ATTACHMENT 3

SOUTH ORANGE COUNTY IRWM DROUGHT GRANT PROPOSAL

PROJECT JUSTIFICATION

I. PROJECT SUMMARY TABLE

Table 4 – 2014 IRWM Drought Solicitation Project Summary Table				
Drought Project Element		**SMWD Califia Recycled Water Project**	**SCWD Recycled Water System Expansion**	**MNWD Recycled Water System Extension**
D.1	Provide immediate regional drought preparedness	X	X	X
D.2	Increase local water supply reliability and the delivery of safe drinking water	X	X	X
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				
IR.1	Water supply reliability, water conservation, and water use efficiency	X	X	X
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	X	X	X
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			

II. PROJECT DESCRIPTION

1. Santa Margarita Water District (SMWD) Califia Recycled Water Project

Project Description: The Project will design and construct laterals and on-site retrofitting to connect 52 existing potable water use sites with 220AFY from SMWD's recycled water system.

This Project will alleviate the following drought impact(s) identified in Attachment 2: at risk of not meeting existing drinking water demands, at risk of not meeting existing agriculture demands, at risk of not meeting ecosystem water demands, groundwater basin overdraft, and other drought related adverse impacts due to the reduction of anticipated SWP imported water supply deliveries to zero percent. SMWD is Orange County's second-largest water district, providing water and wastewater treatment services to more than 155,000 residents and businesses, and encompassing approximately 52,000 acres, with a total domestic water demand of approximately 35,000 AFY. All of SMWD's water supply is purchased through Municipal Water District of Orange County (MWDOC) from the Metropolitan Water District of Southern California (MWD), which delivers water to the region from Northern California via the State Water Project (SWP) and from the Colorado River via the Colorado River Aqueduct. Due to the drought, this imported water supply is at risk. SMWD's recycled water system provides one-fifth of SMWD's annual water demand and further utilizing the available recycled water is necessary to reduce the demand on imported water supplies from MWD. The proposed Califia Recycled Water Project would provide 220 AFY of recycled water to reduce the demand on imported water for the region. The 220 AFY of recycled water would make that same amount of domestic water available to Northern California service areas requiring additional supply as a result of the state's drought. The percentage of total outdoor water use is roughly 55% of SMWD's total domestic demand. Converting dedicated irrigation meters from domestic water service to recycled water service reduces the total domestic water demand for SMWD. Increasing the recycled water usage for irrigation purposes increases the domestic water reliability, thereby making high quality drinking water available for potable uses rather than non-potable uses. The Project helps decrease the reliance on imported water for the delivery of safe drinking water by providing recycled water for non-potable uses. Implementing recycled water will ensure there is adequate supply for irrigation and agricultural uses, including Rancho Mission Viejo's ranching and agricultural operations and 17,000 acres of natural open space. The ability to continue to irrigate landscaping upstream of the natural ecosystems allows for the groundwater levels to stay at a relatively constant level which will support the ground surface habitats. Providing 220 AFY of recycled water for irrigation supply will reduce the amount of wastewater released into the ocean, thereby protecting our waterways and ecosystems. The Project's recycled water supply helps to reduce the drought's threat to residents, agriculture, and businesses in the local economy.

Project is an eligible drought project type because it provides immediate and long-term regional drought preparedness by providing 220 AFY of recycled water to the region for irrigation, thereby promoting potable water conservation, conjunctive use, reuse and recycling. The state's July 15, 2014 news release*, State Water Board Approves Emergency Regulation to Ensure Agencies and State Residents Increase Water Conservation*, asks water agencies to increase recycled water projects. This recycled water Project will utilize approximately 220 AFY of local recycled water to offset imported water demand, contributing to sustainable water supply and reliability during water shortages. The 220 AFY of recycled water is readily available with a backbone delivery system located near the Project. Connection to the backbone delivery system will require relatively minimal piping and the recycled water supply is available for use. In addition to the immediate conversion to recycled water service, the Project addresses long-term drought preparedness in that it is a permanent conversion of existing domestic irrigation accounts to non-domestic irrigation accounts. In conjunction with the conversion of the domestic irrigation accounts to non-domestic water, both the District's Water Efficiency Administrator and Non-Domestic Specialist would be involved with the conversions and will provide assistance to the customer on optimal landscape irrigation methods and assist with other potential means of water use efficiency.

Expedited Funding is needed for this project to bring new recycled water customers on line as quickly as possible. The California Department of Water Resources (DWR) reduced the anticipated SWP water supply deliveries to contractors to zero percent which greatly impacts the water reliability of the Region because the South Orange County Watershed Management Area (SOCWMA) relies on imported water for 90% of its supply. The Project will increase both the local water supply reliability and the ability to deliver safe drinking water by supplying recycled water for irrigation to the region. Irrigating with recycled water allows an equal amount of high quality drinking water to become available for potable uses instead of non-potable uses. The Project will also result in energy saved and greenhouse gases avoided. The funding for the Project is necessary to complete the conversion of the facilities immediately such that the benefits of the conversions can be realized. Without grant funding, the Project would not be immediately implemented due to limited funds.

2. South Coast Water District (SCWD) Recycled Water System Extension Project

Project Description: Project will design and construct laterals to serve five existing potable use sites with 150 AFY from SCWD's recycled water system.

This Project will alleviate the following drought impact(s) identified in Attachment 2: at risk of not meeting existing drinking water demands, at risk of not meeting existing agriculture demands, at risk of not meeting ecosystem water demands, groundwater basin overdraft, and other drought related adverse impacts due to the reduction of anticipated SWP imported water supply deliveries to zero percent. SCWD's total water demand is approximately 7,000 AFY. 80% of the supply required for SCWD's service area is imported from the Colorado River and northern California through MWD. The balance of the water comes from two local sources: 1) The District's Groundwater Recovery Facility in the City of Dana Point near San Juan Creek pumps raw well-water from the San Juan Groundwater Basin, which uses reverse osmosis technology to produce potable water for local drinking water, representing about 10% of the District's total water supply; and 2) The Advanced Wastewater Treatment Facility in Laguna Canyon near Aliso Creek takes treated wastewater from the Coastal Treatment Plant and further disinfects it to produce recycled water for local irrigation, representing about 10% of the District's total water supply. The District is an existing recycled water provider to over 300 acres of land irrigated with recycled water. A District Ordinance requires users to convert to recycled water once distribution system is available, and the Project will make the distribution immediately available to the following users: the County of Orange Dana Point Harbor, State of California Doheny Beach Park, City of Dana Point Lantern Bay Park, Lantern Bay Villas HOA and Lantern Bay Estates HOA. The Project will assist in increasing the recycled water supply to meet its demands. The Project will help alleviate drought impacts by reducing imported potable water used for landscape irrigation by 150 AFY. This irrigation demand will be met by local recycled water, which will reduce the required potable supply for irrigation by 150 AFY and make that potable water available for other uses, including drinking water demands throughout the state. Implementing recycled water will ensure there is adequate supply for irrigation and agricultural uses. The ability to continue to irrigate landscaping upstream of the natural ecosystems allows for the groundwater levels to stay at a relatively constant level which will support the ground surface habitats. Providing 150 AFY of recycled water for irrigation supply will reduce the amount of wastewater released into the ocean, thereby protecting our waterways and ecosystems. The Project's recycled water supply helps to reduce the drought's threat to residents, agriculture, and businesses in the local economy. The Project offers protection of economic investment in landscaped areas should drought conditions force severe restrictions on outdoor watering use. The Project will immediately alleviate these impacts by increasing the use of recycled water within the SCWD service area for irrigation purposes.

Project is an eligible drought project type because it provides immediate and long-term regional drought preparedness by providing 150 AFY of recycled water to the region, thereby promoting potable water conservation, conjunctive use, reuse and recycling. The state's July 15, 2014 news release*, State Water Board Approves Emergency Regulation to Ensure Agencies and State Residents Increase Water Conservation*, asks water agencies to increase recycled water projects. This recycled water Project will utilize approximately 150 AFY of recycled water to offset imported water demand, contributing to sustainable water supply and reliability during water shortages. SCWD provides recycled water to over 300 acres of land. The 150 AFY of recycled water is readily available for distribution upon completion of the Project's recycled water system extension. In addition to the immediate conversion to recycled water service, the Project addresses long-term drought preparedness in that it will provide a permanent conversion of existing domestic irrigation accounts to non-domestic irrigation accounts. The Project will provide a long-term reduction of domestic water use for irrigation purposes by increasing both the local and state water supply reliability and the ability to deliver safe drinking water by supplying recycled water for irrigation to the region.

Expedited Funding is needed for this project to bring new recycled water customers on line as quickly as possible. DWR reduced the anticipated imported SWP water supply deliveries to zero percent which greatly impacts the water reliability of the Region because the SOCWMA relies on imported water for 90% of its supply. The drought has severely limited the amount of imported water supplied to the SOCWMA. Expedited funding is needed because the Project increases both the local and state water supply reliability and decreases the amount of imported drinking water required for the region by serving 150 AFY of irrigation demands with recycled water rather than high quality drinking water. Irrigating with recycled water allows an equal amount of high quality drinking water to become available for potable uses instead of non-potable uses. The recycled water supply is readily available to supply the new users. Expedited funding for the Project is necessary to quickly complete the extension of the facilities so that the benefits of the new recycled water supply can be realized. Without grant funding, the Project would not be immediately implemented due to limited funds.

3. Moulton Niguel Water District (MNWD) Recycled Water System Extension Project

Project Description: Project will design and construct laterals to serve 32 existing potable use meters with 102.3 AFY from MNWD's recycled water system.

This Project will alleviate the following drought impact(s) identified in Attachment 2: at risk of not meeting existing drinking water demands, at risk of not meeting existing agriculture demands, at risk of not meeting ecosystem water demands, groundwater basin overdraft, and other drought related adverse impacts due to the reduction of anticipated SWP imported water supply deliveries to zero percent. Currently, the total water demand for retail customers served by MNWD is approximately 33,846 AF annually consisting of 26,726 AF (79%) of potable water and 7,120 AF (21%) of recycled water. MNWD's imported supply is purchased through MWDOC and MWD. MNWD is wholly reliant upon imported water. Recycled water currently makes up approximately 25% of MNWD's supply and is used for irrigation and other non-potable uses. The Project will extend the existing recycled water system and provide 102.3 acre-feet per year of recycled water in lieu of potable water by installing about 7,500 feet of 8-inch and 6-inch PVC for 32 new recycled water services. The Project will assist in increasing the recycled water supply to meet non-potable demands, which will save imported potable water. MNWD has a mandatory use ordinance that will require users to convert once a recycled meter is installed. The Project will help alleviate drought impacts by reducing imported potable water used for landscape irrigation by 102.3 AFY. This irrigation demand will be met by local recycled water, which will reduce the required potable supply for irrigation by 102.3 AFY and make that potable water available for other uses, including drinking water demands. Implementing recycled water will ensure there is adequate supply for irrigation and agricultural uses. The ability to continue to irrigate landscaping upstream of the natural ecosystems allows for the groundwater levels to stay at a relatively constant level which will support the ground surface habitats. Providing 102.3 AFY of recycled water for irrigation supply will reduce the amount of wastewater released into the ocean, thereby protecting our waterways and ecosystems. The Project's recycled water supply helps to reduce the drought's threat to residents, agriculture, and businesses in the local economy. The Project offers protection of economic investment in landscaped areas should drought conditions force severe restrictions on outdoor watering use. The 102.3 AFY of recycled water would make that same amount of domestic water available to Northern California service areas requiring additional supply as a result of the state's drought. The Project will immediately alleviate these impacts by increasing the use of recycled water within the MNWD service area for irrigation purposes.

Project is an eligible drought project type because it provides immediate and long-term regional drought preparedness by providing 102.3 AFY of recycled water to the region through 32 new recycled water services in various locations, thereby promoting potable water conservation, conjunctive use, reuse and recycling. The state's July 15, 2014 news release, *State Water Board Approves Emergency Regulation to Ensure Agencies and State Residents Increase Water Conservation*, asks water agencies to increase recycled water projects. This recycled water Project will utilize approximately 102.3 AFY of recycled water to offset imported water demand, contributing to sustainable water supply and reliability during the drought. The Project provides reclaimed wastewater that would have otherwise been released to the ocean. MNWD is an existing recycled water provider and therefore, the supply and capacity for recycled water is readily available for distribution upon completion of the Project's recycled water system extension. In addition to the immediate conversion to recycled water service, the Project addresses long-term drought preparedness in that it will provide permanent conversion of existing domestic irrigation accounts to non-domestic irrigation accounts. MNWD has as a mandatory use ordinance that will require the users to convert once a recycled meter is installed. The Project will provide a long-term reduction of domestic water use for irrigation purposes.

Expedited Funding is needed for this project to bring new recycled water customers on line as quickly as possible. The drought has severely limited the amount of imported water supplied to the SOCWMA. Expedited funding is needed because the Project increases both the local and state water supply reliability and the ability to deliver safe drinking water by supplying recycled water for irrigation to the region. The Project decreases the amount of imported drinking water required for the region by serving 102.3 AFY of irrigation demands with recycled water rather than high quality drinking water. Irrigating with recycled water allows an equal amount of high quality drinking water to become available for potable uses instead of non-potable uses. The Project will also result in energy saved and greenhouse gases avoided. The recycled water supply is readily available to supply the new users. Expedited funding for the Project is necessary to quickly complete the extension of the facilities so that the benefits of the new recycled water supply can be realized and the effects of the drought can be minimized. Without grant funding, the Project would not be immediately implemented due to limited funds.

III. REGIONAL AND PROJECT MAPS

Regional and Project maps are attached in Att3_DG_ProJust_2of2 and include the following:

1. Figure 1. SMWD Califia Recycled Water Project Map - *No direct effect on water resources and no proposed new monitoring locations.
2. Figure 2. SCWD Recycled Water Extension Project Map - *No direct effect on water resources and no proposed new monitoring locations.
3. Figure 3. MNWD Recycled Water Extension Project Map - *No direct effect on water resources and no proposed new monitoring locations.
4. Figure 4. A Regional map with IRWM regional boundaries and project locations.

The proposed projects will provide new recycled water supply in place of existing potable water supply used for irrigation. Therefore, it is not anticipated that any of the Projects will directly impact water resources (groundwater or surface) because the same amount of water will be used for irrigation; recycled water will replace potable water. However, the surface waters are shown on the project maps as an added detail for your information. There are no proposed monitoring locations as part of the Projects; however; existing monitoring locations are shown on the Project Maps simply to provide you with additional detail. No water quality benefits are claimed as part of the proposed Projects.

IV. PROJECT PHYSICAL BENEFITS

1. SMWD Califia Recycled Water Project

Table 5a – Annual Project Physical Benefits

Project Name: Santa Margarita Water District Califia Recycled Water Project

Type of Benefit Claimed: Increase Delivery of Recycled Water for Local Reliability and Decrease Dependence on Imported Water

Units of the Benefit Claimed : Acre-Feet per Year (AFY)

Additional Information About this Benefit Amount of recycled water used to meet irrigation demands would be equal to the amount of potable water saved.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project [1]	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	0	220	220
2016	0	220	220
Etc.	0	220	220
Last Year of Project Life 2065	0	220	220

Comments: [1] The Project will be placed in service in 2015. The Project will remain in existence indefinitely; however, for the purposes of this grant application, the estimated life of the project is 50 years. Recycled water is not being used for irrigation at the proposed 52 locations in the Project area. Thus, the benefit without the project is 0 AFY of recycled water and the benefit with the Project is 220 AFY. SMWD staff performed an analysis by looking at the customer list of domestic irrigation accounts within the Project limits. The meters of each domestic irrigation customer were plotted along with the existing recycled water delivery system. Based on the potential demand at each meter, approximate pipe sizes and lengths were determined to serve the meters. The accounts with the greatest consumption history and those most accessible with a new recycled water distribution system were determined to be the most ideal locations for conversion. A total of 52 meters were identified, as shown in Table 1 in Section V. *Technical Analysis of Physical Benefits Claimed* for this Project, and a total of 220AFY recycled water will be supplied by the Project. The benefits are consistently 220AFY each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 220 AFY benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition. A cost estimate was completed based on proposed pipe and number of converted accounts. In completing the analysis, the District's Rules and Regulations for Nondomestic Water Service, which are in compliance with the South Orange County Wastewater Authority (SOCWA) discharge permit, were followed. Over the life of the Project, a benefit of 11,000 AFY of recycled water will be provided and the same amount of imported water will be saved.

Technical Reference:

"Santa Margarita Water District Water Use Efficiency Plan". July 2014. Page 41. Project is identified in Table 4-2. Source for project costs, water savings and the year it is to be implemented.

Table 5b – Annual Project Physical Benefits

Project Name: Santa Margarita Water District Califia Recycled Water Project

Type of Benefit Claimed: Reduced Energy Usage

Units of the Benefit Claimed : Kilowatt hour (kWh)

Additional Information About this Benefit The amount of energy required to treat wastewater for recycled uses, alleviating the need to import that equal amount of potable water for irrigaiton uses.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project [1]	Change Resulting from Project (b) – (c)
2014	559,680	559,680	0
2015	559,680	9,680	550,000
2016	559,680	9,680	550,000
Etc.	559,680	9,680	550,000
Last Year of Project Life 2065	559,680	9,680	550,000

Comments: [1] The Project will be placed in service in 2015. The Project will remain in existence indefinitely; however, for the purposes of this grant application, the estimated life of the project is 50 years. Imported Water Calculation for Total Energy: 220AFY X 2,544 kWh/AF = 559,680 kWh. Recycled Water Calculation for Total Energy: 220AFY X 44 kWh/AF = 9,860 kWh. The benefit is equal to the power savings: 559,680kWh-9,680kWh= 550,000 kWh. The power required to import 1 AF of water is approximately 2,544 kWh/AF. The amount of energy required to deliver 1 AF of recycled water is approximately 44 kWh based on recent and historical conditions. 44 kWh/AF is based on the pumping of the recycled water from the District's Chiquita Water Reclamation Plant to the pressure zone within which the Project is located. The total energy required to deliver each acre-foot of water depends upon the pump capacity and efficiency and the relative elevations of the treatment facility and site of use. Each acre-foot of recycled water that is generated within the District's service area is utilized in place of the imported water. The Project provides 220 AFY of recycled water thus the amount of energy saved is 550,000 kWh. A total benefit of 220 AFY of recycled water will be supplied by the Project, resulting in a total benefit of 27,500,000 kWh over the life of the Project. The benefits are consistently 550,000 kWh each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers, thereby requiring the same amount of energy each year. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 550,000 kWh benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.

Technical Reference:

"Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot of water is 2,544 kWh, or approximately 2,500 kWh, based on the average of 3,044 kWh/AF for State Water Project water and 2,044 kWh/AF for Colorado River water. "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is approximately 2,500 kWh (average of approximately 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct water).

"Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for average of 2,500 kWh energy required to import 1 AF.

Table 5c – Annual Project Physical Benefits

Project Name: Santa Margarita Water District Califia Recycled Water Project

Type of Benefit Claimed: Reduced Greehouse Gas Emissions

Units of the Benefit Claimed : Pounds (lbs) of CO2

Additional Information About this Benefit The reduction of Greehouse Gas Emissions due to the reduction in energy consumption.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project [1]	Change Resulting from Project (b) – (c)
2014	341,405	341,405	0
2015	341,405	5,905	335,500
2016	341,405	5,905	335,500
Etc.	341,405	5,905	335,500
Last Year of Project Life 2065	341,405	5,905	335,500

Comments: [1] The Project will be placed in service in 2015. The Project will remain in existence indefinitely; however, for the purposes of this grant application, the estimated life of the project is 50 years. Based on the total energy required, as identified in the Secondary Benefit above, the Imported Water Total CO2 Emissions Calculation=559,680 kWh X .61 lbs of CO2/kWh= 341,404.8 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 9,860 kWh X .61 lbs of CO2/kWh = 5,904.8 lbs of CO2. The difference between imported and recycled water CO2 emissions is 341,404.8 lbs of CO2 – 5,904.8 lbs of CO2 = 335,500 lbs of CO2 saved annually. The total amount of CO2 emissions reduced as a result of implementing the Califia Recycled Water Project is 16,775,000 lbs of CO2 over the life of the project. The benefits are consistently 335,5000 lbs of CO2 each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers, thereby using the same amount of energy each year and emitting the same amount of CO2 (greenhouse gas) each year. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 335,500 lbs of CO2 benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.

The carbon emission estimates of 0.61 lbs of CO2/kWh is based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases".From the data collected on the amount of CO2 produced for the generation of electricity, CO2 generation factors were determined as a way of estimating the total CO2 that will be emitted based on a given energy consumption. The most current factor applicable in the state of California, released in 2014, was used to determine this Secondary Physical Benefit.
The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:
• "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is 2,544 kWh (average of 3,044 kWh/AF for State Water Project water and 2,044 kWh/AF for Colorado River water).
• "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is approximately 2,500 kWh (average of approximately 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct water).
• "Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for average of 2,500 kWh energy required to import 1 AF.

2. SCWD Recycled Water System Extension Project

Table 5a – Annual Project Physical Benefits

Project Name: South Coast Water District Recycled Water System Extension Project

Type of Benefit Claimed: Increased Delivery of Recycled Water for Local Reliability and Decrease Dependence on Imported Water

Units of the Benefit Claimed : Acre-feet per year (AFY)

Additional Information About this Benefit__Amount of recycled water used would be equal to the amount of potable water saved to meet irrigation demands.___

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	0
2015	0	150	150
2016	0	150	150
2017	0	150	150
Last Year of Project Life 2065	0	150	150

Comments: Estimated life of the project is 50 years. The project would be in operation in 2015 and would produce 150AFY of recycled water for irrigation. Over the life of the project 7,500 acre-feet of recycled water would be delivered. This same amout would be used in place of imported potable water. Recycled water is not being used for irrigation within the project area. Thus the benefit without the project is 0 AFY of recycled water. In 2008, the South Coast Water District developed an Infrastructure Master Plan that included a Recycled Water System Master Plan. In that Master Plan, analyses of potential expansions to the existing recycled water system were developed. All domestic water irrigation customers' records were reviewed to determine those that could be converted to recycled water use. That study identified a number of customers and reviewed the ease at which they could be converted to recycled water to group them in to several categories. The Project will consist of 6,400 feet of new recycled water distribution system pipe to convert 5 sites to recycled water system (County of Orange Dana Point Harbor, State of California Doheny Beach Park, City of Dana Point Lantern Bay Park, Lantern Bay Villas HOA and Lantern Bay Estates HOA). The total recycled water demand for these users was identified as approximately 150 AFY. Based on the location of these users and the amount of demand, pipeline extensions from the current recycled system were determined. The diameter of these pipelines and the required pressures were also reviewed. The benefits are consistently 150 AFY each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 150 AFY benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.

Table 5b – Annual Project Physical Benefits

Project Name: South Coast Water District Recycled Water System Extension Project
Type of Benefit Claimed: Reduced Energy Usage
Units of the Benefit Claimed : Kilowatt Hours (kWh)
Additional Information About this Benefit: Energy required to recycle water is less than energy needed for import

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	375,000	375,000	0
2015	375,000	75,000	300,000
2016	375,000	75,000	300,000
Etc.	375,000	75,000	300,000
Last Year of Project Life 2065	375,000	75,000	300,000

Comments: Estimated life of the project is 50 years. The project would be in operation in 2015. The power required to import one acre-foot (AF) of water is 2,500 kwh (3,000 kWh/AF for State Water Project water and 2,000 kwh/AF for Colorado River water). One acre-foot of recycled water requires 500 kwh of energy to produce and deliver. Imported Water Calculation for Total Energy: 150AFY X 2,500 kWh/AF = 375,000 kWh. Recycled Water Calculation for Total Energy: 150AFY X 500 kWh/AF = 75,000 kWh. The benefits is equal to the power savings: 375,000kWh-75,000kWh= 300,000 kWh. Annual energy savings would be 300,000 kWh, and over the life of the project the total energy savings is 15,000,000 kWh. The benefits are consistently 300,000 kWh each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers; thereby using the same amount of energy each year. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 300,000 kWh benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition. The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

• "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires approximately 500 kWh of energy to produce and deliver.
• "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River Aqueduct).
• "Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for approximately 2,500 kWh energy required to import 1 AF.

Table 5c – Annual Project Physical Benefits

Project Name: South Coast Water District Recycled Water System Extension Project
Type of Benefit Claimed: Reduced Greenhouse Gas Emissions
Units of the Benefit Claimed : Pounds (lbs) of C02
Additional Information About this Benefit: Energy required to recycle water is less than energy needed for import

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	229,000	229,000	0
2015	229,000	46,000	183,000
2016	229,000	46,000	183,000
Etc.	229,000	46,000	183,000
Last Year of Project Life 2065	229,000	46,000	183,000

Comments: Estimated life of the project is 50 years. The project would be in operation in 2015. The power required to import one acre-foot (AF) of water is 2,500 kwh (3,000 kwh/AF for State Water Project water and 2,000 kwh/AF for Colorado River water). One acre-foot of recycled water requires 500kwh of energy to produce and deliver. Average pounds of CO2 emitted per kwh is 0.61 or 183,000 lbs of CO2 annually. Based on the total energy required, the Imported Water Total CO2 Emissions Calculation=375,000 kWh X .61 lbs of CO2/kWh= 228,750 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 75,000 kWh X .61 lbs of CO2/kWh = 45,750 lbs of CO2. The difference between imported and recycled water CO2 emissions is 228,750 lbs of CO2 – 45,750 lbs of CO2 = 183,000 lbs of CO2 saved per year. The total amount of CO2 emission reduced asa result of implementing the Project is 9,150,000 lbs of CO2. The benefits are consistently 183,000 lbs of CO2 each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers; thereby the same amount of energy will be required and the same amount of CO2 will be saved. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 183,000 lbs of CO2 benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.

The carbon emission estimates of 0.61 lbs of CO2/kWh or 183,000 lbs of CO2 annually are based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases".

The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

• "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires 490 kWh, or approximately 500 kWh, of energy to produce and deliver.
• "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River Aqueduct).
• "Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for approximately 2,500 kWh energy required to import 1 AF.

3. MNWD Recycled Water System Extension Project

Table 5a– Annual Project Physical Benefits

Project Name: ____Moulton Niguel Water District Recycled Water System Extension_____
Type of Benefit Claimed: ___Increase Delivery of Recycled Water for Local Reliability and Decrease Dependence on Imported Water___
Units of the Benefit Claimed : _____Acre-feet per year (AFY)_____
Additional Information About this Benefit___Recycled water will replace potable water supply used for irrigation.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project	Change Resulting from Project (b) – (c)
2014	0	0	102.3
2015	0	102.3	102.3
2016	0	102.3	102.3
Etc.	0	102.3	102.3
Last Year of Project Life 2065	0	102.3	102.3

Comments: The estimated life of the project is 50 years. The project would be in operation in 2015. 102.3 AFY of recycled water will be made available by the Project. This same amout would be used in place of imported potable water. Recycled water is not being used for irrigation within the project area. Thus the benefit without the project is 0 AFY of recycled water. The estimated 102.3 AFY is based on the District's extensive research of the overall recycled water usage opportunities within the service area. District staff completed a study of the Project by analyzing the customer list of domestic irrigation accounts within the District boundary of the Project Area. A feasibility study was completed which reviewed the potential demand at each meter and the amount of pipe required to serve that meter. The District's Rules and Regulations for Nondomestic Water Service, which are in compliance with the South Orange County Wastewater Authority (SOCWA) discharge permit, were followed when analyzing the feasibility of converting a meter from domestic to recycled service. Based on demand, location and feasibility 32 meters were identified and the necessary proposed piping to serve them was identified. Approximate pipe sizes were determined based on proposed pipe and number of converted accounts, as shown in Table 1 in Section V. Technical Analysis of Physical Benefits Claimed for MNWD Recycled Water System Extension Project. The previous five years of annual consumption data was reviewed for each conversion location. The annual average consumption for this period was the estimated Project Water Savings. The proposed end users and Project Water Savings for each are summarized in Table 2 in Section V. Technical Analysis of Physical Benefits Claimed for MNWD Recycled Water System Extension Project, with a total estimated Project Water Savings of approximately 102.3 AF annually, by supplying recycled water in place of imported water for irrigation. The proposed Project is part of MNWD's planned recycled water system extension, as described in MNWD's 2010 Urban Water Management Plan, 2010, Malcolm Pirnie, pages 6-3 - 6-4. The benefits are consistently 102.3 AFY each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 102.3 AFY benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.

Table 5b – Annual Project Physical Benefits

Project Name: Moulton Niguel Water District Recycled Water System Extension
Type of Benefit Claimed: Reduced Energy Usage
Units of the Benefit Claimed : Kilowatt hour (kWh)
Additional Information About this Benefit The amount of energy required to treat wastewater for recycled uses, alleviating the need to import that equal amount of potable water for irrigation uses.

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project [1]	Change Resulting from Project (b) – (c)
2014	255,750	255,750	0
2015	255,750	51,150	204,600
2016	255,750	51,150	204,600
Etc.	255,750	51,150	204,600
Last Year of Project Life 2065	255,750	51,150	204,600

Comments: The estimated life of the project is 50 years. The project would be in operation in 2015. The power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kwh/AF for State Water Project water and 2,000 kWh/AF for Colorado River water. One acre-foot of recycled water requires 500 kWh of energy to produce and deliver. Imported Water Calculation for Total Energy: 102.3 AFY X 2,500 kWh/AF = 255,750 kWh. Recycled Water Calculation for Total Energy: 102.3AFY X 500 kWh/AF = 51,150 kWh. The annual benefit is equal to the power savings: 255,750kWh-51,150kWh= 204,600 kWh. Total energy savings would be 10,230,000 kWh over the life of the project. The benefits are consistently 204,600 kWh each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers; thereby the same amount of energy will be required. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 204,600 kWh benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

• "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires approximately 500 kWh of energy to produce and deliver.
• "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River Aqueduct).
• "Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for approximately 2,500 kWh energy required to import 1 AF.

Table 5c – Annual Project Physical Benefits

Project Name: Moulton Niguel Water District Recycled Water System Extension Project

Type of Benefit Claimed: Reduced Green House Gas Emmissions

Units of the Benefit Claimed : ____pounds (lbs) of CO2_____

Additional Information About this Benefit The reduction of greenhouse gas emissions due to reduction in energy consupmtion

(a)	(b)	(c)	(d)
	Physical Benefits		
Year	Without Project	With Project [1]	Change Resulting from Project (b) – (c)
2014	156,008	156,008	0
2015	156,008	31,202	124,806.5
2016	156,008	31,202	124,806.5
Etc.	156,008	31,202	124,806.5
Last Year of Project Life 2065	156,008	31,202	124,806.5

Comments: Estimated life of the project is 50 years. The project would be in operation in 2015. The power required to import one acre-foot (AF) of water is 2,500 kwh (3,000 kwh/AF for State Water Project water and 2,000 kwh/AF for Colorado River water). One acre-foot of recycled water requires 500kwh of energy to produce and deliver. Annual energy savings would be 204,600 kwh. Average pounds of CO2 emitted per kwh is 0.61. Based on the total energy required, the Imported Water Total CO2 Emissions Calculation=255,750 kWh X .61 lbs of CO2/kWh= 156,007.5 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 51,150 kWh X .61 lbs of CO2/kWh = 31,201.5 lbs of CO2. The difference between imported and recycled water CO2 emissions is 156,007.5 lbs of CO2 – 31,201.5 lbs of CO2 = 124,806.5 lbs of CO2 saved. The total amount of CO2 emissions reduced as a result of implementing the Recycled Water System Extension Project is 6,240,325 lbs of CO2. The benefits are consistently 124,806.5 lbs of CO2 each year because the Project will replace existing imported water supply with recycled water supply to meet the existing demand for the identified irrigation meters and customers; thereby the same amount of energy will be required each year and the same amount of CO2 will be emitted. Column (a) in the Table is truncated for simplicity and reviewing convenience; rather than list consecutive years and repeat the 124,806.5 lbs of CO2 benefit each year, it was decided to simply show the last year of project life (2065) to reduce repetition.The carbon emission estimates of 0.61 lbs of CO2/kWh are based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases". The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

• "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires approximately 500 kWh of energy to produce and deliver.
• "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River Aqueduct).
• "Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for approximately 2,500 kWh energy required to import 1 AF.

V. TECHNICAL ANALYSIS OF PHYSICAL BENEFITS CLAIMED

1. SMWD Califia Recycled Water Project

- **SMWD Primary Expected Physical Benefit includes: Increase Delivery of Recycled Water for Local Reliability and Decrease Dependence on Imported Water**

  The Primary Physical Benefit of the Project includes a permanent conversion of approximately 52 irrigation meters from domestic water service to recycled water service. The permanent conversion will allow for the delivery of 220 AFY of recycled water for irrigation purposes within the Project area. SMWD's existing recycled water system has the capacity to supply 220 AFY. The amount of recycled water used for irrigation will make that same amount, 220 AFY, of potable water available for higher priority uses, such as for drinking water. The amount of recycled water reduces the overall demand on imported water to the region.

  Another aspect of this Primary Benefit is the State-wide impact it will have by off-setting the domestic water demand with the recycled water supply proposed for irrigation within the Project area. The effects of this benefit are long-term since the conversion of the irrigation accounts are permanent. The Project makes the same amount of potable water available to the Northern California service area which requires additional supply as a result of the state's drought. This benefit will be a long term benefit and contribute to alleviating water supply shortages beyond this current drought and into the future.

- Technical basis of the project.

  SMWD staff performed an analysis by looking at the customer list of domestic irrigation accounts within the Project limits. The meters of each domestic irrigation customer were plotted along with the existing recycled water delivery system. Based on the potential demand at each meter, approximate pipe sizes and lengths were determined to serve the meters. The accounts with the greatest consumption history and those most accessible with a new recycled water distribution system were determined to be the most ideal locations for conversion. A total of 52 meters were identified. A cost estimate was completed based on proposed pipe and number of converted accounts. In completing the analysis, the District's *Rules and Regulations for Nondomestic Water Service*, which are in compliance with the South Orange County Wastewater Authority (SOCWA) discharge permit, were followed.

  In addition to the cost for the installation of the proposed piping system for delivery, other costs incurred include new service laterals, asphalt concrete paving and engineering and contingency fees. Table 1 summarizes the total estimated construction cost for the Project. A detailed cost estimate will be done upon the completion of the final construction plan set.

Table 1
Califia Conversion Project
Total Estimated Project Construction Cost
(Conversion to Recycled Water)

Item Description [1]	Quantity	Unit	Cost per unit	Total
2-inch PVC Pipe	2,601	LF	$36	$94,000
4-inch PVC Pipe	10,871	LF	$64	$696,000
6-inch PVC Pipe	2,209	LF	$96	$213,000
8-inch PVC Pipe	4,999	LF	$148	$740,000
12-inch PVC Pipe	2,634	LF	$196	$517,000
AC Paving	23,314	SF	$3	$70,000
Number of Converted Connection	52	EA	$1,000	$52,000
Engineering @ 10%				$239,000
Contingencies @ 10%				$239,000
Estimated Total Project Cost				**$2,860,000**

Notes:
[1] Unit cost for pipe is inclusive of all construction costs and all appurtenances.

Technical Reference:
"Santa Margarita Water District Water Use Efficiency Plan". July 2014. Page 41. Attached as Att3_DG_ProJust2of2. Project is identified in Table 4-2. Source for project costs, water savings and the year it is to be implemented.

- Recent and historical conditions that provide background for benefits to be claimed.

  The Primary Benefit is based on actual consumption history for each meter proposed for conversion. The previous seven years of annual consumption data was reviewed for each conversion location. Based on annual rainfall data, the driest year and the one most representative of the current drought conditions, was 2013. The annual consumption from this year was taken to be the estimated Project Water Savings. The proposed end users and Project Water Savings for each are summarized in Table 2 below, with a total estimated Project Water Savings of approximately 220 AF annually.

- Estimates of without-project conditions.

  Without the conversion of meters and construction of the proposed recycled water delivery system, imported domestic water will continue to be supplied to meet the irrigation demands of the 52 identified meters. There will be zero benefits to the amount of recycled water used, the amount of domestic water saved, the amount of energy used and the amount of greenhouse gasses reduced if the Project is not constructed.

- Description of methods used to estimate physical benefits.

  The physical benefits are estimated assuming a one to one ratio of converting domestic water to recycled water for irrigation at the 52 meter sites. The amount of recycled water was estimated to be the amount of water consumed during a record dry year. The amount of water consumed during the dry year is estimated to be the annual demand (220 AFY) and, therefore, Project Water Savings for the Project. The Project estimates were based on those presented in "Santa Margarita Water District Water Use Efficiency Plan". July 2014. Page 41. Attached as Att3_DG_ProJust2of2. Project is identified in Table 4-2. Source for project costs, water savings and the year it is to be implemented.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  The new facilities required will include the installation of approximately 23,000 linear feet of pipe of varying sizes necessary to connect the proposed converted meters to a recycled water delivery system and to connect the delivery system to the existing backbone recycled water system near the Califia area. Conversion will include the work required at the actual connection to the recycled system and retrofitting the existing irrigation systems being served by the converted connections to reflect the use of recycled water (i.e. purple marked appurtenances and appropriate signage). The conversion would require the proposed customer to meet with District staff and discuss the benefits of converting the irrigation accounts from domestic water service to recycled water service. The District's Water Efficiency Administrator and Non-Domestic Specialist can also make recommendations as to watering schedules and assist with optimizing the irrigation systems for the customer to ensure overall water use efficiency.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  The technical analysis completed for the Project is equivalent to a Master Planning level study. Detailed plans and construction specifications will be completed once the project is approved for construction. The technical analysis is commensurate with the size of the Project because it is consistent with the technical analysis provided for the Project in the "Santa Margarita Water District Water Use Efficiency Plan". July 2014. Page 41, attached as Att3_DG_ProJust2of2.

Table 2 Total End Users and Water Savings		
Location #	**CUSTOMER NAME**	**Project Water Savings from Recycled Water (AF)**
1	CALIFIA HOA	4.6
2	CALIFIA HOA	1.2
3	CALIFIA HOA	5.7
4	CALIFIA HOA	6.7
5	CALIFIA HOA	4.0
6	CALIFIA HOA	6.0
7	CALIFIA HOA	7.0
8	ASHTON HOMEOWNERS ASSOC	3.1
9	ASHTON HOMEOWNERS ASSOC	5.0
10	ASHTON HOMEOWNERS ASSOC	0.3
11	CALIFIA HOMEOWNERS ASSOC	3.9
12	AUBURN RIDGE HOA	4.8
13	AUBURN RIDGE HOA	3.9
15	AUBURN RIDGE HOA	4.0
16	OSO VALLEY GREENBELT ASSN	0.8
17	OSO VALLEY GREENBELT ASSN	3.9
18	OSO VALLEY GREENBELT ASSN	1.7
19	OSO VALLEY GREENBELT ASSN	3.3
21	OSO VALLEY GREENBELT ASSN	1.1
200	CALIFIA HOA	2.7
201	CALIFIA HOMEOWNERS ASSOC	6.3
202	CALIFIA HOMEOWNERS ASSOC	5.6
300	CALIFIA HOA	0.8
301	GREYSTONE HOA	1.8
304	CALIFIA HOA	1.7
305	CALIFIA HOA	3.7
307	OSO VALLEY GREENBELT ASSN	1.3
308	GREYSTONE HOA	2.1
309	GREYSTONE HOA	4.1
310	GREYSTONE HOA	2.8
312	GREYSTONE HOA	4.1
314	GREYSTONE HOA	3.9
400	CALIFIA HOMEOWNERS ASSOC	7.7
401	CALIFIA HOA	9.7
501	CALIFIA HOA	6.4
502	CALIFIA HOA	14.8
503	CALIFIA HOA	13.3
505	CITY OF MISSION VIEJO	12.6
507	CALIFIA HOA	0.5
508	CALIFIA HOA	2.8
509	AUBURN RIDGE HOA	3.1
510	AUBURN RIDGE HOA	2.8
512	CAPO U.S.D.	5.9
600	AUBURN RIDGE HOA	1.7
601	CALIFIA HOA	8.1
700	OSO VALLEY GREENBELT ASSN	1.1
701	OSO VALLEY GREENBELT ASSN	0.4
702	CITY OF MISSION VIEJO	13.1
800	OSO VALLEY GREENBELT ASSN	1.6
801	OSO VALLEY GREENBELT ASSN	0.6
	CORDOVA HOA	1.3
	CORDOVA HOA	3.0
Total		**223.6**

- **SMWD Secondary Expected Physical Benefits include: <u>Reduced Energy Usage</u>**

  A Secondary Expected Physical Benefit of the Project is the savings in energy for delivery of every one acre-foot of water (1 AF). Potable water supplied to Southern California is imported via the State Water Project and the Colorado River Aqueduct. An estimate of the amount of energy required to deliver the water to the Southern California area is approximately 3,044 kWh/AF for the State Water Project and 2,044 kWh/AF for the Colorado River Aqueduct. The average amount of energy required for delivery of each acre-foot of water based on a straight average for both sources is 2,544 kWh/AF. For each acre-foot of recycled water that is generated within the District's service area and utilized in place of the imported water, the amount of energy required to deliver it to the customer is that required for pumping, which is calculated by SMWD to be 44 kWh/AF based on the following factors: pump capacity, efficiency, and distance between treatment plant and project location. Thus the benefit of energy savings is the difference in energy necessary to deliver one acre-foot of imported water versus one acre-foot of locally generated recycled water to the customer. The difference is an energy savings of approximately 550,000 kWh/YR.

- Technical basis of the project.

  The amount of energy required to import domestic water is taken from a study completed in March 2007 by Dr. Robert C. Wilkinson, entitled *Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District,* as referenced below. The amount of energy required to deliver the locally generated recycled water (44 kWh/AF) is based on the pumping of the recycled water from the District's Chiquita Water Reclamation Plant to the pressure zone within which the Project is located. The pump capacity and efficiency are used to calculate the total energy per acre-foot of recycled water delivered. The energy required to produce and deliver the imported water cited in the reference materials depend upon the type of treatment, the amount of pumping, and the relative elevations of the treatment facility and site of use. For each acre-foot of recycled water that is generated within the District's service area and utilized in place of the imported water, the amount of energy required to deliver it to the customer is that required for pumping, which is calculated by SMWD to be 44 kWh/AF based on recent and historical conditions of the following: pump capacity, efficiency, and the distance between treatment plant and project location. Imported Water Calculation for Total Energy: 220AFY X 2,544 kWh/AF = 559,680 kWh. Recycled Water Calculation for Total Energy: 220AFY X 44 kWh/AF = 9,860 kWh. The benefits is equal to the power savings: 559,680kWh-9,680kWh= 550,000 kWh.

  Technical References:
  - "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4, attached as Att3_DG_ProJust_2of2. Source for the power required to import one acre-foot of water is 2,544 kWh, or approximately 2,500 kWh, based on the average of 3,044 kWh/AF for State Water Project water and 2,044 kWh/AF for Colorado River water.

  - "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is approximately 2,500 kWh (based on the average of 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct water).

  - "Direct Potable Reuse: Benefits for Public Water Supplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for 2,500 kWh energy required to import 1 AF.

  The references cited above are attached as Att3_DG_ProJust_2of2.

- Recent and historical conditions that provide background for benefits to be claimed.

  The benefits claimed are a direct correlation to the generation and delivery of recycled water in comparison to the average energy required to import potable water. Energy consumption is estimated for imported water supplies based on the amount of pumping required and the efficiency of the pumping systems. The energy required to produce and deliver the imported water cited in the reference materials depend upon the type of treatment, the amount of pumping, and the relative elevations of the treatment facility and site

of use. For each acre-foot of recycled water that is generated within the District's service area and utilized in place of the imported water, the amount of energy required to deliver it to the customer is that required for pumping, which is calculated by SMWD to be 44 kWh/AF based on recent and historical conditions of the following: pump capacity, efficiency, and the distance between treatment plant and project location.

- Estimates of without-project conditions.

  Without the conversion of the domestic irrigation accounts to recycled water, the energy savings will not be realized. This Secondary Physical Benefit is dependent on the implementation of the Project and consequently the realization of the Primary Physical Benefit.

- Description of methods used to estimate physical benefits.

  The estimated amount of energy saved is based on the total kilowatt hour per acre-foot required to import water to MWD as calculated in the Wilkinson study dated 2007 and the calculated cost to deliver the generated recycled water. The amount of energy required per acre foot of water delivered is applied to the total Project Water Savings of 220 AFY. The difference in energy required between the two scenarios (with and without the Project) is the total physical benefit. The power required to import 1 AF of water is approximately 2,544 kWh/AF. The amount of energy required to deliver 1 AF of recycled water is approximately 44 kWh. 44 kWh/AF was calculated by SMWD based on the following factors: pump capacity, efficiency, and distance between treatment plant and project location. The project provides 220 AFY of recycled water thus the amount of energy saved is 559,680 kWh for imported water - 9,680 kWh for recycled water= 550,000 kWh. Imported Water Calculation for Total Energy: 220AFY X 2,544 kWh/AF = 559,680 kWh. Recycled Water Calculation for Total Energy: 220AFY X 44 kWh/AF = 9,860 kWh. The annual benefit is equal to the power savings: 559,680kWh-9,680kWh= 550,000 kWh.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  To obtain these Secondary Physical Benefits, the same facilities that are required to obtain the Primary Physical Benefits will be needed. The Secondary Physical Benefits are dependent on the implementation of the Project. No additional facilities are required to obtain this Secondary Physical Benefit. The Primary Benefits include the new facilities required will include the installation of approximately 23,000 linear feet of pipe of varying sizes necessary to connect the proposed converted meters to a recycled water delivery system and to connect the delivery system to the existing backbone recycled water system near the Califia area. Conversion will include the work required at the actual connection to the recycled system and retrofitting the existing irrigation systems being served by the converted connections to reflect the use of recycled water (i.e. purple marked appurtenances and appropriate signage). The conversion would require the proposed customer to meet with District staff and discuss the benefits of converting the irrigation accounts from domestic water service to recycled water service. The District's Water Efficiency Administrator and Non-Domestic Specialist can also make recommendations as to watering schedules and assist with optimizing the irrigation systems for the customer to ensure overall water use efficiency.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  The technical analysis is commensurate with the size of the project because the analysis compares the energy for delivery of one acre-foot of imported potable water versus one acre-foot for recycled water. The Project will provide 220 AFY of recycled water to replace the same amount of imported water. Since locally produced recycled water requires less energy than the distribution of imported potable water supplied to Southern California via the State Water Project and the Colorado River Aqueduct, there is an energy savings of implementing the recycled water project. It is reasonable to assume a 1 to 1 comparison of replacing recycled water with imported water. The analysis uses the average amount of energy required for delivery of each acre-foot of water based on a straight average for both sources and subtracts the difference. This results in a benefit of energy savings for SMWD as a result of the Project.

- **SMWD Secondary Expected Physical Benefits include: <u>Reduced Greenhouse Gas Emissions</u>**

  One additional Secondary Expected Physical Benefit of the Project is related to the savings in energy for every one acre-foot of potable water converted to recycled water. Along with the saving in energy is a saving in greenhouse gas emissions. For the amount of energy that is not expended to deliver each acre-foot of water from Northern California to Southern California, the greenhouse gas or CO2 emission is avoided. In the State of California, the average pound of CO2 emission per kilowatt hour of energy used is 0.61 lbs/kWh. The savings in energy per acre-foot that results from supplying locally generated recycled water instead of imported water can be used in a direct calculation to determine the reduction in the amount of CO2 produced.

- Technical basis of the project.

  The amount of greenhouse gas, or carbon dioxide, is based on the statistical analysis of data collected by the United States Environmental Protection Agency. From the data collected on the amount of CO2 produced for the generation of electricity, CO2 generation factors were determined as a way of estimating the total CO2 that will be emitted based on a given energy consumption. The most current factor applicable in the state of California, released in 2014, was used to determine this Secondary Physical Benefit.
  The carbon emission estimates of 0.61 lbs of CO2/kWh are based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases". The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

  - "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is 2,544 kWh, or approximately 2,500 kWh, is based on average of 3,044 kWh/AF for State Water Project water and 2,044 kWh/AF for Colorado River water.
  - "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is approximately 2,500 kWh (based on the average of 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct water).
  - "Direct Potable Reuse: Benefits for Public Water Supplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for 2,500 kWh energy required to import 1 AF.

  The references cited above are included in Att3_DG_ProJust_2of2. Based on the total energy required, as identified in the Secondary Benefit above, the Imported Water Total CO2 Emissions Calculation=559,680 kWh X .61 lbs of CO2/kWh= 341,404.8 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 9,860 kWh X .61 lbs of CO2/kWh = 5,904.8 lbs of CO2. The difference between imported and recycled water CO2 emissions is 341,404.8 lbs of CO2 – 5,904.8 lbs of CO2 = 335,500 lbs of CO2 saved. This is the total amount of CO2 emissions reduced as a result of implementing the Califia Recycled Water Project.

- Recent and historical conditions that provide background for benefits to be claimed.

  The amount of greenhouse emissions, or CO2, generated per each kilowatt hour used to deliver water to the Project is based on data collected by the United States Environmental Protection Agency. The average pound of CO2 emitted per kilowatt hour used is based on the EPA's 9th edition of the Emissions and Greenhouse Resource Integrated Database (eGRID) entitled, "Year 2010 eGRID Subregion Emissions – Greenhouse Gases" which was released in 2014.

- Estimates of without-project conditions.

  Without the conversion of the domestic irrigation meters to recycled water, the energy savings will not be obtained and the reduction in CO_2 emissions will not be realized. The benefit of this Secondary Physical Benefit is dependent on the implementation of the Project and consequently the realization of the Primary Physical Benefit.

- Description of methods used to estimate physical benefits.

  The Secondary Physical Benefit is estimated from the generation factor of average pound of CO2 emitted per kilowatt hour used as obtained from the EPA's eGRID released in 2014 data. The factor is applied to the amount of energy required to deliver water to the Project area. The estimated benefit is the difference between the amount of CO2 emitted for supplying imported water (without Project) versus the amount of CO2 generated to deliver recycled water (with Project). Based on the total energy required, as identified in the Secondary Benefit above, the Imported Water Total CO2 Emissions Calculation=559,680 kWh X .61 lbs of CO2/kWh= 341,404.8 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 9,860 kWh X .61 lbs of CO2/kWh = 5,904.8 lbs of CO2. The difference between imported and recycled water CO2 emissions is 341,404.8 lbs of CO2 – 5,904.8 lbs of CO2 = 335,500 lbs of CO2 saved. This is the total amount of CO2 emissions reduced annually as a result of implementing the Califia Recycled Water Project.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  To obtain these Secondary Physical Benefits, the same facilities that are required to obtain the Primary Physical Benefits will be needed. The Secondary Physical Benefits are dependent on the implementation of the Project.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  The technical analysis detail is commensurate with the size of the project because it uses the total amount of greenhouse gases for 220 AFY of imported water compared to 220 AFY of recycled water. The Project will result in 220 AFY new recycled water supply to reduce the same amount of imported water supply, thereby reducing the amount of greenhouse gases required for generating this amount of water supply. The savings in energy per acre-foot that results from supplying locally generated recycled water instead of imported water can be used in a direct calculation to determine the reduction in the amount of CO2 produced.

2. SCWD Recycled Water System Extension Project

- **SCWD Primary Expected Physical Benefit includes: Increase Delivery of Recycled Water for Local Reliability and Decrease Dependence on Imported Water**

  The primary benefit is the delivery of an additional 150 AFY of recycled water to irrigation uses at City, County, and State run facilities. This would reduce the use of imported potable water by an equivalent amount of 150 AFY. That reduction results in an overall decrease in imported water supply to the region. These benefits are permanent in that these demands would be removed from the potable water system. This would help to alleviate not only current supply shortages but future shortages throughout California.

- Technical basis of the project.

  In 2008, the South Coast Water District developed an Infrastructure Master Plan that included a Recycled Water System Master Plan (South Coast Water District 2008 Infrastructure Master Plan, November 2008. PBS&J. Pages 6-1-6-28, attached as Att3_DG_ProJust_2of2). In that Master Plan, analyses of potential expansions to the existing recycled water system were developed. All domestic water irrigation customers' records were reviewed to determine those that could be converted to recycled water use. That study identified a number of customers and reviewed the ease at which they could be converted to recycled water to group them in to several categories. The Project will consist of 6,400 feet of new recycled water distribution system pipe to convert 5 sites to the recycled water system (County of Orange Dana Point Harbor, State of California Doheny Beach Park, City of Dana Point Lantern Bay Park, Lantern Bay Villas HOA and Lantern Bay Estates HOA). The total recycled water demand for these users was identified as approximately 150 AFY. Based on the location of these users and the amount of demand, pipeline

extensions from the current recycled system were determined. The diameter of these pipelines and the required pressures were also reviewed.

- Recent and historical conditions that provide background for benefits to be claimed.

  The primary benefit is based on the water usage for these sites as shown in the 2008 Infrastructure Master Plan. That usage is identified at 150 AFY. For these irrigation uses, employing locally produced recycled water is far more appropriate than utilizing imported drinking water.

- Estimates of without-project conditions.

  Without the Project, SCWD would continue to supply these users with imported potable drinking water for these irrigation uses. Thus there would be no benefits of additional usage of recycled water. There would also be no benefit of decreased energy usage or decreased carbon emissions.

- Description of methods used to estimate physical benefits.

  The physical benefits of 150 AFY of recycled water in place of imported water are based on actual metered potable drinking water usage at these sites as prepared for the 2008 Infrastructure Master Plan (South Coast Water District 2008 Infrastructure Master Plan, November 2008. PBS&J. Pages 6-1-6-28). These numbers were directly measured and not estimated.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  The Project will consist of 6,400 feet of new recycled water distribution system pipe to convert 5 sites to recycled waters (County of Orange Dana Point Harbor, State of California Doheny Beach Park, City of Dana Point Lantern Bay Park, Lantern Bay Villas HOA and Lantern Bay Estates HOA). A pressure reducing station along the pipeline will deliver water at the proper pressure to these customers. On-site conversion to recycled water will be accomplished by these customers who are required to use recycled water by District Ordinance once it is available. Pipeline appurtenances as well as proper signage at the use locations will also be needed.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  This analysis has been according to the District's 2008 Infrastructure Master Plan, and is at a planning level. More detailed documents will be developed during design. This is the District's standard procedure for developing, approving, and executing similar projects.

- **SCWD Secondary Expected Physical Benefits include: <u>Reduced Energy Usage</u>**

  Secondary benefit is a savings of 300,000 kWh annually for 50 years (370,000 kWh annually to import water less 75,000 kWh annual to produce and deliver recycled water). Imported water requires approximately 2,000 kWh of energy per acre foot to deliver water from the Colorado River Aqueduct and 3,000 kWh of energy per acre foot to deliver water from the SWP. Both of these imported supplies are managed by MWD. The blend of the import varies based on current conditions and management choices of MWD. For this analysis, it was assumed that these two sources are blended evenly resulting in an energy use of 2,500 kWh per acre-foot of imported water. The amount of energy required to produce and deliver local recycled water is approximately 500 kWh per acre-foot. Thus for every acre-foot of water converted from imported to recycled water 2,000 kWh of energy is saved. Therefore, for 150 AFY, the annual energy savings would be 300,000 kWh. Over the estimated 50 year life of the project, that equates to 15,000,000 kWh of energy savings.

- Technical basis of the project.

  The power required to import one acre-foot (AF) of water is 2,500 kWh (3,000 kwh/AF for State Water Project water and 2,000 kWh/AF for Colorado River water). One acre-foot of recycled water requires 500 kWh of energy to produce and deliver. Imported Water Calculation for Total Energy: 150AFY X 2,500 kWh/AF = 375,000 kWh. Recycled Water Calculation for Total Energy: 150AFY X 500 kWh/AF = 75,000 kWh. The benefits is equal to the power savings: 375,000kWh-75,000kWh= 300,000 kWh. Annual energy savings would be 300,000 kWh.

  The technical basis of the Project includes the following technical studies that discuss the reduced energy consumption for imported water versus recycled water:

  - "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is 2,500 kWh (3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires 500 kWh of energy to produce and deliver.
  - "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is 2,500 kWh (3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct).
  - "Direct Potable Reuse: Benefits for Public Water Supplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for 2,500 kWh energy required to import 1 AF.

  The references cited above are attached as Att3_DG_ProJust_2of2.

- Recent and historical conditions that provide background for benefits to be claimed.

  Energy consumption is estimated for import water supplies based on the amount of pumping required and the efficiency of the pumping systems. The energy required to produce and deliver the water cited in the reference materials depend upon the type of treatment, the amount of pumping, and the relative elevations of the treatment facility and site of use. 500 kWh is a conservative estimate of those energy costs and is cited in the referenced documents.

- Estimates of without-project conditions (e.g., levels of the physical benefits in the future, without the project, but with other projects that might be planned).

  Without the Project, there will be no decrease in the amount of energy required to deliver drinking water to the sites.

- Description of methods used to estimate physical benefits.

  The referenced documents provide estimated energy requirements for both imported drinking water and locally produced recycled water. The difference in energy required to supply these two sources, 2,000kWh/AF, is the physical benefit to the project. At 150 AFY, the result amounts to an annual benefit of 300,000 kWh of energy saved. The power required to import one acre-foot (AF) of water is 2,500 kWh (3,000 kwh/AF for State Water Project water and 2,000 kwh/AF for Colorado River water). One acre-foot of recycled water requires 500 kWh of energy to produce and deliver. Imported Water Calculation for Total Energy: 150AFY X 2,500 kWh/AF = 375,000 kWh. Recycled Water Calculation for Total Energy: 150AFY X 500 kWh/AF = 75,000 kWh. The benefits are equal to the power savings: 375,000kWh-75,000kWh= 300,000 kWh. Therefore, the annual energy savings would be 300,000 kWh.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  The project will consist of 6,400 feet of new recycled water distribution system pipe to convert 5 sites to recycled water meters (County of Orange Dana Point Harbor, State of California Doheny Beach Park, City of Dana Point Lantern Bay Park, Lantern Bay Villas HOA and Lantern Bay Estates HOA). A pressure

reducing station along the pipeline will deliver water at the proper pressure to these customers. On-site conversion to recycled water will be accomplished by these customers who are required to use recycled water by District Ordinance once it is available. Pipeline appurtenances as well as proper signage at the use locations will also be needed.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  This analysis has been according to the District's 2008 Infrastructure Master Plan, and is at a planning level. The referenced documents contain planning level estimates as well. These are appropriate as more accurate analysis would require detailed design, construction, and operational data to complete.

- **SCWD Secondary Expected Physical Benefits include: <u>Reduced Greenhouse Gas Emissions</u>**

  Secondary benefit is a savings of 300,000 kWh annually for 50 years (370,000 kWh annually to import water less 75,000 kWh annual to produce and deliver recycled water). Imported water requires approximately 2,000 kWh of energy per acre foot to deliver water from the Colorado River Aqueduct and 3,000 kWh of energy per acre foot to deliver water from the SWP. Both of these imported supplies are managed by MWD. The blend of the import varies based on current conditions and management choices of MWD. For this analysis, it was assumed that these two sources are blended evenly resulting in an energy use of 2,500 kWh per acre-foot of imported water. The amount of energy required to produce and deliver local recycled water is approximately 500 kWh per acre-foot (490 kWh/AF). Thus for every acre-foot of water converted from imported to recycled water 2,000 kWh of energy is saved. Therefore for 150 AFY, the annual energy savings would be 300,000 kWh. Generation of energy in California produces 0.61 lbs of CO2/kWh, which results in 183,000 lbs of CO2 saved annually.

- Technical basis of the project.

  Based on the total energy required, as identified in the Secondary Benefit above, the Imported Water Total CO2 Emissions Calculation=375,000 kWh X .61 lbs of CO2/kWh= 228,750 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 75,000 kWh X .61 lbs of CO2/kWh = 45,750 lbs of CO2. The difference between imported and recycled water CO2 emissions is 228,750 lbs of CO2 – 45,750 lbs of CO2 = 183,000 lbs of CO2 saved. This is the total amount of CO2 emissions reduced as a result of implementing the Recycled Water System Extension Project.

  The carbon emission estimates of 0.61 lbs of CO2/kWh or 183,000 lbs of CO2 annually are based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases".

  The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

  - "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires approximately 500 kWh of energy to produce and deliver.
  - "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River Aqueduct).
  - "Direct Potable Reuse: Benefits for Public Water Supplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for approximately 2,500 kWh energy required to import 1 AF.

The references cited above are attached as Att3_DG_ProJust_2of2.

- Recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.

  Carbon emissions from the generation of electrical energy are tracked by a number of different sources and do change depending on the type of generation utilized in that subregion. The generation data used is from the USEPA's 9th edition of eGrid based on the California subregion emission in 2010.

- Estimates of without-project conditions (e.g., levels of the physical benefits in the future, without the project, but with other projects that might be planned).

  Without the Project, there will be no decrease in the amount of greenhouse gas emissions required to deliver drinking water to the sites.

- Description of methods used to estimate physical benefits.

  Based on the total energy required, the Imported Water Total CO2 Emissions Calculation=375,000 kWh X .61 lbs of CO2/kWh= 228,750 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 75,000 kWh X .61 lbs of CO2/kWh = 45,750 lbs of CO2. The difference between imported and recycled water CO2 emissions is 228,750 lbs of CO2 – 45,750 lbs of CO2 = 183,000 lbs of CO2 saved. This is the total amount of CO2 emissions reduced as a result of implementing the Recycled Water System Extension Project. The referenced documents provide estimated energy requirements for both imported drinking water and locally produced recycled water. The difference in energy required to supply these two sources is 2,000 kWh/AF. At 150 AFY, the result is an annual benefit of 300,000 kWh of energy saved. This amount of energy results in a reduced greenhouse gas emission of 0.61 lb of CO2/kWh or 183,000 lbs of CO2 annually. Over the 50 year estimated life of the project, that results in a reduction in emissions of 9,150,000 lbs of CO2.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  The project will consist of 6,400 feet of new recycled water distribution system pipe to convert 5 sites to recycled water meters (County of Orange Dana Point Harbor, State of California Doheny Beach Park, City of Dana Point Lantern Bay Park, Lantern Bay Villas HOA and Lantern Bay Estates HOA). A pressure reducing station along the pipeline will deliver water at the proper pressure to these customers. On-site conversion to recycled water will be accomplished by these customers who are required to use recycled water by District Ordinance once it is available. Pipeline appurtenances as well as proper signage at the use locations will also be needed.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  This analysis has been according to the District's 2008 Infrastructure Master Plan, and is at a planning level. The referenced documents contain planning level estimates as well. These are appropriate as more accurate analysis would require detailed design, construction, and operational data to complete.

3. MNWD Recycled Water System Extension Project

- **MNWD Primary Expected Physical Benefits include: <u>Increase Delivery of Recycled Water for Local Reliability and Decrease Dependence on Imported Water</u>**

  The Primary Physical Benefit of the Project includes a permanent conversion of approximately 32 irrigation meters from domestic water service to recycled water service. The permanent conversion will allow for the delivery of 102.3 AF of recycled water for irrigation purposes within Cities of Aliso Viejo, Laguna Niguel and Laguna Hills. The amount of recycled water used for irrigation will make that same amount, 102.3 AF, of potable water available for higher priority uses, such as for drinking water. The amount of recycled water reduces the overall demand on imported water to the region. Another aspect of this Primary Benefit is the State-wide impact it will have by off-setting the amount of domestic water with the recycled water proposed for irrigation within the Project area. The effects of this benefit are long-term since the conversion of the irrigation accounts are permanent. The Project makes the same amount of potable water available to the Northern California service area which requires additional supply as a result of the state's drought. This benefit will be a long term benefit and contribute to alleviating water supply shortages beyond this current drought and into the future.

- Technical basis of the project.

  The District has done extensive research of the overall recycled water usage opportunities within the service area. MNWD currently serves over 7,000 acre-feet per year of recycled water to its customers and maintains an extensive recycled water distribution system, along with the ability to serve up to an additional 2,000 acre-feet per year of supply. District staff completed a study of the Project by analyzing the customer list of domestic irrigation accounts within the District boundary of the Project Area. A feasibility study was completed which reviewed the potential demand at each meter and the amount of pipe required to serve that meter. The District's Rules and Regulations for Nondomestic Water Service, which are in compliance with the South Orange County Wastewater Authority (SOCWA) discharge permit, were followed when analyzing the feasibility of converting a meter from domestic to recycled service. Based on demand, location and feasibility 32 meters were identified and the necessary proposed piping to serve them was identified. Approximate pipe sizes were determined and a cost estimate was completed based on proposed pipe and number of converted accounts, as shown in Table 1 below. The previous five years of annual consumption data was reviewed for each conversion location. The annual average consumption for this period was the estimated Project Water Savings. The proposed end users and Project Water Savings for each are summarized in Table 2 below, with a total estimated Project Water Savings of approximately 102.3 AF annually, by supplying recycled water in place of imported water for irrigation.

Table 1
MNWD Recycled Water System Extension
Total Estimated Project Construction Cost
(Conversion to Recycled Water)

Item Description [1]	Quantity	Unit	Total
4-inch PVC Pipe	200	LF	$50,000
6-inch PVC Pipe	1,300	LF	$260,000
8-inch PVC Pipe	6,000	LF	$1,340,000
Number of Converted Connection	32	EA	$300,000
Engineering and administration			$110,000
Estimated Total Project Cost			**$2,060,000**

Notes:
[1] cost is inclusive of all construction costs including all appurtenances and contingencies

The proposed Project is part of MNWD's planned recycled water system extension, as described in MNWD's 2010 Urban Water Management Plan, 2010, Malcolm Pirnie, pages 6-3 - 6-4 attached as

Att3_DG_ProJust_2of2. MNWD's demands for recycled water continue to increase as new services are continually being connected to the recycled water system. Recycled water represents approximately 21% of MNWD's supply. With the planned expansion of MNWD's recycled water distribution system, recycled water will increase to about 23% of the supply by 2035.

- Recent and historical conditions that provide background for benefits to be claimed.

  The District has considered irrigation requirements based on historical water usage along with unit irrigation factors appropriate for the region. The Primary Benefit is based on actual consumption history for each meter proposed for conversion. The previous five years of annual consumption data was reviewed for each conversion location. The annual average consumption for this period was taken to be the estimated Project Water Savings. The proposed end users and Project Water Savings for each are summarized in Table 2, with a total estimated Project Water Savings of approximately 102.3 AF annually.

Table 2
Total End Users and Savings Water

Meter NO	CUSTOMER NAME	Project Water Savings from Recycled Water (AF)
96-53001-0 96-53002-1 96-53007-1 96-53006-5 96-53000-1 96-53004-0 96-53005-5 96-52978-1 96-52969-1 96-52971-1 96-52910-1 96-52915-1	Laguna Audubon HOA, Aliso Viejo	21.6
97-07700-1 97-08130-0 97-08018-0 97-08016-0 97-08012-2 97-08010-0 97-08008-0 97-08004-1 91-05090-5 91-07570-0 91-17256-2	Various locations in the City of Laguna Niguel	41.9
96-00763-0 96-00752-0	Woodwind, Aliso Viejo	4.6
91-16520-0	Crown Valley Elementary	8.1
97-07970-0 97-07972-0	Beacon Hill Mount Vernon	9
92-00548-0 92-00976-1 92-00550-0	Alicia Extension	11.4
91-13912-0	South Peak HOA	5.7
Total		102.3

- Estimates of without-project conditions.

  Without the conversion of meters and construction of the proposed recycled water delivery system, domestic water will continue to be supplied to meet the 102.3 AFY irrigation demands of the 32 identified meters. There will be zero benefit of recycled water if the Project is not constructed. Imported water will continue to be used to meet irrigation demands instead of recycled water for the Project area.

- Description of methods used to estimate physical benefits.

  The physical benefits are estimated assuming a one to one ratio of converting domestic water to recycled water for irrigation at the 32 meter sites. The amount of recycled water was estimated to be the amount of water consumed during a record dry year, which is shown in Table 1. The amount of water consumed during the dry year is estimated to be the Project Water Savings for the Project, since recycled water will replace imported potable water as the supply. Table 2 shows this calculation.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  The new facilities required will include the installation of approximately 7,500 linear feet of pipe of varying sizes, as shown in Table 1, which are necessary to connect the proposed converted meters to a recycled water delivery system and to connect the delivery system to the existing backbone recycled water system. Conversion will include the work required at the actual connection to the recycled system and retrofitting the existing irrigation systems being served by the converted connections to reflect the use of recycled water (i.e. purple marked appurtenances and appropriate signage). The proposed customers have been notified of possible conversion and are eager to work with the District to convert their sites to recycled water. The District also offers recommendations as to watering schedules and assist with optimizing the irrigation systems for the customer to ensure overall water use efficiency.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  The technical analysis completed for the Project is equivalent to a Master Planning level study. Detailed plans and construction specifications will be completed once the project is approved for construction.

- **MNWD Secondary Expected Physical Benefits include: <u>Reduced Energy Usage</u>**

  A Secondary Expected Physical Benefit of the Project is the savings in energy for delivery of every one acre-foot of water. Potable water supplied to Southern California is imported via the State Water Project and the Colorado River Aqueduct. An estimate of the amount of energy required to deliver the water to the Southern California area is approximately 3,044 kWh/AF for the State Water Project and 2,044 kWh/AF for the Colorado River Aqueduct. The average amount of energy required for delivery of each acre-foot of water based on a straight average for both sources of approximately 2,500 kWh/AF. For each acre-foot of recycled water that is generated within the District's service area and utilized in place of the imported water, the amount of energy required to produce and deliver it to the customer is that required for pumping, which is calculated to be approximately 500 kWh/AF (actual is 490 kWh/AF). Thus the benefit of energy savings is the difference in energy necessary to deliver one acre-foot of imported water versus one acre-foot of locally generated recycled water to the customer. The difference is an energy savings of 204,600 kWh/AF.

- Technical basis of the project.

  The technical basis of the Project to support the claimed benefits of reduced energy consumption used to irrigation with local recycled water vs. imported water, as described above, includes the following technical studies that discuss the reduced energy consumption for imported water versus recycled water:

The power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kwh/AF for State Water Project water and 2,000 kWh/AF for Colorado River water. One acre-foot of recycled water requires 500 kWh of energy to produce and deliver. Imported Water Calculation for Total Energy: 102.3 AFY X 2,500 kWh/AF = 255,750 kWh. Recycled Water Calculation for Total Energy: 102.3AFY X 500 kWh/AF = 51,150 kWh. The benefits is equal to the power savings: 255,750kWh-51,150kWh= 204,600 kWh. Annual energy savings would be 204,600 kWh.

The technical basis of the Project includes the following technical studies that discuss the reduced energy consumption for imported water versus recycled water:

- "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River water. Also source for one acre-foot of recycled water requires 490 approximately 500 kWh of energy to produce and deliver.
- "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is approximately 2,500 kWh, based on average of 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct.
- "Direct Potable Reuse: Benefits for Public Water Supplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for 2,500 kWh energy required to import 1 AF.

The references cited above are attached as Att3_DG_ProJust_2of2.

- Recent and historical conditions that provide background for benefits to be claimed.

  The benefits claimed are a direct correlation to the generation and delivery of recycled water in comparison to the average energy required to import potable water. Energy consumption is estimated for import water supplies based on the amount of pumping required and the efficiency of the pumping systems. The energy required to produce and deliver the water cited in the reference materials depend upon the type of treatment, the amount of pumping, and the relative elevations of the treatment facility and site of use. 500 kWh is a conservative estimate of those energy costs and is cited in the referenced documents.

- Estimates of without-project conditions.

  Without the conversion of the domestic irrigation accounts to recycled water, the energy savings will not be realized. This Secondary Physical Benefit is dependent on the implementation of the Project and consequently the realization of the Primary Physical Benefit. The amount of energy required to deliver the 102.3 AFY of imported water to the Project area will still be required should the Project not be implemented.

- Description of methods used to estimate physical benefits.

  The power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kwh/AF for State Water Project water and 2,000 kWh/AF for Colorado River water. One acre-foot of recycled water requires 500 kWh of energy to produce and deliver. Imported Water Calculation for Total Energy: 102.3 AFY X 2,500 kWh/AF = 255,750 kWh. Recycled Water Calculation for Total Energy: 102.3AFY X 500 kWh/AF = 51,150 kWh. The benefits is equal to the power savings: 255,750kWh-51,150kWh= 204,600 kWh. Annual energy savings would be 204,600 kWh. The estimated amount of energy required is based on the total kilowatt hour per acre-foot required to import water to Metropolitan Water District as calculated in the Wilkinson study dated 2007 and the calculated cost to deliver the generated recycled water. The amount of energy required per acre foot of water delivered is applied to the total Project Water Savings of 102.3 AFY. The difference in energy required between the two scenarios (with and without the Project) is the total physical benefit. The

difference in energy required to supply these two sources is the physical benefit to the project. At 102.3 AFY, the result is an annual benefit of 204,600 kWh of energy saved.

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  To obtain these Secondary Physical Benefits, the same facilities that are required to obtain the Primary Physical Benefits will be needed. The new facilities required will include the installation of approximately 7,500 linear feet of pipe of varying sizes, as shown in Table 1, necessary to connect the proposed converted meters to a recycled water delivery system and to connect the delivery system to the existing backbone recycled water system. Conversion will include the work required at the actual connection to the recycled system and retrofitting the existing irrigation systems being served by the converted connections to reflect the use of recycled water (i.e. purple marked appurtenances and appropriate signage). The proposed customers have been notified of possible conversion and are eager to work with the District to convert their sites to recycled water. The District also offers recommendations as to watering schedules and assist with optimizing the irrigation systems for the customer to ensure overall water use efficiency. The Secondary Physical Benefits are dependent on the implementation of the Project. No additional facilities are required to obtain this Secondary Physical Benefit.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  The technical analysis detail is commensurate with the size of the project because it uses the total amount of greenhouse gases for 120.3 AFY of imported water compared to 120.3 AFY of recycled water. The Project will result in 120.3 AFY of new recycled water supply to reduce the same amount of imported water supply, thereby reducing the amount of greenhouse gases required for generating this amount of water supply. The savings in energy per acre-foot that results from supplying locally generated recycled water instead of imported water can be used in a direct calculation to determine the reduction in the amount of CO2 produced. This analysis is at the Master Plan level.

- **MNWD Secondary Expected Physical Benefits include: <u>Reduced Greenhouse Gas Emissions</u>**

  One additional Secondary Expected Physical Benefit of the Project is related to the savings in pounds of CO2 emissions for every one acre-foot of potable water converted to recycled water. For the amount of energy that is not expended to deliver each acre-foot of water from Northern California to Southern California, the greenhouse gas or CO_2 emission is avoided. Imported water requires approximately 2,000 kWh of energy per acre foot to deliver water from the Colorado River Aqueduct and 3,000 kWh of energy per acre foot to deliver water from the State Water Project. Both of these imported supplies are managed by MWD. The blend of the import varies based on current conditions and management choices of MWD. For this analysis, it was assumed that these two sources are blended evenly resulting in an energy use of approximately 2,500 kWh per acre-foot of imported water. The amount of energy required to produce and deliver local recycled water is approximately 500 kWh per acre-foot. Thus for every acre-foot of water converted from imported to recycled water 2,000 kWh of energy is saved. Therefore for 102.3 AF, the annual energy savings would be 204,600 kWh. Generation of energy in California produces 0.61 lbs of CO2/kWh. The savings in energy per acre-foot that results from supplying locally generated recycled water instead of imported water can be used in a direct calculation to determine the reduction in the amount of CO_2 produced. The total CO2 saved is 124,806 lbs annually.

- Technical basis of the project.

  Based on the total energy required, as identified in the Secondary Benefit above, the Imported Water Total CO2 Emissions Calculation=255,750 kWh X .61 lbs of CO2/kWh= 156,007.5 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 51,150 kWh X .61 lbs of CO2/kWh = 31,201.5 lbs of CO2. The difference between imported and recycled water CO2 emissions is 156,007.5 lbs of CO2 – 31,201.5 lbs of CO2 = 124,806.5 lbs of CO2 saved annually. The total amount of CO2 emissions reduced as a result of implementing the Recycled Water System Extension Project is 6,240,325 lbs of CO2.

The amount of greenhouse gas, or carbon dioxide, is based on the statistical analysis of data collected by the United States Environmental Protection Agency. From the data collected on the amount of CO2 produced for the generation of electricity, CO2 generation factors were determined as a way of estimating the total CO2 that will be emitted based on a given energy consumption. The most current factor applicable in the state of California, released in 2014, was used to determine this Secondary Physical Benefit. The carbon emission estimates of 0.61 lbs of CO2/kWh are based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases".

The reduced energy consumption for imported water versus recycled water has been documented in a number of technical studies including the following:

- "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on the average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River water). Also source for one acre-foot of recycled water requires approximately 500 kWh of energy to produce and deliver.
- "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot (AF) of water is approximately 2,500 kWh, based on average of approximately 3,000 kWh/AF for State Water Project water and approximately 2,000 kWh/AF for Colorado River Aqueduct).
- "Direct Potable Reuse: Benefits for Public Water Supplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for approximately 2,500 kWh energy required to import 1 AF.

The references cited above are attached as Att3_DG_ProJust_2of2.

- Recent and historical conditions that provide background for benefits to be claimed; for example, recent water shortages, loss of habitat or ecosystem function, and water quality problems.

  Carbon emissions from the generation of electrical energy are tracked by a number of different sources and do change depending on the type of generation utilized in that subregion. The generation data used is from the USEPA's 9th edition of eGrid based on the California subregion emission in 2010.

- Estimates of without-project conditions.

  Without the conversion of the domestic irrigation meters to recycled water, the energy savings will not be obtained and the reduction in CO_2 emissions will not be realized. The benefit of this Secondary Physical Benefit is dependent on the implementation of the Project and consequently the realization of the Primary Physical Benefit. The amount of energy required to deliver the 102.3 AFY of imported water to the Project area will still be required should the Project not be implemented, thus the same amount of emissions of CO_2 will occur. Imported water Supply Greenhouse Gas Emissions calculation: 102.3 AFY of imported water X 2,500 kWh energy for imported water supply X .61 lbs of CO2 = 156,007.5 lbs of CO2 produced.

- Description of methods used to estimate physical benefits.

  The referenced documents provide estimated energy requirements for both imported drinking water and locally produced recycled water. The difference in energy required to supply these two sources is 2,000 kWh/AF. At 102.3 acre-feet, that amounts to an annual benefit of 204,600 kWh of energy saved.

  Based on the total energy required, as identified in the Secondary Benefit above, the Imported Water Total CO2 Emissions Calculation=255,750 kWh X .61 lbs of CO2/kWh= 156,007.5 lbs of CO2. The Recycled Water Total CO2 Emissions Calculation= 51,150 kWh X .61 lbs of CO2/kWh = 31,201.5 lbs of CO2. The difference between imported and recycled water CO2 emissions is 156,007.5 lbs of CO2 – 31,201.5 lbs of CO2 = 124,806.5 lbs of CO2 saved. This is the total amount of CO2 emissions reduced as a result of implementing the Recycled Water System Extension Project. Therefore, a total of 124,806 lbs of CO2 will

be saved. Over the 50 year estimated life of the project, which results in a reduction in emissions of 6,240,300 lbs of CO2. The carbon emission estimates of 0.61 lbs of CO2/kWh or 183,000 lbs of CO2 annually are based on the United States Environmental Protection Agency's 9th edition of eGrid, "Year 2010 eGRID Subregion Emissions - Greenhouse Gases".

- Identification of all new facilities, policies, and actions required to obtain the physical benefits.

  To obtain these Secondary Physical Benefits, the same facilities that are required to obtain the Primary Physical Benefits will be needed. The Secondary Physical Benefits are dependent on the implementation of the Project. The new facilities required will include the installation of approximately 7,500 linear feet of pipe of varying sizes, as shown in Table 1, necessary to connect the proposed converted meters to a recycled water delivery system and to connect the delivery system to the existing backbone recycled water system. Conversion will include the work required at the actual connection to the recycled system and retrofitting the existing irrigation systems being served by the converted connections to reflect the use of recycled water (i.e. purple marked appurtenances and appropriate signage). The proposed customers have been notified of possible conversion and are eager to work with the District to convert their sites to recycled water. The District also offers recommendations as to watering schedules and assist with optimizing the irrigation systems for the customer to ensure overall water use efficiency.

- Description of any potential adverse physical effects.

  None.

- Confirm that the technical analysis detail is commensurate with the size of the project.

  This analysis is at a Master Plan planning level. The referenced documents contain planning level estimates as well. These are appropriate as more accurate analysis will be completed once detailed design, construction, and operational data are completed.

References

The following referenced documents are included in Att3_DG_ProJust_2of2:

- "Analysis of the Energy Intensity of Water Supplies for West Basin Municipal Water District". Robert C. Wilkinson, Ph.D. March, 2007. Page 4. Source for the power required to import one acre-foot (AF) of water is 2,544 kWh (average of 3,044 kWh/AF for State Water Project water and 2,044 kWh/AF for Colorado River water).
- "Direct Potable Reuse:Benefits for Public WaterSupplies, Agriculture, the Environment, and Energy Conservation". EDWARD SCHROEDER, GEORGE TCHOBANOGLOUS, HAROLD L. LEVERENZ, AND TAKASHI ASANO. Department of Civil and Environmental Engineering, University of California, Davis. January, 2012. Page 9. Resource for average of 2,500 kWh energy required to import 1 AF.
- "Moulton Niguel Water District's 2010 Urban Water Management Plan", 2010. Malcolm Pirnie. Pages 6-3 - 6-4.
- "Santa Margarita Water District Water Use Efficiency Plan". July 2014. Page 41. Project is identified in Table 4-2. Source for project costs, water savings and the year it is to be implemented.
- "Seawater Desalination Power Consumption". White Paper. Watereuse. November, 2011. Page 12 and Page 15. Source supporting the power required to import one acre-foot of water is approximately 2,500 kWh (average of approximately 3,000 kWh/AF for State Water Project water and 2,000 kWh/AF for Colorado River Aqueduct water).
- South Coast Water District's 2008 Infrastructure Master Plan, November 2008. PBS&J. Pages 6-1-6-28. Source for the Recycled Water System Master Plan.
- "Year 2010 eGRID Subregion Emissions - Greenhouse Gases". United States Environmental Protection Agency's 9th edition of eGrid, Source for the carbon emission estimate of 0.61 lbs of CO2/kWh.

VI. COST EFFECTIVE ANALYSIS

1. SMWD Califia Recycled Water Project

Table 6 – Cost Effective Analysis Project name: Califia Recycled Water Project	
Question 1	Types of benefits provided as shown in Table 5 - 220 AFY of Recycled Water used for irrigation; 550,00 kWh/Yr savings in energy; and 335,500 lbs of CO2 emissions eliminated.
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes
	If no, why?
	If yes, list the methods (including the proposed project) and estimated costs. The alternative to the Project would be to not convert the domestic irrigation accounts to recycled water service and continue serving the customers with imported domestic water. The cost to continue serving these irrigation customers with imported water is the purchase price of the imported water, which is $947 per AF. The total cost to purchase imported water for the 52 irrigation customers, based on the total annual demand of 220 AF, would be approximately $208,300 in year 2015. In comparison, if the service life of the proposed Project is 50 years, the annualized cost, at a total estimated project cost of $3,145,000, would be $62,900 in year 2015. Applying a 3% escalation rate to the annual price of imported water, the cost of 220 AFY of imported water would equal $913,340 by year 2065. Also applying a 3% escalation rate to the cost of the Project, the cost of 220 AFY of recycled water would equal $275,748 by year 2065. Implementing the Project compared to continuing to purchase imported water would save approximately $145,440 in year 2015 and $637,595 in year 2065. Factoring in a present worth value of approximately 25.729, implementing the Project would save the District approximately $3.74 million in 2014 dollars over 50 years. In this analysis, the cost of the proposed recycled water system extension is much more cost effective versus the use of 220 AFY of imported water supply for irrigation demand. The District pays an average of $.15/kWh for energy. Based on the District's analysis, the average cost for the entire year of 2013 was $0.1363, and the unit price went up to $0.14/kWh for 2014. Applying a cost of living increase factor to the unit cost, the estimate for 2015 would be approximately $0.15/kWh. At a cost of $0.15/kWh, the total annual energy cost of 559,680 kWh of energy for imported water is $83,952, while the total energy cost of 9,680 kWh of energy for recycled water is $1,452, resulting in a cost savings of $82,500. These same annual cost savings will be realized for the 335,500 lbs of CO2 saved, since the same amount of energy is used in both cases. The proposed Project is the least cost alternative and the preferred alternative.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. N/A
Comments:	

2. SCWD Recycled Water System Extension Project

Table 6 – Cost Effective Analysis **Project name: SCWD Recycled Water System Extension Project**	
Question 1	Types of benefits provided as shown in Table 5: 150 AFY of recycled water for irrigation; 300,000 kWh per year savings in energy; 183,000 lbs of CO2 emissions per year eliminated.
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes
	If no, why?
	If yes, list the methods (including the proposed project) and estimated costs. The alternative to the Project would be to not convert the domestic irrigation accounts to recycled water service and continue serving the customers with imported domestic water. The cost to continue serving these irrigation customers with imported water is the purchase price of the imported water, which is approximately $1,000 per AF. The total cost to purchase imported water for the 5 converted areas based on the total annual demand of 150 AF, would be approximately $150,000 for year 2015. In comparison, if the service life of the proposed Project is 50 years, the annualized cost at a total estimated project cost of $1,990,000, would be $39,800 in year 2015. Applying a 3% escalation rate to the annual price of imported water, the cost of 150 AFY of imported water would equal $657,586 by year 2065. Also applying a 3% escalation rate to the cost of the Project, the cost of 150 AFY of recycled water would equal $174,479 by year 2065. Implementing the Project compared to continuing to purchase imported water would save approximately $110,200 in year 2015 and $483,106 in 2065. Factoring in a present worth value of approximately 25.729, implementing the Project would save the District approximately $2.84 million in 2014 dollars over the 50 years. In this cost analysis, the cost of the proposed recycled water system extension is much more cost effective versus the use of 150 AFY of imported water supply for irrigation demand. The District pays an average of $.15/kWh for energy, based on the District's average cost for 2013-2014 and applying a cost of living increase factor to the unit cost. At a cost of $.15/kWh, the total annual energy cost of implementing 375,000 kWh of imported water is $56,250, while the total annual energy cost of implementing 75,000 kWh of recycled water is $11,250, resulting in cost savings of $45,000. These same annual cost savings will be realized for the 183,000 lbs of CO2 saved, since the same amount of energy is used in both cases. The proposed Project is the least cost alternative and the preferred alternative.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. N/A
Comments:	

3. MNWD Recycled Water System Extension Project

Table 6 – Cost Effective Analysis Project name: MNWD Recycled Water System Extension	
Question 1	Types of benefits provided as shown in Table 5: 102.3 AFY of potable water saved with same amount of wastewater converted to recycled use; 204,600 kWh per year of energy saved; and 124,806.5 pounds of CO2 emissions eliminated.
Question 2	Have alternative methods been considered to achieve the same types and amounts of physical benefits as the proposed project been identified? Yes If no, why? If yes, list the methods (including the proposed project) and estimated costs. The alternative to the Project would be to not convert the domestic irrigation accounts to recycled water service and continue serving the customers with imported domestic water. The District carefully evaluated the costs associated with this alternative. The District performs detailed cost analysis to determine the cost effectiveness of the proposed project based on these assumptions: Implementation costs are based on site conditions, recent bids for similar projects, and District staff professional judgment. The cost to continue serving these irrigation customers with imported water is the purchase price of the imported water, which is approximately $1,000 per AF. The total cost to purchase imported water for the 32 meters based on the total annual demand of approximately 102 AFY, would be approximately $102,000 for year 2015. In comparison, if the service life of the proposed Project is 50 years, the annualized cost, at a total estimated project cost of $2,060,000, would be $41,200 in year 2015. Applying a 3% escalation rate to the annual price of imported water, the cost of 102 AFY of imported water would equal $447,158 by year 2065. Also applying a 3% escalation rate to the cost of the Project, the cost of 102 AFY of recycled water would equal $180,617 by year 2065. Implementing the Project compared to continuing to purchase imported water would save approximately $60,800 in year 2015 and $266,541 in year 2065. Factoring in a present worth value of approximately 25.729, implementing the Project would save the District approximately $1.56 million in 2014 dollars over the 50 years. In another analysis, the District compared the annual cost of recycled water production vs. the annual cost of imported water supply. The District's recycled water production cost is $141 per acre-foot which would result in a total estimated production cost of $14,382 per year (calculated based on $141/AF x 102 AFY). The cost of imported water for year 2015 compared to the recycled water production cost of $14,382 per year results in a savings of $87,618 for year 2015. In both analyses, the cost of the proposed recycled water system extension is much more cost effective versus the use of 102 AFY of imported water supply for irrigation demand. The District pays an average of $.15/kWh for energy, based on the District's average cost for 2013-2014 and applying a cost of living increase factor to the unit cost. At a cost of $.15/kWh, the total annual energy cost for 255,750 kWh of energy for imported water is $38,362.50, while the total annual energy cost for 51,150 kWh for recycled water is $7,672.50, resulting in cost savings of $30,690. These same annual cost savings will be realized for the 124,806.5 lbs of CO2 saved, since the same amount of energy is used in both cases. The proposed Project is the least cost alternative and the preferred alternative.
Question 3	If the proposed project is not the least cost alternative, why is it the preferred alternative? Provide an explanation of any accomplishments of the proposed project that are different from the alternative project or methods. N/A
Comments:	