AF
2039	0 AF	72 AF	72 AF
Total	**0 AF**	**14,452 AF**	**14,452 AF**

Comments: Savings are based on phasing in of *Regional Turf Reduction Program* over 5 years, with full benefits beginning in 2020 and a project life of 20 years. Golf course irrigation benefits were estimated using 5 AFY/acre of turf replaced savings (Reyes, Patti. CVWD Programs Manager. Personal communication.). Residential, commercial, municipal, and multi-family customer irrigation savings from turf removal were estimated using 55.8 gal/sqft/yr of water savings (Southern Nevada Water Authority (SNWA). 2005. *Xeriscape Conversion Study: Final Report*. Pg. 60, (Executive Summary and Conclusions 3.).

Table 3-16: Physical Benefits for A-Decrease Groundwater Overdraft
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program* **Type of Benefit Claimed:** Decrease Groundwater Overdraft **Units of the Benefit Claimed:** AFY			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	72 AF	72 AF
2016	0 AF	217 AF	217 AF
2017	0 AF	361 AF	361 AF
2018	0 AF	506 AF	506 AF
2019	0 AF	650 AF	650 AF
2020-2034	0 AF	723 AFY (10,839AF)	723 AFY (10,839AF)
2035	0 AF	650 AF	650 AF
2036	0 AF	506 AF	506 AF
2037	0 AF	36 AF	36 AF
2038	0 AF	217 AF	217 AF
2039	0 AF	72 AF	72 AF
Total	**0 AF**	**14,452 AF**	**14,452 AF**
Comments: Based on Primary Physical Benefit – Reduce Potable Demand.			

Table 3-17: Physical Benefits for B-Avoid Additional Imported Water Supply Purchases
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program* **Type of Benefit Claimed:** Avoid Additional Imported Water Supply Purchases **Units of the Benefit Claimed:** AFY			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	72 AF	72 AF
2016	0 AF	217 AF	217 AF
2017	0 AF	361 AF	361 AF
2018	0 AF	506 AF	506 AF
2019	0 AF	650 AF	650 AF
2020-2034	0 AF	723 AFY (10,839AF)	723 AFY (10,839AF)
2035	0 AF	650 AF	650 AF
2036	0 AF	506 AF	506 AF
2037	0 AF	36 AF	36 AF
2038	0 AF	217 AF	217 AF
2039	0 AF	72 AF	72 AF
Total	**0 AF**	**14,452 AF**	**14,452 AF**
Comments: Based on Primary Physical Benefit – Reduce Potable Demand. CVWD currently carries out groundwater basin replenishment using imported water to offset groundwater pumping and overdraft; IWA. 2011. *2010 UWMP*. September. Pg. 3-8 (3.4.1 Valley-wide Program – State Water Project).			

Table 3-18: Physical Benefits for C-Reduce Future Demand for Net Diversions from the Bay-Delta
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program*
Type of Benefit Claimed: Reduce Future Demand for Net Diversions from the Bay-Delta
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	72 AF	72 AF
2016	0 AF	217 AF	217 AF
2017	0 AF	361 AF	361 AF
2018	0 AF	506 AF	506 AF
2019	0 AF	650 AF	650 AF
2020-2034	0 AF	723 AFY (10,839AF)	723 AFY (10,839AF)
2035	0 AF	650 AF	650 AF
2036	0 AF	506 AF	506 AF
2037	0 AF	36 AF	36 AF
2038	0 AF	217 AF	217 AF
2039	0 AF	72 AF	72 AF
Total	**0 AF**	**14,452 AF**	**14,452 AF**

Comments: Based on Physical Benefits B-Avoid Additional Imported Water Supply Purchases. In 2002 Coachella Valley Water Management Plan, sources of additional imported water supplies included the Colorado River and the SWP (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-3 (2.2.2 Additional Water Supplies)). Any additional imported water would be purchased through SWP contractors (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-4 (Additional Water Purchases)). Therefore, 100% of future water supply purchases would be from SWP Contractors (from the Bay-Delta.)

Table 3-19: Physical Benefits for E-Local Supply Development to Decrease Vulnerabilities
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program*
Type of Benefit Claimed: Local Supply Development to Decrease Vulnerabilities
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	72 AF	72 AF
2016	0 AF	217 AF	217 AF
2017	0 AF	361 AF	361 AF
2018	0 AF	506 AF	506 AF
2019	0 AF	650 AF	650 AF
2020-2034	0 AF	723 AFY (10,839AF)	723 AFY (10,839AF)
2035	0 AF	650 AF	650 AF
2036	0 AF	506 AF	506 AF
2037	0 AF	36 AF	36 AF
2038	0 AF	217 AF	217 AF
2039	0 AF	72 AF	72 AF
Total	**0 AF**	**14,452 AF**	**14,452 AF**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-33 (Existing Water Supplies, 4.9, Summary), pg. 7-10 (Water Supply Evaluation, 7.2.2.4 Reliability).

Table 3-20: Physical Benefits for H-Reduce Net Production of Greenhouse Gases
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program*
Type of Benefit Claimed: Reduce Net Production of Greenhouse Gases
Units of the Benefit Claimed: MT CO2e

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 MT CO2	0 MT CO2e	0 MT CO2e
2015	0 MT CO2	69 MT CO2e	69 MT CO2e
2016	0 MT CO2	207 MT CO2e	207 MT CO2e
2017	0 MT CO2	345 MT CO2e	345 MT CO2e
2018	0 MT CO2	483 MT CO2e	483 MT CO2e
2019	0 MT CO2	621 MT CO2e	621 MT CO2e
2020-2034	0 MT CO2	690 MT CO2e/year (10,349 MT CO2e)	690 MT CO2e/year (10,349 MT CO2e)
2035	0 MT CO2	621 MT CO2e	621 MT CO2e
2036	0 MT CO2	483 MT CO2e	483 MT CO2e
2037	0 MT CO2	345 MT CO2e	345 MT CO2e
2038	0 MT CO2	207 MT CO2e	207 MT CO2e
2039	0 MT CO2	69 MT CO2e	69 MT CO2e
Total	**0 MT CO2**	**13,799 MT CO2e**	**13,799 MT CO2e**

Comments: Based on Primary Physical Benefit – Reduce Potable Demand. Energy per AF of groundwater pumping and imported was calculated using California water and energy information: CEC, 2005, *Water-Energy Relationship*, June, Pg. 22 (Table 1). Equinox, 2010, *San Diego's Water Sources: Assessing the Options*, July, Pg. 10 (Table 1a). GHG production per energy use was then calculated in units of carbon dioxide equivalency (CO2e): CEC, 2014, *California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours)*, April, available at: http://energyalmanac.ca.gov/electricity/electricity_generation.html. U.S. EPA, 2014, *eGRID 9th edition Version 1.0 Year 2010 Summary Tables*, February, available at: http://www.epa.gov/cleanenergy/energy-resources/egrid/.

Table 3-21: Physical Benefits for I-Avoid Social Costs of Greenhouse Gases
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program* **Type of Benefit Claimed:** Avoid Social Costs of Greenhouse Gases **Units of the Benefit Claimed:** $			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	$0	$0	$0
2015	$0	$1,694	$1,694
2016	$0	$5,082	$5,082
2017	$0	$8,469	$8,469
2018	$0	$11,857	$11,857
2019	$0	$15,245	$15,245
2020-2034	$0	$16,938 ($254,076)	$16,938 ($254,076)
2035	$0	$15,245	$15,245
2036	$0	$11,857	$11,857
2037	$0	$8,469	$8,469
2038	$0	$5,082	$5,082
2039	$0	$1,694	$1,694
Total	**$0**	**$338,768**	**$338,768**
Comments: Calculation based on GHG reduction from project, described under Benefit H – Reduce Net Production of Greenhouse Gases. Social cost of carbon source: Interagency Working Group on Social Cost of Carbon, 2010, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, February, pg. 28(Table 4). Costs reported in this document were in converted to 2014 dollars using CPI Inflation calculator, available: http://www.bls.gov/data/inflation_calculator.htm			

Table 3-22: Physical Benefits for J-Contribute to 20x2020 Goals
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program* **Type of Benefit Claimed:** Contribute to 20x2020 Goals **Units of the Benefit Claimed:** %			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2020	0	1%	1%
Comments: Contribution to 20x2020 goals was calculated based on the CVWD 20x2020 baseline of 591 gallons per capita per day (gpcd) and the target of 473 (gpcd); CVWD. 2011. *2010 UWMP*. July. Pg. 3-6 (3.2.2 Urban Water Use Target, Table 3-7 Urban Water Use Targets). Primary Physical Benefit – Reduce Potable Demand was then divided by the CVRWMG service area population estimates for 2020; see 20x2020 Methods section for source.			

Table 3-23: Physical Benefits for L-Reduce Need for Fertilizer and/or Pesticide Application
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program* **Type of Benefit Claimed:** Reduce Need for Fertilizer and/or Pesticide Application **Units of the Benefit Claimed:** Acres of application			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 acres of application	0 acres of application	0 acres of application
2015	0 acres of application	13 acres of application	13 acres of application
2016	0 acres of application	39 acres of application	39 acres of application
2017	0 acres of application	65 acres of application	65 acres of application
2018	0 acres of application	91 acres of application	91 acres of application
2019	0 acres of application	117 acres of application	117 acres of application
2020-2034	0 acres of application	130 acres of application/year (1,948 acres of application)	130 acres of application/year (1,948 acres of application)
2035	0 acres of application	117 acres of application	117 acres of application
2036	0 acres of application	91 acres of application	91 acres of application
2037	0 acres of application	65 acres of application	65 acres of application
2038	0 acres of application	39 acres of application	39 acres of application
2039	0 acres of application	13 acres of application	13 acres of application
Total	**0 acres of application**	**2,597 acres of application**	**2,597 acres of application**
Comments: Based on total acreage of turf converted to water efficient landscaping; (Reyes, Patti. 2014. CVWD Planning and Special Programs Manager. June. Personal communication. Available by telephone at: (760)398-2661, ext. 2270). All types of water efficient landscaping are expected to have reductions in fertilizer and pesticide application.			

Table 3-24: Physical Benefits for O-Reduce Production of Green Waste
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program* **Type of Benefit Claimed:** Reduce Production of Green Waste **Units of the Benefit Claimed:** %			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2015-2039	0	8.9% to 13.5%	8.9% to 13.5%
Comments: The USEPA estimates that green waste makes up 13.5% of household waste (U.S. EPA. 2012. *Municipal Solid Waste (MSW) Generation, Recycled, and Disposal in the United States: Facts and Figures for 2012*. Pg. 5, Materials in MSW Figure 5. Total MSW Generation). Synthetic grass options would completely eliminate yard waste in converted areas, or 100% waste reduction. The Sustainable Site Initiative's The Case for Sustainable Landscapes documented a 66% reduction in green waste between lawn and native plant garden (The Sustainable Sites Initiative. 2009. *The Case for Sustainable Landscapes*. Pp. 36-37. http://www.sustainablesites.org/report/The%20Case%20for%20Sustainable%20Landscapes_2009.pdf). Using the range of waste reduction of 66 to 100% and multiplying by the percentage of green waste in household waste gives the above benefit.			

Technical Analysis of Physical Benefits Claimed – Regional Turf Reduction Program

The project goal and primary benefit of the *Regional Turf Reduction Program* is to reduce water use through turf replacement, thereby decreasing groundwater pumping. This benefit is gained by conducting outreach and education and providing rebates for the removal of high-water consuming turf grass and replacement with desert-friendly, water-efficient landscaping. The project is a multifaceted program that will make turf rebates available throughout the Coachella Valley Regional Water Management Group's (CVRWMG's) collective service area for a variety of water sectors, including: golf, residential, commercial, municipal, and multi-family. The background and physical benefits vary between the different types of water sectors that will be targeted for this program.

Turf Rebates for Golf Sector

The golf sector portion of the *Regional Turf Reduction Program* includes efforts throughout the Region to reduce water use for golf course irrigation, and specifically to reduce groundwater pumping (thereby providing in lieu groundwater replenishment). The Coachella Valley Golf and Water Task Force (Task Force) was formed by the Southern California Golf Association (SCGA), local golf course managers, and CVWD to focus on reducing water usage on the 124 golf courses in the area.[85] The Task Force recently launched a program in response to the 2014 drought to reduce golf course water use by 10%.[86] Despite efforts by the Task Force, local golf courses have indicated that turf replacement is not affordable because the cost of turf removal and re-landscaping is approximately $30,000 per acre.[87] In addition, the majority of golf courses in the Coachella Valley that do not use non-potable water sources for irrigation (recycled water and Canal water) rely upon local groundwater pumping from private wells for irrigation needs. Groundwater pumping is comparatively inexpensive, making economic incentives to replace turf a challenge in the Coachella Valley compared to other regions where golf courses irrigate with higher-cost municipally-supplied potable water. Further, because golf courses that use their own onsite groundwater wells are not customers of and do not obtain their groundwater from local water agencies, the agencies themselves have been unable to develop funding mechanisms for golf course rebates.

Golf course irrigation savings were estimated using figures from local golf course turf removal projects that have been completed and show an average savings of 5 acre feet per year (AFY) per acre of turf removed.[86] As discussed in Attachment 5, the *Regional Turf Reduction Program* requests $1,500,000 in grant funding for the golf sector. The golf course participants would be required to provide a 50/50 cost share, meaning that a total of $3,000,000 would be spent toward golf course turf removal. Using local figures that demonstrate costs to replace turf are $30,000 per acre the project would result in 100 acres of turf removal. Using local water savings figures for golf turf removal, the golf course turf removal portion of the project would result in 500 AFY of in lieu groundwater basin replenishment once the project has been fully implemented.

Table 3-25: Calculation of Water Savings for the Golf Sector
Regional Turf Reduction Program

Total Grant Request	Funding Match	Total Funding	Total Acres of Turf Removed ($30,000 per acre)	Estimated Water Savings (5 AFY per acre)
$1,500,000	$1,500,000	$3,000,000	100	500 AFY

[85] Club and Resort Business. 2013. *Coachella Valley Task Force Targets Golf Course Water Conservation*. November. Available at: http://www.clubandresortbusiness.com/2013/11/20/coachella-valley-task-force-targets-golf-water-conservation/.
[86] Reyes, Patti. 2014. CVWD Planning and Special Programs Manager. June. Personal communication. Available by telephone at: (760)398-2661, ext. 2270
[87] Reyes, Patti. 2014. CVWD Planning and Special Programs Manager. June. Personal communication. Available by telephone at: (760)398-2661, ext. 2270

Turf Rebates for Residential, Commercial, Municipal, and Multi-Family Customers

Throughout the Region, turf landscapes and high irrigation water demands for a variety of sectors has prompted water agencies and municipalities to work together to develop turf rebate programs that incentivize replacing turf grass with low-water use landscapes. The residential, commercial, municipal, and multi-family sectors portion of the *Regional Turf Reduction Program* is a result of individual agency and collective efforts undertaken by the CVRWMG through the regional conservation program known as "CV Water Counts". CV Water Counts is a regional effort to increase a variety of water conservation efforts by making conservation rebates, programs, and educational materials easily accessible to all water users in the Coachella Valley.[88]

Water savings that would accrue as a result of the turf rebates for the residential, commercial, municipal, and multi-family sectors are based on success of other programs in the Region and regions with similar weather patterns and water use. As such, water savings for the residential, commercial, municipal, and multi-family sectors from turf removal were estimated assuming 55.8 gallons of water per year are saved per square foot (sqft) of turf that is removed based on a study done in the desert region served by the Southern Nevada Water Authority (SNWA).[89] As explained in Attachment 5, $2,250,000 of grant funding would be allocated to turf removal for these sectors; $300,000 for multi-family and $1,950,000 for all other sectors. Based on previous experience of the CVRWMG working on turf rebate programs, it was assumed that residential, commercial, and municipal users would receive a rebate of $2 per square foot of turf removed and that those users would be required to contribute at least 19% towards a funding match. For the multi-family program, which is expected to largely involve DAC residents, the users will not be expected to provide a funding match and will receive a rebate of $3 per square feet of turf removed to further incentivize involvement. Given these stipulations, it is expected that the residential, commercial, municipal, and multi-family rebate program would result in a cumulative removal of 1,300,000 square feet of turf and would reduce water consumption by 223 AFY.

Table 3-26: Calculation of Water Savings for the Residential, Commercial, Municipal, and Multi-Family Sectors
Regional Turf Reduction Program

Sector	Total Grant Request	Funding Match	Total Funding	Rebate Provided (per sqft)	Total Amount of Turf Removed (sqft)	Estimated Annual Water Savings (gallons)	Estimated Water Savings (AFY)
Residential/ Commercial/ Municipal	$1,950,000	$450,000	$2,400,000	$2	1,200,000	66,960,000	205
Multi-Family	$300,000	$0	$300,000	$3	100,000	5,580,000	17
				TOTAL	**1,300,000**	**72,540,000**	**223**

In total, the *Regional Turf Reduction Program* is anticipated to result in 723 AFY of water savings. Similar programs have estimated the life span of turf removal projects to be 50 years[90]; however, regional partners have suggested that a more conservative project life of 20 years, or approximately the length of two home ownerships, be used for the *Regional Turf Reduction Program*. Savings over the life of the project are estimated to be 14,452 AF.

Assuming the project will be phased in over a 5-year implementation period, the primary physical benefit of reduced water use through turf replacement is shown over the course of the project life in **Table 3-15**. There are a number of other benefits that will be realized as a result of this primary benefit. The quantitative physical benefits which are summarized in **Table 3-14**, are presented in greater detail in

[88] CVRWMG. 2013. *Water Counts*. Available at: http://www.cvwatercounts.com/
[89] Southern Nevada Water Authority (SNWA). 2005. *Xeriscape Conversion Study: Final Report*. Pg. 60 (Executive Summary and Conclusions 3).
[90] SNWA. 2012. *Water Smart Landscapes Rebate Program II*. 2012. Pg. 9 (4 Technical Proposal: Evaluation Criteria).

Tables 3-15 through **Table 3-24**. Methods for determination of the quantitative physical benefits that were calculated and the qualitative physical benefits that were not calculated are described in the Methods section below.

Background for Benefits Claimed

As described previously and shown in **Tables 3-15** through **Table 3-24**, the primary benefit associated with the *Regional Turf Reduction Program* of reducing water use through turf replacement results in a number of additional benefits. The information presented below provides the background and context for the project, the Region, and the basis for each of the benefits that will accrue as a result of the project. Additional details about how each benefit was calculated are included in the Methods Used to Estimate the Physical Benefits section, below.

Primary Physical Benefit – Reduce Water Use through Turf Replacement

The golf industry represents a significant water demand in the Coachella Valley and is estimated to be responsible for at least 25% of the Region's groundwater pumping. Demands from golf courses are anticipated to increase as up to 75 new golf courses could be constructed within the Whitewater River Sub-basin boundary area by 2045. As part of the *CVWMP 2010 Update*, the CVWD 2009 Landscape Ordinance and irrigation efficiency policies were put forth as conservation priorities, setting a goal of 700 AFY in water use per 18-hole golf course for new and rehabilitated existing golf courses.[91] The CVWD Landscape Ordinance established maximum allowable turf area for new golf courses by limiting turf to 4 acres per hole plus 10 acres for practice areas and requiring other landscaping to consist of low water-using plants.[92] In addition to requiring new golf courses and golf courses that have been rehabilitated to meet these goals, Coachella Valley agencies encourage existing golf courses to reduce water use by reducing turf acreage.[93]

A survey was conducted by CVWD from 2010-2013 to analyze water use at 101 golf courses in the Coachella Valley. Information was collected on number of golf holes, turf acreage, non-turf acreage, and irrigation water use.[94] On average, golf courses surveyed had 5.7 acres of turf per hole, which is 25% more than the 2009 CVWD ordinance allows for new golf courses. All golf courses surveyed except one were built before 2009 prior to the ordinance; however, 20 out of the 101 courses met the restrictions of the 2009 ordinance. Currently, non-turf acres make up 12% of the irrigated area at the 101 golf courses. If the stipulations of the 2009 ordinance were applied to all golf courses, the non-turf acres would constitute 27% of the total golf course area. As such, implementation of the ordinance on a retroactive basis would be anticipated to result in substantial turf reduction, proving that there is a large amount of golf turf within the Region that could be reasonably converted to water-efficient landscaping. Per the CVWD survey, the average total water use per year for all 101 golf courses was 95,817 AF. If all the golf courses reduced their turf to the amounts required for new golf courses by the 2009 ordinance, assuming a 5 AFY reduction in water use after conversion, water usage would be reduced by 12,330 AFY, which would be a 13% reduction in water use.

In 2005, the Mid-Valley area of Coachella Valley was evaluated for golf course irrigation water use due to the specific groundwater issues arising in that area. Within the Mid-Valley area there are approximately 51 golf courses with a projected 2015 irrigation water use of approximately 55,213 AFY.[95] While the Mid-Valley study specifically analyzed conversion from groundwater to non-potable water use for irrigation, the study found that while the golf course managers recognized the need to reduce groundwater pumping, they also operate in a highly competitive market and are concerned with equity among all golf courses. In particular, the study found that golf course managers were concerned with capital costs to

[91] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 3-11 (3.3.1.4 Golf Course Water Demand Assumptions).
[92] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 6-13 (6.3.3 Golf Course Conservation).
[93] CVWD. 2010. CVWMP 2010 Update. December. Pg. 8-4 (8.1.1.1 Water Conservation).
[94] Reyes, Patti. 2014. CVWD Planning and Special Programs Manager. June. Personal communication. Available by telephone at: (760)398-2661, ext. 2270
[95] CVWD. 2005. *Final Concept Paper Mid-Valley Pipeline*. October. Pg. 4 (Table 2-1 Projected Mid-Valley Use of Irrigation Water (2015)).

convert to a non-potable system and how these costs would affect their profitability.[96] The results of the Mid-Valley study demonstrate that golf courses are unlikely to initiate changes to reduce water consumption if there are not financial incentives to do so that are available on a region-wide basis to level the playing field and reduce economic impacts to individual golf courses.

Residential/Commercial/Municipal/Multi-Family Water Use

In addition to golf course irrigation as a primary focus of water conservation efforts in Coachella Valley, the *CVWMP 2010 Update* recognizes urban water use as a priority, noting water efficient landscaping as both an existing and potential new water conservation measure.[97] This recognition is further supported by the amount of turf conversion programs available throughout the Coachella Valley and provided through water districts and local municipalities. The *CVWMP 2010 Update* also states that urban water demands are anticipated to increase with increasing population growth due to anticipated land use conversions from agricultural uses to urban uses throughout the Coachella Valley.[98] Due to the Region's climate, outdoor water use has been considered a priority for urban conservation efforts.[99] For example, in the *CVWMP 2010 Update*, CVWD estimated that approximately 75% of new demand in the eastern Coachella Valley associated with new growth was anticipated to be for outdoor water demand, and would equal approximately 143,000 AFY.[100] Due to high demands associated with outdoor water use in urban settings and anticipated land use conversions from agricultural to urban uses, there is a need to implement a comprehensive program to address and limit outdoor water use throughout the Region.

As discussed in Attachment 2, all five CVRWMG members are signatory to the California Urban Water Conservation Council's MOU and as such implement best management practices to reduce demands throughout their individual service areas. Due to the agencies' long-term involvement in conservation programs, as well as the agencies' collective effort to streamline conservation efforts through CV Water Counts program, each CVRWMG member is well-equipped to complete the outreach and customer interfacing necessary to implement a successful turf rebate program for the residential, commercial, municipal, and multi-family sectors. As a result of the 2014 drought and the CV Water Counts efforts, the CVRWMG agencies have already undertaken efforts to develop materials to educate citizens about the benefits of turf replacement and water-efficient irrigation systems. While the results of these efforts have not yet been quantified, recent polling shows that there is a region-wide interest in conserving water in the Region. A recent survey taken for the CV Water Counts effort found that over 65.5% of respondents thought they could do more to conserve water.[101] Furthermore, the survey found that moving forward, Coachella Valley residents see a need to make long-term changes that will conserve water given that 46.3% of respondents for the CV Water Counts survey indicated that the best reason for conserving water is to ensure water supplies for the future.

High demands for outdoor urban water use combined with regional acceptance and interest in conserving water indicate that a regional program to incentivize reductions in outdoor urban water use will be both regionally beneficial and successful and could help the CVRWMG agencies meet their 20% water conservation measures that have been enacted in response to the 2014 drought (see Attachment 2).

A-Decrease Groundwater Overdraft

The Coachella Valley Region overlays three primary sub-basins: Whitewater River Sub-basin, Mission Creek Sub-basin, and Desert Hot Springs Sub-basin, which are discussed in greater detail below. The groundwater basin primarily utilized and affected by the Region is the Indio Sub-basin per DWR Bulletin

[96] CVWD. 2005. *Final Concept Paper Mid-Valley Pipeline*. October. Pg. ii (Impacts on Golf Course Operations).
[97] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-2 (2.2.1 Water Conservation).
[98] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-2 (1.1 Purpose and Need for Water Management Plan Update).
[99] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-9 (Table 2-2, Status of the 2002 Water Management Plan Implementation).
[100] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 6-31 (6.5.2.4 Non-potable Urban Water Systems in the East Valley).
[101] Probolsky Research. 2013. *Survey Results*. Available: http://www.cvwatercounts.com/wp-content/uploads/2013/10/Survey-graphs.pdf

118, locally referred to as the Whitewater River Sub-basin, shown in **Figure 3-8** above. The Whitewater River Sub-basin has an estimated storage capacity of 30 million AF of water. Prior to 1949, groundwater levels steadily declined due to agricultural pumping, after which the Region began to implement artificial replenishment and groundwater management programs. Today basin inflows consist of natural runoff, returns from groundwater and imported water use, and artificial recharge. Total inflows into the Whitewater River Sub-basin are estimated to be about 331,000 AFY. Outflows consist of pumping, flows to the agricultural drainage system, evapotranspiration by native vegetation, and outflow to the Salton Sea. Total basin outflows are estimated to be 441,000 AFY.[102]

CVWD estimated the decrease in freshwater storage in the Whitewater River Sub-basin for 2009 to be 72,051 AF, which is lower than historical loss due to higher SWP Exchange water deliveries and Canal water recharge. The groundwater overdraft ten-year average for the period of 2000 to 2009 was 110,000 AFY or a total of over 1 million AF in groundwater overdraft for that period.[103] As stated in Attachment 2, the local groundwater basin is in overdraft, and SWP Exchange Allocations for Coachella Valley for 2014 are only 5% allocation due to drought conditions, which is expected to increase groundwater overdraft further.[104] The *CVWMP 2010 Update* identifies eliminating long-term groundwater overdraft as a priority objective of the plan.[105] The plan recommends water conservation and source substitution as two of the primary tools to address the Coachella Valley's overdraft issue and states that a significant focus of urban water conservation activities is on landscape irrigation water use.[106]

B-Avoid Additional Imported Water Supply Purchases

The Desert Hot Springs Sub-basin remains relatively undeveloped due to its relatively poor water quality and does not receive artificial recharge as a result.[107] Therefore, the Whitewater River Sub-basin and the Mission Creek Sub-basin provide the majority of the groundwater needs for the Region and receive all artificial groundwater recharge from imported sources. Groundwater within the Whitewater River Sub-basin is supplemented by artificial recharge with imported SWP Exchange water as well as Colorado River water that is obtained directly from the Coachella Canal (Canal water). The SWP Exchange water refers to Colorado River water allocated to MWD which DWA and CVWD receive in exchange for SWP water allocations that DWA and CVWD hold. This exchange is necessary because while the MWD service area has physical connections to SWP infrastructure, CVWD and DWA cannot access SWP water directly because of lack of physical connections to the system.[108] These imported water supply systems are shown in **Figure 3-4** above. As discussed in Attachment 2, the Region uses imported Colorado River water and SWP Exchange water for groundwater replenishment.

The *CVWMP 2010 Update* demonstrates that the Region already uses its full SWP Exchange and Canal water allocations and purchases additional SWP transfers for additional recharge water as this water is available.[109] As such, potable water conserved by this program would offset the need to purchase additional SWP water for recharge, because the program would reduce groundwater pumping and the need for additional groundwater replenishment.

C-Reduce Future Demand for Net Diversions from the Bay-Delta

About two-thirds of all Californians and millions of acres of irrigated farmland rely on the Sacramento-San Joaquin Bay Delta (Bay-Delta) for water from the SWP and federal Central Valley Project.[110] The SWP is

[102] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-11 (4.1.6 Overdraft Status).
[103] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-11 (4.1.6 Overdraft Status).
[104] CVWD. 2014. *State Increases State Water Project Allocation*. April. Available at: http://www.cvwd.org/news/news232.php.
[105] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-3 (1.1 Purpose and Need for Water Management Plan Update).
[106] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 3-10 (3.3.1.1 Water Conservation).
[107] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-1 – 4-7 (4.1 Local Groundwater).
[108] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 4-11 (4.1.6 Overdraft Status).
[109] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 4-15 (4.3 State Water Project).
[110] DWR. 2014. *Where Rivers Meet – The Sacramento-San Joaquin Delta*. Available at: http://www.water.ca.gov/swp/delta.cfm.

managed by DWR and has contracts to deliver 4.172 million AFY to 29 contracting agencies. DWA and CVWD initially contracted for water from the SWP in 1962 and 1963, respectively. CVWD's original SWP water allocation (Table A Amount) was 23,100 AFY and DWA's original SWP Table A Amount was 38,100 AFY for a combined Table A Amount of 61,200 AFY. Each year, DWR determines the amount of water available for delivery to SWP contractors based on hydrology, reservoir storage, the requirements of water rights licenses and permits, water quality and environmental requirements for protected species in the Bay Delta. The available supply is then allocated according to each SWP contractor's Table A Amount. Currently, no infrastructure exists to deliver SWP water directly to the Coachella Valley. CVWD and DWA exchange their SWP entitlement, when available, with the Metropolitan Water District (MWD) for an equal amount of MWD's Colorado River water.

CVWD and DWA currently have a combined entitlement of 194,100 AFY of imported water; these entitlements are based upon the SWP allocations and several exchange agreements that the agencies have initiated to increase the amount of water available for recharge in the Coachella Valley.[111] Based upon the water balance information provided in the *CVWMP 2010 Update*, the Region already uses its full imported water allocations and purchases additional SWP transfers when available for additional groundwater replenishment. Additional water sources, including the in lieu groundwater replenishment provided by the *Regional Turf Rebate Program*, and water conservation (reduced demands) as a result of program implementation would directly offset future demands for additional net diversions from the Bay-Delta to replenish the groundwater basin.

E-Local Supply Development to Decrease Vulnerabilities

As described in the *CVWMP 2010 Update*, the available water supplies and described in the 2002 Water Management Plan are not adequate to meet projected water demands in 2045. Further, the *CVWMP 2010 Update* acknowledges that available supplies, including Canal water, SWP Exchange water, groundwater, and recycled water face various vulnerabilities, some of which are anticipated to worsen over time. Due to the potential vulnerability of these supplies, the *CVWMP 2010 Update* plans for additional water supplies that will provide a 10% water supply buffer (equal to 974,000 AFY) by 2045 to meet increasing demands even during times when the existing supplies are not available.[112]

Per the *CVWMP 2010 Update*, a supply is considered to have high reliability if it can provide water on a more-or-less continuous basis; that is, average supply is greater than 90 percent of the maximum supply. In the case of source substitution and groundwater recharge, reliability is judged on the basis of the option's ability to reduce overdraft on a continuous basis over the planning period.[113] The water conservation provided by this program is, therefore, considered a highly reliable method of completing source substitution, because it is assumed that the new low-water using landscape options will provide continuous benefits throughout the 20-year project life.

F-Prevent Groundwater Quality Degradation

The Coachella Valley is geographically divided into the East Valley and the West Valley, with the boundary shown in **Figure 3-1**.[114] The geology of the Whitewater River Sub-basin varies from the West Valley to the East Valley both in composition of sediments and structure of the aquifer. Water placed on the ground surface in the West Valley will percolate through the sands and gravels directly into the Lower Aquifer, see **Figure 3-5** above. However, in the East Valley, several impervious clay layers lie between the Upper Aquifer and the Lower Aquifer as shown in **Figure 3-5**. Water applied to the surface in the East Valley does not easily reach the Lower Aquifers due to these impervious clay layers. The only outlet for groundwater in the Whitewater River Sub-basin is through natural subsurface outflow to the Salton Sea or through collection in drains and transport to the Salton Sea via the CVSC.[115]

[111] CVWD. 2010. *CVWMP 2010 Update*. December. Pp. 4-15 and 4-16 (4.3 State Water Project).
[112] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (7.2 Water Supply Evaluation).
[113] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (Evaluation Approach, 7.1.1.4 Reliability).
[114] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-1 (2 Region Description).
[115] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-5 (1-2 Study Area Description).

Throughout much of the East Valley, agricultural tile drains were installed to drain shallow groundwater perched on the Upper Aquifer into the CVSC. Adequate drain flows are needed to export salt from the basin, these drain flows depend upon water levels in the underlying aquifers and the quantities of applied irrigation water. From the 1960s to the early 1980s when groundwater levels were at their highest, groundwater levels in the confined Lower Aquifer were above those in the Upper Aquifer, creating an upward hydraulic gradient. This upward gradient tended to flush the more saline water in the Upper and Semi-perched aquifers into the drain system. Since that time, both water levels and drain flows have declined and Lower Aquifer groundwater levels have declined creating a downward vertical gradient. Because the quality of the return flows is generally poor, an increasing amount of poor quality water recharges the basin when drain flows are low, leading to water quality degradation. While this degradation may initially occur in the Upper and Semi-Perched aquifers, it may eventually contribute to degradation in the Lower Aquifer.[116]

Nitrate is a nitrogen compound that is a nutrient and can also have public health implications when found in drinking water at concentrations above the MCL. The primary drinking water standard (MCL) for nitrate is 10 mg/L as nitrogen, though higher concentrations of nitrate, up to 40 mg/L as nitrogen, exist in some of the shallower portions of the Coachella Valley Groundwater Basin. Generally, nitrates are found in the unsaturated and shallow aquifer zones above 300 to 400 feet, and have not been observed in the deeper aquifer zones below 500 feet.[117] The *CVWMP 2010 Update* indicates that groundwater pumping in some areas can cause water quality issues associated with nitrates, as pumping may cause nitrates to leach into higher quality groundwater due to pressure changes in the basin.

Additionally, as indicated in Attachment 2, mapping of chromium-6 occurrence in groundwater in the Coachella Valley demonstrates that chromium-6 levels are highest along fault lines and in areas that are located at a distance from the Coachella Valley recharge facilities where there is less mixing between recharge water and native groundwater.[118] Currently, approximately half of the drinking water supply in Coachella Valley is above MCL limits for chromium-6, but with decreasing groundwater levels due to groundwater basin overdraft, chromium-6 concentrations are likely to rise.

H-Reduce Net Production of GHGs and I-Avoid Social Costs of GHGs

Imported water is known to be an energy intensive supply of water, as explained below under Benefit H. The energy required to move and treat imported water supplies results in greenhouse gas (GHG) emissions, which can contribute to climate change. The 2014 *Coachella Valley IRWM Plan* anticipates a statewide increase in temperature of 0.13ºC as a result of global increases in GHGs, which would likely modify rainfall and runoff.[119] These effects are expected to have impacts on imported water sources from the SWP and the Colorado River which are dependent on snowpack and precipitation. While groundwater sources in the Coachella Valley are not expected to be immediately impacted by climate change, long term drought caused by climate change would exacerbate groundwater overdraft and groundwater quality degradation. There are social costs associated with increased GHG emissions related to air quality impacts and climate change. The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present.[120] Such costs include, but are not limited to, impacts to

[116] CVWD 2010. *CVWMP 2010 Update.* Pg. 7-21 – 7-22 (7.4.1.1 Drain Flows).
[117] CVWD 2010. *CVWMP 2010 Update.* Pg. 5-13 (5.1.3.5 Nitrate).
[118] CVWD. 2014. *Coachella Valley Groundwater Chromium-6 Occurrence*. June. Available at: http://www.cvwd.org/about/docs/chromium_6_levels_map.pdf.
[119] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-61 – 2-62 (2.8.2 Implications of Effects of Climate Change).
[120] IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability.* April. Pg. 17 (Summary for policymakers)

agricultural productivity, human health, increased flood risk and associated damages, and ecosystem services and their values.[121]

J-Contribute to 20 x 2020 Goals

The threat of water deficiency and overdraft, water needs of the environment, a growing population, and the unknown impact of climate change on water supplies, requires California to act more effectively regarding water conservation.[122] As a result, Senate Bill (SB) X7-7, also known as 20x2020, was passed in 2009 requiring urban water suppliers to reduce their daily per capita water use by 20% by 2020. All five CVRWMG water agencies reported baseline water use and urban 2020 targets in their *2010 UWMPs*, which are presented in **Table 3-27** below in terms of gallons per capita per day (gpcd).[123]

Table 3-27: Gallons per Capita per Day (gpcd) Calculations for each CVRWMG Agency
Regional Turf Reduction Program

Agency	Baseline (gpcd)	2020 Target (gpcd)
CWA	202	181
CVWD	591	473
DWA	736	589
IWA	283	226
MSWD	327	265
Weighted Average[124]	**500**	**395**

As shown in the table, the weighted average gpcd for the five CVRWMG agencies is closest to the CVWD baseline and 2020 target values. In addition, the CVWD service area covers the most area and serves the largest number of customers compared to the other CVRWMG agencies.[124]

K-Reduce Runoff from Irrigation Flows

Surface waters of the Coachella Valley IRWM Region consist of the Whitewater River Stormwater Channel (WRSC) and its tributaries, which normally remain dry. In the eastern portion of the valley the WRSC becomes the CVSC, a man-made, lined channel used to convey stormwater and flood flows to the Salton Sea. Irrigation and rainwater runoff in the western portion of the Coachella Valley recharges the groundwater basin as it flows through the WRSC, which is un-lined and contains soils that are permeable and facilitate groundwater replenishment. However, in the eastern portion of the Valley, flows conveyed to the CVSC move out of the Region and into the Salton Sea because the shallow aquitard in that area impedes groundwater replenishment.[125]

The Riverside County Flood Control and Water Conservation District (RCFC&WCD) and the County of Riverside (County) are considered Principal Permittees for the 2013 Whitewater River Municipal Separate Storm Sewer System (MS4) Permit. The Whitewater Region Stormwater Management Plan (SWMP) describes activities and programs implemented by all Permittees to manage urban runoff to comply with the requirements of the MS4 permit for the Whitewater River watershed. The 2013 permit recognizes that, as of the 2010 water quality assessments, only one of the water bodies in the Region (the CVSC) is

[121] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 2 (I. Monetizing Carbon Dioxide Emissions).
[122] DWR, et.al. 2010. *20x2020 Water Conservation Plan*. February. Pg. 13 (Chapter 1 Introduction).
[123] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 6-12 (Table 6-1 Coachella Valley IRWM Plan Goals, Objectives, Targets; D.).
[124] Calculated using 2010 and projected 2020 populations: Coachella Water Authority (CWA), 2011, *2010 UWMP*, July, Pg. 2-6 (2.2 Service Area Population, Table 2.2-1 City of Coachella Population Projections). CVWD, 2011, *2010 UWMP*, July, Pg. 2-8 (2.3.2 Future Population Projections, Table 2-4 Current and Projected Population). Desert Water Agency (DWA), 2011, *2010 UWMP*, March, Pg. I-6 (2 Population, Table 2 Population Current and Projected). IWA, 2011, *2010 UWMP*, September, Pg. 1-15 (1.7 Demographic Features, Table 1-3 Population Current and Projected). Mission Springs Water District (MSWD), 2011, *2010 UWMP*, June, Pg. 1-13 (1.3.3 Demographics, Table 1.3-2 Mission Springs Water District Population Projections).
[125] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-12 (Surface Water).

considered impaired under the Clean Water Act, and included on the 303(d) list for impaired water bodies.

The CVSC is listed on the 303(d) list of impaired water bodies for DDT, Dieldrin, PCBs, E. Coli, and toxaphene. A Total Maximum Daily Load (TMDL) has been established for indicator bacteria (E. Coli) in the lower 17 miles of the CVSC. As part of the TMDL, research has been conducted to determine the source of this water quality impact, which is currently listed as "unknown" by the United States Environmental Protection Agency (USEPA). Despite the uncertain nature of water quality concerns in the CVSC, a 2012 study found that one potential source of bacteria is urban water runoff from irrigation, which suggests that excess water use can contribute to the Coachella Valley's inability to meet regional and national stormwater regulatory requirements.[126]

L-Reduce Need for Fertilizer and/or Pesticide Application and N-Benefit Wildlife or Habitat

Fertilizer and pesticide application can be required to maintain turf grass at ideal aesthetic levels, especially in arid regions such as the Coachella Valley. According to the EPA, in 1996 U.S. citizens used an estimated 70 million tons of fertilizer (lawn and garden use combined) and 70-75 million pounds of pesticide active ingredients. The EPA's 1996 Fact Sheet on Lawn Care Pesticide Use reports that approximately 55 pounds of pesticide active ingredients per acre were applied annually to the average golf course. Pesticides and fertilizers can have negative impacts associated with water quality concerns and also represent a potentially significant cost for turf users such as golf courses.[127]

Native species, drought tolerant species, or artificial turf, often need little to no chemicals. Many sustainable landscaping guides and programs encourage the use of native plants because they are well adapted to local climate conditions and will therefore require less maintenance.[128] In addition, local plant species can help to maintain a native environment that is more suitable to local climate conditions, and therefore helps to support local biodiversity by providing habitat. A study for Coastkeeper and Southern California Edison on the presence of native bird species in water efficient native landscapes versus an unimproved site (with turf grass) found that bird diversity was greater in the native landscape site compared to the turf grass site.[129]

O-Reduce Production of Green Waste

The use of turf grass for landscaping requires ongoing maintenance to maintain the physical appearance, including frequent mowing. Lawn care produces green waste in the form of lawn clippings. The Sustainable Site Initiative's *The Case for Sustainable Landscapes* profiles a series of case studies that document the benefit of conversion from turf grass to sustainable landscaping. The Santa Monica Garden case profiles the cost and care differences between a traditional lawn and a native plant garden. The sites were designed to be directly comparable – they were located on the same size lots, immediately adjacent to one another, and both sites were cleared completely and in the same manner prior to lawn/garden installation. This case documented a 66% reduction in green waste between the lawn and the native plant garden. [130]

Green waste is comprised of compostable materials and can be used as a resource. However, even when utilizing green waste as a resource, costs are associated with the collection, transport, and processing of these materials. In some communities, green waste may simply be disposed of with other household waste, whether by policy or customer behavior (such as disposing of lawn clippings the

[126] Colorado River Basin Regional Water Quality Control Board. 2007. *Natural Environment Study: Bacterial Indicators Total Maximum Daily Load (TMDL) Coachella Valley Storm Water Channel Riverside County, California*. Pg. 2 (Project Description).
[127] Joyce, S. 1998. *Why the Grass Isn't Always Greener*. Environmental Health Perspectives: Volume 106, Number 8, August. Pg. A 379 (The Pros and Cons of Lawns).
[128] University of California Division of Agriculture and Natural Resources (AMR). 2014. *Sustainable Landscaping in California*. March. Pg. 19 (The Basic Wildlife Needs: Food, Water, and Cover – 3).
[129] Haller, A. 2012. *Smartscape Design Provides Improved Avian Habitat*. June. Pg. 5 (Discussion).
[130]The Sustainable Sites Initiative. 2009. The Case for Sustainable Landscapes. Available http://www.sustainablesites.org/report/The%20Case%20for%20Sustainable%20Landscapes_2009.pdf.Pp. 36-37.

garbage instead of a green waste collection container). The USEPA estimates that green waste makes up 13.5% of household waste.[131]

P-Decrease Water Use Costs for DACs

The Coachella Valley contains large portions of DACs. DACs are defined as areas having a mean household income (MHI) that is 80% or less of the statewide MHI. Severely economically disadvantaged communities are defined as those communities with a MHI that is less than 60% of the statewide MHI. Decreasing water use costs for DACs is considered an important aspect of the Human Right to Water in that water affordability is one of the four basic components of the California Water Code policy.[132] Because DACs constitute a large portion of the Coachella Valley, lowering water use costs in the Region can contribute to water affordability to DACs.

The *CVWMP 2010 Update* considered the potential sources of additional water supply and ranked those supplies based on anticipated cost and yield. In the ranking process, the most cost-effective supply augmentation approaches involve water conservation ($40/AF to $600/AF) followed by recycled water ($400/AF).[133] Alternatively, imported water is considered a high cost water source ranging from a low of $700 per AF to a high of $1,900 per AF. As such, water use costs for customers in Coachella Valley, including the large number of DACs, are expected to fluctuate depending on the proportion of water supplies that are used by agencies in the Region to supply potable water.

Without Project Baseline

Without the *Regional Turf Reduction Program*, 723 AFY of potable groundwater would continue to be applied to irrigate wide expanses of existing turf landscapes in the Region. This irrigation water would continue to be supplied by private groundwater wells or the Region's water purveyors (the CVRWMG agencies) by pumping high-quality groundwater from the underlying basins that are in overdraft, and would therefore exacerbate overdraft conditions. Without the project, continued groundwater pumping would also exacerbate demands for imported water, which is used to replenish groundwater basins when available. A portion of the water that is imported to the Region is from SWP entitlements, which would continue the Region's reliance on the Bay-Delta system.

Without the project, no water will be conserved from turf replacement and 723 AFY of potable water will continue to be used for irrigation. As addressed in Attachment 2, continued groundwater pumping will affect both groundwater quality and quantity. **Figure 3-6** shows that without the normal SWP allocations as a result of the 2014 drought, concentrations of chromimum-6 will likely increase as less replenishment water is available. Without the project, groundwater will continue to be pumped leading to higher chromimum-6 concentrations. As discussed in the background for *F-Prevent Groundwater Quality Degradation*, further groundwater overdraft will contribute to an unfavorable pressure gradient between the Upper and Lower Aquifer that could lead to contamination of the Lower Aquifer with the lower quality Upper Aquifer water. Overall, these further contributions to groundwater quality degradation will increase the risk of not meeting existing drinking water demands.

In addition to concerns of decreasing groundwater quality, as groundwater levels decline, so too does the ability of current users and beneficiaries to physically reach the groundwater. While many of the agricultural users in Coachella Valley rely on Colorado River canal water for irrigation needs, there are a number of agricultural users who rely on groundwater resources. As part of the U.S. Bureau of Reclamation's Inadvertent Overrun and Payback Policy implemented in October 2002, CVWD defined the Colorado River irrigation service area as Improvement District No. 1, shown in **Figure 3-7** above.[134] All agricultural users that lie outside of Improvement District No. 1 do not have rights to use Colorado River canal water and must rely on groundwater resources. With declining groundwater resources, deeper wells

[131] U.S. EPA. 2012. *Municipal Solid Waste (MSW) Generation, Recycled, and Disposal in the United States: Facts and Figures for 2012*. Pg. 5 (Materials in MSW Figure 5. Total MSW Generation).
[132] California Water Code. 2012. *Section 106.3(a)*.
[133] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).
[134] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-13 (4.2 Colorado River).

and more powerful pumps must be utilized which can amount to large capital costs making agricultural production economically inaccessible.

As discussed in Attachment 2, further increased groundwater pumping will make water less available to local ecosystems. Without the project, 0 AFY of water will be conserved through turf replacement. The *Coachella Valley Multiple Species Habitat Conservation Plan* identifies monitoring groundwater pumping as a priority to protecting various habitats and species in Coachella Valley. These include habitats such as mesquite hummocks habitat and species such as the Desert Pupfish, the Crissal Thrasher, the Southern Yellow Bat, and the Coachella Valley Round-Tailed Ground Squirrel.[135] Without the project, future groundwater pumping is likely to lead to impacts on these habitats and species.

In 2009, electrical energy demand for water management in the Coachella Valley was 211,130,000 kilowatt hour per year (kWhr/yr); it is estimated that groundwater pumping attributed to 93 percent of this overall demand.[136] Without the project, there will not be conservation to offset irrigation uses of groundwater and energy use from groundwater pumping will continue and likely increase due to decreasing groundwater levels and energy use from importing water for groundwater recharge. Overall, without the project 2,023 MWh, 40,467 MWh over the 20-year life of the project, will be used to pump groundwater and import recharge water.

Finally, the drought impact of subsidence is projected to further increase with decreasing groundwater levels. Land subsidence rates in Coachella Valley have increased in recent years and is likely attributable to groundwater overdraft.[137] Without the project groundwater overdraft will continue and further land subsidence is likely to occur as a result.

In addition to increasing drought impacts without the project, none of the physical benefits that would have been achieved with the project will be realized. Such benefits that will not be realized without the project include alleviating water supply vulnerabilities associated with imported water, preventing groundwater quality degradation, reducing GHG emissions and avoiding associated social costs, contributing to meeting 20x2020 goals, reducing runoff from irrigation flows, reducing fertilizer and pesticide application, benefiting wildlife, reducing production of green waste, and decreasing water use costs for DACs.

Methods Used to Estimate the Physical Benefits

The methods used to estimate the physical benefits provided by the *Regional Turf Reduction Program* are provided below. **Appendix 3-1** includes backup documentation (spreadsheets) that show the annual calculation for each quantifiable benefit.

A-Decrease Groundwater Overdraft

Groundwater overdraft, as discussed in Attachment 2, has been identified as an important regional issue and an impact felt by the Region as a result of the 2014 drought. Additionally, conservation has been identified as a cost-effective and reliable management strategy to address current overdraft conditions. The *Regional Turf Reduction Program* will help various customers that currently depend on local groundwater for irrigation purposes reduce their overall water use, thereby providing in lieu groundwater recharge that will help reduce groundwater overdraft.

By achieving the primary benefit of reducing water use through turf replacement, the project will directly decrease groundwater pumping, allowing more groundwater to remain in storage, thus reducing overdraft. In total, the in lieu groundwater recharge achieved by reducing groundwater pumping as a result of this program would be 723 AFY once the program is fully implemented. Given the Without Project Baseline of 0 AFY of potable water savings, the project would offset pumping of local groundwater

[135] Coachella Valley Association of Governments. 2007. *Coachella Valley Multiple Species Habitat Conservation Plan*. September. Pg. 9-77 (9.4.1.2 Threats, Limiting Factors, and Adaptive Management), 9-158 (9.7.5.2 Threats, Limiting Factors, and Adaptive Management), 9-224 (9.8.1.4 Take Analysis), 9-236 (9.8.2.4 Take Analysis).
[136] CVWD. 2011. *Draft Subsequent Program EIR: Coachella Valley WMP 2010 Update*. July. Pg. 8-42 (8.5.3.1 In Valley Energy Use).
[137] USGS. 2013. *Scientific Investigations Report 2007-5251, Version 2.0.* June. Pg. 1 (Abstract).

by 723 AFY as shown in **Table 3-16** above, thus reducing groundwater basin overdraft by the same amount. Over the 20-year life of the project, groundwater overdraft would decrease by 14,452 AF.

B-Avoid Additional Imported Water Supply Purchases

As addressed above, one of the ways in which groundwater overdraft is addressed in the Coachella Valley is through artificial recharge with imported water supplies. Because the Region already uses its full Colorado River and SWP allocations and purchases additional SWP transfers for additional recharge water,[138] it is reasonable to assume that potable water conserved by this program would directly offset the need to purchase additional SWP transfer water for recharge.

If the program was not implemented, imported water purchases would be required to provide groundwater overdraft relief. Specifically, in order to account for the avoided imported water purchases that would be required as a result of this program, 723 AFY of additional water would need to be imported from outside the Region. It is assumed that water demands would remain consistent and that water use would be directly offset by additional imported water purchases. The project would avoid a total of 14,452 AF, based on totals in **Table 3-17**, of imported over its expected 20-year project life.

C-Reduce Future Demand for Net Diversions from the Bay-Delta

This project will reduce water use for golf and other irrigation applications, thus offsetting the need for groundwater extraction. Reduced groundwater pumping in turn reduces aquifer drawdown and thus lessens the amount of imported water that is needed for groundwater recharge. Because the Region already receives its entire imported water entitlements (as they are available) and also purchases additional SWP Table A water from other agencies[139], any additional imported water needed to balance groundwater extraction would be purchased and transferred from the SWP. Transfers or leases from north of or within the Bay-Delta could potentially affect Bay-Delta water quantity or quality. The *Regional Turf Reduction Program*, however, will decrease water use through rebates for replacement of turf with water efficient landscapes, thus reducing the demand for additional imported water, which would ultimately be delivered from the Bay-Delta via a SWP water exchange. Therefore, the program will reduce net diversions from the Bay-Delta by the same amount of groundwater pumping that would be avoided by the project, which is 723 AFY or 14,452 AF over the 20-year life of the project as shown in **Table 3-18**.

E-Local Supply Development to Decrease Vulnerabilities

As discussed above, imported water supplies are considered to be vulnerable water supplies due to existing climate, legal, and other issues that are anticipated to continue into the future. As demonstrated in Attachment 2, years in which groundwater replenishment is low due to the lack of availability of imported water sources (such as in drought years), groundwater overdraft conditions can be exacerbated if pumping continues, as indicated by lower groundwater levels in such years.[140]

While the vulnerability of conservation programs is contingent upon the level of participation and commitment of customers, it is expected that this program in particular will not suffer these issues. Success of similar programs in Coachella Valley in the CVWD service and in similar regions such as the service area of SNWA, suggest that level of participation for this turf rebate program will be high. Part of the regional conservation program known as CV Water Counts included a survey of local Coachella Valley residents; as part of this survey, over 65.5% of respondents indicated that they thought they could do more to conserve water.[141] Additionally, unlike other conservation measures, this program is a structural conservation project that does not rely on continual behavioral changes. Once the turf has been removed and the rebate has been distributed, participants may not revert their yards, thus, long-term dependence on customer commitment is not likely to be a large factor in the success of the program.

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[138] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-15 (4.3 State Water Project)
[139] CVWD. 2011. *2010 UWMP*. July. Page 4-19 (4.2.3.2 Other SWP Transfers).
[140] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-10 (Water Supply Evaluation, 7.2.2.4 Reliability).
[141] Probolsky Research. 2013. *Survey Results*. Available: http://www.cvwatercounts.com/wp-content/uploads/2013/10/Survey-graphs.pdf

Therefore, conservation is considered a highly dependable and reliable local source of water especially into the future. Reduction of water use through turf removal as a result of the *Regional Turf Reduction Program* will reduce localized groundwater pumping (in lieu groundwater recharge) to decrease water supply vulnerabilities in the future. Therefore, the project will develop local supplies equal to the amount of water conserved, 723 AFY, which is compared the amount of local supplies developed without the project, 0 AFY, in **Table 3-19**. The total local supply developed of the 20-year life of the project will be 14,452 AF.

F-Prevent Groundwater Quality Degradation

The *CVWMP 2010 Update* indicates that groundwater pumping in some areas can cause water quality issues associated with constituents such as nitrates, as pumping may cause nitrates to leach into higher quality groundwater due to pressure changes in the basin.[142] Additionally, chromium-6 levels have been found to be highest in areas that are located at a distance from the Coachella Valley recharge facilities where dilution of native groundwater containing chromium-6 is not diluted with recharge water.[143] Therefore, it is probable that with decreasing groundwater levels due to groundwater basin overdraft and decreasing replenishment as a result of the drought, chromium-6 concentrations will rise above regulated limits in additional places within the Coachella Valley.

Without the project, the use of groundwater for irrigation purposes would continue to contribute to overdraft problems in the basin, resulting in further water quality degradation in the aquifer. With the project, reductions in potable groundwater use would abate localized groundwater pumping and therefore could prevent pumping activities from causing nitrate-contaminated water from coming into contact with the basin's high-quality deep aquifer and will allow groundwater to remain in the basin, therefore potentially avoiding chromium-6 levels to increase in concentration.

Given that the program will be implemented on a regional basis, it is not possible to reasonably quantify the water quality benefits that would be provided as a direct result of the program. As such, benefits that would accrue to water quality as a result of the program have not been physically or economically quantified.

H-Reduce Net Production of GHGs

The *Regional Turf Reduction Program* would reduce water use for irrigation within the Coachella Valley Region. These conservation reductions will offset the use of local groundwater, and the conveyance of additional SWP exchange water for groundwater recharge purposes. As a result, this program would avoid energy requirements associated with groundwater pumping, and the energy requirements associated with transporting SWP exchange water to the Coachella Valley. This in turn would result in avoided GHGs – namely CO_2 emissions – associated with reduced energy consumption.

For this analysis, it is assumed that energy requirements associated with delivering and using Colorado River water (including Canal water) are 2.0 mega-watt hours per acre-foot (MWh/AF).[144] Groundwater pumping energy requirements for the Coachella Valley are not available, thus, values for similar regions were compared and the average, 0.8 MWh/AF, between the high and low estimates other regions' groundwater was used.[145] The energy savings were determined by calculating the amount of energy saved by offsetting both imported water and groundwater pumping. Therefore, the energy savings per acre foot of water saved as a result of the project is 2.8 MWh/AF. As described in the Primary Physical Benefit, reduced water use for irrigation, this project will conserve 723 AFY of water. Therefore, energy savings per year would be 2,023 MWh or 40,467 MWh over the 20-year life of the project as shown in the bullet points below:

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142 CVWD 2010. *CVWMP 2010 Update*. December. Pg. 5-13 (5.1.3.5 Nitrate).

143 CVWD. 2014. *Coachella Valley Groundwater Chromium-6 Occurrence*. June. Available at: http://www.cvwd.org/about/docs/chromium_6_levels_map.pdf.

144 CEC. 2005. *Water-Energy Relationship*. June. Pg. 22 (Energy Use and Production of Surface Water, Table 1 Energy Consumption for Various MWD Sources). Confirmed in Navigant 2006.

145 Equinox. 2010. *San Diego's Water Sources: Assessing the Options*. July. Pg. 10 (Table 1a Marginal Costs and Energy Intensity of San Diego County's Water Alternatives, 2010e).

- Energy intensity of conserving water: 0 MWh/AF
- Energy intensity of delivering Colorado River water and pumping groundwater: 2.8 MWh/AF
- Energy savings resulting from the project: 2.8 MWh/AF

To translate energy savings into net reduction of GHG emissions, California energy mix and associated GHG emissions were used from the CEC and USEPA's eGRID. Per the CEC's Energy Almanac, California produces 70% of its energy and imports 10% from the Pacific Northwest, and 20% from the Pacific Southwest.[146] USEPA eGRID data provides information about the GHGs associated with each of the energy supplies (calculated as carbon dioxide equivalent units or CO2e) as 613.28 pounds of CO2e per MWH (lbs/MWh), 846.97 lbs/MWh, and 1,182 lbs/MWh, respectively.[147] Averaging each of these CO2e emissions factors shows that California energy supplies have a combined CO2e emissions factor of 750.57 lbs/MWh, or 0.341 metric tons (MT) of CO2e per MWh. Applying this number to the energy saved as a result of the project finds GHG reduction of 13,799 MT CO2e over the life of the project. These benefits are provided by year in **Table 3-20** and summarized in the bullets below:

- Energy savings resulting from the project: 2.8 MWh/AF
- Average GHG in California energy grid: 0.341 MT of CO2e/MWh
- Resulting GHG reductions resulting from the project: 0.955 MT of CO2e/AF
- Annual GHG reductions resulting from the project (assuming 723 AFY of water conserved by the project): 690 MT/Year
- Cumulative GHG reductions over project lifetime: 13,799 MT CO2e

I-Avoid Social Costs of GHGs

As discussed above, social costs associated with increased GHG emissions related to air quality impacts and climate change including, impacts to agricultural productivity, human health, increased flood risk and associated damages, and ecosystem services and their values.[148]. The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present.[149] The recommended mean estimate of the social cost of one metric ton (MT) of CO2 in 2014 is $24.55. This value was updated from the 2007 value of $21.40 reported by the Interagency Working Group on Social Cost of Carbon[150], using the CPI Inflation Calculator.[151] An estimate of the social costs of carbon avoided by the project can be calculated by applying the $24.55/MT CO2 to the emissions savings from Benefit D. **Table 3-21** shows the avoided social costs of carbon from the *Regional Turf Reduction Program*, which are anticipated to total $338,768 over the 20-year life of the project.

J-Contribute to 20 x 2020 Goals

SBX7-7, also known as 20x2020, is legislation passed that requires urban water suppliers to reduce their daily per capita water use by 20% by 2020. The largest participant by service area and service area population is CVWD. After computing a weighted average of the 20x2020 goals for all five participating

[146] CEC. 2014. California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours). April Accessed 24 June 2014. Available: http://energyalmanac.ca.gov/electricity/electricity_generation.html
[147] U.S. Environmental Protection Agency (USEPA). 2014. eGRID 9th edition Version 1.0 Year 2010 Summary Tables. February. Available: http://www.epa.gov/cleanenergy/energy-resources/egrid/
[148] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 2 (I. Monetizing Carbon Dioxide Emissions).
[149] IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability.* April. Pg. 17 (Summary for policymakers)
[150] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 28 (Table 4 Social Cost of CO_2).
[151] U.S. Bureau of Labor Statistics. 2014. *CPI Inflation Calculator*. Available at: http://www.bls.gov/data/inflation_calculator.htm

agencies, the CVWD goals were found to be closest to the weighted average, therefore, the CVWD 20x2020 goals will be used for the purposes of determining this physical benefit. CVWD's 20x2020 goal is reported in its *2010 UWMP* as 473 gallons per capita per day (gpcd).[152] This 20% reduction of 118 gpcd was determined using the 10 year baseline of 591 gpcd for the period of 1999 through 2008. The *Regional Turf Reduction Program* will reduce potable water use by incentivizing the replacement of turf with water efficient landscaping, thereby directly contributing to the Region's 20x2020 goals. Contribution to these 20x2020 goals was calculated by converting the water saved by the project (presented in AFY in Benefit A) to gpcd using the sum of the 2020 population estimates in each agency *2010 UWMP*, 601,555 people.[153] Population estimates from 2020 were used because that is the year by which the 2020 goals must be met. The project's contribution to meeting 20x2020 goals is gpcd from the project (1.1 gpcd once full benefits realized) as a percentage of the overall gpcd reduction goal (118 gpcd), as shown in **Table 3-22**. Because the 20x2020 goals must be met by 2020, the benefit is only calculated to 2020, rather than through the full life of the project. An overview of the calculation is provided in the bullets below:

- Regional 2020 gpcd reduction target: 118 gpcd
- Amount of water from the project that will contribute to 20x2020 goals (amount of water conserved in 2020): 723 AFY or 645,111 gallons per day
- GPCD reduction provided by the project in 2020 (645,111 gallons per day/601,555 people): 1.1
- Percent contribution towards 20x2020 goals (1.1 gpcd/118 gpcd): 1%

K-Reduce Runoff from Irrigation Flows

Water conservation in irrigated landscapes directly reduces urban runoff by reducing the sources of non-point source runoff. Urban irrigation runoff can include pollutants such as chemicals and bacteria, which can flow from urban landscapes into existing water bodies. As part of the CVSC Total Maximum Daily Load (TMDL) approved in April 2012, a Natural Environment Study was carried out to determine bacteria levels and sources in the Coachella Valley Region. The study found that one potential source of bacterial indicators was urban water runoff from irrigation, which suggests that excess water use can contribute to exacerbation of water quality issues in the Coachella Valley.[154] Conversion of turf to water-efficient landscaping will conserve 723 AFY of water, and reduce associated non-point source pollution that carries nutrients, fertilizers, and pesticides into local water bodies. Exact values of the economic and physical aspects of this benefit are not quantified due to the lack of information on runoff conversion factors for the Region; however, it can be assumed that this benefit will be proportional to the amount of water conserved.

L-Reduce Need for Fertilizer and/or Pesticide Application

The *Regional Turf Reduction Program* is expected to also reduce nutrient and pesticide loading as a result of reduced need for fertilizer and pesticide. Turf conversion consists of removing turfgrass, which in its ideal aesthetic state of appeal is fertilizer and pesticide intensive,[155] and replacing turfgrass with native species, drought tolerant species, or artificial turf, which can need little to no chemicals.[156]

The program is anticipated to convert approximately 5,656,000 square feet or 130 acres to water efficient landscaping. It is assumed that all turf area that is converted to water efficient landscaping will result in a reduction in fertilizer and pesticide use whether it is a partial reduction, in the case of native and drought

[152] CVWD. 2011. *2010 UWMP*. July. Pg. 3-6 (3.2.2 Urban Water Use Target, Table 3-7 Urban Water Use Targets).
[153] CWA, 2011, *2010 UWMP*, July, Pg. 2-6 (2.2 Service Area Population, Table 2.2-1 City of Coachella Population Projections). CVWD, 2011, *2010 UWMP*, July, Pg. 2-8 (2.3.2 Future Population Projections, Table 2-4 Current and Projected Population). DWA, 2011, *2010 UWMP*, March, Pg. I-6 (2 Population, Table 2 Population Current and Projected). IWA, 2011, *2010 UWMP*, September, Pg. 1-15 (1.7 Demographic Features, Table 1-3 Population Current and Projected). MSWD, 2011, *2010 UWMP*, June, Pg. 1-13 (1.3.3 Demographics, Table 1.3-2 Mission Springs Water District Population Projections).
[154] Colorado River Basin Regional Water Quality Control Board. 2007. *Natural Environment Study: Bacterial Indicators TMDL Coachella Valley Storm Water Channel Riverside County, California*. Pg. 2 (Project Description).
[155] Joyce, S. 1998. *Why the Grass Isn't Always Greener*. Environmental Health Perspectives: Volume 106, Number 8, August. Pg. 379 (The Pros and Cons of Lawns).

resistant plants, or a complete reduction, in the case of artificial turf. **Table 3-23** provides an estimate of the square footage of land area wherein fertilizer and pesticide application will be reduced, and therefore the area of physical benefit.

N-Benefit Wildlife or Habitat

In addition to reducing chemical inputs to the natural environment, the *Regional Turf Reduction Program* has the potential to produce new natural habitats for wildlife by replacing turfgrass with native pants. While the turf reduction program incentivizes all types of turf replacement, including non-native landscapes, many sustainable landscaping guides and programs encourage the use of native plants because they are well adapted to local climate conditions and will require less maintenance.[156] A study for Coastkeeper and Southern California Edison on the presence of native bird species in water-efficient native landscapes versus an unimproved site found that avian diversity and species richness was greater in the native landscape site.[157] Exact values for economic or physical benefits cannot be quantified for this benefit because it is unknown how many of the 130 acres of turf will be converted to native landscaping.

O-Reduce Production of Green Waste

Turf removal reduces the amount of green waste produced from landscaping care. The Santa Monica Garden case of Sustainable Site Initiative's *The Case for Sustainable Landscapes* documented a 66% reduction in green waste between the lawn and the native plant garden.[158] Alternatively, synthetic grass options, which qualify for the rebate based on water efficiency, would completely eliminate yard waste in converted areas.

The *Regional Turf Reduction Program* will convert 5,656,000 square feet to water efficient landscaping, using this value, the reduction in total waste produced by an individual site after conversion to water-efficient landscaping can be calculated. Green waste is 13.5% of total waste,[159] and can reduced by from 66% up to 100% after turf conversion. Therefore, by multiplying percentage of total waste that can be attributed to green waste (13.5%) by the percentage reduction in yard waste that would result from the project (66% to 100%), turf conversion would reduce total waste 8.9% to 13.5% per conversion site. **Table 3-24** shows the benefits that would accrue as a result of the project.

P-Decrease Water Use Costs for DACs

With water supply costs relatively low for water conservation, $40 to $600 per AF, and relatively high for imported water sources, up to $1,900 per AF, water conservation is considered a cost-effective measure when compared to groundwater pumping and subsequent recharge with imported water.[160] Additionally, considering much of the CVRWMG Region is considered DAC or severely DAC, measures that reduce overall water costs in the Region (such as conservation) are considered to decrease water use costs for all water users, including DACs.[161] As such, the implementation of the *Regional Turf Reduction Program*, with the help of expedited drought funding, is expected to lower water costs for DACs in the Region.

[156] ANR. 2014. *Sustainable Landscaping in California*. March. Pg. 19 (The Basic Wildlife Needs: Food, Water, and Cover – 3).
[157] Haller, A. 2012. *SmartScape Design Provides Improved Avian Habitat*. June. Pg. 5 (Discussion).
[158] The Sustainable Sites Initiative. 2009. The Case for Sustainable Landscapes. Available http://www.sustainablesites.org/report/The%20Case%20for%20Sustainable%20Landscapes_2009.pdf.Pg. 37.
[159] U.S. EPA. 2012. *MSW Generation, Recycled, and Disposal in the United States: Facts and Figures for 2012*. Pg. 5 (Materials in MSW Figure 5. Total MSW Generation).
[160] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).
[161] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 4-18 (Figure 4-7 Coachella Valley Disadvantaged Communities – 2010 Census).

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

No additional facilities, policies, and actions beyond what is included in the Work Summary (see Attachment 4) would be required to obtain the physical benefits of the *Regional Turf Reduction Program*. The physical benefits of the Turf Replacement Rebates require participants to complete their individual turf replacement projects. Rebates are not issued until projects are complete. There are no facilities, policies, or actions required to obtain the physical benefits described here. Please note, however, that individual users that receive rebates would be required to pay for upfront costs and provide matching funds as described in Attachment 5, and the program would pay the incentive upon completion.

Potential Physical Effects of the Project

There are no anticipated adverse physical effects from this project. There may be temporary construction-related effects associated with turf replacement such as hauling and disposal of removed turf; however, these effects are anticipated to be minor and temporary.

Cost Effectiveness Analysis – Regional Turf Reduction Program

The following cost effectiveness analysis was carried out for the *Regional Turf Reduction Program* to evaluate whether the physical benefits provided by the project are provided at the least possible cost. The analysis summary is shown below in **Table 3-28,** which contains information on the types of benefits provided by the project, any possible project alternatives, and whether or not the project is the lowest cost alternative. No alternatives were considered for this program, because there are no alternatives that would achieve the same types and amounts of benefits described above for the project.

Table 3-28: Project Cost Effective Analysis
Regional Turf Reduction Program

Project Name: *Regional Turf Reduction Program*	
Question 1 Physical Benefits Summary	The project will provide drought relief benefits by reducing groundwater pumping through removal of turf. This will achieve the benefits summarized in **Table 3-14**, including: • Reduce water use through turf replacement by 723 AFY (14,452 AF) • Decrease groundwater overdraft by 723 AFY (14,452 AF) • Avoid additional imported water supply purchases by 723 AFY (14,452 AF) • Reduce future demand for net diversions from the Bay-Delta by 723 AFY (14,452 AF) • Local supply development to decrease vulnerabilities of 723 AFY (14,452 AF) • Prevent groundwater quality degradation • Reduce net production of GHGs by 690 MT CO2/year (13,799 MT CO2) • Avoid social costs of GHGs of $16,938/year ($338,768) • Contribute to 20 x 2020 goals by 2% of total reductions • Reduce runoff from irrigation flows • Reduce need for fertilizer and/or pesticide application • Benefit wildlife or habitat • Reduce production of green waste • Decrease water use costs for DACs
Question 2 Alternatives Considered	No alternatives were considered for this program.
	No alternatives exist that achieve the same types and amounts of benefits described above. The primary alternative to this project (no-project alternative) would be to retain turf in the Region, and therefore continue groundwater pumping to meet demands. Under the no-project alternative none of the secondary benefits associated with offsetting imported water would be achieved. Further, given the current drought that has substantially reduced imported water supplies; continued groundwater pumping would exacerbate overdraft and would worsen the drought impacts discussed in Attachment 2.
Question 3 Preferred Alternative	This program is the preferred alternative, because it is the only type of project that could accrue the types and quantities of benefits provided herein, and is considered lowest-cost compared to the no-project alternative and compared to other water sources.
Comments: [A] CVWD. 2010. *Coachella Valley WMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).	

Alternatives Considered and Least-Cost Analysis

The only alternative program would be the no-project alternative, which was evaluated in detail above (see Without Project Baseline). Under the no-project alternative, the project would not be carried out and none of the physical benefits listed under Question 1 in **Table 3-28** would be achieved. Furthermore, without the project the severe drought-related impacts that are occurring in the Region, namely exacerbation of groundwater overdraft, would continue to take place.

While no alternative projects were evaluated for comparison, alternative water sources can be compared to conservation efforts on a whole. Any other water supply source in the Region would provide benefits of in lieu groundwater replenishment provided by the *Regional Turf Reduction Program,* because additional supplies would reduce groundwater pumping. The *Coachella Valley Water Management Plan 2010 Update* ranks various water sources for the Coachella Valley, including water conservation, recycled water, water transfers, and desalinated agricultural drain water (from the Region's agricultural drain system). In the ranking process, the most cost-effective source is water conservation ($40/AF to $600/AF) followed by recycled water ($400/AF). Alternatively, imported water is considered a high cost water source ranging from a low of $700 per AF to a high of $1,900 per AF.[162] As such, water conservation is a proven least cost water source when compared to other possible water sources in the Coachella Valley. Furthermore, these additional options would not accrue the same types of ancillary benefits provided by the program, and are therefore not methods that would achieve the same types and amounts of physical benefits as identified for the proposed project.

Preferred Alternative

The proposed project is the least cost alternative when analyzing other potential in lieu groundwater recharge options (other water supply sources). Further, given the high water demand of turf grass, the demonstrated demand for rebates to implement turf reduction programs, and the relatively low cost of the program compared to other groundwater overdraft measures (other water supply sources), the project is considered both the least cost and the preferred alternative.

[162] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).

Project 3: Disadvantaged Community (DAC) Onsite Plumbing Retrofit Program

Local Project Sponsor: Coachella Valley Water District (CVWD)
Partners: Pueblo Unido Community Development Corporation (PUCDC) and Leadership Counsel for Justice and Accountability (Leadership Counsel)

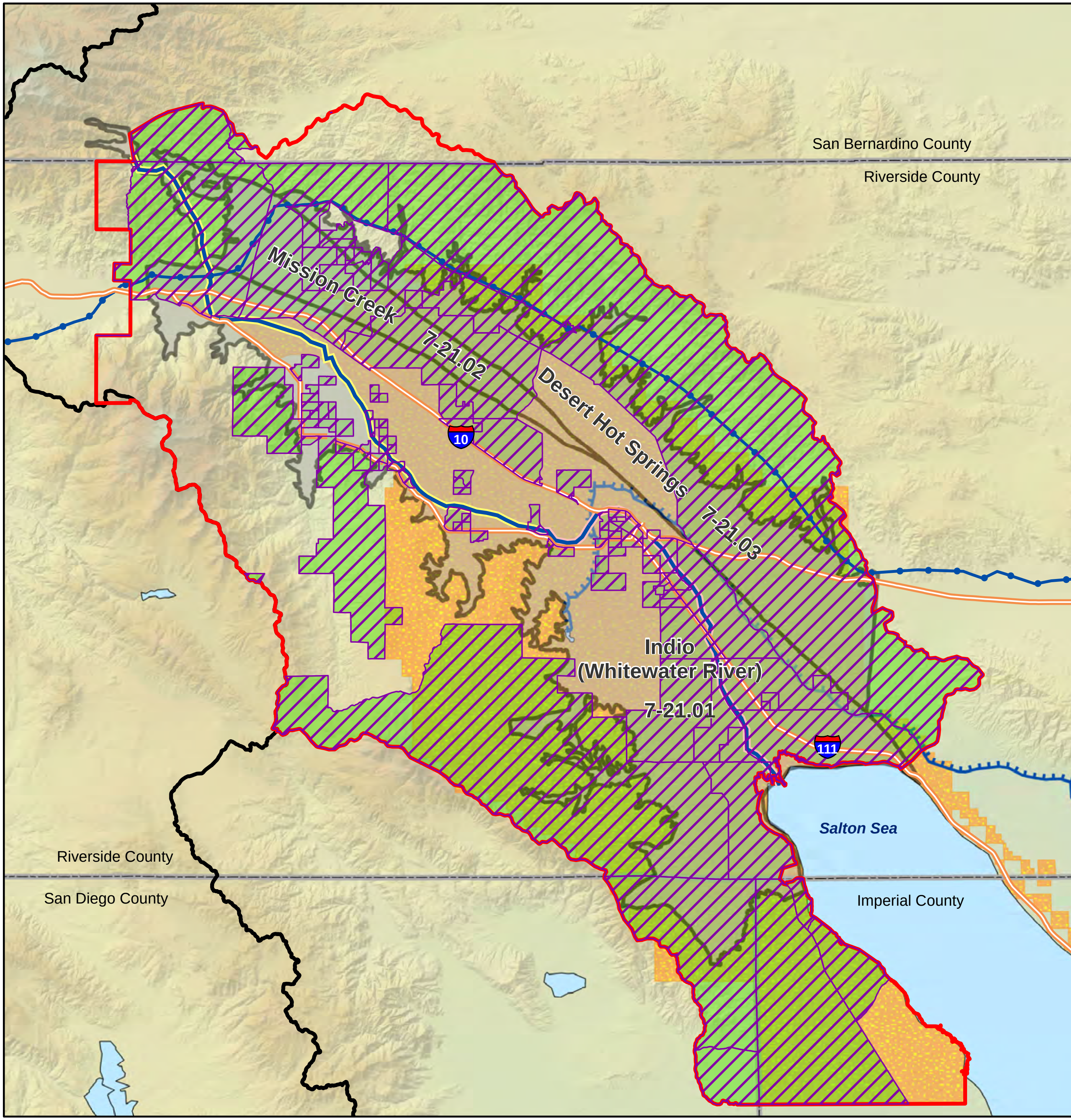
Information in the following sections pertain to the *DAC Onsite Plumbing Retrofit Program*, and include the following sub-sections indicated in the PSP:

1. Project Description
2. Project Map
3. Project Physical Benefits
4. Technical Analysis of Physical Benefits Claimed, which includes the following sub-sections:
    - Technical Basis of the Project
    - Background for Benefits Claimed (Recent and Historical Conditions)
    - Without-Project Baseline (Estimates of Without-Project Conditions)
    - Methods Used to Estimate Physical Benefits
    - New Facilities, Policies, and Actions Required to Obtain Physical Benefits
    - Potential Physical Effects of the Project
5. Cost Effectiveness Analysis

Leaking Plumbing System under a Mobile Home Laundry Area

Project Map – DAC Onsite Plumbing Retrofit Program

Figure 3-9 includes a map of the *DAC Onsite Plumbing Retrofit Program*, which shows the project's geographical location and the surrounding work boundaries, project facilities, the water resources that will be affected by the project, disadvantaged communities within the project service area (for this project DACs are within the entire project area), and proposed monitoring locations for the project.



Project Map
DAC Onsite Plumbing
Retrofit Program
Figure 3-9

Colorado River Aqueduct
Coachella and All American
Whitewater River Storm Water Channel
Coachella Valley Storm Water Channel
Highways
Water Bodies
Coachella Valley IRWM Region
Colorado River Funding

Local Project Sponsor

Coachella Valley Water District
Project 3: DAC Onsite Plumbing Retrofit Program
7-X Affected Groundwater Basins
Disadvantaged Communities (DACs)

Project Monitoring will be on site and specific to rebate participants, therefore, it is currently unknown, but within the project area.

Source: DWR Bulletin 118 & 2014 Coachella Valley IRWM Plan

Disadvantaged communities are considered those who earned less than $48,706 (80% Statewide MHI)

N S W E

0 2.5 5 10
Miles

COACHELLA VALLEY IRWMP

File Name: Fig 3-7_Project Map_Project 3.mxd
File Location:N:\Projects\0574-002 Coachella IRWM Plan Update \03_GIS\MXD\Round 3\
Date Updated: July 7, 2014
Department: RMC Water & Environment

Project Description – DAC Onsite Plumbing Retrofit Program

Program will provide outreach, technical support, and rebates for Disadvantaged Communities in Coachella Valley, primarily mobile home parks, to retrofit plumbing systems.

Project Nexus to Drought Impacts:

The *DAC Onsite Plumbing Retrofit Program* meets three of the Drought Project Elements defined by DWR: 1) Project will provide regional drought preparedness by decreasing water waste in DACs and offsetting groundwater pumping (in lieu groundwater replenishment), 2) Project will increase local water supply reliability and the delivery of safe drinking water to DACs by correcting plumbing issues that compromise drinking water quality and reliability, and 3) Project will reduce water quality conflicts or ecosystem conflicts created by the drought by reducing groundwater demands.

As described in Attachment 2, the Coachella Valley IRWM Region's groundwater basin is in overdraft; however, regional efforts to manage the basin have helped this condition. One of the most substantial groundwater management efforts involves artificial replenishment with imported water from the SWP and the Colorado River. The 2014 drought has had a direct impact on the Region as it has reduced SWP deliveries to 5% across California, and has substantially reduced artificial recharge in the Region. The seven specific drought impacts addressed in Attachment 2 stem from groundwater overdraft in the Region, which can be attributed to the drought due to reduced availability of water for groundwater replenishment. The *DAC Onsite Plumbing Retrofit Program*, which reduces potable water demand and provides in lieu groundwater recharge by decreasing water waste, will address all seven of the drought impacts identified in Attachment 2:

1. Groundwater Basin Overdraft: The project will alleviate groundwater basin overdraft by decreasing water waste and directly reducing groundwater pumping by 107 AFY.
2. Drinking Water MCL Violations: Portions of the Region are not in compliance with the drinking water MCL for chromium-6. Groundwater replenishment helps reduce chromium-6 concentration by diluting native groundwater that contains the constituent. By providing in lieu groundwater replenishment, the project will help maintain existing chromium-6 levels and avoid additional chromium-6 MCL violations.
3. Risk of Not Meeting Existing Drinking Water Demands: The project will help manage concerns regarding chromium-6 that prevent some residents from drinking local water. By increasing in-lieu recharge, and therefore avoiding additional chromium-6 MCL violations, the project will help avoid an increase in the number of residents receiving water that exceeds regulatory limits.
4. Risk of Not Meeting Existing Agricultural Water Demands: The project will directly reduce local groundwater pumping, thereby leaving additional water in the groundwater basin to meet demands for other users, including agricultural water users.
5. Risk of Not Meeting Existing Ecosystem Water Demands: The project will directly reduce local groundwater pumping, thereby leaving additional water in the groundwater basin to meet ecosystem water demands.
6. Land Subsidence: Land subsidence is a serious consequence of groundwater overdraft; therefore by helping to manage overdraft, the project will help to manage subsidence.
7. Energy Demand and GHG Emissions: The project will provide in lieu recharge and therefore avoid energy demands for groundwater pumping, which increase during droughts as groundwater levels become lower. The project will also provide replenishment benefits, thereby reducing energy needed for additional imported water.

This project was selected for inclusion in this application because it is an IRWM project that addresses critical drought impacts to the Region, and specifically to DACs, and is able to be implemented on an expedited timeline. Expedited funding is needed because the project will provide an immediate benefit to DACs and provide an additional local water supply that will directly benefit the groundwater basin through in lieu groundwater replenishment. Without grant funding, this project would not move forward due to lack of financial resources for local DACs. Therefore, expedited funding for this project is critical to ensure that the project is implemented and provides drought relief benefits to DACs and the Region in a timely manner.

Project Physical Benefits – DAC Onsite Plumbing Retrofit Program

The *DAC Onsite Plumbing Retrofit Program* provides a number of physical benefits. The primary physical benefit of the project is decreased water waste and prevention of drinking water contamination for DACs. This primary benefit results in a number of secondary benefits, as summarized in **Table 3-30**. The project life is anticipated to be 15 years, as explained in the Technical Justification section, below. The benefits will be phased in (and subsequently out) over the project life, as shown in **Tables 3-31** through **3-39**. Detailed explanation of how these benefits were calculated are provided in the Technical Analysis of Physical Benefits Claimed section, below, along with the context for the importance of these benefits. **Appendix 3-1** includes spreadsheets that show details about how all quantifiable benefits were calculated for this program.

Table 3-30: Physical Benefits Summary
DAC Onsite Plumbing Retrofit Program

Primary Physical Benefit	Physical Benefit		Quantification of Benefits (cumulative quantification of benefits)
Decrease Water Waste and Prevent Contamination of Drinking Water for DACs	A	Decrease Groundwater Overdraft	107 AFY (1,597 AF)
	B	Avoid Additional Imported Water Supply Purchases	107 AFY (1,597 AF)
	C	Reduce Future Demand for Net Diversions from the Bay-Delta	107 AFY (1,597 AF)
	E	Local Supply Development to Decrease Vulnerabilities	107 AFY (1,597 AF)
	F	Prevent Groundwater Quality Degradation	Qualitative
	G	Increase Water Supply Reliability for DACs	200 Households or 1,000 people
	H	Reduce Net Production of GHGs	102 MT CO_2e/year (1,525 MT CO_2e)
	I	Avoid Social Costs of GHGs	$2,496/year ($37,440)
	P	Decrease Water Use Costs for DACs	868,129 gph for non-mobile homes 2,250,671 gph for mobile homes
	Q	Avoid Bottled Water Purchases	Households/Qualitative
	R	Promote Social Health and Safety	Households/Qualitative

Table 3-31: Primary Physical Benefit – Decrease Water Waste and Prevent Contamination of Drinking Water for DACs
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program*
Type of Benefit Claimed: Decrease Water Waste and Prevent Contamination of Drinking Water for DACs
Units of the Benefit Claimed: Acre-feet per year (AFY)

(a)	(b)	(c)	(d)
Year	**Annual Without Project (cumulative without project)**	**Annual With Project (cumulative with project)**	**Annual Change Resulting from Project (cumulative change from project)**
2014	0 AF	0 AF	0 AF
2015	0 AF	16 AF	16 AF
2016	0 AF	48 AF	48 AF
2017	0 AF	80 AF	80 AF
2018	0 AF	100 AF	100 AF
2019-2029	0 AF	107 AFY (1,172 AF)	107 AFY (1,172 AF)
2030	0 AF	91 AF	91 AF
2031	0 AF	59 AF	59 AF
2032	0 AF	27 AF	27 AF
2033	0 AF	7 AF	7 AF
Total	**0 AF**	**1,598 AF**	**1,598 AF**

Comments: Savings are based on phasing in of *DAC Onsite Plumbing Retrofit Program* over 3.5 years, with full benefits beginning in 2019 and a project life of 20 years. Water savings for each portion of the project were calculated in: CVRWMG, 2014, *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum*, July, pg. 6 (Program Savings).

Table 3-32: Physical Benefits for A-Decrease Groundwater Overdraft
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program*
Type of Benefit Claimed: Decrease Groundwater Overdraft
Units of the Benefit Claimed: AFY

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	16 AF	16 AF
2016	0 AF	48 AF	48 AF
2017	0 AF	80 AF	80 AF
2018	0 AF	100 AF	100 AF
2019-2029	0 AF	107 AFY (1,172 AF)	107 AFY (1,172 AF)
2030	0 AF	91 AF	91 AF
2031	0 AF	59 AF	59 AF
2032	0 AF	27 AF	27 AF
2033	0 AF	7 AF	7 AF
Total	**0 AF**	**1,598 AF**	**1,598 AF**

Comments: Based on Primary Physical Benefit – Reduce Water Waste.

Table 3-33: Physical Benefits for B-Avoid Additional Imported Water Supply Purchases
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program* **Type of Benefit Claimed:** Avoid Additional Imported Water Supply Purchases **Units of the Benefit Claimed:** AFY			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	16 AF	16 AF
2016	0 AF	48 AF	48 AF
2017	0 AF	80 AF	80 AF
2018	0 AF	100 AF	100 AF
2019-2029	0 AF	107 AFY (1,172 AF)	107 AFY (1,172 AF)
2030	0 AF	91 AF	91 AF
2031	0 AF	59 AF	59 AF
2032	0 AF	27 AF	27 AF
2033	0 AF	7 AF	7 AF
Total	**0 AF**	**1,598 AF**	**1,598 AF**
Comments: Based on Primary Physical Benefit – Reduce Water Waste. CVWD currently carries out groundwater recharge using imported water to offset groundwater pumping and overdraft; IWA. 2011. *2010 UWMP*. September. Pg. 3-8 (3.4.1 Valley-wide Program – State Water Project).			

Table 3-34: Physical Benefits for C-Reduce Future Demand for Net Diversions from the Bay-Delta
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program* **Type of Benefit Claimed:** Reduce Future Demand for Net Diversions from the Bay-Delta **Units of the Benefit Claimed:** AFY			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	16 AF	16 AF
2016	0 AF	48 AF	48 AF
2017	0 AF	80 AF	80 AF
2018	0 AF	100 AF	100 AF
2019-2029	0 AF	107 AFY (1,172 AF)	107 AFY (1,172 AF)
2030	0 AF	91 AF	91 AF
2031	0 AF	59 AF	59 AF
2032	0 AF	27 AF	27 AF
2033	0 AF	7 AF	7 AF
Total	**0 AF**	**1,598 AF**	**1,598 AF**
Comments: Based on Physical Benefits B-Avoid Imported Water Supply Purchases. Under the 2002 Coachella Valley Water Management Plan, sources of additional imported water supplies included the Colorado River and the SWP (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-3 (2.2.2 Additional Water Supplies)). In October 2003, CVWD agreed on a formal QSA regarding Colorado River Water which created a finite allocation for CVWD from the Colorado River (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-3 (Colorado River Water)). Any additional imported water would be purchased through SWP contractors to fulfill additional needs (CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 2-4 (Additional Water Purchases)). Therefore, 100% of future water supply purchases would be conducted through SWP Contractors and thus rely upon diversions from the Bay-Delta			

Table 3-35: Physical Benefits for E-Local Supply Development to Decrease Vulnerabilities
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program* **Type of Benefit Claimed:** Local Supply Development to Decrease Vulnerabilities **Units of the Benefit Claimed:** AFY			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 AF	0 AF	0 AF
2015	0 AF	16 AF	16 AF
2016	0 AF	48 AF	48 AF
2017	0 AF	80 AF	80 AF
2018	0 AF	100 AF	100 AF
2019-2029	0 AF	107 AFY (1,172 AF)	107 AFY (1,172 AF)
2030	0 AF	91 AF	91 AF
2031	0 AF	59 AF	59 AF
2032	0 AF	27 AF	27 AF
2033	0 AF	7 AF	7 AF
Total	**0 AF**	**1,598 AF**	**1,598 AF**
Comments: Based on Primary Physical Benefit – Reduce Water Waste. CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-33 (Existing Water Supplies, 4.9, Summary), pg. 7-10 (Water Supply Evaluation, 7.2.2.4 Reliability).			

Table 3-36: Physical Benefits for G-Increase Water Supply Reliability for DACs
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program* **Type of Benefit Claimed:** Increase Water Supply Reliability for DACs **Units of the Benefit Claimed:** Number of households			
(a)	**(b)**	**(c)**	**(d)**
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 Households	0 Households	0 Households
2015	0 Households	30 Households	30 Households
2016	0 Households	60 Households	60 Households
2017	0 Households	60 Households	60 Households
2018	0 Households	50 Households	50 Households
Total	**0 Households**	**200 Households**	**200 Households**
Comments: CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum (TM)*. July. Pg. 3 (Population and Household Estimates for Study).			

Table 3-37: Physical Benefits for H-Reduce Net Production of Greenhouse Gases
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program*
Type of Benefit Claimed: Reduce Net Production of Greenhouse Gases
Units of the Benefit Claimed: Megatons of carbon dioxide equivalence (MT CO2e)

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 MT CO2	0 MT CO2e	0 MT CO2e
2015	0 MT CO2	15 MT CO2e	15 MT CO2e
2016	0 MT CO2	46 MT CO2e	46 MT CO2e
2017	0 MT CO2	76 MT CO2e	76 MT CO2e
2018	0 MT CO2	95 MT CO2e	95 MT CO2e
2019-2029	0 MT CO2	102 MT CO2/year (1,119 MT CO2e	102 MT CO2/year (1,119 MT CO2e
2030	0 MT CO2	86 MT CO2e	86 MT CO2e
2031	0 MT CO2	56 MT CO2e	56 MT CO2e
2032	0 MT CO2	25 MT CO2e	25 MT CO2e
2033	0 MT CO2	6 MT CO2e	6 MT CO2e
Total	**0 MT CO2**	**1,525 MT CO2e**	**1,525 MT CO2e**

Comments: Based on Primary Physical Benefit – Reduce Water Waste. Energy per AF of groundwater pumped and imported was calculated using California water and energy information: CEC, 2005, *Water-Energy Relationship*, June, pg. 22 (Table 1). Equinox, 2010, *San Diego's Water Sources: Assessing the Options*, July, pg. 10 (Table 1a). GHG production (reported in carbon dioxide equivalency or CO2e) per energy use was then calculated: CEC, 2014, *California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours)*, April, available at: http://energyalmanac.ca.gov/electricity/electricity_generation.html. U.S. EPA, 2014, *eGRID 9th edition Version 1.0 Year 2010 Summary Tables*, February, available at: http://www.epa.gov/cleanenergy/energy-resources/egrid/.

Table 3-38: Physical Benefits for I-Avoid Social Costs of Greenhouse Gases
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program*
Type of Benefit Claimed: Avoid Social Costs of Greenhouse Gases
Units of the Benefit Claimed: $

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	$0	$0	$0
2015	$0	$374	$374
2016	$0	$1,123	$1,123
2017	$0	$1,872	$1,872
2018	$0	$2,341	$2,340
2019-2029	$0	$2,497 per year ($27,463)	$2,497 per year ($27,463)
2030	$0	$2,122	$2,122
2031	$0	$1,373	$1,373
2032	$0	$624	$624
2033	$0	$156	$156
Total	**$0**	**$37,449**	**$37,449**

Comments: Calculation based on GHG reduction from project, described under Benefit H – Reduce Net Production of Greenhouse Gases. Social cost of carbon source: Interagency Working Group on Social Cost of Carbon, United States Government, 2010, *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, pg. 28(Table 4). Costs reported in this document were in 2010 dollars. Converted to 2014 dollars using CPI Inflation calculator, available: http://www.bls.gov/data/inflation_calculator.htm

Table 3-39: Physical Benefits for P-Decrease Water Use Costs for DACs
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program*
Type of Benefit Claimed: Decrease Water Use Costs for DACs
Units of the Benefit Claimed: Gallons per household per day (gphd)

(a)	(b)	(c)	(d)
Year	**Without Project**	**With Project**	**Change Resulting from Project**
2014	0 gallons per household per day (gphd)	0 gphd	0 gphd
2015-2029 (non-mobile home) [a]	0 gphd [0 gallons per household/year (gphy)] [0 gallons/ household (gph)]	71.1 gphd (25,955 gphy) **(389,320 gph)**	71.1 gphd (25,955 gphy) **(389,320 gph)**
2015-2029 (mobile home) [b]	0 gphd (0 gphy) (0 gph)	411 gphd (150,191 gphy) **(2,252,862 gph)**	411 gphd (150,191 gphy) **(2,252,862 gph)**

Comments: CVRWMG, 2014, *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum*, July, (Program Savings. [a] Based on 3.4 residents per non-mobile home household (CVRWMG, 2014, *2014 CVIRWM Plan: Volume I*, February, pg. 4-24 Table 4-5:Focus Area Select Statistics). [b] Based on 5 residents per mobile home household (CVRWMG, 2014, *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum*, July, pg. 3 Population and Household Estimates for Study).

Technical Analysis of Physical Benefits Claimed – DAC Onsite Plumbing Retrofit Program

Primary Physical Benefit

The primary goal and benefit of the *DAC Onsite Plumbing Retrofit Program* is to decrease water waste and prevent contamination of drinking water for DACs. This overarching benefit is gained from the onsite water infrastructure improvements and water fixture replacements that will be funded by this program, including mobile home park plumbing system retrofits, individual mobile home plumbing repairs, installation of individual water meters, and replacement of toilets and showerheads with low-flow fixtures.

The program was created as a result of findings from the *Coachella Valley Disadvantaged Communities Outreach Program* (DAC Outreach Program) conducted in 2012 and 2013 through a grant from DWR. During the DAC Outreach Program, DAC residents noted that onsite plumbing leaks and faulty onsite plumbing systems cause drinking water quality issues and water waste.[163] The survey conducted for the DAC Outreach Program found that DAC residents that expressed concerns of poor tap water quality also reported drinking tap water, indicating that residents do not have many non-tap water options due to cost restraints and other issues. As such, the survey concluded that water supply provisions to DACs must be cost-effective and easily accessible to be effective.

The *DAC Onsite Plumbing Retrofit Program* proposes two main elements: indoor plumbing fixture replacement rebates and mobile home park plumbing system rehabilitation rebates.[164] The indoor portion of the program will provide rebates for high efficiency toilets, low flow showerheads, and faucet aerators to up to 180 non-mobile home DAC households and 200 mobile home households, garnering a total of 63 acre feet per year (AFY) of water savings. The plumbing system rehabilitation portion of the program would provide rebates for plumbing system repairs for up to 200 households giving a total of 44 AFY in savings. This equates to total program savings of 107 AFY. Water savings calculations associated with the project are shown in the **Table 3-40.**

Table 3-40: Water Savings Calculations
DAC Onsite Plumbing Retrofit Program

Project Component	Total Savings per Day per Household (Gallons)	Total Annual Savings per Household (Gallons)	Number of Households	Total Annual Savings (AFY)
Non-Mobile Home Indoor Replacements	71	25,955	180	14.3
Mobile Home Indoor Replacements	215	78,529	200	48.2
Distribution System Repairs	153	55,883	200	34.3
Individual Unit Repairs	43	15,779	300	9.7
TOTAL	**-**	**-**	**380**	**107**

The *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum* estimates a program life of 15 years (**see Appendix 3-3**).[165] Therefore, savings over the total life of the project are estimated to be 1,598 AFY over the 15-year life of the project. Project phasing is based on a 3-year project implementation period, 2015 – 2017, plus an additional 6 months for DACs to complete final onsite repairs and retrofits past the end of rebate implementation, to July 2018. The primary physical

[163] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. Pg. 35 (4.1 Water Supply).
[164] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum (TM)*. July. Pg. 4 (2.1 Indoor Water Use), pg. 5 (2.2 Mobile Home Park Plumbing System Rehabilitation).
[165] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program TM*. July. Pg. 11 (4.8 Expected Length of Beneficial Use).

benefit of decreased water waste is shown over the course of the project phasing and subsequent project life in **Table 3-31**. There are a number of other benefits that will be realized as a result of this primary benefit. The quantitative physical benefits that were calculated for the project are summarized in **Table 3-30**, and presented in greater detail in **Tables 3-31** through **3-39.** Methods for determination of the quantitative physical benefits that were calculated and the qualitative physical benefits that were not calculated are described in the Methods Used to Estimate the Physical Benefits section below.

Background for Benefits Claimed

As described previously and shown in **Tables 3-31** through **3-39**, the primary benefit associated with the *DAC Onsite Plumbing Retrofit Program* of decreasing water waste and preventing contamination of drinking water for DACs results in a number of additional benefits. The information presented below provides the background and context for the project, the Region, and the basis for each of the benefits that will accrue as a result of the project. Additional details about how each benefit was calculated are included in the Methods Used to Estimate the Physical Benefits section, below.

Primary Physical Benefit

The Coachella Valley is home to numerous DACs, defined as communities with a median household income (MHI) that is 80 percent or less than the statewide MHI, and severely economically disadvantaged communities, defined as those communities with a MHI of less than 60 percent of the statewide MHI. DACs can face multiple water-related challenges, which can be more difficult to address as compared to other residents due to a lack of financial and other resources. DAC populations and locations have been historically hard to determine in the Coachella Valley due to both the rural nature of most DACs and disinclination of DAC residents to participate in government-administered surveys; however, recent efforts to characterize DACs have been relatively successful. Across the Coachella Valley, new development near existing DACs tends to increase cost of living, driving low-income residents to seek more affordable housing, effectively pushing low-income residents out of urbanized areas and into more rural communities. In addition, many of the DACs in the Coachella Valley are populated by immigrants or first-generation families, and language barriers are common, with those DAC residents that are not fluent in English generally speaking Spanish.[166]

In the period just prior to and during the formation of the Coachella Valley IRWM Program, DAC groups in the Region were becoming more organized. In 2010, IRWM-related planning was initiated and DAC needs and issues were identified as special and different than other groups. The DAC Issues Group was formed that same year to provide direct outreach to DACs as part of the IRWM Program and gain input on water-related DAC issues. Several DAC representatives were also invited to join the Planning Partners - representatives from local cities, County of Riverside, tribal governments, disadvantaged community representatives, and other local water management stakeholders that serve in an advisory role for the development of the IRWM Plan, planning studies, and grant applications. During the development of the Region's first IRWM Plan (the 2010 IRWM Plan), the following water-related issues concerning DACs in the Coachella Valley were identified: affordability, connection to the sewer system, drinking water quality, water supply, and flooding and stormwater.[167]

Preliminary work with DAC groups in the Coachella Valley IRWM Region prior to development of the Coachella Valley IRWM Plan in 2010 resulted in the formulation of projects that could benefit DACs. Some projects, such as onsite water treatment systems and septic system to sewer connection conversion, were ultimately funded as part of the Proposition 84 Round 1 and Round 2 Implementation Grants. However, other potential projects such as the DAC Conservation and Water Testing Pilot Project, meant to promote water conservation, leak repair, water quality testing, and education, have yet to be implemented.[168]

In 2011, the CVRWMG, represented by the CVWD, entered into a contract with DWR to develop the *Coachella Valley DAC Outreach Program*. The overall purpose of the *Coachella Valley DAC Outreach*

[166] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-54 (2.6 Social and Cultural Make-up).
[167] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 6 (2 History of DAC Outreach).
[168] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 7 (2.2.2 Identified Projects).

Program, in addition to improving participation in the development of the 2014 Coachella Valley IRWM Plan, was to identify DAC issues, address DAC issues through project development and support, and provide DWR with suggestions for improving DAC involvement in IRWM planning and IRWM Program activities on a statewide-level.[169]

As part of the *Coachella Valley DAC Outreach Program*, a survey to assess topic areas of drinking water, wastewater management, and flooding in six known and likely DAC locations was conducted by three community non-profit organizations. Ninety eight percent of the survey respondents were confirmed to be severely DAC based on self-reported annual income, indicating that areas of focus used when selecting survey sites were correctly identified as potential DACs, and that the Coachella Valley IRWM Region has a continually better understanding of where DACs are located. Though many of the respondents reported water and wastewater issues, very few respondents indicated that they knew of any community groups or organizations that help with health, water, or other problems. This finding indicates that communities may not have knowledge of available resources to contact in the event of a problem or a concern regarding water and wastewater systems and thus there is a need to provide outreach and education to these communities.[170]

In addition to findings on perceived water quality, wastewater system conditions, and flooding, the study also produced recommendations for DWR concerning how to support DAC projects and community efforts in Coachella Valley. One recommendation was that regional water management groups should partner with established and successful non-profit organizations to assist with community outreach and identify, develop, and implement DAC water-related projects. As discussed above, part of the *Coachella Valley DAC Outreach Program* included a survey that was successfully administered by local non-profit organizations. Part of the CVRWMG's goal in utilizing the non-profit organizations for outreach efforts was to determine if working through established non-profit organizations with personal connections to DAC areas would increase DAC participation and involvement in the IRWM Program. Outreach efforts demonstrated that the non-profit organizations did impart this benefit, because prior to the DAC Outreach Program, few DAC community members attended IRWM Program meetings. As proof, the DAC Outreach Program workshops, held in June, 2013 and co-hosted/sponsored by the non-profit organizations, were attended by over 100 people, most of who were local residents of DACs.[171] This outcome demonstrates that the existing trust and relationships the local non-profit organizations have with the DACs they serve contributed strongly to resident interest and participation in the DAC workshops. Furthermore, services provided by the non-profit organizations such as bilingual translation for meeting materials and meeting facilitation encouraged involvement in the DAC workshops.

The *DAC Onsite Plumbing Retrofit Program* was developed and structured to both address pressing DAC issues and also take into consideration lessons learned from the *Coachella Valley DAC Outreach Program*. As such, the *DAC Onsite Plumbing Retrofit Program* includes rebates that do not require a cost-match for local residents and will also involve local non-profit organizations to work with community members to identify and repair onsite issues. The program takes into consideration the major findings and lessons learned from the *Coachella Valley DAC Outreach Program* and is therefore expected to be successful in accruing the benefits presented herein.

A-Decrease Groundwater Overdraft

The Coachella Valley Region overlays three primary sub-basins: Whitewater River Sub-basin, Mission Creek Sub-basin, and Desert Hot Springs Sub-basin, which are discussed in greater detail below. The groundwater basin primarily utilized and affected by the Region is the Indio Sub-basin per DWR Bulletin 118, locally referred to as the Whitewater River Sub-basin, shown in **Figure 3-9** above. The Whitewater River Sub-basin has an estimated storage capacity of 30 million AF of water. Prior to 1949, groundwater levels steadily declined due to agricultural pumping, after which the Region began to implement artificial replenishment and groundwater management programs. Today basin inflows consist of natural runoff,

[169] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 1 (1 Executive Summary).
[170] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 29 (Survey Indications).
[171] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 48 – 50 (6.1 Utilize Assistance from Community Non-Profit Organizations).

returns from groundwater and imported water use, and artificial recharge. Total inflows into the Whitewater River Sub-basin are estimated to be about 331,000 AFY. Outflows from the basin consist of pumping, flows to the agricultural drainage system, evapotranspiration by native vegetation, and subsurface outflow to the Salton Sea. Total basin outflows are estimated to be 441,000 AFY.[172]

CVWD estimated the decrease in freshwater storage in the Whitewater River Sub-basin for 2009 to be 72,051 AF, which is lower than historical loss due to higher SWP Exchange water deliveries and Canal water recharge. The groundwater overdraft ten-year average for the period of 2000 to 2009 was 110,000 AFY or a total of over 1 million AF in groundwater overdraft for that period.[173] As stated in Attachment 2, SWP Exchange Allocations for Coachella Valley for 2014 are only 5% of the allotted water supplies from the state due to drought conditions, which is expected to increase groundwater overdraft further.[174] The *CVWMP 2010 Update* identifies eliminating long-term groundwater overdraft as a priority objective of the plan.[175] The plan recommends source substitution (in lieu recharge), which would be provided by the *DAC Onsite Plumbing Retrofit Program*, as one of the primary tools to address the Coachella Valley's overdraft issue, and specifically sets forth conservation as a strategy for managing overdraft.[176]

B-Avoid Additional Imported Water Supply Purchases

The Desert Hot Springs Sub-basin remains relatively undeveloped due to its relatively poor water quality and does not receive artificial recharge as a result.[177] Therefore, the Whitewater River Sub-basin and the Mission Creek Sub-basin provide the majority of the groundwater needs for the Region and receive all artificial groundwater recharge from imported sources. Groundwater within the Whitewater River Sub-basin is supplemented by artificial recharge with imported SWP Exchange water and Colorado River water that is obtained directly from the Coachella Canal (Canal water). The SWP Exchange water refers to Colorado River water allocated to Metropolitan Water District of Southern California's (MWD) which Desert Water Agency (DWA) and CVWD receive in exchange for SWP water allocations that DWA and CVWD hold. This exchange is necessary because while the MWD service area has physical connections to SWP infrastructure, CVWD and DWA cannot access SWP water directly because of lack of physical connections to the system.[178] These imported water supply systems are shown in **Figure 3-4** above.

The *CVWMP 2010 Update* demonstrates that the Region already uses its full SWP Exchange and Canal water allocations and purchases additional SWP transfers for additional recharge water as this water is available.[179] As such, it is reasonable to assume that water conservation measures provided by the *DAC Onsite Plumbing Retrofit Program* would directly offset the need to purchase conservation that would result in source substitution (in lieu of groundwater recharge).

C-Reduce Future Demand for Net Diversions from the Bay-Delta

Approximately two-thirds of all Californians and millions of acres of irrigated farmland rely on the Sacramento-San Joaquin Bay Delta (Bay-Delta) for water from the SWP and federal Central Valley Project.[180] The SWP is managed by DWR, which has contracts to deliver 4.172 million AFY to 29 contracting agencies. DWA and CVWD initially contracted for water from the SWP in 1962 and 1963, respectively. CVWD's original SWP water allocation (Table A Amount) was 23,100 AFY and DWA's original SWP Table A Amount was 38,100 AFY for a combined Table A Amount of 61,200 AFY. Each year, DWR determines the amount of water available for delivery to SWP contractors based on hydrology,

[172] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-11 (4.1.6 Overdraft Status).
[173] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-11 (4.1.6 Overdraft Status).
[174] CVWD. 2014. *State Increases State Water Project Allocation*. April. Available at: http://www.cvwd.org/news/news232.php.
[175] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-3 (1.1 Purpose and Need for Water Management Plan Update).
[176] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 6-24 (6.5 Source Substitution).
[177] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-1 – 4-7 (4.1 Local Groundwater).
[178] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 4-11 (4.1.6 Overdraft Status).
[179] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 4-15 (4.3 State Water Project).
[180] DWR. 2014. *Where Rivers Meet – The Sacramento-San Joaquin Delta*. Available at: http://www.water.ca.gov/swp/delta.cfm.

reservoir storage, the requirements of water rights licenses and permits, water quality, and environmental requirements for protected species in the Bay-Delta. The available supply is then allocated according to each SWP contractor's Table A Amount. Currently, no infrastructure exists to deliver SWP water directly to the Coachella Valley. CVWD and DWA exchange their SWP entitlement, when available, with MWD for an equal amount of MWD's Colorado River water.

CVWD and DWA currently have a combined entitlement of 194,100 AFY; these entitlements are based upon the SWP allocations and several exchange agreements that the agencies have initiated to increase the amount of water available for recharge in the Coachella Valley.[181] Based upon the water balance information provided in the *CVWMP 2010 Update*, the Region already uses its full imported water allocations and purchases additional SWP transfers when available for additional recharge. As such, it is reasonable to assume that conservation, in the form of reduced water waste provided by the *DAC Onsite Plumbing Retrofit Program*, would directly offset future demands for additional net diversions from the Bay-Delta to recharge the groundwater basin.

E-Local Supply Development to Decrease Vulnerabilities

As described in the *CVWMP 2010 Update*, the currently available supplies that were planned for and described in the 2002 WMP are not adequate to meet projected water demands in 2045. Further, the *CVWMP 2010 Update* acknowledges that the currently available supplies, including Canal water, SWP Exchange water, available groundwater supply, recycled water, and water conservation face various vulnerabilities, some of which are anticipated to increase over time. Due to the potential vulnerability of these supplies, the *CVWMP 2010 Update* plans for additional water supplies that will provide a 10% water supply buffer (equal to 974,000 AFY) by 2045 to meet increasing demands even during times when the existing supplies are not available.[182]

Per the *CVWMP 2010 Update*, a supply is considered to have high reliability if it can provide water on a more-or-less continuous basis; that is, average supply is greater than 90% of the maximum supply. In the case of source substitution and groundwater recharge, reliability is judged on the basis of the option's ability to reduce overdraft on a continuous basis over the planning period.[183] The water conservation provided by this program is, therefore, considered a highly reliable method of completing source substitution, because it is assumed that the new low-water using landscape options will provide continuous benefits throughout the 15-year project life.

F-Prevent Groundwater Quality Degradation

The Coachella Valley is geographically divided into the East Valley and the West Valley, with the boundary shown in **Figure 3-1**.[184] The geology of the Whitewater River Sub-basin varies from the West Valley to the East Valley both in composition of sediments and structure of the aquifer. Water placed on the ground surface in the West Valley will percolate through the sands and gravels directly into the Lower Aquifer, see **Figure 3-5** above. However, in the East Valley, several impervious clay layers lie between the Upper Aquifer and the Lower Aquifer as shown in **Figure 3-5**. Water applied to the surface in the East Valley does not easily reach the Lower Aquifers due to these impervious clay layers. The only outlet for groundwater in the Whitewater River Sub-basin is through natural subsurface outflow to the Salton Sea or through collection in drains and transport to the Salton Sea via the CVSC.[185]

Throughout much of the East Valley, agricultural tile drains were installed to drain shallow groundwater perched on the Upper Aquifer into the CVSC. Adequate drain flows are needed to export salt from the basin, these drain flows depend upon water levels in the underlying aquifers and the quantities of applied irrigation water. From the 1960s to the early 1980s when groundwater levels were at their highest, groundwater levels in the confined Lower Aquifer were above those in the Upper Aquifer, creating an upward hydraulic gradient. This upward gradient tended to flush the more saline water in the Upper and

[181] CVWD. 2010. *CVWMP 2010 Update*. December. Pp. 4-15 and 4-16 (4.3 State Water Project).
[182] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (7.2 Water Supply Evaluation).
[183] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-2 (Evaluation Approach, 7.1.1.4 Reliability).
[184] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-1 (2 Region Description).
[185] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 1-5 (1-2 Study Area Description).

Semi-perched aquifers into the drain system. Since that time, both water levels and drain flows have declined and Lower Aquifer groundwater levels have declined creating a downward vertical gradient. Because the quality of the return flows is generally poor, an increasing amount of poor quality water recharges the basin when drain flows are low, leading to water quality degradation. While this degradation may initially occur in the Upper and Semi-Perched aquifers, it may eventually contribute to degradation in the Lower Aquifer.[186]

Nitrate is a nitrogen compound that is a nutrient and can also have public health implications when found in drinking water at concentrations above the MCL. The primary drinking water standard (MCL) for nitrate is 10 mg/L as nitrogen, though higher concentrations of nitrate, up to 40 mg/L as nitrogen, exist in some of the shallower portions of the Coachella Valley Groundwater Basin. Generally, nitrates are found in the unsaturated and shallow aquifer zones above 300 to 400 feet, and have not been observed in the deeper aquifer zones below 500 feet.[187] The *CVWMP 2010 Update* indicates that groundwater pumping in some areas can cause water quality issues associated with nitrates, as pumping may cause nitrates to leach into higher quality groundwater due to pressure changes in the basin.

Additionally, as indicated in Attachment 2, mapping of chromium-6 occurrence in groundwater in the Coachella Valley demonstrates that chromium-6 levels are highest along fault lines and in areas that are located at a distance from the Coachella Valley recharge facilities where there is less mixing between recharge water and native groundwater.[188] Currently, approximately half of the drinking water supply in Coachella Valley is above MCL limits for chromium-6, but with decreasing groundwater levels due to groundwater basin overdraft, chromium-6 concentrations are likely to rise.

G-Increase Water Supply Reliability for DACs, P-Decrease Water Use Costs for DACs, Q-Avoid Bottled Water Purchases, and R-Promote Social Health and Safety

The Coachella Valley is home to numerous DACs. DACs are defined as areas having a MHI that is 80% or less than the state MHI. Severely economically disadvantaged communities are defined as those communities with a MHI of less than 60% of the statewide MHI. DACs can face multiple water-related issues, which can be more difficult to address as compared to other residents due to a lack of financial and other resources. In 2011 CVWD, representing the CVRWMG, entered into a contract with DWR to develop a *DAC Outreach Demonstration Program* (DAC Outreach Program) for the Coachella Valley IRWM Region. The DAC Outreach Program was supported by a separate stream of funding associated with the Proposition 84 IRWM Program specific to conducting outreach to DACs, and concluded at the end of 2013.[189]

The DAC Outreach Program included an analysis of the location of DACs in the Coachella Valley by analyzing statistics for separate Study Areas within the Coachella Valley (refer to **Table 3-41**). 2010 United States Census Data is the primary source of information for the data provided in **Table 3-41**, during which time the MHI for California was $60,883, making DAC and severely DAC a MHI of $48,706 and $36,530, respectively. As shown in **Table 3-41**, there are fourteen Study Areas within the Coachella Valley that are classified as disadvantaged, and ten that are classified as severely disadvantaged.

[186] CVWD 2010. *CVWMP 2010 Update*. December. Pg. 7-21 – 7-22 (7.4.1.1 Drain Flows).
[187] CVWD. 2010. *CVWMP 2010 Update.* December. Pg. 5-13 (5.1.3.5 Nitrate).
[188] CVWD. 2014. *Coachella Valley Groundwater Chromium-6 Occurrence*. June. Available at: http://www.cvwd.org/about/docs/chromium_6_levels_map.pdf.
[189] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 1 (1 Executive Summary)

Table 3-41: DAC Outreach Program Focus Area Select Statistics

Study Area	Population	Households (HH)	HH Size	MHI	80% of State MHI ($48,706)	60% of State MHI ($36,529)
White Water	859	312	2.8	$39,375	Y	N
Desert Hot Springs	25,938	8,650	3.0	$36,326	Y	Y
Garnet	7,543	2,174	3.5	$32,132	Y	Y
Desert Edge	3,823	1,969	1.9	$25,984	Y	Y
Cathedral City	51,000	17,047	3.0	$45,693	Y	N
Sky Valley	2,406	1,064	2.3	$31,771	Y	Y
Thousand Palms	7,715	2,849	2.7	$42,656	Y	N
Coachella	40,704	8,998	4.5	$43,012	Y	N
Thermal	2,864	684	4.2	$33,998	Y	Y
Mecca	8,577	2,020	4.2	$26,207	Y	Y
Oasis	6,890	1,474	4.7	$25,469	Y	Y
North Shore	3,477	750	4.6	$31,591	Y	Y
Desert Shores	1,104	344	3.2	$18,958	Y	Y
Salton City	3,763	1,204	3.1	$32,805	Y	Y

The 2014 *DAC Onsite Plumbing Retrofit Technical Memorandum* (see **Appendix 3-3**) estimates that there are between 24,770 and 34,936 households, or between 83,332 and 116,524 persons that are considered DAC or extremely DAC in the Coachella Valley Region.[190] The DAC Outreach Program found that on average, there are five residents per mobile home within Coachella Valley disadvantaged communities and that the average number of mobile home units per mobile home park (is 23.3. A study currently underway that is continuing survey efforts from the DAC Outreach Program has ground truth validated 123 mobile homes parks, or 2,861 mobile home units, in the Valley.[191] Sergio Carranza from PUCDC, a local nonprofit organization that works to address DAC issues in the Coachella Valley, estimates that there are approximately 200 permitted and unpermitted mobile home parks in the Coachella Valley.[192] The *DAC Onsite Plumbing Retrofit Technical Memorandum* estimates that there are approximate 4,600 DAC mobile home units with 23,000 residents within the Coachella Valley.[190]

The DAC Outreach Program included extensive outreach meetings and surveys of local DAC residents to refine the location of DACs within the Coachella Valley and to establish a comprehensive understanding of water-related issues and needs within the Region's DACs. The DAC survey had many findings, including that DAC residents are largely unaware of local resources that are available to address water and wastewater concerns and that further outreach and education would be beneficial in addressing pressing DAC water quality and water supply issues. During implementation of the DAC Outreach Program, DAC residents noted that onsite plumbing leaks and faulty onsite plumbing systems may cause drinking water quality issues and water waste. For water quality issues, onsite plumbing systems may be compromised by structural damage or improper construction or design, which can allow water quality constituents to enter the potable water system. For onsite plumbing leaks, aging, damaged or improperly constructed or designed systems may leak and waste water. Only 35% of respondents reported that they drink tap water, and the majority of respondents, 65%, reported their source of drinking water as either disposable plastic bottles or self-filled large containers. Additionally, 47% of respondents reported occasionally running out of drinking water, whether it was tap water or purchased water (e.g., bottled

[190] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program TM*. July. Pg. 3 (1.2.2 Population and Household Estimates for Study).
[191] Sinclair, R. 2014. Assistant Professor, Environmental and Global Health, Loma Linda University. May. Personal Communication. Available by email at: rsinclair@llu.edu.
[192] Carranza, S. 2014. Executive Director, Pueblo Unido Community Development Corporation (PUCDC). May. Personal Communication. Available by telephone at: (760) 777-7550.

water). Further, the DAC survey found that DAC residents that expressed concerns of poor tap water quality also reported drinking tap water, indicating that residents do not have many non-tap water options due to cost and other issues. As such, the survey concluded that water supply provisions to DACs must be cost-effective and accessible in order to be effective.[193]

H-Reduce Net Production of GHGs and I-Avoid Social Costs of GHGs

Imported water is known to be an energy intensive supply of water, as explained below under Benefit H. The energy required to move and treat imported water supplies results in GHG emissions, which can contribute to climate change. The 2014 *Coachella Valley IRWM Plan* anticipates a statewide increase in temperature of 0.13ºC as a result of global increases in GHGs, which would likely modify rainfall and runoff.[194] These effects are expected to have impacts on imported water sources from the SWP and the Colorado River which are dependent on snowpack and precipitation. While groundwater sources in the Valley are not expected to be immediately impacted by climate change, long term drought caused by climate change would add to groundwater overdraft and groundwater quality degradation. There are social costs associated with increased GHG emissions related to air quality impacts and climate change. The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present.[195] Such costs include, but are not limited to, impacts to agricultural productivity, human health, increased flood risk and associated damages, and ecosystem services and their values.[196]

Without Project Baseline

Without the project, the faulty plumbing systems and inefficient water fixtures in DACs will continue to waste water and cause drinking water quality issues for economically disadvantaged residents. Residents that would have been given retrofit rebates to carry out plumbing system rehabilitation will continue to pump an extra 107 AFY of groundwater above their actual needs and potentially consume water that does not meet drinking water quality standards. This continued waste of groundwater means that none of the benefits of rehabilitating DAC plumbing systems will be realized.

Without the project no water would be conserved through plumbing retrofits and 107 AFY of groundwater will continue to be wasted through leaky systems and inefficient plumbing fixtures. As addressed in Attachment 2, continued groundwater pumping will affect both groundwater quality and quantity. **Figure 3-6** demonstrates that without the normal SWP allocations as a result of the 2014 drought, concentrations of Chromimum-6 will likely increase as less recharge water is available to the Region. Without the project, groundwater will continue to be pumped leading to higher chromimum-6 concentrations. As discussed in the background for *F-Prevent Groundwater Quality Degradation*, further groundwater overdraft will contribute to an unfavorable pressure gradient between the Upper and Lower Aquifer that could lead to contamination of the Lower Aquifer with the lower quality Upper Aquifer water. Overall, these further contributions to groundwater quality degradation will increase the risk of not meeting existing drinking water demands.

In addition to concerns of decreasing groundwater quality, as groundwater levels decline, so too does the ability of current users and beneficiaries to physically reach the groundwater. While many of the agricultural users in Coachella Valley rely on Colorado River canal water for irrigation needs, there are a number of agricultural users who rely on groundwater resources. As part of the U.S. Bureau of Reclamation's Inadvertent Overrun and Payback Policy implemented in October 2002, CVWD defined the Colorado River irrigation service area as Improvement District No. 1, shown in **Figure 3-7** above.[197] All

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[193] CVRWMG. 2014. *2014 CVIRWM Plan: Volume II*. February. Pg. 29 (Survey Indications)

[194] CVRWMG. 2014. *2014 CVIRWM Plan: Volume I*. February. Pg. 2-61 – 2-62 (2.8.2 Implications of Effects of Climate Change).

[195] IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability.* April. Pg. 17 (Summary for policymakers)

[196] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 2 (I. Monetizing Carbon Dioxide Emissions).

[197] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 4-13 (4.2 Colorado River).

agricultural users that lie outside of Improvement District No. 1 do not have rights to use Colorado River canal water and must rely on groundwater resources. With declining groundwater resources, deeper wells and more powerful pumps must be utilized which can amount to large capital costs making agricultural production economically inaccessible.

As discussed in Attachment 2, further increased groundwater pumping will make water less available to local ecosystems. Without the project, 0 AFY of water will be saved without plumbing retrofits. The *Coachella Valley Multiple Species Habitat Conservation Plan* identifies monitoring groundwater pumping as a priority to protecting various habitats and species in Coachella Valley. These include habitats such as mesquite hummocks habitat and species such as the Desert Pupfish, the Crissal Thrasher, the Southern Yellow Bat, and the Coachella Valley Round-Tailed Ground Squirrel.[198] Without the project, future groundwater pumping is likely to lead to impacts on these habitats and species.

In 2009, electrical energy demand for water management in the Coachella Valley was 211,130,000 kilowatt hour per year (kWhr/yr); it is estimated that groundwater pumping attributed to 93 percent of this overall demand.[199] Without the project, potable water waste will not be avoided and energy use from groundwater pumping will continue and likely increase due to decreasing groundwater levels and energy use from importing water for groundwater recharge. Overall, without the project 298 MWh, 4,472 MWh over the 15-year life of the project, will be used to pump groundwater and import recharge water.

Finally, the drought impact of subsidence is projected to further increase with decreasing groundwater levels. Land subsidence rates in Coachella Valley have increased in recent years and is likely attributable to groundwater overdraft.[200] Without the project, 0 AFY of water will be will be saved because leaks will not be repaired and inefficient fixtures will not be replaced, as a result further groundwater overdraft and subsequent land subsidence is likely to occur.

In addition to increasing drought impacts without the project, none of the physical benefits that would have been achieved with the project will be realized. Such benefits that will not be realized without the project include reducing groundwater overdraft, offsetting imported water, reducing future pumping from the Bay-Delta, decreasing high reliance on imported water and alleviating associated supply vulnerabilities, preventing groundwater quality degradation, increasing water supply reliability for DACs, reducing GHG emissions for importing water and avoiding associated social costs, decreasing water use costs for DACs, avoiding bottled water purchases, and promoting social health and safety.

Methods Used to Estimate the Physical Benefits

The methods used to estimate the physical benefits provided by the *DAC Onsite Plumbing Retrofit Program* are provided below. **Appendix 3-1** includes backup documentation (spreadsheets) that show the annual calculation for each quantifiable benefit.

A-Decrease Groundwater Overdraft

Groundwater overdraft has been identified as an important regional issue. Additionally, conservation has been identified as a cost-effective and reliable part of the solution to managing current overdraft conditions. The *DAC Onsite Plumbing Retrofit Program* will help DACs in the Region reduce overall water use and water waste that currently contributes to groundwater overdraft.

By achieving the primary benefit of reducing water waste in DACs, thereby decreasing potable water demand, this project allows more groundwater to remain in storage and contributes to overdraft reduction. In total, the groundwater savings supplied by this program would be 107 AFY. Given the Without Project Baseline of no water savings, the project would offset pumping of local groundwater by 107 AFY, thus

[198] Coachella Valley Association of Governments. 2007. *Coachella Valley Multiple Species Habitat Conservation Plan*. September. Pg. 9-77 (9.4.1.2 Threats, Limiting Factors, and Adaptive Management), 9-158 (9.7.5.2 Threats, Limiting Factors, and Adaptive Management), 9-224 (9.8.1.4 Take Analysis), 9-236 (9.8.2.4 Take Analysis).
[199] CVWD. 2011. *Draft Subsequent Program EIR: Coachella Valley WMP 2010 Update*. July. Pg. 8-42 (8.5.3.1 In Valley Energy Use).
[200] USGS. 2013. *Scientific Investigations Report 2007-5251, Version 2.0.* June. Pg. 1 (Abstract).

reducing groundwater basin overdraft by the same amount. Over the 15-year useful life of the project, this would decrease groundwater overdraft by 1,598 AF as shown in **Table 3-32**.

B-Avoid Additional Imported Water Supply Purchases

As addressed above, one of the ways in which groundwater overdraft is addressed in the Coachella Valley is by groundwater replenishment with imported water supplies. Because the Region already uses its full Colorado River and SWP allocations and purchases additional SWP transfers for additional recharge water,[201] groundwater conserved by this program would directly offset the need to purchase additional SWP transfer water for recharge.

Specifically, in order to account for the avoided imported water purchases that would be required as a result of this program, 107 AFY of additional water would need to be imported from outside the Region to replenish the groundwater basin to mitigate overdraft. The Region already uses its full SWP imported water allocations, so additional replenishment water needs to be acquired from other external sources. This is done by acquiring rights to SWP water held by other entities, and exchanging these purchased rights with MWD for locally-available Colorado River water. It is assumed that water demands would remain consistent and that localized groundwater pumping would be directly offset by additional imported water. The project would avoid a total of 1,598 AF, based on totals in **Table 3-33**, of imported over its expected 15-year project life.

C-Reduce Future Demand for Net Diversions from the Bay-Delta

This project will reduce water waste in DACs, thus offsetting the need for groundwater replenishment to mitigate groundwater overdraft. Because the Region already receives its entire imported water entitlements (as they are available) and also purchases additional SWP Table A water from other agencies[202], any additional imported water needed to balance groundwater extraction would be purchased and transferred from the SWP. The *DAC Onsite Plumbing Retrofit Program*, however, will decrease water use through rebates for replacement and rehabilitation of plumbing fixtures and systems, thus reducing the demand for additional imported water, which would ultimately be delivered from the Bay-Delta via a SWP water exchange. Therefore, the program will reduce net diversions from the Bay-Delta by the same amount of groundwater pumping that would be avoided as a result of the project, which is 1,598 AF over the 15-year project life as shown in **Table 3-34**.

E-Local Supply Development to Decrease Vulnerabilities

As discussed above, imported water supplies are considered to be vulnerable water supplies due to existing climate, legal, and other issues that are anticipated to continue into the future. As demonstrated in Attachment 2, years in which groundwater replenishment is low due to the lack of availability of imported water sources (such as in drought years), groundwater overdraft conditions can be exacerbated if pumping continues, as indicated by lower groundwater levels in such years.[203]

While the vulnerability of conservation programs is contingent upon the level of participation and commitment of customers, it is expected that this program will not suffer these issues. Personal communication with local community organizations suggest that the level of participation for this program will be high based on the desire of residents to improve their local water systems and potentially offset costs associated with obtaining additional water supplies such as bottled water.[204] Additionally, unlike other conservation measures, this program is a structural conservation project which does not rely on behavioral change. Once the fixture replacements have been made, the plumbing system rehabilitations have been carried out, and the rebate has been distributed, participants may not revert their system repairs, thus, dependence on customer commitment is not likely to be a large factor in the success of the program. Therefore, conservation is considered a highly dependable and reliable local source of water

[201] CVWD. 2010. *CVWMP Update 2010*. December. Pg. 4-15 (4.3 State Water Project).
[202] CVWD. 2011. *2010 UWMP*. July. Page 4-19 (4.2.3.2 Other SWP Transfers).
[203] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-10 (Water Supply Evaluation, 7.2.2.4 Reliability).
[204] Carranza, S. 2014. Executive Director, PUCDC. May. Personal Communication. Available by telephone at: (760) 777-7550.

especially into the future. Reduction of water use through turf removal as a result of the *DAC Onsite Plumbing Retrofit Program* will reduce localized groundwater pumping (in lieu groundwater recharge) to decrease water supply vulnerabilities in the future. Therefore, the project will develop local supplies equal to the amount of water conserved, 107 AFY, which is compared the amount of local supplies developed without the project, 0 AFY, shown in **Table 3-35**. The total local supply developed of the 15-year life of the project will be 1,598 AF.

F-Prevent Groundwater Quality Degradation

The *CVWMP 2010 Update* indicates that groundwater pumping in some areas can cause water quality issues associated with constituents such as nitrates, as pumping may cause nitrates to leach into higher quality groundwater due to pressure changes in the basin.[205] Additionally, chromium-6 levels have been found to be highest in areas that are located at a distance from the Coachella Valley recharge facilities where dilution of native groundwater containing chromium-6 is not diluted with recharge water.[206] Therefore, it is probable that with decreasing groundwater levels due to groundwater basin overdraft and decreasing replenishment as a result of the drought, chromium-6 concentrations will rise above regulated limits in additional places within the Coachella Valley.

Without the project, the use of groundwater for drinking water and other purposes would continue to contribute to overdraft problems in the basin, resulting in further water quality degradation in the aquifer. With the project, reductions in groundwater use would abate localized groundwater pumping and therefore could prevent pumping activities from causing nitrate-contaminated water from coming into contact with the basin's high-quality deep aquifer and will allow groundwater to remain in the basin, therefore potentially avoiding chromium-6 levels to increase in concentration.

Given that the program will be implemented on a regional basis, it is not possible to reasonably quantify the water quality benefits that would be provided as a direct result of the program. As such, benefits that would accrue to water quality as a result of the program have not been physically or economically quantified.

G-Increase Water Supply Reliability for DACs

The Coachella Valley is home to numerous DACs. DACs can face multiple water-related challenges, which can be more difficult to address as compared to other residents due to a lack of financial and other resources. As discussed above, survey results have indicated that 33 percent of DACs believe their water quality is poor and many attribute it to the faulty water distribution systems that carry water from their water source to their tap.[207] Additionally, 47 percent of DACs reported running out of drinking water, indicating that water supply reliability is extremely low for these communities.

As such, the *DAC Onsite Plumbing Retrofit Program* aims to retrofit a total of 200 mobile home park units and associated plumbing systems to improve local water supply reliability. The program has three elements to specifically target water supply reliability of mobile home park drinking water distribution systems: water system distribution rehabilitation, submetering to monitor water loss, and individual unit repairs.208 The program will be phased in over a 3.5 year period which indicates that benefits will be accrued over the period from January 2015 to July 2018, as shown in **Table 3-36**. As demonstrated above, DACs do not have the necessary funds to be able to complete these kinds of repairs themselves and will be unable to complete the repairs without the program; therefore, it is assumed that water supply reliability will be improved for 0 households without the project. Thus, the total water supply reliability improvement for this project will be 200 households, or approximately 1,000 persons.

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[205] CVWD 2010. *CVWMP 2010 Update*. December. Pg. 5-13 (5.1.3.5 Nitrate).

[206] CVWD. 2014. *Coachella Valley Groundwater Chromium-6 Occurrence*. June. Available at: http://www.cvwd.org/about/docs/chromium_6_levels_map.pdf.

[207] CVRWMG. 2014. *2014 CVIRWM Plan Volume II: Disadvantaged Communities*. February. Pg. 30 (3.3.3 Survey Indications, Drinking Water Findings).

[208] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program TM*. July. Pg. 5 – 6 (2.2 Mobile Home Park Plumbing System Rehabilitation).

H-Reduce Net Production of GHGs

The *DAC Onsite Plumbing Retrofit Program* would reduce water waste within the Coachella Valley Region. These conservation reductions will offset the use of local groundwater, and the conveyance of additional SWP exchange water for groundwater recharge purposes. As a result, this program would avoid energy requirements associated with groundwater pumping, and the energy requirements associated with transporting SWP exchange water to the Coachella Valley. This in turn would result in avoided greenhouse gases (GHGs) – namely carbon dioxide (CO_2) emissions – associated with reduced energy consumption.

For this analysis, it is assumed that energy requirements associated with delivering and using Colorado River water (including Canal water) are 2.0 mega-watt hours per acre-foot (MWh/AF).[209] Groundwater pumping energy requirements for the Coachella Valley are not available, thus, values for similar regions were compared and the average, 0.8 MWh/AF, between the high and low estimates for another Southern California region's groundwater was used.[210] The energy savings were determined by calculating the amount of energy saved by offsetting both exchanged (imported) water and groundwater pumping. Therefore, the energy savings per acre foot of water from not using water instead of pumping and replenishing groundwater with Colorado River water is 2.8 MWh/AF. As described in the Primary Physical Benefit, reduced water waste, this project will conserve 107 AFY of water. Therefore, energy savings per year would be 298 MWh, or 4,472 MWh over the 15-year life of the project as shown in the bullet points below:

- Energy intensity of conserving water: 0 MWh/AF
- Energy intensity of delivering Colorado River water and pumping groundwater: 2.8 MWh/AF
- Energy savings resulting from the project: 2.8 MWh/AF

To translate energy savings into net reduction of GHG emissions, California energy mix and associated GHG emissions were used from the CEC and USEPA's eGRID. Per the CEC's Energy Almanac, California produces 70% of its energy and imports 10% from the Pacific Northwest, and 20% from the Pacific Southwest.[211] USEPA eGRID data provides information about the GHGs associated with each of the energy supplies (calculated as carbon dioxide equivalent units or CO2e) as 613.28 pounds of CO2e per MWH (lbs/MWh), 846.97 lbs/MWh, and 1,182 lbs/MWh, respectively.[212] Averaging each of these CO2e emissions factors shows that California energy supplies have a combined CO2e emissions factor of 750.57 lbs/MWh, or 0.341 metric tons (MT) of CO2e per MWh. Applying this number to the energy saved as a result of the project finds GHG reduction of 1,525 MT CO2e over the life of the project. These benefits are provided by year in **Table 3-37** and summarized in the bullets below:

- Energy savings resulting from the project: 2.8 MWh/AF
- Average GHG in California energy grid: 0.341 MT of CO2e/MWh
- Resulting GHG reductions from the project: 0.955 MT of CO2e/AF
- Annual GHG reductions resulting from the project (assuming 107 AFY of water conserved by the project): 102 MT/Year
- Cumulative GHG reductions over project lifetime: 1,525 MT CO2e

[209] CEC. 2005. *Water-Energy Relationship*. June. Pg. 22 (Energy Use and Production of Surface Water, Table 1 Energy Consumption for Various MWD Sources). Confirmed in Navigant 2006.
[210] Equinox. 2010. *San Diego's Water Sources: Assessing the Options*. July. Pg. 10 (Table 1a Marginal Costs and Energy Intensity of San Diego County's Water Alternatives, 2010e).
[211] CEC. 2014. California Electrical Energy Generation Total Production, by Resource Type (Gigawatt hours). April Accessed 24 June 2014. Available: http://energyalmanac.ca.gov/electricity/electricity_generation.html
[212] U.S. EPA. 2014. eGRID 9th edition Version 1.0 Year 2010 Summary Tables. February. Available: http://www.epa.gov/cleanenergy/energy-resources/egrid/

I-Avoid Social Costs of GHGs

As discussed above, social costs associated with increased GHG emissions related to air quality impacts and climate change including, impacts to agricultural productivity, human health, increased flood risk and associated damages, and ecosystem services and their values.[213]. The social cost of carbon is estimated as the aggregate net economic value of damages from climate change across the globe, and is expressed in terms of future net benefits and costs that are discounted to the present.[214] The recommended mean estimate of the social cost of one metric ton (MT) of CO_2 in 2014 is $24.55. This value was updated from the 2007 value of $21.40 reported by the Interagency Working Group on Social Cost of Carbon[215], using the CPI Inflation Calculator.[216] An estimate of the social costs of carbon avoided by the project can be calculated by applying the $24.55/MT CO2 to the emissions savings from Benefit D. **Table 3-38** shows the avoided social costs of carbon from the *DAC Onsite Plumbing Retrofit Program*, which are anticipated to be $37,449 over the 15-year life of the project.

P-Decrease Water Use Costs for DACs

In addition to improving water supply reliability for DACs, the program will lower water use costs for DACs by reducing overall water use. As discussed above, DACs are affected by small financial burdens because of their low income status. Small savings in water use can have a large impact on buying power and quality of life. Additionally, many mobile home parks have a single supply well for the park and do not have individual meters for each home.[217] This suggests that even if only a few mobile homes and associated plumbing system components are fixed in each mobile home park, benefits will be distributed throughout each individual community.

This benefit is calculated by determining the gallons of water saved per person per day (gpcd) in each household and then multiplying by various conversion factors to determine gallons per household per day (gphd), gallons per household per year (gphy), and finally gallons per household (gph) for the entire life of the program. The program is separated by household type because the 180 households that are eligible for indoor fixture replacements will save less overall than the 200 mobile home park households that are eligible for indoor fixture replacements, water distribution system rehabilitation, submetering, and individual unit repairs.[218] As shown in **Table 3-39**, non-mobile home units will save have a project life savings of 389,320 gph. Alternatively, mobile home units in the program will have a project life savings of 2,252,862 gph. As mentioned earlier, these savings are valuable for both individual households and entire mobile home park communities.

Q-Avoid Bottled Water Purchases

Another finding of the *DAC Outreach Program* was that a majority of DAC households, approximately 69%, report purchasing disposable plastic bottles or self-filled large containers as their source of drinking water.[219] Considering that DACs have relatively low incomes, purchasing bottled water can be a large part of their income that could otherwise be used for other important goods such as food, clothing, and shelter.

[213] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 2 (I. Monetizing Carbon Dioxide Emissions).

[214] IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability.* April. Pg. 17 (Summary for policymakers)

[215] Interagency Working Group on Social Cost of Carbon, United States Government. 2010. *Technical Support Document: Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*. February. Pg. 28 (Table 4 Social Cost of CO_2).

[216] U.S. Bureau of Labor Statistics. 2014. *CPI Inflation Calculator*. Available at: http://www.bls.gov/data/inflation_calculator.htm

[217] Carranza, S. 2014. Executive Director, PUCDC. May. Personal Communication. Available by telephone at: (760) 777-7550.

[218] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program TM*. July. Pg. 4 (2.1 Indoor Water Use), pg. 5 – 6 (2.2 Mobile Home Park Plumbing System Rehabilitation).

[219] CVRWMG. 2014. *2014 CVIRWM Plan Volume II: Disadvantaged Communities*. February. Pg. 30 (3.3.3 Survey Indications, Drinking Water Findings).

Many of the parks have state of the art treatment systems or are receiving high quality source water from water agencies, meaning that water may become contaminated between the water source and water taps within the mobile home park water distribution systems or that residents falsely identify water as poor in quality due to the perception of onsite water infrastructure as faulty or failing.[220]

The *DAC Onsite Plumbing Retrofit Program* sets forth a solution to water waste and water contamination by rehabilitating distribution systems. If the contamination source drinking water in these systems can be eliminated households can reduce or eliminate their reliance on purchased water. *DAC Onsite Plumbing Retrofit* Program will include outreach with local residents by non-profit organizations that are trusted by local residents, which will help provide education about drinking water safely from the tap. The quantity and cost of bottled water purchases in the households that will be targeted by this program are unknown, thus, this benefit was not numerically determined. However, it is assumed that the benefit will be proportional to the number of households served by this program, 200 households over the 3.5 year phasing in of benefits.

R-Promote Social Health and Safety

The *DAC Outreach Program* found that 33% of DACs reported poor quality drinking water, but also reported that they drink tap water despite water quality concerns because of the cost of bottled water.[219] Considering that many respondents reported running out of purchased water, it is likely that even if DACs purchase water, they may resort to drinking poor quality drinking water from the tap when they run out. The *DAC Onsite Plumbing Retrofit* Program will help to alleviate health and safety issues associated with drinking poor-quality tap water by providing improvements that will ensure high-quality drinking water is delivered to residents. It is difficult to quantify this physical benefit because the quantity of contaminated water individual households are currently consuming is unknown.

In addition to the health and safety risks of consuming poor quality drinking water, leaks from mobile home park water distribution systems and individual unit systems can cause water ponding around high density mobile home units.[221] Standing water in Coachella Valley is an important public health concern because of the presence of West Nile Virus positive mosquito populations.[222] By eliminating leak sources, the *DAC Onsite Plumbing Retrofit Program* promotes health and safety by reducing breeding conditions for West Nile Virus vectors. The amount of standing water that will be eliminated is unknown ;therefore, the exact quantification of this physical benefit was not completed.

New Facilities, Policies, and Actions Required to Obtain Physical Benefits

No additional facilities or policies would be required to obtain the physical benefits of the *DAC Onsite Plumbing Retrofit Program*. Community organization partners, PUCDC and the Legal Counsel, will provide DAC residents with technical support for the project. The onsite labor costs will not be provided through the grant and will thus need to be borne by the residents or by the partner organizations. However, labor costs for the project are expected to be minimal because the projects are relatively small and can be decreased further if projects are grouped together by partner organizations.

Potential Physical Effects of the Project

There are no anticipated adverse physical effects from this project. There may be temporary effects associated with plumbing and fixture replacement such as digging, hauling and disposal of removed pipes; however these effects are anticipated to be minor and temporary.

[220] Carranza, S. 2014. Executive Director, PUCDC. May. Personal Communication. Available by telephone at: (760) 777-7550.
[221] Sinclair, R. 2014. Assistant Professor, Environmental and Global Health, Loma Linda University. May. Personal Communication. Available by email at: rsinclair@llu.edu.
[222] Coachella Valley Mosquito and Vector Control District. 2014. *Fight the Bite.* April. Pg. 3 (Join the Fight). Available at: http://www.cvmvcd.org/press/fight_the_bite_coachella_valley_ni.pdf.

Cost Effectiveness Analysis – DAC Onsite Plumbing Retrofit Program

The following cost effectiveness analysis was carried out for the *DAC Onsite Plumbing Retrofit Program* to evaluate whether the physical benefits provided by the project are provided at the least possible cost. The analysis summary is shown below in **Table 3-42,** which contains information on the types of benefits provided by the program, any possible project alternatives, and whether or not the program is the lowest cost alternative. No alternatives were considered for this program, because there are no alternatives that would achieve the same types and amounts of benefits described above for the project.

Table 3-42: Project Cost Effective Analysis
DAC Onsite Plumbing Retrofit Program

Project Name: *DAC Onsite Plumbing Retrofit Program*	
Question 1 Physical Benefits Summary	The program will provide drought relief benefits by reducing water waste through the provision of rebates for onsite retrofits to DACs. This will achieve the benefits summarized in **Table 3-30**, including: • Decrease water waste and prevent contamination of drinking water for DACs by 107 AFY (1,597 AF) • Decrease groundwater overdraft by 107 AFY (1,597 AF) • Avoid additional imported water supply purchases of 107 AFY (1,597 AF) • Reduce future demand for net diversions from the Bay-Delta • Local supply development to decrease vulnerabilities of 107 AFY (1,597 AF) • Prevent groundwater quality degradation • Increase water supply reliability for 200 DAC households • Reduce net production of GHGs by 102 MT CO2/year (1,525 MT CO2) • Avoid social costs of GHGs of $2,496/year ($37,440) • Decrease water use costs for DACs by 389,320 gallons per non-mobile home household and by 2,252,862 gallons per mobile home household • Avoid bottled water purchases • Promote social health and safety
Question 2 Alternatives Considered	No alternatives were considered for this program.
	No alternatives exist that achieve the same types and amounts of benefits described above. The primary alternative to this project (no-project alternative) would be to not install DAC retrofits, allow for continued water waste, and therefore continue groundwater pumping to meet demands. Under the no-project alternative none of the secondary benefits associated with offsetting imported water or providing social and water quality benefits to DACs would be achieved. Further, given the current drought that has substantially reduced imported water supplies; continued groundwater pumping would exacerbate overdraft and would worsen the drought impacts discussed in Attachment 2.[A]
Question 3 Preferred Alternative	This program is the preferred alternative, because it is the only type of project that could accrue the types and quantities of benefits provided herein, and is considered lowest-cost compared to the no-project alternative and compared to other water sources.
Comments: [A] CVWD. 2010. *Coachella Valley WMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs)	

Alternatives Considered and Least-Cost Analysis

The proposed project would achieve the primary goal of decreasing water waste and preventing contamination of drinking water for DACs through rebates to retrofit plumbing systems and replace plumbing fixtures. This program was developed as a result of the *Coachella Valley DAC Outreach Program* and input from community organizations in the Region.[223] The specific combination of rebates was determined based on need for DACs in mobile home parks, communication with community organizations, and water savings potential of the fixture replacements and retrofits.[224] This program is modeled after other similar programs such as the Santa Clara Valley Water District Mobile Home

[223] CVRWMG. 2014. *CVIRWM Plan: Volume II*. February. Pg. 35 (4.1 Water Supply).
[224] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum*. July. Pp. 4 – 6 (2 Determining Water Savings Potential).

Submetering Program and the Coachella Valley Regional Water Conservation Program, however, it is the first of its kind directed specifically at DACs in Coachella Valley and therefore does not have possible alternatives that would provide the same types of benefits.[225]

The only feasible alternative to the program would be the no-project alternative, which was evaluated in detail above (see Without Project Baseline). Under the no-project alternative, the project would not be carried out and none of the physical benefits listed under Question 1 in **Table 3-42** would be achieved. Furthermore, without the project the benefits to DACs that address the Human Right to Water Policy such as promoting social health and safety through provision of safe drinking water would not be accrued and initiatives established through the *Coachella Valley DAC Outreach Program* would not be implemented.

While no alternative projects were evaluated for comparison, alternative water sources can be compared to measures that reduce water waste (water conservation). Any other water supply source in the Region would provide benefits of in lieu recharge as provided by the *DAC Onsite Plumbing Retrofit Program,* because additional supplies would either directly or indirectly reduce groundwater pumping. The *Coachella Valley Water Management Plan 2010 Update* ranks various water sources for the Coachella Valley, including water conservation, recycled water, water transfers, and desalinated drain water. In the ranking process, the most cost-effective source is water conservation ($40/AF to $600/AF) followed by recycled water ($400/AF). Alternatively, imported water is considered a high cost water source ranging from a low of $700 per AF to a high of $1,900 per AF.[226] As such, water conservation is a proven least cost water source when compared to other possible water sources in the Coachella Valley. Furthermore, these options would likely not have targeted benefits to DACs, would not accrue the same types of ancillary benefits provided by the program, and are therefore not methods that would achieve the same types and amounts of physical benefits as identified for the proposed project.

[225] CVRWMG. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum*. July. Pg. 7 (3 Supporting Information – Implementation of Successful Programs).
[226] CVWD. 2010. *CVWMP 2010 Update*. December. Pg. 7-9 (7.2.2.3 Costs).

Appendix 3-1

Backup Documentation for Quantifiable Benefits:

The following spreadsheets were used to calculate the physical benefits discussed in the preceding technical justification. The spreadsheets correspond to the physical benefit and table number in the technical justification and are organized in the same order as the previous text. This analysis was only carried out for quantifiable physical benefits and does not include any physical benefits that were indicated as qualitative.

Indio Water Authority Recycled Water Project

Table 3-3: Primary Physical Benefit – Increase Recycled Water Use and Offset Potable Water Demand

Phase 1 Recycled Water Customers

Customer	Irrigable Area (Acres)	Average Annual Demand (AFY)
Rancho Casa Blanca Country Club and HOA	14	117
Terra Lago Golf Club	192	1,728
Posse Park	15	81
Phase 1A Total Benefit	221	1,926

Source: Indio Water Authority (IWA). 2014. *IWA Recycled Water Project – Phase 1A Project Definition Technical Memorandum* . June. Pg. 2-1 (2.1 Demands and Design Sizing Criteria, Table 3-1 Phase 1 Recycled Water Customers

Project Life	30 years
Project Completion	June 30, 2017
Benefits Accrue	July 1, 2017 - June 30, 2047

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Phase 1A Total Benefit	Annual Without Project (cumulative without project)	Phase 1A Total Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	AF
2017	50%	0	963	963	AF
2018	100%	0	1,926	1,926	AF
2019	100%	0	1,926	1,926	AF
2020	100%	0	1,926	1,926	AF
2021	100%	0	1,926	1,926	AF
2022	100%	0	1,926	1,926	AF
2023	100%	0	1,926	1,926	AF
2024	100%	0	1,926	1,926	AF
2025	100%	0	1,926	1,926	AF
2026	100%	0	1,926	1,926	AF
2027	100%	0	1,926	1,926	AF
2028	100%	0	1,926	1,926	AF
2029	100%	0	1,926	1,926	AF
2030	100%	0	1,926	1,926	AF
2031	100%	0	1,926	1,926	AF
2032	100%	0	1,926	1,926	AF
2033	100%	0	1,926	1,926	AF
2034	100%	0	1,926	1,926	AF
2035	100%	0	1,926	1,926	AF
2036	100%	0	1,926	1,926	AF
2037	100%	0	1,926	1,926	AF
2038	100%	0	1,926	1,926	AF
2039	100%	0	1,926	1,926	AF
2040	100%	0	1,926	1,926	AF
2041	100%	0	1,926	1,926	AF
2042	100%	0	1,926	1,926	AF
2043	100%	0	1,926	1,926	AF
2044	100%	0	1,926	1,926	AF
2045	100%	0	1,926	1,926	AF
2046	100%	0	1,926	1,926	AF
2047	50%	0	963	963	AF
Total = 2016 through 2047		**0 AF**	**57,780 AF**	**57,780 AF**	

Indio Water Authority Recycled Water Project

Table 3-4: Physical Benefits A-Decrease Groundwater Overdraft

Based on Primary Physical Benefit - Increase Recycled Water Use and Offset Potable Water Demand			1,926		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	AF
2017	50%	0	963	963	AF
2018	100%	0	1,926	1,926	AF
2019	100%	0	1,926	1,926	AF
2020	100%	0	1,926	1,926	AF
2021	100%	0	1,926	1,926	AF
2022	100%	0	1,926	1,926	AF
2023	100%	0	1,926	1,926	AF
2024	100%	0	1,926	1,926	AF
2025	100%	0	1,926	1,926	AF
2026	100%	0	1,926	1,926	AF
2027	100%	0	1,926	1,926	AF
2028	100%	0	1,926	1,926	AF
2029	100%	0	1,926	1,926	AF
2030	100%	0	1,926	1,926	AF
2031	100%	0	1,926	1,926	AF
2032	100%	0	1,926	1,926	AF
2033	100%	0	1,926	1,926	AF
2034	100%	0	1,926	1,926	AF
2035	100%	0	1,926	1,926	AF
2036	100%	0	1,926	1,926	AF
2037	100%	0	1,926	1,926	AF
2038	100%	0	1,926	1,926	AF
2039	100%	0	1,926	1,926	AF
2040	100%	0	1,926	1,926	AF
2041	100%	0	1,926	1,926	AF
2042	100%	0	1,926	1,926	AF
2043	100%	0	1,926	1,926	AF
2044	100%	0	1,926	1,926	AF
2045	100%	0	1,926	1,926	AF
2046	100%	0	1,926	1,926	AF
2047	50%	0	963	963	AF
Total = 2016 through 2047		**0 AF**	**57,780 AF**	**57,780 AF**	

Indio Water Authority Recycled Water Project Table 3-5: Physical Benefits B-Avoid Additional Imported Water Supply Purchases					
Based on Primary Physical Benefit - Increase Recycled Water Use and Offset Potable Water Demand			**1,926**		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	AF
2017	50%	0	963	963	AF
2018	100%	0	1,926	1,926	AF
2019	100%	0	1,926	1,926	AF
2020	100%	0	1,926	1,926	AF
2021	100%	0	1,926	1,926	AF
2022	100%	0	1,926	1,926	AF
2023	100%	0	1,926	1,926	AF
2024	100%	0	1,926	1,926	AF
2025	100%	0	1,926	1,926	AF
2026	100%	0	1,926	1,926	AF
2027	100%	0	1,926	1,926	AF
2028	100%	0	1,926	1,926	AF
2029	100%	0	1,926	1,926	AF
2030	100%	0	1,926	1,926	AF
2031	100%	0	1,926	1,926	AF
2032	100%	0	1,926	1,926	AF
2033	100%	0	1,926	1,926	AF
2034	100%	0	1,926	1,926	AF
2035	100%	0	1,926	1,926	AF
2036	100%	0	1,926	1,926	AF
2037	100%	0	1,926	1,926	AF
2038	100%	0	1,926	1,926	AF
2039	100%	0	1,926	1,926	AF
2040	100%	0	1,926	1,926	AF
2041	100%	0	1,926	1,926	AF
2042	100%	0	1,926	1,926	AF
2043	100%	0	1,926	1,926	AF
2044	100%	0	1,926	1,926	AF
2045	100%	0	1,926	1,926	AF
2046	100%	0	1,926	1,926	AF
2047	50%	0	963	963	AF
Total = 2016 through 2047		**0 AF**	**57,780 AF**	**57,780 AF**	

Indio Water Authority Recycled Water Project Table 3-6: Physical Benefits C-Reduce Future Demand for Net Diversions from the Bay-Delta					
Based on Primary Physical Benefit - Increase Recycled Water Use and Offset Potable Water Demand			1,926		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	AF
2017	50%	0	963	963	AF
2018	100%	0	1,926	1,926	AF
2019	100%	0	1,926	1,926	AF
2020	100%	0	1,926	1,926	AF
2021	100%	0	1,926	1,926	AF
2022	100%	0	1,926	1,926	AF
2023	100%	0	1,926	1,926	AF
2024	100%	0	1,926	1,926	AF
2025	100%	0	1,926	1,926	AF
2026	100%	0	1,926	1,926	AF
2027	100%	0	1,926	1,926	AF
2028	100%	0	1,926	1,926	AF
2029	100%	0	1,926	1,926	AF
2030	100%	0	1,926	1,926	AF
2031	100%	0	1,926	1,926	AF
2032	100%	0	1,926	1,926	AF
2033	100%	0	1,926	1,926	AF
2034	100%	0	1,926	1,926	AF
2035	100%	0	1,926	1,926	AF
2036	100%	0	1,926	1,926	AF
2037	100%	0	1,926	1,926	AF
2038	100%	0	1,926	1,926	AF
2039	100%	0	1,926	1,926	AF
2040	100%	0	1,926	1,926	AF
2041	100%	0	1,926	1,926	AF
2042	100%	0	1,926	1,926	AF
2043	100%	0	1,926	1,926	AF
2044	100%	0	1,926	1,926	AF
2045	100%	0	1,926	1,926	AF
2046	100%	0	1,926	1,926	AF
2047	50%	0	963	963	AF
Total = 2016 through 2047		**0 AF**	**57,780 AF**	**57,780 AF**	

Backup Documentation for Quantifiable Benefits

Indio Water Authority Recycled Water Project Table 3-7: Physical Benefits D-Increase Beneficial Use of Local Wastewater					
Based on Primary Physical Benefit - Increase Recycled Water Use and Offset Potable Water Demand			1,926		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	AF
2017	50%	0	963	963	AF
2018	100%	0	1,926	1,926	AF
2019	100%	0	1,926	1,926	AF
2020	100%	0	1,926	1,926	AF
2021	100%	0	1,926	1,926	AF
2022	100%	0	1,926	1,926	AF
2023	100%	0	1,926	1,926	AF
2024	100%	0	1,926	1,926	AF
2025	100%	0	1,926	1,926	AF
2026	100%	0	1,926	1,926	AF
2027	100%	0	1,926	1,926	AF
2028	100%	0	1,926	1,926	AF
2029	100%	0	1,926	1,926	AF
2030	100%	0	1,926	1,926	AF
2031	100%	0	1,926	1,926	AF
2032	100%	0	1,926	1,926	AF
2033	100%	0	1,926	1,926	AF
2034	100%	0	1,926	1,926	AF
2035	100%	0	1,926	1,926	AF
2036	100%	0	1,926	1,926	AF
2037	100%	0	1,926	1,926	AF
2038	100%	0	1,926	1,926	AF
2039	100%	0	1,926	1,926	AF
2040	100%	0	1,926	1,926	AF
2041	100%	0	1,926	1,926	AF
2042	100%	0	1,926	1,926	AF
2043	100%	0	1,926	1,926	AF
2044	100%	0	1,926	1,926	AF
2045	100%	0	1,926	1,926	AF
2046	100%	0	1,926	1,926	AF
2047	50%	0	963	963	AF
Total = 2016 through 2047		**0 AF**	**57,780 AF**	**57,780 AF**	

Indio Water Authority Recycled Water Project Table 3-8: Physical Benefits E-Local Supply Development to Decrease Vulnerabilities					
Based on Primary Physical Benefit - Increase Recycled Water Use and Offset Potable Water Demand			1,926		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	AF
2017	50%	0	963	963	AF
2018	100%	0	1,926	1,926	AF
2019	100%	0	1,926	1,926	AF
2020	100%	0	1,926	1,926	AF
2021	100%	0	1,926	1,926	AF
2022	100%	0	1,926	1,926	AF
2023	100%	0	1,926	1,926	AF
2024	100%	0	1,926	1,926	AF
2025	100%	0	1,926	1,926	AF
2026	100%	0	1,926	1,926	AF
2027	100%	0	1,926	1,926	AF
2028	100%	0	1,926	1,926	AF
2029	100%	0	1,926	1,926	AF
2030	100%	0	1,926	1,926	AF
2031	100%	0	1,926	1,926	AF
2032	100%	0	1,926	1,926	AF
2033	100%	0	1,926	1,926	AF
2034	100%	0	1,926	1,926	AF
2035	100%	0	1,926	1,926	AF
2036	100%	0	1,926	1,926	AF
2037	100%	0	1,926	1,926	AF
2038	100%	0	1,926	1,926	AF
2039	100%	0	1,926	1,926	AF
2040	100%	0	1,926	1,926	AF
2041	100%	0	1,926	1,926	AF
2042	100%	0	1,926	1,926	AF
2043	100%	0	1,926	1,926	AF
2044	100%	0	1,926	1,926	AF
2045	100%	0	1,926	1,926	AF
2046	100%	0	1,926	1,926	AF
2047	50%	0	963	963	AF
Total = 2016 through 2047		**0 AF**	**57,780 AF**	**57,780 AF**	

Indio Water Authority Recycled Water Project

Table 3-9: Physical Benefits H-Reduce Net Production of Greenhouse Gases (GHGs)

Use	Energy	Units
Without Project		
Convey and Treat Imported Water	2.0	MWh/AF
Pump and Treat Groundwater	0.8	MWh/AF
With Project		
Treat and Convey Recycled Water	0.8	MWh/AF
Savings of With Project over Without Project		
Difference	2.0	MWh/AF

Primary Physical Benefit (AFY)	Project Energy Savings [Savings of With Project x Primary Physical Benefit] (MWh/AF)	Average Carbon Emissions for California (MT CO2/MWh)	Project GHG Savings [Project Energy Savings x Average Carbon Emissions] (MT CO2/year)
1,926	3,852	0.341	1,314

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Physical Benefit H	Annual Without Project (cumulative without project)	Physical Benefit H x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2016	0%	0	0	0	MT CO2
2017	50%	0	657	657	MT CO2
2018	100%	0	1,314	1,314	MT CO2
2019	100%	0	1,314	1,314	MT CO2
2020	100%	0	1,314	1,314	MT CO2
2021	100%	0	1,314	1,314	MT CO2
2022	100%	0	1,314	1,314	MT CO2
2023	100%	0	1,314	1,314	MT CO2
2024	100%	0	1,314	1,314	MT CO2
2025	100%	0	1,314	1,314	MT CO2
2026	100%	0	1,314	1,314	MT CO2
2027	100%	0	1,314	1,314	MT CO2
2028	100%	0	1,314	1,314	MT CO2
2029	100%	0	1,314	1,314	MT CO2
2030	100%	0	1,314	1,314	MT CO2
2031	100%	0	1,314	1,314	MT CO2
2032	100%	0	1,314	1,314	MT CO2
2033	100%	0	1,314	1,314	MT CO2
2034	100%	0	1,314	1,314	MT CO2
2035	100%	0	1,314	1,314	MT CO2
2036	100%	0	1,314	1,314	MT CO2
2037	100%	0	1,314	1,314	MT CO2
2038	100%	0	1,314	1,314	MT CO2
2039	100%	0	1,314	1,314	MT CO2
2040	100%	0	1,314	1,314	MT CO2
2041	100%	0	1,314	1,314	MT CO2
2042	100%	0	1,314	1,314	MT CO2
2043	100%	0	1,314	1,314	MT CO2
2044	100%	0	1,314	1,314	MT CO2
2045	100%	0	1,314	1,314	MT CO2
2046	100%	0	1,314	1,314	MT CO2
2047	50%	0	657	657	MT CO2
Total = 2016 through 2047		**0 MT CO2**	**39,406 MT CO2**	**39,406 MT CO2**	

Backup Documentation for Quantifiable Benefits

Indio Water Authority Recycled Water Project

Table 3-10: Physical Benefits I-Avoid Social Costs of GHGs

Project GHG Savings (MT CO2/Year)	Social Cost of GHGs ($/MT CO2)	Social Cost of GHGs Avoided by Project [Project GHG Savings x Social Cost of GHGs]
1,314	24.55	$32,247

(a)	(b)	(c)	(d)	(e)
Year	Percent of Physical Benefit H	Annual Without Project (cumulative without project)	Physical Benefit H x (b)	Annual Change Resulting from Project (cumulative change from project)
2016	0%	0	$0	$0
2017	50%	0	$16,124	$16,124
2018	100%	0	$32,247	$32,247
2019	100%	0	$32,247	$32,247
2020	100%	0	$32,247	$32,247
2021	100%	0	$32,247	$32,247
2022	100%	0	$32,247	$32,247
2023	100%	0	$32,247	$32,247
2024	100%	0	$32,247	$32,247
2025	100%	0	$32,247	$32,247
2026	100%	0	$32,247	$32,247
2027	100%	0	$32,247	$32,247
2028	100%	0	$32,247	$32,247
2029	100%	0	$32,247	$32,247
2030	100%	0	$32,247	$32,247
2031	100%	0	$32,247	$32,247
2032	100%	0	$32,247	$32,247
2033	100%	0	$32,247	$32,247
2034	100%	0	$32,247	$32,247
2035	100%	0	$32,247	$32,247
2036	100%	0	$32,247	$32,247
2037	100%	0	$32,247	$32,247
2038	100%	0	$32,247	$32,247
2039	100%	0	$32,247	$32,247
2040	100%	0	$32,247	$32,247
2041	100%	0	$32,247	$32,247
2042	100%	0	$32,247	$32,247
2043	100%	0	$32,247	$32,247
2044	100%	0	$32,247	$32,247
2045	100%	0	$32,247	$32,247
2046	100%	0	$32,247	$32,247
2047	50%	0	$16,124	$16,124
Total = 2016 through 2047		**$0**	**$967,416**	**$967,416**

Indio Water Authority Recycled Water Project

Table 3-11: Physical Benefits J-Contribute to 20 x 2020 Goals

Indio Water Authority Base Numbers		
Primary Physical Benefit	1,926	AFY
20x2020 Goal	236	gallons per capita per day (gpcd)
20x2020 Baseline	285	gpcd
Reduction Target [20 x 2020 Baseline - 20 x 2020 Goal]	57	gpcd
2020 Population Estimate	93,115	persons

Conversion Factors		
Gal/AF	325,851	gal/AF
Days per year	365.25	day/yr
AFY to gpd conversion	892.13	gpd/AFY

Reduction from Project [Primary Physical Benefit x AFY to gpd conversion] (gpcd)	Reduction from Project per Person [Reduction from Project ÷ 2020 Population Estimate] (gpcd)	Contribution to 20x2020 Goals [Reduction from Project per Person ÷ Reduction Target]
1,718,245	18	32%

Regional Turf Reduction Program

Table 3-15: Primary Physical Benefit – Reduce Water Use through Turf Replacement

Sector	Irrigable Area (Acres)	Annual Water Savings Per Unit Area	Total Annual Savings (gallons/year) [Irrigable Area x Annual Water Savings Per Unit Area]	Total Annual Savings (AFY)
Golf	100 Acres	5 AF/Acre	-	500
Residential	150,000 Square Feet (sqft)	55.8 gallons/sqft	8,370,000	26
Commercial	150,000 sqft	55.8 gal/sqft	8,370,000	26
Municipal	900,000 sqft	55.8 gal/sqft	50,220,000	154
Multi-Family	100,000 sqft	55.8 gal/sqft	5,580,000	17
Total Benefit	5,656,000 sqft	-	-	723

Annual Water Savings Per Unit Area Source:
Golf - Reyes, Patti. 2014. Coachella Valley Water District Programs Manager. Personal Communication.
Residential / Commercial / Municipal / Multi-Family - Southern Nevada Water Authority. 2005. *Xeriscape Conversion Study: Final Report*. Pg. 60

Project Life	20 years
Project Completion	December 31, 2019
Benefits Start to Accrue	January 1, 2015
Full Benefits Realized	January 1, 2020

Benefits Phasing	
Year	Percent
2015 & 2039	10%
2016 & 2038	30%
2017 & 2037	50%
2018 & 2036	70%
2019 & 2035	90%
2020 -- 2034	100%

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Total Benefit	Annual Without Project (cumulative without project)	Total Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	10%	0	72	72	AF
2016	30%	0	217	217	AF
2017	50%	0	361	361	AF
2018	70%	0	506	506	AF
2019	90%	0	650	650	AF
2020	100%	0	723	723	AF
2021	100%	0	723	723	AF
2022	100%	0	723	723	AF
2023	100%	0	723	723	AF
2024	100%	0	723	723	AF
2025	100%	0	723	723	AF
2026	100%	0	723	723	AF
2027	100%	0	723	723	AF
2028	100%	0	723	723	AF
2029	100%	0	723	723	AF
2030	100%	0	723	723	AF
2031	100%	0	723	723	AF
2032	100%	0	723	723	AF
2033	100%	0	723	723	AF
2034	100%	0	723	723	AF
2035	90%	0	650	650	AF
2036	70%	0	506	506	AF
2037	50%	0	361	361	AF
2038	30%	0	217	217	AF
2039	10%	0	72	72	AF
Total = 2014 through 2039		**0 AF**	**14,452 AF**	**14,452 AF**	

Regional Turf Reduction Program

Table 3-16: Physical Benefits A-Decrease Groundwater Overdraft

Based on Primary Physical Benefit - Reduce Water Use through Turf Replacement			723		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	10%	0	72	72	AF
2016	30%	0	217	217	AF
2017	50%	0	361	361	AF
2018	70%	0	506	506	AF
2019	90%	0	650	650	AF
2020	100%	0	723	723	AF
2021	100%	0	723	723	AF
2022	100%	0	723	723	AF
2023	100%	0	723	723	AF
2024	100%	0	723	723	AF
2025	100%	0	723	723	AF
2026	100%	0	723	723	AF
2027	100%	0	723	723	AF
2028	100%	0	723	723	AF
2029	100%	0	723	723	AF
2030	100%	0	723	723	AF
2031	100%	0	723	723	AF
2032	100%	0	723	723	AF
2033	100%	0	723	723	AF
2034	100%	0	723	723	AF
2035	90%	0	650	650	AF
2036	70%	0	506	506	AF
2037	50%	0	361	361	AF
2038	30%	0	217	217	AF
2039	10%	0	72	72	AF
Total = 2014 through 2039		**0 AF**	**14,452 AF**	**14,452 AF**	

Regional Turf Reduction Program

Table 3-17: Physical Benefits B-Avoid Additional Imported Water Supply Purchases

Based on Primary Physical Benefit - Reduce Water Use through Turf Replacement			723		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	10%	0	72	72	AF
2016	30%	0	217	217	AF
2017	50%	0	361	361	AF
2018	70%	0	506	506	AF
2019	90%	0	650	650	AF
2020	100%	0	723	723	AF
2021	100%	0	723	723	AF
2022	100%	0	723	723	AF
2023	100%	0	723	723	AF
2024	100%	0	723	723	AF
2025	100%	0	723	723	AF
2026	100%	0	723	723	AF
2027	100%	0	723	723	AF
2028	100%	0	723	723	AF
2029	100%	0	723	723	AF
2030	100%	0	723	723	AF
2031	100%	0	723	723	AF
2032	100%	0	723	723	AF
2033	100%	0	723	723	AF
2034	100%	0	723	723	AF
2035	90%	0	650	650	AF
2036	70%	0	506	506	AF
2037	50%	0	361	361	AF
2038	30%	0	217	217	AF
2039	10%	0	72	72	AF
Total = 2014 through 2039		**0 AF**	**14,452 AF**	**14,452 AF**	

Regional Turf Reduction Program

Table 3-18: Physical Benefits C-Reduce Future Demand for Net Diversions from the Bay-Delta

Based on Primary Physical Benefit - Reduce Water Use through Turf Replacement			723		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	10%	0	72	72	AF
2016	30%	0	217	217	AF
2017	50%	0	361	361	AF
2018	70%	0	506	506	AF
2019	90%	0	650	650	AF
2020	100%	0	723	723	AF
2021	100%	0	723	723	AF
2022	100%	0	723	723	AF
2023	100%	0	723	723	AF
2024	100%	0	723	723	AF
2025	100%	0	723	723	AF
2026	100%	0	723	723	AF
2027	100%	0	723	723	AF
2028	100%	0	723	723	AF
2029	100%	0	723	723	AF
2030	100%	0	723	723	AF
2031	100%	0	723	723	AF
2032	100%	0	723	723	AF
2033	100%	0	723	723	AF
2034	100%	0	723	723	AF
2035	90%	0	650	650	AF
2036	70%	0	506	506	AF
2037	50%	0	361	361	AF
2038	30%	0	217	217	AF
2039	10%	0	72	72	AF
Total = 2014 through 2039		**0 AF**	**14,452 AF**	**14,452 AF**	

Regional Turf Reduction Program Table 3-19: Physical Benefits E-Local Supply Development to Decrease Vulnerabilities					
Based on Primary Physical Benefit - Reduce Water Use through Turf Replacement			723		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	10%	0	72	72	AF
2016	30%	0	217	217	AF
2017	50%	0	361	361	AF
2018	70%	0	506	506	AF
2019	90%	0	650	650	AF
2020	100%	0	723	723	AF
2021	100%	0	723	723	AF
2022	100%	0	723	723	AF
2023	100%	0	723	723	AF
2024	100%	0	723	723	AF
2025	100%	0	723	723	AF
2026	100%	0	723	723	AF
2027	100%	0	723	723	AF
2028	100%	0	723	723	AF
2029	100%	0	723	723	AF
2030	100%	0	723	723	AF
2031	100%	0	723	723	AF
2032	100%	0	723	723	AF
2033	100%	0	723	723	AF
2034	100%	0	723	723	AF
2035	90%	0	650	650	AF
2036	70%	0	506	506	AF
2037	50%	0	361	361	AF
2038	30%	0	217	217	AF
2039	10%	0	72	72	AF
Total = 2014 through 2039		**0 AF**	**14,452 AF**	**14,452 AF**	

Regional Turf Reduction Program

Table 3-20: Physical Benefits H-Reduce Net Production of Greenhouse Gases

Use	Energy	Units
Without Project		
Convey and Treat Imported Water	2.0	MWh/AF
Pump and Treat Groundwater	0.8	MWh/AF
With Project		
Conserve Water	0	MWh/AF
Savings of With Project over Without Project		
Difference	2.8	MWh/AF

Primary Physical Benefit (AFY)	Project Energy Savings [Savings of With Project x Primary Physical Benefit] (MWh/AF)	Average Carbon Emissions for California (MT CO2/MWh)	Project GHG Savings [Project Energy Savings x Average Carbon Emissions] (MT CO2/year)
723	2,023	0.341	690

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Physical Benefit H	Annual Without Project (cumulative without project)	Physical Benefit H x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	MT CO2
2015	10%	0	69	69	MT CO2
2016	30%	0	207	207	MT CO2
2017	50%	0	345	345	MT CO2
2018	70%	0	483	483	MT CO2
2019	90%	0	621	621	MT CO2
2020	100%	0	690	690	MT CO2
2021	100%	0	690	690	MT CO2
2022	100%	0	690	690	MT CO2
2023	100%	0	690	690	MT CO2
2024	100%	0	690	690	MT CO2
2025	100%	0	690	690	MT CO2
2026	100%	0	690	690	MT CO2
2027	100%	0	690	690	MT CO2
2028	100%	0	690	690	MT CO2
2029	100%	0	690	690	MT CO2
2030	100%	0	690	690	MT CO2
2031	100%	0	690	690	MT CO2
2032	100%	0	690	690	MT CO2
2033	100%	0	690	690	MT CO2
2034	100%	0	690	690	MT CO2
2035	90%	0	621	621	MT CO2
2036	70%	0	483	483	MT CO2
2037	50%	0	345	345	MT CO2
2038	30%	0	207	207	MT CO2
2039	10%	0	69	69	MT CO2
Total = 2014 through 2039		**0 MT CO2**	**13,799 MT CO2**	**13,799 MT CO2**	

Backup Documentation for Quantifiable Benefits

Regional Turf Reduction Program

Table 3-21: Physical Benefits I-Avoid Social Costs of GHGs

Project GHG Savings (MT CO2/Year)	Social Cost of Carbon ($/MT CO2)	Social Costs of GHGs Avoided by Project [Project GHG Savings x Social Cost of Carbon]
690	24.55	$16,938

(a)	(b)	(c)	(d)	(e)
Year	Percent of Physical Benefit H	Annual Without Project (cumulative without project)	Physical Benefit H x (b)	Annual Change Resulting from Project (cumulative change from project)
2014	0%	0	$0	$0
2015	10%	0	$1,694	$1,694
2016	30%	0	$5,082	$5,082
2017	50%	0	$8,469	$8,469
2018	70%	0	$11,857	$11,857
2019	90%	0	$15,245	$15,245
2020	100%	0	$16,938	$16,938
2021	100%	0	$16,938	$16,938
2022	100%	0	$16,938	$16,938
2023	100%	0	$16,938	$16,938
2024	100%	0	$16,938	$16,938
2025	100%	0	$16,938	$16,938
2026	100%	0	$16,938	$16,938
2027	100%	0	$16,938	$16,938
2028	100%	0	$16,938	$16,938
2029	100%	0	$16,938	$16,938
2030	100%	0	$16,938	$16,938
2031	100%	0	$16,938	$16,938
2032	100%	0	$16,938	$16,938
2033	100%	0	$16,938	$16,938
2034	100%	0	$16,938	$16,938
2035	90%	0	$15,245	$15,245
2036	70%	0	$11,857	$11,857
2037	50%	0	$8,469	$8,469
2038	30%	0	$5,082	$5,082
2039	10%	0	$1,694	$1,694
Total = 2014 through 2039		**$0**	**$338,768**	**$338,768**

Regional Turf Reduction Program

Table 3-22: Physical Benefits J-Contribute to 20 x 2020 Goals

Coachella Valley Water District Base Numbers		
Primary Physical Benefit	723	AFY
20x2020 Goal	473	gallons per capita per day (gpcd)
20x2020 Baseline	591	gpcd
Reduction Target [20 x 2020 Baseline - 20 x 2020 Goal]	118	gpcd
Coachella Valley 2020 Population Estimate	601,555	persons

Conversion Factors		
Gal/AF	325,851	gal/AF
Days per year	365.25	day/yr
AFY to gpd conversion	892.13	gpd/AFY

Reduction from Project [Primary Physical Benefit x AFY to gpd conversion] (gpcd)	Reduction from Project per Person [Reduction from Project ÷ 2020 Population Estimate] gpcd	Contribution to 20x2020 Goals [Reduction from Project per Person ÷ Reduction Target]
644,669	1.1	1%

Regional Turf Reduction Program

Table 3-23: Physical Benefits L-Reduce Need for Fertilizer and/or Pesticide Application

Sector	Turf Reduction	Turf Reduction (acres)
Golf	100 Acres	100
Residential	150,000 Square Feet (sqft)	3.4
Commercial	150,000 sqft	3.4
Municipal	900,000 sqft	20.7
Multi-Family	100,000 sqft	2.3
Total Benefit	-	130

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Total Benefit	Annual Without Project (cumulative without project)	Total Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	acres of application
2015	10%	0	13	13	acres of application
2016	30%	0	39	39	acres of application
2017	50%	0	65	65	acres of application
2018	70%	0	91	91	acres of application
2019	90%	0	117	117	acres of application
2020	100%	0	130	130	acres of application
2021	100%	0	130	130	acres of application
2022	100%	0	130	130	acres of application
2023	100%	0	130	130	acres of application
2024	100%	0	130	130	acres of application
2025	100%	0	130	130	acres of application
2026	100%	0	130	130	acres of application
2027	100%	0	130	130	acres of application
2028	100%	0	130	130	acres of application
2029	100%	0	130	130	acres of application
2030	100%	0	130	130	acres of application
2031	100%	0	130	130	acres of application
2032	100%	0	130	130	acres of application
2033	100%	0	130	130	acres of application
2034	100%	0	130	130	acres of application
2035	90%	0	117	117	acres of application
2036	70%	0	91	91	acres of application
2037	50%	0	65	65	acres of application
2038	30%	0	39	39	acres of application
2039	10%	0	13	13	acres of application
Total = 2014 through 2039		0 acres of application	2,597 acres of application	2,597 acres of application	

Backup Documentation for Quantifiable Benefits

Regional Turf Reduction Program Table 3-24: Physical Benefits O-Reduce Production of Green Waste			
Reduce Production of Green Waste		8.9% to 13.5% per household	
(a)	(c)	(e)	(f)
Year	Annual Without Project	Annual With Project	Annual Change Resulting from Project
2014	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2015	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2016	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2017	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2018	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2019	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2020	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2021	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2022	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2023	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2024	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2025	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2026	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2027	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2028	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2029	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2030	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2031	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2032	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2033	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2034	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2035	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2036	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2037	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2038	0	8.9% to 13.5% per household	8.9% to 13.5% per household
2039	0	8.9% to 13.5% per household	8.9% to 13.5% per household

DAC Onsite Plumbing Retrofit Program

Table 3-31: Primary Physical Benefit – Decrease Water Waste and Prevent Contamination of Drinking Water for DACs

Project Component	Total Savings Per Day Per Household (Gallons)	Total Annual Savings Per Household (Gallons)	Number of Households	Total Annual Savings (AFY)
Non-Mobile Home Indoor Replacement	71	25,955	180	14.3
Mobile Home Indoor Replacement	215	78,529	200	48.2
Distribution System Repairs	153	55,883	200	34.3
Individual Unit Repairs	43	15,779	200	9.7
Total Benefit	-	-	380	107

Source: Coachella Valley Regional Water Management Group. 2014. *Coachella Valley IRWM Program: DAC Onsite Plumbing Retrofit Program Technical Memorandum.* Pg. 6 (Program Savings).

Project Life	15 years
Project Completion	June 30, 2018
Benefits Start to Accrue	January 1, 2015
Full Benefits Realized	July 1, 2018

Benefits Phasing			
Year	Percent	Year	Percent
2015	15%	2030	85%
2016	45%	2031	55%
2017	75%	2032	25%
2018	94%	2033	6%
2019 -- 2029	100%	2034	0%

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Total Benefit	Annual Without Project (cumulative without project)	Total Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	15%	0	16	16	AF
2016	45%	0	48	48	AF
2017	75%	0	80	80	AF
2018	94%	0	100	100	AF
2019	100%	0	107	107	AF
2020	100%	0	107	107	AF
2021	100%	0	107	107	AF
2022	100%	0	107	107	AF
2023	100%	0	107	107	AF
2024	100%	0	107	107	AF
2025	100%	0	107	107	AF
2026	100%	0	107	107	AF
2027	100%	0	107	107	AF
2028	100%	0	107	107	AF
2029	100%	0	107	107	AF
2030	85%	0	91	91	AF
2031	55%	0	59	59	AF
2032	25%	0	27	27	AF
2033	6%	0	7	7	AF
Total = 2014 through 2033		0 AF	1,598 AF	1,598 AF	

DAC Onsite Plumbing Retrofit Program

Table 3-32: Physical Benefits A-Decrease Groundwater Overdraft

Based on Primary Physical Benefit - Decrease Water Waste and Prevent Contamination of Drinking Water for DACs			107		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	15%	0	16	16	AF
2016	45%	0	48	48	AF
2017	75%	0	80	80	AF
2018	94%	0	100	100	AF
2019	100%	0	107	107	AF
2020	100%	0	107	107	AF
2021	100%	0	107	107	AF
2022	100%	0	107	107	AF
2023	100%	0	107	107	AF
2024	100%	0	107	107	AF
2025	100%	0	107	107	AF
2026	100%	0	107	107	AF
2027	100%	0	107	107	AF
2028	100%	0	107	107	AF
2029	100%	0	107	107	AF
2030	85%	0	91	91	AF
2031	55%	0	59	59	AF
2032	25%	0	27	27	AF
2033	6%	0	7	7	AF
Total = 2014 through 2033		**0 AF**	**1,598 AF**	**1,598 AF**	

DAC Onsite Plumbing Retrofit Program Table 3-33: Physical Benefits B-Avoid Additional Imported Water Supply Purchases					
Based on Primary Physical Benefit - Decrease Water Waste and Prevent Contamination of Drinking Water for DACs			107		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	15%	0	16	16	AF
2016	45%	0	48	48	AF
2017	75%	0	80	80	AF
2018	94%	0	100	100	AF
2019	100%	0	107	107	AF
2020	100%	0	107	107	AF
2021	100%	0	107	107	AF
2022	100%	0	107	107	AF
2023	100%	0	107	107	AF
2024	100%	0	107	107	AF
2025	100%	0	107	107	AF
2026	100%	0	107	107	AF
2027	100%	0	107	107	AF
2028	100%	0	107	107	AF
2029	100%	0	107	107	AF
2030	85%	0	91	91	AF
2031	55%	0	59	59	AF
2032	25%	0	27	27	AF
2033	6%	0	7	7	AF
Total = 2014 through 2033		**0 AF**	**1,598 AF**	**1,598 AF**	

DAC Onsite Plumbing Retrofit Program Table 3-34: Physical Benefits C-Reduce Future Demand for Net Diversions from the Bay-Delta					
Based on Primary Physical Benefit - Decrease Water Waste and Prevent Contamination of Drinking Water for DACs			107		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	15%	0	16	16	AF
2016	45%	0	48	48	AF
2017	75%	0	80	80	AF
2018	94%	0	100	100	AF
2019	100%	0	107	107	AF
2020	100%	0	107	107	AF
2021	100%	0	107	107	AF
2022	100%	0	107	107	AF
2023	100%	0	107	107	AF
2024	100%	0	107	107	AF
2025	100%	0	107	107	AF
2026	100%	0	107	107	AF
2027	100%	0	107	107	AF
2028	100%	0	107	107	AF
2029	100%	0	107	107	AF
2030	85%	0	91	91	AF
2031	55%	0	59	59	AF
2032	25%	0	27	27	AF
2033	6%	0	7	7	AF
Total = 2014 through 2033		**0 AF**	**1,598 AF**	**1,598 AF**	

DAC Onsite Plumbing Retrofit Program Table 3-35: Physical Benefits E-Local Supply Development to Decrease Vulnerabilities					
Based on Primary Physical Benefit - Decrease Water Waste and Prevent Contamination of Drinking Water for DACs			107		
(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Primary Physical Benefit x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	AF
2015	15%	0	16	16	AF
2016	45%	0	48	48	AF
2017	75%	0	80	80	AF
2018	94%	0	100	100	AF
2019	100%	0	107	107	AF
2020	100%	0	107	107	AF
2021	100%	0	107	107	AF
2022	100%	0	107	107	AF
2023	100%	0	107	107	AF
2024	100%	0	107	107	AF
2025	100%	0	107	107	AF
2026	100%	0	107	107	AF
2027	100%	0	107	107	AF
2028	100%	0	107	107	AF
2029	100%	0	107	107	AF
2030	85%	0	91	91	AF
2031	55%	0	59	59	AF
2032	25%	0	27	27	AF
2033	6%	0	7	7	AF
Total = 2014 through 2033		**0 AF**	**1,598 AF**	**1,598 AF**	

DAC Onsite Plumbing Retrofit Program

Table 3-36: Physical Benefits G-Increase Water Supply Reliability for DACs

Number of Households Receiving Plumbing System Rebates
200

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Primary Physical Benefit	Annual Without Project (cumulative without project)	Number of Households Receiving Plumbing System Rebates x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	Households
2015	15%	0	30	30	Households
2016	30%	0	60	60	Households
2017	30%	0	60	60	Households
2018	25%	0	50	50	Households
Total		**0 Households**	**200 Households**	**200 Households**	

DAC Onsite Plumbing Retrofit Program

Table 3-37: Physical Benefits H-Reduce Net Production of Greenhouse Gases

Use	Energy	Units
Without Project		
Convey and Treat Imported Water	2.0	MWh/AF
Pump and Treat Groundwater	0.8	MWh/AF
With Project		
Conserve Water	0	MWh/AF
Savings of With Project over Without Project		
Difference	2.8	MWh/AF

Primary Physical Benefit (AFY)	Project Energy Savings [Savings of With Project x Primary Physical Benefit] (MWh/AF)	Average Carbon Emissions for California (MT CO2/MWh)	Project GHG Savings [Project Energy Savings x Average Carbon Emissions] (MT CO2/year)
107	298	0.341	102

(a)	(b)	(c)	(d)	(e)	(f)
Year	Percent of Physical Benefit H	Annual Without Project (cumulative without project)	Physical Benefit H x (b)	Annual Change Resulting from Project (cumulative change from project)	Units
2014	0%	0	0	0	MT CO2
2015	15%	0	15	15	MT CO2
2016	45%	0	46	46	MT CO2
2017	75%	0	76	76	MT CO2
2018	94%	0	95	95	MT CO2
2019	100%	0	102	102	MT CO2
2020	100%	0	102	102	MT CO2
2021	100%	0	102	102	MT CO2
2022	100%	0	102	102	MT CO2
2023	100%	0	102	102	MT CO2
2024	100%	0	102	102	MT CO2
2025	100%	0	102	102	MT CO2
2026	100%	0	102	102	MT CO2
2027	100%	0	102	102	MT CO2
2028	100%	0	102	102	MT CO2
2029	100%	0	102	102	MT CO2
2030	85%	0	86	86	MT CO2
2031	55%	0	56	56	MT CO2
2032	25%	0	25	25	MT CO2
2033	6%	0	6	6	MT CO2
Total = 2014 through 2033		**0 MT CO2**	**1,525 MT CO2**	**1,525 MT CO2**	

DAC Onsite Plumbing Retrofit Program

Table 3-38: Physical Benefits I-Avoid Social Costs of Greenhouse Gases

Project GHG Savings (MT CO2/Year)	Social Cost of Carbon ($/MT CO2)	Social Costs of GHGs Avoided by Project [Project GHG Savings x Social Cost of Carbon]
102	**24.55**	**$2,497**

(a)	(b)	(c)	(d)	(e)
Year	**Percent of Physical Benefit H**	**Annual Without Project (cumulative without project)**	**Physical Benefit H x (b)**	**Annual Change Resulting from Project (cumulative change from project)**
2014	0%	0	$0	$0
2015	15%	0	$374	$374
2016	45%	0	$1,123	$1,123
2017	75%	0	$1,872	$1,872
2018	94%	0	$2,341	$2,341
2019	100%	0	$2,497	$2,497
2020	100%	0	$2,497	$2,497
2021	100%	0	$2,497	$2,497
2022	100%	0	$2,497	$2,497
2023	100%	0	$2,497	$2,497
2024	100%	0	$2,497	$2,497
2025	100%	0	$2,497	$2,497
2026	100%	0	$2,497	$2,497
2027	100%	0	$2,497	$2,497
2028	100%	0	$2,497	$2,497
2029	100%	0	$2,497	$2,497
2030	85%	0	$2,122	$2,122
2031	55%	0	$1,373	$1,373
2032	25%	0	$624	$624
2033	6%	0	$156	$156
Total = 2014 through 2033		**$0**	**$37,449**	**$37,449**

DAC Onsite Plumbing Retrofit Program

Table 3-39: Physical Benefits P-Decrease Water Use Costs for DACs

Project Component		Total Savings Per Day Per Household (Gallons)	Total Annual Savings (Gallons per Household (gph))
Non-Mobile Home	Indoor Replacement	71.1	25,955
Mobile Home	Indoor Replacement	215	78,529
	Distribution System Repairs	153	55,883
	Individual Unit Repairs	43	15,779
	Total	411	150,191

(a) Household Type	(b) Year	(c) Percent of Total Benefit	(d) Annual Without Project (cumulative without project)	(e) Total Benefit x (b)	(f) Annual Change Resulting from Project (cumulative change from project)	(g) Units
Non-Mobile Home	2014	0%	0	0	0	AF
	2015	15%	0	3,893	3,893	AF
	2016	45%	0	11,680	11,680	AF
	2017	75%	0	19,466	19,466	AF
	2018	94%	0	24,332	24,332	AF
	2019	100%	0	25,955	25,955	AF
	2020	100%	0	25,955	25,955	AF
	2021	100%	0	25,955	25,955	AF
	2022	100%	0	25,955	25,955	AF
	2023	100%	0	25,955	25,955	AF
	2024	100%	0	25,955	25,955	AF
	2025	100%	0	25,955	25,955	AF
	2026	100%	0	25,955	25,955	AF
	2027	100%	0	25,955	25,955	AF
	2028	100%	0	25,955	25,955	AF
	2029	100%	0	25,955	25,955	AF
	2030	85%	0	22,061	22,061	AF
	2031	55%	0	14,275	14,275	AF
	2032	25%	0	6,489	6,489	AF
	2033	6%	0	1,622	1,622	AF
	Total = 2014 through 2033		**0 gph**	**389,320 gph**	**389,320 gph**	
Mobile Home	2014	0%	0	0	0	AF
	2015	15%	0	22,529	22,529	AF
	2016	45%	0	67,586	67,586	AF
	2017	75%	0	112,643	112,643	AF
	2018	94%	0	140,804	140,804	AF
	2019	100%	0	150,191	150,191	AF
	2020	100%	0	150,191	150,191	AF
	2021	100%	0	150,191	150,191	AF
	2022	100%	0	150,191	150,191	AF
	2023	100%	0	150,191	150,191	AF
	2024	100%	0	150,191	150,191	AF
	2025	100%	0	150,191	150,191	AF
	2026	100%	0	150,191	150,191	AF
	2027	100%	0	150,191	150,191	AF
	2028	100%	0	150,191	150,191	AF
	2029	100%	0	150,191	150,191	AF
	2030	85%	0	127,662	127,662	AF
	2031	55%	0	82,605	82,605	AF
	2032	25%	0	37,548	37,548	AF
	2033	6%	0	9,387	9,387	AF
	Total = 2014 through 2033		**0 gph**	**2,252,862 gph**	**2,252,862 gph**	

Appendix 3-2

Technical Memorandum:

Indio Water Authority Recycled Water Project – Phase 1A Project Definition

Technical Memorandum

Indio Water Authority Recycled Water Project

Subject: **Phase 1A Project Definition**

Prepared For: Indio Water Authority

Prepared by: Marc Nakamoto, P.E.

Reviewed by: Rosalyn Prickett and Rich Bichette, P.E.

Date: July 9, 2014

Reference: 0574-002

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Appendices

Appendix A – Detailed Cost Estimate
Appendix B – Cost Estimates for Alternate Options

List of Abbreviations

AACE	Association for the Advancement of Cost Engineering
AF	Acre-Feet
AFY	Acre-Feet per Year
ASR	Aquifer Storage and Recovery
DPH	Department of Public Health
CEQA	California Environmental Quality Act
CUP	Conditional Use Permit
CVRWMG	Coachella Valley Regional Water Management Group
CVWD	Coachella Valley Water District
DAC	Disadvantaged Community
DWR	California Department of Water Resources
EA	Each
EIR	Environmental Impact Report
ENR CCI	Engineering News Record Construction Cost Index
FPS	Feet per Second
FT	Feet
GPD	Gallons per Day
GPM	Gallons per Minute
HOA	Home Owners Association
HP	Horsepower
IN	Inch
IRWM	Integrated Regional Water Management
IWA	Indio Water Authority
JPA	Joint Powers Authority
LF	Lineal Feet
MG	Million Gallons
MGD	Million Gallons per Day
MSL	Mean Sea Level
OWTS	On-Site Wastewater Treatment Systems
PSI	Pounds per Square Inch
RFP	Request for Proposals
RFQ	Request for Qualifications
RWMP	Recycled Water Master Plan (Indio Water Authority)
RWQCB	Regional Water Quality Control Board
SRF	State Revolving Fund
SWRCB	State Water Resource Control Board
TM	Technical Memorandum
VSD	Valley Sanitation District
WWTP	Wastewater Treatment Plant

1 Introduction and Background

This chapter presents the project background and purpose, and the scope of this study.

1.1 Project Background and Purpose

Indio Water Authority (IWA), in collaboration with Valley Sanitary District (VSD), has developed a strategic goal of reclaiming wastewater for use as recycled water to reduce demand for potable water resources and to recharge the groundwater aquifer beneath IWA's service area. Tertiary treated recycled water can be distributed to large landscape irrigation customers. Construction of a recycled water distribution system will offset potable water demand currently served by the over-drafted groundwater basin and prepare for groundwater recharge. IWA is currently seeking IRWM Proposition 84 Drought Relief Funding to assist in funding construction of the project.

Development of a recycled water distribution system will require construction of a distribution system to deliver the water to existing and future customers. The improvements will be phased as identified in the *2011 Recycled Water Master Plan*, which was based on the phasing plan identified in VSD's *Wastewater Treatment Plant Master Plan*. Figure 1-1 shows the proposed recycled water capital improvement program (CIP) from the *2011 Recycled Water Master Plan*. The improvements are broken down into two phases:

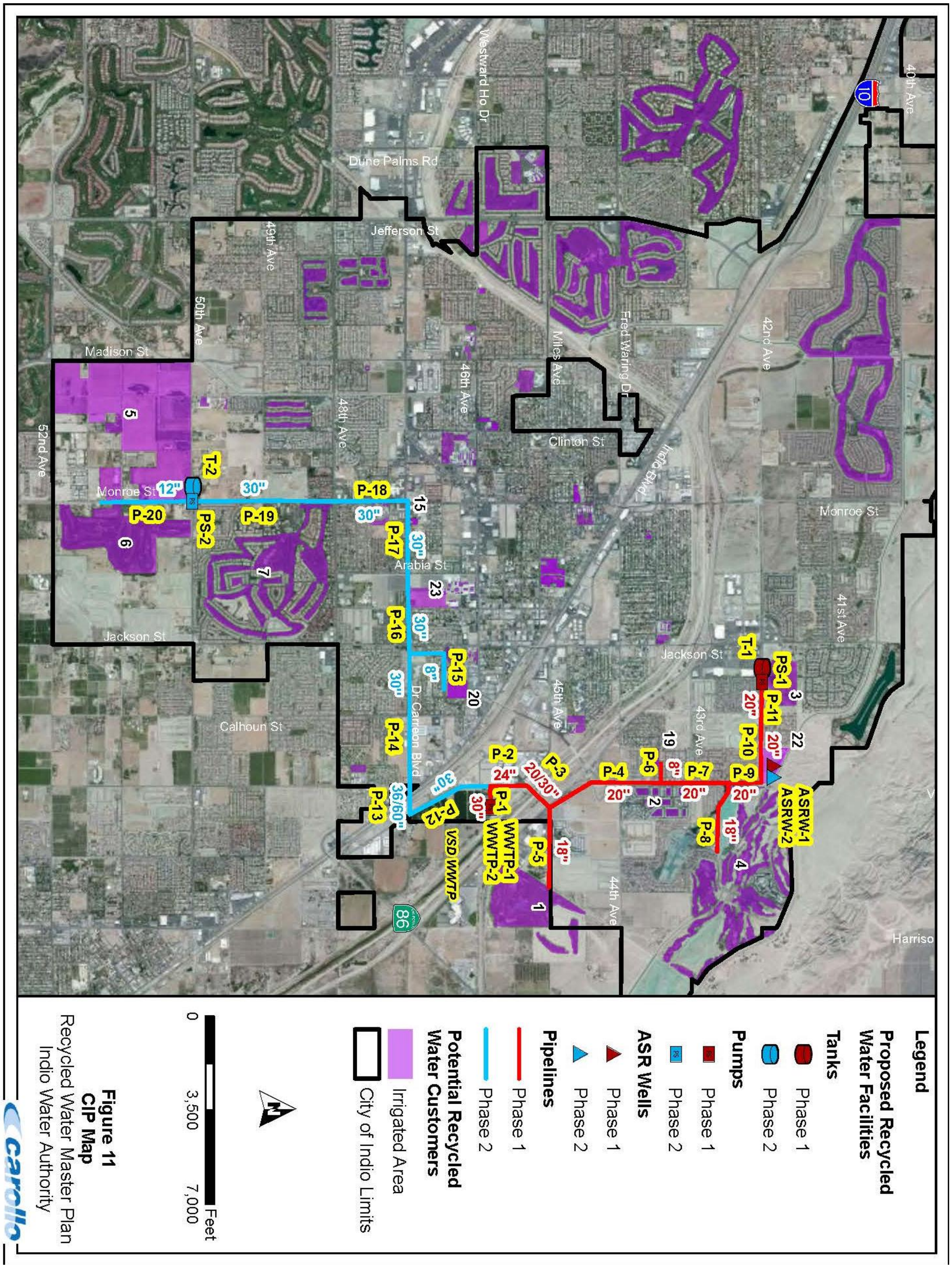
- Phase 1 Near-Term (Years 2011 through 2025)
- Phase 2 Build-Out (Years 2026 through 2040)

This technical memorandum (TM) presents a smaller "Phase 1A" project to deliver recycled water to existing customers in the vicinity of the VSD wastewater treatment plant (WWTP). The Phase 1A project includes recycled water treatment facilities and the backbone of the recycled water distribution system, including an essential pipeline that would deliver recycled water to future injection wells for groundwater recharge. The Phase 1A project would serve an estimated 1,930 acre-feet per year (AFY) of recycled water to roadway medians, home owners associations (HOAs), golf courses, and park facilities. Future phases will include branches off of the backbone distribution system to connect the remainder of customers and facilitate groundwater replenishment.

1.2 Scope of Study

The scope of this study includes definition of the Phase 1A project, including identifying recycled water demands and distribution pipelines, and identifying recycled water treatment, storage and pumping needs to serve a reduced customer base than the *2011 Recycled Water Master Plan* Phase 1 project. Cost estimates for the Phase 1A project were developed and a detailed implementation plan was established.

Figure 1-1: Capital Improvement Plan (CIP) Map from *2011 Recycled Water Master Plan*



1.3 Study Area and Setting

This chapter provides a description of the Study Area and conditions within the Study Area that have an impact on the recycled water project, primarily as an alternative supply to local groundwater.

1.4 Study Area Location

The proposed recycled water project is located within the Indio Water Authority (IWA) service area (Study Area), shown in Figure 1-2. IWA's service area is 38 square miles and IWA supplies approximately 24,900 AFY of water to an estimated 75,000 businesses and residents in the City of Indio in 2010 (CVRWMG 2014). Valley Sanitary District (VSD) operates an 11.0-million gallon per day (MGD) capacity WWTP that services the majority of IWA customers and discharges approximately 6.3 MGD of effluent to the Coachella Valley Stormwater Channel.

The Coachella Valley is geologically divided into the West Valley and the East Valley. The boundary between the East Valley and West Valley extends from Washington Street and Point Happy northeast to the Indio Hills near Jefferson Street. Generally, the West Valley, which includes the cities of Palm Springs, Cathedral City, Rancho Mirage, Indian Wells and Palm Desert, is contained within the service areas of Mission Springs Water District, Desert Water Agency, or Coachella Valley Water District, and residents within this area receive municipal water and wastewater services. The East Valley, which includes the cities of Coachella, Indio, and La Quinta and the communities of Mecca, Oasis and Thermal (located within unincorporated Riverside County), is lower in population density. Portions of the East Valley are provided water and wastewater services by IWA, Coachella Valley Water District, Coachella Water Authority, and VSD.

1.5 Groundwater Conditions

The Coachella Valley Groundwater Basin encompasses much of the Coachella Valley floor. Geologic faults and structures divide the basin into five sub-basins. Two of the sub-basins, Whitewater River (also referred to as Indio) and Desert Hot Springs, fall within the project Study Area. The locations of these groundwater sub-basins are shown in Figure 1-3.

The Indio/Whitewater River Subbasin is the largest groundwater sub-basin in the Coachella Valley, and is the sub-basin that IWA pumps from for potable water supply. The sub-basin has a storage capacity of approximately 40 million acre-feet (AF) (DWR, 1964). The geology of the basin varies with coarse-grained sediments located in the vicinity of Whitewater and Palm Springs (West Valley), gradually transitioning to fine-grained sediments near the Salton Sea (East Valley). Development of the proposed recycled water project would offset pumping of groundwater supply to serve multiple large irrigators within the Study Area. In accordance with the *2010 Coachella Valley Water Management Plan* and the *2011 Recycled Water Master Plan,* implementation of recycled water will reduce continued overdraft of the Indio/Whitewater River Subbasin.

Figure 1-2: Project Study Area

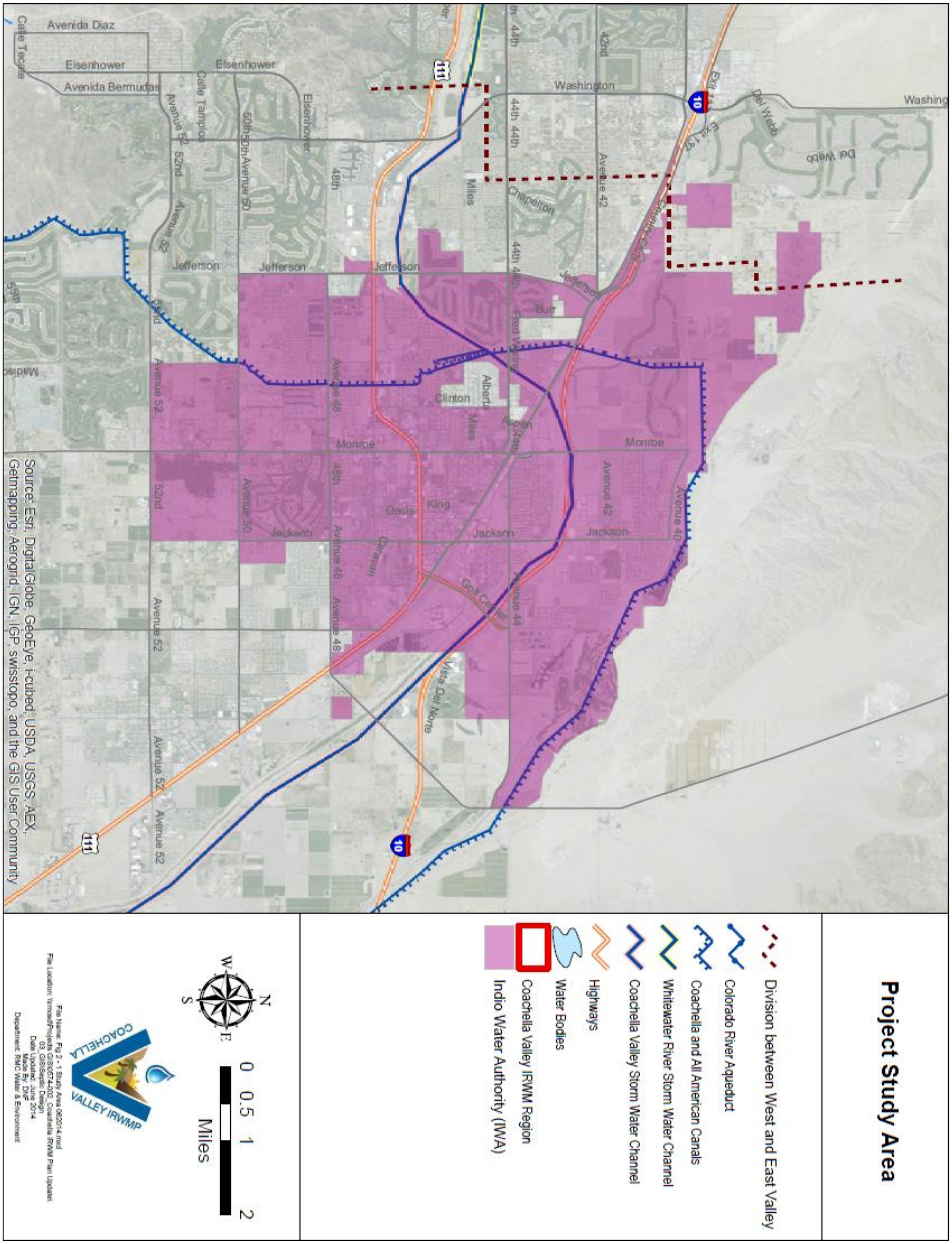
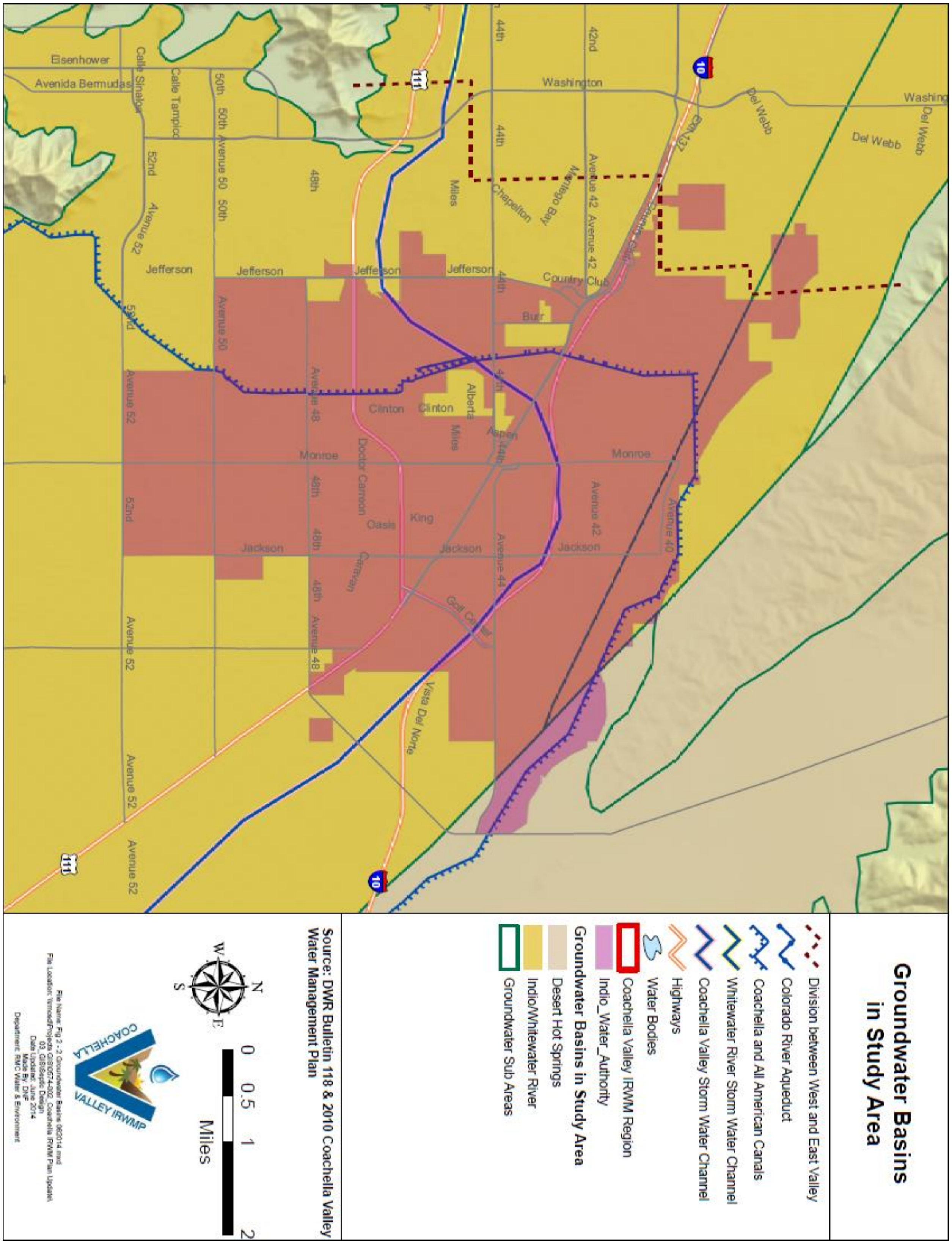


Figure 1-3: Groundwater Basins in Coachella Valley



2 Phase 1A Project Definition

IWA's *2011 Recycled Water Master Plan* (RWMP) identified the cost and feasibility of developing a recycled water system to diversity IWA's water supply. The use of recycled water would supplement groundwater that is currently used to meet water demand. Due to the substantial construction cost estimated for the full Phase 1 project identified in the RWMP, IWA chose to develop a smaller Phase 1A project that could be constructed with available funding. This study defines the recommended Phase 1A customers and infrastructure required to deliver recycled water to those customers.

The Phase 1A Recycled Water Project includes construction of recycled water treatment facilities with a capacity of 3.4 MGD complying with Department of Public Health Title 22 Standards for landscape irrigation water , storage, pump stations, and 15,200 feet (ft) of recycled water conveyance ranging in size from 18-inch to 30-inch.

The Phase 1A project will serve the Terra Lago Golf Club, Posse Park, and Rancho Casa Blanca Country Club and HOA, delivering approximately 1,930 AFY of recycled water. Phase 1A also paves the way for future expansions (remaining portions of Phase 1 and Phase 2), which includes expanded irrigation use of recycled water and indirect potable reuse (through groundwater recharge) as defined in the RWMP and Environmental Impact Report (EIR).

2.1 Demands and Design Sizing Criteria

Table 2-1 summarizes the Phase 1 customers identified in the RWMP and identifies the demands for the three Phase 1A customers. Terra Lago Golf Course was the largest water user identified in Phase 1 of the RWMP with an estimated annual demand of 1,730 AFY. Targeting of large customers typically results in favorable unit cost metrics for recycled water programs. With the proposed transmission line in Golf Center Parkway, short pipeline connections will facilitate recycled water service to Posse Park and Rancho Casa Blanca County Club and HOA in Phase 1A.

Table 2-1: Phase 1 Recycled Water Customers

Customer	Phase 1A	Irrigable Area (acres)	Average Day Demand (mgd)	Average Annual Demand (AFY)	Max Day Demand (mgd)	Irrigation Window (hrs)	Peak Hour Demand (gpm)
Eagle Falls Golf Course		123	0.99	1,107	1.98	10	3,294
Rancho Casa Blanca Country Club and HOA	✓	14	0.10	117	0.21	8	435
Indio Municipal Golf Course		40	0.32	358	0.64	8	1,332
Terra Lago Golf Club	✓	192	1.54	1,728	3.1	12	4,285
Posse Park[2]	✓	15	0.07	81	0.14	10	241
Indio Terrace Park		5	0.02	25	0.04	10	74
Phase 1 Total		**389**	**3.0**	**3,416**	**6.1**		**9,662**
Phase 1A Total		**221**	**1.72**	**1,926**	**3.44**		**4,962**

Notes:

1. Reference: *Indio Water Authority Recycled Water Master Plan*, December 2011.
2. Posse Park irrigated acreage was increase from 4 acres shown in the RWMP to 15 acres based on revised estimates of the park area. Annual demand estimated at 5.4 acre-feet/acre of irrigated area per RWMP.

Table 2-2 summarizes the demand and distribution system criteria from the IWA RWMP that was used to size infrastructure.

Table 2-2: Demand and Distribution System Criteria

	Units	Criteria
Irrigation Demand	Acre feet/acre	5.4
Max Month to Average Demand Factor	-	1.87
Max Day to Average Demand Factor	-	2.0
Required Operational Storage	% of Max Day Demand	58%
Minimum Delivery Pressure	Pounds per Square Inch (PSI)	60
Maximum Velocity	Feet per Second (FPS)	5

Notes:

1. Reference: *Indio Water Authority Recycled Water Master Plan*, December 2011.

2.2 Recycled Water Treatment, Storage and Pump Station

New recycled water treatment facilities will be required to meet California of Public Health Title 22 Disinfected Tertiary Recycled Water Requirements. At a minimum, recycled water treatment capacity is typically designed to meet maximum daily demand. Additional capacity may be provided to enhance reliability depending on customer needs. Treatment facilities will include filtration and disinfection.

Assuming treatment capacity equals to maximum daily demand, operational storage is necessary to capture recycled water flows during non-irrigation (low use) periods. The RWMP identified a need for 3.5 million gallons (MG) of operational storage capacity for the full Phase 1, while the required storage capacity for Phase 1A is approximately 2.0 MG based on 58% of max day demand per the RWMP sizing criteria. In Phase 1A, a portion of the storage should be incorporated into the distribution pump station clearwell to provide operational flexibility for treatment and distribution (i.e. allows shutdown of treatment without shutdown of distribution pump station).

A raw water pump station will convey secondary effluent to the recycled water treatment facilities. The Phase 1A raw water pump station was sized with pumps that will meet the full Phase 1 maximum daily demand. The distribution pump station is sized to meet the Phase 1A peak hour demand. Multiple pumps are envisioned to achieve minimum flow and provide unit redundancy.

Phase 1A treatment and storage capacity will be further optimized during the design of facilities as it may make sense to increase treatment capacity and reduce storage recognizing future Phase 1 demand. As Phase 1 storage of 3.5 MG will ultimately be needed, IWA will need to decide if the storage volume is met with multiple tanks or if one storage tank should be implemented.

Table 2-3 summarizes the baseline design treatment capacity needed for both Phase 1A and Phase 1 assuming sizing for max day demand and applicable storage to capture recycled water during non-irrigation periods during the day.

Table 2-3: Phase 1A Design Criteria

	Units	Phase 1A	Phase 1
Filter Design Capacity	MGD	3.4	6.1
Disinfection Design Capacity	MGD	3.4	6.1
Storage Volume	MG	2.0	3.5
Raw Water Pump Station			
Duty Capacity	MGD	6.0	6.0
No. of Pumps		2 duty and 0 standby[1]	2 duty and 1 standby
Capacity Each Pump	MGD	3.0	3.0
Capacity Each Pump	GPM	2,080 GPM	2,080 GPM
Motor HP, Each	HP	30	30
Distribution Pump Station			
Duty Capacity	MGD	7.2	7.2
No. of Pumps		4 duty and 1 standby	4 duty and 1 standby
Capacity Each Pump	MGD	1.8	1.8
Capacity Each Pump	GPM	1,250 GPM	1,250 GPM
Motor HP, Each	HP	125	125

Notes:

1. Raw water pump station sizing for Phase 1A were based on Phase 1 needs. Assuming 3.0 MGD pumps would be implemented for Phase 1, two pumps are needed to deliver the 3.4 MGD Phase 1A flow. In Phase 1A, the duration of two pump operation will be minimal; therefore, typical operation will be with one pump with the second available as a backup. An additional standby pump was not included in Phase 1A to minimize project capital costs.

2.3 Distribution System

The Phase 1A Recycled Water Project includes the main distribution pipeline from the VSD WWTP to the Posse Park and Terra Lago Golf Course. The pipeline would be tunneled under the Coachella Valley Storm Water Channel and Highway 10 or could potentially be attached to existing roadway bridges that cross the channel and highway. The transmission line will generally travel north on Golf Course Parkway and then west along Avenue 42 to Posse Park. Service to Terra Lago Golf Course will be provided by a distribution pipeline along Terra Lago Parkway (See Figure 2-1 for the Phase 1A pipeline).

Table 2-4 summarizes the Phase 1A pipeline segment sizes and lengths. The pipelines are sized to meet the full Phase 1 demands identified in the RWMP. The pipeline sizes assume that storage is located at Indio Municipal Golf Course as identified in the RWMP.

Figure 2-1: Phase 1A Distribution System

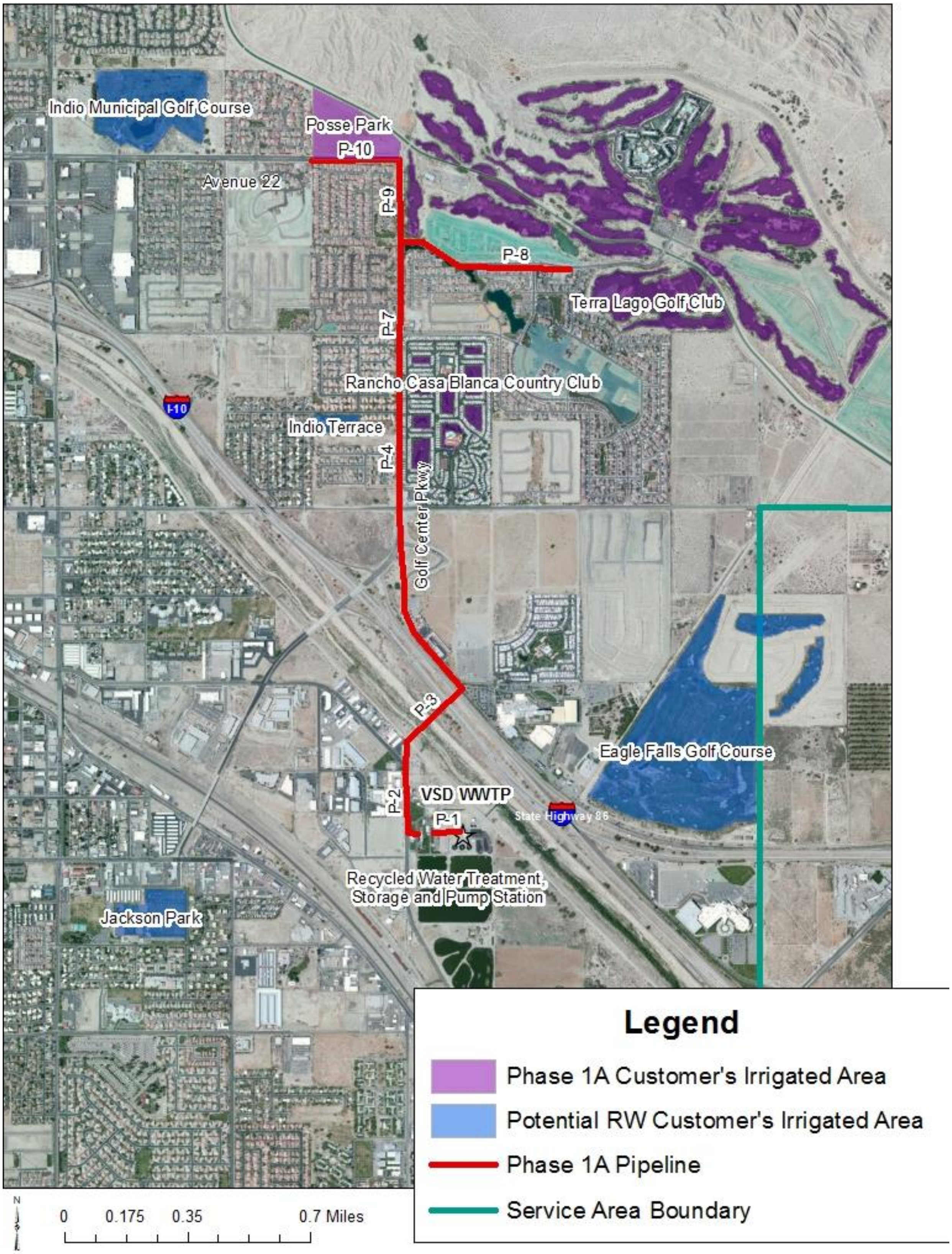


Table 2-4: Phase 1A Pipeline Segments

Pipeline	Type	Description/Street	Description/Limits	New Size/Dia (IN)	Length (FT)
P-1	Pipe	WWTP	From WWTP to Van Buren Street	30	400
P-2	Pipe	Van Buren Street, Avenue 45	From WWTP Connection to Commerce Street	24	1,400
P-3	Pipe/ Casing	State Highway 10 Crossing	From Avenue 45 to Indio Springs Drive	20 (pipe) 30 (casing)	1,100
P-4	Pipe	Indio Springs Drive, Golf Center	From Indio Springs Drive to Avenue 44	20	3,100
P-7	Pipe	Golf Center Parkway	From Avenue 44 to Avenue 42	20	4,000
P-8	Pipe	Terra Lago Parkway	From Golf Center Parkway to Terra Lago Golf Course	18	2,700
P-9	Pipe	Avenue 42	From Terra Lago Parkway to Avenue 42	20	1,300
P-10	Pipe	Avenue 42	From Golf Center Parkway to Posse Park	20	1,300

Notes:

1. Reference: Based on Table 10 from the *Indio Water Authority Recycled Water Master Plan*, December 2011.

3 Estimated Cost

Conceptual level cost estimates for the Phase 1A project are based on unit costs in Table 3-1. The benchmark Engineering News Record Construction Cost Index (ENR CCI) for this estimate (June 2014) 20-Cities average is 9800.38. The cost estimate was developed for budgetary purposes for Phase 1A Project implementation and is based on available information The cost estimate includes a 20% construction contingency, a 16% allowance for engineering and construction management. Other implementation costs (i.e. administration, legal, etc.) are assumed to be covered by in-house personnel and were not included in the project estimate. The costs presented are based on conceptual-level engineering. The cost estimate is a Class 4 estimate and is expected to be within a +50% to -30% level of accuracy, as defined by the Association for the Advancement of Cost Engineering (AACE). Final costs will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, and other variable factors.

Table 3-1: Cost Estimate Basis

Element	Value
Cost Estimate Date Reference	June 2014
Cost Estimate Basis – Engineering News Record (ENR) 20-City Construction Cost Index (CCI)	9800.38
Financing Term	30 years
Interest Rate	3%
Buried Pipe Installation (open cut)	$9.00/inch diameter/lineal foot
Pipe Installation (Tunneling)	$17.00/in/LF
Jacking Pit	$100,000 each (EA)
Receiving Pit	$50,000 EA
Turnout (flow meter, isolation valve, and vault)	$30,000 EA
Pipeline Appurtenances	10% of total cost
Pump Station Capacity (Cost Curve)	2.3*13,185*HP^(-0.36)
Microfiltration	$1.30 per gallon
Disinfection	$0.15 per gallon
Treatment Electrical Allowance	5%
Treatment Instrumentation and Control System Allowance	5%
Pipeline Annual O&M Costs	0.50% of installed cost
Equipment Annual O&M Costs (not incl. energy)	2.0% of installed cost
Mechanical Annual O&M Costs	2.0% of installed cost
Instrumentation Annual O&M Costs	2.0% of installed cost
Operations and Maintenance Labor Rate (including benefits)	$75 per hour
Energy Costs	$0.15/kWh
Construction Contingency	20% of Raw Construction Cost
Engineering and Construction Management Costs	16% of Construction Cost

Other cost estimate assumptions include the following:

- On-site retrofit costs are not included as that is assumed to be the responsibility of the owner. For large irrigated areas, onsite retrofit cost can range from $50,000 to $100,000 per site.
- No land acquisition costs have been included as pipelines are anticipated to be located in public right of way and treatment is assumed to be located at VSD treatment plant without additional property cost.
- O&M costs for the distribution system do not include customer costs for onsite maintenance, testing, and reporting.

Table 3-2 summarizes the estimated capital, operation and maintenance cost of the Phase 1A project.

Table 3-2: Phase 1A Cost Estimate

Element	Value
Capital	
Distribution Pipelines/System	$3,470,400

0.5 MG Partially Buried Distribution Pump Station Clearwell	$1,250,000
1.5 MG Steel Tank	$2,700,000
Treatment and Pump Stations	$7,225,000
Treatment Electrical Allowance	$361,250
Treatment I&C Allowance	$361,250
Raw Construction Cost	**$15,400,000**
Construction Contingency (20%)	$3,100,000
Base Construction Cost	**$18,500,000**
Engineering and Construction Management (16%)	$3,000,000
Total Capital Cost	**$21,500,000**
Annualized Capital Cost (3% interest, 30-year term)	**$1,100,000**
Annual Operations and Maintenance	
Annual Cost of Consumables	$167,000
Annual Cost of Power	$93,000
Annual Cost of Chemicals	$100,000
Annual Labor Costs (Two O&M staff)	$312,000
Total Annual O&M Cost	**$672,000**
Total Annual Cost	$1,772,000
Annual Yield	1,926 AFY
Unit Cost	**$920/AF**

While the useful life of infrastructure and equipment vary and are also dependent on operations and maintenance practices, the expected useful life based on an approximate average of all the components is 30 years for the project.

4 Implementation Plan

Major next steps for Phase 1A implementation include pursuit of grant funding, coordination with proposed customers, development of a financing plan, development of recycled water program tools, design, and construction. The tasks below summarize the upcoming efforts in greater detail. Figure 5-1 shows the implementation schedule for the project.

Task 1: Project Administration (Funding, Outreach, Program Tools, and Partner Collaboration)

IWA and VSD have formed the East Valley Reclamation Authority, a Joint Powers Authority (JPA), to facilitate the implementation, finance, management, and operation of the recycled water program. IWA and VSD will continue to collaborate on the recycled water program including pursuing funding, defining finance plan, siting of facilities, and identifying the detailed steps needed for program implementation. The agencies plan to procure consultants as needed to assist with implementation activities such as rate studies, design, and construction management.

IWA will coordinate with recycled water customers to confirm recycled water user needs (flow rate, pressure, water quality) and identify connection locations. A recycled water use agreement will be developed with each customer defining the responsibility of the retailer and the end user. IWA will also work with customers to ensure proper onsite retrofit to prevent cross connection between potable and recycled water supplies.

The recycled water project is on the State Water Resources Control Board (SWRCB) State Revolving Fund (SRF) priority list for recycled water funding. IWA will complete and submit the formal application to the SWRCB in the coming months. The SRF application is comprised of five sections including a general information package, technical package, environmental package, financial security package, and final budget approval package.

IWA will develop recycled water program rules and regulations, a recycled water use manual, and miscellaneous recycled water program materials needed to meet Department of Public Health (DPH) requirements (service application, annual reporting template, standard details). The Watereuse Association and other agencies have development guides and standards that can be adopted by IWA to meet DPH requirements.

Task 2: Permitting

Permits for the project will be obtained for construction of infrastructure and use of recycled water. Many of these permits are typically secured during the design process. Under a design-build approach (see Task 3), the permits are can be secured by the design-build contractor or could be secured ahead of the design-build process if adequate detail is developed in the preliminary design phase. Construction and infrastructure permits include:

- Caltrans Encroachment Permit for Highway 10 crossing
- City Encroachment Permit
- Coachella Valley Water District (CVWD) Coachella Valley Storm Water Channel Encroachment Permit
- Union Pacific Railroad (UPRR) encroachment permit
- California Department of Fish and Game 1600 Streambed Alteration Agreement (if required)
- US Army Corp of Engineers 404 Permit for River Crossing (if required)
- Regional Water Quality Control Board (RWQCB) Section 401 Water Quality Certification (if required)
- SWRCB Notice of Intent and General Construction Activities Storm Water Permit

Recycled water use and distribution permits

- RWQCB Waste Discharge Requirements for Recycled Water Use
- Division of Water Rights approval for change in discharge location

Task 3: Design-Build Approach

IWA plans to use a design-build approach for Phase 1A project implementation. To facilitate the design-build approach, a preliminary design will be completed to define the desired scope of work for the design build contractor. The preliminary design will define and identify treatment process, major design criteria, equipment redundancy requirements, materials of construction, available land for treatment facilities, required provisions for future treatment facilities if any, and other pertinent requirements.

The design-build contractor procurement process will include:

1) issue a request for qualification (RFQ)
2) identify top three qualified firms
3) issue request for proposal (RFP) to top three firms
4) interview of top firm(s)
5) selection for design-build contractor
6) contract negotiation
7) council contract award

In a design-build approach, design and construction will overlap. Following council award and notice to proceed, the contractor will initiate required field investigations, design of the facilities, and required permitting steps. Once adequate design details have been set and construction permitting is secured, the construction team will mobilize and site preparation will be initiated. As design is completed for portions of the system, construction will commence on the designed element. Follow construction completion, the contractor will be required to demonstrate performance and proper operation of the treatment facilities and to provide training of operations and maintenance staff. Finally, the recycled water facility will be commissioned and recycled water service will commence.

The construction management team will be responsible for tracking construction activities, managing construction documentation, inspection, ensuring the design-build team meets requirements of the contract, confirming labor compliance, and confirming permit/regulatory compliance. Construction management may be provided by one of the agencies or could be contracted to a consulting firm.

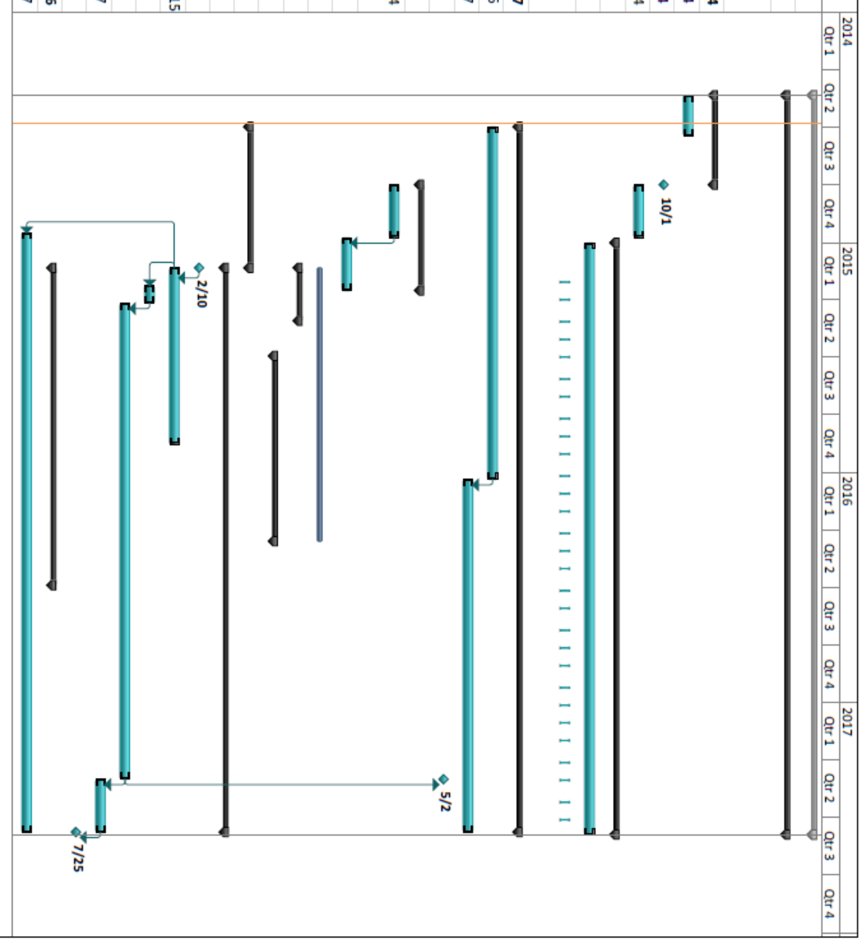
5 References

Carollo Engineers, *Indio Water Authority Recycled Water Master Plan*, December 2011.

Tom Dodson and Associates, *Environmental Impact Report for Indio Water Authority Recycled Water Project*, December 2011.

Figure 5-1: Implementation Schedule

ID	Task Name	Duration	Start	Finish
0	**IWA Phase 1A Recycled Water Project**	**840 days?**	**Mon 5/12/14**	**Fri 7/28/17**
1	**1 Project Administration**	**840 days?**	**Mon 5/12/14**	**Fri 7/28/17**
2	1.1 Established East Valley Reclamation Authority JPA (Completed)			
3	**1.2 IRWMP Funding**	**102 days**	**Mon 5/12/14**	**Wed 10/1/14**
4	1.2.1 IRWMP Funding Pursuit	2.3 mons	Mon 5/12/14	Mon 7/14/14
5	1.2.2 IRWMP Award Notification	0 days	Wed 10/1/14	Wed 10/1/14
6	1.3 SRF Application	3 mons	Wed 10/1/14	Tue 12/23/14
7	**1.4 Reporting**	**672 days**	**Thu 1/1/15**	**Fri 7/28/17**
8	1.4.1 Quarterly Updates for DWR	672 days	Thu 1/1/15	Fri 7/28/17
9	**1.4.2 Monthly Progress Report and Reimbursement Request for SRF**	**611 days**	**Wed 3/4/15**	**Wed 7/5/17**
39	**1.5 Customer and Public Outreach**	**800 days**	**Tue 7/1/14**	**Mon 7/24/17**
40	1.5.1 Customer Coordination	20 mons	Tue 7/1/14	Mon 1/11/16
41	1.5.2 Customer Agreements	20 mons	Tue 1/12/16	Mon 7/24/17
42	1.5.3 Site Supervisor Training	0 days	Tue 5/2/17	Tue 5/2/17
43	**1.6 Rate Study and Assessment District Evaluation**	**120 days**	**Wed 10/1/14**	**Tue 3/17/15**
44	1.6.1 Procure Consultant for Rate Study, Connection Fee Evaluation, and Assessment District	3 mons	Wed 10/1/14	Tue 12/23/14
45	1.6.2 Rate Study and Assessment District	3 mons	Wed 12/24/14	Tue 3/17/15
46	**2 Permitting**			
47	**2.1 Construction Permits**	**60 days**	**Tue 2/10/15**	**Mon 5/4/15**
53	**2.2 RWQCB WDR for Recycled Water Use**	**210 days**	**Tue 6/30/15**	**Tue 4/19/16**
61	**3 Design Build Contractor Procurement**	**160 days**	**Tue 7/1/14**	**Tue 2/10/15**
79	**4 Design Build**	**640 days**	**Tue 2/10/15**	**Tue 7/25/17**
80	4.1 NTP	0 days	Tue 2/10/15	Tue 2/10/15
81	4.2 Design	10 mons	Tue 2/10/15	Mon 11/16/15
82	4.3 Mobilization	1 mon	Tue 3/10/15	Mon 4/6/15
83	4.4 Construction	27 mons	Tue 4/7/15	Mon 5/1/17
84	4.5 Startup and Training	3 mons	Tue 5/2/17	Mon 7/24/17
85	4.6 Facility Commissioned	0 days	Tue 7/25/17	Tue 7/25/17
86	**5 Environmental Compliance / Mitigation / Enhancement**	**360 days?**	**Tue 2/10/15**	**Mon 6/27/16**
89	**6 Construction Management**	34 mons	Tue 12/16/14	Mon 7/24/17



Project: IWA Phase 1A Recycled Water Project
Date: Thu 6/26/14

Legend: Task; Split; Milestone; Summary; Project Summary; External Tasks; External Milestone; Inactive Task; Inactive Milestone; Inactive Summary; Manual Task; Duration-only; Manual Summary Rollup; Manual Summary; Start-only; Finish-only; Deadline; Progress

Page 1

Appendix A – Detailed Cost Estimate

Project: IWA Phase 1A Recycled Water Project

Component: 1,930 AFY (Terra Lago GC, Posse Park, Rancho Casa Blanca)

Date: June 30, 2014
Project Number: 574-002
Prepared by: MN
Checked by: RMB

Estimate Type: Conceptual Design

Process Cost Summary by Division

Spec. Division		Subtotal	Notes
2 - Sitework		$ 3,470,400	
3 - Concrete		$ 1,250,000	
5 - Metals		$ 2,700,000	
11 - Equipment		$ 7,225,000	
15 - Mechanical		$ -	
16 - Electrical		$ 361,250	
17- I&C		$ 361,250	
RAW CONSTRUCTION COST		**$ 15,400,000**	
Construction Contingency	20%	$ 3,100,000	
BASE CONSTRUCTION COST		**$ 18,500,000**	
Implementation (Design and CM)	16%	$ 3,000,000	
TOTAL PROJECT COST		**$ 21,500,000**	

Spec. Division	Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
2 - Sitework							**$ 3,470,400**	
	P-1 Pipe	30	in	400	LF	$ 270.00	$ 108,000	
	P-2 Pipe	24	in	1,400	LF	$ 216.00	$ 302,400	
	P-3 Pipe	24	in	1,100	LF	$ 216.00	$ 237,600	
	P-3 Jack and Boı	30	in	1,100	LF	$ 510.00	$ 561,000	
	P-4 Pipe	20	in	3,100	LF	$ 180.00	$ 558,000	
	P-7 Pipe	20	in	4,000	LF	$ 180.00	$ 720,000	
	P-8 Pipe	18	in	2,700	LF	$ 162.00	$ 437,400	
	P-9 Pipe	20	in	1,200	LF	$ 180.00	$ 216,000	
	Turnout Connections			3	EA	$ 10,000.00	$ 30,000	
	Jacking Pit			2	LS	$ 100,000.00	$ 200,000	
	Receiving Pit			2	LS	$ 50,000.00	$ 100,000	
							$ -	
3 - Concrete							**$ 1,250,000**	
	Below Grade Storage Tank with Dist. PS			500,000	Gals	$ 2.5	$ 1,250,000	
							$ -	
5 - Metals							**$ 2,700,000**	
	Above Grade Steel Storage Tank			1500000	Gals	$ 1.8	$ 2,700,000	
							$ -	
11 - Equipment							**$ 7,225,000**	
	Raw Water Pump Station			60	hp	$ 7,000	$ 420,000	
	Microfiltration			3.4	mgd	$ 1,300,000	$ 4,420,000	
	Disinfection			3.4	mgd	$ 150,000	$ 510,000	
	Distribution Pump Station			625	hp	$ 3,000	$ 1,875,000	
							$ -	
15 - Mechanical							**$ -**	
							$ -	
							$ -	
16 - Electrical							**$ 361,250**	
							$ -	
Electrical Allowance	5% of Division 11 (Equipment)					5%	$ 361,250.00	
17 - I&C							**$ 361,250**	
I&C Allowance	5% of Division 11 (Equipment)					5%	$ 361,250	

EASEMENT ACQUISITION

Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost
						$ -
						$ -
						$ -
						$ -
						$ -

ANNUAL O&M COSTS

		Amount	Unit	Value	Cost	
Consumables				Total Consumables	**$ 167,000**	
	Pipeline	$ 3,140,400		0.5%	$ 15,702	
	Equipment Consumables	$ 7,225,000		2%	$ 144,500	2% of Equipment
	Mechanical Consumables	$ -		2%	$ -	2% of Mechanical
	Instrumentation Consumables	$ 361,250		2%	$ 7,225	2% of Instrumentation
Power Costs				Total Power	**$93,000**	
			kWh	618,625		
			Annual Cost		$92,794	
Chemicals				Total Chemicals	**$ 100,000**	
	Chemicals Allowance	1	LS	$ 100,000	$ 100,000	
					$ -	
Labor Costs				Total Labor	$ 312,000	
	Total # Operators	2	number			
	Average Annual Hours per operator	2080	hrs/yr			
	Total Operators per year	4160	Total hrs	$ 75	**$ 312,000**	
	TOTAL ANNUAL O&M COSTS				**$ 672,000**	

Appendix B – Cost Estimates for Alternate Options

Project: Indio Water Authority Recycled Water Project Development

Component: Option 3 - 1,220 AFY (Eagle Falls GC and Rancho Casa Blanca)

Date: June 2, 2014
Project Number: 574-002
Prepared by:

Estimate Type: Conceptual Design

Process Cost Summary by Division

Spec. Division		Subtotal	Notes
2 - Sitework		$ 2,734,380	
3 - Concrete		$ 3,250,000	
5 - Metals		$ -	
11 - Equipment		$ 5,260,000	
15 - Mechanical		$ -	
16 - Electrical		$ 263,000	
17- I&C		$ 263,000	
	RAW CONSTRUCTION COST	**$ 11,770,380**	
Construction Contingency	20%	$ 2,354,076	
	BASE CONSTRUCTION COST	**$ 14,124,456**	
Implementation (Program Management, Design, CEQA, Legal, CM)	16%	$ 2,259,913	
	TOTAL PROJECT COST	$ 16,384,369	

Spec. Division	Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
2 - Sitework							**$ 2,734,380**	
	P-1 Pipe	30	in	400	LF	$ 270.00	$ 108,000	
	P-2 Pipe	24	in	1,400	LF	$ 216.00	$ 302,400	
	P-3 Pipe	24	in	1,100	LF	$ 216.00	$ 237,600	
	P-3 Jack and Bor	30	in	1,100	LF	$ 510.00	$ 561,000	
	P-4 Pipe	20	in	3,100	LF	$ 180.00	$ 558,000	
	P-5 Pipe	18	in	2,900	LF	$ 162.00	$ 469,800	
	Turnout Connections			3	EA	$ 10,000.00	$ 30,000	
	Jacking Pit			2	LS	$ 100,000.00	$ 200,000	
	Receiving Pit			2	LS	$ 50,000.00	$ 100,000	
	Pipeline Appurtenances			$ 1,675,800		10%	$ 167,580	
							$ -	
							$ -	
3 - Concrete							**$ 3,250,000**	
	Below Grade Storage Tank with Dist. PS			1,300,000	Gals	$ 2.5	$ 3,250,000	
							$ -	
5 - Metals							**$ -**	
							$ -	
							$ -	
							$ -	
11 - Equipment							**$ 5,260,000**	
	Raw Water Pump Station			60	hp	$ 7,000	$ 420,000	
	Microfiltration			2.2	mgd	$ 1,300,000	$ 2,860,000	
	Disinfection			2.2	mgd	$ 150,000	$ 330,000	
	Distribution Pump Station			500	hp	$ 3,300	$ 1,650,000	13,185*HP^(-0.36)
							$ -	
							$ -	
							$ -	
15 - Mechanical							**$ -**	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
16 - Electrical							**$ 263,000**	
							$ -	
Electrical Allowance	5% of Division 11 (Equipment)					5%	$ 263,000.00	
17 - I&C							**$ 263,000**	
I&C Allowance	5% of Division 11 (Equipment)					5%	$ 263,000	

EASEMENT ACQUISITION

Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost
						$ -
						$ -
						$ -
						$ -
						$ -

ANNUAL O&M COSTS

	Item	Amount	Unit	Value	Cost	
Consumables				Total Consumables	**$ 121,644**	
	Pipeline	$ 2,236,800		0.5%	$ 11,184	
	Equipment Consumables	$ 5,260,000		2%	$ 105,200	2% of Equipment

	Mechanical Consumables	$ -			2%	$	-	2% of Mechanical
	Instrumentation Consumables	$ 263,000			2%	$	5,260	2% of Instrumentation
Power Costs					Total Power		**$92,794**	
			kWh		618,625			
			Annual Cost				$92,794	
			Horsepower					
			Hours per year operation					
			Annual Cost				$0	
Chemicals					Total Chemicals	**$**	**100,000**	
	Chemicals Allowance	1	LS	$	100,000	$	100,000	
						$	-	
						$	-	
Labor Costs					Total Labor	$	312,000	
	Total # Operators	2	number					
	Average Annual Hours per operator	2080	hrs/yr					
	Total Operators per year	4160	Total hrs	$	75	**$**	**312,000**	
			TOTAL ANNUAL O&M COSTS			**$**	**626,438**	

Project: Indio Water Authority Recycled Water Project Development

Component: Option 1 - 560 AFY (Indio Municipal GC, Posse Park, Rancho Casa Blanca)

Date: June 2, 2014
Project Number: 0057-007.02
Prepared by:

Estimate Type: Conceptual Design

Process Cost Summary by Division

Spec. Division		Subtotal	Notes
2 - Sitework		$ 3,999,600	
3 - Concrete		$ 1,500,000	
5 - Metals		$ -	
11 - Equipment		$ 3,008,000	
15 - Mechanical		$ -	
16 - Electrical		$ 150,400	
17- I&C		$ 150,400	
	RAW CONSTRUCTION COST	**$ 8,808,400**	
Construction Contingency	20%	$ 1,761,680	
	BASE CONSTRUCTION COST	**$ 10,570,080**	
Implementation (Program Management, Design, CEQA, Legal, CM)	16%	$ 1,691,213	
	TOTAL PROJECT COST	$ 12,261,293	

Spec. Division	Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost	Notes
2 - Sitework							**$ 3,999,600**	
	P-1 Pipe	30	in	400	LF	$ 270.00	$ 108,000	
	P-2 Pipe	24	in	1400	LF	$ 216.00	$ 302,400	
	P-3 Pipe	24	in	1100	LF	$ 216.00	$ 237,600	
	P-3 Jack and Bor	30	in	1100	LF	$ 510.00	$ 561,000	
	P-4 Pipe	20	in	3100	LF	$ 180.00	$ 558,000	
	P-7 Pipe	20	in	4000	LF	$ 180.00	$ 720,000	
	P-9 Pipe	20	in	1200	LF	$ 180.00	$ 216,000	
	P-10 Pipe	20	in	1300	LF	$ 180.00	$ 234,000	
	P-11 Pipe	20	in	2500	LF	$ 180.00	$ 450,000	
	Turnout Connections			3	EA	$ 10,000.00	$ 30,000	
	Jacking Pit			2	LS	$ 100,000.00	$ 200,000	
	Receiving Pit			2	LS	$ 50,000.00	$ 100,000	
	Pipeline Appurtenances			$ 2,826,000		10%	$ 282,600	
							$ -	
							$ -	
3 - Concrete							**$ 1,500,000**	
	Storage Tank			600,000	Gals	$ 3	$ 1,500,000	
							$ -	
							$ -	
5 - Metals							**$ -**	
							$ -	
							$ -	
							$ -	
11 - Equipment							**$ 3,008,000**	
	Raw Water Pump Station			20	hp	$ 10,400	$ 208,000	
	Microfiltration			1	mgd	$ 1,300,000	$ 1,300,000	
	Disinfection			1	mgd	$ 150,000	$ 150,000	
	Distribution Pump Station			375	hp	$ 3,600	$ 1,350,000	13,185*HP^(-0.36)
							$ -	
							$ -	
							$ -	
15 - Mechanical							**$ -**	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
							$ -	
16 - Electrical							**$ 150,400**	
							$ -	
Electrical Allowance	5% of Division 11 (Equipment)					5%	$ 150,400	
17 - I&C							**$ 150,400**	
I&C Allowance	5% of Division 11 (Equipment)					5%	$ 150,400	

EASEMENT ACQUISITION

Item	Size	Units	Quantity	Unit	Unit Cost	Total Cost
						$ -
						$ -
						$ -
						$ -
						$ -

ANNUAL O&M COSTS		Amount	Unit	Value	Cost	
Consumables				Total Consumables	**$ 80,103**	
	Pipeline	$ 3,387,000		0.5%	$ 16,935	
	Equipment Consumables	$ 3,008,000		2%	$ 60,160	2% of Equipment

	Mechanical Consumables	$	-			2%	$ -	2% of Mechanical
	Instrumentation Consumables	$	150,400			2%	$ 3,008	2% of Instrumentation
Power Costs						Total Power	**$26,225**	
			kWh			174,831		
			Annual Cost				$26,225	
			Horsepower					
			Hours per year operation					
			Annual Cost				$0	
Chemicals						Total Chemicals	**$ 50,000**	
	Chemicals Allowance	1	LS	$		50,000	$ 50,000	
							$ -	
							$ -	
Labor Costs						Total Labor	$ 312,000	
	Total # Operators	2	number					
	Average Annual Hours per operator	2080	hrs/yr					
	Total Operators per year	4160	Total hrs	$		75	**$ 312,000**	
			TOTAL ANNUAL O&M COSTS				**$ 468,328**	

Appendix 3-3

Technical Memorandum:

Coachella Valley IRWM Program –

Disadvantaged Community (DAC) Onsite Plumbing Retrofit Program

Technical Memorandum

Coachella Valley IRWM Program

Subject: **DAC Onsite Plumbing Retrofit Program**

Prepared For: Coachella Valley Regional Water Management Group (CVRWMG)

Prepared by: Marina Mautner

Reviewed by: Crystal Mohr

Date: July 11th, 2014

Reference: 0574-002.002

1 Introduction and Background

During implementation of the Coachella Valley Disadvantaged Communities (DAC) Outreach Program, DAC residents noted that onsite plumbing leaks and faulty onsite plumbing systems may cause drinking water quality issues and water waste. For water quality issues, onsite plumbing systems may be compromised by structural damage or improper construction or design, which can allow water quality constituents to enter the potable water system. For onsite plumbing leaks, aging, damaged or improperly constructed or designed systems may leak and waste water.

The DAC Outreach Program included extensive outreach meetings and surveys of local DAC residents to refine the location of DACs within the Coachella Valley and also establish a comprehensive understanding of water-related issues and needs within the Region's DACs. The DAC survey had many findings, including that DAC residents are largely unaware of local resources that are available to address water and wastewater concerns and that further outreach and education would be beneficial in addressing pressing DAC water quality and water supply issues. Further, the DAC survey found that DAC residents that expressed concerns of poor tap water quality also reported drinking tap water, indicating that residents do not have many non-tap water options due to cost issues. As such, the survey concluded that water supply provisions to DACs must be cost-effective in order to be effective.

As a result of information gathered during the DAC Outreach Program, the Coachella Valley Regional Water Management Group (CVRWMG) developed a project that would include outreach and education to DACs and also provide a cost-effective mechanism for addressing DAC-reported water quality and water supply needs. The DAC Onsite Plumbing Retrofit Program was, therefore, developed to address both drinking water quality and water conservation issues by providing a cost-effective mechanism to repair faulty systems that leak and address potential sources of drinking water quality contamination. Program partners will include CVRWMG water agencies and community organizations Pueblo Unido Community Development Corporation (PUCDC) and Leadership Counsel for Justice and Accountability (Leadership Counsel).

1.1 Purpose and Outline

To develop a comprehensive DAC Onsite Plumbing Retrofit Program to address DAC water quality and conservation needs, the following activities were conducted:

- **Identification of Rehabilitation Potential** – Existing studies and reports regarding DACs in the Coachella Valley were reviewed to estimate an approximate number of eligible residents and housing units. Organizations and people implementing similar programs were also contacted to determine common onsite water system needs in and around homes.

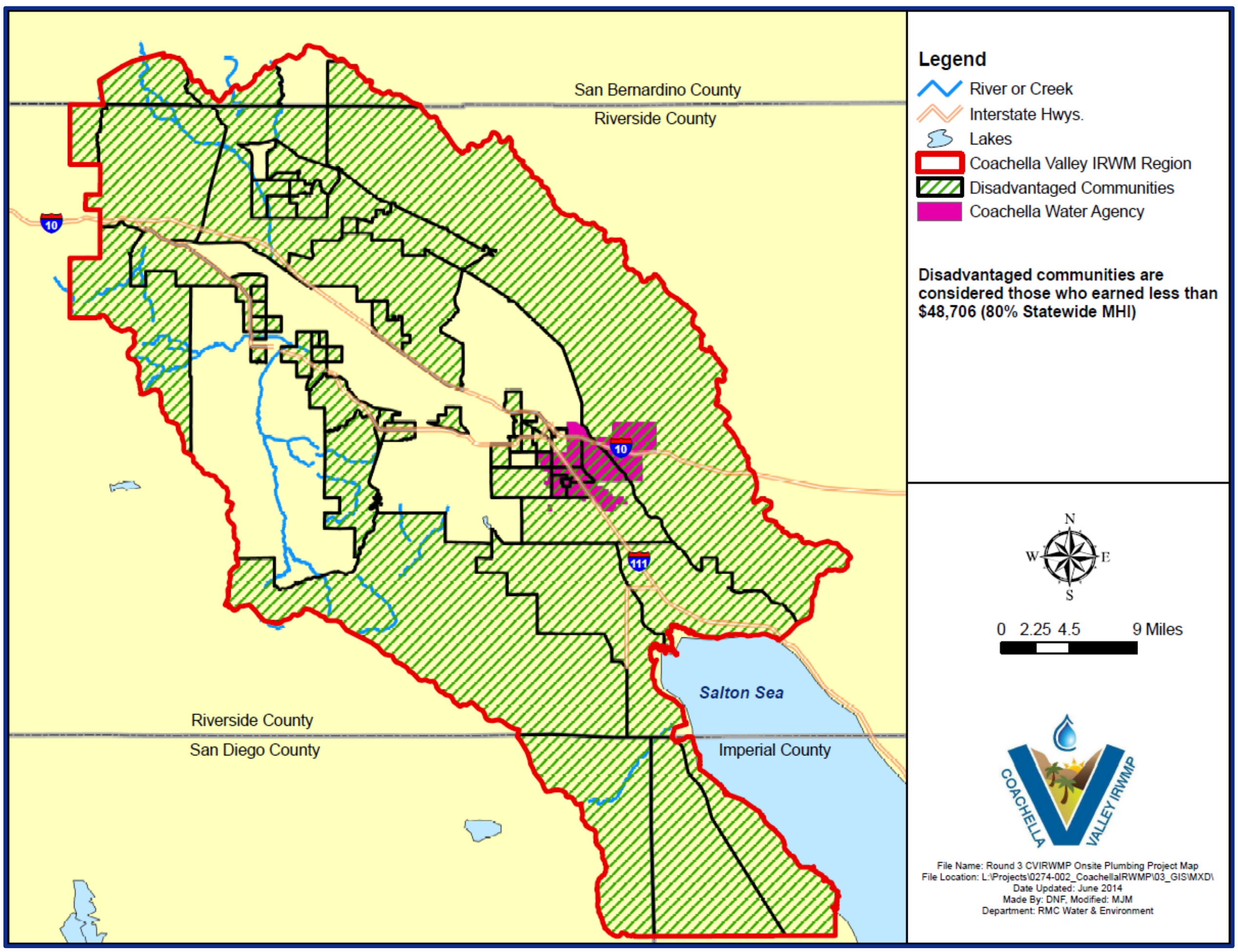
- **Determination of Water Savings** – Leak estimates based on national averages and similar programs were used to determine the approximate amount of water that could be saved by implementing the DAC Onsite Plumbing Retrofit Program.
- **Structural Development of the Retrofit Program** – Organizations and people involved in DAC issues in the Coachella Valley were contacted to obtain an understanding of programs already in place and potential tie-ins for the rebate program. Based on previous efforts and local estimates, costs per unit were determined to provide an appropriate total program cost.

1.2 Study Area and Background Information

1.2.1 Location

The Study Area evaluated for the DAC Onsite Plumbing Retrofit Program includes the Coachella Valley IRWM Region (Coachella Valley or Region), which is the same Study Area evaluated by the DAC Outreach Program. The distribution of DACs in Coachella Valley is represented in **Figure 1-1** below. While there are DACs located throughout the Coachella Valley, a majority of the DACs are located in the East Valley. As shown in **Figure 1-**1, the majority of the service area of the Coachella Water Authority (CWA) includes DACs. Because CWA provides services to a largely DAC area, water use data from CWA will be used for the basis of water savings calculations in this study.

Figure 1-1: Disadvantaged Communities in Coachella Valley IRWM Region



1.2.2 Population and Household Estimates for Study

The DAC Outreach Program included an analysis of the location of DACs in the Coachella Valley by analyzing statistics for separate Study Areas within the Coachella Valley (refer to **Table 1-1**). 2010 United States Census Data is the primary source of information for the data provided in **Table 1-1**, during which time the median household income (MHI) for California was $60,883. Disadvantaged communities are defined by the California Department of Water Resources (DWR) as those households earning 80% of the state MHI ($48,706); severely disadvantaged communities are those with a MHI that is less than 60% of the state MHI ($36,530). As shown in **Table 1-1**, there are fourteen Study Areas within the Coachella Valley that are classified as disadvantaged, and ten that are classified as severely disadvantaged.

All the Study Areas have a MHI less than 80% of the statewide MHI which indicates that at least half, usually more, of the households are disadvantaged; this is a total of 24,770 households or 83,332 persons. If it is assumed that within the areas that are considered disadvantaged, 50% of residents are disadvantaged (a conservative estimate) and that within areas that are considered severely disadvantaged, 100% of residents are disadvantaged, in the Coachella Valley approximately 34,936 households or 116,524 persons would be classified as DACs. For this study, a conservative estimate of 24,770 households was used to determine the amount of DAC households that could potentially qualify for the indoor portion of the rebate program.

The DAC Outreach Program found that on average, there are five residents per mobile home within Coachella Valley disadvantaged communities and that the average number of mobile home units per mobile home park (MHP) is 23.3. A study currently underway that is continuing these efforts has ground truth validated 123 mobile homes parks, or 2,861 mobile home units, in the Valley. Sergio Carranza from PUCDC, a local nonprofit organization that works to address DAC issues in the Coachella Valley, estimates that there are approximately 200 permitted and unpermitted mobile home parks in the Coachella Valley. Given the estimated number of mobile home parks (200), the average number of mobile homes per park (23.3), and the average number of residents per mobile home (5), this study estimates that there are approximately 4,600 DAC mobile home units with approximately 23,000 residents within the Coachella Valley. This number of mobile home units and residents will be used as the basis for the number of units qualifying for the plumbing system component of the DAC Onsite Plumbing Retrofit Program.

Table 1-1: Focus Area Select Statistics

Study Area	Population	Households (HH)	HH Size	MHI	80% of Statewide MHI ($48,706)	60% of Statewide MHI ($36,529)
White Water	859	312	2.8	$39,375	Y	N
Desert Hot Springs	25,938	8,650	3.0	$36,326	Y	Y
Garnet	7,543	2,174	3.5	$32,132	Y	Y
Desert Edge	3,823	1,969	1.9	$25,984	Y	Y
Cathedral City	51,000	17,047	3.0	$45,693	Y	N
Sky Valley	2,406	1,064	2.3	$31,771	Y	Y
Thousand Palms	7,715	2,849	2.7	$42,656	Y	N
Coachella	40,704	8,998	4.5	$43,012	Y	N
Thermal	2,864	684	4.2	$33,998	Y	Y
Mecca	8,577	2,020	4.2	$26,207	Y	Y
Oasis	6,890	1,474	4.7	$25,469	Y	Y
North Shore	3,477	750	4.6	$31,591	Y	Y
Desert Shores	1,104	344	3.2	$18,958	Y	Y
Salton City	3,763	1,204	3.1	$32,805	Y	Y

2 Determining Water Savings Potential

2.1 Indoor Water Use

Average base daily per capita water use in the CWA service area is 191 gallons per capita per day (gpcd); given that the CWA service are contains a large proportion of DAC residents, these water use values are used as a proxy to assess existing DAC water use. Using the Southern California average from a 2011 California Department of Water Resources (DWR) study, indoor water use is approximately 44% of total water use, which is 84 gpcd for a typical disadvantaged community in the Coachella Valley. Water savings calculations will assume weighted average from the study of 3.4 residents per non mobile home DAC residence. The program will offer 200 rebates for mobile home residences (discussed in submetering below), about 4.3% of MHP households, and 180 rebates for any DAC residence, a total of 380 DAC households or 1.5%. The calculation below only includes the 180 rebates for general DACs because the MHP DACs will be addressed in the submetering savings calculation.

Based on the Association of California Water Agencies' (ACWA) informational flyer for water conservation and the DWR 2011 study, the following savings would be made if the proposed 180 households received a rebate package. The rebate package would consist of two aerators for faucets, one low flow showerhead, and one high efficiency toilet.

Table 2-1 Potential Indoor Water Savings Based

	Toilet Flush	Aerator	Showerhead
Average (gal)	2.761[1]		2.14[1]
Low Flow (gal)	1.28[2]		1.5[2]
Savings (gal)	1.48	1.2[1]	0.64
Uses Per Person Per Day	4.76[1]	1	5.92[1] minutes
Loss Per Fixture Per Day (gal)	30		
Savings Per Person Per Day (gal)	15.9	1.2	3.8
Total Savings Per Day (gal)	9693	731	2307
Total Savings Per Year (AF)	10.9	0.8	2.6

[1] ACWA. *Infographics and Flyers*. http://saveourh2o.org/toolkit
[2] DWR 2011.

The most savings are found by replacing old toilets with High Efficiency Toilets (HET), which are required to have 1.28 gallons per flush based on the Water Sense guidelines of the EPA. The savings are potentially much more because the average gallons per flush in the study included HETs. Many rebate programs in California require that the toilet to be replaced must be at least 2 gallons per flush, this assumption would increase the average gallons per flush and create even more savings. Additionally, many toilets have leaks that go unnoticed or unattended which is assumed to be fixed with a toilet replacement.

The showerhead replacement had the second highest savings. For the program to be most effective, the rebate should only be for high efficiency showerheads that use 1.5 gallons per minute (gpm) or less water. The WaterSense product list has showerheads that use up to 2 gpm, however, this would yield less than 1/3 of the water savings and therefore would not be covered by the program.

While the aerators yield the least savings, they are also the least expensive fix as explained below in the Potential Retrofit Costs section.

The total program water savings with these three indoor fixes implemented in 180 residences, would be 14.3 acre feet per year (AFY). The savings per person per day is 20.9 gpcd or 24.9% savings on indoor water use.

2.2 Mobile Home Park Plumbing System Rehabilitation

Both in the DAC 2013 survey and communication with Sergio Carranza and Ryan Sinclair, the DAC survey contact at Loma Linda University, plumbing systems in the MHPs were described as substandard. In many cases the residents, with little to no professional plumbing experience, constructed the systems themselves out of PVC pipes and faulty joints. The systems leak often and are repaired in a haphazard fashion with improper supplies. These poor plumbing systems are claimed to be the cause of water quality issues for residents in addition to the water loss problems associated with the leaks.

One way of calculating distribution system leakage would be by subtracting the measured water consumption from the total water produced or purchased. In a mobile home park, the total water produced or purchased would be the water measured at the meter. Water consumption can then be calculated using sub-meter data, as a more direct method, or it can be calculated by using estimated amounts based on average usage amounts per person, which is less direct.

For both measurement methods, the amount of water used by each MHP is necessary to provide a baseline usage. The non-profit contact in the area, Mr. Carranza, communicated that it is uncommon for MHPs to have data on park usage if they use a community well. This is because community wells often lack a meter or recording apparatus (Carranza, pers.comm.). While it is possible to obtain data from those parks that receive water from municipal sources, Carranza stated that many MHPs are not connected to municipal water supplies and thus this data would not be representative of the MHPs in general.

With this information, it became clear that the first step in determining the amount of water lost to leaks and the potential savings would be to install meters and submeters in various MHPs. In addition to the ability to monitor water savings, there are various studies, one of which is described in the Similar Programs section below, that show that submetering can also serve as a water conservation tool.

A less accurate assumption for MHP distribution system leaks for the purposes of this TM will be calculated based on the generalized principal that municipal distribution systems have a 16% water loss (EPA 2013). Using a weighted average between a sample DAC Polanco Park, 1,071 gallons per day (gpd), and a sample medium sized DAC MHP, 735 gpd, gives an average household use of 767 gpd. Using the CWA estimate of 191 gpcd and multiplying by the average number of residents in mobile homes gives a total of 955 gpd per household. Assuming that the true number is closest to this estimate based on Polanco park agreement with this number, this study will use the 955 gpd per mobile home household estimate. The program proposes 200 unit rebates for distribution system fixes, which equates to 214 AFY of water use. Multiplying this by the 16% water loss factor gives a savings of 34.3 AFY. This number is expected to be very conservative because it represents municipal distribution systems, while the DAC MHP systems are often times of much lower quality workmanship and in greater disrepair.

Submetering

As described in more detail in Section 3.3, submetering can reduce water usage by 22.5% on average. Using the average of 5 people per mobile home gives an average of 955 gallons per household per day (gphd). Water savings per household would be 215 gphd or 0.24 AFY. The program proposes an implementation of 200 rebates, which would yield 48.2 AFY in water savings.

Table 2-2: Potential Water Savings from Submetering

Water Use per Person (gpcd)	Water Use per HH (gphd)	Submetering Savings of 22.5%[1] (gphd)	HH Annual Savings (AFY)	Total Annual Savings (AFY)
191	955	215	0.24	48.2

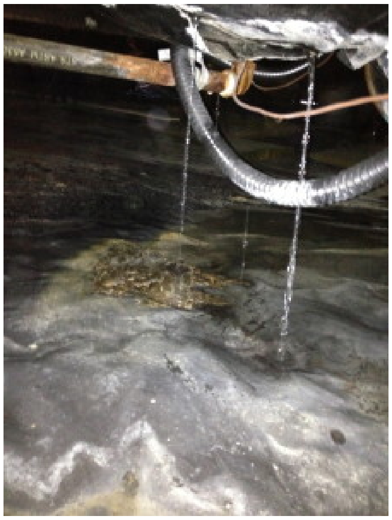
[1] SCVWD. 2008.

Individual Unit Repairs

In addition to MHP distribution system rehabilitation, repairs on individual homes will be necessary for many units. One of the most common mobile home repairs is a trap leak under the mobile home or a water supply line leak underneath the mobile home (McKinnish 2013). Pictures of these types of problems are shown below. In communication with both Mr. Carranza and Mr. Sinclair, these types of conditions were confirmed to be a problem in the MHPs. Using a Drip Calculator and a 5 drip per second steady stream assumption (as seen in **Figure 2-1** water leaks in a steady stream in these cases), approximately 43.2 gallons are wasted per day from this type of faulty plumbing per mobile home (AWWA 2013). The program proposes 200 rebates, which would yield 9.7 AFY of water savings.

Figure 2-1 Common Plumbing Issues in Mobile Homes

Leak at bathroom trap under mobile home



Leak under mobile home laundry area

Source: McKinnish 2013

2.3 Total Program Savings

Overall, the total program savings would be approximately 106.5 AFY. This would be a weighted average of 24.4% reduction in water use and consequently costs for each household. This figure includes a very conservative figure for the potential savings from water distribution rehabilitation and therefore the savings are likely much higher than this estimate.

3 Supporting Information – Implementation of Successful Programs

3.1 Santa Clara Valley Water District (SCVWD) Mobile Home Submetering

As discussed in Section 2.2, one upgrade that can provide a variety of benefits is the installation of water meters on individual mobile home units or "submetering". In 2000 SCVWD began a study in Santa Clara County; 1,187 meters were installed in mobile homes in 5 mobile home parks (MHPs). The goal was to reduce water use and thus overall water costs.

SCVWD staff predicted a water savings of about 15% per submeter installed at mobile homes based on an American Water Work Association study from 1999. Submetering reduces water use by having residents pay directly for the amount of water they use, thereby encouraging conservation via both behavior and fixture changes. Savings would also occur through identifying high priority areas for rehabilitation through the Mobile Home Park Plumbing System Rehabilitation component of the Onsite Plumbing Retrofit Program. By installing meters on wells and individual units, a mass balance equation will determine where and how much water is being lost in the system.

The program included a water survey for residents and offers of rebates for fixture replacements. Over 10 years of water use data, the study found an overall reduction of 22.5% in water use. The total water use savings per year for 754 submeters installed was 43 AF. Savings were attributed to both installation of fixtures through the rebate program and behavioral changes based on awareness of actual water use.

3.2 Indio Water Authority (IWA)

IWA is one of the five agencies that make up the CVRWMG. In the IWA Urban Water Management Plan (UWMP) for 2010, IWA outlines the conservation programs that are being developed and implemented within their service area. As part of the IWA conservation program, the agency offers free Water Surveys for residents to help inform residents of ways to save water and identify necessary behavior and fixture changes in individual households. IWA estimates the cost for each residential survey to be $110/survey, which accounts for the time spent by IWA staff to perform surveys and track program implementation (IWA 2010).

IWA indicated that it may want to consider requiring in-home surveys for any residents interested in participating in its Smart Controller and/or Re-landscape Rebate programs. As of the 2010 UWMP the program was still in the planning phase, and had not yet been implemented. Implementation goals through 2015 were estimated in the conservation master plan. According to that plan, IWA should perform at least 1,400 residential surveys by 2015.

3.3 Coachella Valley Regional Water Conservation Program

The Coachella Valley Regional Water Conservation Program was implemented by the Coachella Valley Water District (CVWD) in partnership with the four other Coachella Valley Water Management Group agencies: IWA, CWA, Desert Water Agency, and Mission Springs Water District. The focus of the program was on concentrated outreach activities for water use efficiency, focus on the Water Wise program, water audits and workshops, turf replacement, and irrigation system retrofits.

4 Program Structure and Costs

4.1 Program Administration

This program will be submitted to the 2014 IRWM Drought Grant Solicitation of DWR for program funding; as such, the program will need to include measures to coordinate with DWR and report program status and results. This will include approximately 70 hours of CVWD Program Manager staff time to coordinate funding and requirements with DWR and 145 hours of staff time to complete all quarterly, final, and post-completion reports for the program. Assuming a CVWD staff billing rate of $85 per hour equates to $18,105 in administrative and reporting costs.

4.2 Indoor Water Savings Rebate

The EPA Water Sense website contains an online database for WaterSense approved replacement fixtures to improve water use efficiency in homes. Taking a random sampling of 4-5 fixtures in each category yielded the price range per unit shown in Table 4.1. Old toilets and showerheads must be recycled to be eligible for program, similar to the CVWD Toilet Replacement program. CVWD states that toilet recycling is $10 through Desert Recycling in Thousand Palms and thus a $10 recycling fee will be incorporated into the rebate. The rebate amount for each fixture was then determined to be within the range and low enough to reach more residents in a more cost effective manner.

Table 4-1: Selected Price Range from WaterSense Fixture Database

	Toilet	Aerator (2 units)	Showerhead	Total
Per unit	$150 - $300	$10	$20 - $100	$230 - $410
Maximum Rebate	$200	$10	$30	$240
380 Households	$76,000	$3,795	$11,400	$91,195

The program proposes 380 rebates, approximately 1.5% of all households, are provided for each category: one toilet, two aerators, and one showerhead. Therefore total program costs for the indoor water savings rebate would be approximately $91,195 split between $43,195 for general DAC rebates and $48,000 for DACs in MHPs.

4.3 Water Distribution System Rehabilitation

Water distribution system rehabilitation costs were based on a combination of various studies due to the lack of previous studies that have been done on this type of program. A rough estimate was developed based on a study done by the Real Estate Center Texas A&M (REC) to determine base construction costs for new mobile home parks using data from California, Arizona, and Texas (REC 2000). The REC study determined costs per mobile home for new plumbing systems which are adapted to MHP type using various modifiers.

For the purposes of this study, all MHPs were assumed to be type “Low Cost” from the REC study which is defined by 3” mains, ¾” service lines, and a hydrant at each two spaces. The initial cost per mobile home for a water system for a “low cost” park was $365 per space. The following modifiers were provided for this MHP type:

Table 4-2: Selected Price Range from WaterSense Fixture Database

Number of Spaces per Park	Modifier	Area per Space (sqft)	Modifier
40	1.07	1200	0.83
80	1.00	2000	0.95
100	0.97	2400	1.00
120	0.95	2800	1.05
160	0.91	3600	1.12

Source: REC 2000.

Area per space for this study was based on site areas in the Oasis Mobile Home Park in Thermal, California as evaluated using the GoogleMaps polygon tool. At the Oasis Mobile Home Park, mobile home spaces range in size from about 1,300 to 4,500 square feet, with the majority at about 2,500 square feet. Therefore, the multiplier applied for area per space was 1.00. This mobile home park had over 200 mobile homes, though some in the area have closer to 80, there are other large parks. Thus, the Number of Space multiplier used was 0.95.

Once modified for the average space and number of spaces, which gave an approximate value of $347 per site for water main installation, the value was adjusted for inflation. Using the United States Department of Labor Consumer Price Index Inflation Calculator, the $347 per site installation cost from 2000, was adjusted to $478 in 2014 dollars.

While some systems may need a complete overhaul, it is likely that most systems will only need upgrades or repairs. Assuming that a third of the system will need replacement, a third of the system will only need repair, and the final third will not need plumbing system upgrades, the final cost was then multiplied by 0.5 to account for these three cases. Therefore the average plumbing retrofit cost per household in mobile home parks will be $240 according to this calculation.

Information was also collected from Carranza who confirmed a below ground plumbing system repair cost $3,240. The project replaced and rehabilitated asbestos insulated pipes that were below ground in a portion of a MHP with 88 mobile homes. Carranza confirmed that this was only a portion of the park, probably less than 1/5 of the total system. Using that fraction, the project cost about $185 per unit. This value is slightly less than the above estimated $240 and it was for one of the more difficult types of rehabilitation which would involve underground digging, complete pipe replacement, and management of hazardous materials.

This suggests that for the Coachella Valley area, a limit of $200 per unit for water distribution system rehabilitation is appropriate. The maximum program costs for water distribution system rehabilitation would therefore be $920,000 if water distribution systems were replaced for every mobile home. If the program begins with a target of system rehabilitation for 200 units, the costs would be approximately $40,000.

Submetering

The Santa Clara Valley Water District (SCVWD) determined an average cost of $84 with installation for submetering on mobile home units in 2000. Using the CPI Inflation Calculator, this is equal to $115 in 2014. Using an upper limit of $120 rebate for each unit, total program costs for submetering for 200 units would be $24,000.

Individual Unit Repairs

Jerry McKinnish provides a quote of approximately $250 for repairs to individual mobile homes with trap leaks and water supply line leaks. Providing for 200 homes, total program costs for individual unit repairs in MHPs would be $50,000.

4.4 Water Survey Program

The Water Survey program would be implemented for all rebates available in order for a household to be eligible for a rebate. The Water Survey may be conducted by a representative from one of the five agencies partnered in the program or by an alternative and previously approved program, including the DAC survey program being conducted through Loma Linda University. Based on the IWA program, the cost per Water Survey plus tracking costs is $110. The DAC program will also provide services to connect program participants with contractors and aid in filling out applications, the total costs of which are shown in Table 4-3 below. Using these activities as a basis for the water surveys, this study found that water survey costs will total about $60,000.

There will be 380 surveys available for DAC households in general and 200 available particularly for mobile home units. Assuming no overlap, 580 household surveys, each household would only have about 40 minutes of pre- and post-construction survey time with project partners and less than half an hour of application assistance. Alternatively, assuming complete overlap, all mobile home units also receive indoor plumbing retrofits, this would decrease the total surveys to only 380, but each household would then receive at least an hour of survey time with program partners and about 40 minutes of application assistance. The conservative figure of complete overlap will be used for this study in order to provide more attentive service and complete rehabilitation for those households that are in the program.

Table 4-3: Water Survey Program Costs

Project Component	Implementing Organization	Hourly Wage	Hours	Total
Determine Final Program Structure	CVWD	$85	30	$2,550
Determine Final Program Structure	Partners	$60	40	$2,400
Determine DAC Status and Provide Application Assistance	Partners	$60	240	$14,400
Invoicing and Check Preparation	CVWD	$85	100	$8,500
Invoicing and Check Preparation	Partners	$60	50	$3,000
Pre- and Post-Construction Survey	Partners	$60	400	$24,000
Post-Program Reporting and Water Savings Calculation	CVWD	$85	10	$850
Post-Program Reporting and Water Savings Calculation	Partners	$60	60	$3,600
Total				**$59,300**

4.5 Outreach and Education

The Regional Water Conservation Program proposed in 2011 received $1,000,000, which included costs for thousands of sprinkler controllers, sprinkler upgrades, and square feet of turf replacement. Total outreach and education costs were estimated at $60 per hour for 1,000 hours of outreach or $60,000. The current program is 30% of the size of the Regional Water Conservation Program based on total program costs and therefore expects less than 300 hours of outreach and education costs.

Program outreach will be shared between partner organizations with Leadership Counsel providing the bulk of the outreach, about 270 hours, and PUCDC providing approximately 20 hours. At the base rate of $60 per hour, total outreach and education costs for the DAC Onsite Plumbing Retrofit Program will be $17,400.

4.6 Total Combined Program Costs

The total program cost would be $300,000. The total acre feet per year (AFY) saved is 106.5 AFY, which does not include the potentially very large savings made by fixing distribution system leaks. While the individual unit repairs have the highest cost per program element, they also have other intrinsic value that is not factored into the equation such as elimination of standing water below and around the units. Costs would be approximately $2,815 per AFY.

Table 4.3 Costs per Program Element and Cost per Acre Feet per Year of Water Savings

	Cost	Element Percent of Program	AFY Saved	Cost per AFY
Project Administration	$18,105	6%	NA	-
Indoor (General)	$43,195	14%	14.3	$3,020
Indoor (MHP)	$48,000	16%	See Submetering	-
Distribution System	$40,000	13%	34.3	$1,165
Submetering	$24,000	8%	48.2	$1,495[1]
Individual Unit	$50,000	17%	9.7	$5,155
Water Surveys	$59,300	20%	NA	-
Outreach	$17,400	6%	NA	-
Total	$300,000	100%	106.5	$2,815

[1]Includes costs for assumed fixture replacement.

4.7 Expected Length of Beneficial Use

Below, in Table 4.4, the expected length of the beneficial use is given in years for each component of the program.

Table 4.4 Beneficial Use Life of Program Elements

	Toilet	Aerator	Showerhead	Piping
Beneficial Life (years)	20[1]	15[2]	10[2]	10-35[3]

[1] EPA. 2014. [2] Homer, TLC. 2014. [3] REC. 2000.

Given that the lifetime of most of these fixes is between 10 and 35 years, the cost would lower to between $80 and $282 per AFY over the lifetime of the project. The expected life of the project will be set to 15 years based on an approximate weighted average of all the program elements.

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