7 Technical Justification of Projects

Filename: Att7_IG2_TechJust_1of8

7.1 Hi-Desert Water District Wastewater Treatment and Water Reclamation Project

Brief introduction discussing benefits

The Hi-Desert Water District (HDWD) is proposing to construct a wastewater treatment plant and eliminate septic system discharges. The Colorado River RWQCB is scheduled to impose a septic prohibition in March 2016 to protect the drinking water supply.

Benefits of the project include:

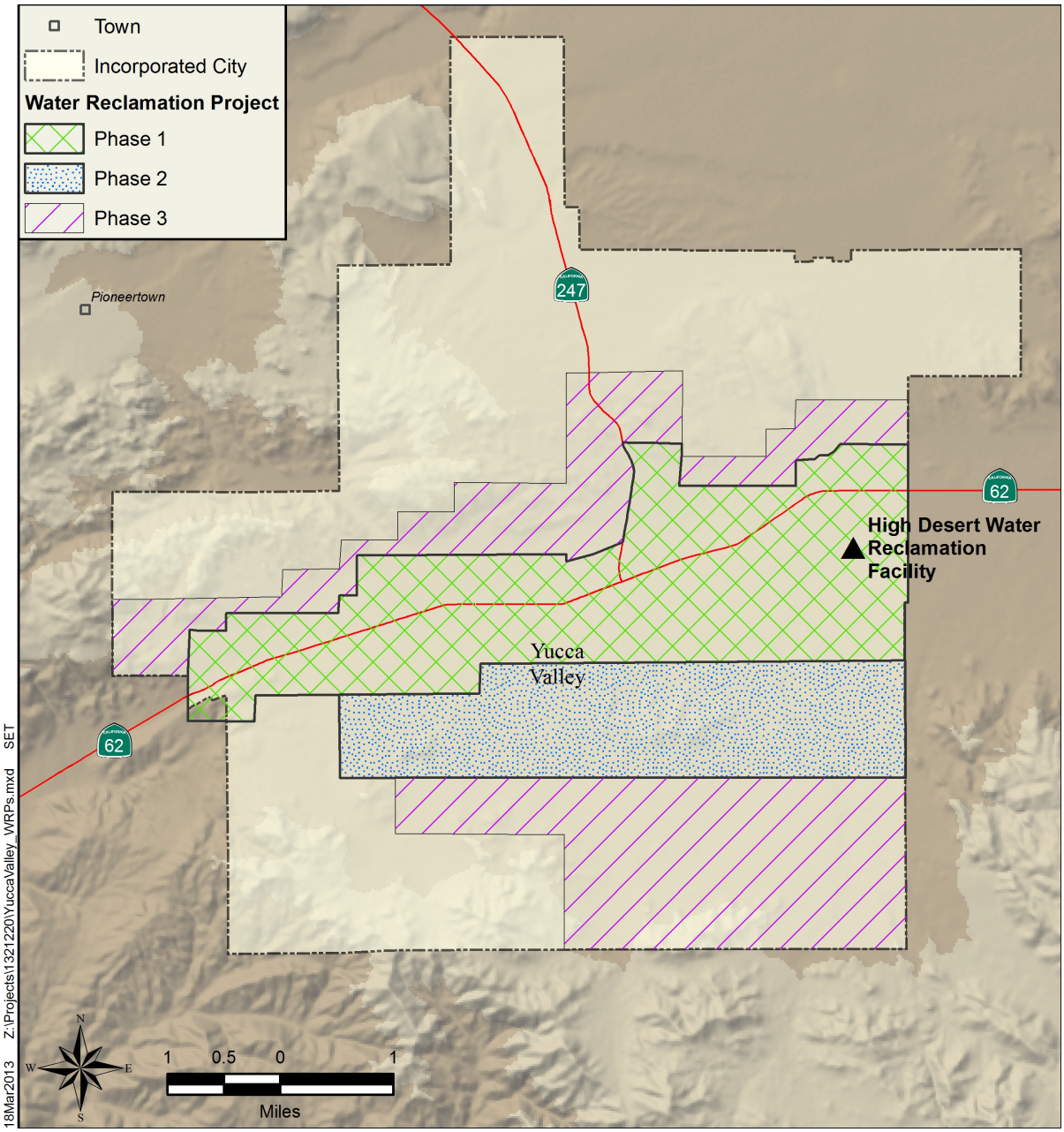
- Removal of nitrates, suspended solids, and other contaminants from the waste stream and preventing their entry to the drinking water aquifer. This benefit is not monetized but is expected to be significant.
- Recharge of the aquifer system with 1,400 acre-feet per year of reclaimed tertiary-treated water, avoiding the need for additional water supply imports from the Bay-Delta through the State Water Project. This benefit maintains the current water volume recharging the aquifer system through septic tanks. There is no additional net water recharged and this benefit is not monetized.

7.1.1 *Technical Justification*

Applicants should provide technical justification for the proposed projects claimed physical benefits. Regardless of the magnitude of benefits claimed, studies or documents used to support the projects must be clearly referenced. Estimates based on expert opinion or local knowledge (for example, from a District Engineer) should be documented with the individual's contact information. See Section V for guidance on submitting studies, documents, or other reference materials.

Phase 1 of the project will sewer the eastern portion of the Town of Yucca Valley and convey and treat an average of 1.25 million gallons per day (mgd). Phase 1 is a portion of the ultimate project that will collect up to 4 mgd of sewage. Not implementing the Hi-Desert wastewater treatment plant project would result in RWQCB enforcement. Such enforcement for the similar Los Osos area included fines of up to $500 per day per connection and a moratorium of new septic systems. Such punitive measures would have severe near-term and long-term impacts on the local economy.

Figure 7-1 Location Map - HDWD Water Reclamation Facility and Phase 1 Service Area



7.1.2 *Project Physical Benefits*

Physical benefits are the expected measurable accomplishments of projects. Physical benefits should be based on estimated measures of project accomplishments over the period of analysis. Any measurable restoration, protection, or enhancement of beneficial uses should be included.

Physical benefits from implementing the Hi-Desert Water District Wastewater Treatment and Water Reclamation Project include, but are not limited to:

- Water Quality Improvements
- Water Supply/Groundwater Replenishment

All monetized benefits of the Hi-Desert Water District Wastewater Treatment and Water Reclamation Project are included in Attachment 8, Benefits and Cost Analysis.

7.1.2.1 Water Quality Improvements

Hi-Desert Water District will construct Phase 1 to begin construction of the District's ultimate wastewater collection, treatment, and disposal system. The intent is to provide a blueprint for the multi-phase sewer service to the Town of Yucca Valley. Phase 1will provide 5,500 sewer connections in the Town of Yucca Valley and convey and treat an average of 1.25 mgd. The project will be expanded in stages to collect up to 4 mgd. The wastewater will be treated to meet Title 22 recycled water standards and discharge to percolation basins to recharge the treated effluent into the Warren Valley groundwater basin.

The first phase of the wastewater treatment and collection system will provide service to the most densely populated area in Yucca Valley, which is also the location of the majority of the District's groundwater wells. The Town of Yucca is disadvantaged community based on 80 percent of year 2010 statewide median household income and is listed on the DWR website as such. A wastewater system collection and treatment will result in the elimination of septic systems, as customers will be required to connect. The effluent from the treatment facility will be percolated into the District's recharge basin. Diversion of a portion of the effluent to parks and the local golf course is being considered as a future option, but currently there are no immediate plans for this.

The goals and objectives of the proposed project consist of the following:

1. Reduce the quantity of leachate from septic tank systems flowing into aquifers used for the District's potable water supply.
2. Construct a wastewater collection system and treat wastewater to a level such that percolated effluent will not degrade groundwater quality.
3. Provide the core infrastructure for expansion of the collection, treatment and disposal system as needed either to further protect groundwater, or to accommodate growth in the District's service area.
4. Maximize the total water supply available to the District.
5. Minimize any adverse economic and environmental impacts on the community.
6. In addition, specific objectives for the Phase 1 treatment facilities are as follows:
    a. Provide sufficient treatment capacity to ensure continuous compliance with anticipated regulatory requirements for an average annual wastewater flow of 1.25 mgd.
    b. Provide for future expansion of the plant to an annual average flow capacity of 6 mgd.

The Colorado River Basin Region of California Regional Water Quality Control Board passed Resolution No. R7-2011-0004 in May 2011. This Resolution is attached to this application as Appendix F (Att7_IG2_TechJust_2of8). This Resolution prohibits the discharge from septic tanks after 2016. The Regional Board's objective is to protect public health by ensuring that water quality meets water quality objectives.

The January 2009 Hi-Desert Water District Water Reclamation Facility Preliminary Design Report[23] reports nitrogen effluent loadings of 510 pounds per day in a Phase 1 influent flow of 1.0 mgd, or about 61 parts per million total nitrogen. This will be reduced to 8 parts million through the water treatment process, comfortably below the Colorado River Basin Plan limit of 10 parts per million.[24] A total nitrogen load of 15,900 pounds per year will be diverted from the drinking water aquifer.

Other alternatives that would serve the same function as the wastewater treatment plant include regular pumping of septic tanks, and export of the effluent out of the basin for treatment. Importing additional surface water through MWA's State Water Project contract would improve drinking water quality but would not meet the Regional Board's water quality objectives for the groundwater basin and is not an acceptable alternative. Wellhead treatment systems would improve drinking water quality but would not meet the Regional Board's water quality objectives for the groundwater basin and are not an acceptable alternative.[25]

This project has no relationship to other projects in this application. Adverse effects are limited to temporary noise, dust and traffic impacts during construction. The certainty of achieving the nitrogen load reduction is very high.

7.1.2.2 Water Supply Benefits

Water imported from the State Water Project is percolated into the drinking water aquifer to supplement limited natural supplies. Currently, water not lost to evaporative consumptive uses re-enters the groundwater system as effluent from septic systems.

The Hi-Desert Water District 2010 Urban Water Management Plan estimates septic returns of approximately 32 percent of gross water demand. These septic returns are about 1,000 acre-feet per year under current (2013) demands, and would rise to about 1,200 acre-feet per year under 2035 demand conditions.[26] This information is summarized in Table 7-1.

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[23] Montgomery Watson Harza, January 2009, Hi-Desert Water District Water Reclamation Facility Preliminary Design Report, Volume 1, Report. Tables 2-2 and 2-4; attached to this application as Appendix G (Att7_IG2_TechJust_3of8)

[24] MWH, 2009, Op cit., p. 2-6

[25] Tom Vandenberg, attorney for the Colorado River RWQCB, personal communication March 19, 2013

[26] HDWD 2010 UWMP Table 2-7, from MWA 2010 demand model. Assumes SBX7-7 target reductions are being met. The HDWD 2010 UWMP is included in this grant application as Appendix I (Att7_IG2_TechJust_5of8).

Table 7-1 Current and Projected HDWD Water Deliverers by Customer Type (af/yr)

Water Use Sector	2005	2010	2015	2020	2025	2030	2035
Metered Single-Family	2,467	2,308	2,222	2,239	2,338	2,436	2,551
Metered Multi-Family	284	250	277	291	304	318	321
Metered Comm/Ind	0	371	715	754	790	827	863
Metered Irrigation	60	49	52	55	58	60	63
Metered Other	0	17	24	26	27	28	22
Unaccounted For/System Losses	255	152	193	202	210	219	229
Total	3,066	3,147	3,483	3,567	3,727	3,888	4,049
Metered Non-Irrigation	2,751	2,946	3,238	3,310	3,459	3,609	3,757
Estimated Septic Return @32%	880	943	1,036	1,059	1,107	1,155	1,202

Source: HDWD 2010 UWMP Table 2-7, from MWA 2010 demand model. 2005 and 2010 demands are actual. Assumes SBX7-7 target reductions are being met.

The Hi-Desert Water District Wastewater Treatment and Water Reclamation Project will continue to recharge these same amounts of water in the future, and thus no net benefit is claimed. Alternatives to the project would export the water from the basin for treatment, and would require additional State Water Project (SWP) imports to keep the basin in balance.

The project is thus neutral in impacts to the groundwater basin, and neutral in the amount of SWP water to be imported.

7.1.3 *Annual Physical Benefits*

The time stream of annual benefits for the Hi-Desert Water District Wastewater Treatment and Water Reclamation Project are reported in Table 9 below. The volumes of water are interpolated between the values estimated in the Urban Water Management Pan reported in Table 7-1.

Table 9 – Annual Project Physical Benefits

Project Name: Hi-Desert Water District Wastewater Treatment and Reclamation Project

Type of Benefit Claimed: Drinking Water Source Improvement through Tertiary Treatment of Wastewater and Discharge to Percolation Ponds

Measure of Benefit Claimed (Name of Units): Acre-feet per year

Additional Information About this Measure: On-line June 2016 with 50 year life. Benefits will increase as future phases are added, but these benefits have not been claimed in this application. Water treatment assumed contrant from 2035 through end of project life. Phase 1 is designed for an average flow of 1 mgd (1,400 af/yr).

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013			
2014			
2015	0	0	0
2016	0	519	519
2017	0	1,040	1,040
2018	0	1,042	1,042
2019	0	1,044	1,044
2020	0	1,059	1,059
2021	0	1,063	1,063
2022	0	1,067	1,067
2023	0	1,071	1,071
2024	0	1,075	1,075
2025	0	1,107	1,107
2026	0	1,111	1,111
2027	0	1,115	1,115
2028	0	1,119	1,119
2029	0	1,123	1,123
2030	0	1,155	1,155
2031	0	1,159	1,159
2032	0	1,163	1,163
2033	0	1,167	1,167
2034	0	1,171	1,171
2035	0	1,202	1,202
2036	0	1,202	1,202
2037	0	1,202	1,202
2038	0	1,202	1,202
2039	0	1,202	1,202
2040	0	1,202	1,202
2041	0	1,202	1,202
2042	0	1,202	1,202
2043	0	1,202	1,202
2044	0	1,202	1,202
2045	0	1,202	1,202
2046	0	1,202	1,202
2047	0	1,202	1,202
2048	0	1,202	1,202
2049	0	1,202	1,202
2050	0	1,202	1,202
2051	0	1,202	1,202
2052	0	1,202	1,202
2053	0	1,202	1,202
2054	0	1,202	1,202
2055	0	1,202	1,202
2056	0	1,202	1,202
2057	0	1,202	1,202
2058	0	1,202	1,202
2059	0	1,202	1,202
2060	0	1,202	1,202
2061	0	1,202	1,202
2062	0	1,202	1,202
2063	0	1,202	1,202
2064	0	1,202	1,202
2065	0	1,202	1,202
2066	0	1,202	1,202
Etc.			0
Last Year of Project Life			

Comments: Source: Montgomery Watson Harza, January 2009, Hi-Desert Water District Water Reclamation Facility Preliminary Design Report, Volume 1, Report. Tables 2-2 and 2-4; attached to this application as "Att7_IG2_TechJust_3of5"

7.2 Victor Valley Wastewater Reclamation Authority Subregional Reclamation Project

Brief introduction discussing benefits

The Victor Valley Wastewater Reclamation Authority (VVWRA) will construct two water reclamation plants (WRPs) to recycle water for percolation to groundwater and serving recycled water to customers in Hesperia and Apple Valley. This will expand VVWRA's regional recycled water system to new locations within its service area. The Apple Valley WRP and Hesperia WRP have been designed as scalping facilities, meaning that these facilities will take a relatively constant wastewater flow from the interceptor system. Wastewater flow in the interceptor in excess of the plant capacity will continue to flow through the collection system to the Westside Regional WRP for treatment. The WRPs have been designed with membrane bioreactors and ultraviolet disinfection to provide advanced treatment suitable for both Title 22 customers and groundwater percolation basins.

Project Objective

The goals and objectives of the proposed project are to:

1. Construct two wastewater reclamation plants at locations that facilitate an increase in the use of recycled water near end users.
2. Treat wastewater to produce effluent meeting the most stringent Title 22 Recycled Water criteria.
3. Provide the core infrastructure for expansion of the collection, treatment and disposal system as needed either to protect groundwater, or to accommodate growth in the VVWRA service area.
4. Maximize the total water supply available to the community.
5. Minimize any adverse economic and environmental impacts to the community.
6. In addition to these general objectives, specific objectives for the proposed facilities are as follows:
    a. Provide sufficient wastewater treatment to ensure continuous compliance with anticipated regulatory requirements.
    b. Provide additional treatment capacity in the upper reaches of the service area to alleviate existing flows in downstream interceptors
    c. Provide for future expansion of services.

7.2.1 *Technical Justification*

Applicants should provide technical justification for the proposed projects claimed physical benefits. Regardless of the magnitude of benefits claimed, studies or documents used to support the projects must be clearly referenced. Estimates based on expert opinion or local knowledge (for example, from a District Engineer) should be documented with the individual's contact information. See Section V for guidance on submitting studies, documents, or other reference materials.

The proposed Hesperia Water Reclamation Plant and Apple Valley Water Reclamation Plant (WRP) are very similar in design and planned operation, giving economy to designing both at the same time and reliability to operating two systems with common equipment and controls. The plants are scalping plants, meaning they draw a constant portion of the flow from existing sewers to supply recycled water demands, and return the residual solids to the same sewer. The two Subregional Reclamation Project facilities will be operated at 1 mgd each initially, starting in June 2015, and will transition to 2 mgd operations by 2020. Each plant will initially withdraw 1.0 million gallons per day, and will relieve the sewer system and supplying a total of 4.0 mgd (4,480 acre-feet/year) at build-out. As shown in Table 7-2, projected wastewater flow volumes available to the plants will comfortably exceed the plants' 2.0 mgd initial capacities by 2020.[27] Both areas will generate average dry weather flows of at least 4.0 mgd by 2017, and are projected to each reach around 5.0 mgd by 2020. The plants have been located near large users to provide reliable water supply while minimizing energy for pumping. The Preliminary Design Reports for the Apple Valley and Hesperia Water Reclamation Plants are attached to this application as Appendix K (Att7_IG2_TechJust_7of8) and Appendix L (Att7_IG2_TechJust_8of8).

Table 7-2 Actual and Projected Flows Available to Scalping Plants

Year	Service Area Average Dry Weather Flow (mgd)	Hesperia Average Dry Weather Flow (mgd)	Apple Valley Average Dry Weather Flow (mgd)
2008	12.63	1.70	2.02
2009	12.84	1.76	2.07
2010	13.05	1.81	2.12
2011	14.89	2.42	2.72
2012	15.89	2.71	2.97
2013	16.89	3.00	3.21
2014	17.89	3.29	3.46
2015	18.87	**3.58**	**3.70**
2016	19.86	3.88	3.95
2017	20.84	4.17	4.19
2018	21.82	4.46	4.43
2019	22.80	4.75	4.68
2020	24.62	**5.33**	**4.98**
2021	26.44	5.92	5.28
2022	28.26	6.51	5.59
2023	30.08	7.09	5.89
2024	31.90	7.68	6.19
2025	33.72	8.26	6.49
2026	35.54	8.85	6.79
2027	37.36	9.43	7.09
2028	39.18	10.02	7.40
2029	41.00	10.60	7.70
2030	42.82	11.19	8.00

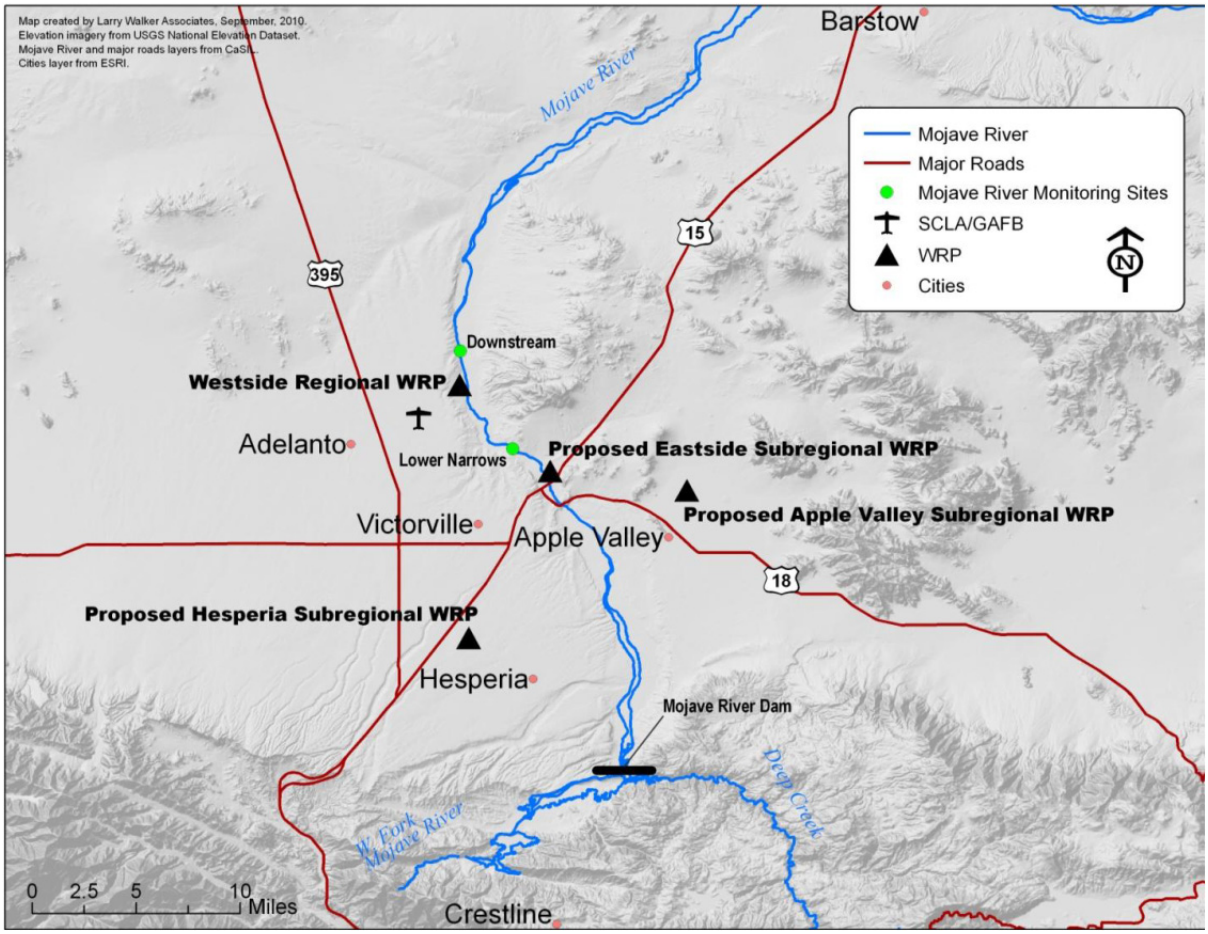
Source: VVWRA Flow Projection Update, Update 2, August 2008, Table 5 and Figure 8

The subregional WRPs use advanced treatment technologies to generate recycled water meeting California Title 22 effluent requirements for unrestricted use. The proposed Subregional Reclamation Project facilities will be used to provide highly treated reclaimed wastewater for irrigation uses on parks, golf courses and open space areas, and for commercial and industrial uses. Excess effluent not used for recycling will be disposed of in percolation ponds.

The treatment process includes primary treatment followed by biological nutrient reduction and Membrane Bioreactors (MBR). The effluent is disinfected with ultraviolet (UV) light. The residual solids are returned to the sanitary sewer for treatment at the Westside Regional WRP. This minimizes odor potential, energy use and facility size.

[27] RBF Consulting, August 2008, VVWRA Flow Projection Update – Update 2. This document is included with this grant application as Att7_IG2_TechJust_6of8

Figure 7-2 Location Map - VVWRA Subregional Water Reclamation Plants



7.2.2 *Project Physical Benefits*

Physical benefits are the expected measurable accomplishments of projects. Physical benefits should be based on estimated measures of project accomplishments over the period of analysis. Any measurable restoration, protection, or enhancement of beneficial uses should be included.

Benefits from the project include but are not limited to:

- Water Supply
- Energy and Greenhouse Gas Emission Reduction

7.2.2.1 Water Supply

The MWA service area lies in the California High Desert, which is part of the Mojave Desert. The High Desert Area is located on the northeastern flanks of the San Bernardino and San Gabriel Mountains, which separate the High Desert from the coastal basins and inland valleys of the greater Los Angeles area. Average rainfall within the lower lying areas of the Mojave Basin Area and Morongo Basin/Johnson Valley area is roughly five inches per

year[28]. The 1980 edition of the Department of Water Resources' Bulletin 118 states that there is evidence of overdraft in the following MWA basins: Lower Mojave River Valley, Middle Mojave River Valley, Upper Mojave River Valley, Harper Valley, Warren Valley and Lucerne Valley.

All water suppliers share a keen interest in their local and regional water supplies. The economic health of the region is tied to its ability to demonstrate that affordable high quality water will be available as the region develops. Overdraft in 2000 averaged approximately 34,300 acre-feet per year, and is projected to increase to 50,600 acre-feet by 2020.[29] Consumptive use in the MWA service area is currently approximately 108,000 acre-feet per year, and is expected to grow to approximately 124,000 acre-feet by 2020.[30] Less than half of 2020 demands would be met without RWMP implementation and full implementation of two adjudicated physical solutions.[31] To keep the basins in balance and prevent further overdraft, MWA imports water from the State Water Project (SWP).

The VVWRA is located in heart of the most populous potion of the MWA region, with approximately 80 percent of the total population. The majority of the imported SWP supplies are used within the VVWRA territory. The proposed Subregional Reclamation Project facilities will be used to provide highly treated reclaimed wastewater for irrigation uses on parks, golf courses and open space areas, and for commercial and industrial uses. Excess effluent not used for recycling will be disposed of in percolation ponds. Every acre-foot of reclaimed water used in this way will eliminate the need for the importation of an acre-foot of SWP water.

7.2.3 *Annual Physical Benefits*

The two Subregional Reclamation Project facilities will be operated at 1 mgd each initially, starting in June 2015, and will transition to 2 mgd operations by 2020. The time stream of these benefits is presented in DWR Table 9 format below. The Subregional Treatment Plants are not related to other projects in this application. The certainty of achieving these benefits is very high.

[28] MWA 2004 Regional Water Management Plan (RWMP) p.3-23; attached as Att2_IG2_Adopt_2of2.pdf

[29] RWMP Tables 5-6 and 5-12 with current SWP imports level of 8,000 acre-feet per year

[30] RWMP Tables 5-9 and 5-10

[31] MWA 2004 Regional Water Management Plan PEIR p.6-15

Table 9 – Annual Project Physical Benefits			
Project Name: Victor Valley Wastewater Reclamation Authority Subregional Reclamation Project			
Type of Benefit Claimed: Recycled water produced for non-potable use			
Measure of Benefit Claimed (Name of Units): acre-feet per year			
Additional Information About this Measure: On-line June 2015 with 50 year life.			
(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013	0	0	0
2014	0	0	0
2015	0	1,120	1,120
2016	0	2,240	2,240
2017	0	2,240	2,240
2018	0	2,240	2,240
2019	0	2,240	2,240
2020	0	4,480	4,480
2021	0	4,480	4,480
2022	0	4,480	4,480
2023	0	4,480	4,480
2024	0	4,480	4,480
2025	0	4,480	4,480
2026	0	4,480	4,480
2027	0	4,480	4,480
2028	0	4,480	4,480
2029	0	4,480	4,480
2030	0	4,480	4,480
2031	0	4,480	4,480
2032	0	4,480	4,480
2033	0	4,480	4,480
2034	0	4,480	4,480
2035	0	4,480	4,480
2036	0	4,480	4,480
2037	0	4,480	4,480
2038	0	4,480	4,480
2039	0	4,480	4,480
2040	0	4,480	4,480
2041	0	4,480	4,480
2042	0	4,480	4,480
2043	0	4,480	4,480
2044	0	4,480	4,480
2045	0	4,480	4,480
2046	0	4,480	4,480
2047	0	4,480	4,480
2048	0	4,480	4,480
2049	0	4,480	4,480
2050	0	4,480	4,480
2051	0	4,480	4,480
2052	0	4,480	4,480
2053	0	4,480	4,480
2054	0	4,480	4,480
2055	0	4,480	4,480
2056	0	4,480	4,480
2057	0	4,480	4,480
2058	0	4,480	4,480
2059	0	4,480	4,480
2060	0	4,480	4,480
2061	0	4,480	4,480
2062	0	4,480	4,480
2063	0	4,480	4,480
2064	0	4,480	4,480
2065	0	2,240	2,240
2066	0	0	0
Etc.			
Last Year of Project Life			
Comments:			

7.2.3.1 Energy and GHG Emission Reduction

Whether derived from the natural flow of the Mojave River or imported from the State Water project, the communities of Hesperia and Apple Valley obtain their water supply by pumping groundwater. Both communities have well fields along the Mojave River channel that are the principal sources of supply. This water is drawn up from below the ground, lifted to distribution systems above the River floodplain, and pressurized for distribution to customers.

The Subregional Wastewater Treatment Plants will eliminate much of this pumping by treating wastewater flows adjacent to their point of reuse, at approximately the same elevation. The pumping energy to distribute the treated reclaimed water is added back in to this calculation as part of the operations cost (see Chapter 8). Another significant energy use is the pumping of water from the Delta as part of the SWP supply; this energy is accounted for separately as part of the SWP supply cost.

As presented in Table 7-3, the elevation of the floodplain aquifer wells is approximately 2800 feet above mean sea level (MSL). The elevations of the Hesperia and Apple Valley Subregional Treatment Plants are approximately 3200 and 2950 feet MSL, respectively. Well pumping drawdown is typically 200 feet. Water deliveries are pressurized to about 70 pounds per square inch (psi) which is equivalent to about 160 feet of lift. In all, water is pumped the equivalent of 510 to 760 feet from the well to the top of distribution system. At a typical pump efficiency of 70 percent, each acre-foot pumped requires 1.46 kilowatt-hours (kWh) of energy per foot of lift. At an average energy cost of $0.232 per kWh, energy savings of nearly $1 million per year will be realized. (As noted above, the energy cost for distribution of the reclaimed water, and for SWP imports is dealt with elsewhere.)

At a typical conversion of 1,400 kWh of energy generation producing one ton of CO2 equivalents,[32] the project will eliminate 3,000 tons of carbon emissions per year. There is not yet a reliable market for these emissions, and this benefit is not monetized in this application.

The Subregional Treatment Plants are not related to other projects in this application. The certainty of achieving these benefits is very high. The time stream of these benefits is reported in the DWR Table 9 below.

[32] http://theclimateregistry.org 1,400 kWh = One ton of CO2e

Table 7-3 Energy Use Reduction for VVWRA Subregional Treatment Plants

	Hesperia	Apple Valley
Elevation of Wastewater Treatment Plant (ft)	3,200	2,950
Elevation of Floodplain Aquifer Wells (ft)	2,800	2,800
Static Lift (ft)	400	150
Well Drawdown (ft)	200	200
System Pressure (70 psi in ft)	160	160
Total Pumping Lift (ft)	760	510
Annual Satellite Treatment Plant Flow (af/yr)	2,240	2,240
Pumping Energy @e=70% (kWh/yr)	2,488,000	1,669,000
Unit Energy Cost ($/kWh)[1]	$0.232	$0.232
Energy Cost ($/yr)	$577,000	$387,000
	$964,000	
Approximate tons of CO2 equivalents per year[2]	3,000	

[1] U.S. Bureau of Labor Statistics, southern California in http://w w w .bls.gov/ro9/cpilosa_energy.htm

[2] http://theclimateregistry.org 1,400 kWh = One ton of CO2e

Table 9 – Annual Project Physical Benefits

Project Name: Victor Valley Wastewater Reclamation Authority Subregional Reclamation Project

Type of Benefit Claimed: Reduced energy consumption

Measure of Benefit Claimed (Name of Units): kiloWatt-hours per year

Additional Information About this Measure: On-line June 2015 with 50 year life.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013	0	0	0
2014	0	0	0
2015	0	-1,039,250	-1,039,250
2016	0	-2,078,500	-2,078,500
2017	0	-2,078,500	-2,078,500
2018	0	-2,078,500	-2,078,500
2019	0	-2,078,500	-2,078,500
2020	0	-4,157,000	-4,157,000
2021	0	-4,157,000	-4,157,000
2022	0	-4,157,000	-4,157,000
2023	0	-4,157,000	-4,157,000
2024	0	-4,157,000	-4,157,000
2025	0	-4,157,000	-4,157,000
2026	0	-4,157,000	-4,157,000
2027	0	-4,157,000	-4,157,000
2028	0	-4,157,000	-4,157,000
2029	0	-4,157,000	-4,157,000
2030	0	-4,157,000	-4,157,000
2031	0	-4,157,000	-4,157,000
2032	0	-4,157,000	-4,157,000
2033	0	-4,157,000	-4,157,000
2034	0	-4,157,000	-4,157,000
2035	0	-4,157,000	-4,157,000
2036	0	-4,157,000	-4,157,000
2037	0	-4,157,000	-4,157,000
2038	0	-4,157,000	-4,157,000
2039	0	-4,157,000	-4,157,000
2040	0	-4,157,000	-4,157,000
2041	0	-4,157,000	-4,157,000
2042	0	-4,157,000	-4,157,000
2043	0	-4,157,000	-4,157,000
2044	0	-4,157,000	-4,157,000
2045	0	-4,157,000	-4,157,000
2046	0	-4,157,000	-4,157,000
2047	0	-4,157,000	-4,157,000
2048	0	-4,157,000	-4,157,000
2049	0	-4,157,000	-4,157,000
2050	0	-4,157,000	-4,157,000
2051	0	-4,157,000	-4,157,000
2052	0	-4,157,000	-4,157,000
2053	0	-4,157,000	-4,157,000
2054	0	-4,157,000	-4,157,000
2055	0	-4,157,000	-4,157,000
2056	0	-4,157,000	-4,157,000
2057	0	-4,157,000	-4,157,000
2058	0	-4,157,000	-4,157,000
2059	0	-4,157,000	-4,157,000
2060	0	-4,157,000	-4,157,000
2061	0	-4,157,000	-4,157,000
2062	0	-4,157,000	-4,157,000
2063	0	-4,157,000	-4,157,000
2064	0	-4,157,000	-4,157,000
2065	0	-2,078,500	-2,078,500
2066	0	0	0
Etc.			
Last Year of Project Life			

Comments:

Table 9 – Annual Project Physical Benefits

Project Name: Victor Valley Wastewater Reclamation Authority Subregional Reclamation Project

Type of Benefit Claimed: Reduced greenhouse gas (GHG) emissions

Measure of Benefit Claimed (Name of Units): tons of CO2 equivalents per year

Additional Information About this Measure: On-line June 2015 with 50 year life.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (c) – (b)
2012			
2013	0	0	0
2014	0	0	0
2015	0	(742)	(742)
2016	0	(1,485)	(1,485)
2017	0	(1,485)	(1,485)
2018	0	(1,485)	(1,485)
2019	0	(1,485)	(1,485)
2020	0	(2,969)	(2,969)
2021	0	(2,969)	(2,969)
2022	0	(2,969)	(2,969)
2023	0	(2,969)	(2,969)
2024	0	(2,969)	(2,969)
2025	0	(2,969)	(2,969)
2026	0	(2,969)	(2,969)
2027	0	(2,969)	(2,969)
2028	0	(2,969)	(2,969)
2029	0	(2,969)	(2,969)
2030	0	(2,969)	(2,969)
2031	0	(2,969)	(2,969)
2032	0	(2,969)	(2,969)
2033	0	(2,969)	(2,969)
2034	0	(2,969)	(2,969)
2035	0	(2,969)	(2,969)
2036	0	(2,969)	(2,969)
2037	0	(2,969)	(2,969)
2038	0	(2,969)	(2,969)
2039	0	(2,969)	(2,969)
2040	0	(2,969)	(2,969)
2041	0	(2,969)	(2,969)
2042	0	(2,969)	(2,969)
2043	0	(2,969)	(2,969)
2044	0	(2,969)	(2,969)
2045	0	(2,969)	(2,969)
2046	0	(2,969)	(2,969)
2047	0	(2,969)	(2,969)
2048	0	(2,969)	(2,969)
2049	0	(2,969)	(2,969)
2050	0	(2,969)	(2,969)
2051	0	(2,969)	(2,969)
2052	0	(2,969)	(2,969)
2053	0	(2,969)	(2,969)
2054	0	(2,969)	(2,969)
2055	0	(2,969)	(2,969)
2056	0	(2,969)	(2,969)
2057	0	(2,969)	(2,969)
2058	0	(2,969)	(2,969)
2059	0	(2,969)	(2,969)
2060	0	(2,969)	(2,969)
2061	0	(2,969)	(2,969)
2062	0	(2,969)	(2,969)
2063	0	(2,969)	(2,969)
2064	0	(2,969)	(2,969)
2065	0	(1,485)	(1,485)
2066	0	0	0
Etc.			
Last Year of Project Life			

Comments: