FINAL REPORT

Wastewater Management Plan

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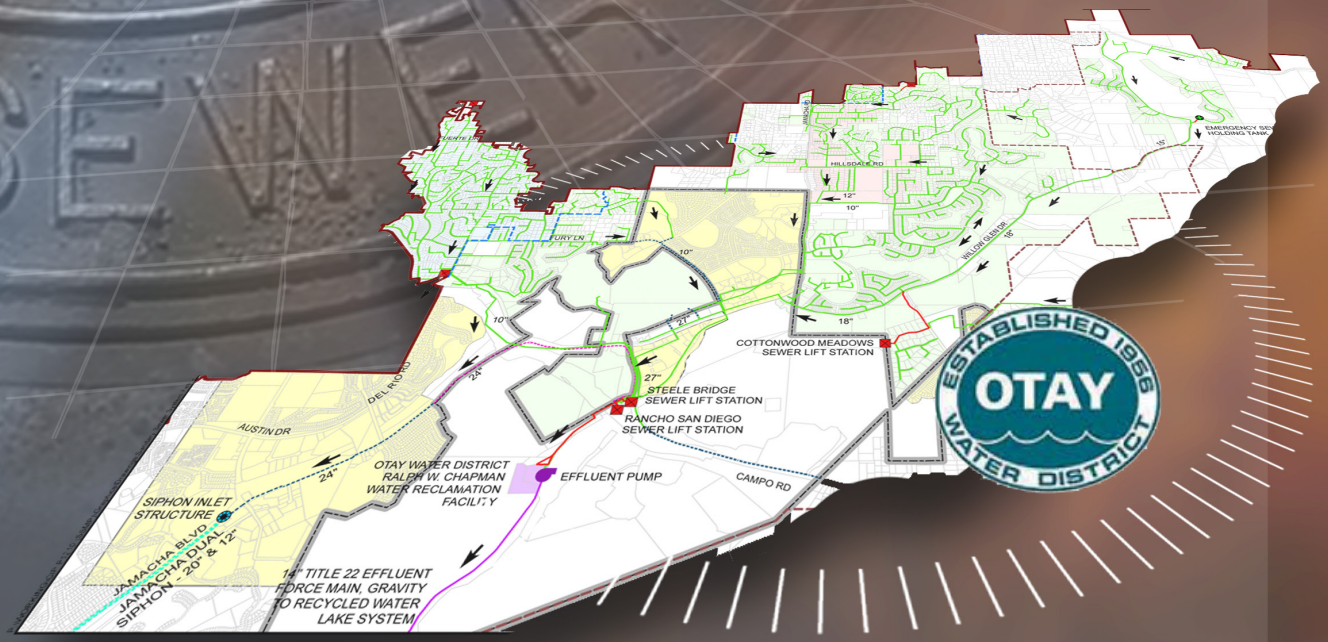

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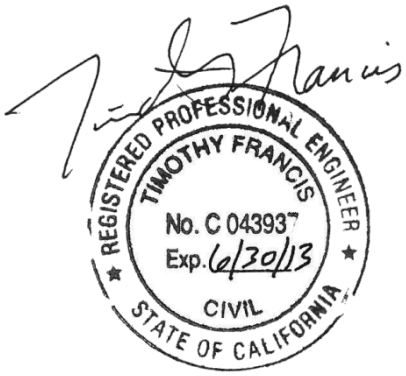
Wastewater Management Plan

May, 2013



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Abbreviations and Acronyms

AACE	Association for the of Advancement of Cost Engineering International
AF	acre-foot
AFY	acre-foot per year
Bureau	U.S. Bureau of Reclamation
CIP	Capital improvement program
County	County of San Diego
District	Otay Water District
ENR CCI	Engineering News Record Construction Cost Index
EPA	Environmental Protection Agency
FY	Fiscal Year
gpcd	gallons per capita per day
gpm	gallons per minute
IBWC	International Boundary and Water Commission
IPR	Indirect potable reuse
KWH	Kilowatt-hour
MBR	Membrane bioreactor
Metro System	City of San Diego Metropolitan Wastewater System
MGD	million gallons per day
MGRA	Master geographic reference area
MWD	Metropolitan Water District of Southern California
NPDES	National Pollution Discharge Elimination System
O&M	operations and maintenance
PEIR	Program Environmental Impact Report
PLWWTP	Point Loma Wastewater Treatment Plant
PVC	Polyvinyl chloride
RCW	Recycled water
RDII	Rainfall derived infiltration and inflow
RSDPS	Rancho San Diego Pump Station
RSDOF	Rancho San Diego Outfall Facilities
RWCWRF	Ralph W. Chapman Water Recycling Facility
SANDAG	San Diego Association of Governments
SBPS	Steel Bridge Pump Station
SBWRP	City of San Diego South Bay Water Reclamation Plant
SDCWA	San Diego County Water Authority
SPEIR	Supplemental Program Environmental Impact Report
SSMP	Sewer System Management Plan
SVO	Spring Valley Outfall

Title 22	Title 22, Division 4, Chapter 3 of the *California Code of Regulations*
USBR	United States Bureau of Reclamation
WAS	Water Agencies' Standards
WRF	Water Reclamation Facility
WWTP	Wastewater Treatment Plant

EXECUTIVE SUMMARY

Background and Purpose

The Otay Water District (District), located in the southern portion of San Diego County, provides wastewater service to a portion of the land area within the Jamacha Basin, which is located within its North District. The County of San Diego also provides wastewater service in a portion of the Jamacha Basin. Wastewater flows from each agency's customers are conveyed in joint collection and pumping systems.

Wastewater generated in the Jamacha Basin can be discharged into the City of San Diego Metropolitan Wastewater System (Metro System). The District owns and operates the Ralph W. Chapman Water Reclamation Facility (RWCWRF) within the Jamacha Basin, which is operated as a skimming facility. Wastewater flows generated within the Jamacha Basin are pumped to the RWCWRF and treated to produce recycled water, which is used to meet a portion of the District's existing recycled water demand. All remaining wastewater flows are discharged into the Metro System via the County's Rancho San Diego Outfall Facilities (RSDOF) and the downstream Spring Valley Outfall (SVO). The 2010 wastewater collection rates within the Jamacha Basin for connected sewer customers only were about 1.3 MGD for the District and about 0.65 MGD for the County. Wastewater collection, pumping, and treatment costs are shared between the District and the County as provided in the 1998 agreement between the Spring Valley Sanitation District (now San Diego County) and the Otay Water District.

There are currently two sources of recycled water supply to the District. The RWCWRF can treat up to 1.3 MGD. The District also entered into an agreement with the City of San Diego that allows the District to purchase up to 6.0 MGD of recycled water generated by the City's South Bay Water Reclamation Plant (SBWRP).

Previous planning studies have evaluated various wastewater treatment and disposal options available to the District and the County. These studies have indicated that local treatment and marketing of recycled water are economical and preferable under certain conditions, and Metro System wastewater disposal is superior under other conditions. The primary factors affecting the comparison of the options available are total wastewater collected for disposal, total costs of local and Metro System service, revenues from the sale of recycled water, and risk exposure to future costs in the Metro System.

The purpose of this project is to prepare a comprehensive *Wastewater Management Plan* that considers required improvements to the District's wastewater collection system and identifies a preferred strategy for future wastewater management and recycled water generation and purchase. The scope of services for the project generally includes the following:

- Update of the wastewater flow projections for the Jamacha Basin.
- Identification of wastewater collection system improvements and costs that will accommodate projected wastewater flows.
- Determination of additional recycled water supplies needed through 2030.
- Review of potential sources and costs of additional recycled water supplies.
- Identification and analysis of local and regional options available to the District for future wastewater management and recycled water supply to identify a preferred strategy.
- Development of recommended wastewater system improvements and costs for consideration in the District's wastewater capital improvement program.

Summary of Conclusions

The work conducted in this *Wastewater Management Plan* yields the following conclusions:

Wastewater Flow Projections

- The total Jamacha Basin wastewater generation, including connected and unconnected properties are projected to increase from 2.48 MGD in 2010 to 2.96 MGD in 2030.
- Wastewater generation in the District's service area within the Jamacha Basin, from connected **and** unconnected properties, is projected to increase from 1.84 MGD in 2010 to 2.15 MGD in 2030
- Wastewater generation in the County's service area within the Jamacha Basin, including connected **and** unconnected properties, is projected to increase from 0.64 MGD in 2010 to 0.81 MGD in 2030.

Wastewater Collection System

- The existing collection system has three problem areas that do not meet system performance criteria under peak flow conditions. These problem areas can be corrected by replacing the existing undersized sewer pipes.
- One of the existing problem areas is along Campo Road in a section of 10-inch pipe that has been converted from a forcemain to a gravity pipe, and is

undersized to act adequately as a gravity pipe. The District wants the entire length of this pipe replaced with a 15-inch gravity pipe.

- The existing collection system has two additional areas that do not meet system performance criteria under 2030 peak flow conditions. The undersized sewer pipes in these areas should also be replaced as funds become available.

Recycled Water Supply and Demand

- The District's existing recycled water supply consists of an average of 1.0 MGD from the RWCWRF and up to 6 MGD annually from the SBWRP. Due to problems with wastewater supply to SBWRP, other large demands taking priority, etc., the actual peak availability of recycled water from the SBWRP has recently been only 5.3 MGD. These problems are anticipated to be corrected by 2015.
- The District projects that its recycled water volumetric demand will increase from 4,074 AFY in 2010 to 8,000 AFY in 2035.
- The District will begin seeing deficits in monthly recycled water supply by 2020 during the peak demand months. The deficits during the two peak demand months are projected to grow from approximately 670 AF in 2020 to 1,100 AF in 2035. The deficits are also expected to occur for over half the year. These deficits are not annual and can be mitigated if the District/SBWRP agreement can be amended to allow the District to take its contracted amount at up to two times its annual average rate during peak demand months.
- The District is already seeing supply deficits in meeting peak day recycled water demands and has had to occasionally supplement with potable water. The peak day supply deficit is projected to grow from approximately 1.0 MGD in 2010 to 7.3 MGD in 2035. The deficits can be managed with appropriate recycled water system storage and a modification to the District/SBWRP agreement, as described above.
- Potential additional supplies of recycled water include the following sources:
    - Expansion of the RWCWRF
    - Additional purchases from the City of San Diego SBWRP
    - Purchase of recycled water from a potential new City of Chula Vista regional WRF
    - A potential new joint WRF with San Diego County
    - A new joint WRF with the International Boundary and Water Commission at the South Bay International Wastewater Treatment Plant.

Future Wastewater and Recycled Water Management Options

- Future wastewater treatment options include the RWCWRF, discharge to the Metro System, and potential partnership with the County in a new 10 MGD water reclamation plant.
- Five overall future wastewater management and recycled water options were selected for economic evaluations:

  - Option A – maintain RWCWRF at 1.3 MGD
  - Option B – expand RWCWRF to 2.6 MGD
  - Option C – expand RWCWRF to 3.9 MGD
  - Option D – decommission RWCWRF and send all flow to Metro
  - Option E – decommission RWCWRF and build joint plant with County

- The evaluation of RWCWRF options considered onsite solids handling and no onsite solids handling. The joint District/County plant options considered only onsite solids handling consistent will all previous planning efforts. All options involving discharge of flows to Metro included consideration of the Point Loma WWTP remaining a primary treatment plant and potential upgrade to a secondary treatment plant.
- A detailed present worth cost evaluation of the five primary management options through 2030 lead to the following conclusions:

  - Option A has the lowest present worth cost, followed by Option B (expand RWCWRF to 2.6 MGD), then Option C. This is due to the existing investment in RWCWRF and the avoidance of Metro costs and additional recycled water purchases.
  - Option D has the highest present worth due to the existing cost structure, potential for Point Loma WWTP upgrade, and need to purchase additional Metro and County system capacity.
  - The lowest cost options involve onsite solids handling, purchase of recycled water from a Chula Vista WRF, and avoidance of costs for a Point Loma WWTP upgrade.
  - For all RWCWRF expansion options (Options A, B, and C), construction and operation of onsite solids handling is more cost-effective due to the potential to reduce Metro discharges and costs.
  - Abandoning the RWCWRF and relying on Metro or a new joint District/County WRF is significantly more costly than retaining RWCWRF at any of the three capacities evaluated. This reinforces the value of the existing plant and the District's Metro/County system capacity ownership.

- Purchase of recycled water from a new Chula Vista WRF appears to be more cost-effective than purchase from the SBWRP due to the current "take or pay" provision in the SBWRP agreement.

Wastewater Collection System Recommendations

Hydraulic Model

The existing hydraulic model was last calibrated in 2006 and should be recalibrated in the next planning effort. Typically, a hydraulic model is calibrated every 5 years as changes in development occur or modeled system components (pump stations and pipelines) are updated. The District should also consider calibrating the model using predictive hydrologic methods in the next model update. In terms of versatility and range of applications, the predictive hydrologic method far exceeds the capabilities of the peaking factor methodology which is currently utilized.

Recommended Wastewater System Improvements

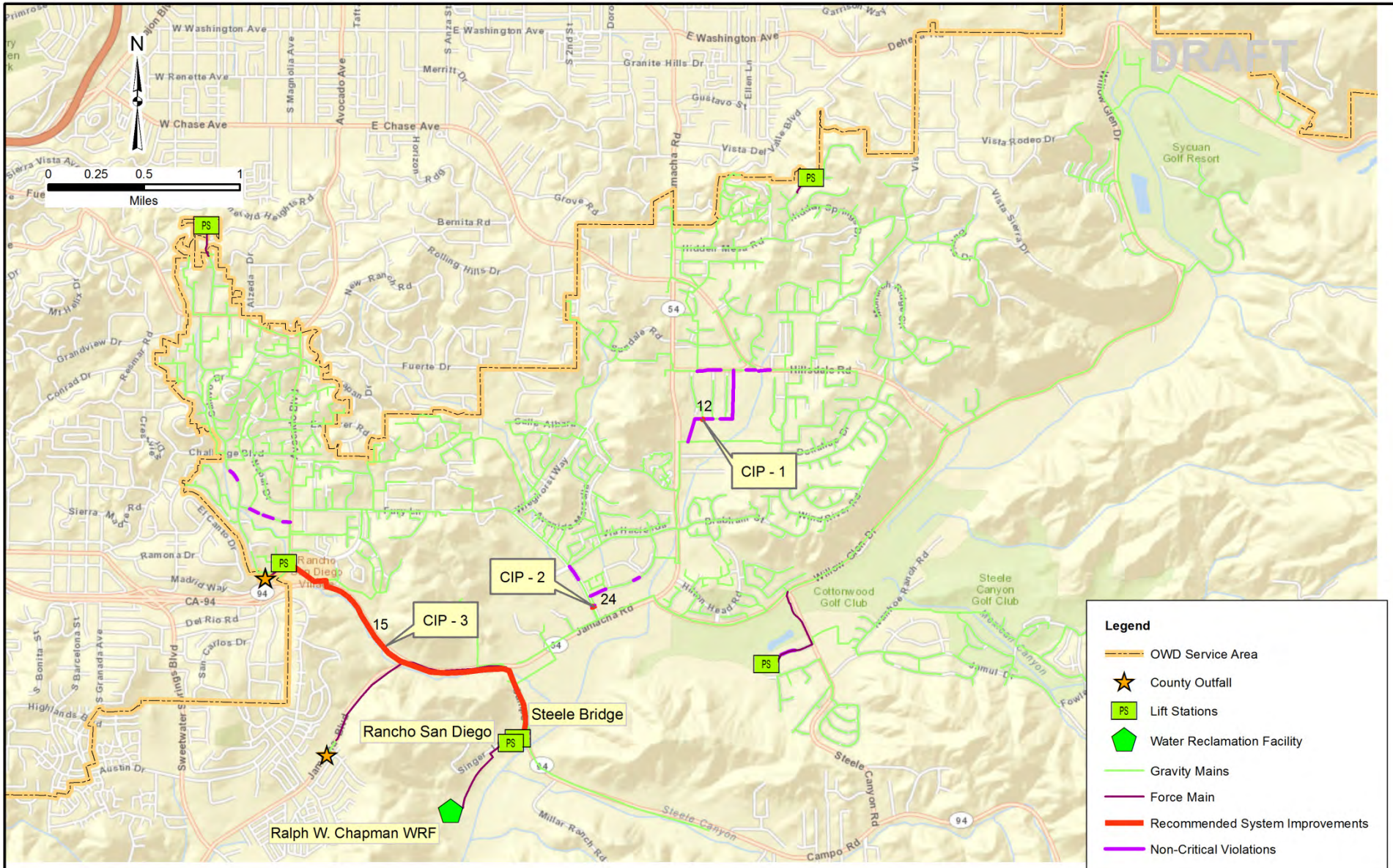
Table ES-1 summarizes the schedule and capital cost opinions for the recommended wastewater collection system improvements. Figures ES-1 and ES-2 illustrate the recommended improvements.

Table ES-1. Recommended Wastewater Collection System Improvements

Project No.	Description		Location	Unit Cost ($/LF)[1]	Conceptual Cost Opinion ($)	
					Existing	2030
Collection System Pipes						
CIP #1	12-inch	36 LF	Near Fury Ln and Jamacha Rd	1,020	$37,000	--
CIP #2	24-inch	91 LF	Near Hillsdale Rd and Jamacha Rd	2,040	$190,000	--
CIP #3	15-inch	9,225 LF	Along Campo Road from Avocado Rd to Singer Lane	900	$8,300,000	--
CIP #4	15-inch	900 LF	Near Jamacha Rd and Donahue Dr	1,275	--	$1,150,000
CIP #5	15-inch	1,235 LF	Along Ivanhoe Ranch Rd upstream of Cottonwood Pump Station	1,275	--	$1,570,000
Total					**$8,527,000**	**$2,720,000**

Note:
1. January 2012 Costs (ENR CCI = 9176). Includes 30% for engineering and administration, 10% for contractor bonding and insurance, and 30% for project contingencies.

CIP #3 involves replacement of the former 10-inch forcemain in Campo Road that currently acts as a gravity pipe. The entire stretch of this pipe should be replaced with a new 15-inch gravity sewer pipe.



OTAY WATER DISTRICT

Wastewater Management Plan

EXISTING SYSTEM IMPROVEMENTS

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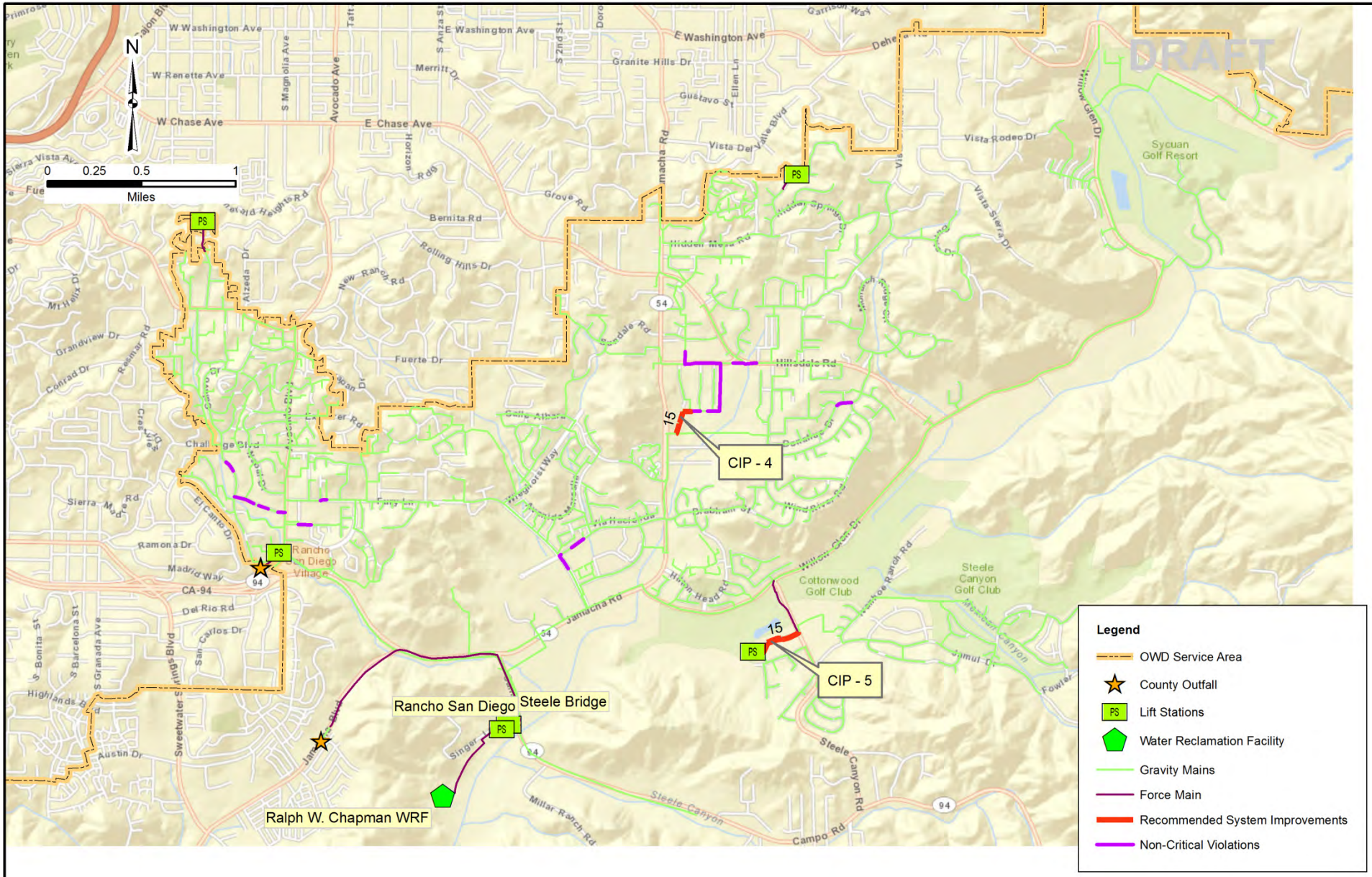
April 2013

FIGURE ES-1



OTAY WATER DISTRICT

Wastewater Management Plan

FUTURE SYSTEM IMPROVEMENTS

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The Water Division of ARCADIS

April 2013
FIGURE ES-2

Recommended Wastewater Management and Recycled Water Strategies

The recommended wastewater and recycled water management strategies for consideration by the District are as follows.

- Retain and maintain the RWCWRF at its current capacity. This recommendation, however, does not preclude a future expansion of RWCWRF capacity if additional reclaimed water for the District cannot be obtained from a new assumed Chula Vista WRF or from the SBWRP.
- If regulatory restrictions prohibit the use of the existing reclaimed water pipeline to achieve required chlorine contact times before expansion of the RWCWRP, then plan, design, and construct a chlorine contact chamber. **The estimated capital costs for the chlorine contact chamber is $3,420,000** (includes 30 percent for engineering and administration, 10 percent for contractor bonding and insurance, and 30 percent for project contingencies).
- Plan, design, and construct on-site solids handling facilities on the RWCWRF site for a capacity of 1.3 MGD expandable to 2.6 MGD. **The estimated capital cost for the on-site solids handling facilities is $5,690,000** (includes 30 percent for engineering and administration, 10 percent for contractor bonding and insurance, and 30 percent for project contingencies).
- Target the start-up date for RWCWRF on-site solids handling as early as possible, but no later than 2015, to avoid potential Point Loma WWTP upgrade costs.
- Confirm that construction and operation of RWCWRF on-site solids handling facilities will preclude significant discharge to the Metro System, except on plant maintenance or emergency events.
- Upon construction of RWCWRF on-site solids handling, re-determine new quality and resulting unit costs for Metro discharge.
- Renegotiate the SBWRP recycled water purchase agreement to allow short-term, peak month and peak-day purchases of recycled water from the 6 MGD limit stated in the contract to a new limit of 12 MGD. Also, renegotiate the agreement to remove the “take or pay” provision.
- If the take or pay provision of the SBWRP agreement cannot be negotiated out, support the construction of a Chula Vista WRF and negotiate a contract to take all recycled water produced by that plant.
- Perform a District recycled water storage evaluation to assess daily and peak month water balances to assure that projected peak period recycled water demands can be achieved by the combination of RWCWRF, SBWRP/Chula Vista WRP recycled water purchases with no or little supplementation by other water sources, such as SDCWA water.

1.0 INTRODUCTION

1.1 Background

The Otay Water District (District) is located in the southern portion of San Diego County. The District provides wastewater service to a portion of the land area within the Jamacha Basin, which is located within its North District. The County of San Diego also provides wastewater service in a portion of Jamacha Basin. Wastewater flows from each agency customers are conveyed in joint collection and pumping systems.

Wastewater generated in Jamacha Basin can be discharged into the City of San Diego Metropolitan Wastewater System (Metro System) up to the District and County contract capacity rights in the system. The District owns and operates the Ralph W. Chapman Water Reclamation Facility (RWCWRF) within the Jamacha Basin. The RWCWRF is operated as a skimming or stripping facility, whereby wastewater flows generated within Jamacha Basin are pumped to the RWCWRF and treated to produce recycled water, which is used to meet a portion of the District's existing recycled water irrigation demand. All of the remaining wastewater flows are discharged into the Metro System via the County's Rancho San Diego Outfall Facilities (RSDOF) and the downstream Spring Valley Outfall (SVO). The District has capacity rights within the RSDOF and the SVO of 1.2 MGD, and slightly more in the Metro System. The design capacity of the RSDOF is 4.5 MGD. The 2010 wastewater collection rates within the Jamacha Basin from connected sewer customers was about 1.3 MGD for the District and about 0.65 MGD for the County.

There are currently two sources of recycled water supply to the District. The RWCWRF can treat up to 1.3 MGD of wastewater to produce recycled water to meet a portion of the District's demands. The District also entered into an agreement with the City of San Diego in 2003 that provides for recycled water supply from the City's South Bay Water Reclamation Plant (SBWRP). The agreement allows the District to purchase up to 6.0 MGD of recycled water generated by the SBWRP.

Previous planning studies have evaluated various wastewater treatment and disposal options available to the District and the County. These studies have indicated that local treatment and marketing of recycled water are the economical and preferable outcome under certain conditions, and Metro System wastewater disposal is superior under other conditions. The primary factors affecting the comparison of the options available are total wastewater collected for disposal, total costs of local and Metro

System service, revenues from the sale of recycled water, and risk exposure to future costs in the Metro System.

1.2 Project Purpose and Scope

The purpose of this project is to prepare a comprehensive wastewater management plan that considers required improvements to the District's wastewater collection system and identifies a preferred strategy for future wastewater management and recycled water generation and purchase. The project also includes assistance in the preparation of a State of California Program Environmental Impact Report, which encompasses the recommendations of the Wastewater Management Plan. The scope of services for the project generally includes the following:

- Update of the wastewater flow projections for the Jamacha Basin.
- Analysis of the wastewater collection system using the District's existing wastewater system hydraulic model to identify existing system deficiencies and to identify system improvements and costs that will correct deficiencies and accommodate projected wastewater flows.
- Analysis of existing and projected recycled water demands to determine additional recycled water supplies that are needed currently and through 2030.
- Review of potential sources and costs of additional recycled water supplies.
- Identification and analysis of local and regional options available to the District for future wastewater management and recycled water generation and purchase to identify a preferred strategy or strategies.
- Development of a capital improvement program for the recommended collection system and wastewater facility improvements.
- Assistance in the preparation, public noticing, and regulatory approval of the Program Environmental Impact Report (PEIR) that encompasses the Wastewater Management Plan recommendations.

This Wastewater Management Plan contains the findings and results of the first six bullet items above. The PEIR assistance and documentation is provided separately.

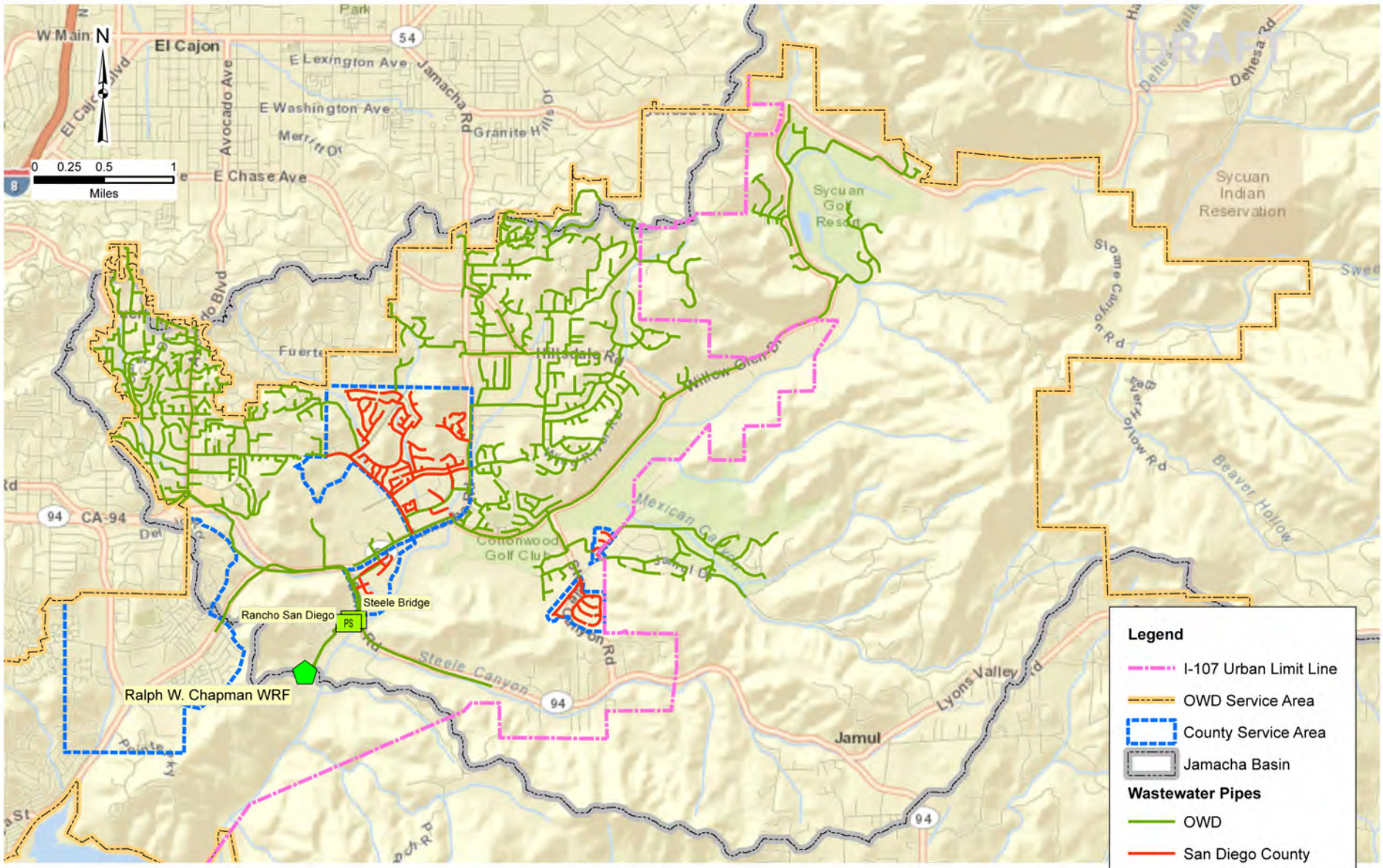
2.0 WASTEWATER FLOW PROJECTIONS

This chapter presents updated wastewater flow projections through 2030, including flows from San Diego County and Otay Water District collection service areas.

2.1 Study Area

The study area for this Wastewater Management Plan is the watershed drainage basin known as the Jamacha Basin, which is located in the northern portion of the District's water service area. Figure 2-1 shows the Jamacha Basin and the boundaries of the District's water service area in relation to the wastewater collection area. As shown on Figure 2-1, the Jamacha Basin includes a portion of San Diego County's wastewater service area in addition to the District's service area. The 16,820-acre Jamacha Basin drains to the Rancho San Diego Pump Station (RSDPS) that is owned and operated by the County and is located on Singer Lane just off of Campo Road. The RSDPS pumps wastewater collected from the Jamacha Basin to the County SVO facilities. Just upstream of the RSDPS, the District's Steele Bridge Pump Station (SBPS) diverts up to 1.3 MGD of wastewater to the District's RWCWRF. The RWCWRF treats up to 1.3 MGD of wastewater and has recently produced an average of 1.0 MGD of recycled water. Treatment solids and sludge are pumped back to the RSDPS. The remaining flows from the District and County service areas and RWCWRF solids and sludge are pumped to the SVO, and the flow continues to the Metro System and ultimately to the Metro System Point Loma Wastewater Treatment Plant (WWTP) for treatment and disposal.

The District currently provides sewer service to over 4,000 customers within the Jamacha Basin, and has the latent powers to provide sewer service to potential future sewer customers in the study area. Most current District wastewater customers are in areas west of the County of San Diego Policy I-107 Urban Limit Line as shown on Figure 2-1.



OTAY WATER DISTRICT

Wastewater Management Plan

STUDY AREA

October 2012

FIGURE 2-1

2.2 Previous Wastewater Flow Projections

In April, 2010, the County completed the most recent wastewater flow projections for the Jamacha Basin as part of its RSDPS Sewer Flow Projection Study. The study was a precursor to the preliminary design phase for upgrading pumping and wet well capacity at the RSDPS. The County based this effort on the San Diego Association of Governments (SANDAG) 2030 Regional Growth Forecast population projections. Specifically, the population projections of the Series 11 – 2030 San Diego Regional Growth Forecast Update, completed in April 2008, were utilized.

Unit per capita wastewater generation rates were developed and calibrated to wastewater flows monitored by the County. The calibrated unit flow factors were 80 gallons per capita per day (80 gpcd) for residential populations and 25 gpcd for employment populations. Typical design and planning standards for agencies in San Diego County assume per capita wastewater generation rates between 60 to 100 gpcd for residential and 15 to 35 gpcd for employment populations. Therefore, the calibrated unit generation rates fall within industry standards.

The County cross-referenced populations with permitted parcel data to determine existing and projected population for properties with existing sewer permits from either agency. The balance of the population projections were attributed to vacant parcels and parcels that were occupied but did not have a sewer permit.

The methodology for developing parcel-based wastewater flow projections in the 2010 County study is used in this Wastewater Management Plan. Updated (2012) population projections from SANDAG were utilized, and unit wastewater flow factors are calibrated to recent District wastewater metering data.

2.3 Population Projections

Population projections of the Series 12 – 2030 San Diego Regional Growth Forecast Update, completed in May 2012, were obtained from SANDAG. SANDAG provided the projections for Master Geographic Reference Areas (MGRAs), which are similar in size to census blocks in urban areas and census block groups in suburban and rural areas. Property parcel data in GIS was then overlaid on the MRGA data to develop population data at the parcel level. The data included residential population estimates for 2008 through 2030 and employment estimates for 2015 through 2030. SANDAG indicated that employment population estimates for 2008 and 2010 were not available due to confidentiality concerns. Table 2-1 summarizes the population projections

provided by SANDAG. The SANDAG data was cross-referenced with parcels that had wastewater permits from either agency to identify permitted parcels which are connected to the wastewater system. Unpermitted (unconnected) parcels were either designated as vacant or on individual septic systems (occupied parcels that were categorized as unpermitted were assumed to be on septic). Figure 2-2 shows the parcels within the District service area that are assumed to be on septic.

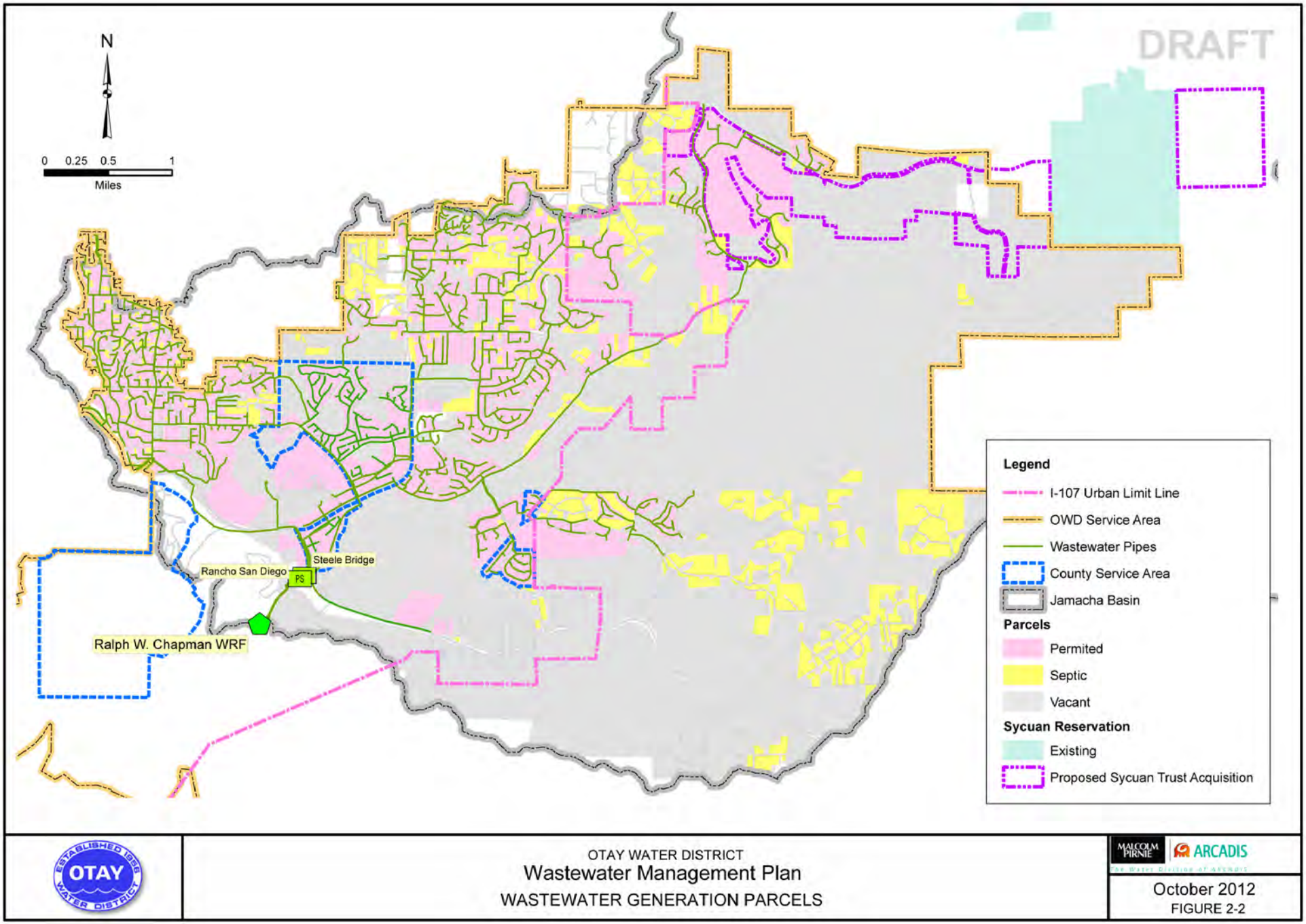
Table 2-1. Existing and Projected Populations within the Jamacha Basin[1]

Year	Permitted/Connected				Unconnected[4]				Total	
	County		District		Vacant		Septic[2]			
	Res	Emp[3]	Res	Emp[3]	Res	Emp[3]	Res	Emp[3]	Res	Emp[3]
2008	8,956	--	16,390	--	2,176	--	3,635	--	31,157	--
2010	7,351	--	15,790	--	2,156	--	3,641	--	28,938	--
2015	9,101	2,011	16,817	2,768	2,207	731	3,691	1,087	31,816	6,597
2020	9,136	2,020	16,931	2,806	2,591	735	3,697	1,107	32,355	6,668
2025	9,262	2,020	17,179	2,807	2,907	737	4,633	1,116	33,981	6,680
2030	9,288	2,018	17,532	2,817	3,099	741	4,722	1,137	34,641	6,713

Notes:
1. SANDAG Series 12 Forecast. Res – Residential, Emp – Employment.
2. Occupied but unpermitted parcels assumed to be on septic.
3. Employment population not available from SANDAG.
4. Includes unconnected parcels in both County and District service areas.

2.4 Calibration of Unit Wastewater Flow Factors

A calibration check was made of the unit wastewater generation factors used by the County in its 2010 study. The calculated 2008 and 2010 wastewater flows using the unit factors were compared against the District's wastewater flow monitoring data. Table 2-2 summarizes the calibration check. The County is currently updating its wastewater master plan for the portion of its service area that includes the Jamacha Basin. The County provided its most recent population projections, which had been updated since its 2010 RSDPS study (although the updates were also based on the Series 11 data). The employment population estimates for 2008 and 2010 provided by the County were used to calibrate unit wastewater flow factors.



OTAY WATER DISTRICT

Wastewater Management Plan

WASTEWATER GENERATION PARCELS

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FIGURE 2-2

Table 2-2. Calibration Summary of Unit Wastewater Generation Factors

Year	Total County and District Permitted/Connected Populations		Total County and District Calculated Wastewater Flows[2] (MGD)	Total District Metered Flows (MGD)	Percent Difference
	Residential	Employment[1]			
2008	25,346	5,592	2.17	2.06	- 5%
2010	23,141	5,335	1.98	1.97	- 1%

Notes:

1. From County-provided (January 2012) most recent updates of SANDAG Series 11 data.
2. Based on 80 gpcd for Residential and 25 gpcd for Employment populations.

The calibration check of the unit wastewater factors indicate a maximum difference between calculated and metered wastewater flows of 5 percent. This is considered acceptable for master planning purposes. Thus, the unit factors of 80 gpcd for residential and 25 gpcd for employment populations were used in updating the wastewater flow projections.

2.5 Wastewater Flow Projections

Table 2-3 summarizes the updated wastewater flow projections for the Jamacha Basin. The table includes estimated flows from the Sycuan Indian Reservation as documented in the Final Environmental Assessment, Sycuan Band of the Kumeyaay Nation Fee-to-Trust (August 2011). The environmental assessment covers, among other activities, construction of economic developments on the Reservation, including an Outdoor Events Center with limited parking for recreational vehicles (RVs) operated in conjunction with the existing Sycuan Resort; relocation of the Tribe's Equestrian Center to maximize use of existing trails near the Sycuan Property; creation of additional Tribal housing to accommodate Tribal growth; and, construction of permanent facilities for the Tribe's annual Pow Wow event. Figure 2-2 also shows the location of the planned Sycuan developments. The Sycuan development will become part of the District's service area, and it is assumed that all facilities will be in place and operating by 2020.

Table 2-3. Updated Wastewater Flow Projections for the Jamacha Basin

Year	District					County				Basin Total
	Permitted/ Connected	Unconnected		Sycuan	District Total	Permitted/ Connected	Unconnected		County Total	
		Vacant	Septic				Vacant	Septic		
2010	1.35	0.18	0.32	0	1.84	0.64	0	0	0.64	2.48
2015	1.41	0.18	0.32	0	1.92	0.78	0	0	0.78	2.70
2020	1.42	0.20	0.32	0.02	1.97	0.78	0.03	0	0.81	2.78
2025	1.44	0.23	0.40	0.02	2.09	0.79	0.02	0	0.81	2.91
2030	1.47	0.25	0.41	0.02	2.15	0.79	0.02	0	0.81	2.96

Most current District and County wastewater customers are in areas west of the County of San Diego Policy I-107 Urban Limit Line as shown on Figure 2-2. This line reflects a regional planning policy that has generally restricted urban development in the area to the east of the line. Discussions are currently underway regarding the future of this policy. The disposition of the policy is currently unknown.

Table 2-4 summarizes the wastewater flow projections for the District's wastewater service area only and delineates the portion of wastewater flows that are generated west and east of the County of San Diego Policy I-107 Urban Limit Line.

Table 2-4. Updated Wastewater Flow Projections for District Service Area

Year	West of I-107 Urban Limit Line			East of I-107 Urban Limit Line[2]	Total
	Permitted/ Connected (MGD)	Unconnected[1] (MGD)	Subtotal (MGD)	(MGD)	(MGD)
2010	1.23	0.23	1.46	0.38	1.84
2015	1.30	0.26	1.56	0.38	1.93
2020	1.31	0.28	1.59	0.39	1.97
2025	1.33	0.31	1.64	0.46	2.09
2030	1.35	0.33	1.68	0.47	2.15

Note:
1. Includes unconnected parcels within the District service area only.
2. Includes Sycuan flows.

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3.0 WASTEWATER COLLECTION SYSTEM ANALYSIS

This chapter summarizes the hydraulic modeling of the District's wastewater collection system for existing and projected future wastewater flow conditions. The modeling results are used to: 1) identify existing system deficiencies, develop recommendations to correct the deficiencies, 3) and determine system improvements to accommodate future growth, and 4) develop estimated improvement costs.

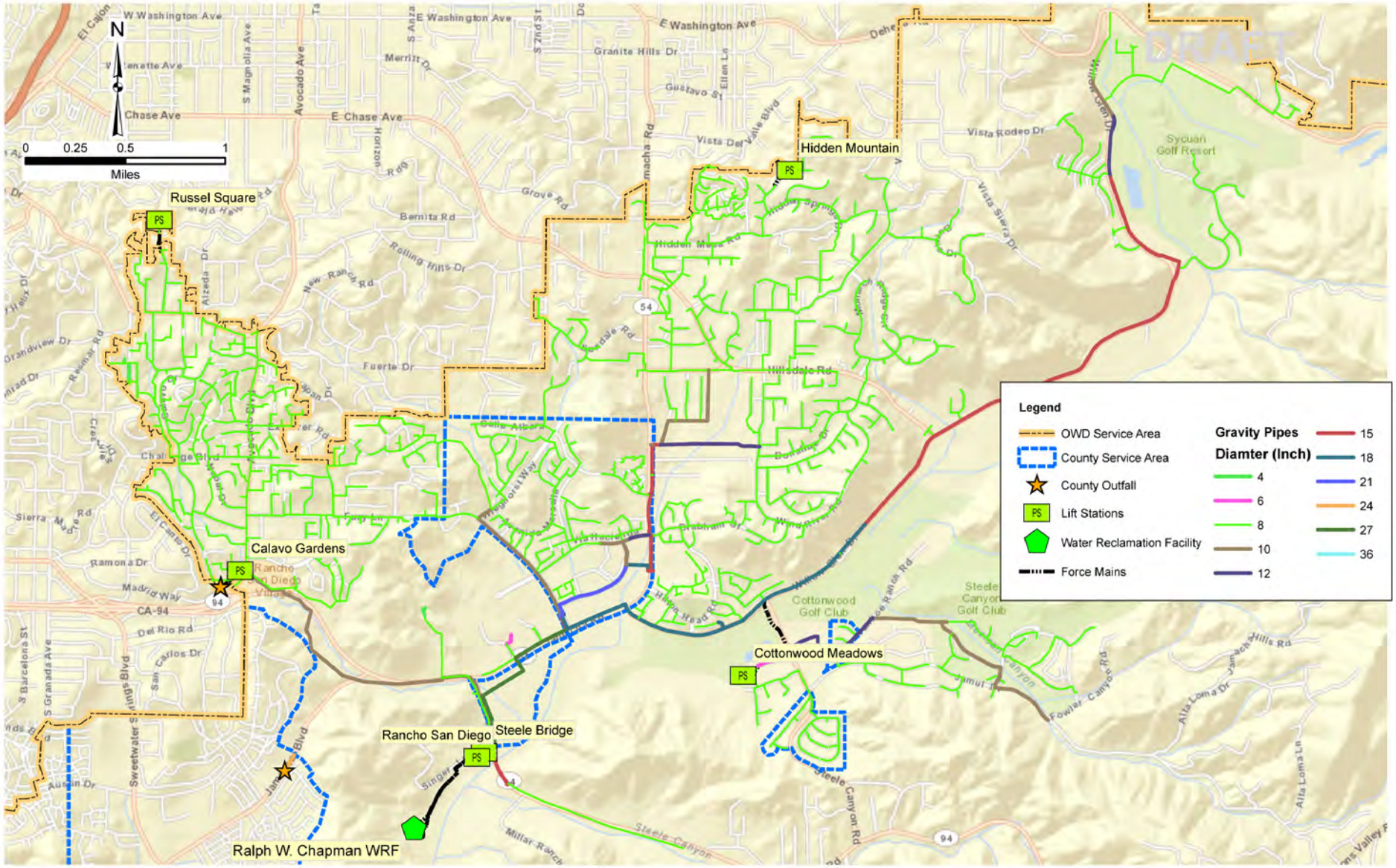
3.1 Existing Wastewater Collection System

The 16,820-acre Jamacha Basin drains to the RSDPS that is owned and operated by the County and is located on Singer Lane just off of Campo Road. The RSDPS pumps wastewater collected from the Jamacha Basin to the SVO facilities. Just upstream of the RSDPS, the District's SBPS diverts up to 1.3 MGD of wastewater to the RWCWRF. The RWCWRF treats up to 1.3 MGD of wastewater and has recently produced an average of 1.0 MGD of recycled water, and returned an average of 0.3 MGD of solids and sludge to the RSDPS. The remaining flows from the District and County service areas are pumped to the SVO, and the wastewater continues to flow to the Metro System and, ultimately, to the Point Loma WWTP for treatment and disposal.

The District's existing wastewater system that was evaluated includes the RWCWRF, pump stations, and collection system pipes. Figure 3-1 illustrates the existing wastewater collection system within the Jamacha Basin.

3.1.1 Ralph W. Chapman Water Reclamation Facility

The District owns and operates the RWCWRF. The existing capacity of the RWCWRF is 1.3 MGD, and the facility is located on a site master-planned for an ultimate build-out capacity of 3.9 MGD.



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Wastewater Management Plan

EXISTING COLLECTION SYSTEM

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FIGURE 3-1

Influent flows to the RWCWRF are conveyed through a 12-inch forcemain from the SBPS. The RWCWRF is a scalping plant, and not all flows from the District wastewater service area are conveyed to the facility. A concrete weir structure near the SBPS diverts flow to the SBPS, and the remaining flow continues to the RSDPS. The RWCWRF employs a series of physical, biological, and chemical processes for advanced treatment of wastewater to yield Title 22 reclaimed water. The plant does not have solids handling facilities. Solids are pumped back to the RSDPS, which, in turn, pumps the wastewater to the SVO.

3.1.2 Pump Stations

The wastewater system has 6 pump stations, as shown on Figure 3-1. Information on the pump station equipment was originally obtained from the District's existing wastewater system hydraulic model (described in Section 3.2) and updated based on information provided by District staff. Table 3-1 summarizes the characteristics of the wastewater pump stations.

Table 3-1. Summary of Wastewater Pump Stations

Pump Station	Number of Pumps	Total Design Capacity (gpm)	Firm Capacity (gpm)	Year Built or Last Refurbished	Wet Well			
					Cross Section	Invert Elevation (feet)	Depth (feet)	Diameter (feet)
Calavo	2	700*	350*	2008	Circular	504.15	20.13	9
Cottonwood	2	510	510	1996	Circular	323	22	8
Hidden Mountain	2	100*	100*	1978	Circular	701.15	14.85	5
Russell Square	2	20*	20*	1984	Circular	783	10	5
Steel Bridge (SBPS)	2	2,400*	1,200*	2008	Circular	299.4	9	9.292
Rancho San Diego (RSDPS)	3	4,500*	3,500*	--	Variable	295.3	19.7	Variable

* Information in the hydraulic model was updated based on information provided by the District.

The Cottonwood, Hidden Mountain and Russell Square Pump Stations convey wastewater from within the collection system, where conveyance via gravity is not feasible due to topography. The Calavo Pump Station does not operate continuously and is used to divert flow from the Calavo drainage basin to the SVO facilities when the RWCWRF is not operating at full capacity or is offline. The SBPS pumps the diverted

flow from the weir structure to the RWCWRF, and the RSDPS pumps the remaining flow from the weir structure to the Spring Valley outfall facilities.

The pump station wet well characteristics derived from the District's existing hydraulic model are also summarized in Table 3-1.

3.1.3 Collection System Pipes

The wastewater system includes approximately 95 miles of collection system pipelines, of which 92 miles are gravity sewers and 3 miles are force mains. The District owns approximately 78 miles of the gravity sewers, and the rest is owned by the County, as shown previously on Figure 2-1.

The gravity sewers range in diameter from 4 inches to 27 inches, with the vast majority (84 percent) of the collection system being comprised of 8-inch diameter pipes. The force mains range in diameter from 4 inches to 24 inches. The 4-inch and 6-inch force mains are associated with the Hidden Mountain, Russell Square and Cottonwood stations, while the 12-inch and 24-inch force mains are associated with the SBPS and RSDPS, respectively.

Table 3-2 provides a summary of the collection system pipelines based on the diameters and type of pipe.

Table 3-2. Summary of Collection System Pipes

Diameter (Inch)	Gravity Sewers		Force Mains	
	Length (feet)	% of Total	Length (feet)	% of Total
4	811	0.2	1,568	9.3
6	835	0.2	3,773	22.3
8	410,955	84.4	--	--
10	25,870	5.3	--	--
12	8,190	1.7	3,400	20.1
15	21,646	4.4	--	--
18	10,226	2.1	--	--
21	2,678	0.5	--	--
24	603	0.1	8,188	48.3
27	5,303	1.1	--	--
Total	487,117	100	16,929	100

3.2 Wastewater System Hydraulic Model

The District provided its existing wastewater system hydraulic model and supporting planning documentation for use in this Wastewater Management Plan. The details of the model development, model calibration, and planning analysis are documented in the 2006 *Sewer Model Calibration, Capacity Analysis, and System Assessment* (2006 Study), which was a part of the District's Sewer System Management Plan (SSMP, completed in 2009).

3.2.1 Model Software and Modeled System

The District's wastewater system hydraulic model was developed in H2OMAP Sewer, Version 7.0 software. The model is an all-pipes model. The entire infrastructure described in the previous section has been included in the model. The RWCWRF is modeled as an outfall, and the return solids line from the RWCWRF to the RSDPS is not included in the model. The concrete diversion structure splitting flow between the SBPS and the RSDPS is modeled as a manhole.

H2OMAP Sewer can run both steady state and extended period analyses. The District's hydraulic model was calibrated under extended period analysis for the dry weather flow condition, and steady state analysis was performed using the peaking factor methodology for the peak flow condition.

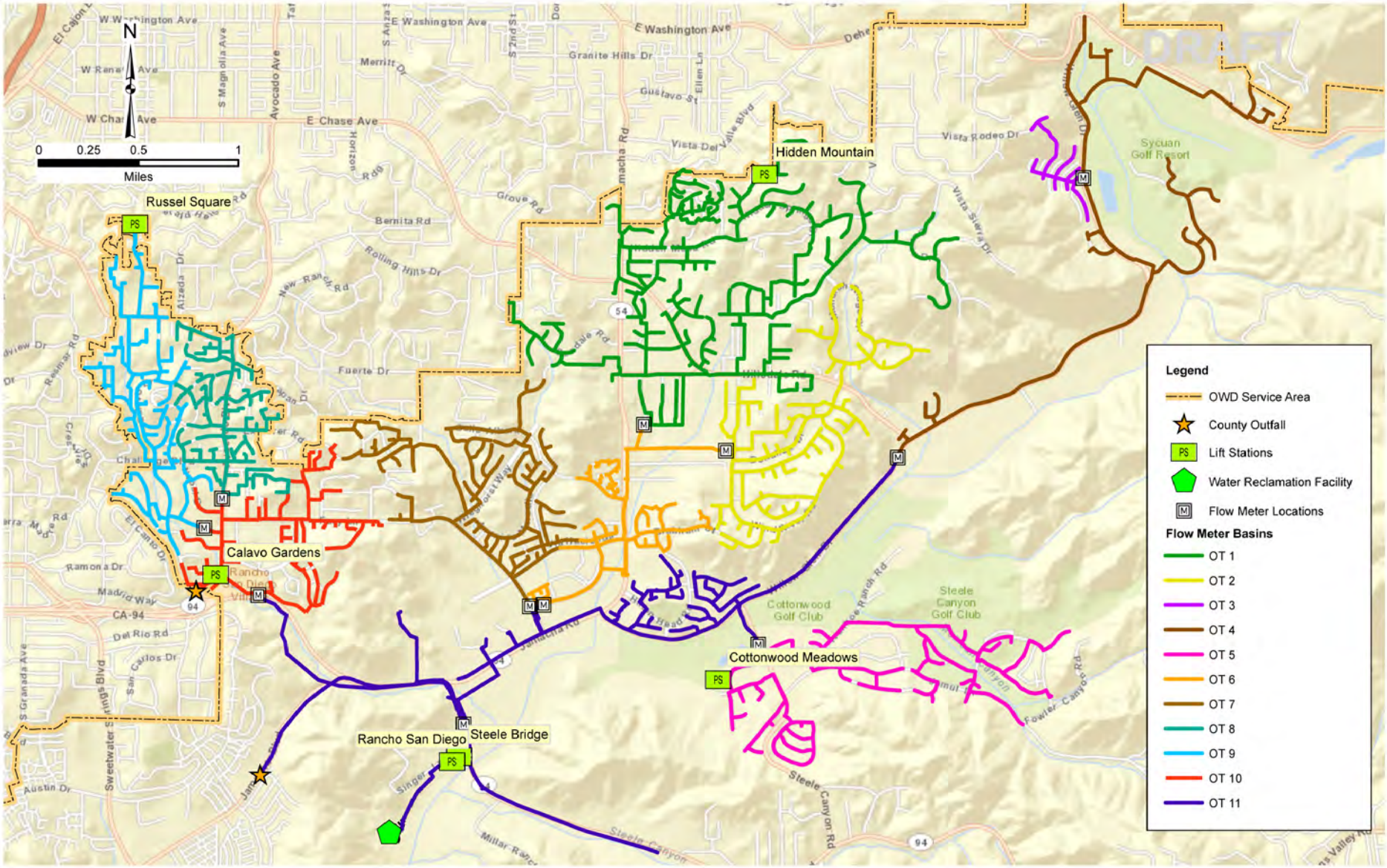
The average daily flow in the model's "existing system scenario" is 2.1 MGD (the last model runs were completed in 2006). Of this total flow, 1.9 MGD came from residential sources, and 0.2 MGD came from commercial sources. Separate diurnal patterns were assigned to each load type – residential and commercial.

3.2.2 Model Calibration

The District last calibrated the hydraulic model in 2006 based on data collected from 11 open channel flow meters in 2005. The flow monitoring was performed between January 25, 2005 and March 25, 2005. The model was calibrated for flow on February 8th and February 9th, 2005, which was the driest 2-day period during these two months. Figure 3-2 shows the meter locations and the associated upstream pipes associated with the monitored basins. After model calibration, the collection system was modeled using the peaking factor method. The peaking factors used in the 2006 Study were applied to the updated wastewater flow projections to determine updated peak flow loading conditions. Table 3-3 summarizes the peaking factors developed and used in the 2006 Study. The peak wet weather to average dry weather factor (last column in Table 3-3) was applied to the updated wastewater loadings for each monitored basin.

Table 3-3: Peaking Factors

Flow Meter Basin	Peak Dry Weather to Average Dry Weather Factor	Peak Wet Weather to Peak Dry Weather Factor	Peak Wet Weather to Average Dry Weather Factor
OT01	1.36	1.70	2.32
OT02	1.78	1.60	2.85
OT03	2.85	1.40	3.98
OT04	1.46	1.50	2.19
OT05	1.53	2.70	4.13
OT06	2.84	1.70	4.82
OT07	1.89	1.60	3.02
OT08	1.95	2.10	4.10
OT09	2.13	3.00	6.38
OT10	1.67	2.50	4.16
OT11	1.40	1.80	2.53



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Wastewater Management Plan

FLOW METER BASINS

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FIGURE 3-2

3.2.3 Assessment of Existing Hydraulic Model

A cursory review was conducted on the District's existing hydraulic model to determine functionality and suitability for use in the Wastewater Management Plan. The model was found to be complete and suitable for master planning purposes. However, the following minor limitations should be considered in the next major update of the model (addressing the limitations was not within the scope of services for this Wastewater Management Plan).

The model was last calibrated in 2006. Typically, a hydraulic model is calibrated every 5 years, since during this time period new development (or population decline) within the system can cause changes in the system flows, and, as the existing pipes age, rainfall derived infiltration and inflow (RDII) responses may change. The model should also be calibrated when changes are made to the modeled systems. For example, the pump station modifications previously presented in Section 3.1.2 and other model updates described later in Section 3.2.5 could significantly affect model calibration.

The calibration was also performed using a peaking factor methodology. The peaking factor methodology entails the application of a factor to convert average dry weather flow into peak wet weather flow. This methodology does not provide any information on the type of storm which causes the peak flows. This does not mean that the methodology is flawed, just that the model will only predict the exceedance in the infrastructure and not the frequency of exceedance.

The District should consider calibrating the model using predictive hydrologic methods in the next model update. In terms of versatility and range of applications, it far exceeds the capabilities of the peaking factor methodology. The hydrologic method uses traditional surface hydrology methods to mimic the RDII response and provides a flexible model capable of representing the desired wide range of wet weather conditions. The hydrologic method will predict not only the peak flow but the entire RDII hydrograph. It also allows for a calibrated model to be used as a planning tool by applying a storm that was not part of the calibration period (either a synthetic design storm or an actual historic storm event of record) to the system for planning level evaluation and for conceptual sizing of improvements. This could be important since the District could develop an understanding of the level of control that system improvements might provide (e.g., the frequency, typically in terms of a design storm, beyond which capacity could be exceeded or during which proposed facilities will be expected to perform).

3.2.4 Model Use in the Wastewater Management Plan

The District's existing hydraulic model, with the minor updates to the modeled system, was utilized similar to the modeling last conducted in 2006. The model was further updated with current base wastewater loads from updated wastewater flow projections. Updated wastewater flow projections were described and presented in Chapter 2. Peak flows were determined by applying the previously determined peaking factors to the projected dry weather flows. As indicated in Chapter 2.0, most current District and County wastewater customers are in areas west of the I-107 Urban Limit Line. Since the disposition of the policy behind the line is currently unknown, the wastewater system evaluations focus only on the existing system, and projected wastewater flows are added at the closest model node (manhole) within the specific wastewater drainage basin to assess impacts to the existing system due to future flows.

3.2.5 Hydraulic Model Updates

In addition to the updates made to the pump stations noted in Table 3-1 previously, the model was reviewed and compared to recent information to determine if any additional model elements needed to be updated. There were some locations where the attribute information stored within the modeling database appeared to be incorrect. These were limited to mostly invert elevations that caused significant adversely sloped sewer pipelines that often resulted in surcharged condition in the immediate upstream sewers. The attribute information was corrected, as summarized below in Table 3-4.

Table 3-4. Hydraulic Model Invert Elevation Updates

Model Link ID	Pipe Diameter (Inch)	Location	Comments
SM1369	8	Sundale Road	Upstream Invert Changed
SM1034	10	Near Jamacha Road and Hillsdale Road	Upstream Invert Changed
SM1524	12	Near Lasven Ct and Ivanhoe Ranch Road	Upstream Invert Changed
SM1525	12	Near Lasven Ct and Ivanhoe Ranch Road	Upstream Invert Changed
SM1566	8	Near Stonefield Dr and Tamara Ct	Upstream Invert Changed
SM1720	8	Near Cuyamaca College Dr and Jamacha Rd	Upstream Invert Changed

A comparison was also made of the District's modeled system and a modeled system database obtained from San Diego County, which is currently conducting a wastewater master planning effort for its service area, which includes the Jamacha Basin. Several

differences were noted and provided to the District, which had the differences field verified. After field verification, the updates noted in Table 3-5 were made to the hydraulic model.

Table 3-5. Hydraulic Model Pipe Size Updates

Location	Pipe Size in District Model (inch)	Pipe Size in County Model (inch)	Update Made	Length (feet)
Vista Rodeo Dr	10	8	10-inch to 8-inch	278
Pine Glen Ln	15	8	15-inch to 8-inch	1,062
Willow Glen Ln	15	8	15-inch to 8-inch	227
Rancho San Diego	15	21	15-inch to 21-inch	346
Brabham St	8	10	8-inch to 10-inch	400

Lastly, several capital improvement program (CIP) projects have been completed since 2005 or are in progress. These CIP projects listed in Table 3-6 below were added to the model and were modeled as existing system elements.

Table 3-6. CIP Projects Added to the Hydraulic Model

Location	Update Made	Length (feet)	Source
Avacado Blvd	New 15-inch PVC Pipe	1,601	CIP S2019, S2020 and S2022
Hidden Mesa Rd	New 8-inch PVC Pipe	313	CIP S2019, S2020 and S2023
Louisa Dr	New 8-inch PVC Pipe	985	CIP S2019, S2020 and S2024
Calavo Dr and Challenge Blvd	New 8-inch PVC Pipe	431	CIP S2019, S2020 and S2025

3.3 Analysis of Existing System

The updated wastewater flow estimates for 2010 were used to simulate existing flow conditions within the wastewater system. The existing flows and peaking factors were used to develop updated peak loading conditions, which were then imported into the hydraulic model.

3.3.1 Evaluation Criteria

Table 3-7 summarizes the wastewater system performance criteria that the District and other surrounding jurisdictions use to size and evaluate collection systems.

Table 3-7. Wastewater System Performance Criteria

Parameter			Criteria[1]
Peaking Factor	Peak Flow	Dry Weather	Peaking Factors developed from 2006 *Sewer Model Calibration, Capacity Analysis, and System Assessment* Report[2]
		Wet Weather	
Collection[1] System Pipes	Gravity	Design Criteria	Peak Wet Weather Flow
		Manning's Coefficient	0.01 - Old Pipes 0.011 or 0.013 depending on material - New Pipes
		Minimum Velocity	<= 12 inch - 2 ft/s under peak hour flow >15 inch - 2 ft/s under peak hour flow
		Maximum Velocity	<= 12 inch - 10 ft/s under peak hour flow >15 inch - 10 ft/s under peak hour flow
		Minimum Pipe Size	8 inch
	Force Main	Design Criteria	Peak Wet Weather Flow
		Hazen Williams Coefficient	100 - Old Pipes 120 or 140 depending on material - New Pipes
		Minimum Velocity	3.5 ft/s
		Maximum Velocity	8 ft/s
Depth Ratio[1]	Peak Dry Weather	Future pipes	Design < 12 inch - 0.5 > 12 inch - 0.75
		Existing pipes	Trigger: For all sizes - 1.0[3]
	Peak Wet Weather	Future pipes	Design < 12 inch - 0.5 > 12 inch - 0.75
		Existing pipes	Trigger: For all sizes - 1.0[3]
Pump Stations[1]	Firm Capacity		Largest pump out of service
	Design Criteria		Peak Hour Flow

Notes:
1. Source: Water Agencies' Standards (WAS): Design Guidelines for Water and Sewer Facilities
2. Criteria used in District's 2006 SSMP.
3. Criteria added to assess existing pipes.

Sewer system capacity was determined based on surcharging conditions using the peak water depth to diameter ratio (d/D). For all sewer pipelines less than 12 inches in diameter, any d/D greater than 0.5 is assumed to have a capacity constraint. A d/D

ratio of 0.75 was used as a trigger for all sewers with a diameter of 12 inches or greater. Pump stations were evaluated if the firm capacity (station capacity with the largest pump out of service) was exceeded by the peak wet weather flow. Forcemain velocities were used to determine the cause of the pump station's firm capacity being exceeded. If high forcemain velocities were noted at a station whose firm capacity was exceeded, this would indicate that the capacity constraint is associated with the forcemain. If a station's firm capacity is exceeded but forcemain velocities are low, the capacity constraint is typically associated with the station's pumps being undersized.

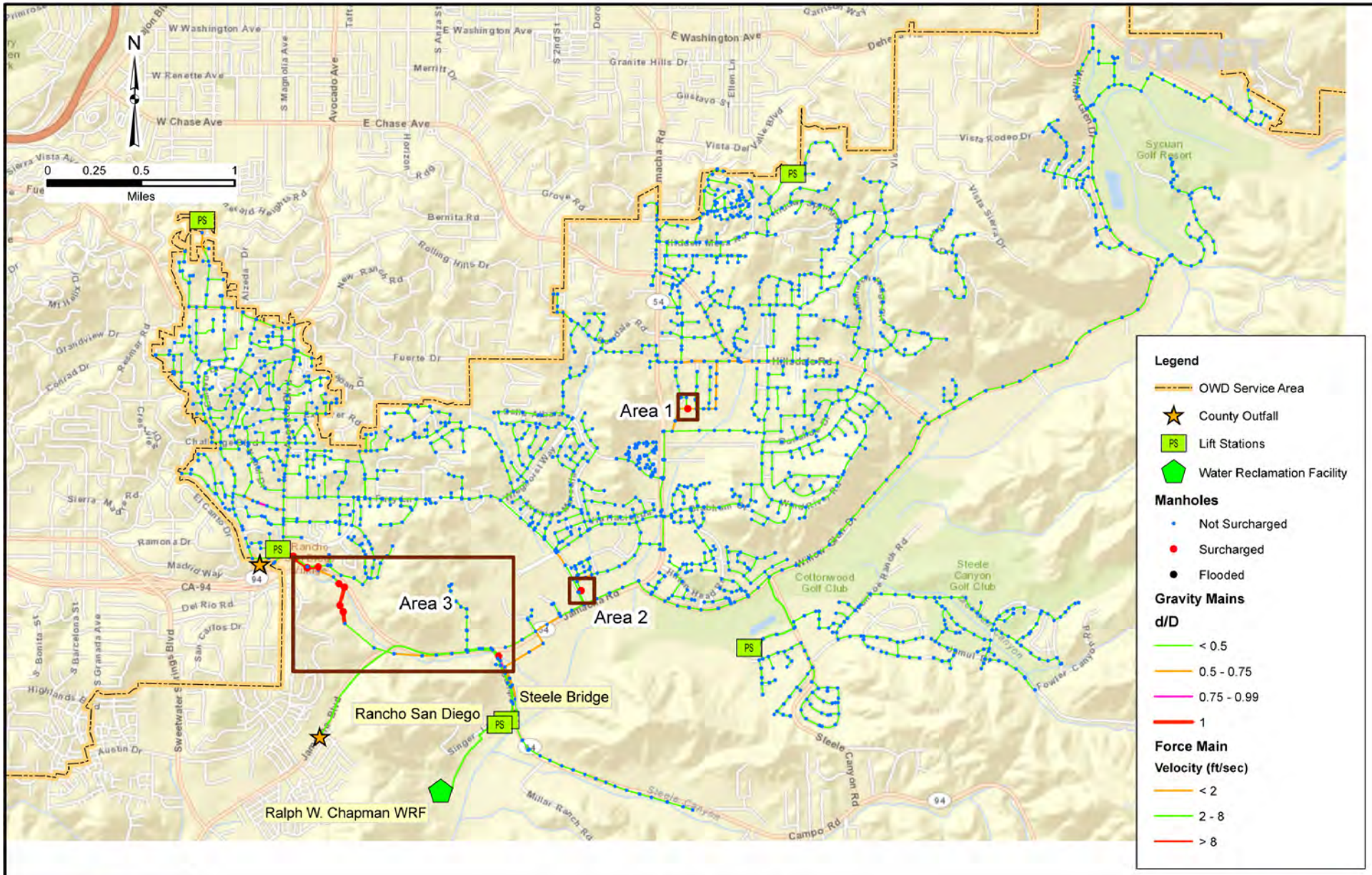
3.3.2 Existing System Assessment

To analyze the existing system, loadings from all permitted/connected parcels were assigned and imported to the hydraulic model. The existing average dry weather load of 1.98 MGD was applied to the system. Using the evaluation criteria and peaking factors described above, the existing collection was assessed to determine capacity deficiencies during the peak wet weather loading conditions.

Figure 3-3 shows the results of the system assessment. Overall, the system performed quite well under the peak loading conditions. None of the pump stations had capacity concerns. There were some areas, however, where the system performance exceeded the evaluation criteria for gravity sewers as summarized on Table 3-8.

Table 3-8. Existing System Deficiencies

Name	Location	Criteria Violated
Area 1	Near Fury Ln and Jamacha Rd	Manhole surcharging and d/D > 0.75
Area 2	Near Hillsdale Rd and Jamacha Rd	Manhole surcharging and d/D > 0.75
Area 3	Along Campo Road from Avocado Rd to Singer Lane	Manhole surcharging and d/D > 0.75



OTAY WATER DISTRICT

Wastewater Management Plan

EXISTING SYSTEM ASSESSMENT

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FIGURE 3-3

3.3.3 Existing System Improvements

Each of the areas described above was reviewed to identify improvements to address system deficiencies. The water level in manholes and depth to diameter ratios in pipes were studied to assess if the criteria were only moderately violated, or if there was a significant violation. If a manhole was flooded or the sewer was completely surcharged (d/D > 1), then an improvement would be recommended. Areas that violated the evaluation criteria, but had a d/D ratio less than 1, were considered not to be as critical for improvements. It is recommended that the District observe these areas during high flow conditions to verify if unacceptable surcharging does occur.

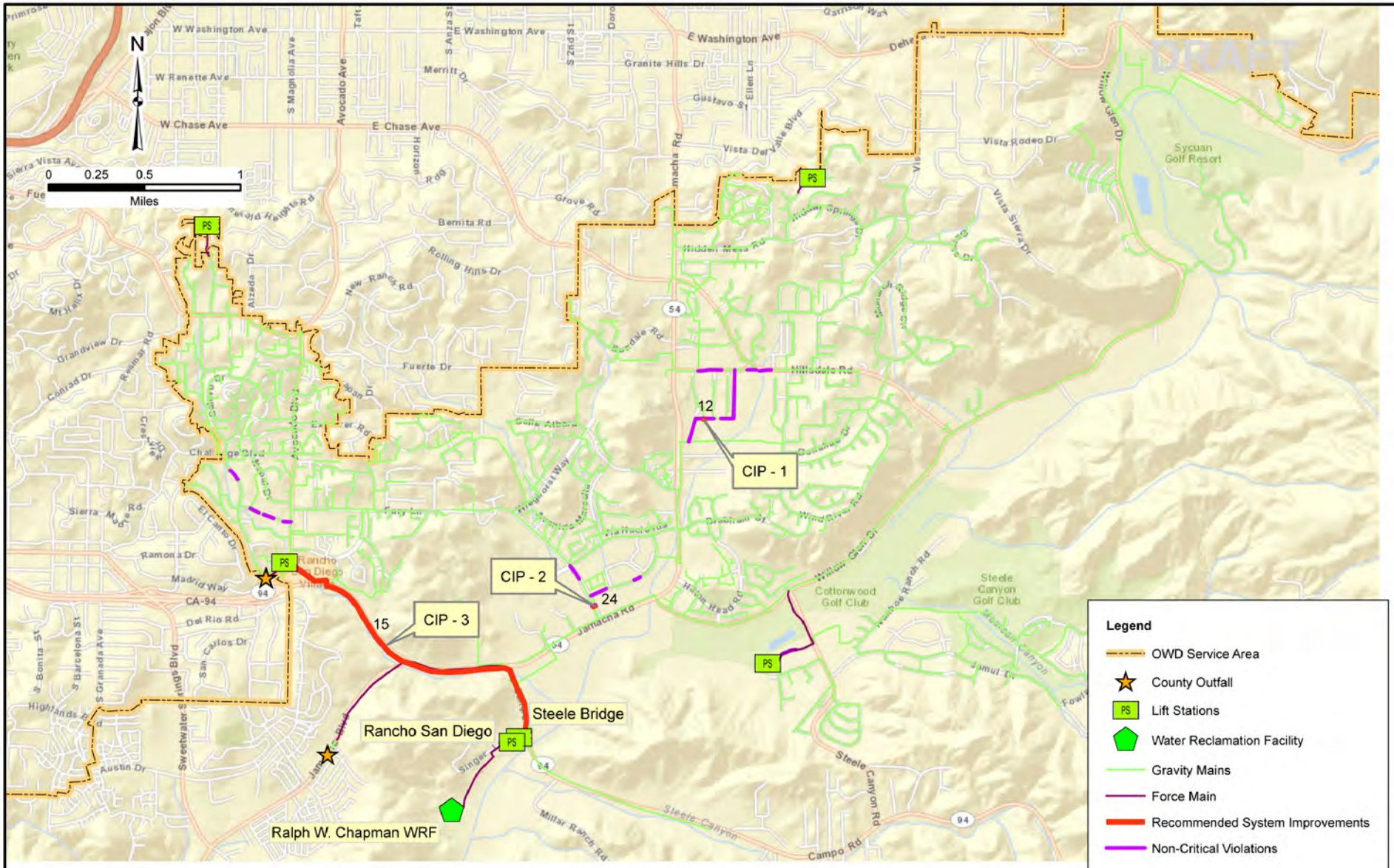
Based on the hydraulic modeling analysis, the recommended existing system improvements are listed on Table 3-9 and shown on Figure 3-4. The areas that the District should observe for unacceptable surcharging are also shown on Figure 3-4. It should be noted that one of the improvements along Campo Road (Area 3) was specifically requested by the District to convert a forcemain (currently operated as a gravity sewer) to a traditional gravity sewer.

Table 3-9. Recommended Existing System Improvements

Area	CIP	Existing Pipe Size (inch)	Recommendation	New Pipe Size (inch)	Length (feet)	Slope
Area 1	#1	10	Replacement Pipe	12	36	0.002
Area 2	#2	15	Replacement Pipe	24	91	0.002
Area 3	#3	10	Replacement Pipe	15	9225	0.032

3.4 Analysis of Future Conditions

The updated wastewater flow projections and peaking factors were used to develop future peak loading conditions, which were then imported into the hydraulic model to assess future system conditions.



OTAY WATER DISTRICT

Wastewater Management Plan

EXISTING SYSTEM IMPROVEMENTS

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FIGURE 3-4

3.4.1 Future System Assessment

Initially, the flow projections for 2030 were modeled to determine future system improvements. The hydraulic network, including the improvements recommended in Section 3.3, was used as a basis for assessing how the system will perform for the projected 2030 loading conditions. The average 2030 wastewater loading from the entire service area (2.94 MGD) was applied to the system along with the peaking factors to assess the system under peak wet weather conditions. The future loading of 0.02 MGD from the Sycuan reservation was allocated at the upstream-most manhole on Dehesa Road. The total average wastewater loading for this scenario was therefore, 2.96 MGD. The same system performance criteria that were used for the existing system assessment were used for the future system assessment.

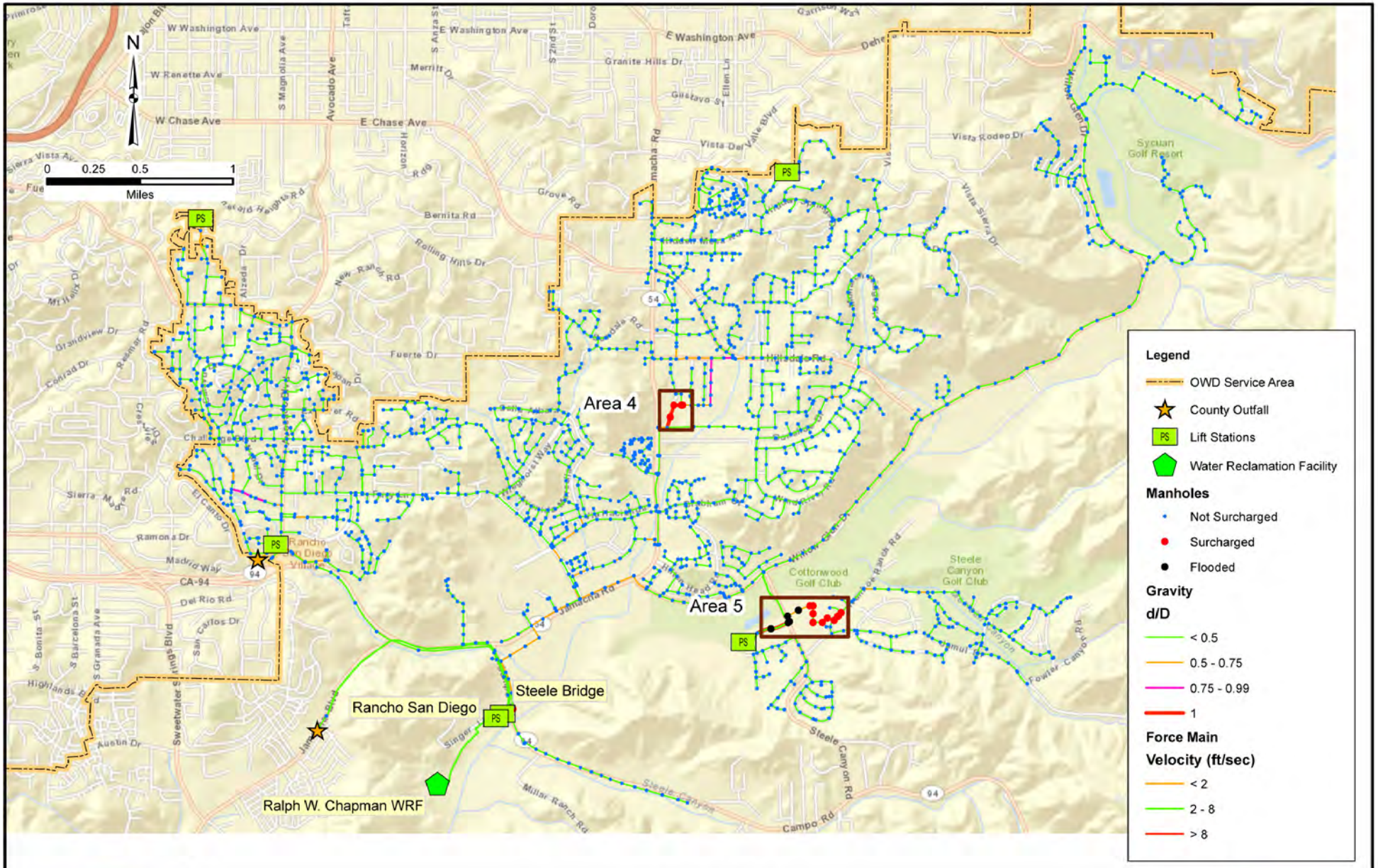
Figure 3-5 shows the results of the future system assessment. Table 3-10 summarizes the areas where violations of the system performance criteria were noted.

Table 3-10. Future System Deficiencies

Name	Location	Criteria Violated
Area 4	Near Fury Ln and Jamacha Rd	Manhole surcharging and d/D > 1.0
Area 5	Along Ivanhoe Ranch Rd upstream of Cottonwood Pump Station	Manhole flooding and d/D > 1.0

3.4.2 Future System Improvements

Each of the areas described above was reviewed to recommend improvements to address system deficiencies. Similar to the existing system improvements, areas where the d/D ratios were greater than 1.0 and observed flooded manholes were given priority for improvements. None of the pump stations had capacity concerns under 2030 loading conditions. Table 3-11 summarizes the resulting system improvements recommended for the 2030 flow conditions, the improvements are also shown on Figure 3-6. Figure 3-6 also shows areas that the District should observe for any future unacceptable surcharging conditions.



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Wastewater Management Plan

FUTURE SYSTEM ASSESSMENT

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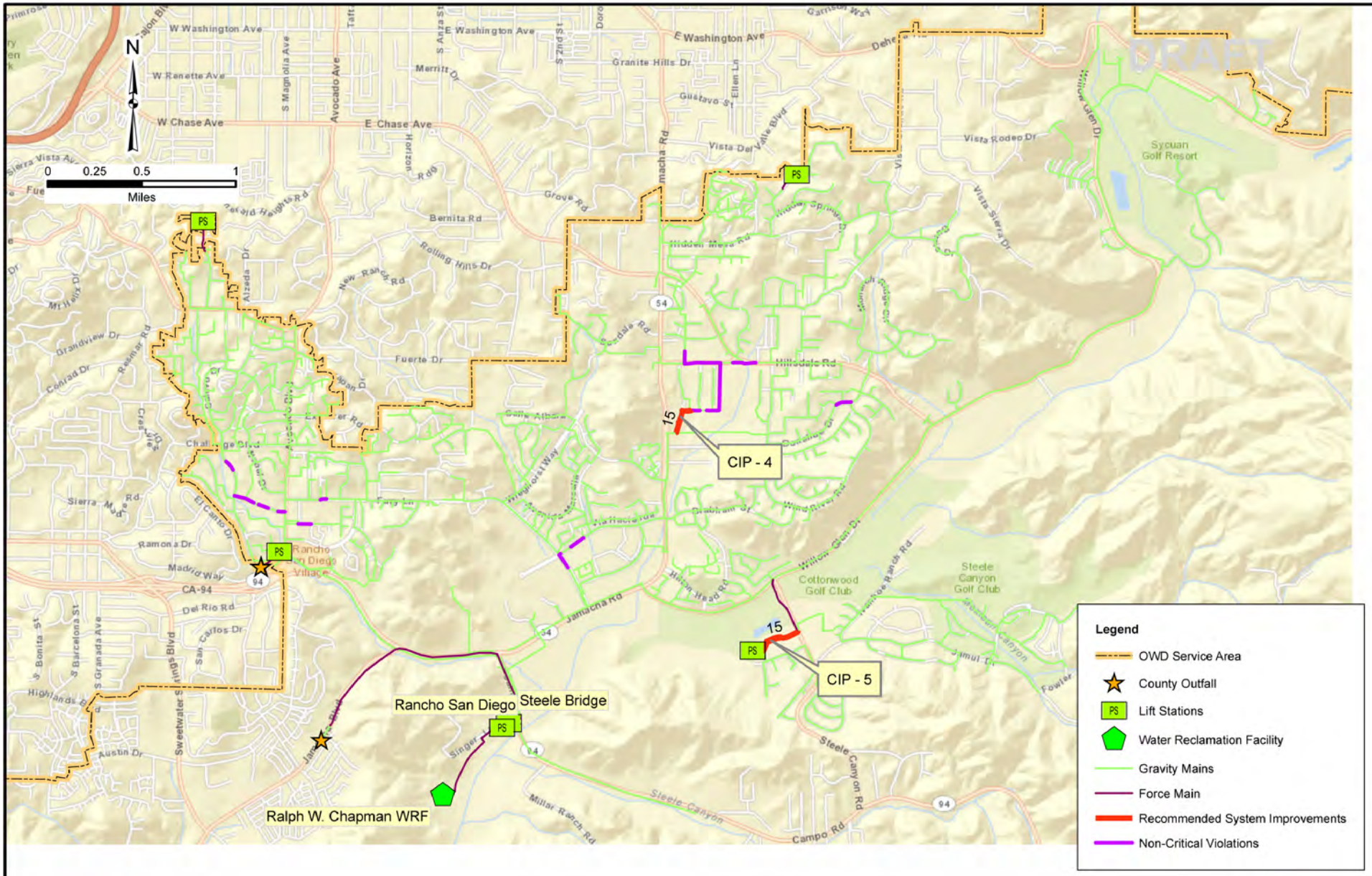
FIGURE 3-5



OTAY WATER DISTRICT

Wastewater Management Plan

FUTURE SYSTEM IMPROVEMENTS

October 2012

FIGURE 3-6

Table 3-11. Recommended System Improvements for 2030 Flow Conditions

Area	CIP	Existing Pipe Size (inch)	Recommendation	New Pipe Size (inch)	Length (feet)	Slope
Area 4	#4	10	Replacement Pipe	15	900	0.004
Area 5	#5	8	Replacement Pipe	15	1235	0.004 - 0.015

3.5 Summary of Recommended System Improvements & Conceptual Cost Opinions

Conceptual capital cost opinions were developed for the recommended system improvements described in the previous sections. The cost opinions are based on available recent projects with similar components, manufacturer's budget estimates, standard construction cost estimating manuals, and engineering judgment. The level of accuracy for the cost estimates corresponds to the Class 4 estimate as defined by the Association for the Advancement of Cost Engineering (AACE) International. This level of engineering cost estimating is approximate and generally made without detailed engineering data and site layouts, but is appropriate for preliminary budget-level estimating. The accuracy range of a Class 4 estimate is minus 15 percent to plus 20 percent in the best case and minus 30 percent to plus 50 percent in the worst case.

All cost opinions also include a 30 percent factor for engineering and construction administration, 10 percent for Contractor bonding and insurance, and 30 percent for project contingencies. All costs are in January 2012 dollars referenced to an Engineering News Record Construction Cost Index (ENR CCI) of 9,176.

Table 3-12 summarizes the schedule and capital cost opinions for the recommended system improvements. The estimated total capital cost for the recommended infrastructure to correct existing deficiencies is $8.53 million. To accommodate 2030 wastewater flows, the additional capital cost is approximately $2.72 million.

Table 3-12. Summary of Recommended System Improvements

Project No.	Description		Location	Unit Cost ($/LF)[1]	Conceptual Cost Opinion ($)	
					Existing	2030
Collection System Pipes						
CIP #1	12-inch	36 LF	Near Fury Ln and Jamacha Rd	1,020	$37,000	--
CIP #2	24-inch	91 LF	Near Hillsdale Rd and Jamacha Rd	2,040	$190,000	--
CIP #3	15-inch	9,225 LF	Along Campo Road from Avocado Rd to Singer Lane	900	$8,300,000	--
CIP #4	15-inch	900 LF	Near Jamacha Rd and Donahue Dr	1,275	--	$1,150,000
CIP #5	15-inch	1,235 LF	Along Ivanhoe Ranch Rd U?S of Cottonwood Pump Station	1,275	--	$1,570,000
Total					**$8,527,000**	**$2,720,000**

Note:
1. January 2012 Costs (ENR CCI = 9176). Includes 30% for engineering and administration, 10% for contractor bonding and insurance, and 30% for project contingencies.

4.0 RECYCLED WATER SUPPLY ANALYSIS

For over 30 years, the District's Board has pursued a recycled water program based on the fundamental belief that, by developing and utilizing recycled water, the need for imported water use within the District can be reduced. Section 26 of the District's Code of Ordinances states that "reclaimed water shall be used within the jurisdiction wherever its use is financially and technically feasible, and consistent with legal requirements, preservation of public health, safety and welfare, and the environment." This policy provides the District the opportunity to plan, fund, and construct facilities to meet projected recycled water market demands. The uncertainty of water supply in San Diego County and the recent drought conditions make recycled water a viable and critical reliable supply to meet future growth needs. This chapter presents an analysis of projected recycled water demands and recycled water supplies.

4.1 Recycled Water Distribution Facilities

The District operates and maintains over 77 miles of recycled water transmission and distribution pipelines, pump stations, and reservoirs and currently serves recycled water customers primarily within its Central Area System, south of the Sweetwater Reservoir and west of the Otay Lakes Reservoirs.

The District's Central Area continues to grow and is characterized by large master-planned developments. The District will continue to require developers to connect to the recycled water system to serve irrigation demands. Otay Mesa is also a growing part of the District with significant planned industrial development. Anticipating that a recycled water supply will become available, developers in Otay Mesa have also been constructing dual distribution pipelines for over twenty years. The District will continue to construct reservoirs, pump stations, and transmission mains that will incorporate these distribution pipelines into a complete delivery system.

4.2 Existing Recycled Water Supplies

The District currently has two sources of recycled water supply: recycled water produced locally at the RWCWRF and, through an agreement with the City of San Diego, recycled water produced at the City of San Diego's SBWRP.

4.2.1 Recycled Water from the RWCWRF

The RWCWRF was originally constructed in 1979 and was upgraded in 1990 to its current rated design capacity of 1.3 MGD. At the design flow, the RWCWRF has recently produced an average of 1.0 MGD of recycled water. However, on a peak demand day, the RWCWRF has been operated to produce a supply of 1.2 MGD. In 2011, the RWCWRF provided a recycled water supply of 1,077 acre-feet (AF) to the District.

The RWCWRF provides tertiary treatment that meets the State of California's Title 22 requirements for reuse. The recycled water is pumped to two lined and covered reservoirs 3.4 miles south of the RWCWRF. The recycled water pump station at the RWCWRF consists of 5 pumps with a total capacity of 3,500 gpm (5 MGD) and a firm capacity (with the largest pump out of service) of 2,600 gpm (3.7 MGD). The 14-inch diameter force main to the reservoirs serves as a vessel to fulfill the Title 22 requirement of 450 milligram-minutes per liter of chlorine contact time before the recycled water can be used.

4.2.2 Recycled Water from the SBWRP

In order to serve existing demand for recycled water without supplementing with potable water, the District entered into an agreement to purchase recycled water from the City of San Diego's SBWRP in October, 2003. The SBWRP has a rated capacity of 15 MGD and is located at Monument and Dairy Mart Roads near the international border with Mexico. The SBWRP receives wastewater from a pump station that scalps flow from the Metro System interceptor that conveys flow northward to the Point Loma WWTP for treatment and ocean outfall disposal. The agreement entitles the District to purchase up to a maximum amount of 6 MGD of recycled water at any time. The term of the agreement is 20 years from January 1, 2007. The agreement establishes annual contract amounts that the District must pay for, even if it cannot take all the recycled water. In 2011, the District purchased 2,803 AF of recycled water from the SBWRP compared to that year's annual required take amount of 4,044 AF. The District pays a commodity rate of $350 per AF for the recycled water supply. The commodity rate is subject to escalation at the same rate adopted by the City Council for its other reclaimed water customers. In 2011, the commodity rate remained at $350 per AF.

The agreement stipulates that the City will meet all applicable federal, state and local health and water quality requirements for recycled water produced at the SBWRP to

the point of delivery. Also, as part of the agreement, in 2007 the District completed construction of a 30-inch transmission main to deliver the recycled water from the point of delivery to the District service area. The City retains 1 MGD of capacity in this transmission pipeline that runs through the City's system. The recycled water pump station at the SBWRP has two 3,500 gpm pumps with a total capacity of 7,000 gpm (10 MGD).

The actual availability of recycled water from the SBWRP has recently been about 5.3 MGD due to wastewater availability, other large demands taking priority, etc. The District and other water agencies are pushing the City of San Diego to complete projects that will direct more wastewater flows to the SBWRP and increase supply reliability. The City has a new capital improvement program that will start addressing these issues over the next couple of years. Thus, the supply from the SBWRP will be about 5.3 MGD until 2015 whereby it will increase to the agreement's 6 MGD.

4.3 Existing and Projected Recycled Water Usage

The District currently provides recycled water service to 684 customers who used approximately 3,880 AF of recycled water in 2011. Current recycled water uses include commercial landscape irrigation, golf course irrigation, and irrigation of public areas such as parks, streetscapes, schools, highway medians, and open space areas. The Olympic Training Center facility in Chula Vista also uses recycled water to irrigate practice fields and common areas.

The District is committed to expanding the recycled water system in order to further reduce future dependence on imported water. Areas with the greatest potential for expansion include the existing Central and Otay Mesa areas, discussed previously, and the North District area. The District plans to maximize the use of recycled water in these areas by converting large potable irrigation users to recycled water and continuing to require new developments within the District to use recycled water, wherever feasible. The District estimated future recycled water demands based on known sub-area master plan and general plan land uses and applying irrigated area percentages and recycled water irrigation duty factors. Table 4-1 provides a summary of the District's actual 2010 recycled water usage and projected recycled water demands through 2035.

Table 4-1. Projected Recycled Water Demands[1]

	Year					
	2010	2015	2020	2025	2030	2035
Demand (AFY)[2]	4,074	4,400	5,000	5,800	6,800	8,000

Notes:
1. Source, Otay Water District 2010 Urban Water Management Plan (adopted June 1, 2011).
2. Acre-feet per year (AFY)

4.4 Comparison of Recycled Water Demands and Existing Supplies

The current effective capacity of the RWCWRF is 1.0 MGD, or 1,120 AFY. The maximum supply from the SBWRP is currently 5.3 MGD (5,940 AFY) and will increase to 6 MGD, or 6,720 AFY in 2015. Thus, the two existing recycled supply sources could provide up to 7,060 AFY currently and up to 7,840 AFY after 2015. These supplies could meet the projected annual average demand through 2030. However, because the supply from the SBWRP is limited to the agreement amounts at any time, there may be supply deficits on a monthly basis and almost certainly on peak demand days. Table 4-2 provides a summary of projected monthly recycled water demands based on historical District seasonal and peak recycled water demand patterns reported in the Otay Water District Water Resources Master Plan Update (revised November 2010). The existing combined monthly recycled water supply from the RWCWRF and the SBWRP is 588 AF (7,060 AF/12 months). This amount will increase to 653 AF (7,840 AF / 12 months) after 2015. Thus, on a monthly basis, the District will begin seeing deficits by 2020 during the peak demand months. The peak month deficits are projected to grow from approximately 670 AF in 2020 during the two peak demand months, to 1,100 AF during the two peak demand months in 2035. In addition, the deficits are expected to occur for over half the year by 2035.

Table 4-2. Projected Monthly Recycled Water Demands

Month	Demand (% of Ann. Ave.)[1]	Projected Recycled Water Demand (AF)					
		2010	2015	2020	2025	2030	2035
Jan	3.50%	143	154	175	203	238	280
Feb	3.50%	143	154	175	203	238	280
Mar	2.33%	95	103	117	135	159	187
Apr	4.92%	200	216	246	285	334	393
May	7.67%	312	337	383	445	521	613
Jun	11.17%	455	491	558	648	759	893
Jul	12.00%	489	528	600	696	816	960
Aug	13.17%	536	579	658[3]	764	895	1,053
Sep	13.42%	547	590	671	778	912	1,073
Oct	10.75%	438	473	538	624	731	860
Nov	9.25%	377	407	463	537	629	740
Dec	8.33%	340	367	417	483	567	667
Ann. Ave.[2]	**100.00%**	**4,074**	**4,400**	**5,000**	**5,800**	**6,800**	**8,000**

Notes:
1. Source: 2010 Water Resources Master Plan Update (revised November 2010).
2. Source: 2010 Urban Water Management Plan (adopted June 1, 2011).
3. Highlighted numbers indicate months where demand will exceed the available supply of 668 AF.

Table 4-3 summarizes the projected peak day recycled water demand versus existing supply, based also on peak day demand usage reported in the 2010 Water Resources Master Plan Update. The District is already seeing deficits in meeting peak day recycled water demands and has had to supplement with potable water. The 2010 peak day deficit of 1.0 MGD is projected to increase to 7.3 MGD in 2035. The projected monthly and peak day recycled water supply deficits would have to be supplied from alternative sources. Potential additional recycled water supplies are discussed in the next section.

Table 4-3. Projected Peak Day Recycled Water Demands vs. Existing Supply

Demand/Supply	Projected Recycled Water Demand					
	2010	**2015**	**2020**	**2025**	**2030**	**2035**
Ann. Ave. Demand (AFY)[1]	4,074	4,400	5,000	5,800	6,800	8,000
Ann. Ave. Demand (MGD)	3.64	3.93	4.46	5.18	6.07	7.14
Peak Day Demand (MGD)[2]	7.3	7.9	8.9	10.4	12.1	14.3
RCWRF Supply (MGD)[3]	1.0	1.0	1.0	1.0	1.0	1.0
SBWRP Maximum Supply (MGD)	5.3	6.0	6.0	6.0	6.0	6.0
Total Existing Supply (MGD)	6.3	7.0	7.0	7.0	7.0	7.0
Surplus/(Deficit) (MGD)	**(1.0)**	**(0.9)**	**(1.9)**	**(3.4)**	**(5.1)**	**(7.3)**

Notes:
1. Source: 2010 Urban Water Management Plan (adopted June 1, 2011).
2. Source: 2010 Water Resources Master Plan Update (revised November 2010). Peak day to annual average demand factor = 2.0.
3. Effective treatment capacity.

4.5 Potential Additional Recycled Water Supply Options

Previous planning efforts have identified additional recycled water supplies that may be available to supplement existing and future District supplies. A brief summary of these potential sources is presented below based on details provided in the Otay Water District Integrated Water Resources Plan (March 2, 2007), the Otay Water District 2010 Urban Water Management Plan (adopted June 1, 2011), and the Otay Water District Water Resources Master Plan Update (revised November 2010). The potential additional supplies could come from the following sources:

- Expansion of the RWCWRF
- Additional purchases from the City of San Diego SBWRP
- Partnership with the City of Chula Vista on a regional WRF
- A new joint WRF with San Diego County

An additional option was identified early in the project that involved a new supply from the International Boundary and Water Commission (IBWC) South Bay International Wastewater Treatment Plant. This option would involve providing additional advanced treatment facilities at the international plant as well as multiple international treaties and agreements that would have to be implemented. It was determined that this option had too many uncertainties compared to the other options and was not included in this Wastewater Management Plan. Appendix A provides a planning level study of additional advanced treatment at the IBWC plant.

4.5.1 Expansion of the RWCWRF

This option involves an expansion of the production capacity of the RWCWRF in order to produce additional recycled water. The District indicated that this option could include expanding the RWCWRF in 1.3 MGD increments up to an ultimate capacity of 3.9 MGD. The wastewater flow projections presented in Chapter 2.0 indicated that the current wastewater flows from the District's service area are approximately 1.84 MGD, which would increase to approximately 2.15 MGD by 2030. Flow from the entire Jamacha Basin is currently approximately 2.48 MGD, including customers not currently connected to the sewer system, and is projected to increase to approximately 2.96 MGD in 2030. Thus, an expansion to 3.9 MGD would be a long-term option unless additional wastewater flows could be transferred into the Jamacha Basin. Evaluation of transferring such wastewater flows is not within the scope of this project. However, the evaluations will consider an expansion of the RWCWRF to an ultimate capacity of 3.9 MGD. The costs for transferring wastewater into the Jamacha Basin are not included in the evaluations, nor are the potential increased flow impacts on the existing wastewater collection system. There exists a cost-sharing agreement from 1998 that allocates capital and operating costs between the District and San Diego County. Allocated costs are typically based on proportionate flow discharged by the two service areas.

The total recycled water supply under the RWCWRF expansion options would be up to 2,600 AFY for an expansion to 2.6 MGD and 3,900 AFY for an expansion to 3.9 MGD, based on a 90 percent production efficiency. Any additional sewer flows beyond the RWCWRF treatment capacities would be bypassed to the Metro System facilities.

The infrastructure required for this option would include expansion of plant facilities, including addition of a dedicated chlorine contact basin to achieve the Title 22 contact time requirements before reuse that is currently provided in the 14-inch recycled water pipeline. The flow velocity in a 14-inch steel pipeline flowing at 3,500 gpm (the current capacity of the recycled water pump station) is approximately 7.5 feet per second (fps). The flow velocity at the RWCWRF capacity of 3.9 MGD (2,730 gpm) is approximately 5.5 fps. Assuming continued structural integrity of the 14-inch pipeline over an assumed pipeline life of 50 years, the range of velocities at the proposed RWCWRF expansions of 2.6 and 3.9 MGD should be acceptable operationally. New infrastructure could also include sludge treatment and disposal facilities located at the plant. The total cost for this option would include capital costs for all new infrastructure and the additional operations and maintenance (O&M) costs associated with the additional yield of recycled water supply.

4.5.2 Additional Purchases from the SBWRP

Under this option, the District could currently acquire an additional supply of up to 4 mgd (4,500 AFY) of SBWRP recycled water (for a total of 10 MGD). The City of San Diego is providing the District with transmission capacity in a 30-inch transmission system to deliver recycled water from the point of delivery to the District service area which is 4,100 feet from the SBWRP. The capacity of this transmission system to accept the additional flows would have to be verified. The District is responsible for the construction of conveyance infrastructure from the City's pipeline to the District's 450 Zone Reservoirs. The capacity of this conveyance structure to accept the additional flows would also have to be verified. No other infrastructure would be required for the additional purchase of recycled water from SBWRP. Annual purchase and operation costs would also exist, which would most likely be equivalent to costs incurred for the existing agreement on a per unit basis.

This option would require coordination with the City of San Diego to amend the current agreement allowing the additional purchases.

4.5.3 Partnership with City Of Chula Vista

This option involves a partnership whereby a new proposed WRF would be owned by the City of Chula Vista, and the District would only purchase recycled water but not be responsible for the construction or operation of the treatment plant. Recycled water from this plant would be delivered to serve the District's Central Area System recycled water demands.

The City of Chula Vista and the District completed a study in 2012 (Acquisition of Additional Wastewater Capacity Project, Final Report, April 2012) that, in addition to comparing the purchase of additional wastewater treatment capacity in the Metro System for Chula Vista purposes, investigated the potential partnership to provide an additional supply of Title 22 recycled water to the District. The City of San Diego received its third modified permit, or waiver, for the Point Loma WWTP in June 2010 from the California Coastal Commission for meeting federal standards for secondary treatment of sewage, extending the permit for ocean disposal of advanced primary treated wastewater until 2015. The permit will be reevaluated in 2015 by the Coastal Commission, and it is uncertain whether an upgrade to secondary treatment will be required at that time. The costs of purchasing capacity in the Metro System will substantially increase should an upgrade to full secondary treatment at the Point Loma WWTP be required.

The basic concepts for the potential District/Chula Vista partnership included the following:

- The majority of recycled water produced by the Chula Vista plant can be used by the District; however, the District would have to make the Chula Vista recycled water a second priority behind RWCWRF recycled water and before recycled water purchased from the SBWRP. It is anticipated that the District could take most of the recycled water produced during the peak summer demand months but would take essentially no water during low demand months. Thus, Chula Vista would have to make arrangements for disposal of unused recycled water, most likely through an agreement with the IBWC, to use their ocean outfall for the South Bay International Wastewater Treatment Plant.
- The RWCWRF would continue to produce recycled water at current levels a minimum of 8 months of the year for the duration of the study period (i.e., no expansions).
- Recycled water would be sold to the District at a rate of $350 per AF.
- The Chula Vista plant would be built in three phases of 2 MGD increments: 2 MGD, 4 MGD, and 6 MGD to match Chula Vista population and growth.
- The plant would utilize modern technologies, such as a membrane bioreactor (MBR), to provide a high level of treatment efficiency on a small site.
- The preferred site for the MBR plant is near the Salt Creek Interceptor between I-805 and I-5 in the southwestern portion of the District's water service area, about 3 miles north of the SBWRP.

Infrastructure required for this option would include a pump station and a transmission pipeline to convey recycled water from the Chula Vista plant to the District's Central Area System. This option would also require coordination with the City of Chula Vista, the City of San Diego, and the County of San Diego.

The decision to build a new regional plant versus continuing to discharge wastewater to the Metro System will depend on whether the Metro System Point Loma WWTP will need to be upgraded to secondary treatment, a decision that will be reevaluated in 2015. Chula Vista anticipates needing additional wastewater treatment capacity within the next 14 to 19 years, but with the looming Point Loma WWTP decision and with permitting, design and construction anticipated to take 5 to 10 years, the City will have to make a decision regarding project implementation soon.

4.5.4 Joint WRF with San Diego County

The District and County have conducted previous studies related to joint water reclamation facilities (Metcalf & Eddy, 1997). The efforts have identified a preferred location near the I-805 and the Sweetwater River. This location is downstream of the RWCWRF, which would allow collection of additional wastewater flows. The proposed capacity of the joint District/County facility is 10 MGD. There are many uncertainties and concerns associated with the preferred location, such as the ability to obtain a discharge permit to the Sweetwater River. This option has not been studied further, thus, at the direction of the District, the evaluations herein, including treatment facility concepts and costs, are assumed to be similar to the Chula Vista option.

5.0 ANALYSIS OF WASTEWATER MANAGEMENT OPTIONS

This chapter summarizes the analysis of potential future wastewater treatment, disposal, and reuse options for the District by comparing capital and operational costs over the 20-year planning horizon to 2030. The objective of the comparison is to recommend a wastewater treatment, disposal, and recycling plan to the District based on updated planning and cost estimates for local and regional wastewater management elements potentially affecting future costs to the District wastewater and recycled water customers. Appendix D provides detailed discussion and cost estimates for the wastewater management options.

5.1 Identification of Wastewater Management Options

Wastewater management options were identified, reviewed and discussed in multiple workshops with District staff. From these discussions, wastewater management options were defined and synthesized into five major feasible alternatives involving wastewater treatment, disposal, and reclamation. The five wastewater management options selected for evaluation are listed below:

- Option A: Maintain RWCWRF at 1.3 MGD
- Option B: Expand RWCWRF to 2.6 MGD
- Option C: Expand RWCWRF to 3.9 MGD
- Option D: Abandon RWCWRF and Utilize Metro
- Option E: Abandon RWCWRF and Utilize New Joint District/County WRF

All options presume continued ownership, operation, maintenance, and required expansion of the District's existing wastewater collection system consistent with the wastewater flow projections, hydraulic modeling analyses, and capital improvement projects discussed in Chapter 3 of this report. All options also assume that the required improvements to the Rancho San Diego Pump Station will be implemented. Finally, all options assume that the disinfection facilities at the RWCWRF will be upgraded such that all disinfection contact time and dosage required are achieved at the plant.

Within the wastewater management options, there are also alternatives for wastewater sludge handling (onsite and continued discharge to Metro), sources of reclaimed water (described in Chapter 4), and future Metro wastewater treatment. The Metro wastewater treatment alternatives include 1) continued advanced primary treatment at the Point Loma WWTP and assumed continuance of an existing waiver from the Environmental Protection Agency, and 2) upgrade of the Point Loma WWTP to secondary treatment with attendant costs and allocation of the District's fair share of

the future capital and operating costs. In a recent Recycled Water Study performed for the City of San Diego and released on May 10, 2012, alternatives to the Point Loma Upgrade were evaluated. Alternatives include diversion of wastewater from Point Loma, increased recycled water use, and Indirect Potable Reuse (IPR) using the San Vicente reservoir and Otay Lakes. Multiple alternatives are presented with projected capital and operating costs. The selected IPR alternative could result in a reduction in costs from the secondary upgrade costs allocated to the District for those wastewater management options which include continued discharge to the Metro System. Although it is presumed that San Diego and its participating agencies will select the most cost-effective long-term wastewater and recycled water management solution approvable by EPA, this Wastewater Management Plan uses the assumption of upgrade to secondary treatment for Point Loma.

5.1.1 Option A: Maintain RWCWRF at 1.3 MGD

This wastewater management option maintains the status quo at the RWCWRF, with the exception of water quality enhancements and potential solids handling facilities at the treatment plant location. The capacity of the RWCWRF will remain at the existing 1.3 MGD. All flows conveyed via the District's wastewater collection system in excess of 1.3 MGD will be discharged to the San Diego Metro wastewater collection and treatment system with the associated institutional and financial impacts. The evaluation of Option A includes the following sub-options:

Wastewater Solids Handling

- Onsite treatment at RWCWRF
- Continued discharge to the Metro system

Future San Diego Metro Treatment

- Continued primary treatment
- Upgrade to secondary treatment

Recycled Water Sources

- RWCWRF
- SBWRP
- Chula Vista WRF

Figure 5.1 below depicts the conceptual flow, treatment, wastewater discharge, and recycled water use schematic for Option A. Note that the options for recycled water sources are not indicated on the diagram, but are included in the evaluations.

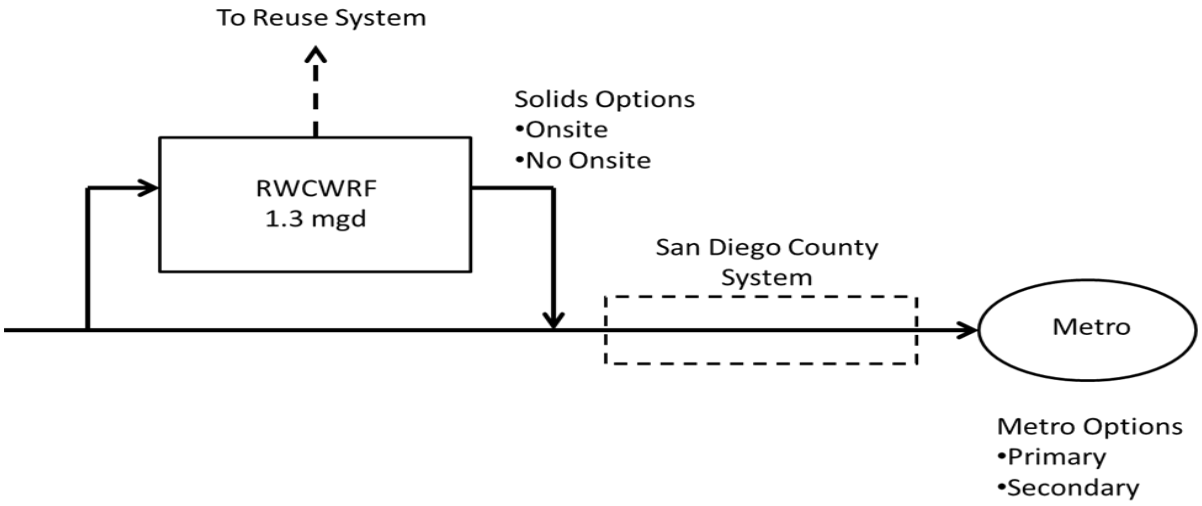


Figure 5.1 Option A: Maintain RWCWRF at 1.3 MGD

5.1.2 Option B: Expand RWCWRF to 2.6 MGD

Option B includes the expansion of the RWCWRF from 1.3 MGD to 2.6 MGD consistent with the flow projections discussed in Chapter 2. Flows in excess of 2.6 MGD will be conveyed to the Metro system. The evaluation of Option B includes the following sub-options:

Wastewater Solids Handling

- Onsite treatment at RWCWRF
- Continued discharge to the Metro system

Future San Diego Metro Treatment

- Continued primary treatment
- Upgrade to secondary treatment

Recycled Water Sources

- RWCWRF
- SBWRP

Purchase of recycled water from a future Chula Vista MBR water reclamation plant is not included in Option B since the engineering feasibility studies for the Chula Vista facility were based on the RWCWRP remaining at its current 1.3 MGD capacity. Figure 5.2 below shows the conceptual wastewater flow and discharge diagram for Option B. Note that the recycled water purchase from SBWRP is not shown, but is included in the evaluations.

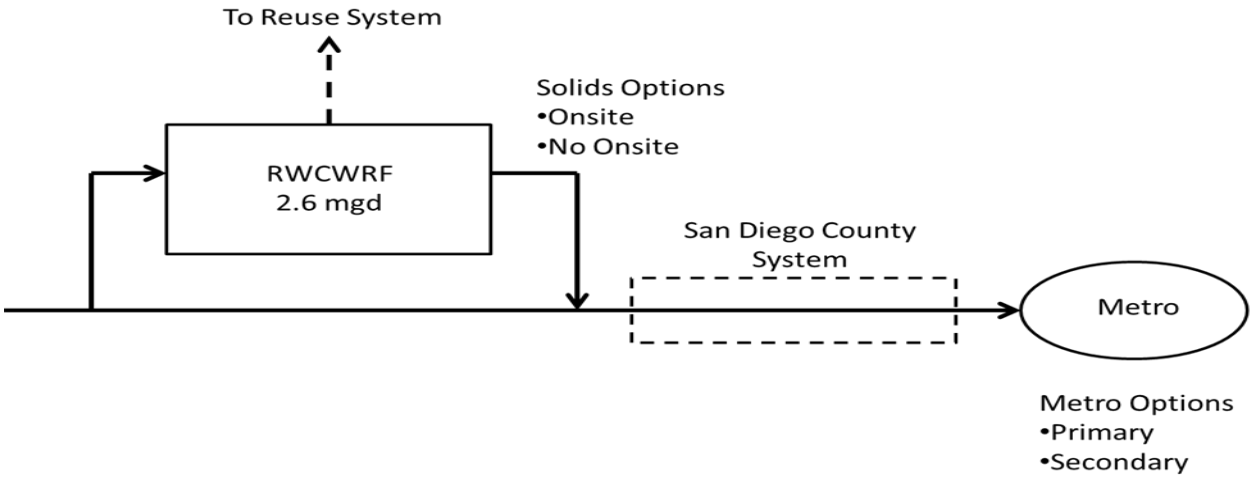


Figure 5.2 Option B: Expand RWCWRF to 2.6 MGD

5.1.3 Option C: Expand RWCWRF to 3.9 MGD

Option C includes the expansion of the RWCWRF from 1.3 MGD to 3.9 MGD. It is recognized that the Jamacha Basin wastewater flow projections developed in Chapter 2 do not indicate the need for a 3.9 MGD treatment capacity at the RWCWRF. However, the District decided to maintain the incremental modularity of the treatment plant capacity and assume an expansion module of 2.6 MGD consistent with Option B. Flows in excess of those treated by RWCWRF will be conveyed to the Metro System. Flows anticipated to be treated by Metro are anticipated to be minimal only, conveyed

at times of RWCWRF plant maintenance or emergency interruptions. The evaluation of Option C includes the following sub-options:

Wastewater Solids Handling

- Onsite treatment at RWCWRF
- Continued discharge to the Metro system

Future San Diego Metro Treatment

- Continued primary treatment
- Upgrade to secondary treatment

Recycled Water Sources

- RWCWRF
- SBWRP

For the same reason as Option B, purchase of recycled water from a future Chula Vista MBR water reclamation plant is not included in Option C. Figure 5.3 below shows the conceptual wastewater flow and discharge diagram for Option C. Note that the recycled water purchase from SBWRP is not shown, but is included in the evaluations.

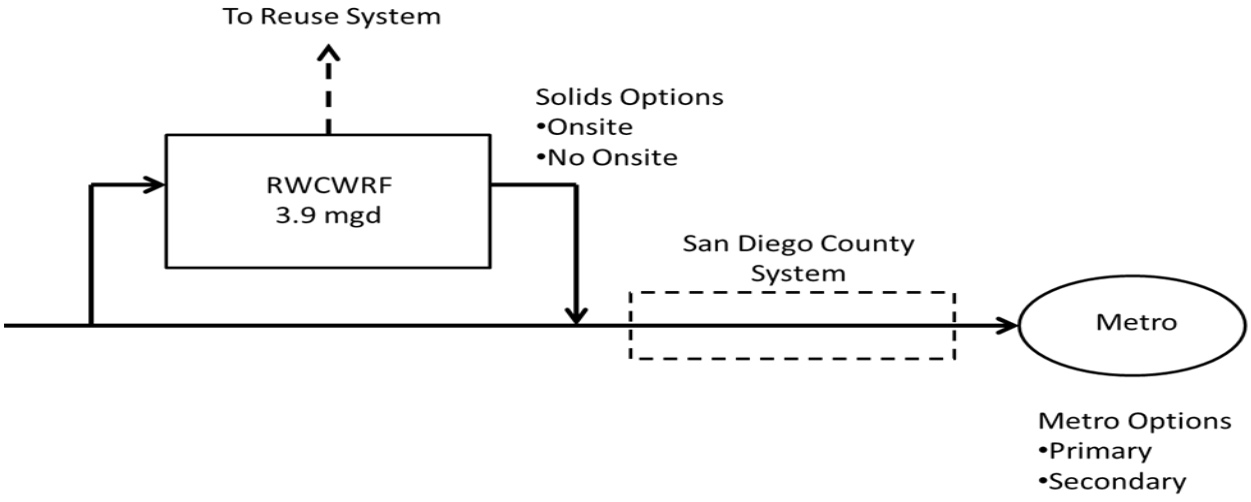


Figure 5.3 Option C: Expand RWCWRF to 3.9 MGD

5.1.4 Option D: Abandon RWCWRF and Utilize Metro

Option D includes the decommissioning and demolition of the RWCWRF. All wastewater collected in the Jamacha Basin will be sent to the Point Loma WWTP through the Rancho San Diego Pump Station. The evaluation of Option D includes the following sub-options:

Future San Diego Metro Treatment

- Continued primary treatment
- Upgrade to secondary treatment

Recycled Water Sources

- SBWRP
- Chula Vista WRF

Figure 5.4 below shows the conceptual wastewater flow and discharge diagram for Option D. Note that the recycled water purchases from the SBWRP and Chula Vista WRF are not shown, but are included in the evaluations.

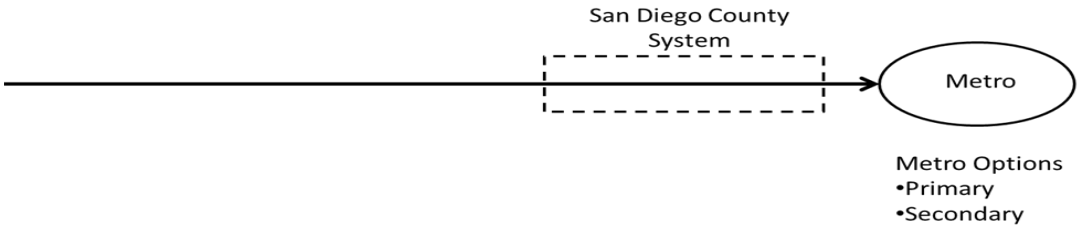


Figure 5.4 Option D: Abandon RWCWRF and Utilize Metro

5.1.5 Option E: Abandon RWCWRF and Utilize New Joint District/County WRF

Option E includes the decommissioning and demolition of the RWCWRF. Wastewater collected in the Jamacha Basin will be sent to a new proposed joint wastewater treatment and recycling facility with San Diego County or the Point Loma WWTP through the Rancho San Diego Pump Station. Collection system modifications and extensions will be required to convey existing flow to the new joint WWTP and to by-

pass to the Metro System, as required. Solids treatment at the new joint plant is assumed, since the plant process is assumed to be the same as the Chula Vista MBR plant. The conceptual joint new WWTP has been described in the 1997 report by Metcalf and Eddy for San Diego County entitled "Water Reclamation Facility Project Feasibility Report". The concept included a 10 MGD plant located near I-805 and the Sweetwater River, using an activated sludge aeration process. This Wastewater Management Plan assumes an MBR plant similar to the Chula Vista proposal with cost estimates the same as the Chula Vista plant for equivalent capacity. The evaluation of Option E includes the following sub-options:

Future San Diego Metro Treatment

- Continued primary treatment
- Upgrade to secondary treatment

Recycled Water Sources

- Joint District/County WRF
- SBWRP

Purchase of recycled water from the Chula Vista WRF is not included in this option, because it is assumed that the new joint WRF will be sized to provide as much recycled water as the Chula Vista WRF would. Figure 5.5 below shows the conceptual wastewater flow and discharge diagram for Option E. Note that the recycled water purchases from the SBWRP and Chula Vista WRF are not shown, but are included in the evaluations.

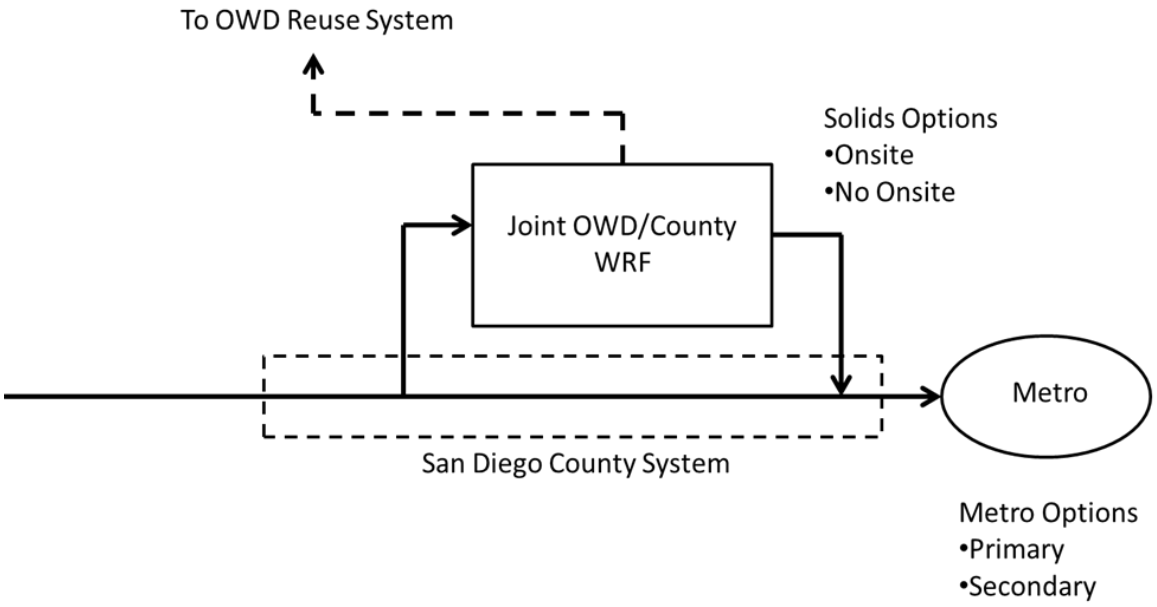


Figure 5.5 Option E: Abandon RWCWRF and Utilize New Joint District/County WRF

5.2 Summary of Cost Components for Wastewater Management Options

The cost components applicable to each wastewater management option included wastewater treatment components and recycled water components. Table 5-1 summarizes the wastewater treatment cost elements applicable to each option.

Table 5-1. Wastewater Treatment Cost Components

Cost Component	Option				
	A	B	C	D	E
RWCWRF					
Expansion		●	●		
On-Site Solids Handling	●	●	●		
Decommissioning				●	●
Metro System Capacity					
Existing Charge (w/o on-site solids handling)	●	●	●	●	
New Capacity Charge (w/o on-site solids handling)		●	●	●	
Point Loma WWTP Upgrade (w/o on-site solids handling)	●	●	●	●	
New County/Otay WWTP					●

Table 5-2 indicates the recycled water sources which exist for each of the wastewater management options. For facilities other than the RWCWRF, cost elements allocated for recycled water include costs to purchase each unit of recycled water and costs for new booster stations and pipelines to deliver water from the facilities to the District's recycled water distribution system.

Table 5-2. Recycled Water Sources for Wastewater Management Options

Recycled Water Source	Option				
	A	B	C	D	E
RWCWRF	●	●	●		
SBWRP	●	●	●	●	●
New Chula Vista WRF	●			●	
New County/District WWTP					●

In consideration of the key variables for evaluating capital and annual O&M costs for the wastewater management options, sub-options have been identified to compare present worth costs. Sub-options are combinations of wastewater treatment, disposal, and recycled water purchase variables. Table 5-3 presents the matrix of options and sub-options that are evaluated.

Table 5-3. Matrix of Wastewater Management Sub-Options Evaluated

Wastewater Management Option		Recycled Water from SBWRP Only, No Chula Vista Purchases		No SBWRP Purchases, Recycled Water from Chula Vista WRF Only	
		No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade	No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade
A	Onsite sludge	A-2	--	A-1	--
	No onsite sludge	A-6	A-4	A-5	A-3
B	Onsite sludge	B-1	--	--	--
	No onsite sludge	B-3	B-2	--	--
C	Onsite sludge	C-1	--	--	--
	No onsite sludge	C-3	C-2	--	--
D		D-4	D-3	D-2	D-1
E (onsite sludge)		E-2	E-1		

5.3 Cost Estimates for Expansion and Demolition of the RWCWRF

The wastewater management options include expansion or decommissioning of the RWCWRF. Detailed construction cost estimates have been prepared associated with upgrading, expanding, and decommissioning the RWCWRF. Appendix B provides a site map of the RWCWRF with suggested locations for new processes and expansions for Options A, B and C. Appendix C provides a report detailing cost estimates for the RWCWRF expansions and demolition alternatives.

In addition to the assumed expansions, Options B and C include addition of a larger chlorine contact chamber to achieve CA Title 22 requirements for contact time at the plant site. Options A through C also consider potential addition of solids handling facilities. Options D and E include decommissioning of the RWCWRF and restoring the site.

5.3.1 Estimated Construction Costs for RWCWRF Options

A summary of opinions of capital costs for the three options that involve continued use and/or expansion of the RWCWRF is presented in Table 5-4. Table 5-4 includes onsite solids handling costs which are removed when evaluating wastewater management options that do not include onsite solids handling.

5.3.2 Estimated Additional O&M Costs for RWCWRF Options

In addition to capital cost estimates for the RWCWRF components of Options A through C, specific elements of annual O&M costs have been estimated for the three options. Key elements of the operational costs include additional power and chemical costs. Additional power costs were based on a blended rate of $0.12 per KWH. Table 5-5 summarizes the estimated additional O&M costs.

Similar to estimated construction costs, Table 5-5 includes onsite solids handling O&M costs which are removed when evaluating wastewater management options that do not include onsite solids handling.

Table 5-4. Opinions of Construction Costs for RWCWRF Options

Treatment Process	Estimated Construction Costs ($)		
	Option A: Maintain RWCWRF at 1.3 MGD	Option B: Expand RWCWRF to 2.6 MGD	Option C: Expand RWCWRF to 3.9 MGD
Influent Pump Station	0	1,130,000	1,290,000
Headworks & Grit Removal	0	2,040,000	2,200,000
Aeration Basins	0	3,330,000	5,900,000
Secondary Clarifiers	0	1,960,000	3,580,000
RAS/WAS Pump Station	0	820,000	1,490,000
Scum Pump Station	0	173,000	173,000
Effluent Pump Station	0	788,000	1,540,000
Administration Building	0	0	1,040,000
Blower & Electrical Building	0	2,050,000	2,490,000
Aerobic Digestion	1,460,000	2,760,000	3,940,000
Digested Sludge Pump St.	121,000	229,000	331,000
WAS Thickening	848,000	1,580,000	2,310,000
Sludge Dewatering Centrifuge	915,000	915,000	1,750,000
Tertiary Filters (+Flocculation)	0	648,000	1,300,000
NaOCl Storage, Pumping and Chlorine Contact Tank	0	2,010,000	2,200,000
Totals	**$3,350,000**	**$20,500,000**	**$31,500,000**

Table 5-5. Opinions of Additional O&M Costs for RWCWRF Options

Annual O&M Component	Estimated Additional O&M Costs ($/year)		
	Option A: Maintain RWCWRF at 1.3 MGD	Option B: Expand RWCWRF to 2.6 MGD	Option C: Expand RWCWRF to 3.9 MGD
Additional KWHs	468,000	4,850,000	10,600,000
Additional Power Cost	56,200	581,000	1,280,000
DAF Polymer Cost	10,000	19,900	29,900
Solid Dewatering (Polymer) Cost	32,400	64,800	97,200
Sodium Hypochlorite Cost	0	31,000	77,100
Totals	**$98,600**	**$697,000**	**$1,480,000**

5.3.3 Estimated Decommissioning Costs for RWCWRF Options

The report in Appendix C also includes the estimated costs to decommission the RWCWRF and the Steel Bridge Pump Station, which pumps raw wastewater to the RWCWRF. Costs were estimated for decommissioning the plant and pump station, and for demolition of facilities and restoration of the plant site. These costs are associated with wastewater management Option D and Option E. The estimated costs are as follows:

- Decommissioning: $492,000
- Demolition and restoration: $3,460,000
- Total: $3,960,000 (rounded)

5.4 Summary of Wastewater Management Options Cost Evaluations

Based on the wastewater flow projections presented in Chapter 2 and the recycled water use projections presented in Chapter 4, a major objective of this wastewater management plan is to compare projected capital and operating costs for the five wastewater management options to develop a recommended District course of action for the future. The comparative cost approach was estimates of present worth costs, using the sum of capital costs in 2012 dollars and today's value of annual O&M costs from 2015 through 2030 (16 years).

5.4.1 Common Economic Cost Assumptions

A common set of assumptions was developed for all five options. The assumptions include considerations for both wastewater discharge and recycled water purchases. The list of assumptions is presented in Table 5-6. In addition to the assumed cost factors, the projected value of money was assumed to be increasing at 2 percent per year for determining the present worth of operating and maintenance expense.

Table 5-6. Common Economic Cost Assumptions

SBWRF, Chula Vista, Joint Plant Recycled Water Purchase Rate (per AF)[1]	$350
2012 Metro County Wastewater Discharge Rate (per MGD)[2,6]	$3,089,634
Additional Metro Capacity Cost (per MGD)[3]	$30,000,000
PLWWTP Upgrade Capital Cost[4]	$1,161,174,957
Otay WD Capital Cost for PLWWTP Upgrade (0.513%)[4]	$5,956,828
PLWWTP Upgrade O&M Cost[4]	$37,497,060
Otay WD Annual O&M Cost for PLWWTP Upgrade (per MGD)[4]	$156,238
MWD/SDCWA Rebate (per AF)[5]	$385

1. Based on Recycled Purchase Agreement between City of San Diego and Otay WD.
2. Based on Metro Discharge Agreement between City of San Diego and Otay WD.
3. $22 Million paid to Metro, $8 Million paid to the County. A one-time up-front cost for buying capacity in these systems.
4. Point Loma WWTP Secondary Treatment Upgrade Costs at Different Capacities from The City of San Diego's Wastewater Master Plan and Recycled Water Study, May 2012
5. $185/AF is received from MWD; $200/AF comes from the SDCWA.
6. Lump sum of Metro Cost and County cost based on recent District invoices.

5.4.2 Summary of Cost Comparisons for Wastewater Management Options

Appendix D provides the details of the cost evaluation for the wastewater management options. For all options, wastewater discharge costs are based on projected wastewater discharge rates, facilities used, and facility and contract costs through 2030. For all options, recycled water purchase costs are based on projected recycled water needs, production sources, production amounts, and facility and contract costs through 2030. The bases for costs for each of the sub-options summarized in Table 5-3 are evaluated separately as (1) wastewater discharge amounts and costs and (2) recycled water use amounts and costs. Wastewater discharge and recycled water use volumes are indicated for five-year planning horizons from 2010 (actual) through 2030, consistent with District projections indicated previously.

A summary of estimated present worth costs for the wastewater management options is presented in Table 5-7.

Table 5-7. Present Worth Cost Summary for Wastewater Management Options

Wastewater Management Option	Sludge Handling Option	Estimated Present Worth ($ millions)			
		SBWRP Purchases Only, No Chula Vista Purchases		No SBWRP Purchases, Chula Vista Purchases Only	
		No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade	No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade
A	Onsite sludge	$37.1	--	$34.7	--
	No onsite sludge	$79.3	$87.0	$77.0	$84.6
B	Onsite sludge	$82.7	--	--	--
	No onsite sludge	$86.4	$92.8	--	--
C	Onsite sludge	$134.3	--	--	--
	No onsite sludge	$139.8	$146.3	--	--
D	NA	$153.7	$163.0	$156.8	$166.1
E	Onsite Sludge	$148.0	$154.0	--	--

The cost evaluation of wastewater management options results in the following key conclusions:

- The present worth costs for Option A are significantly less for on-site solids handling at RWCWRF due to presumed avoidance of significant discharge to Metro and future Point Loma upgrade costs, or its Metro alternative.
- For Options A, B and C, the lowest present worth costs are for retaining the RWCWRF at 1.3 MGD capacity and not expanding.
- Options D and E are significantly more costly due to increased discharge to Metro, with risks of incurring costs for Point Loma upgrade, and cost of a new joint WWTP in partnership with the County.

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Summary of Conclusions

The work conducted in this Wastewater Management Plan yields the following significant conclusions:

Wastewater Flow Projections

- The total Jamacha Basin wastewater flows from connected and unconnected properties are projected to increase from 2.48 MGD in 2010 to 2.96 MGD in 2030.
- Wastewater flows from the District's service area within the Jamacha Basin, from connected and unconnected properties, are projected to increase from 1.84 MGD in 2010 to 2.15 MGD in 2030
- Wastewater flows from the County's service area within the Jamacha Basin, from connected and unconnected properties, are projected to increase from 0.64 MGD in 2010 to 0.81 MGD in 2030.

Wastewater Collection System

- The existing wastewater collection system has only three areas that do not meet system performance criteria under existing peak wastewater flow conditions. These problem areas should be corrected by replacing the existing undersized sewer pipes.
- One of the existing problem areas is along Campo Road in a section of 10-inch sewer pipe that was, in the past, converted from a forcemain to a gravity pipe. The former forcemain pipe is undersized to act adequately as a gravity pipe. The District would like to replace the entire section of former forcemain pipe with a 15-inch gravity pipe.
- The existing wastewater collection system has only two additional areas that do not meet system performance criteria under 2030 peak flow conditions. The undersized sewer pipes in these areas should also be replaced as funds become available.

Recycled Water Supply and Demand

- The District's existing recycled water supply is an average 1.0 MGD from the RWCWRF and up to 6 MGD annually from the City of San Diego's SBWRP. Due to problems with wastewater supply, other large demands taking priority, etc., the actual peak availability of recycled water from the SBWRP

has recently been only 5.3 MGD. The problems with District recycled water supply are anticipated to be corrected by San Diego by 2015.

- The District projects that its recycled water demand will increase from 4,074 AFY in 2010 to 8,000 AFY in 2035.
- On a monthly basis, the District will begin seeing deficits in recycled water supply by 2020 during the peak demand months. The peak month deficits are projected to grow from approximately 670 AF in 2020 during the two peak demand months, to 1,100 AF during the two peak demand months in 2035. In addition, the deficits are expected to occur for over half the year by 2035. These deficits are not annual and can be mitigated if the District/SBWRP agreement can be amended to allow the District to take its contracted amount at up to two times its annual average rate.
- The District is already seeing supply deficits in meeting peak day recycled water demands and has had to occasionally supplement with potable water. The peak day supply deficit is projected to grow from approximately 1.0 MGD in 2010 to 7.3 MGD in 2035. The deficits can be managed with appropriate recycled water system storage and a modification to the District/SBWRP agreement, as described above.
- Potential additional supplies of recycled water evaluated include the following sources:
    - Expansion of the RWCWRF
    - Additional purchases from the City of San Diego SBWRP
    - Purchase of recycled water from a potential new City of Chula Vista regional WRF
    - A new joint WRF with San Diego County

Future Wastewater and Recycled Water Management Options

- There exist multiple economic, institutional, regulatory, and environmental factors which are currently affecting and will affect the District's future options for treating, reusing, and discharging wastewater generated within the District's limited wastewater service area.
- Wastewater treatment options include the RWCWRF, discharge to the Metro System, and partnership with the County in a conceptual new 10 MGD plant.
- Recycled water supply options include the RWCWRF, the Metro SBWRP, a potential new 6 MGD WRF in Chula Vista, and a potential new joint treatment and reclamation plant in partnership with the County.
- The wastewater management and recycled water options were combined into five overall management options for cost evaluations:
    - Option A – maintain RWCWRF at 1.3 MGD

  - Option B – expand RWCWRF to 2.6 MGD
  - Option C – expand RWCWRF to 3.9 MGD
  - Option D – decommission RWCWRF and send all flow to Metro
  - Option E – decommission RWCWRF and build joint plant with County

- The evaluation of RWCWRF options considered onsite solids handling/ sludge management and no onsite sludge management. The joint County plant options considered only onsite sludge management consistent will all previous planning efforts. All options that involved discharge of any flows to the Metro System included consideration of the Metro Point Loma WWTP remaining a primary treatment plant and upgrade to a secondary treatment plant with associated capital and O&M cost impacts to the District.
- A detailed present worth cost evaluation of the five primary management options and many sub-options, that included estimates of capital costs, annual O&M costs, and recycled water purchases through 2030 lead to the following conclusions:

  - Option A (RWCWRF stays at 1.3 MGD) has the lowest present worth costs of the five options, followed by Option B (expand RWCWRF to 2.6 MGD), then Option C (expand RWCWRF to 3.9 MGD). This is due to the existing investment in RWCWRF and the avoidance of Metro discharge costs and additional recycled water purchase costs.
  - Option D (send all flow to Metro System) has the highest present worth cost due to the existing cost structure, potential for upgrade costs associate with Point Loma, and need to purchase additional Metro and County system capacity.
  - The lowest cost sub-options involve onsite solids handling, purchase of recycled water from a Chula Vista WRF, and avoidance of payment for a Metro Point Loma WWTP upgrade.
  - For all RWCWRF expansion options (A, B, and C), construction and operation of onsite solids handling is more cost-effective than no onsite solids handling due to the reduced Metro discharge volumes and costs.
  - Abandonment of RWCWRF and reliance on Metro or a new joint District/County WRF is significantly more costly than retaining RWCWRF at any of the three capacities evaluated. This reinforces the District's value in the existing plant and in its Metro and County system capacity ownership.
  - Purchase of recycled water from a new Chula Vista WRF appears to be more cost-effective than purchase from the SBWRP due to the current take or pay provision in the SBWRP agreement.

6.2 Wastewater Collection System Recommendations

6.2.1 Hydraulic Model

The existing hydraulic model was last calibrated in 2006 and should be recalibrated in the next planning effort. Typically, a hydraulic model is calibrated every 5 years as changes in development occur, or as happened in the current planning effort, several of the modeled system components (pump stations and pipelines) were updated. The District should also consider calibrating the model using predictive hydrologic methods in the next model update. In terms of versatility and range of applications, it far exceeds the capabilities of the peaking factor methodology which is currently utilized.

6.2.2 Recommended Wastewater System Improvements

Table 6-1 summarizes the schedule and capital cost opinions for the recommended wastewater collection system improvements. Figures 3-4 and 3-6 illustrated the recommended improvements. The estimated total capital cost for the recommended infrastructure to correct existing system deficiencies is $8.53 million. To accommodate 2030 wastewater flows, the additional capital cost is approximately $2.72 million.

Table 6-1. Recommended Wastewater Collection System Improvements

Project No.	Description		Location	Unit Cost ($/LF)[1]	Conceptual Cost Opinion ($)	
					Existing	2030
Collection System Pipes						
CIP #1	12-inch	36 LF	Near Fury Ln and Jamacha Rd	1,020	$37,000	--
CIP #2	24-inch	91 LF	Near Hillsdale Rd and Jamacha Rd	2,040	$190,000	--
CIP #3	15-inch	9,225 LF	Along Campo Road from Avocado Rd to Singer Lane	900	$8,300,000	--
CIP #4	15-inch	900 LF	Near Jamacha Rd and Donahue Dr	1,275	--	$1,150,000
CIP #5	15-inch	1,235 LF	Along Ivanhoe Ranch Rd upstream of Cottonwood Pump Station	1,275	--	$1,570,000
Total					**$8,527,000**	**$2,720,000**

Note:
1. January 2012 Costs (ENR CCI = 9176). Includes 30% for engineering and administration, 10% for contractor bonding and insurance, and 30% for project contingencies.

CIP #3 involves replacement of a former 10-inch forcemain that currently acts as a gravity pipe. Portions of the pipe undersized for gravity flow. The District desires to replace the entire stretch of this pipe with a new 15-inch gravity sewer pipe. The alignment is primarily along Campo Road which is a major highway. Figure 6-1 shows conditions along the pipeline alignment. A cursory site inspection revealed the following potential problem areas that should be addressed during preliminary design:

- Intersection of Campo Road and Via Mercado.
- Intersection of Campo Road and Jamacha Boulevard, where Jamacha Boulevard joins Campo Road from the south.
- Intersection of Campo Road and Jamacha Boulevard, where Campo Road turns south.

Figure 6-1. Alignment for CIP #3

6.3 Recommended Wastewater Management and Recycled Water Strategies

From the economic evaluations of the five wastewater (and recycled water) management options, the following are recommended strategies for consideration by the District.

- Retain and maintain the RWCWRF at its current capacity. This recommendation, however, does not preclude a future expansion of RWCWRF capacity if additional reclaimed water for the District cannot be obtained from a new assumed Chula Vista WRF or from the SBWRP.
- If regulatory restrictions prohibit the use of the existing reclaimed water pipeline to achieve required chlorine contact times before expansion of the RWCWRP, then plan, design, and construct a chlorine contact chamber. The estimated capital costs for the chlorine contact chamber is $3,420,000 (includes 30 percent for engineering and administration, 10 percent for contractor bonding and insurance, and 30 percent for project contingencies).
- Plan, design, and construct on-site solids handling facilities on the RWCWRF site for a capacity of 1.3 MGD expandable to 2.6 MGD. The estimated capital costs for the on-site solids handling facilities is $5,690,000 (includes 30 percent for engineering and administration, 10 percent for contractor bonding and insurance, and 30 percent for project contingencies).
- Target the on-site solids handling start-up date as early as possible, but no later than 2015, to avoid potential Point Loma WWTP upgrade costs.
- Confirm that construction and operation of on-site solids handling facilities will preclude significant discharges to the Metro System, except for plant maintenance or emergency events.
- Upon construction of RWCWRF on-site solids handling, re-determine new quality and resulting unit costs for Metro discharges.
- Renegotiate the SBWRP recycled water purchase agreement to allow short-term, peak month and peak-day purchases of recycled water in excess of the 6 MGD limit stated in the contract, preferably to achieve 12 MGD. Also, renegotiate the agreement to remove the take or pay provision.
- If the take or pay provision of the SBWRP agreement cannot be negotiated out, support the future planning, design, permitting, and construction of the Chula Vista WRF and negotiate a contract to take all recycled water produced by the plant.
- Perform a District recycled water storage evaluation to assess daily and peak month water balances to assure that projected peak period recycled water demands can be achieved by the combination of RWCWRF, SBWRP/Chula Vista WRP recycled water purchases with no or little supplementation by other water sources, such as SDCWA water.

6.4 Potential Funding Sources for Wastewater Capital Improvements

This Wastewater Management Plan has recommended capital improvement projects for the District's wastewater collection system and the RWCWRF. There are available options for funding these improvements through internal and external sources having benefits and conditions requiring additional assessment by the District related to each individual project.

6.4.1 Internal Funding Options

Internal funding options include conventional sources familiar to the District. These include wastewater rates and connection fees that would fund debt service on revenue bonds that the District would authorize and sell for specific projects. Since the District typically funds projects in this manner, no more discussion is provided herein.

6.4.2 External Funding Options

External funding for the District's proposed wastewater collection and treatment projects could come from a number of public sources. The following discussion is a summary of those potential sources.

Federal Funding

Federal funding for wastewater projects providing for wastewater reuse in lieu of use of potable supplies has been included in the budget of the U.S. Bureau of Reclamation (Bureau). Title II of the Senate version of the Fiscal Year 2013 (FY2013) Energy and Water Development Appropriations Bill calls for $1B in funding for the Bureau, which is $19.8M less than the FY2012 enacted amount. The House Energy and Water Development Appropriations Bill recommends $967M for the Bureau, which is approximately $81M below the House appropriation in FY2012.

The Water and Related Resources account of Title II supports the development, construction, management, and restoration of water and related natural resources in the 17 western states. The account includes funds for operating and maintaining existing facilities and conducting studies on ways to improve the use of water and related natural resources. Wastewater reuse projects can be potentially funded under the TITLE XVI Water Reclamation and Reuse Program. A Title XVI Water Reclamation and Reuse Program funding opportunity has been previously available through WaterSMART. The Bureau invites sponsors of congressionally authorized Title XVI

projects to request cost-shared funding for the planning, design, or construction of those proposed wastewater reuse projects. This funding opportunity is available by searching funding opportunity number R13SF80002 on *www.grants.gov*.

The Bureau anticipates providing no more than $4M per applicant. This is subject to WaterSMART's future FY2014 appropriations, project funding capability, and the amount remaining under the appropriations ceiling for each authorized project. Approximately 5 to 10 awards are typically made each year.

Through the Title XVI Water Reclamation and Reuse Program, the Bureau provides funding for projects that reclaim and reuse municipal, industrial, domestic or agricultural wastewater and naturally impaired ground or surface waters. Reclaimed water can be used for a variety of purposes, such as environmental restoration, fish and wildlife, groundwater recharge, municipal, domestic, industrial, agricultural, power generation or recreation.

The WaterSMART Program focuses on improving water conservation and sustainability and helping water resource managers make sound decisions about water use. It identifies strategies to ensure that this and future generations will have sufficient supplies of clean water for drinking, economic activities, recreation and ecosystem health. The program also identifies adaptive measures to address climate change and its impact on future water demands. Through WaterSMART and other conservation programs funded over the last three years, more than 580,000 acre-feet of water per year is estimated to have been saved.

State Funding

The last two decades has seen an unprecedented series of bond measures passed by the voters of California to fund water resources development throughout the State, including reclamation projects. Beginning in 1996, voters passed a water-related proposition roughly every four years as highlighted in the following list:

- Proposition 204 – Safe, Clean, Reliable Water Supply Act. (1996)
- Proposition 13 – Safe Drinking Water, Clean Water, Watershed Protection, and Flood Protection Bond Act. (2000)
- Proposition 40 – The California Clean Water, Clean Air, Safe Neighborhood Parks, and Coastal Protection Act of 2002 (2002)
- Proposition 50 – Water Quality, Supply and Safe Drinking Water Projects. Coastal Wetlands Purchase and Protection. Bonds. (2002)

- Proposition 84 – Bonds for clean water, flood control, state and local park improvements, etc. (2006)

The Clean Water State Revolving Loan Fund Program (CWSRF) was established by the Federal Water Pollution Control Act, as amended in 1987. The CWSRF offers low interest financing agreements for water quality improvement projects. Annually, the program disburses between $200 and $300 M to eligible projects. Eligible projects include construction of publicly-owned treatment facilities, such as wastewater treatment, local sewers, sewer interceptors, water reclamation facilities, and storm water treatment. Eligible applicants include and city, town, district, or other public body created under state law and any designated and approved management agency under Section 208 of the Clean Water Act. There exist favorable financing terms, including low interest rate, 20 year repayment, up to $50M per agency per year, and deferred repayment until 1 year after construction is completed.

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Spring Valley Sanitary District Sewer Agreement, May 1998.

Appendix A

Technical Memorandum: Recycled Water Supply Augmentation Planning Level Study

MALCOLM PIRNIE | ARCADIS
The Water Division of ARCADIS

Technical Memorandum

Date: January 6, 2012

To: Bob Kennedy, Otay Water District

From: Liberato Tortorici, Malcolm Pirnie / ARCADIS
Brent Alspach, Malcolm Pirnie / ARCADIS

Re: Recycled Water Supply Augmentation Planning Level Study

I. Introduction

Malcolm Pirnie / ARCADIS (Malcolm Pirnie) was retained by the Otay Water District (District) to perform a "high altitude level" planning study to evaluate options for augmenting the District's recycled water supply from the City of San Diego's (City) South Bay Water Reclamation Plant (SBWRP) with effluent from the International Boundary and Water Commission (IBWC) South Bay International Wastewater Treatment Plant (SBIWTP). The South Bay recycled water mains, along with the locations of the both the SBWRP and the SBIWTP, are shown in **Figure 1**. The District currently purchases an average of approximately 5.9 MGD of recycled water from the City's SBWRP and distributes that water to recycled water customers within the District's service area. The IBWC's SBIWTP, which is adjacent to the City's SBWRP, was recently upgraded from an advanced primary to a full secondary treatment facility and discharges an average of 25 MGD of secondary effluent to the South Bay Land and Ocean Outfall system. The District is interested in potentially reclaiming secondary effluent from the IBWC's SBIWTP to augment the recycled water supply from the City's SBWRP as described under *Option 1* below or to replace the recycled water supply available from the City's SBWRP as described under *Option 2* below.

II. Focus of Technical Memorandum

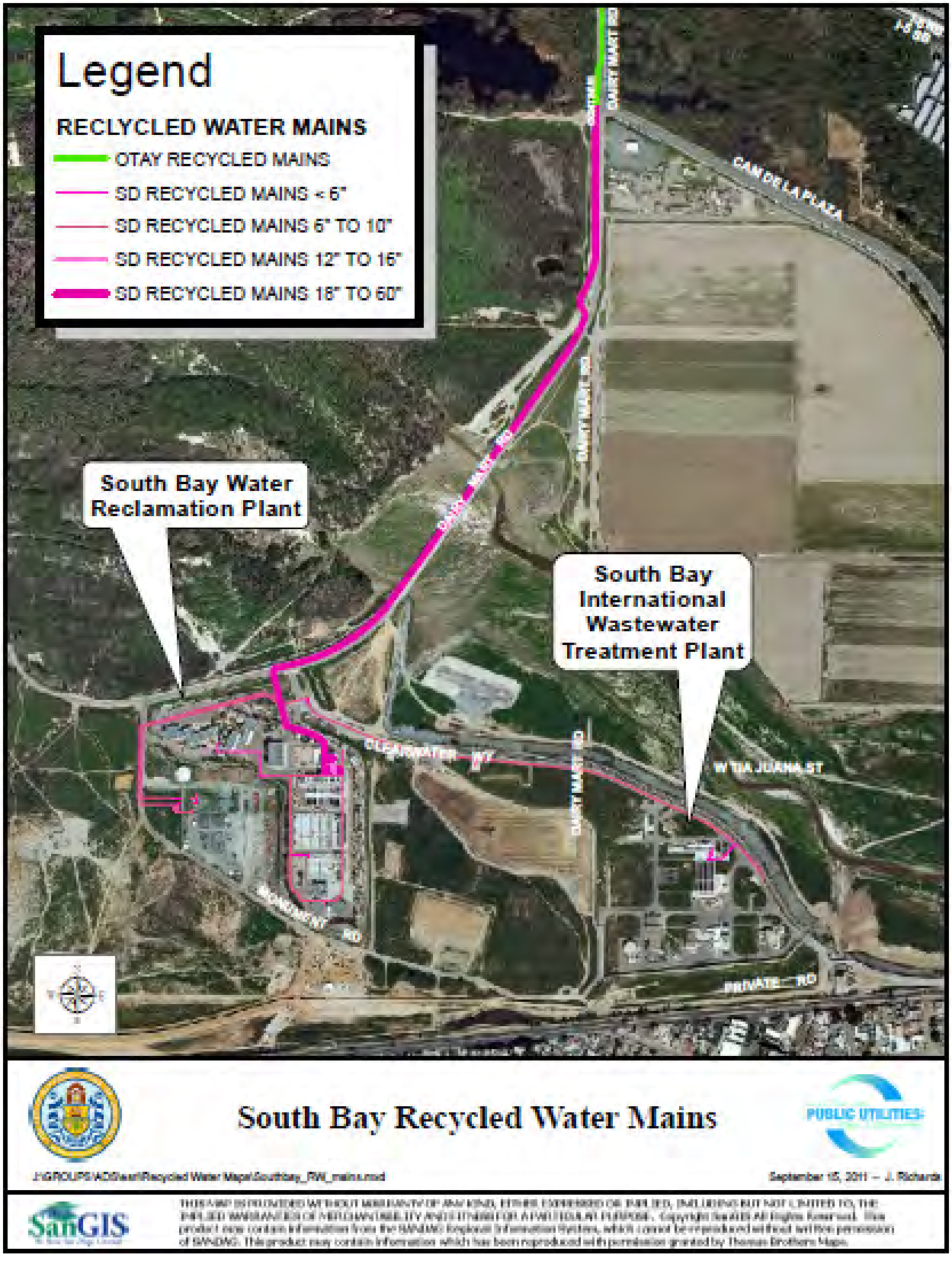
The focus of this memorandum is to develop planning level information, including process requirements and estimates of probable capital and total annual costs, for the following recycled water supply options:

Option 1 *– Deliver SBIWTP Secondary Effluent to the City's SBWRP*

Option 2 *– Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment*

This technical memorandum is intended to provide the District with sufficient "high altitude level" information to determine whether augmenting the District's recycled water supply with effluent from the SBIWTP might be economically viable and whether either or both of the above options merit further development in more detailed study, conceptual design, and/or preliminary design.

Figure 1
South Bay Recycled Water Mains



III. Definition of Recycled Water Supply Options

The two options for augmenting recycled water supplies are defined below. The assumptions used for sizing of the required new facilities and for developing estimates of probable costs are included in Appendix A. It should be noted that these assumptions represent Malcolm Pirnie's best estimate of existing facilities and recycled water quality objectives; these assumptions need to be confirmed by the District prior to further developing the concept in a more detailed planning study. Of particular importance in such a planning study will be a detailed review and assessment of priority pollutants and pollutants of concern which might render recycled water from the SBIWTP undesirable for District recycled water end users.

Option 1 *– Deliver SBIWTP Secondary Effluent to the City's SBWRP*

Under this option the following key project components as identified in **Figure 2** would need to be implemented:

- Construct effluent discharge piping from the IBWC's SBIWTP to the City's SBWRP tertiary treatment facilities. These will include a 14" CMLDI pipeline and appurtenant metering and control facilities.

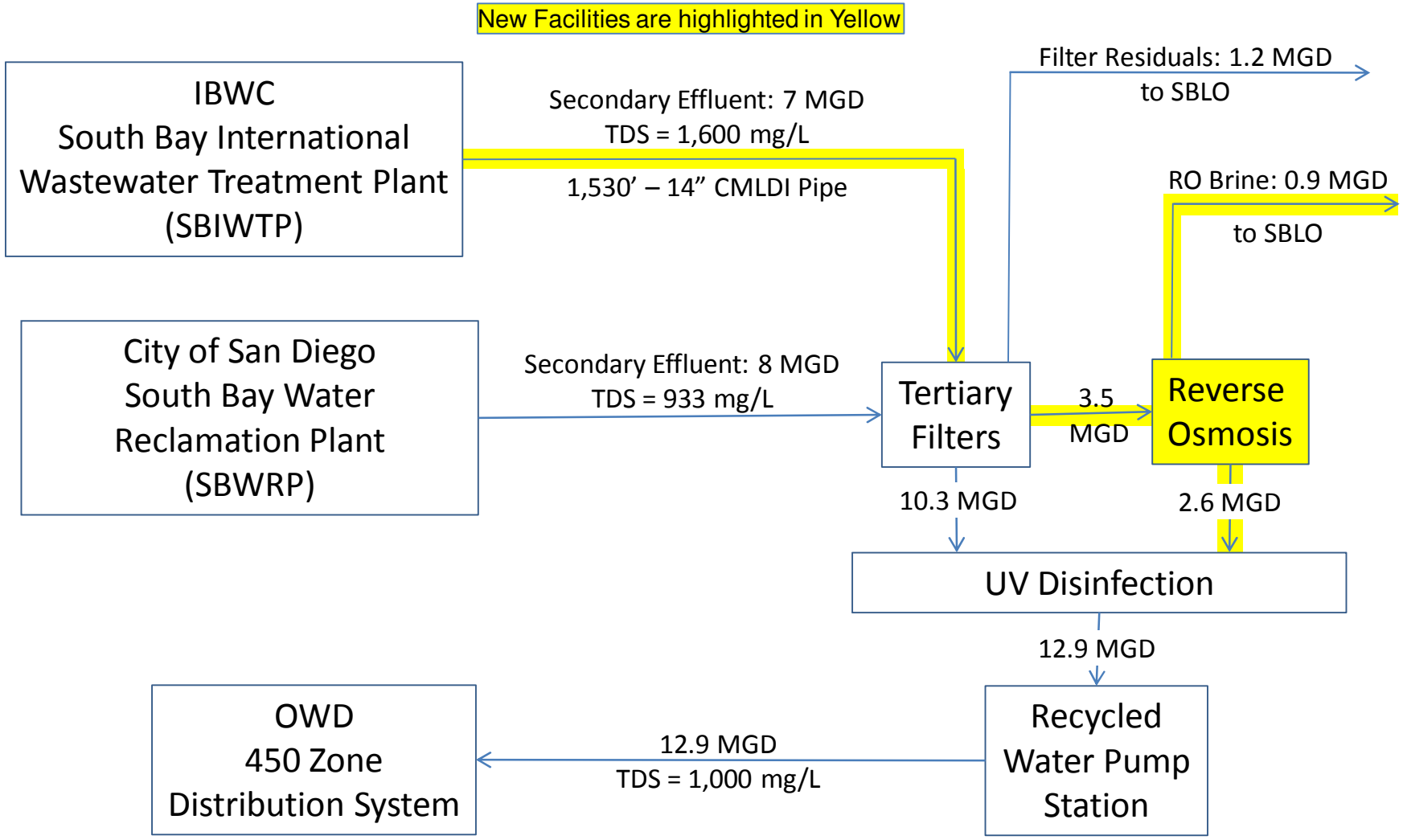
- Utilize the existing tertiary filters, UV disinfection facilities, and recycled pumping facilities on the City's SBWRP site as shown in Figure 2. Note that California Department of Public Health (CDPH) disinfection requirements vary depending on the end use of recycled water; for some uses, disinfection may not be necessary. This analysis conservatively assumes the use of full disinfection via the existing UV disinfection system to allow the District the greatest flexibility for the sale of recycled water to potential customers.

- Construct reverse osmosis (RO) facilities on the City's SBWRP site to reduce the total dissolved solids (TDS) in the recycled water supply. The TDS concentration in the secondary effluent from the SBIWTP averages 1,600 mg/L. This dictates that a portion of the filtered tertiary effluent will be processed through RO, with the desalinated permeate blended with the remainder of the filtered effluent to produce recycled water that would meet the District's TDS goal of 1,000 mg/L. The RO concentrate would be diverted to the existing South Bay Land Outfall and Ocean Outfall for disposal.

- Utilize the existing recycled water conveyance pipeline to deliver recycled water to the District's point of connection at Dairy Mart Road and Camino De La Plaza. The recycled water will continue to be delivered to the District's 450' pressure zone.

These project components and facilities would yield a daily average recycled water production of 12.9 MGD, as limited by the assumed ability of the City's SBWRP tertiary filters to accommodate 15 MGD of feed water. A recovery of 92% is assumed for the existing tertiary filters, yielding a filtrate flow of 13.8 MGD, as shown in Figure 2 (i.e., 3.5 to the RO system and 10.3 MGD directly to UV disinfection).

Figure 2
Option 1 – Deliver SBIWTP Secondary Effluent to the City's SBWRP
Process Schematic



Option 2 *– Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment*

Under this option the following key project components as identified in **Figure 3** would need to be implemented:

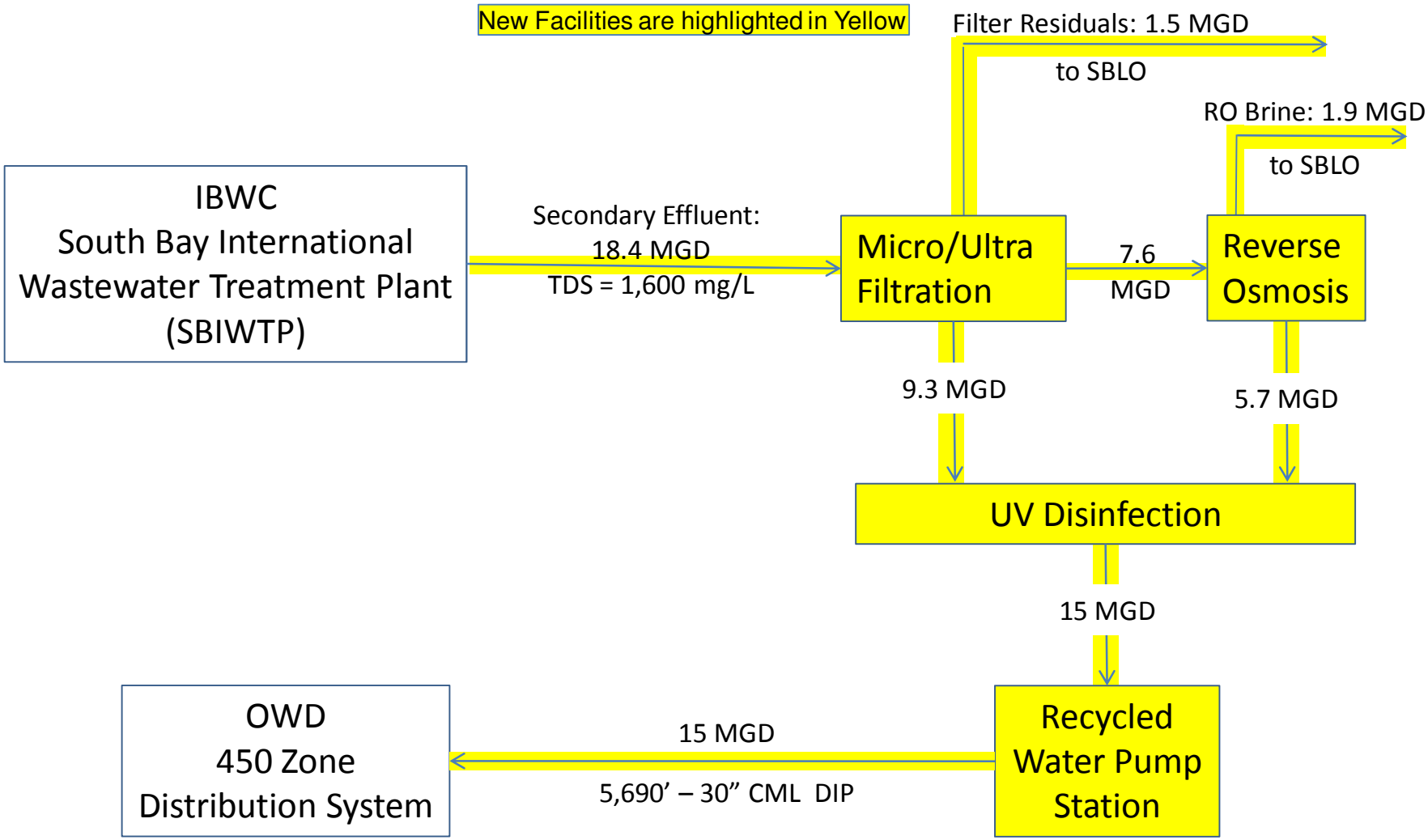
- Construct new tertiary treatment facilities (micro-/ultrafiltration (MF/UF), RO, and UV disinfection) on the SBIWTP site to produce an average recycled water supply of 15 MGD. The TDS concentration in the secondary effluent from the SBIWTP averages 1,600 mg/L. This dictates that a portion of the filtered tertiary effluent will be processed through RO, with the desalinated permeate blended with the remainder of the filtered effluent to produce recycled water that would meet the District's TDS goal of 1,000 mg/L. The RO concentrate would be diverted to the existing South Bay Land Outfall and Ocean Outfall for disposal. As indicated in conjunction with Option 1, CDPH disinfection requirements vary depending on the end use of recycled water; for some uses, disinfection may not be necessary. As with Option 1, this analysis conservatively assumes the use of full disinfection to allow the District the greatest flexibility for the sale of recycled water to potential customers. Although both chemical (e.g., chlorine) or UV disinfection are permitted under CDPH regulations, the use of UV disinfection is increasingly employed in recycled water treatment applications, including the SBWRP and the Orange County Water District's landmark Groundwater Replenishment System. In addition to being chemical-free, UV disinfection avoids the need to construct a tank or basin for chemical disinfectant contact time. As a result, UV disinfection is assumed in this evaluation.

- Construct a new recycled water pump station on the SBIWTP site.

- Construction effluent discharge piping from the SBIWTP to the deliver recycled water to the District's point of connection at Dairy Mart Road and Camino De La Plaza. These will include a 30" CMLDI pipeline and appurtenant metering and control facilities. The recycled water will continue to be delivered to the District's 450' pressure zone.

The daily average recycled water production would be 15.0 MGD. Unlike *Option 1*, the capacity of *Option 2* is not limited by the capacity of existing facilities. Sufficient secondary effluent from the SBIWTP is available to provide the full 15 MGD flow desired by the District.

Figure 3
Option 2 – Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment
Process Schematic



IV. Estimates of Probable Costs

Estimates of probable construction and annual total costs presented in Appendix A and summarized below for this "high altitude level" planning study are consistent with the *Association for Advancement of Cost Engineering (AACE)* Class 5 Order of Magnitude Estimates and are based on October 2011 dollars. However, it should be noted that estimates of probable costs do **not** include the costs for potential upsizing of the SDG&E power supply and/or potential upsizing of in-plant power distribution systems at SBIWTP or at the SBWRP.

Option 1 *– Deliver SBIWTP Secondary Effluent to the City's SBWRP*

Construction costs	$4,048,800
Pre-design costs	$106,300
Engineering costs	$424,900
Post design and CM costs	$531,100
District admin/permitting costs	$212,500
Project contingencies	$318,800
Estimate of probable capital costs**	$5,642,400
Estimate of annual capital costs (amortized)**	$491,500
Estimate of annual O&M costs**	$2,569,400
Estimate of total annual costs**	$3,060,900
Estimate of total recycled water cost**	**$590/acre-foot**

** See Appendix A for a detailed breakdown of costs

Option 2 *– Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment*

Construction costs	$37,623,500
Pre-design costs	$940,600
Engineering costs	$3,762,400
Post design and CM costs	$4,702,900
District admin/permitting costs	$1,881,200
Project contingencies	$2,821,800
Estimate of probable capital costs**	$51,732,400
Estimate of annual capital costs (amortized)**	$4,505,900
Estimate of annual O&M costs**	$6,177,500
Estimate of total annual costs**	$10,683,400
Estimate of total recycled water cost**	**$670/acre-foot**

** See Appendix "A" for detailed breakdown of costs

The **estimate of total recycled water cost** for *Option 1* represents only the costs for producing an additional 4.9 MGD of recycled water and does **not** include any associated amortized capital costs or operating costs for existing SBWRP treatment facilities upstream of the new facilities identified for *Option 1.* These estimates also do **not** include potential upsizing of SDG&E's power supply and/or upsizing of the in-plant power distribution facilities at the SBWRP. It is Malcolm Pirnie's understanding that the SBWRP is currently served from the same redundant SDG&E 12 kV feeders identified below. The discussion below in the context of Option 2 outlines potential costs to upsize SDG&E power service from 12 kV to 69 kV.

The **estimate of total recycled water cost** for *Option 2* does **not** include any associated amortized capital costs or operating costs for existing SBIWTP treatment facilities upstream of the new facilities identified for *Option 2.* These estimates also do **not** include potential upsizing of SDG&E's power supply and/or upsizing of the in-plant power distribution facilities at the SBIWTP. SDG&E provides power to the SBIWTP via a redundant 12 kV service, which is sufficient for the existing power loads for the current average design flow of 25 MGD. It is Malcolm Pirnie's understanding that this power service will need to be upsized to 69 kV to augment power loads in conjunction with the additional treatment. Based on records from Malcolm Pirnie's previous work with the IBWC, it is believed that a Memorandum of Understanding (MOU) between the IBWC and SDG&E signed in late 1995 establishes that SDG&E would upgrade to a 69 kV services at its expense ($5 million in Year 2000 dollars) when the combined City and IBWC plant loads exceed the capacity of the existing SDG&E 12 kV service. However, Malcolm Pirnie does not have a copy of the MOU and is unable to confirm this agreement.

V. Recommendations

Should the District decide to pursue either or both of the options identified in this Technical Memorandum, the following actions are recommended:

1. Option 1 assumes the use of the existing tertiary media filters at the SBWRP pretreatment prior to the RO system. The use of media filters is **not** an industry standard practice for RO system pretreatment and will need to be further evaluated to determine whether this is feasible or if more standard MF/UF technology is necessary.

2. The RO system is based on lowering TDS concentrations to produce a blended filtrate/RO permeate with a TDS concentration of 1,000 mg/L. Other constituents such as chlorides, sulfates, boron, and/or priority pollutants were not considered in this planning level study. A more detailed review and assessment of these and other constituents will need to be undertaken.

3. Consult the Regional Water Quality Control Board to obtain its preliminary opinion and requirements for the District to pursue disposal of RO concentrate to the ocean through the South Bay Land and Ocean Outfall system.

4. The SBIWTP only treats flows from Mexico, and on occasion there have been upsets at the plant. These upsets are thought to be related to constituents in the influent wastewater flows that are inhibitory to the activated sludge process. Such upsets may continue in the future and thus may impact the ability to produce an uninterrupted recycled water supply from the SBIWTP secondary effluent supply. The District should consider the impact of these potential upsets on the ability to deliver recycle water to its customers. Accordingly, it is recommended that the District conduct a detailed review of historical effluent data for the SBIWTP to assess potential constituents of concern and priority pollutants relative to the District's recycled water quality objectives.

5. Confirm the assumptions contained herein and in Appendix A.

6. Evaluate the ability of the SBWRP and SBIWTP to accommodate the additional power loads that will be required to support the new facilities identified for both options. This will required a detailed review and assessment of the existing motor control centers, power supply facilities, and power distribution facilities.

7. Request a copy of the Memorandum of Understanding signed by the IBWC and SDG&E in late 1995, and evaluate the ability of SDG&E to accommodate the additional power loads that will be required to support the new facilities identified for *Option 1* and Option 2. This will require a detailed listing or current and future power loads and consultation with SDG&E.

8. Consult with the City to obtain its preliminary opinion on both locating additional facilities on the SBWRP site and operating the additional facilities.

9. It is Malcolm Pirnie's understanding that treated water from the SBIWTP belongs to Mexico, which may require compensation in either the form of payments and/or delivery of a portion of the recycled water to Mexico at little or no cost. It is also Malcolm Pirnie's understanding that the cost for operation and maintenance of the existing SBIWTP is shared between the US and Mexico, and that Mexico's contribution towards O&M consists of both an annual payment to the US Section for volume of wastewater treated, as well as full responsibility for hauling and disposal of residual solids generated at the SBIWTP. The District should consult with the IBWC - US Section to obtain its preliminary thoughts on potentially locating and operating additional treatment facilities on the SBIWTP site, as well as on potential agreements and financial arrangements that may be required by the IBWC - US Section and the IBWC - Mexico Section to reclaim and recycle water from wastewater flows that originate in Mexico.

10. Undertake a detailed study and prepare a focused Facility Plan to address the recommendations identified above and to further develop and evaluate the options presented herein.

Appendix A:
Cost Estimates

A.1: Project Assumptions

EFFLUENT QUALITY

1. IBWC SBIWTP secondary effluent TDS = 1,600 mg/L (average for January 2011 through July 2011)
2. City's South Bay Plant tertiary effluent TDS = 933 mg/L (average for 2007, 2008, and 2009). This is not to exceed 1,000 mg/l.
3. Recycled water target TDS = 1,000 mg/L per Bob Kennedy 10/4/11 e-mail
4. Recycled water demand is 15 MGD per 9/22/11 scoping meeting with Bob Kennedy

OPTION 1: Deliver SBIWTP Secondary Effluent to City's South Bay Plant (12.9 MGD Recycled Water Production)

1. Current SBWRP peak reclaimed water production = 8 MGD (peaks for 2007, 2008, 2009)
2. City's SBWRP tertiary treatment and pumping system has firm feed capacity of 15 MGD
3. Deliver 7 MGD of SBIWTP secondary effluent to SBWRP
4. Treat 7 MGD of SBIWTP secondary effluent via SBWRP tertiary filters
5. Recovery of SBWRP tertiary filters is 92%
6. Blended effluent without RO will be as follows: [City's effluent: 8 MGD @ 933 mg/L TDS] + [SBIWTP filtered effluent: 7 MGD @ 1,600 mg/L TDS] = 15 MGD @ 1,244 mg/L
7. RO system: 98% rejection and 75% recovery
8. RO with 98% rejection of TDS and permeate flow of 2.6 MGD yields a blended finished water of 1,000 mg/L TDS
9. Size RO @ 2.6 MGD permeate
10. Combined tertiary filtrate (10.3 MGD) and RO permeate (2.6 MGD) yields 12.9 MGD
11. Utilize existing SBWRP 15 MGD UV facility
12. Size SBIWTP secondary effluent line to City's South Bay Plant for velocity of 10 fps @ 7 MGD.
    - Use 14" CMLDI pipe
    - Per Google maps install 1,530' of pipe from the SBIWTP EDS to the City's tertiary treatment facilities

OPTION 2: Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment (15.0 MGD Recycled Water Production)

1. Treat 18.4 MGD of SBITWP secondary effluent via MF/UF
2. Target finished recycled water TDS of 1,000 mg/L
3. RO system: 98% TDS rejection and 75% recovery
4. MF/UF system: 92% recovery
5. Blended effluent will be as follows: [SBIWTP MF/UF filtrate: 9.3MGD MF/UF filtrate @ 1,600 mg/L TDS] + [5.7 MGD RO permeate @ 25 mg/L TDS] = 15 MGD @ 1,000 mg/L TDS
6. Size MF/UF @ 16.9 MGD filtrate (9.3 MGD directly to UV and 7.6 MGD to RO), requiring 18.4 MGD feed

7. Size RO @ 5.7 MGD permeate, requiring 7.6 MGD feed
8. Size UV for 15 MGD
9. Size new recycled water pump station for 15 MGD
10. Size SBIWTP recycled water effluent line to District tie-in on Dairy Mart Road and Camino De La Plaza for velocity of 5 fps @ 15 MGD
    - Use 30" CMLDI pipe
    - Per Google maps install 5,690' of pipe from the SBIWTP EDS to the District Tie-in

A.2: Estimates of Probable Construction Costs

COST ASSUMPTIONS

1. Estimates based on October 2011 dollars
2. Power costs based on $0.135 per kWh per IBWC power bills
3. Costs do **not** include potential upsizing of SDG&E power supply and/or in-plant power distribution upsizing

OPTION 1: Deliver SBIWTP Secondary Effluent to City's South Bay Plant (12.9 MGD Recycled Water Production)

1. SBIWTP Secondary Effluent Pipeline to City's South Bay Plant
    - 1,530' of 14" CMDI pipe
    - use $15 per inch-foot installed
    - Installed cost:

1,530' x 14" x $15/inch-foot =	$321,300
Corrosion protection @ 7% =	$23,000
Traffic control @ 7% =	$23,000
Contingencies @ 25% =	$80,400
Conveyance costs	$447,700

2. Reverse Osmosis (RO) @ 2.6 MGD Capacity
    - Assumes 98% TDS rejection and 75% recovery
    - Manufacture installed cost @ $0.74/gpd (Includes: skid frame, pressure vessels, membranes, cartridge filters, valves, pumps, piping, instrumentation, control panel, cleaning equipment, and other associated appurtenances) = $1,924,000

Contractor P&OH @ 15% =	$291,300
Electrical & I&C @ 18% =	$346,300
Contingencies @ 25% =	$481,000
RO costs	$3,042,600

3. Sub - total estimate of probable construction costs	$3,490,300
Contractor Division 1 costs @ 10%	$349,000
Contractor Bonds & Insurance @ 6%	$209,500
Option 1 - total estimate of probable construction costs	**$4,048,800**

OPTION 2: Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment (15.0 MGD Recycled Water Production)

1. SBIWTP Recycled Water Pipeline to District tie-in on Dairy Mart Road and Camino De La Plaza
   - 5,690′ of 30″ CMDI pipe
   - use $15 per inch-foot installed
   - Installed cost:

5,690′ x 30″ x $15/inch-foot =	$2,560,500
Corrosion protection @ 5% =	$128,000
Traffic control @ 5 % =	$128,000
Contingencies @ 25% =	$640,000
Conveyance costs	$3,456,500

2. New 15 MGD Recycled Water Pump Station
   - Assume wet well similar to SBIWTP NPW PS (36′L x 18′W x 22′D)
   - Concrete quantities

Walls: 2 x (36′L x 22′D x 1.25′T)/27 =	73 cubic yards
Walls: 2 x (18′L x 22′D x 1.25′T)/27 =	37 cubic yards
Slab: 40′L x 22′W x 2′T)/27 =	65 cubic yards
Top: 36′L x 18′W x 1.5′T/27 =	36 cubic yards
Total	211 cubic yards

   - Construction Costs

Concrete: 211 cubic yards @ $900/cy =	$189,900
Contractor P&OH @ 15% =	$28,500
Excavation & Backfill @ 8% =	$15,200
Supplier services @ 4% =	$7,600
Misc metals @ 8% =	$15,200
Electrical & I&C @ 20% =	$38,000
Coatings @ 7 % =	$13,300
Contingencies @ 25% =	$47,500
Structure costs	$355,200

   - Equipment Costs

Need 6 Fairbanks Morse 6 stage vertical turbine pumps (Model 14F)
Capacity of each pump is 2,100 GPM @ 507′ TDH (5 operating)
Use 3 VFD driven pumps and 3 "soft start" constant speed pumps
Purchase price:

6 pumps @ $162,000 each =	$972,000
3 VDS @ $105,000 each =	$315,000
Purchase price	$1,287,000

Tax & Delivery @ 12.5% =	$160,900
Contractor P&OH @ 15% =	$193,100
Manufacturer services @ 4% =	$51,500
Install @ 10% =	$128,700
Piping & Valves @15% =	$193,000
Surge Protection @ 10% =	$128,700
Electrical & I&C @ 18% =	$231,700
Metering @ 5% =	$64,400
Contingencies @ 25% =	$321,800
Pumping/Piping costs	$2,760,800

3. Microfiltration / Ultrafiltration System @ 16.9 MGD Filtrate Capacity
   - Assumes 92% recovery

Manufacture installed cost @ $0.38/gpd (Includes: pressure vessels, membranes, strainers, valves, pumps, piping, instrumentation, control panel, cleaning equipment, integrity testing equipment, and other assoc. appurtenances) =	$6,440,000
Contractor P&OH @ 15% =	$966,000
Electrical & I&C @ 18% =	$1,159,200
Contingencies @ 25% =	$1,610,000
MF/UF costs	$10,175,200

4. Reverse Osmosis System @ 5.7 MGD Permeate Capacity
   - Assumes 98% TDS rejection and 75% recovery

Manufacturer installed cost @ $0.74/gpd Includes: skid frame, pressure vessels, membranes, cartridge filters, valves, pumps, piping, instrumentation, control panel, cleaning equipment, and other associated appurtenances =	$2,966,000
Contractor P&OH @ 15% =	$444,900
Electrical & I&C @ 18% =	$533,900
Contingencies @ 25% =	$741,500
RO costs	$4,686,300

5. UV Disinfection (UV) @ 15 MGD Capacity
   - Assumes 80 mJ/cm^2 dose and 65% UV transmittance
   - Based on Indianapolis Belmont UV Disinfection Facility

Total construction cost =	$11,000,000

6. Sub - total estimate of probable construction costs =	$32,434,000
Contractor Division 1 costs @ 10%	$3,243,400
Contractor bonds and insurance @ 6%	$1,946,100
Option 2 - total estimate of probable construction costs	**$37,623,500**

A.3: Estimates of Probable Capital Costs

COST ASSUMPTIONS

1. Estimates based on October 2011 dollars
2. Pre-design investigations @ 2.5%
3. Engineering costs based on 10% of construction costs
4. Post design and CM costs based on 12.5%
5. District administration and permitting costs based on 5%
6. Project contingencies based on 7.5%

OPTION 1: Deliver SBIWTP Secondary Effluent to City's South Bay Plant (12.9 MGD Recycled Water Production)

Construction costs	$4,048,800
Pre-design costs	$106,300
Engineering costs	$424,900
Post design and CM costs	$531,100
District admin/permitting costs	$212,500
Project contingencies	$318,800
Option 1 – total capital cost estimate	**$5,642,400**

OPTION 2: Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment (15.0 MGD Recycled Water Production)

Construction costs	$37,623,500
Pre-design costs	$940,600
Engineering costs	$3,762,400
Post design and CM costs	$4,702,900
District admin/permitting costs	$1,881,200
Project contingencies	$2,821,800
Option 2 - total capital cost estimate	**$51,732,400**

A.4: Estimates of Probable Annual Costs

COST ASSUMPTIONS

1. Estimates based on October 2011 dollars
2. Power costs based on $0.135 per kWh per IBWC power bills
3. Annual capital costs based 20 year amortization and 6% interest (CR factor = 0.0871)

OPTION 1: Deliver SBIWTP Secondary Effluent to City's South Bay Plant (12.9 MGD Recycled Water Production)

1. Annual capital costs $5,642,400 x 0.0871 = $491,500/year
2. RO operating costs @ $1.47/kgal) = $1,395,000/year
   Includes: power, labor, chemicals, membrane replacement, maintenance
3. Pumping costs for additional 6.9 MGD beyond the current 6 MGD average flow supplied by the City's SBWRP $852,300/year
   (2,100 HP x 24 hrs/day x 365 days/yr x 0.746 kW/HP x $0.135/kWh x 6.9 MGD/15 MGD)
4. Labor costs $322,100/year
   (1.5 operator x 12 hrs/day x $35/hr x 365 days/yr x 1.40 overhead)
5. Total annual cost estimate = $3,060,900
6. **Cost per acre-foot for 4.9 MGD additional supply = $590/acre-foot**

OPTION 2: Partial Upgrade of the SBIWTP from Secondary to Tertiary Treatment (15.0 MGD Recycled Water Production)

1. Annual capital costs $51,732,400 x 0.0871 = $4,505,900/year
2. MF/UF operating costs @ $0.12/kgal + $740,000/year
   Includes: power, labor, chemicals, membrane replacement, maintenance
3. RO operating costs @ $1.20/kgal) = $2,597,400 / year
   Includes: power, labor, chemicals, membrane replacement, maintenance
4. Pumping costs $1,852,700/year
   (2,100 HP x 24 hrs/day x 365 days/yr x 0.746 kW/HP x $0.135/kWh)
5. Labor costs $572,400/year
   (2 operator x 16 hrs/day x $35/hr x 365 days/yr x 1.40 overhead)
6. UV operating costs @ $415,000/year
7. Total annual cost estimate = $10,683,400/year
8. **Cost per acre-foot for 15 MGD $670/acre-foot**

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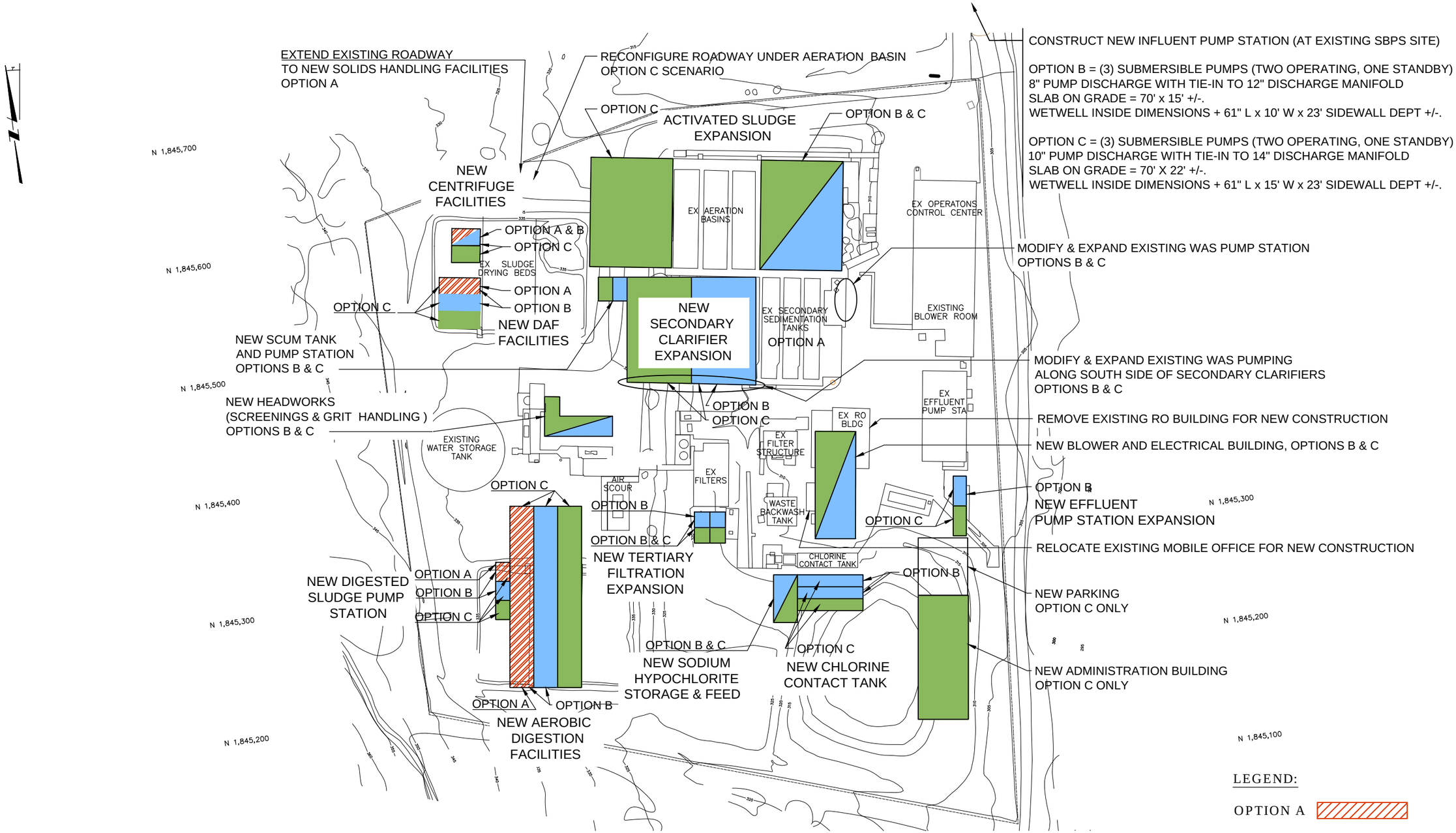
Appendix B

RWCWRF Expansion Options Site Layout



MALCOLM PIRNIE | ARCADIS

The Water Division of ARCADIS

OTAY WATER DISTRICT
2554 SWEETWATER SPRINGS BLVD. SPRING VALLEY CA

WASTEWATER MANAGEMENT PLAN
OTAY CONTRACT NUMBER; S1210-026000

UPGRADE AND EXPANSION OPTIONS FOR THE RALPH W. CHAPMAN WATER RECLAMATION FACILITY

SCALE: APPROXIMATELY 1" = 40'

ARCADIS U.S., INC.

7/25/2012

Appendix C

Technical Memorandum: Summary of Costs Associated with Upgrade, Expansion and Decommissioning of the Ralph W. Chapman Water Reclamation Facility

Technical Memorandum

Date: October 29, 2012

To: Steve Davis; ARCADIS

CC: Libby Tortorici; ARCADIS
Tim Francis; ARCADIS
Ray Fakhoury; KEH & Associates

From: Ken Hume; KEH & Associates

Subject: **Otay Water District RWCWRF Assessment of Capital Cost -
Process Upgrades, Expansions and Estimates of Probable Construction Costs for
Various Treatment Plant Capacity Options**

The following final technical memorandum is in response to the scope of work identified in our subconsultant agreement dated February 21, 2012, which supports the development of the Otay Water District Wastewater Management Plan. Review comments to the memorandum provided by ARCADIS on September 12, 2012 are addressed herein. Feedback regarding CT criteria for CA Title 22 disinfection as received on October 29, 2012 is also incorporated into this final memorandum. The information is presented in the following three major areas:

- Part A - Estimate Of Conceptual Capital Costs
- Part B - Estimate Of Additional Conceptual Power Consumption Costs
- Part C - Estimate Of Additional Conceptual Chemical Costs

Costs are broken down based on unit processes at the Ralph W. Chapman Water Recycling Facility and the alternatives identified by ARCADIS, which are summarized as follows:

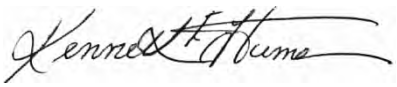
- Option A – Maintain Wastewater Treatment, do not Expand RWCWRF
- Option B – Maintain Wastewater Treatment, Expand RWCWRF To 2.6 MGD
- Option C – Maintain Wastewater Treatment, Expand RWCWRF To 3.9 MGD
- Option D – Eliminate Wastewater Treatment, Abandon RWCWRF

An executive summary provides a review of the results of the assessment discussed above. A description of assessment criteria and cost estimate accuracy is presented in the executive summary.

Thank you for the opportunity to work with your team on this important project for the Otay Water District.

Sincerely,

KEH & Associates, Inc.



Kenneth E. Hume
Principal

KEH & Associates, Inc.
2173 Salk Avenue, Suite 250
Carlsbad, CA 92008
P: 760-579-7650 F: 760-579-7651

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Executive Summary

The capital costs presented herein are based on the description of WWMP Options prepared by ARCADIS and titled "Alternatives Fact Sheets". The information presented in this Technical Memorandum is related to the Ralph W. Chapman Water Recycling Facility (RWCWRF) and Steel Bridge Pump Station, as identified under Options A through D of the Alternatives Fact Sheets as developed by ARCADIS. The information presented herein is intended to provide a general basis for management planning of wastewater infrastructure by the District. The memorandum does not include a detailed assessment of existing operations or evaluation of unit process alternatives, which would be considered a pre-design effort and not a part of the scope of this planning level assessment. The unit processes for secondary and tertiary treatment of wastewater consider expansions of existing processes at the RWCWRF, and those considered for solids handling were selected as examples of typical treatment processes employed at municipal wastewater treatment facilities in California.

Capital costs presented are derived according to the methodology presented here. All cost estimates are conceptual, and are expressed in 2012 dollars (Engineering News Record 20-Cities Average Construction Cost Index = 10285.30 Los Angeles May 2012) rounded to the nearest thousand dollars, with no allowance for inflation or financing costs.

Capital cost estimates were prepared to provide comparative order of magnitude costs for new or expanded construction of unit processes considered necessary for the RWCWRF under the options identified in the Wastewater Management Plan. These conceptual estimates, summarized in the table below, were prepared in accordance with the guidelines of the Association for the Advancement of Cost Engineering International (AACEI). According to AACEI, a Class 3 estimate is defined as follows:

“Class 3 estimates are generally prepared to form the basis for budget authorization, appropriation, and/or funding. Class 3 estimates are typically prepared to support full project funding requests, and become the first of the project phase “control estimate” against which all actual costs and resources will be monitored for variations to the budget. They are used as the project budget until replaced by more detailed estimates. In many owner organizations, a Class 3 estimate may be the last estimate required and could well form the only basis for cost/schedule control. Typical level of project definition required: 10% to 40% of full project definition.”

Recognizing the conceptual level of development undertaken to define the alternatives identified herein, it can reasonably be estimated that a 10% to 20% project definition can be assigned to the RWCWRF assessment. Given this level of project definition and using a Class 1 (final engineering) estimate accuracy for municipal wastewater treatment facilities of +5% / -3%, AACEI standards project that a Class 3 estimate would fall within an accuracy range of approximately +25% / - 15%. General contingencies were applied to each unit process estimates. It is therefore considered reasonable that actual capital costs for the unit processes identified may be expected to be between 15% higher to 10% lower than the conceptual estimates presented herein. These percentages should be viewed as statistical confidence limits, and not associated with additional project contingencies.

The probable construction cost pricing for each unit process area identified herein includes the following within the cost line items presented:

General Conditions	Subcontracted Specialty Trades
Supervision	Freight and delivery charges

Project Management	Labor
Bonds	Materials
Insurance	Equipment
Sales taxes	Overhead & Profit
Temporary facilities including utilities (power, water, and communications), field offices, storage, small tools, safety program and equipment, vehicles, fuel, and other support items required by the onsite prime/general contractor.	

A budget for interconnecting yard piping and yard electrical, miscellaneous site improvements and restoration of the general work areas (landscaping, irrigation, paving, sidewalks, etc.) is also included.

The cost estimates shown are related only to costs that would be included in a general contractor's bid for related construction work and does not include other costs such as District administration, engineering, third party construction management, environmental documentation, etc. Costs identified have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project will depend on the type of project delivery selected by the District, actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, and other factors. As a result, the final project costs will vary from estimates presented here. Because of these factors, funding needs must be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure project evaluation and adequate funding.

A summary of the conceptual capital costs presented herein is provided in the following table.

Summary of Conceptual Capital Costs for Assessment Options A, B and C

Process	Option A – 1.3 MGD	Option B – 2.6 MGD	Option C – 3.9 MGD
Influent Pump Station	$0	$1,131,928	$1,293,335
Headworks & Grit Removal	0	2,043,111	2,195,870
Aeration Basins	0	3,332,990	5,897,031
Secondary Clarifiers	0	1,964,010	3,581,601
RAS/WAS Pump Station	0	820,187	1,490,724
Scum Pump Station	0	173,323	173,323
Effluent Pump Station	0	788,179	1,542,203
Administration Building	0	0	1,039,893
Blower & Electrical Building	0	2,052,257	2,487,873
Aerobic Digestion	1,461,547	2,759,576	3,936,060
Digested Sludge Pump Station	121,111	229,215	331,281
WAS Thickening	847,504	1,578,858	2,309,062
Sludge Dewatering Centrifuge	915,458	915,458	1,747,885
Tertiary Filters (includes flocculation)	0	648,138	1,296,276
NaOCl Storage, Pumping and Chlorine Contact Tank	0	2,012,465	2,201,274
Total	$3,345,620	$20,449,695	$31,523,691

Option D as identified in the Wastewater Management Plan establishes requirements for estimate of costs associated with the abandonment, decommissioning, demolition and site restoration of the RWCWRF and SBPS. The following table presents a summary of costs for Option D.

Summary of Decommissioning and Demolition Costs of RWCWRF and SBPS

Decommissioning	$492,000
Demolition/Restoration	$3,463,800
Grand Total	$3,955,800

Additional annual power costs associated with the options identified by ARCADIS are presented in Part B of the technical memorandum. The summary of additional power costs above existing operations at 1.3 MGD ADWF is as follows:

Summary of Additional Annual Power Costs

Option A Solids Handling Facilities @ 1.3 MG ADF	$56,168
Option B – Expansion to 2.6 MGD ADF	$581,499
Option C – Expansion to 3.9 MGD ADF	$1,275,534

Additional annual chemical costs associated with the options identified by ARCADIS are presented in Part C of the technical memorandum. The summary of additional chemical costs above existing operations at 1.3 MGD ADWF is as follows:

Summary of Additional Annual Chemical Costs

Option A Solids Handling Facilities @ 1.3 MG ADF	$42,359
Option B – Expansion to 2.6 MGD ADF	$115,665
Option C – Expansion to 3.9 MGD ADF	$204,158

Some of the estimates presented herein for each unit process consider an economy of scale in assessing unit costs for areas such as equipment, ancillary support facilities, labor, concrete (common wall), electrical/I&C related systems, common excavation, general conditions, etc.

This technical memorandum identifies basic conceptual flow design assumptions and criteria for sizing of unit processing and determining scope of improvements associated with the capital improvements for the options assessed. The assumptions and criteria are not intended to be exhaustive relative to parameters that would be used to establish detailed design, rather it is meant only to provide a high level basis for sizing under each option.

Part A – Estimate of Conceptual Capital Costs

1. Influent Pump Station Sizing Criteria and Estimates of Probable Construction Costs for Various Treatment Plant Capacities

1.1. 1.3 MGD Plant Capacity – Option A

1.1.1. Sizing Criteria - Average flow: 1.3 MGD

No Influent Pump Station improvements are required for Option A. The existing facility remains in operation in its current size and condition.

1.2. 2.6 MGD Plant Capacity – Option B

1.2.1. Sizing Criteria - Average flow: 2.6 MGD

1.2.2. Influent Pump Station Preliminary Design Assumptions

- Abandon existing pump station and construct new 2.6 MGD pump station
- Assume 1 reinforced concrete pump station with wetwell inside dimensions of 61' L x 10'W x 23' SWD.
- Assume 3 submersible pumps (2 operating, 1 standby) complete with quick-release coupling and cable rail removal system.
- Assume 8" pump discharge piping into a 12" and 14" discharge manifold complete with piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

1.2.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

INFLUENT PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx.15% of Total	LS	1	147,680	147,680
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	8,600	7	60,200
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	77,280	77,280
Structural (Reinforced Concrete)					
IPS SOG	15'x70'x1.5'	CY	62	597	37,014
IPS Walls (Lower Half)	152'x13'x1.5'	CY	116	854	99,064
IPS Walls (Upper Half)	152'x10'x1.5	CY	89	705	62,745
IPS Deck & Beams	66'x12'x1'	CY	32	1,406	44,992
IPS Mechanical Area SOG	9'x68'x1'	CY	24	468	11,232

Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	2,500	2,500
Structural (Misc. Metals)					
Aluminum Access Hatches	Est. Labor + Supplier Pricing	EA	3	3,390	10,170
Hose Racks	Est. Labor + Supplier Pricing	EA	2	200	400
Mechanical					
Submersible Pumps, Bases & Guide Rails	Est. Labor + Supplier Pricing	EA	3	52,828	158,484
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	93,495	93,495
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	160,279	160,279
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	7,500	7,500
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	11,250	11,250
Subtotal					984,285
Contingencies @ 15%					147,643
Total					1,131,928

Total Option B relative estimate of probable construction costs = $1,131,928

1.3. 3.9 MGD Plant Capacity – Option C

1.3.1. Sizing Criteria - Average flow: 3.9 MGD

1.3.2. Influent Pump Station Preliminary Design Assumptions

- Abandon existing pump station and construct new 3.9 MGD pump station
- Assume 1 reinforced concrete pump station expansion with wetwell inside dimensions of 61’ L x 15’W x 23’ SWD.
- Assume 3 submersible pumps (2 operating, 1 standby) complete with quick-release coupling and cable rail removal system.
- Assume 8”-10” pump discharge piping into a 14” and 16” discharge manifold complete with piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

1.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

INFLUENT PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	147,680	147,680
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	9,600	7	67,200
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	77,280	77,280
Structural (Reinforced Concrete)					
IPS SOG	22'x70'x1.5'	CY	90	597	53,730
IPS Walls (Lower Half)	162'x13'x1.5'	CY	123	854	105,042
IPS Walls (Upper Half)	162'x10'x1.5	CY	96	705	67,680
IPS Deck & Beams	66'x12'x1'	CY	32	1,406	44,992
IPS Mechanical Area SOG	9'x68'x1'	CY	24	468	11,232
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	2,500	2,500
Structural (Misc. Metals)					
Aluminum Access Hatches	Est. Labor + Supplier Pricing	EA	3	3,390	10,170
Hose Racks	Est. Labor + Supplier Pricing	EA	2	200	400
Mechanical					
Submersible Pumps, Bases & Guide Rails	Est. Labor + Supplier Pricing	EA	3	72,828	218,484
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	103,495	103,495
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	196,004	196,004
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	7,500	7,500
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	11,250	11,250
Subtotal					1,124,639
Contingencies @ 15%					168,696
Total					1,293,335

Total Option C relative estimate of probable construction costs = $1,293,335

1.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR INFLUENT PUMP STATION

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$1,131,928
3.9 MGD	$1,293,335

2. HEADWORKS AND GRIT REMOVAL SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

2.1. 1.3 MGD PLANT CAPACITY – OPTION A

2.1.1. SIZING CRITERIA - AVERAGE FLOW: 1.3 MGD

No Headworks and Grit Removal improvements are required for Option A. The existing facility remains in operation in its current size and condition.

2.2. 2.6 MGD PLANT CAPACITY – OPTION B

2.2.1. SIZING CRITERIA - AVERAGE FLOW: 2.6 MGD

2.2.2. HEADWORKS AND GRIT REMOVAL PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 reinforced concrete structure with overall dimensions of 55’-4” L x 18’W x 11’ D including parallel 4’ channels, two 8’ diameter grit collection tanks, and 1 grit dewatering equipment pad.
- Assume 1 mechanical climber screen and 1 manual bar rack screen in parallel channels.
- Assume 1 screenings screw conveyor with discharge chute.
- Assume 2 grit removal systems including grit pumps and grit dewatering cyclones.
- Assume 4 slide gates for parallel channel flow control.
- Assume 4”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

2.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

HEADWORKS & GRIT REMOVAL – PROBABLE CONSTRUCTION COSTS

Description	Dimensions / Notes	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	276,616	276,616
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	800	9	7,200
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	112,250	112,250
Structural (Reinforced Concrete)					
Grit Tank Sump SOG	14' Diam x 1' (2 Each)	CY	18	481	8,658
Grit Tank Sump Walls	6' Diam x 6' x 1' (2 Each)	CY	10	1,144	11,440
Grit Tank Main Body Slab	10' Diam x 1' (2 Each)	CY	10	766	7,660
Grit Tank Main Body Walls	9' Diam x 12.5' x 1' (2 Each)	CY	32	1,280	40,960
Grit Tank Main Body Deck	12' Diam x 1' (2 Each)	CY	10	1,237	12,370
Headworks SOG (Section 1)	58' x 11' x 8"	CY	18	554	9,972
Headworks SOG (Section 2)	58' x 11' x 8"	CY	18	554	9,972

Headworks Walls (Section 1)	92' x 11' x 1'	CY	40	1,115	44,600
Headworks Walls (Section 2)	92' x 11' x 1'	CY	40	1,115	44,600
Headworks Deck (Partial)	120 SF x 8"	CY	4	1,721	6,884
Grit Cyclone SOG	14' x 28' x 1' (2 Each)	CY	30	667	20,010
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	3,000	3,000
Structural (Misc. Metals)					
Aluminum Checker Plate	Est. Labor + Supplier Pricing	SF	127	60	7,620
Manual Bar Rack & Supports	Est. Labor + Supplier Pricing	EA	1	32,075	32,075
Aluminum Access Hatches	Est. Labor + Supplier Pricing	EA	2	1,365	2,730
Hose Racks	Est. Labor + Supplier Pricing	EA	2	200	400
Mechanical					
Mechanical Bar/Climber Screen Equipment	Est. Labor + Supplier Pricing	EA	1	130,605	130,605
Screw Conveyor & Discharge Chute	Est. Labor + Supplier Pricing	EA	1	129,330	129,330
Grit Pump	Est. Labor + Supplier Pricing	EA	2	77,183	154,366
Grit Dewatering Cyclone	Est. Labor + Supplier Pricing	EA	2	107,468	214,936
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	4	15,592	62,368
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	78,653	78,653
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	249,900	301,843
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	18,000	18,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	27,500	27,500
Subtotal					1,776,618
Contingencies @ 15%					266,493
Total					2,043,111

Total Option B relative estimate of probable construction costs = $2,043,111

2.3. 3.9 MGD Plant Capacity – Option C

2.3.1. Sizing Criteria - Average flow: 3.9 MGD

2.3.2. Headworks and Grit Removal Preliminary Design Assumptions

- Assume 1 reinforced concrete structure with overall dimensions of 55’-4” L x 18’W x 11’ D including parallel 5’ channels, two 10’ diameter grit collection tanks, and 1 grit dewatering equipment pad.
- Assume 1 mechanical climber screen and 1 manual bar rack screen in parallel channels.
- Assume 1 screenings screw conveyor with discharge chute.
- Assume 2 grit removal systems including grit pumps and grit dewatering cyclones.
- Assume 4 slide gates for parallel channel flow control.
- Assume 4”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

2.3.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

HEADWORKS & GRIT REMOVAL – PROBABLE CONSTRUCTION COSTS

Description	Dimensions / Notes	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	276,616	276,616
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	1,500	9	13,500
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	112,250	112,250
Structural (Reinforced Concrete)					
Grit Tank Sump SOG	16' Diam x 1' (2 Each)	CY	24	481	11,544
Grit Tank Sump Walls	8' Diam x 6' x 1' (2 Each)	CY	14	1,144	16,016
Grit Tank Main Body Slab	12' Diam x 1' (2 Each)	CY	14	766	10,724
Grit Tank Main Body Walls	11' Diam x 12.5' x 1' (2 Each)	CY	36	1,280	46,080
Grit Tank Main Body Deck	12' Diam x 1' (2 Each)	CY	14	1,237	17,318
Headworks SOG (Section 1)	58' x 14' x 8"	CY	23	554	12,742
Headworks SOG (Section 2)	58' x 14' x 8"	CY	23	554	12,742
Headworks Walls (Section 1)	92' x 14' x 1'	CY	45	1,115	50,175
Headworks Walls (Section 2)	92' x 14' x 1'	CY	45	1,115	50,175
Headworks Deck (Partial)	120 SF x 8"	CY	4	1,721	6,884
Grit Cyclone SOG	14' x 28' x 1' (2 Each)	CY	30	667	20,010
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	3,000	3,000
Structural (Misc. Metals)					
Aluminum Checker Plate	Est. Labor + Supplier Pricing	SF	160	60	9,600
Manual Bar Rack & Supports	Est. Labor + Supplier Pricing	EA	1	42,075	42,075
Aluminum Access Hatches	Est. Labor + Supplier Pricing	EA	2	2,500	5,000
Hose Racks	Est. Labor + Supplier Pricing	EA	2	200	400
Mechanical					
Mechanical Bar/Climber Screen Equipment	Est. Labor + Supplier Pricing	EA	1	175,605	175,605
Screw Conveyor & Discharge Chute	Est. Labor + Supplier Pricing	EA	1	159,330	159,330
Grit Pump	Est. Labor + Supplier Pricing	EA	2	77,183	154,366
Grit Dewatering Cyclone	Est. Labor + Supplier Pricing	EA	2	107,468	214,936
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	4	15,592	62,368
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	78,653	78,653
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	343,701	301,843

Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	18,000	18,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	27,500	27,500
Subtotal					1,909,452
Contingencies @ 15%					286,418
Total					2,195,870

Total Option C relative estimate of probable construction costs = $2,195,870

2.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR HEADWORKS AND GRIT REMOVAL

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$2,043,111
3.9 MGD	$2,195,870

3. AERATION BASIN SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

3.1. 1.3 MGD PLANT CAPACITY – OPTION A

3.1.1. SIZING CRITERIA - AVERAGE FLOW: 1.3 MGD

No Aeration Basin improvements are required for Option A. The existing facility remains in operation in its current size and condition.

3.2. 2.6 MGD PLANT CAPACITY – OPTION B

3.2.1. SIZING CRITERIA - AVERAGE FLOW: 2.6 MGD

3.2.2. AERATION BASINS PRELIMINARY DESIGN ASSUMPTIONS

- Assume 2 reinforced concrete structures with total overall dimensions of 152’-4” L x 83’-6 W x 18’ D (inside dimensions of 150’ L x 30’ W x 18’ D each basin) including interior zone dividing walls, influent and effluent channels, and access walkways.
- Assume 4 portable submersible mixers for use in the preanoxic and postanoxic zones (16 locations prepared with supports and mounting hardware).
- Assume fine bubble aeration equipment including headers, diffusers and valving in both basins.
- Assume sluice gates and slide gates for influent and effluent channel flow control.
- Assume 8”-16” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

3.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars

- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

AERATION BASINS – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	455,620	455,620
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	2,800	9	25,200
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	225,926	225,926
Structural (Reinforced Concrete)					
18" Slab On Grade (Center Section 1-4)	15.5' x 25' x 1.5' (4 Each)	CY	90	551	49,590
18" Slab On Grade (Section 5-6)	15.5' x 27.17' x 1.5' (2 Each)	CY	50	509	25,450
18" Slab On Grade (Outer Section 1-8)	25' x 25' x 1.5' (8 Each)	CY	292	495	144,540
18" Slab On Grade (Outer Section 9-12)	25' x 27.17' x 1.5' (4 Each)	CY	159	449	71,391
Walls - 18' Center Dividing (Section 1-6)	181' x 18' x1.17'	CY	152	927	140,904
Walls - 18' Exterior (Section 1-8)	300' x 18' x 1.17'	CY	245	927	227,115
Walls - 18' Exterior (Section 9-12)	110' x 18' x 1.17'	CY	90	920	82,800
Walls - 15' Interior Zones (Section 1-4)	96' x 15' x 1'	CY	56	1,074	60,144
Center Walkway (Section 1-6)	173' x 4' x 6"	CY	17	2,115	35,955
Exterior Walkways (Section 1-8)	250' x 4' x 6"	CY	25	2,175	54,375
Infl Inlet Box Ftg & Support Wall	16.5' x 9' x 1'	CY	6	1,240	7,440
Infl Inlet Box Deck Slab (Section 1)	14' x 16' x 1'	CY	9	1,365	12,285
Infl Inlet Box Walls (Section 1)	36' x 9' x 1'	CY	13	1,053	13,689
Influent Channel Deck Slab	64' x 5' x 6"	CY	13	1,374	17,862
Influent Channel Walls	74' x 9' x 1'	CY	26	1,045	27,170
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	5,000	5,000
Structural (Misc. Metals)					
Checker Plate	Est. Labor + Supplier Pricing	SF	380	42	15,960
Stairs	Est. Labor + Supplier Pricing	EA	1	5,940	5,940
Handrails	Est. Labor + Supplier Pricing	LF	1,030	55	56,650
Precast Vault & Hatch	Est. Labor + Supplier Pricing	EA	1	6,960	6,960
Hose Racks	Est. Labor + Supplier Pricing	EA	6	270	1,620
					87,130
Mechanical					
Submersible Mixers	Est. Labor + Supplier Pricing	EA	4	31,448	125,792
MLSS Return Pumps & Piping	Est. Labor + Supplier Pricing	EA	2	50,000	100,000
Fine Bubble Aeration Equipment	Est. Labor + Supplier Pricing	EA	2	81,192	162,384
C.I. Sluice Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	2	6,990	13,980
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	2	6,825	13,650
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	170,154	170,154
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	497,250	497,250
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	31,500	31,500

Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	27,000	27,000
Subtotal					2,911,296
Contingencies @ 15%					421,694
Total					3,332,990

Total Option B relative estimate of probable construction costs = $3,332,990

3.3. 3.9 MGD Plant Capacity – Option C

3.3.1. Sizing Criteria - Average flow: 3.9 MGD

3.3.2. Aeration Basins Preliminary Design Assumptions

- Assume 4 reinforced concrete structures with total overall dimensions of 152’-4” L x 83’-6 W x 18’ D (inside dimensions of 150’ L x 30’ W x 18’ D each basin) including interior zone dividing walls, influent and effluent channels, and access walkways.
- Assume 8 portable submersible mixers for use in the preanoxic and postanoxic zones (32 locations prepared with supports and mounting hardware).
- Assume 4 MLSS Return Pumps, 1 per aeration pass
- Assume fine bubble aeration equipment including headers, diffusers and valving in both basins.
- Assume sluice gates and slide gates for influent and effluent channel flow control.
- Assume 8”-16” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

3.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

AERATION BASINS – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	455,620	455,620
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	5,600	9	50,400
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	305,000	305,000
Structural (Reinforced Concrete)					
18" Slab On Grade (Center Section 1-4)	15.5' x 25' x 1.5' (8 Each)	CY	180	551	99,180
18" Slab On Grade (Section 5-6)	15.5' x 27.17' x 1.5' (4 Each)	CY	100	509	50,900
18" Slab On Grade (Outer Section 1-8)	25' x 25' x 1.5' (16 Each)	CY	584	495	289,080

18" Slab On Grade (Outer Section 9-12)	25' x 27.17' x 1.5' (8 Each)	CY	318	449	142,782
Walls - 18' Center Dividing (Section 1-6)	181' x 18' x1.17' (2 Each)	CY	304	927	281,808
Walls - 18' Exterior (Section 1-8)	300' x 18' x 1.17' (2 Each)	CY	490	927	454,230
Walls - 18' Exterior (Section 9-12)	110' x 18' x 1.17' (2 Each)	CY	180	920	165,600
Walls - 15' Interior Zones (Section 1-4)	96' x 15' x 1' (2 Each)	CY	112	1,074	120,288
Center Walkway (Section 1-6)	173' x 4' x 6" (2 Each)	CY	34	2,115	71,910
Exterior Walkways (Section 1-8)	250' x 4' x 6" (2 Each)	CY	50	2,175	108,750
Infl Inlet Box Ftg & Support Wall	16.5' x 9' x 1' (2 Each)	CY	12	1,240	14,880
Infl Inlet Box Deck Slab (Section 1)	14' x 16' x 1' (2 Each)	CY	18	1,365	24,570
Infl Inlet Box Walls (Section 1)	36' x 9' x 1' (2 Each)	CY	26	1,053	27,378
Influent Channel Deck Slab	64' x 5' x 6" (2 Each)	CY	26	1,374	35,724
Influent Channel Walls	74' x 9' x 1' (2 Each)	CY	52	1,045	54,340
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	10,000	10,000
Structural (Misc. Metals)					
Checker Plate	Est. Labor + Supplier Pricing	SF	720	42	30,240
Stairs	Est. Labor + Supplier Pricing	EA	2	5,940	11,880
Handrails	Est. Labor + Supplier Pricing	LF	2,060	55	113,300
Precast Vault & Hatch	Est. Labor + Supplier Pricing	EA	2	6,960	13,920
Hose Racks	Est. Labor + Supplier Pricing	EA	12	270	3,240
Mechanical					
Submersible Mixers	Est. Labor + Supplier Pricing	EA	8	31,448	251,584
MLSS Return Pumps & Piping	Est. Labor + Supplier Pricing	EA	4	50,000	200,000
Fine Bubble Aeration Equipment	Est. Labor + Supplier Pricing	EA	4	81,192	324,768
C.I. Sluice Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	4	6,990	27,960
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	4	6,825	27,300
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	2	170,154	340,308
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	2	465,000	930,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	2	31,500	63,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	2	27,000	54,000
Subtotal					5,153,940
Contingencies @ 15%					743,091
Total					5,897,031

Total Option C relative estimate of probable construction costs = $5,897,031

3.4. ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR AERATION BASINS

Plant Capacity	Estimate of Probable Construction Costs**
1.3 MGD	No Improvements Required

2.6 MGD	$3,332,990
3.9 MGD	$5,897,031

4. SECONDARY CLARIFIERS SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

4.1. 1.3 MGD PLANT CAPACITY – OPTION A

4.1.1. SIZING CRITERIA - AVERAGE FLOW: 1.3 MGD

No Secondary Clarifier improvements are required for Option A. The existing facility remains in operation in its current size and condition.

4.2. 2.6 MGD PLANT CAPACITY – OPTION B

4.2.1. SIZING CRITERIA - AVERAGE FLOW: 2.6 MGD

4.2.2. SECONDARY CLARIFIERS PRELIMINARY DESIGN ASSUMPTIONS

- Assume 2 reinforced concrete structures with total overall dimensions of 96’-5” L x 43’-6 W x 15’ D (inside dimensions of 94’ L x 20’ W x 15’ D each basin) including influent and effluent channels, hoppers and access walkways.
- Assume chain and flight sludge collection equipment in each basin.
- Assume rotating scum collection equipment in each basin.
- Assume FRL launders, weirs and supports in the effluent end of each basin.
- Assume slide gates for influent and effluent channel flow control.
- Assume 6”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

4.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

SECONDARY CLARIFIERS – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	265,300	265,300
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	1,520	9	13,680
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	141,230	141,230
Structural (Reinforced Concrete)					
Sludge Hopper SOG (Section 1)	6' x 11' x 1'	CY	4	759	3,036
Sludge Hopper SOG (Section 2)	11' x 20' x 1.5' (2 Each)	CY	26	536	13,936
Center Div. Wall SOG (Section 1-4)	6' x 21.6' x 1.5' (4 each)	CY	31	698	21,638
Main Slab On Grade (Section 1-8)	20' x 21.6' x 1.5' (8 Each)	CY	202	491	99,182

Walls- Interior Div. (Section 1)	16' x 20' x 1.5'	CY	18	854	15,372
Walls- Interior Div. (Section 2-5)	93' x 15' x 1.17'	CY	64	939	60,096
Walls - Exterior (Section 1-2)	62' x 20' x 1.17'	CY	57	942	53,694
Walls - Exterior (Section 3-10)	216' x 15' x 1.17'	CY	146	933	136,218
Deck - Infl Channel Invert (Section 1-3)	43.5' x 5' x 1'	CY	9	1,198	10,782
Walls - Infl Channel (Section 1-3)	54' x 6' x 1'	CY	13	1,168	15,184
Deck - Effl Channel Invert (Section 1-3)	43.5' x 5' x 1'	CY	9	1,198	10,782
Walls - Effl Channel (Section 1-3)	54' x 8' x 1'	CY	17	1,153	19,601
Center Walkway (Section 1-5)	97' x 5' x 6"	CY	12	2,097	25,164
Effl Drop Box Slab at Effl Channel	5' x 5'	CY	2	979	1,958
Effl Drop Box Walls at Effl Channel	20' x 6' x 1'	CY	5	1,143	5,715
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	5,000	5,000
Structural (Misc. Metals)					
Aluminum Grating	Est. Labor + Supplier Pricing	SF	328	51	16,728
Stairs	Est. Labor + Supplier Pricing	EA	1	6,645	6,645
Handrails	Est. Labor + Supplier Pricing	LF	530	55	29,150
Hose Racks	Est. Labor + Supplier Pricing	EA	6	270	1,620
Mechanical					
Sludge Collection Equipment	Est. Labor + Supplier Pricing	EA	2	88,222	176,444
Rotating Scum Troughs	Est. Labor + Supplier Pricing	EA	2	20,700	41,400
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	8	10,425	83,400
FRP Weirs, Launders & Supports	Est. Labor + Supplier Pricing	EA	4	18,630	74,520
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	15,360	15,360
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	301,500	301,500
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	21,000	21,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	22,500	22,500
Subtotal					1,707,835
Contingencies @ 15%					256,175
Total					1,964,010

Total Option B relative estimate of probable construction costs = $1,964,010

4.3. 3.9 MGD Plant Capacity – Option C

4.3.1. Sizing Criteria - Average flow: 3.9 MGD

4.3.2. Secondary Clarifiers Preliminary Design Assumptions

- Assume 4 reinforced concrete structures with total overall dimensions of 96’-5” L x 43’-6 W x 15’ D (inside dimensions of 94’ L x 20’ W x 15’ D each basin) including influent and effluent channels, hoppers and access walkways.
- Assume chain and flight sludge collection equipment in each basin.

- Assume rotating scum collection equipment in each basin.
- Assume FRL launders, weirs and supports in the effluent end of each basin.
- Assume slide gates for influent and effluent channel flow control.
- Assume 6”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

4.3.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

SECONDARY CLARIFIERS – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	265,300	265,300
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	3,040	9	27,360
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	2	141,230	282,460
Structural (Reinforced Concrete)					
Sludge Hopper SOG (Section 1)	6' x 11' x 1' (2 Each)	CY	8	759	6,072
Sludge Hopper SOG (Section 2)	11' x 20' x 1.5' (4 Each)	CY	52	536	27,872
Center Div. Wall SOG (Section 1-4)	6' x 21.6' x 1.5' (8 each)	CY	62	698	43,276
Main Slab On Grade (Section 1-8)	20' x 21.6' x 1.5' (16 Each)	CY	404	491	198,364
Walls- Interior Div. (Section 1)	16' x 20' x 1.5' (2 Each)	CY	36	854	30,744
Walls- Interior Div. (Section 2-5)	93' x 15' x 1.17' (2 Each)	CY	128	939	120,192
Walls - Exterior (Section 1-2)	62' x 20' x 1.17' (2 Each)	CY	114	942	107,388
Walls - Exterior (Section 3-10)	216' x 15' x 1.17' (2 Each)	CY	292	933	272,436
Deck - Infl Channel Invert (Section 1-3)	43.5' x 5' x 1' (2 Each)	CY	18	1,198	21,564
Walls - Infl Channel (Section 1-3)	54' x 6' x 1' (2 each)	CY	26	1,168	30,368
Deck - Effl Channel Invert (Section 1-3)	43.5' x 5' x 1' (2 Each)	CY	18	1,198	21,564
Walls - Effl Channel (Section 1-3)	54' x 8' x 1' (2 Each)	CY	34	1,153	39,202
Center Walkway (Section 1-5)	97' x 5' x 6" (2 Each)	CY	24	2,097	50,328
Effl Drop Box Slab at Effl Channel	5' x 5' (2 Each)	CY	4	979	3,916
Effl Drop Box Walls at Effl Channel	20' x 6' x 1' (2 each)	CY	10	1,143	11,430
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	2	5,000	10,000
Structural (Misc. Metals)					
Aluminum Grating	Est. Labor + Supplier Pricing	SF	656	51	33,456
Stairs	Est. Labor + Supplier Pricing	EA	2	6,645	13,290
Handrails	Est. Labor + Supplier Pricing	LF	1,060	55	58,300
Hose Racks	Est. Labor + Supplier Pricing	EA	12	270	3,240
Mechanical					
Sludge Collection Equipment	Est. Labor + Supplier Pricing	EA	4	88,222	352,888

Rotating Scum Troughs	Est. Labor + Supplier Pricing	EA	4	20,700	82,800
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	16	10,425	166,800
FRP Weirs, Launders & Supports	Est. Labor + Supplier Pricing	EA	8	18,630	149,040
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	2	15,360	30,720
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	2	283,533	567,066
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	2	21,000	42,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	2	22,500	45,000
Subtotal					3,114,436
Contingencies @ 15%					467,165
Total					3,581,601

Total Option C relative estimate of probable construction cost = $3,581,601

4.4. ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR SECONDARY CLARIFIERS

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$1,964,010
3.9 MGD	$3,581,601

5. RAS/WAS PUMP STATION SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

5.1. 1.3 MGD PLANT CAPACITY – OPTION A

5.1.1. SIZING CRITERIA - AVERAGE FLOW: 1.3 MGD

No RAS/WAS Pump Station improvements are required for Option A. The existing facility remains in operation in its current size and condition.

5.2. 2.6 MGD PLANT CAPACITY – OPTION B

5.2.1. SIZING CRITERIA - AVERAGE FLOW: 2.6 MGD

5.2.2. RAS/WAS PUMP STATION PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 reinforced concrete dry-pit pump station structure with inside dimensions of 41-2” L x 26’-10” W x 20’ D including stairs and pump foundations.
- Assume 3 horizontal centrifugal or progressive cavity skid-mounted RAS pumps & motors.
- Assume 2 horizontal centrifugal or progressive cavity skid-mounted WAS pumps & motors.
- Assume 1 duplex submersible drain pump system.
- Assume 4”-12” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

5.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

RAS/WAS PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	110,530	110,530
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	600	9	5,400
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	63,434	63,434
Structural (Reinforced Concrete)					
RAS/WAS 18" SOG (Section 1-4)	16.25' x 23' x 1.5' (4 Each)	CY	88	544	47,872
RAS/WAS Exterior Walls (Section 1-2)	104' x 20' x 1.17'	CY	95	1,160	110,200
Structural (Misc. Metals)					
Aluminum Grating	Est. Labor + Supplier Pricing	SF	50	49	2,450
Stairs	Est. Labor + Supplier Pricing	EA	1	14,760	14,760
Handrails	Est. Labor + Supplier Pricing	LF	80	55	4,400
Hose Racks	Est. Labor + Supplier Pricing	EA	2	270	540
Mechanical					
RAS Pumps & Motors	Est. Labor + Supplier Pricing	EA	3	16,710	50,130
WAS Pumps & Motors	Est. Labor + Supplier Pricing	EA	2	12,810	25,620
Drain Submersible Duplex Pump	Est. Labor + Supplier Pricing	EA	1	7,470	7,470
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	128,100	128,100
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	124,800	124,800
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	10,000	10,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	7,500	7,500
Subtotal					713,206
Contingencies @ 15%					106,981
Total					820,187

Total Option B relative estimate of probable construction costs = $820,187

5.3. 3.9 MGD Plant Capacity – Option C

5.3.1. Sizing Criteria – Average flow: 3.9 MGD

5.3.2. RAS/WAS Pump Station Preliminary Design Assumptions

- Assume 1 reinforced concrete dry-pit pump station structure with inside dimensions of 82-4" L x 26'-10" W x 20' D including stairs and pump foundations.
- Assume 6 horizontal centrifugal or progressive cavity skid-mounted RAS pumps & motors.
- Assume 4 horizontal centrifugal or progressive cavity skid-mounted WAS pumps & motors.
- Assume 2 duplex submersible drain pump system.
- Assume 4"-12" interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

5.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

RAS/WAS PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	110,530	110,530
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	1,200	9	10,800
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	2	63,434	126,868
Structural (Reinforced Concrete)					
RAS/WAS 18" SOG (Section 1-4)	16.25' x 23' x 1.5' (8 Each)	CY	176	544	95,744
RAS/WAS Exterior Walls (Section 1-2)	104' x 20' x 1.17' (2 Each)	CY	190	1,160	220,400
Structural (Misc. Metals)					
Aluminum Grating	Est. Labor + Supplier Pricing	SF	100	49	4,900
Stairs	Est. Labor + Supplier Pricing	EA	2	14,760	29,520
Handrails	Est. Labor + Supplier Pricing	LF	160	55	8,800
Hose Racks	Est. Labor + Supplier Pricing	EA	4	270	1,080
Mechanical					
RAS Pumps & Motors	Est. Labor + Supplier Pricing	EA	6	16,710	100,260

WAS Pumps & Motors	Est. Labor + Supplier Pricing	EA	4	12,810	51,240
Drain Submersible Duplex Pump	Est. Labor + Supplier Pricing	EA	2	7,470	14,940
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	2	128,100	256,200
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	2	115,000	230,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	2	10,000	20,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	2	7,500	15,000
Subtotal					1,296,282
Contingencies @ 15%					194,442
Total					1,490,724

Total Option C relative estimate of probable construction cost = $1,490,724

5.3.4. ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR RAS/WAS PUMP STATION

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvement Required
2.6 MGD	$820,187
3.9 MGD	$1,490,724

6. AEROBIC DIGESTION SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

6.1. MGD PLANT CAPACITY – OPTION A

6.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

- Thickened WAS (TWAS) production at 1.3 MGD Capacity
- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project*
- Pounds TWAS total solids per day = 2,730 lbs TSS/day
- Gallons per day (assume TWAS @ 4.0% TSS) = 8,100 GPD
- Aerobic Digester Capacity
- Detention time @ 40 days to meet “Class B” requirements
- Digester volume required for 40 day detention time is 324,000 active gallons (43,300 cu. Ft.)

6.1.2. AEROBIC DIGESTER PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 reinforced concrete structures with total overall dimensions of 152’ L x 23-6” W x 18’ D (divided into 3 tanks with inside dimensions of 49’-4” L x 19-6’ W x 15’SWD) including access walkways (T-walkways).
- Assume 1 reinforced concrete pad for digester aeration air blowers.
- Assume coarse bubble aeration equipment in each of the three tanks.
- Assume 2 positive displace blowers (1operational, 1 standby)
- Assume 1 telescoping valve in each of the three tanks.
- Assume 4”-16” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

6.1.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 1.3 MGD (approximate) water reclamation facility within the State of California.

AEROBIC DIGESTER – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	183,033	183,033
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	1,500	9	13,500
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	87,250	87,250
Structural (Reinforced Concrete)					
18" SOG (Section 1-4)	25' x 27.17' x 1.5' (4 Each)	CY	159	564	89,676
18" SOG (Section 5-6)	27' x 27.17' x 1.5' (2 Each)	CY	85	443	37,655
Walls - Exterior (Section 1-6)	207' x 18' x 1.17'	CY	170	922	156,740
Walls - Exterior (Section 3-5)	55' x 18' x 1.17'	CY	45	922	41,490
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	4,000	4,000
PD Blower SOG	25' x 25' x 1.5' (1 Each)	CY	37	443	16,391
Structural (Misc. Metals)					
Handrails	Est. Labor + Supplier Pricing	LF	120	55	6,600
Hose Racks	Est. Labor + Supplier Pricing	EA	4	300	1,200
Mechanical					
Telescoping Valves	Est. Labor + Supplier Pricing	EA	3	4,980	14,940
Coarse Bubble Aeration Equipment	Est. Labor + Supplier Pricing	EA	3	44,059	132,177
Positive Displacement Blowers	Est. Labor + Supplier Pricing	EA	2	50,000	100,000
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	124,554	124,554
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	223,204	223,204
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	13,000	13,000

Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	25,500	25,500
Subtotal					1,270,910
Contingencies @ 15%					190,637
Total					1,461,547

Total Option A relative estimate of probable construction costs = $1,461,547

6.2. 2.6 MGD Plant Capacity – Option B

6.2.1. Sizing Criteria – Average flow: 2.6 MGD

- Thickened WAS (TWAS) production at 2.6 MGD Capacity
- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project*
- Pounds TWAS total solids per day = 5469 lbs TSS/day
- Gallons per day (assume TWAS @ 4.0% TSS) = 16,200 GPD
- Aerobic Digester Capacity
- Detention time @ 40 days to meet "Class B" requirements
- Digester volume required for 40 day detention time is 648,000 active gallons

6.2.2. Aerobic Digester Preliminary Design Assumptions

- Assume 2 reinforced concrete structures with total overall dimensions of 152'-4" L x 20'-2" W x 18' D (each divided into 3 tanks with inside dimensions of 49'-4" L x 27' W x 18' D) including access walkways.
- Assume 1 reinforced concrete pad for digester aeration air blowers.
- Assume coarse bubble aeration equipment in each of the three tanks in each digester.
- Assume 3 positive displace blowers (2 operational, 1 standby)
- Assume 1 telescoping valve in each of the three tanks in each digester.
- Assume 4"-16" interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

6.2.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

AEROBIC DIGESTER – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	289,085	289,085

Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	3,000	9	27,000
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	174,500	174,500
Structural (Reinforced Concrete)					
18" SOG (Section 1-4)	25' x 27.17' x 1.5' (8 Each)	CY	318	564	179,352
18" SOG (Section 5-6)	27' x 27.17' x 1.5' (4 Each)	CY	170	443	75,310
Walls - Exterior (Section 1-6)	207' x 18' x 1.17' (2 Each)	CY	340	922	313,480
Walls - Exterior (Section 3-5)	55' x 18' x 1.17' (2 Each)	CY	90	922	82,980
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	2	4,000	8,000
PD Blower SOG	25' x 25' x 1.5' (2 Each)	CY	74	443	32,782
Structural (Misc. Metals)					
Handrails	Est. Labor + Supplier Pricing	LF	240	55	13,200
Hose Racks	Est. Labor + Supplier Pricing	EA	8	300	2,400
Mechanical					
Telescoping Valves	Est. Labor + Supplier Pricing	EA	6	4,980	29,880
Coarse Bubble Aeration Equipment	Est. Labor + Supplier Pricing	EA	6	44,059	264,354
Positive Displacement Blowers	Est. Labor + Supplier Pricing	EA	3	50,000	150,000
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	2	124,554	249,108
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	EA	2	215,600	431,200
Testing, Start-Up & Commissioning	Average 1.25% of Total	EA	2	13,000	26,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	EA	2	25,500	51,000
Subtotal					2,399,631
Contingencies @ 15%					359,945
Total					2,759,576

Total Option B relative estimate of probable construction cost = $2,759,576

6.3. 3.9 MGD Plant Capacity – Option C

6.3.1. Sizing Criteria – Average flow: 3.9 MGD

- Thickened WAS (TWAS) production at 3.9 MGD Capacity
- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project*
- Pounds TWAS total solids per day = 8,190 lbs TSS/day
- Gallons per day (assume TWAS @ 4.0% TSS) = 24,300 GPD
- Aerobic Digester Capacity
- Detention time @ 40 days to meet "Class B" requirements
- Digester volume required for 40 day detention time is 972,000 active gallons

6.3.2. Aerobic Digester Preliminary Design Assumptions

- Assume 3 reinforced concrete structures with total overall dimensions of 152'-4" L x 20'-2" W x 18' D (each divided into 3 tanks with inside dimensions of 49'-4" L x 27' W x 18' D) including access walkways.
- Assume 1 reinforced concrete pad for digester aeration air blowers.
- Assume coarse bubble aeration equipment in each of the three tanks in each digester.
- Assume 4 positive displace blowers (3 operational, 1 standby)
- Assume 1 telescoping valve in each of the three tanks in each digester.
- Assume 4"-16" interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

6.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

AEROBIC DIGESTER – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	329,085	329,085
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	4,500	9	40,500
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	261,750	261,750
Structural (Reinforced Concrete)					
18" SOG (Section 1-4)	25' x 27.17' x 1.5' (12 Each)	CY	477	564	269,028
18" SOG (Section 5-6)	27' x 27.17' x 1.5' (6 Each)	CY	255	443	112,965

Walls - Exterior (Section 1-6)	207' x 18' x 1.17' (3 Each)	CY	510	922	470,220
Walls - Exterior (Section 3-5)	55' x 18' x 1.17' (3 Each)	CY	135	922	124,470
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	3	4,000	12,000
PD Blower SOG	25' x 25' x 1.5' (3 Each)	CY	110	443	48,730
Structural (Misc. Metals)					
Handrails	Est. Labor + Supplier Pricing	LF	360	55	19,800
Hose Racks	Est. Labor + Supplier Pricing	EA	12	300	3,600
Mechanical					
Telescoping Valves	Est. Labor + Supplier Pricing	EA	9	4,980	44,820
Coarse Bubble Aeration Equipment	Est. Labor + Supplier Pricing	EA	9	44,059	396,531
Positive Displacement Blowers	Est. Labor + Supplier Pricing	EA	4	50,000	200,000
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	3	124,554	373,662
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	EA	3	200,000	600,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	EA	3	13,000	39,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	EA	3	25,500	76,500
Subtotal					3,422,661
Contingencies @ 15%					513,399
Total					3,936,060

Total Option C relative estimate of probable construction cost = $3,936,060

6.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR AEROBIC DIGESTION

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	$1,461,547
2.6 MGD	$2,759,576
3.9 MGD	$3,936,060

7. DIGESTED SLUDGE PUMP STATION SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

7.1. MGD PLANT CAPACITY – OPTION A

7.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

7.1.2. DIGESTED SLUDGE PUMP STATION PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 reinforced concrete slab with total overall dimensions of 16’ L x 12’ W x 1’ T.
- Assume 2 horizontal centrifugal or progressive cavity skid-mounted pumps & motors.
- Assume 6”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

7.1.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 1.3 MGD (approximate) water reclamation facility within the State of California.

DIGESTED SLUDGE PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	15,311	15,311
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	120	15	1,800
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	9,250	9,250
Structural (Reinforced Concrete)					
DSL Pump Station SOG	12' x 16' x 1'	CY	8	592	4,736
Structural (Misc. Metals)					
Hose Racks	Est. Labor + Supplier Pricing	EA	2	250	500
Mechanical					
Digested Sludge Pumps & Motors	Est. Labor + Supplier Pricing	EA	2	13,650	27,300
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	20,667	20,667
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	19,500	19,500
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	2,500	2,500

Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	3,750	3,750
Subtotal					105,314
Contingencies @ 15%					15,797
Total					121,111

Total Option A relative estimate of probable construction costs = $121,111

7.2. 2.6 MGD PLANT CAPACITY – OPTION B

7.2.1. 7.2.1 SIZING CRITERIA – AVERAGE FLOW: 2.6 MGD

7.2.2. DIGESTED SLUDGE PUMP STATION PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 reinforced concrete slab with total overall dimensions of 32’ L x 12’ W x 1’ T.
- Assume 4 horizontal centrifugal or progressive cavity skid-mounted pumps & motors.
- Assume 6”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

7.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

DIGESTED SLUDGE PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	19,311	19,311
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	240	15	3,600
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	18,500	18,500
Structural (Reinforced Concrete)					
DSL Pump Station SOG	12' x 32' x 1'	CY	16	592	9,472

Structural (Misc. Metals)					
Hose Racks	Est. Labor + Supplier Pricing	EA	4	250	1,000
Mechanical					
Digested Sludge Pumps & Motors	Est. Labor + Supplier Pricing	EA	4	13,650	54,600
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	2	20,667	41,334
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	39,000	39,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	5,000	5,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	7,500	7,500
Subtotal					199,317
Contingencies @ 15%					29,898
Total					229,215

Total Option B relative estimate of probable construction cost = $229,215

7.3. 3.9 MGD Plant Capacity – Option C

7.3.1. Sizing Criteria – Average flow: 3.9 MGD

7.3.2. Digested Sludge Pump Station Preliminary Design Assumptions

- Assume 1 reinforced concrete slab with total overall dimensions of 48’ L x 12’ W x 1’ T.
- Assume 6 horizontal centrifugal or progressive cavity skid-mounted pumps & motors.
- Assume 6”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

7.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

DIGESTED SLUDGE PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	24,311	24,311
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	360	15	5,400
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	27,000	27,000
Structural (Reinforced Concrete)					
DSL Pump Station SOG	12' x 48' x 1'	CY	24	592	14,208
Structural (Misc. Metals)					
Hose Racks	Est. Labor + Supplier Pricing	EA	6	250	1,500
Mechanical					
Digested Sludge Pumps & Motors	Est. Labor + Supplier Pricing	EA	6	13,650	81,900
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	3	20,667	62,001
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	53,000	53,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	7,500	7,500
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	11,250	11,250
Subtotal					288,070
Contingencies @ 15%					43,211
Total					331,281

Total Option C relative estimate of probable construction cost = $331,281

7.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR DIGESTED SLUDGE PUMP STATION

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	$121,111
2.6 MGD	$229,215
3.9 MGD	$331,281

8. SCUM PUMP STATION SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

8.1. 1.3 MGD PLANT CAPACITY – OPTION A

8.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

No Scum Pump Station improvements are required for Option A. The existing facility remains in operation in its current size and condition.

8.2. 2.6 MGD PLANT CAPACITY – OPTION B

8.2.1. SIZING CRITERIA – AVERAGE FLOW: 2.6 MGD

8.2.2. SCUM PUMP STATION PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 reinforced concrete scum box with total overall dimensions of 19’ L x 12’ W x 15’ D.
- Assume 1 reinforced concrete slab with total overall dimensions of 19’ L x 12’ W x 1.5’ T.
- Assume 2 horizontal centrifugal or progressive cavity skid-mounted pumps & motors.
- Assume 6”-8” interconnecting piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

8.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

SCUM PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	23,455	23,455
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	125	15	1,875
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	13,240	13,240
Structural (Reinforced Concrete)					
Scum Box SOG	12' x 19' x 1.5'	CY	14	526	7,364
Scum Box Walls	43' x 15' x 1'	CY	25	1,014	25,350
Scum Pump Station SOG	10' x 11.17' x 1'	CY	5	674	3,370
Structural (Misc. Metals)					

FRP Grating & Supports	Est. Labor + Supplier Pricing	SF	150	44	6,600
Galv Ladder & Supports	Est. Labor + Supplier Pricing	EA	1	2,730	2,730
Hose Racks	Est. Labor + Supplier Pricing	EA	1	270	270
Mechanical					
Scum Pumps & Motors	Est. Labor + Supplier Pricing	EA	2	10,635	21,270
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	12,992	12,992
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	26,450	26,450
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	2,000	2,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	3,750	3,750
Subtotal					150,716
Contingencies @ 15%					22,607
Total					173,323

Total Option B relative estimate of probable construction costs = $173,323

8.3. 3.9 MGD PLANT CAPACITY – OPTION C

8.3.1. SIZING CRITERIA – AVERAGE FLOW: 3.9 MGD

No additional scum pumping facility requirements are considered necessary for Option C above those identified under Option B.

8.4. SUMMARY OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR SCUM PUMP STATION

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$173,323
3.9 MGD	$173,323

9. EFFLUENT PUMP STATION SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

9.1. 1.3 MGD PLANT CAPACITY – OPTION A

9.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

No Effluent Pump Station improvements are required for Option A. The existing facility remains in operation in its current size and condition.

9.2. 2.6 MGD Plant Capacity – Option B

9.2.1. Sizing Criteria – Average flow: 2.6 MGD

9.2.2. Effluent Pump Station Preliminary Design Assumptions

- Assume 1 reinforced concrete pump station with wetwell inside dimensions of 25’ L x 11’W x 23’-3” HWL.
- Assume 3 vertical turbine pumps and motors.
- Assume 1 slide gate for flow control.
- Assume 12” pump discharge piping into a 12” discharge manifold complete with piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

9.2.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

EFFLUENT PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	108,545	108,545
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	1,100	9	9,900
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	62,350	62,350
Structural (Reinforced Concrete)					
EPS SOG	13' x 27' x 1.5'	CY	21	541	11,361
EPS Walls (Lower Half)	72' x 12.5' x 1.5'	CY	53	814	43,142
EPS Walls (Upper Half)	72' x 12.5' x 1.5'	CY	53	814	43,142
EPS Interior Baffle Walls	6' x 6' x 6"	CY	2	1,420	2,840
EPS Interior Chamber Wall	9' x 22.5' x 1'	CY	8	999	7,992
EPS Deck Slab & Beams	11' x 25' x 1'	CY	11	1,494	16,434
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	5,000	5,000
Structural (Misc. Metals)					

FRP Grating & Supports	Est. Labor + Supplier Pricing	SF	12	58	696
Aluminum Handrail	Est. Labor + Supplier Pricing	LF	100	55	5,500
Stairs	Est. Labor + Supplier Pricing	EA	1	5,205	5,205
Hose Racks	Est. Labor + Supplier Pricing	EA	1	210	210
Precast Vault & Hatch	Est. Labor + Supplier Pricing	EA	1	6,210	6,210
Mechanical					
Vertical Turbine Pumps & Motors	Est. Labor + Supplier Pricing	EA	3	62,865	188,595
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	1	9,915	9,915
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	23,106	23,106
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	110,230	110,230
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	10,000	10,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	15,000	15,000
Subtotal					685,373
Contingencies @ 15%					102,806
Total					788,179

Total Option B relative estimate of probable construction costs = $788,179

9.3. 3.9 MGD Plant Capacity – Option C

9.3.1. Sizing Criteria – Average flow: 3.9 MGD

9.3.2. Effluent Pump Station Preliminary Design Assumptions

- Assume 1 reinforced concrete pump station with wetwell inside dimensions of 50’ L x 11’W x 23’-3” HWL.
- Assume 6 vertical turbine pumps and motors.
- Assume 1 slide gate for flow control.
- Assume 12” pump discharge piping into a 16” discharge manifold complete with piping, valves, supports and appurtenances.
- Assume electrical & instrumentation systems for power and control.

9.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars

- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

EFFLUENT PUMP STATION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	175,550	175,550
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	2,200	9	19,800
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	125,000	125,000
Structural (Reinforced Concrete)					
EPS SOG	13' x 54' x 1.5'	CY	42	541	22,722
EPS Walls (Lower Half)	122' x 12.5' x 1.5'	CY	106	814	86,284
EPS Walls (Upper Half)	122' x 12.5' x 1.5'	CY	106	814	86,284
EPS Interior Baffle Walls	6' x 6' x 6" (2 Each)	CY	4	1,420	5,680
EPS Interior Chamber Wall	9' x 22.5' x 1' (2 Each)	CY	16	999	15,984
EPS Deck Slab & Beams	11' x 50' x 1'	CY	22	1,494	32,868
Misc. - Hydrotest Tanks & Dewater	Est. Labor & Equipment	LS	1	10,000	10,000
Structural (Misc. Metals)					
FRP Grating & Supports	Est. Labor + Supplier Pricing	SF	24	58	1,392
Aluminum Handrail	Est. Labor + Supplier Pricing	LF	200	55	11,000
Stairs	Est. Labor + Supplier Pricing	EA	2	5,205	10,410
Hose Racks	Est. Labor + Supplier Pricing	EA	2	210	420
Precast Vault & Hatch	Est. Labor + Supplier Pricing	EA	2	6,210	12,420
Mechanical					
Vertical Turbine Pumps & Motors	Est. Labor + Supplier Pricing	EA	6	62,865	377,190
Aluminum Slide Gates, Frames & Operators	Est. Labor + Supplier Pricing	EA	2	9,915	19,830
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	46,212	46,212
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	232,000	232,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	20,000	20,000

Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	30,000	30,000
Subtotal					1,341,046
Contingencies @ 15%					201,157
Total					1,542,203

Total Option C relative estimate of probable construction cost = $1,542,203

9.4. ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR EFFLUENT PUMP STATION

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$788,179
3.9 MGD	$1,542,203

10. ADMINISTRATION BUILDING SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

10.1. 1.3 MGD PLANT CAPACITY – OPTION A

10.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

No Administration Building improvements are required for Option A. The existing facility remains in operation in its current size and condition.

10.2. 2.6 MGD PLANT CAPACITY – OPTION B

10.2.1. SIZING CRITERIA – AVERAGE FLOW: 2.6 MGD

No Administration Building improvements are required for Option B. The existing facility remains in operation in its current size and condition.

10.3. 3.9 MGD PLANT CAPACITY – OPTION C

10.3.1. SIZING CRITERIA – AVERAGE FLOW: 3.9 MGD

10.3.2. ADMINISTRATION BUILDING PRELIMINARY DESIGN ASSUMPTIONS

- Assume 1 single-story masonry and wood framed structure with outside dimensions of 104’ L x 42’W (4,368 square feet).
- Assume reinforced concrete slab on grade.
- Assume fully-grouted split-face masonry (CMU) exterior walls.
- Assume wood roof trusses with insulation and standing seam metal roofing system.
- Assume multi-use floor plan with offices, lab, break room, rest rooms, hallways and shop/garage.

- Assume exterior hollow metal doors, frames and finish hardware.
- Assume interior wood doors, frames and finish hardware.
- Assume exterior aluminum frame windows with interior window coverings.
- Assume interior vinyl flooring.
- Assume ceramic tile rest rooms complete with toilet partitions and accessories.
- Assume laboratory with cabinetry and lab equipment.
- Assume interior metal stud partition walls with drywall, tape, texture, and painted finish.
- Assume fire sprinkler system throughout.
- Assume HVAC system throughout.
- Assume plumbing system throughout.
- Assume fire and security alarm systems throughout.
- Assume electrical & instrumentation systems for power, lighting and control.
- Assume ADA compliance for the entire building.

10.3.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

ADMINISTRATION BUILDING – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	135,471	135,471
Civil					
Demolish & Dispose of Existing Admin. Bldg.	Future Demo	N/A	0	0	0
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	500	9	4,500
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	73,515	73,515
Structural					
Concrete Slab On Grade & Footings	4365 x 6"	CY	85	515	43,775
CMU Masonry Walls	Est. Subcontractor Pricing	SF	3,130	18	56,340
Wood Roof Trusses	Est. Subcontractor Pricing	SF	5,184	8	41,472
Roofing, Insulation & Trim	Est. Subcontractor Pricing	SF	5,184	11	57,024
Hollow Metal Doors, Frames & Hardware	Est. Subcontractor Pricing	EA	5	1,050	5,250
Overhead Roll-up Doors & Operators	Est. Subcontractor Pricing	EA	2	4,500	9,000
Aluminum Windows & Frames	Est. Subcontractor Pricing	EA	10	830	8,300
Louvers & Vents	Est. Subcontractor Pricing	EA	1	450	450

Caulking & Sealants	Est. Subcontractor Pricing	LS	1	2,250	2,250
Painting & Coatings	Est. Subcontractor Pricing	LS	1	7,500	7,500
Architectural					
Misc. Metals	Est. Subcontractor Pricing	LS	1	3,000	3,000
Metal Studs	Est. Subcontractor Pricing	SF	5,100	3	15,300
Drywall, Tape & Texture	Est. Subcontractor Pricing	SF	9,000	2	18,000
Acoustical Ceiling	Est. Subcontractor Pricing	SF	2,164	5	10,820
Building Insulation	Est. Subcontractor Pricing	SF	2,548	2	5,096
Flooring	Est. Subcontractor Pricing	SF	2,548	6	15,288
Interior Doors, Frames & Hardware	Est. Subcontractor Pricing	EA	10	450	4,500
Cabinetry & Countertops	Est. Subcontractor Pricing	LF	32	295	9,440
Lab Equipment & Furnishings	Est. Subcontractor Pricing	LS	1	18,000	18,000
Restroom Ceramic Tile	Est. Subcontractor Pricing	SF	448	8	3,584
Toilet Partitions	Est. Subcontractor Pricing	LF	56	30	1,680
Toilet Accessories	Est. Subcontractor Pricing	LS	1	2,250	2,250
Benches, Shelving & Lockers	Est. Subcontractor Pricing	EA	8	1,300	10,400
Window Coverings	Est. Subcontractor Pricing	SF	176	15	2,640
Caulking & Sealants	Est. Subcontractor Pricing	LS	1	2,250	2,250
Painting & Coatings	Est. Subcontractor Pricing	LS	1	13,026	13,026
ADA Compliance	Est. Subcontractor Pricing	LS	1	2,250	2,250
Signage & Misc. Specialties	Est. Subcontractor Pricing	LS	1	7,500	7,500
Mechanical					
HVAC	Est. Subcontractor Pricing	SF	2,548	15	38,220
Plumbing (Rough & Finish)	Est. Subcontractor Pricing	LS	1	15,000	15,000
Fire Protection & Extinguishers	Est. Subcontractor Pricing	SF	4,368	4	17,472
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	167,540	167,540
Building Lighting & Circuits	Est. Subcontractor Pricing	SF	4,368	11	48,048
Fire Alarms	Est. Subcontractor Pricing	SF	4,368	1	4,368
Security Systems	Est. Subcontractor Pricing	SF	4,368	2	8,736
Communication & Data Systems	Est. Subcontractor Pricing	LS	1	3,000	3,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	12,000	12,000
Subtotal					904,255

Contingencies @ 15%	135,638
Total	1,039,893

Total Option C relative estimate of probable construction costs = $1,039,893

10.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR ADMINISTRATION BUILDING

Plant Capacity	Estimate of Probable Construction Costs**
1.3 MGD	No Improvements Required
2.6 MGD	No Improvements Required
3.9 MGD	$1,039,893

11. BLOWER AND ELECTRICAL BUILDING WITH STANDBY POWER GENERATION SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

11.1. 1.3 MGD PLANT CAPACITY OPTION

11.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

No Blower and Electrical Building improvements are required for Option A. The existing facility remains in operation in its current size and condition.

11.2. 2.6 MGD PLANT CAPACITY – OPTION B

11.2.1. SIZING CRITERIA – AVERAGE FLOW: 2.6 MGD

11.2.2. BLOWER AND ELECTRICAL BUILDING WITH STANDBY POWER GENERATOR PRELIMINARY DESIGN ASSUMPTIONS

- Assume demolition of existing Blower Building.
- Assume relocation and reuse of 2 existing blowers.
- Assume 1 single-story pre-engineered metal building structure with outside dimensions of 90’ L x 34’W (3,060 square feet).
- Assume reinforced concrete slab on grade.
- Assume metal frame wall and roof construction with wall and roof insulation, fluted metal roofing system, and metal trim.
- Assume multi-use floor plan with one blower equipment room and one electrical room.
- Assume exterior and interior hollow metal doors, frames and finish hardware.
- Assume exterior aluminum frame windows.
- Assume no interior flooring (smooth trowel finish concrete).
- Assume fire sprinkler system throughout.
- Assume HVAC system in electrical room only.
- Assume plumbing system for washwater in blower room only.
- Assume fire and security alarm systems throughout.
- Assume 3 multi-stage centrifugal blowers, motors and appurtenances (4 operating and 1 standby with 3 new blowers and 2 relocated blowers).
- Assume 4”-30” interconnecting piping, ductwork, valves, supports and appurtenances.
- Assume 1 skid-mounted 250 kW diesel-fuel standby power generator (exterior install).

- Assume electrical & instrumentation systems for power, lighting and control.

11.2.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

BLOWER AND ELECTRICAL BUILDING WITH STANDBY POWER GENERATOR – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	312,450	312,450
Civil					
Demolish & Dispose of Existing Blower Bldg.	Est. Labor & Equipment	LS	1	50,000	50,000
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	250	9	2,250
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	148,650	148,650
Structural					
Concrete Slab On Grade & Foundations	3090 x 6" + Blower Pads	CY	101	679	68,579
Pre-Engineered Metal Building	Est. Subcontractor Pricing	SF	3,060	45	137,700
Wall Louvers	Est. Subcontractor Pricing	SF	104	45	4,680
Insulation	Est. Subcontractor Pricing	SF	3,060	2	6,120
Hollow Metal Doors, Frames & Hardware	Est. Subcontractor Pricing	EA	4	1,200	4,800
Overhead Roll-up Doors & Operators	Est. Subcontractor Pricing	EA	1	4,500	4,500
Aluminum Windows & Frames	Est. Subcontractor Pricing	EA	4	500	2,000
Louvers & Vents	Est. Subcontractor Pricing	EA	1	500	500
Caulking & Sealants	Est. Subcontractor Pricing	LS	1	1,000	1,000
Painting & Coatings	Est. Subcontractor Pricing	LS	1	15,000	15,000
Concrete Equipment Pads & Foundations	Est. Subcontractor Pricing	LS	1	2,487	2,487
Signage	Est. Subcontractor Pricing	LS	1	1,125	1,125
Mechanical (Process)					
Multi-Stage Centrifugal Blowers	Est. Labor + Supplier Pricing	EA	3	140,885	422,655
Install OFCI Relocated Blowers	Est. Labor + Supplier Pricing	EA	2	15,000	30,000
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	106,185	106,185

Mechanical (Building)					
HVAC	Est. Subcontractor Pricing	SF	600	6	3,600
Fire Protection & Extinguishers	Est. Subcontractor Pricing	SF	3,060	4	12,240
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	317,500	317,500
Lighting	Est. Subcontractor Pricing	SF	3,060	2	6,120
Fire Alarms	Est. Subcontractor Pricing	SF	3,060	1	3,060
Security Systems	Est. Subcontractor Pricing	SF	3,060	2	6,120
250 KW Standby Generator	Est. Labor + Supplier Pricing	EA	1	95,250	95,250
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	20,000	20,000
Subtotal					1,784,571
Contingencies @ 15%					267,686
Total					2,052,257

Total Option B relative estimate of probable construction costs = $2,052,257

11.3. 3.9 MGD Plant Capacity – Option C

11.3.1. Sizing Criteria – Average flow: 3.9 MGD

11.3.2. Blower and Electrical Building with Standby Power Generator Preliminary Design Assumptions

- Assume demolition of existing Blower Building.
- Assume relocation and reuse of two existing blowers.
- Assume 1 single-story pre-engineered metal building structure with outside dimensions of 90’ L x 34’W (3,060 square feet).
- Assume reinforced concrete slab on grade.
- Assume metal frame wall and roof construction with wall and roof insulation, fluted metal roofing system, and metal trim.
- Assume multi-use floor plan with one blower equipment room and one electrical room.
- Assume exterior and interior hollow metal doors, frames and finish hardware.
- Assume exterior aluminum frame windows.
- Assume no interior flooring (smooth trowel finish concrete).
- Assume fire sprinkler system throughout.
- Assume HVAC system in electrical room only.
- Assume plumbing system for washwater in blower room only.
- Assume fire and security alarm systems throughout.
- Assume 5 multi-stage centrifugal blowers, motors and appurtenances (6 operating and 1 standby with 5 new blowers and 2 relocated blowers).
- Assume 4”-30” interconnecting piping, ductwork, valves, supports and appurtenances.
- Assume 1 skid-mounted 250 kW diesel-fuel standby power generator (exterior install).

- Assume electrical & instrumentation systems for power, lighting and control.

11.3.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

BLOWER AND ELECTRICAL BUILDING WITH STANDBY POWER GENERATOR – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	312,450	312,450
Civil					
Demolish & Dispose of Existing Blower Bldg.	Est. Labor & Equipment	LS	1	50,000	50,000
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	250	9	2,250
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	148,650	148,650
Structural					
Concrete Slab On Grade & Foundations	3090 x 6" + Blower Pads	CY	101	679	68,579
Pre-Engineered Metal Building	Est. Subcontractor Pricing	SF	3,060	45	137,700
Wall Louvers	Est. Subcontractor Pricing	SF	104	45	4,680
Insulation	Est. Subcontractor Pricing	SF	3,060	2	6,120
Hollow Metal Doors, Frames & Hardware	Est. Subcontractor Pricing	EA	4	1,200	4,800
Overhead Roll-up Doors & Operators	Est. Subcontractor Pricing	EA	1	4,500	4,500
Aluminum Windows & Frames	Est. Subcontractor Pricing	EA	4	500	2,000
Louvers & Vents	Est. Subcontractor Pricing	EA	1	500	500
Caulking & Sealants	Est. Subcontractor Pricing	LS	1	1,000	1,000
Painting & Coatings	Est. Subcontractor Pricing	LS	1	15,000	15,000
Concrete Equipment Pads & Foundations	Est. Subcontractor Pricing	LS	1	2,487	2,487
Signage	Est. Subcontractor Pricing	LS	1	1,125	1,125
Mechanical (Process)					
Multi-Stage Centrifugal Blowers	Est. Labor + Supplier Pricing	EA	5	140,885	704,425
Install OFCI Relocated Blowers	Est. Labor + Supplier Pricing	EA	2	15,000	30,000
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	146,185	146,185

Mechanical (Building)					
HVAC	Est. Subcontractor Pricing	SF	600	6	3,600
Fire Protection & Extinguishers	Est. Subcontractor Pricing	SF	3,060	4	12,240
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	374,527	374,527
Lighting	Est. Subcontractor Pricing	SF	3,060	2	6,120
Fire Alarms	Est. Subcontractor Pricing	SF	3,060	1	3,060
Security Systems	Est. Subcontractor Pricing	SF	3,060	2	6,120
250 KW Standby Generator	Est. Labor + Supplier Pricing	EA	1	95,250	95,250
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	20,000	20,000
Subtotal					2,163,368
Contingencies @ 15%					324,505
Total					2,487,873

Total Option C relative estimate of probable construction cost = $2,487,873

11.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR BLOWER AND ELECTRICAL BUILDING WITH STANDBY POWER GENERATOR

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$2,052,257
3.9 MGD	$2,487,873

12. WAS THICKENING SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COST FOR VARIOUS TREATMENT PLANT CAPACITIES

12.1. 1.3 MGD PLANT CAPACITY – OPTION A

12.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

- Secondary sludge production at 1.3 MGD Capacity
- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project*
- Pounds WAS total solids per day = 2,730 lbs TSS/day
- Gallons per day (assume RAS @ 0.50% TSS) = 64,800 GPD
- Gallons per minute (assume 24 hour/day operation) = 45 GPM

DAF Thickener Sizing Criteria

- Maximum Hydraulic Loading: 0.50 GPM/SF

- Maximum Solids Loading: 1.3 lbs TSS/hr-SF
- Minimum Float Solids: 4.0 %TS
- Minimum SS Capture: 97%
- Maximum Polymer Dose: 5 dry lbs/dry ton TSS

NUMBER AND SIZE OF DAF UNITS

- Number: 1
- Length: 13'-2"
- Width: 7'-10"
- Effective surface area: 103 SF

CHECK LOADINGS VERSUS SIZING CRITERIA

- Hydraulic Loading: 0.43 GPM/SF OK
- Solids Loading: 0.90 lbs TSS/hr-SF OK

12.1.2. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 1.3 MGD (approximate) water reclamation facility within the State of California.

WAS THICKENING – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	95,000	95,000
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	390	9	3,510
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	56,000	56,000
Structural (Reinforced Concrete)					
18" SOG	25' x 19' x 1.5'	CY	27	850	22,950
Structural (Misc. Metals)					
Misc. Metals & Fabrications	Est. Labor + Supplier Pricing	LS	1	3,500	3,500
Mechanical					
DAF Equipment	Est. Labor + Supplier Pricing	EA	1	405,000	405,000
Electrical & Instrumentation					

E&I Power & Control Systems	Average 17.5% of Total	LS	1	115,000	115,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	14,000	14,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	22,000	22,000
Subtotal					736,960
Contingencies @ 15%					110,544
Total					847,504

Total Option A relative estimate of probable construction cost = $847,504

12.2. 2.6 MGD Plant Capacity – Option B

12.2.1. Sizing Criteria – Average flow: 2.6 MGD

- Secondary sludge production at 2.6 MGD Capacity
- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project (submittal based on 1.3 MGD ADF and projected for 2.6 MGD ADF herein)*
- Pounds WAS total solids per day = 5,460 lbs TSS/day
- Gallons per day (assume RAS @ 0.50% TSS) = 129,600 GPD
- Gallons per minute (assume 24 hour/day operation) = 90 GPM

DAF Thickener Sizing Criteria

- Maximum Hydraulic Loading: 0.50 GPM/SF
- Maximum Solids Loading: 1.3 lbs TSS/hr-SF
- Minimum Float Solids: 4.0 %TS
- Minimum SS Capture: 97%
- Maximum Polymer Dose: 5 dry lbs/dry ton TSS

Number and Size of DAF Units

- Number: 2
- Length: 13’-2”
- Width: 7’-10”
- Effective surface area: 103 SF

Check Loadings versus Sizing Criteria

- Hydraulic Loading: 0.43 GPM/SF OK
- Solids Loading: 0.90 lbs TSS/hr-SF OK

12.2.2. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars

- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

WAS THICKENING – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	120,000	120,000
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	780	9	7,020
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	75,000	75,000
Structural (Reinforced Concrete)					
18" SOG (2 Each)	25' x 19' x 1.5'	CY	54	850	45,900
Structural (Misc. Metals)					
Misc. Metals & Fabrications	Est. Labor + Supplier Pricing	LS	2	3,500	7,000
Mechanical					
DAF Equipment	Est. Labor + Supplier Pricing	EA	2	405,000	810,000
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	236,000	236,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	28,000	28,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	44,000	44,000
Subtotal					1,372,920
Contingencies @ 15%					205,938
Total					1,578,858

Total Option B relative estimate of probable construction cost = $1,578,858

12.3. 3.9 MGD Plant Capacity – Option C

12.3.1. Sizing Criteria – Average flow: 3.9 MGD

- Secondary sludge production at 3.9 MGD Capacity

- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project(submittal based on 1.3 MGD ADF and projected for 3.9 MGD ADF herein)*
- Pounds WAS total solids per day = 8,190 lbs TSS/day
- Gallons per day (assume RAS @ 0.50% TSS) = 194,400 GPD
- Gallons per minute (assume 24 hour/day operation) = 135 GPM

DAF Thickener Sizing Criteria

- Maximum Hydraulic Loading: 0.50 GPM/SF
- Maximum Solids Loading: 1.3 lbs TSS/hr-SF
- Minimum Float Solids: 4.0 %TS
- Minimum SS Capture: 97%
- Maximum Polymer Dose: 5 dry lbs/dry ton TSS

NUMBER AND SIZE OF DAF UNITS

- Number: 3
- Length: 13'-2"
- Width: 7'-10"
- Effective surface area: 103 SF

CHECK LOADINGS VERSUS SIZING CRITERIA

- Hydraulic Loading: 0.43 GPM/SF OK
- Solids Loading: 0.90 lbs TSS/hr-SF OK

12.3.2. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

WAS THICKENING – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	150,000	150,000
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	1,170	9	10,530
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	105,000	105,000
Structural (Reinforced Concrete)					
18" SOG (3 Each)	25' x 19' x 1.5'	CY	81	850	68,850

Structural (Misc. Metals)					
Misc. Metals & Fabrications	Est. Labor + Supplier Pricing	LS	1	10,500	10,500
Mechanical					
DAF Equipment	Est. Labor + Supplier Pricing	EA	3	405,000	1,215,000
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	354,000	354,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	28,000	28,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	66,000	66,000
Subtotal					2,007,880
Contingencies @ 15%					301,182
Total					2,309,062

Total Option C relative estimate of probable construction cost = $2,309,062

12.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR WAS THICKENING

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	$847,504
2.6 MGD	$1,578,858
3.9 MGD	$2,309,062

13. SLUDGE DEWATERING CENTRIFUGE SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT OPTIONS

13.1. 1.3 MGD PLANT CAPACITY – OPTION A

13.1.1. SIZING CRITERIA – AVERAGE FLOW: 1.3 MGD

- Digested sludge production at 1.3 MGD Capacity
- Reference JSME November 12, 1989 *Preliminary Design Submittal for Jamacha Basin Water Reclamation Facility Upgrade and Expansion Project (parameters for 2.6 MGD and 3.9 MGD options projected base on preliminary design at 1.3 MGD ADF)*
- Pounds TWAS total solids per day = 2,730 lbs TSS/day
- Gallons TWAS per day (assume TWAS @ 4.0% TSS) = 8,100 GPD

- Digested sludge total solids per day (assume 35% TSS reduction via aerobic digestion) = 1,775 lbs TSS/day
- Centrifuge Loading and Performance Criteria
- Operate 6 hours/day (assumes 1 hour per day for start-up and 1 hour/day for shut down)
- Hydraulic loading = 8,100/(6 x 60) = 23 GPM
- Total solids loading = 1,775 lbs/6 hours = 296 lbs/hour
- Cake solids = 20% TS minimum
- Solids capture = 95% minimum
- Polymer dose = 25 dry lbs/dry ton TSS maximum

13.1.2. Sludge Dewatering Centrifuge Preliminary Design Assumptions

- Number: 1
- Manufacture: Alfa Laval
- Model: ALDEC G2-45
- Assume centrifuge installed on new above ground steel covered structure
- Assume one centrifuge to be installed
- Assume electrical & instrumentation systems for power and control.

13.1.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 1.3 MGD (approximate) water reclamation facility within the State of California.

SLUDGE DEWATERING CENTRIFUGE – PROBABLE CONSTRUCTION COSTS

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	105,000	105,000
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	50	9	450
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	45,000	45,000
Structural (Reinforced Concrete)					
Misc. / Footings	Misc.	CY	2	850	1,700
Structural (Misc. Metals)					
Cover & Support Structure	Est. Labor + Supplier Pricing	LS	1	96,300	96,300
Mechanical					

Centrifuge Equipment	Est. Labor + Supplier Pricing	EA	1	418,000	418,000
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	107,600	107,600
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	11,000	11,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	11,000	11,000
Subtotal					796,050
Contingencies @ 15%					119,408
Total					915,458

Total Option A relative estimate of probable construction cost = $915,458

13.2. 2.6 MGD Plant Capacity – Option B

13.2.1. Sizing Criteria – Average flow: 2.6 MGD

Selected Alfa Laval ALDEC G2-45 Centrifuge is sized for an upper operating range of 50 GPM. Under the 2.6 MGD scenario the daily digested sludge volume will be 8,200 GPD and the centrifuge will be loaded at 46 GPM over a 6 hour operating period. No additional improvements are required beyond the installation of one centrifuge.

Total Option B relative estimate of probable construction cost = $915,458

13.3. 3.9 MGD Plant Capacity – Option C

13.3.1. Sizing Criteria – Average flow: 3.9 MGD

13.3.2. Sludge Dewatering Centrifuge Preliminary Design Assumptions

- Number: 2
- Manufacture: Alfa Laval
- Model: ALDEC G2-45
- Assume centrifuges installed on new above ground steel covered structures
- Assume two centrifuges to be installed
- Assume electrical & instrumentation systems for power and control.

13.3.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Centrifuge installed on new above ground steel covered structure

- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

SLUDGE DEWATERING CENTRIFUGE – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	105,000	105,000
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	100	9	900
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	75,000	75,000
Structural (Reinforced Concrete)					
Misc. / Footings	Misc.	CY	4	850	3,400
Structural (Misc. Metals)					
Cover & Support Structure	Est. Labor + Supplier Pricing	LS	2	96,300	192,600
Mechanical					
Centrifuge Equipment	Est. Labor + Supplier Pricing	EA	2	418,000	836,000
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	263,000	263,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	22,000	22,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	22,000	22,000
Subtotal					1,519,900
Contingencies @ 15%					227,985
Total					1,747,885

Total Option C relative estimate of probable construction cost = $1,747,885

13.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR CENTRIFUGE DEWATERING

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	$915,458
2.6 MGD	$915,458
3.9 MGD	$1,747,885

14. TERTIARY FILTER SIZING CRITERIA AND ESTIMATES OF PROBABLE CONSTRUCTION COSTS FOR VARIOUS TREATMENT PLANT CAPACITIES

14.1. BASIS OF COST ESTIMATES FOR TERTIARY FILTRATION IMPROVEMENTS

- Use ARCADIS / Malcolm Pirnie's cost estimates for the recently completed Fallbrook WRP 1 Capital Improvement Plan.
- Fallbrook estimates are based on November 2010 dollars
- Fallbrook estimates are based on ADWF of 2.7 MGD and 2.9 MGD ADWF + recycle flows
- Prorate Fallbrook estimates for inflation at 3.5% per year from November 2010 to May 2012. Inflation factor is 1.053
- Prorate Fallbrook estimates for capacity/size adjustments
- For 1.3 MGD Option A scenario, no additional capacity is required
- For 2.6 MGD Option B scenario use additional capacity/size adjustment factor of 0.481 (1.3/2.7)
- For 3.9 MGD Option C scenario use additional capacity/size adjustment factor of 0.963 (2.6/2.7)
- Given the conservative loading rates established for this assessment, it is assumed that filter effluent requirements can be met without the addition of upstream coagulants.

14.2. BASELINE IMPROVEMENTS TO ESTABLISH OPTIONS A, B, AND C COST ESTIMATES

Use basis of cost for Fallbrook WRP 1 Estimates of Probable Construction Costs (based on November 2010 dollars)

14.2.1. SIZING CRITERIA

- Ultimate average flow: 2.7 MGD
- Ultimate average flow + Recycle: 2.9 MGD
- Maximum Hydraulic Loading Rate (with one unit out of service) @ Q AVG + Recycle: 4.0 GPM/SF

NUMBER AND SIZE OF FILTERS IDENTIFIED BY ARCADIS / MALCOLM PIRNIE FOR FALLBROOK WRP 1 TERTIARY FILTRATION

- Number: 4
- Length: 13'
- Width: 13'
- Depth: 14.5'
- Side Wall Freeboard: 3'
- Media Depth: 60"
- Media Type: Anthracite

- Flocculation channels 7'W X 7'D X 26'L with 2' freeboard
- Mechanical Flocculators 2 units @ 5 Hp each
- Polyblend Units 2 units (1 operating, 1 standby)
- Use chemical totes for polymer

CHECK LOADINGS VERSUS SIZING CRITERIA (WITH ONE UNIT OUT OF SERVICE)

- Overflow Rate (with one unit out of service) @ Q AVG + Recycle: 4.0 GPM/SF OK

14.2.2. ESTIMATES OF PROBABLE CONSTRUCTION COSTS BY ARCADIS MALCOLM PIRNIE FOR FALLBROOK WRD 1 TERTIARY FILTRATION AT A CAPACITY OF 2.7 MGD AVERAGE FLOW

Assumptions:

- Costs based on November 2010 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar water reclamation facility within the State of California.

TERTIARY FILTERS – PROBABLE CONSTRUCTION COSTS FOR 2.7 MGD (November 2010 Dollars)

Description	Dimensions/Clarifications	Unit	Quantity	Unit Price	Total Price
General Conditions	Approx. 15% of Total	LS	1	132,900	132,900
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	2,500	9	22,500
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	63,500	63,500
Structural (Reinforced Concrete)					
Base SOG Filters	15' x 15' x 2' (4 Each)	CY	67	975	65,325
Walls Filters	56' x 14.5' x 1' (2 Each)	CY	60	975	58,500
Walls Filters	15' x 14.5' x 1' (4 Each)	CY	33	975	32,175
WBW Tank SOG	22' x 22' x 2'	CY	36	975	35,100
WBW Tank Walls	20' x 14.5' x 1.25' (4 Each)	CY	54	975	52,650
Floc Tank SOG	28 x 10' x 2'	CY	21	975	20,475
Floc Tank Walls	(26'+7') x 2 x 9' x 1'	CY	22	975	21,450
Structural (Misc. Metals)					
Misc. Metals & Fabrications	Est. Labor + Supplier Pricing	LS	1	26,600	26,600
Mechanical					
Launders, Weirs & Supports	Est. Labor + Supplier Pricing	EA	1	32,000	32,000
Underdrains	Est. Labor + Supplier Pricing	SF	676	150	101,400
Air Scour Compressors	Est. Labor + Supplier Pricing	EA	2	15,000	30,000
Filter Media	Est. Labor + Supplier Pricing	CY	125	175	21,875
Waste Backwash Pumps	Est. Labor + Supplier Pricing	EA	2	15,000	30,000
Polymer Addition	Est. Labor + Supplier Pricing	EA	2	32,000	64,000
Process Piping, Valves & Supports	Est. Labor + Supplier Pricing	LS	1	110,000	110,000
Electrical & Instrumentation					

E&I Power & Control Systems	Average 17.5% of Total	LS	1	145,000	145,000
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	35,000	35,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	25,000	25,000
Subtotal					1,125,450
Contingencies @ 15%					152,929
Total					1,278,379

Total relative estimate of probable construction cost for capacity of 2.7 MGD average flow = $1,278,379 (November 2010 dollars)

14.3. Summary of Tertiary Filtration Estimates of Probable Construction Costs (based on May 2012 dollars)

14.3.1. 1.3 MGD Plant Capacity – Option A (Existing Facilities Value)

No Tertiary Filter improvements are required for Option A. The existing facility remains in operation in its current size and condition.

14.3.2. 2.6 MGD Plant Capacity – Option B (Expand From 1.3 MGD to 2.6 MGD)

Determine additional cost for Option B capacity to existing facilities based on the probable estimate for 1.3 MGD expansion.

$1,278,379 X 1.3 / 2.7 (size adjustment) x 1.053 (inflation adjustment) = **$648,138**

14.3.3. 3.9 MGD Plant Capacity – Option C (Expand From 1.3 MGD to 3.9 MGD)

Determine additional cost for Option C capacity to existing facilities based on the probable estimate for 2.6 MGD expansion.

$1,278,379 x 2.6 / 2.7 (size adjustment) x 1.053 (inflation adjustment) = **$1,296,276**

15. Chlorine Contact Tank, Sodium Hypochlorite Storage and Chemical Feed facilities for Tertiary Disinfection

15.1. 1.3 MGD Plant Capacity – Option A

15.1.1. Sizing Criteria – Average flow: 1.3 MGD

No Tertiary Disinfection improvements are required for Option A. The existing facility remains in operation in its current size and condition.

15.2. 2.6 MGD Plant Capacity – Option B

15.2.1. Sizing Criteria – Average flow: 2.6 MGD

15.2.2. Disinfection Preliminary Design Assumptions

- Assume a minimum CT of 450 mg-min/l for Title 22 treatment.
- Provide 90 minute hydraulic detention time in contact tank at peak flowrates. Recognizing that the RWCWRF is a scalping facility, use average flow or 2.6 MGD to be equal to peak process flowrate to disinfection. Assume an additional 15% flow to the process flowrate to consider clean-out volumes, surges, etc. Therefore assume total maximum design flow to chlorination @ 3.0 MGD.
- Contact volume @ 25,065 cu. Ft.
- CCT channel dimensions @ 8 ft wide x 8 ft deep x 390 ft long. Use 3 pass configuration each pass @ 130 ft. long with 2 ft freeboard. Slab with 1 foot extended footings.
- Assume a chlorine dosage of 5 mg/l for effluent disinfection
- Detention time in reclaimed water transmission line not considered for contact time
- Assume 12.5% sodium hypochlorite delivered to site
- Assume continuous RAS chlorination at 1.5 # chlorine/1,000 #s MLVSS
- Assume 12 hr HRT and MLSS of 2,500 mg/l (% MLVSS @ 72%)
- Assume RAS concentration @ 7,500 mg/l
- Volume of sodium hypochlorite/day required for disinfection = 120 gal/day
- Volume of sodium hypochlorite / day required for RAS bulking control = 92 gal/day
- Provide 15 days of sodium hypochlorite storage (Note: half-life of NaOCl solution is approximately 30 days, therefore limit storage to not more than approximately 2 weeks)
- Storage volume = approximately 3,180 gals (use totes for storage)
- Provide duty and standby chemical metering pumps for sodium hypochlorite delivery to disinfection and RAS
- Provide protective canopy over contact tank and chemical feed facilities

15.2.3. Estimates of Probable Construction Costs

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 2.6 MGD (approximate) water reclamation facility within the State of California.

CHLORINE CONTACT TANK, SODIUM HYPOCHLORITE STORAGE AND CHEMICAL FEED FACILITIES FOR TERTIARY DISINFECTION FACILITIES – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	570	9	5,130
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	150,000	150,000
Structural (Reinforced Concrete)					

CCT SOG	132' x 30 x 2' (3 passes)	CY	293	850	249,050
Walls	130' x 10' x 1' (2 Each)	CY	96	975	93,600
Walls	122 x 10' x 1' (2 Each)	CY	90	975	87,750
Walls	28 x 10' x 1' (2 Each)	CY	21	975	20,475
NaOCl Storage and Feed SOG	22' x 22' x 2'	CY	36	975	35,100
NaOCl Storage and Feed Containment Walls	22' x 3' x 1' (4 Each)	CY	10	975	9,750
Structural (Misc. Metals)					
Misc. Metals & Fabrications	Est. Labor + Supplier Pricing	LS	1	20,500	20,500
Structural (Misc. Metals)					
Canopy & Support Structure (3,625 sq. ft.)	Est. Labor + Supplier Pricing	LS	1	180,000	180,000
Mechanical					
Chemical Feed Equipment, piping and misc. valves and instruments	Est. Labor + Supplier Pricing	EA	4	64,000	256,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	52,000	52,000
Subtotal					1,159,355
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	225,000	306,245
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	8,500	21,875
General Conditions	Average 15% of Total	LS	1	120,410	262,495
Subtotal					1,749,970
Contingencies @ 15%					262,495
Total					2,012,465

Total Option B relative estimate of probable construction cost = $ 2,012,465

15.3. 3.9 MGD Plant Capacity – Option C

15.3.1. Sizing Criteria – Average flow: 3.9 MGD

15.3.2. Disinfection Preliminary Design Assumptions

- Assume a minimum CT of 450 mg-min/l for Title 22 treatment.

- Provide 90 minute hydraulic detention time in contact tank at peak flowrates. Recognizing that the RWCWRF is a scalping facility, use average flow or 3.9 MGD to be equal to peak process flowrate to disinfection. Assume an additional 15% flow to the process flowrate to consider clean-out volumes, surges, etc. Therefore assume total maximum design flow to chlorination @ 4.5 MGD
- Contact volume @ 37, 598 cu. Ft.
- CCT channel dimensions @ 9 ft wide x 9 ft deep x 465 ft long. Use 3 pass configuration each pass @ 155 ft. long with 2 ft freeboard. Slab with 1 foot extended footings.
- Assume a chlorine dosage of 5 mg/l
- Detention time in reclaimed water transmission line not considered for contact time
- Assume 12.5% sodium hypochlorite delivered to site
- Assume continuous RAS chlorination at 1.5 # chlorine/1,000 #s MLVSS
- Assume 12 hr HRT in AS Tanks and MLSS of 2,500 mg/l (% MLVSS @ 72%)
- Assume RAS concentration @ 7,500 mg/l
- Volume of sodium hypochlorite/day required for disinfection = 180 gpd
- Volume of sodium hypochlorite / day required for RAS bulking control = 190 gal/day
- Provide 15 days of sodium hypochlorite storage (Note: half-life of NaOCl solution is approximately 30 days, therefore limit storage to not more than approximately 2 weeks)
- Storage volume = approximately 5,550 gals (use 8 ft diameter FRP tank approximately 20 ft high to provide approximately 5 ft freeboard)
- Provide duty and standby chemical metering pumps for sodium hypochlorite delivery to disinfection and RAS
- Provide protective canopy over contact tank and chemical feed facilities

15.3.3. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary design and associated cost estimates are based upon the design and construction of a similar 3.9 MGD (approximate) water reclamation facility within the State of California.

CHLORINE CONTACT TANK, SODIUM HYPOCHLORITE STORAGE AND CHEMICAL FEED FACILITIES FOR TERTIARY DISINFECTION – PROBABLE CONSTRUCTION COSTS

Description	Dimensions	Unit	Quantity	Unit Price	Total Price
Civil					
Earthwork (Excavation, Backfill, & Grading)	Est. Labor & Equipment	CY	850	9	7,650
Site Improvements, Yard Piping & Restoration	Approx. 8% of Total	LS	1	175,000	175,000
Structural (Reinforced Concrete)					
CCT SOG	159' x 33' x 2' (3 passes)	CY	389	850	330,650
Walls	155' x 11' x 1' (2 Each)	CY	126	975	122,850
Walls	146 x 11' x 1' (2 Each)	CY	119	975	116,025
Walls	31 x 11' x 1' (2 Each)	CY	26	975	25,350

NaOCl Storage and Feed SOG	22' x 22' x 2'	CY	36	975	35,100
NaOCl Storage and Feed Containment Walls	22' x 3' x 1' (4 Each)	CY	10	975	9,750
Structural (Misc. Metals)					
Misc. Metals & Fabrications	Est. Labor + Supplier Pricing	LS	1	20,500	20,500
Structural (Misc. Metals)					
Canopy & Support Structure (4,225 sq. ft.)	Est. Labor + Supplier Pricing	LS	1	211,250	211,250
Mechanical					
Chemical Feed Equipment, piping and misc. valves and instruments	Est. Labor + Supplier Pricing	EA	2	72,000	144,000
NaOCl Storage tank and Accessories	Est. Labor + Supplier Pricing	EA	1	18,000	18,000
Miscellaneous					
Painting & Coatings	Est. Subcontractor Pricing	LS	1	52,000	52,000
Subtotal					1,268,125
Electrical & Instrumentation					
E&I Power & Control Systems	Average 17.5% of Total	LS	1	140,480	334,976
Testing, Start-Up & Commissioning	Average 1.25% of Total	LS	1	10,035	23,927
General Conditions	Approx. 15% of Total	LS	1	120,410	287,123
Subtotal					1,914,151
Contingencies @ 15%					287,123
Total					2,201,274

Total Option C relative estimate of probable construction cost = $ 2,201,274

15.4. SUMMARY ESTIMATE OF PROBABLE CONSTRUCTION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) TERTIARY DISINFECTION FACILITIES

Plant Capacity	Estimate of Probable Construction Costs
1.3 MGD	No Improvements Required
2.6 MGD	$ 2,012,465
3.9 MGD	$ 2,201,274

16. OPTION D – DECOMMISSIONING OF RWCWRF AND SBPS - OVERVIEW

16.1. ABANDON EXISTING RWCRWF PRELIMINARY SCOPE OF WORK ASSUMPTIONS

- All facilities to be abandoned are to be removed from service include all wastewater flows, potable water, electrical power, and communications.
- All underground piping and electrical conduits & duct banks are to be abandoned and capped in place.
- All biological solids to be removed and legally disposed of offsite.
- Mechanical and electrical demolition includes complete removal and offsite disposal of all electrical equipment, conduit wire and other appurtenances.
- Structural demolition includes complete removal and offsite disposal of all structures including reinforced concrete below grade structures in their entirety.
- Civil demolition includes complete removal and offsite disposal of all surface improvements including asphalt paving, concrete drainage improvements, landscaping, irrigation and others as required.
- Civil restoration includes importation of soils required to backfill all below grade structural removals plus full site finish grading to ensure positive storm water drainage.
- All demolished materials to be recycled to the greatest extent possible.

16.2. ESTIMATES OF PROBABLE CONSTRUCTION COSTS

Assumptions:

- Costs based on May 2012 dollars
- Preliminary cost estimates are based upon typical abandonment, demolition and decommissioning work performed at similar 1.3 MGD (approximate) water reclamation facilities within the State of California.

EXISTING RWCWRF SITE - TREATMENT PLANT DECOMMISSIONING

DESCRIPTION	EST. COST
DECOMMISSION (TERMINATE) PLANT PROCESS FLOW	
TERMINATE SEWAGE FLOW TO RWCWRF, REDIRECT TO RSDPS - DECOMMISSIONING OF SBPS	50,000
DECOMMISSION UTILITY SERVICES	
SDGE - TERMINATE ELECTRICAL SERVICE TO FACILITY	25,000
SDGE - REMOVE TRANSFORMER(S) AND ANY EXISTING SERVICE MATERIALS	75,000
DISTRICT - TERMINATE POTABLE WATER SERVICE, REMOVE METER	5,000
DISTRICT - TERMINATE TELECOMMUNICATIONS SERVICE	5,000
DECOMMISSIONING REGULATORY ADMINISTRATIVE REQUIREMENTS	
DISTRICT - VERIFY IF ANY REGULATORY FILINGS ARE REQUIRED	TBD
DISTRICT - COMPLETE ANY INTERNAL ACCOUNTING & ADMIN FOR WWTP	TBD
DISTRICT - ANY ADDITIONAL RWCWRF CLOSURE REQUIREMENTS	TBD
OTHER DISTRICT REQUIREMENTS FOR PLANT DECOMMISSIONING	

ASSIGN OVERALL CONTINGENCY OF $250,000	250,000
SUBTOTAL - DECOMMISSIONING	**$410,000**
CONTINGENCY FOR DECOMMISSIONING REQUIREMENTS @ 20%	$82,000
TOTAL DECOMMISSIONING	**$492,000**
EXISTING RWCWRF SITE - TREATMENT PLANT DEMOLITION, REMOVAL AND SITE RESTORATION	
DEWATER EXISTING TANKS AND BASINS	
DEWATER ALL EXISTING BASINS VIA PUMPING OR EVAPORATION	50,000
CLEAN & DISPOSE OF ANY BIO-SOLIDS IN THE BASIN BOTTOMS (NOT RETURNED TO RSDPS)	200,000
DEMOLITION OF MECHANICAL, ELECTRICAL/I&C AND MISC CIVIL WORKS	
DEMO & DISPOSE - STEEL BRIDGE PS (ABANDON FM TO RWCWRF IN PLACE)	10,000
DEMO & DISPOSE - HEADWORKS	15,000
DEMO & DISPOSE - ACTIVATED SLUDGE	30,000
DEMO & DISPOSE - SECONDARY CLARIFIERS	20,000
DEMO & DISPOSE - RAS PUMPING	7,500
DEMO & DISPOSE - BLOWER BUILDING MECHANICAL, ELECTRICAL/I&C, PIPING, METALS & MISC.	25,000
DEMO & DISPOSE - TERTIARY FILTRATION FACILITIES	20,000
DEMO & DISPOSE - CHEMICAL ADDITION FACILITIES	10,000
DEMO & DISPOSE - AREA RELATED TO ORIGINAL FILTER FACILITIES	10,000
DEMO & DISPOSE - ABANDONED RO FACILITIES	15,000
DEMO & DISPOSE - CHLORINATION FACILITIES AND RELATED AREA	10,000
DEMO & DISPOSE - CHLORINE CONTACT TANK MECHANICAL	12,000
DEMO & DISPOSE - EFFLUENT PUMP STATION	20,000
DEMO & DISPOSE - ADMINISTRATION BUILDING	10,000
DEMO & DISPOSE - WATER STORAGE TANKS NEAR HEADWORKS AREA (INCL CONCRETE PADS)	25,000
DEMO & DISPOSE - MISC MECHANICAL AREAS	50,000
DEMO & DISPOSE - ELECTRICAL SWITCHGEAR, METERING & MCC'S	60,000
DEMOLITION OF ALL EXISTING STRUCTURES	
CLEAN,DEMO & DISPOSE - STEEL BRIDGE PS AND ADJACENT IMHOFF TANK	165,000
CLEAN, DEMO & DISPOSE - HEADWORKS STRUCTURES	35,000
CLEAN, DEMO & DISPOSE - ACTIVATED SLUDGE TANKS	485,000
CLEAN, DEMO & DISPOSE - SECONDARY CLARIFIERS	235,000
CLEAN, DEMO & DISPOSE - RAS PUMPING STRUCTURES	25,000
CLEAN, DEMO & DISPOSE - BLOWER BUILDING	105,000
CLEAN, DEMO & DISPOSE - TERTIARY FILTRATION FACILITIES AND CANOPY	30,000
CLEAN, DEMO & DISPOSE - CHEMICAL ADDITION FACILITIES	10,000
CLEAN, DEMO & DISPOSE - AREA RELATED TO ORIGINAL FILTER FACILITIES	25,000
CLEAN, DEMO & DISPOSE - ABANDONED RO BUILDING	37,000
CLEAN, DEMO & DISPOSE - CHLORINATION FACILITIES AND RELATED AREA	35,000

CLEAN, DEMO & DISPOSE - CHLORINE CONTACT TANK AND CANOPY	45,000
CLEAN, DEMO & DISPOSE - EFFLUENT PUMP STATION	75,000
CLEAN, DEMO & DISPOSE - ADMINISTRATION BUILDING	275,000
CLEAN, DEMO & DISPOSE - MISC STRUCTURES	100,000
CLEAN, DEMO & DISPOSE - ELECTRICAL SWITCHGEAR, METERING & MCC'S	40,000
CIVIL IMPROVEMENTS	
DEMO PAVING & DISPOSE OF ALL SURFACE IMPROVEMENTS	120,000
REGRADE SITE AFTER DEMOLITION OF EXIST FACILITIES INCLUDING IMPORT SOILS TO BACKFILL	290,000
INCORPORATE STORM WATER AND DRAINAGE MEASURES FOR PROPER CONTROL OF RUNOFF	30,000
SURFACE RESTORATION AND FINAL CIVIL IMPROVEMENTS	
LANDSCAPE - LANDSCAPING & IRRIGATION OF SURFACE IMPROVEMENTS	75,000
MISC. SURFACE IMPROVEMENTS (PAVING, SIDEWALKS, ETC.)	50,000
SUBTOTAL - DEMOLITION, REMOVAL AND SITE RESTORATION	**$2,886,500**
CONTINGENCY FOR DEMOLITION, REMOVAL AND SITE RESTORATION	**$577,300**
TOTAL FOR DEMOLITION, REMOVAL AND SITE RESTORATION	**$3,463,800**
GRAND TOTAL	**$3,955,800**

Total Option D relative estimate of probable construction costs = $3,955,800

16.3. ESTIMATE OF PROBABLE ABANDONMENT, DECOMMISSIONING, DEMOLITION AND RESTORATION COSTS SUMMARY (BASED ON MAY 2012 DOLLARS) FOR RWCWRF

Description	Estimate of Probable Total Decommissioning & Demolition Costs
Decommissioning	$492,000
Demolition/Restoration	$3,463,800
Grand Total	$3,955,800

Part B – Estimate of Additional Conceptual Power Consumption Costs

The following tables present conceptual estimates of additional annual power costs for each of the management options developed by ARCADIS. Annual costs presented are in addition to existing operational costs for the RWCWRF.

Additional Principal Power Loads - 1.3 MGD (Option A)

Equipment Description	Total No. of Units	Hp per Unit	No. of Operating Units	Total Motor Hp	Total BHp	Total Run KW	Run Time per Day (hrs)	Total KW-Hrs per Year	Annual Power Consumption Cost
DAF Pressurization Pump	2	15.00	1	15	11	8	24	71,885	8,626
DAF Top Scraper Drive	2	0.75	1	0.75	0.50	0.37	24	3,267	392
DAF Air Compressor	2	5.00	1	5	4.00	2.98	24	26,140	3,137
DAF Polymer Feed Pumps	2	5.00	1	5	3.75	2.80	24	24,506	2,941
Supernatant Pump (No pumping req'd. Gravity flow to headworks)	0	0.00	0	0	0	0	0	0	0
Thickened Sludge Pump	2	15.00	1	15	26	19	8	56,636	6,796
Aerobic Digestion Blower	2	40.00	1	40	34	25	24	222,189	26,663
Digested Sludge Pumps	2	10.00	1	10	7.50	5.60	4	8,169	980
Dewatering Polymer Feed Pumps	2	7.50	1	7.5	6.75	5.04	4	7,352	882
Centrifuge Drive	1	50.00	1	50	40	30	4	43,566	5,228
Dewatered Solids Conveyors	1	5.00	1	5	4.00	2.98	4	4,357	523
Total Connected Load	**-**	**-**	**-**	**153**	**138**	**103**	-	**468,067**	**$56,168**

monthly average **$4,681**

Notes:

1- Number of units identified are additive to the existing facilities at 1.3 MDG ADWF

2- Electrical service 480/3/60 with assumed power factor @ 0.8.

3- Assumes a blended electrical service rate of $0.12 per KW-hr

Additional Principal Power Loads - 2.6 MGD (Option B)

Equipment Description	Total No. of Units	Hp per Unit	No. of Operating Units	Total Motor Hp	Total BHp	Total Run KW	Run Time per Day (hrs)	Total KW-Hrs per Year	Annual Power Consumption Cost
Influent Pumps	3	75.00	2	150	110	82	24	718,846	86,261
Mechanical Bar Rack	1	1.00	1	1	0.75	0.56	24	4,901	588
Grit Handling Equipment (Vortex drive and grit pump/classifier)	2	15.00	2	30	22	16	24	143,769	17,252
Aeration Blowers	3	100.00	2	200	170	127	24	1,110,943	133,313
Anoxic Zone Mixers	8	5.00	8	40	32	24	24	209,119	25,094
MLSS Return Pump	2	25.00	2	50	41	31	24	267,933	32,152
Secondary Scum (clarifier) Pumps	2	5.00	1	5	3.70	2.76	6	6,045	725
Secondary Clarifier Drives	4	0.75	4	3	2.20	1.64	24	14,377	1,725
RAS Pumps	3	20.00	2	40	30	22	24	194,742	23,369
WAS Pumps	2	5.00	2	10	7.50	5.60	8	16,337	1,960
Flocculator Drives	2	5.00	2	10	7.50	5.60	24	49,012	5,881
Tertiary Filtration Polymer Feed Pumps	2	5.00	2	10	7.50	5.60	24	49,012	5,881
Air Scour Compressors	2	10.00	1	10	8.00	5.97	4	8,713	1,046
Backwash Pumps	2	10.00	1	10	8.00	5.97	4	8,713	1,046
Sodium Hypochlorite Feed Pumps	4	5.00	2	10	8.50	6.34	24	55,547	6,666
Effluent Pumps	3	100.00	2	200	170	127	24	1,110,943	133,313
DAF Pressurization Pump	2	15.00	2	30	22	16	24	143,769	17,252
DAF Top Scraper Drive	2	0.75	2	1.5	1.00	0.75	24	6,535	784
DAF Air Compressor	2	5.00	1	5	4.00	2.98	24	26,140	3,137
DAF Polymer Feed Pumps	2	5.00	2	10	7.50	5.60	24	49,012	5,881
Supernatant Pump (No pumping req'd. Gravity flow to headworks)	0	0.00	0	0	0	0	0	0	0
Thickened Sludge Pump	3	15.00	2	30	26	19	8	56,636	6,796
Aerobic Digestion Blower	3	40.00	2	80	68	51	24	444,377	53,325

Digested Sludge Pumps	2	10.00	1	10	7.50	5.60	6	12,253	1,470
Dewatering Polymer Feed Pumps	2	7.50	1	7.5	6.75	5.04	6	11,028	1,323
Centrifuge Drive	1	50.00	1	50	40	30	6	65,350	7,842
Dewatered Solids Conveyors	1	5.00	1	5	4.00	2.98	6	6,535	784
Drainage Pumps	2	2.00	1	2	1.50	1.12	4	1,634	196
Sludge Filtrate Pumps (No pumping req'd. Gravity flow to headworks)	0	0.00	0	0	0	0	0	0	0
Blower Room Ventilation	2	1.00	2	2	1.50	1.12	24	9,802	1,176
Miscellaneous Loads	1	1.00	1	-	-	5	24	43,800	5,256
Total Connected Load	**-**	**-**	**-**	**1012**	**818**	**615**	-	**4,845,825**	**$581,499**
								monthly average	**$48,458**

Notes:

1- Number of units identified are additive to the existing facilities at 1.3 MDG ADWF

2- Electrical service 480/3/60 with assumed power factor @ 0.8.

3- Assumes a blended electrical service rate of $0.12 per KW-hr

Additional Principal Power Loads - 3.9 MGD (Option C)

Equipment Description	Total No. of Units	Hp per Unit	No. of Operating Units	Total Motor Hp	Total BHp	Total Run KW	Run Time per Day (hrs)	Total KW-Hrs per Year	Annual Power Consumption Cost
Influent Pumps	3	125.00	2	250	170	127	24	1,110,943	133,313
Mechanical Bar Rack	1	1.00	1	1	0.75	0.56	24	4,901	588
Grit Handling Equipment (Vortex drive and grit pump/classifier)	2	15.00	2	30	22	16	24	143,769	17,252
Aeration Blowers	5	200.00	4	800	680	507	24	4,443,773	533,253
Anoxic Zone Mixers	16	5.00	16	80	66	49	24	431,307	51,757
MLSS Return Pump	4	25.00	4	100	82	61	24	535,867	64,304
Secondary Scum (clarifier) Pumps	2	5.00	1	5	3.70	2.76	6	6,045	725
Secondary Clarifier Drives	4	0.75	4	3	2.20	1.64	24	14,377	1,725
RAS Pumps	6	20.00	4	80	30	22	24	194,742	23,369
WAS Pumps	4	5.00	3	15	11	8	8	24,506	2,941
Flocculator Drives	2	5.00	2	10	7.50	5.60	24	49,012	5,881
Tertiary Filtration Polymer Feed Pumps	2	5.00	2	10	7.50	5.60	24	49,012	5,881
Air Scour Compressors	2	10.00	1	10	8.00	5.97	4	8,713	1,046
Backwash Pumps	2	10.00	1	10	8.00	5.97	4	8,713	1,046
Sodium Hypochlorite Feed Pumps	4	7.50	2	15	12.75	9.51	24	83,321	9,998
Effluent Pumps	6	100.00	4	400	340	254	24	2,221,886	266,626
DAF Pressurization Pump	3	15.00	3	45	36	27	24	235,259	28,231
DAF Top Scraper Drive	3	0.75	3	2	1.50	1	24	9,802	1,176
DAF Air Compressor	3	5.00	2	10	8.00	5.97	24	52,280	6,274
DAF Polymer Feed Pumps	2	5.00	2	10	7.50	5.60	24	49,012	5,881
Supernatant Pump (No pumping req'd. Gravity flow to headworks)	2	5.00	1	5	3.70	2.76	0	0	0
Thickened Sludge Pump	4	15.00	3	45	39	29	8	84,954	10,195
Aerobic Digestion Blower	4	40.00	3	120	102	76	24	666,566	79,988

Digested Sludge Pumps	2	10.00	1	10	8	6	8	16,337	1,960
Dewatering Polymer Feed Pumps	2	7.50	1	7.5	6.75	5.04	8	14,704	1,764
Centrifuge Drive	1	50.00	1	50	40	30	8	87,133	10,456
Dewatered Solids Conveyors	2	5.00	2	10	8.50	6.34	8	18,516	2,222
Drainage Pumps	2	2.00	1	2	2	1	4	1,634	196
Sludge Filtrate Pumps (No pumping req'd. Gravity flow to headworks)	2	5.00	1	5	4	3	0	0	0
Blower Room Ventilation	2	1.00	2	2	2	1	24	9,802	1,176
Miscellaneous Loads	1	1.00	1	-	-	6	24	52,560	6,307
Total Connected Load	**-**	**-**	**-**	**2143**	**1719**	**1288**	-	**10,629,447**	**$1,275,534**
								monthly average	**$106,294**

Notes:

1- Number of units identified are additive to the existing facilities at 1.3 MDG ADWF

2- Electrical service 480/3/60 with assumed power factor @ 0.8.

3- Assumes a blended electrical service rate of $0.12 per KW-hr

Part C – Estimate of Additional Conceptual Chemical Consumption

The following tables present conceptual estimates of additional annual chemical costs for each of the management options developed by ARCADIS. Annual costs presented are in addition to existing operational costs for the RWCWRF. It should be noted that the quantity of sodium hypochlorite is a worst case type of scenario where RAS chlorination is assumed to be continuous on an annual basis. Sodium hypochlorite costs at 1.3 MGD ADF is assumed to be 50% of projected costs for the 2.6 MGD capacity scenario for general planning comparison.

Additional Chemical Consumption Costs – 1.3 MGD (Option A)

Chemical	Additional Annual Consumption	Unit Cost	Annual Cost
DAF Polymer	2,491 active lbs/year	$4.00/lb active	$9,965
Solids Dewatering Polymer	8,098 active lbs/year	$4.00/lb active	$32,394
Sodium Hypochlorite	0 gal/year	$0.80/gal	$0
Total Additional Annual Cost			**$42,359**

Additional Chemical Consumption Costs – 2.6 MGD (Option B)

Chemical	Additional Annual Consumption	Unit Cost	Annual Cost
DAF Polymer	4,982 active lbs/year	$4.00/active lb	$19,929
Solids Dewatering Polymer	16,196 active lbs/year	$4.00/active lb	$64,784
Sodium Hypochlorite	38,690 gal/year	$0.80/gal	$30,952
Total Additional Annual Cost			**$115,665**

Additional Chemical Consumption Costs – 3.9 MGD (Option C)

Chemical	Additional Annual Consumption	Unit Cost	Annual Cost
DAF Polymer	7,473 active lbs/year	$4.00/active lb	$29,894
Solids Dewatering Polymer	24,294 active lbs/year	$4.00/active lb	$97,176
Sodium Hypochlorite	96,360 gal/year	$0.80/gal	$77,088
Total Additional Annual Cost			**$204,158**

Appendix D

Analysis of Wastewater Management Options

APPENDIX D: ANALYSIS OF WASTEWATER MANAGEMENT OPTIONS

This appendix provides detailed discussion and information on the analysis of wastewater management options presented in Chapter 5 of the Wastewater Management Plan report.

5.1 Identification of Wastewater Disposal Options

The purpose of this Appendix is to present potential future wastewater treatment, disposal, and reuse options for the District and compare capital and operational costs over the 20-year planning horizon to 2030. The objective of the comparison is to recommend a wastewater treatment, disposal, and recycling plan to the District based on updated planning and cost estimates for local and regional wastewater management elements potentially affecting future costs to the District wastewater and recycled water customers.

The scope of work for the project includes multiple wastewater disposal and recycled water use variables which result in a large matrix of about 61 alternatives presented to the District staff early in the project implementation stage. In multiple review and discussion meetings and a collaboration and decision-making workshop with District staff, wastewater management options were defined and synthesized into five major feasible alternatives involving wastewater treatment, disposal, and reclamation. In considering all cost elements for wastewater treatment and recycled water use, multiple sub-options were developed for each of the five. The total number of cost sub-options is 18, as presented in sub-section 5.2.

All options presume continued ownership, operation, maintenance, and required expansion of the District's existing wastewater collection system consistent with the wastewater flow projections, hydraulic modeling analyses, and capital improvement projects discussed previously in this report. The five wastewater management options are denoted as Options A through E, as described below.

5.1.1 Option A – Maintain Existing Wastewater Treatment Capacity at the Ralph W. Chapman Water Recycling Facility

This wastewater management option maintains the status quo at the RWCWRF, with the exception of water quality enhancements and potential solids handling facilities at the treatment plant location. The required improvements to the Rancho San Diego Pump Station will be implemented. The capacity of the RWCWRF will remain at the existing 1.3 MGD. All flows conveyed via the District's wastewater collection system in excess of 1.3 MGD will be discharged to the San Diego Metro wastewater collection and treatment system with the associated institutional and financial impacts.

Alternative wastewater solids handling options include onsite treatment at RWCWRF and disposal of residuals in a landfill and continued discharge of solids to the Metro system with attendant costs. Two future City of San Diego wastewater treatment processes and costs are evaluated in Option A. These include 1) continued advanced primary treatment at the Point Loma WWTP and assumed continuance of an existing waiver from the Environmental Protection Agency and 2) upgrade of the Point Loma WWTP to secondary treatment with attendant costs and allocation of the District's fair share of the future capital and operating costs. In a recent Recycled Water Study performed for the City of San Diego and released on May 10, 2012, alternatives to the Point Loma Upgrade were evaluated. Alternatives include diversion of wastewater from Point Loma, increased recycled water use, and Indirect Potable Reuse (IPR) using the San Vicente reservoir and Otay Lakes. Multiple alternatives are presented with projected capital and operating costs.

The selected IPR alternative could result in a reduction in costs from the secondary upgrade costs allocated to the District for those wastewater management options which include continued discharge to the Metro System. Although it is presumed that San Diego and its participating agencies will select the most cost-effective long-term wastewater and recycled water management solution approvable by EPA, this management plan uses the assumption of upgrade to secondary for Point Loma, as prescribed in the original project scope of work.

There are three recycled water treatment and use alternatives in Option A, including continued direct use for irrigation from the RWCWRF, purchase and use of tertiary effluent from the City of San Diego SBWRP in accordance with an existing agreement with the City, and potential purchase from a future Chula Vista membrane bio-reactor (MBR) wastewater reclamation plant recommended at Site 3 (at Main Street and Mace Street) in Chula Vista in the April 2012 Acquisition of Additional Wastewater Capacity Report.

Figure 5.1 below depicts the conceptual flow, treatment, wastewater discharge, and recycled water use schematic for wastewater management Option A. Note that recycled water purchases from the San Diego South Bay plant and a potential future Chula Vista plant are not indicated on the diagram, although these alternatives are evaluated in the cost comparisons. For cost evaluations, there are 6 sub-options for Option A with alternatives for purchase of recycled water, RWCWRF on-site solids handling or not, and Point Loma WWTP upgrade or not. Sub-options are designated as A-1 through A-6, for Option A

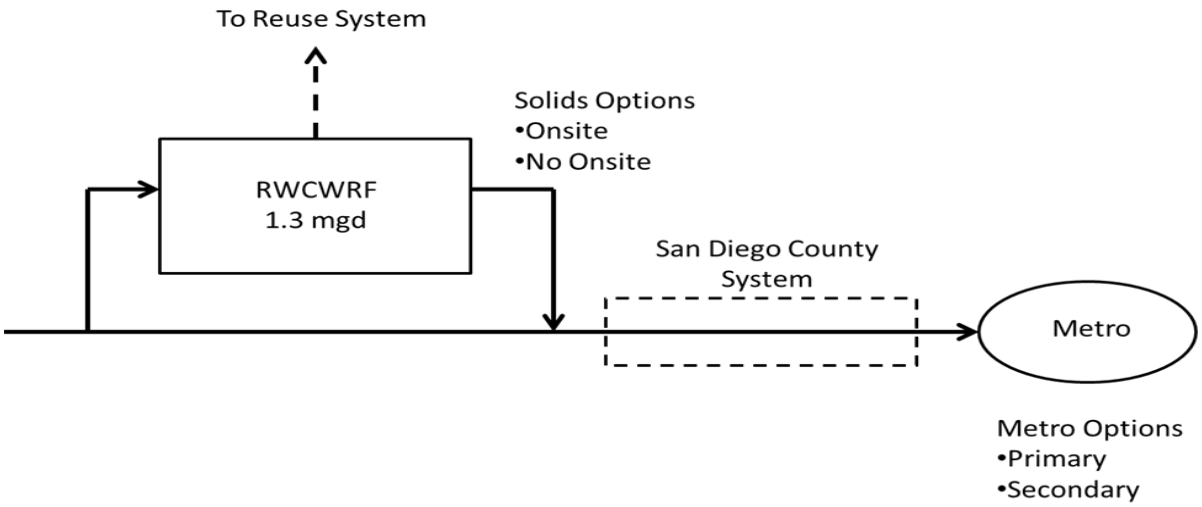

Figure 5.1 Option A: Maintain Existing Wastewater Treatment Capacity at the Ralph W. Chapman Water Recycling Facility

5.1.2 Option B – Expand the Ralph W. Chapman Water Recycling Facility to 2.6 MGD

Option B includes the expansion of the RWCWRF from 1.3 MGD to 2.6 MGD consistent with the flow projections discussed in Chapter 2. Flows in excess of 2.6 MGD will be conveyed to the Metro wastewater collection and treatment system. Required improvements at the Rancho San Diego Pump Station will continue to be funded by the District proportional to its capacity ownership and wastewater discharges to the pump station. The District will continue to pay the existing and future unit costs associated with the Rancho

San Diego Pump Station and the associated charges for treatment at the San Diego Point Loma WWTP under the assumed two alternatives of advanced primary treatment and full secondary treatment if solids handling is not constructed at the RWCWRF

Solids handling options include onsite treatment at the RWCWRF and disposal of residuals in landfill and continued discharge to the Metro collection and treatment system. Recycled water treatment and use alternatives include treatment and conveyance from the RWCWRF and purchase and use from the SBWRP. Purchase and use from a future Chula Vista MBR water reclamation plant are not included since the engineering feasibility conditions were based on the RWCWRP remaining at its current 1.3 MGD capacity. Figure 5.2 below indicates a conceptual wastewater flow and discharge diagram from the RWCWRF for Option B. Note that the recycled water purchase from SBWRP is not shown. There are 3 sub-options for cost evaluations from Option B, designated as B-1, B-2 and B-3.

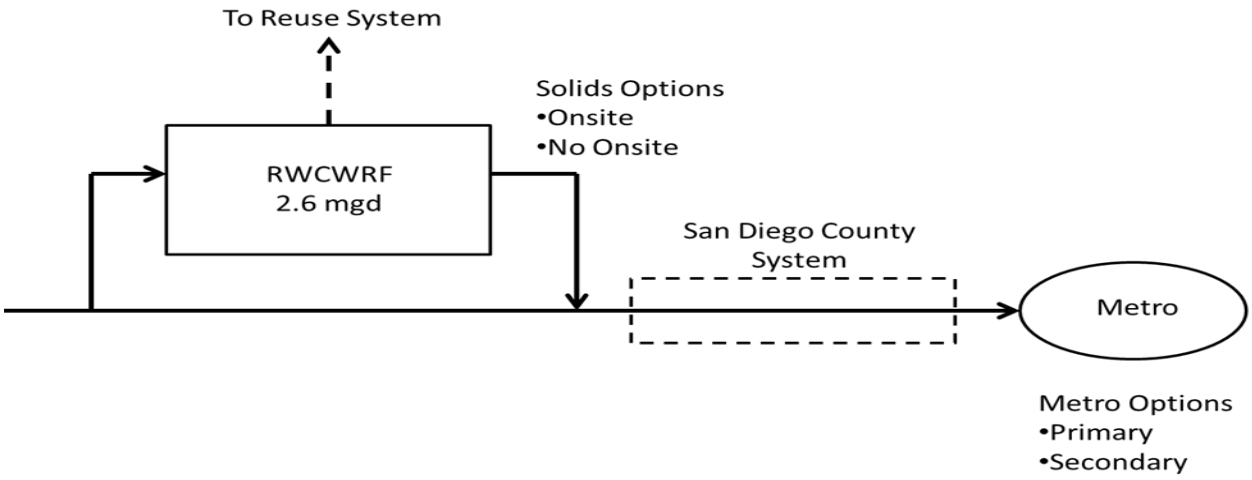

Figure 5.2 Option B: Expand the Ralph W. Chapman Water Recycling Facility to 2.6 MGD

5.1.3 Option C – Expand the Ralph W. Chapman Water Recycling Facility to 3.9 MGD

Option C includes the expansion of the RWCWRF from 1.3 MGD to 3.9 MGD. It is recognized that the Jamacha Basin wastewater flow projections discussed in Chapter 2 do not indicate the need for a 3.9 MGD treatment capacity at the RWCWRF. However, the District decided to maintain the incremental modularity of the treatment plant capacity and assume an expansion module of 2.6 MGD consistent with Option B. Flows in excess of those treated by RWCWRF will be conveyed to the Metro System. Flows anticipated to be treated by Metro are anticipated to be minimal only, conveyed at times of RWCWRF plant maintenance or emergency interruptions. Required improvements at the Rancho San Diego Pump Station will continue to be funded by the District proportional to its ownership and wastewater discharges to the pump station. The District will continue to pay the existing and future unit costs associated with the Rancho San Diego Pump Station and the associated charges for treatment at the Point Loma WWTP under the assumed two alternatives of advanced primary treatment and full secondary treatment, if no solids handling facilities are constructed at RWCWRF.

Solids handling options include onsite treatment at the RWCWRF and disposal of residuals in a landfill and continued discharge to the Metro System. Recycled water treatment and use alternatives include treatment and conveyance from the RWCWRF and purchase and use from the SBWRP. Purchase and use from a future Chula Vista MBR water reclamation plant are not assumed for Option C based on the engineering and economic feasibility study for the Chula Vista plant. Figure 5.3 below indicates a conceptual wastewater flow and discharge diagram for Option C. Recycled water use from SBWRP is not indicated on the diagram. There are 3 sub-options for cost evaluation for Option C.

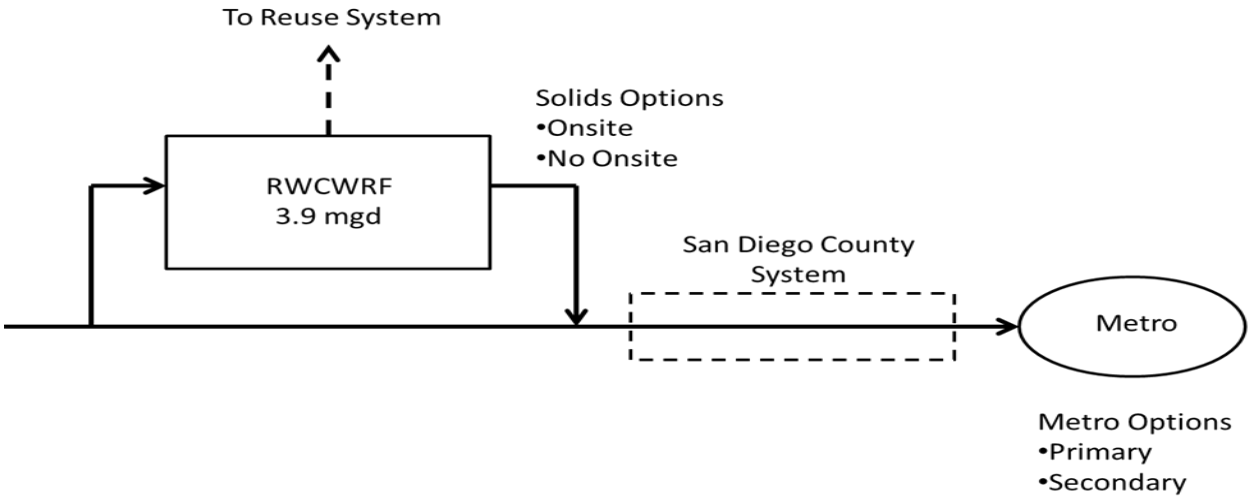

Figure 5.3 Option C: Expand the Ralph W. Chapman Water Recycling Facility to 3.9 MGD

5.1.4 Option D – Abandon and Demolish the Ralph W. Chapman Water Recycling Facility

Option D includes the decommissioning and demolition of the RWCWRF. All wastewater collected in the Jamacha Basin will be sent to the Point Loma WWTP through the Rancho San Diego Pump Station. Required improvements at the Rancho San Diego Pump Station will continue to be funded by the District proportional to its ownership and wastewater discharges to the pump station. The District will continue to pay the existing and future unit costs associated with the Rancho San Diego Pump Station and the associated charges for treatment at the Point Loma WWTP under the assumed two alternatives of advanced primary treatment and full secondary treatment.

Recycled water treatment and use alternatives are limited to purchase and use from the San Diego SBWRP and purchase and use from a future Chula Vista MBR water reclamation plant. There are provisions in the Otay/San Diego SBWRP agreement that require a minimum amount of recycled water to be annually purchased from South Bay whether the District uses the recycled water or not. This provision is typically referred to as a "Take-or-pay" requirement and was considered in determining the financial impacts to the District's annual recycled water costs. Additionally, in the Chula Vista Acquisition of Additional Wastewater Capacity Project, the Chula Vista consultant assumed that RWCWRF would remain at 1.3 MGD capacity and that Chula Vista recycled water would be purchased prior to purchase of recycled water from the SBWRP. This provision would require a modification to the existing District-SBWRP agreement. Figure 5.4 below indicates a conceptual wastewater flow and discharge diagram for Option D, with no recycled water use shown from RWCWRF. There are 4 sub-options for cost evaluations for Option D.

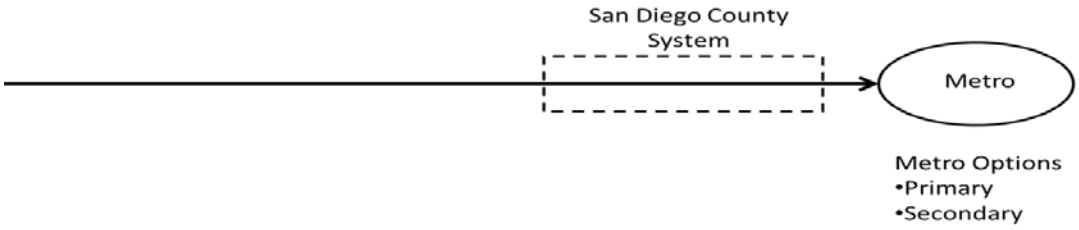

Figure 5.4 Option D: abandon and Demolish the Ralph W. Chapman Water Recycling Facility

5.1.5 OPTION E – Abandon and Demolish the Ralph W. Chapman Water Recycling Facility and Participate in a New Joint Wastewater Treatment and Recycling Facility with San Diego County

Option E includes the decommissioning and demolition of the RWCWRF. Wastewater collected in the Jamacha Basin will be sent to a new proposed joint wastewater treatment and recycling facility with San Diego County or the Point Loma WWTP through the Rancho San Diego Pump Station. Required improvements at the Rancho San Diego Pump Station will continue to be funded by the District proportional to its capacity ownership and wastewater discharges to the pump station. The District will continue to pay the existing and future unit costs associated with the Rancho San Diego Pump Station and the associated charges for treatment at the San Diego Point Loma WWTP under the assumed two alternatives of advanced primary treatment and full secondary treatment. Collection system modifications and extensions will be required to convey existing flow to the new joint WWTP and to by- pass to the Metro System, as required. Solids treatment at the new joint plant is assumed, since the plant process is assumed to be the same as the Chula Vista MBR plant. The conceptual joint new WWTP has been described in the 1997 report by Metcalf and Eddy for San Diego County entitled “Water Reclamation Facility Project Feasibility Report”. The concept included a 10 MGD plant located near I-805 and the Sweetwater River, using an activated sludge aeration process. For the District's Wastewater Management Plan, we have assumed an MBR plant similar to the Chula Vista proposal with cost estimates the same as the Chula Vista plant for equivalent capacity.

Recycled water treatment and use alternatives include production and delivery from a new joint WWTP, purchase and use from the existing SBWRP, and purchase and use from a future Chula Vista MBR water reclamation plant. Figure 5.5 below indicates a conceptual wastewater flow and discharge diagram for Option E. There are two sub-options for cost evaluation for Option E.

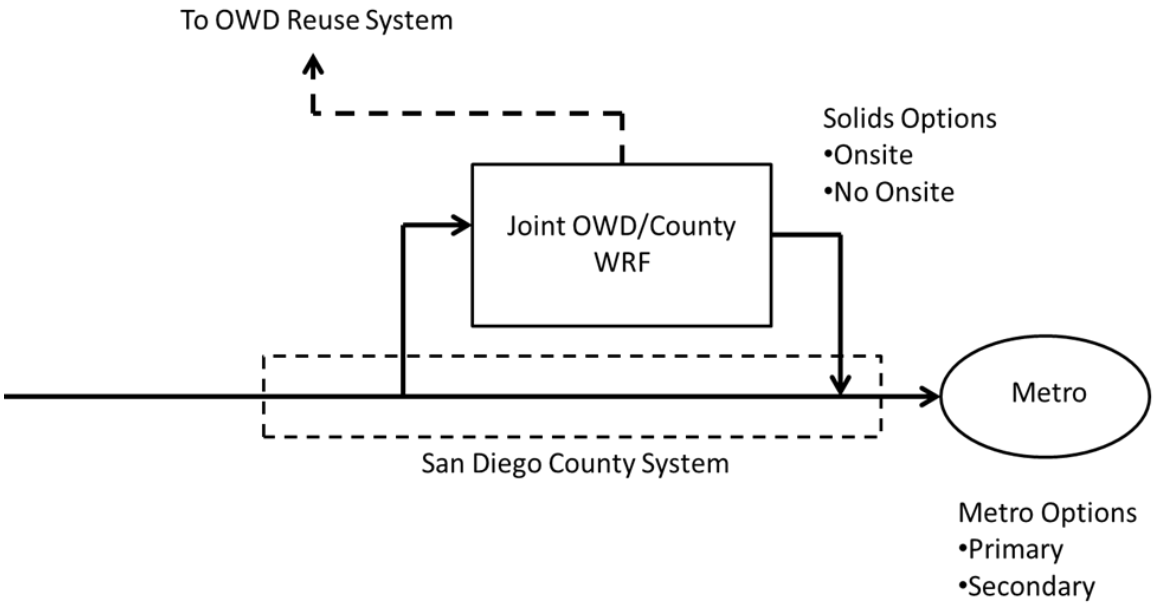

Figure 5.5 Option E: abandon the Ralph W. Chapman Water Recycling Facility and Participate in a New Joint WWTP and Recycling Project with San Diego County

5.2 Economic Evaluations of Wastewater Disposal and Recycled Water Use Options

An initial project challenge involved the determination of key cost factors associated with each of the five wastewater management options described above. Cost factors were broken into wastewater treatment components and recycled water components. Table 5-1 indicates the wastewater treatment cost elements; including costs for solids handling, expansion, and decommissioning of the RWCWRF; existing, new capacity, and Point Loma WWTP upgrade costs to Metro; and the District's share of a proposed joint San Diego County/Otay new wastewater treatment and recycled water facility. Wastewater treatment costs include capital and annual operation and maintenance costs.

Table 5-1. Wastewater Treatment Cost Components for Different Options

Wastewater Management Option	A	B	C	D	E
RWRWRF					
• Expansion	0	$	$	0	0
• On-Site Solids Handling	$	$	$	0	0
• Decommissioning	0	0	0	$	$
Metro System Capacity					
• Existing Charge (w/o on-site solids handling)	$	$	$	$	0
• New Capacity Charge (w/o on-site solids handling)	0	$	$	$	0
• Point Loma WWTP Upgrade (w/o on-site solids handling)	$	$	$	$	0
New County/Otay WWTP	0	0	0	0	$

Notes: $ = capital and operational costs exist for this option. 0 = no costs exist for this option.

Table 5-2 indicates the recycled water sources which exist for each of the wastewater management options. There exist four potential sources of recycled water under the five options, including the RWCWRF, the Metro SBWRP, a new potential Chula Vista MBR WRP, and a new potential joint County/Otay WWTP. Cost elements allocated for recycled water include costs to purchase each unit of recycled water from the SBWRP and the new Chula Vista WRP and capital costs for new booster stations and pipelines to deliver water from the proposed two new plants to the District's recycled water distribution system. Option E only assumes purchase of recycled water from the SBWRP and the new County/District plant.

Table 5-2. Recycled Water Sources Under Different Management Options

Wastewater Management Option	A	B	C	D	E
RWCWRF	X	X	X	0	0
SBWRP	X	X	X	X	X
New Chula Vista WRP	X	0	0	X	0
New County/District WWTP	0	0	0	0	X

Notes: X = recycled water provided to Otay for this option. 0 = no recycled water for this option.

In consideration of the key variables for evaluating capital and annual O&M costs for Options A through E, sub-options have been identified to compare present worth costs. Sub-options are combinations of wastewater treatment, disposal, and recycled water purchase variables. The matrix of options and sub-options included the following:

Option A: Six total sub-options.

(1) RWCWRF on-site solids handling, no Point Loma upgrade, Chula Vista RCW purchase

(2) RWCWRF on-site solids handling, no Point Loma upgrade, no Chula Vista RCW purchase

(3) RWCWRF no on-site solids handling, Point Loma upgrade, Chula Vista RCW purchase

(4) RWCWRF no on-site solids handling, Point Loma upgrade, no Chula Vista RCW purchase

(5) RWCWRF no on-site solids handling, no Point Loma upgrade, Chula Vista RCW purchase

(6) RWCWRF no on-site solids handling, no Point Loma upgrade, no Chula Vista RCW purchase

Option B: Three total sub-options.

(1) RWCWRF on-site solids handling, no Point Loma upgrade

(2) RWCWRF no on-site solids handling, Point Loma upgrade

(3) RWCWRF no on-site solids handling, no Point Loma upgrade

Option C: Three total sub-options.

(1) RWCWRF on-site solids handling, no Point Loma upgrade

(2) RWCWRF no on-site solids handling, Point Loma upgrade

(3) RWCWRF no on-site solids handling, no Point Loma upgrade

Option D: Four total sub-options (Metro discharge).

(1) No RWCWRF, Point Loma upgrade, Chula Vista RCW purchase

(2) No RWCWRF, no Point Loma upgrade, Chula Vista RCW purchase

(3) No RWCWRF, Point Loma upgrade, no Chula Vista RCW purchase

(4) No RWCWRF, no Point Loma upgrade, no Chula Vista RCW purchase

Option E: Two sub-options (new County/District WWTP).

(1) No RWCWRF, Point Loma upgrade

(2) No RWCWRF, no Point Loma upgrade

A matrix indicating the sub-options associated with each major wastewater management option is included below as table 5-3.

Table 5-3. Matrix of Sub-Options Evaluated

Wastewater Management Option		Recycled Water from SBWRP Only No Chula Vista Purchases		Recycled Water from Chula Vista WRF Only No SBWRP Purchases	
		No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade	No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade
A	Onsite sludge	A-2	--	A-1	--
	No onsite sludge	A-6	A-4	A-5	A-3
B	Onsite sludge	B-1	--	--	--
	No onsite sludge	B-3	B-2	--	--
C	Onsite sludge	C-1	--	--	--
	No onsite sludge	C-3	C-2	--	--
D		D-4	D-3	D-2	D-1
E (onsite sludge)		E-2	E-1		

5.3 Cost Estimates for Expansion and Demolition of the RWCWRF

The District treats raw wastewater and produces recycled water at the RWCWRF and purchases additional recycled water from the SBWRP. Detailed capital cost estimates have been prepared associated with upgrading, expanding, and decommissioning the RWCWRF under Options A through D, based on site visits, review of construction plans, and layout of new facilities. A site map of the RWCWRF with suggested new locations of processes required for upgrade and expansion for Options A through C is included as Appendix B. Option A maintains the RWCWRF at its current nominal ADWF of 1.3 MGD and adds solids handling facilities. Option B expands the RWCWRF to a nominal ADWF of 2.6 MGD, adds solids handling facilities, and adds tertiary filtration and chlorination, including a larger chlorine contact chamber to preclude the recycled water pipeline from meeting CA Title 22 requirements for contact time. Option C expands the RWCWRF to 3.9 MGD, adds solids handling facilities, and adds tertiary filtration and chlorination. Option D decommissions the RWCWRF, restores the site, and relies on other agencies to treat District wastewater and provide required recycled water for irrigation.

Capital cost estimates provided are expressed in May 2012 dollars based on the Los Angeles ENR Construction Cost Index of 10285. No allowances for inflation or financing costs have been included. Cost estimates are prepared in accordance with a Class 3 estimate of the Association for the Advancement of Cost Engineering International (AACEI). A Class 3 estimate may be expected to fall within the range of +25%/-15% of actual costs. For planning studies such as this, capital cost estimates are generally Class 5, having a much broader range of predicted accuracy for actual costs. The higher class estimate provides more detailed analysis of treatment process component size and costs that will add value to the planning

and budgeting process. General contingencies were applied to the estimates for each of the treatment processes evaluated. The cost estimates shown are related only to costs that would be included in a general contractor's bid for related construction work and do not include District administration, engineering, third party construction management, environmental documentation, and other non-contractor costs. Actual project final costs will depend on the type of project delivery selected by the District, actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, and other factors.

The RWCWRF Assessment of Capital Costs Report, included in Appendix C, is very detailed and organized by treatment process at the RWCWRF. Individual treatment processes have component sizing criteria, dimensions, units for costing, quantities, unit prices, and total price. In the detailed report, costs for Options A through C are grouped under each treatment process category. A summary of total capital costs for 15 components of the RWCWRF solids handling and improved disinfection upgrade and expansion Options A through C is shown in the Table 5-4 below.

Table 5-4. Summary of RWCWRF Conceptual Capital Costs for Options A, B and C in millions

Treatment Process	Option A – Maintain RWCWRF at 1.3MGD	Option B – Expand RWCWRF to 2.6MGD	Option C – Expand RWCWRF to 3.9MGD
Influent Pump Station	0	1.132	1.293
Headworks & Grit Removal	0	2.043	2.196
Aeration Basins	0	3.333	5.897
Secondary Clarifiers	0	1.964	3.582
RAS/WAS Pump Station	0	0.820	1.491
Scum Pump Station	0	0.173	0.173
Effluent Pump Station	0	0.788	1.542
Administration Building	0	0	1.040
Blower & Electrical Building	0	2.052	2.488
Aerobic Digestion	1.462	2.760	3.936
Digested Sludge Pump St.	0.121	0.229	0.331
WAS Thickening	0.848	1.579	2.309
Sludge Dewatering Centrifuge	0.915	0.915	1.748
Tertiary Filters (+Flocculation)	0	0.648	1.296
NaOCl Storage, Pumping, and Chlorine Contact Tank	0	2.012	2.201
Total	**3.346**	**20.450**	**31.524**

5.3.1 Estimate of Additional RWCWRF Power Loads and Chemical Costs

In addition to capital cost estimates for the RWCWRF components of Options A through C, specific elements of annual operating costs have been projected for the three options. Key elements of operational

cost include additional power cost and additional chemical costs. Added chemical and power costs are assumed to be attributed to new solids handling facilities for Option A. Solids handling operational costs for Option B are assumed to be twice the annual costs for Option A. Solids handling costs for Option C are assumed to be three times annual costs for Option A. Additional salary, benefit, and admin costs have not been estimated. Power cost per KWH assumes a blended rate of $0.12. These values are incorporated into Table 5-5 below.

Table 5-5. Summary of RWCWRF Annual Added Operational Costs for Options A, B and C

O & M Component	Option A – Maintain RWCWRF at 1.3MGD	Option B – Expand RWCWRF to 2.6MGD	Option C – Expand RWCWRF to 3.9MGD
Additional KWHs per year	468,067	4,845,825	10,629,447
Annual added power cost	$56,168	$581,499	$1,275,534
DAF polymer annual cost	$9,965	$19,929	$29,894
Solids dewatering polymer	$32,394	$64,784	$97,176
Sodium Hypochlorite cost	$0	$30,952	$77,088

5.3.2 Estimate of Cost to Decommission and Abandon the RWCWRF and Steel Bridge Pump Station

The Appendix C report also includes the estimated costs to decommission the RWCWRF and the Steel Bridge Pump Station, which pumps raw wastewater to the RWCWRF. Costs are expressed as two primary elements: decommissioning and demolition/restoration. These costs are associated with wastewater management Option D. Decommissioning is estimated to cost $492,000. Demolition and restoration have a combined estimated cost of $3,463,800. The collective cost is $3,955,800.

The total estimated capital and operational costs presented above for Options A through D have been combined with other cost elements associated with meeting the projected wastewater treatment and recycled water needs of the District to year 2030, provided in Chapters 2 and 4 of this wastewater management plan.

5.4 Wastewater Treatment and Recycled Water Use Cost Modeling for Options A through E.

Based on the Otay wastewater flow projections presented in Chapter 2 and the recycled water use projections presented in Chapter 4, a major objective of this wastewater management plan is to compare projected capital and operating costs for the five wastewater management options to develop a recommended District course of action for the future. To facilitate comparison of costs, the consultant team prepared a detailed Excel workbook of individual, linked spreadsheets for each option. Linking spreadsheets allows changes in financial assumptions to automatically recalculate anticipated costs. The comparative cost approach was present worth, using the sum of capital costs in 2012 dollars and today's value of annual operating and maintenance costs from 2015 through 2030 (16 years). Both capital and operating and maintenance costs for wastewater treatment and recycled water purchase were separately calculated and summed to a total present worth value. The goal of the present worth analysis was to determine the predicted values for all five options and sub options (on-site solids handling and Metro Point Loma treatment

process) and compare results. The Excel workbook is included as Appendix D on a CD contained in a pocket at the end of the hard copy of this report.

A common set of assumptions was developed for all five options, which are included as variables in the Excel workbook for future "what-if" scenario evaluation. For initial economic analyses in this study, the list of assumptions indicated in Table 5-6 was used. References for individual cost values are indicated in the table footnotes. Assumptions for both wastewater discharge and recycled water purchase are shown.

Table 5-6. Economic Cost Assumptions for All Options

SBWRF, Chula Vista, Joint Plant Recycled Water Purchase Rate (per AF) [1]	$350
2012 Metro County Wastewater Discharge Rate (per MGD) [2,6]	$3,089,634
Additional Metro Capacity Cost (per MGD) [3]	$30,000,000
PLWWTP Upgrade Capital Cost [4]	$1,161,174,957
Otay WD Capital Cost for PLWWTP Upgrade (0.513%) [4]	$5,956,828
PLWWTP Upgrade O&M Cost [4]	$37,497,060
Otay WD Annual O&M Cost for PLWWTP Upgrade (per MGD) [4]	$156,238
MWD/SDCWA Rebate (per AF) [5]	$385

[1] Based on Recycled Purchase Agreement between City of San Diego and Otay WD.

[2] Based on Metro Discharge Agreement between City of San Diego and Otay WD.

[3] $22 Million paid to Metro, $8 Million paid to the County. A one-time up-front cost for buying capacity in these systems.

[4] Point Loma WWTP Secondary Treatment Upgrade Costs at Different Capacities from The City of San Diego's Wastewater Master Plan and Recycled Water Study, May 2012

[5] $185/AF is received from MWD; $200/AF comes from the SDCWA.

[6] Lump sum of Metro Cost and County cost based on recent District invoices.

In addition to the above assumed cost factors, it was necessary to make an assumption about projected value of money (assumed to be increasing at 2 percent per year) for determining the present worth of operating and maintenance expense. This value is a workbook variable that can be modeled, as desired.

The potential new Chula Vista MBR water recycling plant was assumed to be available for purchase of recycled water for Options A and D at a price of $350 per acre-foot per the 2012 feasibility study for the City of Chula Vista. The study assumed that the RWCWRF would not be expanded and that Otay would purchase recycled water from Chula Vista prior to purchase from the Metro SBWRF. This provision would require an amendment to the existing Metro/Otay agreement for recycled water purchase from the SBWRP.

5.4.1 Present Worth Costs for Option A

For all options, wastewater discharge present worth costs are based on projected wastewater discharge rates, facilities used, and facility and contract costs over the planning horizon (2030). For all options, recycled water purchase costs are based on projected recycled water needs, production sources, production amounts, and facility and contract costs over the planning horizon. In the sections that follow, the bases for costs for each of the 18 sub-options have been indicated separately as wastewater discharge amounts and costs and recycled water use amounts and costs. Wastewater discharge and recycled water use volumes are indicated for five-year planning horizons from 2010 (actual) through 2030, consistent with District projections indicated previously. This subsection of the report presents individual O&M and capital cost elements, assumptions for present worth analyses, and present worth calculation results for the six sub-options associated with Option A.

Table 5-7 indicates projected District wastewater flows and total projected Metro System discharge based on a treatment flow of 1.0 MGD by the RWCWRF per sub-options A-2, A-4, and A-6. Additionally, the table indicates recycled water use projections, RWCWRF production, SBWRP needs, and SBWRP required annual purchase under the existing contract "take or pay" provision for minimum annual purchase amounts. The required purchase is used for determining annual costs to the District, even though the District may not need nor take the amount indicated in the table as the annual contract amount. Table 5-8 indicates the same formation in terms of acre-feet per year. For the remaining options and associated sub-options for B-E, only the MGD units tables will be shown, since it is easy to convert to acre-feet per year (AFY) using 1120 AFY equals 1 MGD.

Table 5-7. Option A – Projected Wastewater Discharge and Recycled Water Production Rates (MGD) (Sub-options 2, A-4, A-6)

Wastewater Discharge	2010	2015	2020	2025	2030
Total Metro Discharge [1]	0.84	0.93	0.97	1.09	1.15
Total District WW Flow	1.84	1.93	1.97	2.09	2.15
Recycled Water					
RWCWRF Production [2]	1.00	1.00	1.00	1.00	1.00
Recycled Demand [3]	3.64	3.93	4.46	5.18	6.07
SBWRP Purchase	2.64	2.93	3.46	4.18	5.07
SBWRP Annual Contract Amount [4]	2.98	4.11	4.74	5.14	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Producing 77% of Total RWCWRF Capacity per existing condition.

[3] Based on Recycled Water Memo 06-08-12.

[4] Based on Recycled Purchase Agreement between City of San Diego and the District.

Table 5-8. Option A – Projected Wastewater Discharge and Recycled Water Production Rates (AFY) (Sub-options A A-4, A-6)

Wastewater Discharge	2010	2015	2020	2025	2030
Total Metro Discharge [1]	941	1,042	1,086	1,221	1,288
Total District WW Flow	2,061	2,162	2,206	2,341	2,408
Recycled Water					
RWCWRF Production [2]	1,120	1,120	1,120	1,120	1,120
Recycled Demand [3]	4,077	4,402	4,995	5,802	6,798
SBWRP Purchase	2,957	3,282	3,875	4,682	5,678
SBWRP Annual Contract Amount [4]	3,338	4,604	5,312	5,758	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Producing 77% of Total RWCWRF Capacity per existing condition.

[3] Based on Recycled Water Memo 06-08-12.

[4] Based on Recycled Purchase Agreement between City of San Diego and the District.

Options A and D have an alternative involving purchase of recycled water from a new Chula Vista MBR plant, if that plant is constructed per Chula Vista's Acquisition of Additional Wastewater Capacity Project Report dated April 2012. This report recommends the Membrane Bioreactor (MBR) treatment process at a specified location approximately 8,000 feet from existing Otay recycled water system. The plant is proposed to be constructed in three equal phases of 2 MGD capacity each to a maximum of 6 MGD. This management plan assumes that recycled water will be available to Otay beginning in 2020 at $350 per acre-foot. This plan also assumes that the requirement to hold RWCWRF to 1.3 MGD capacity is enforced and

that Chula Vista recycled water may be purchased only under Option A and D. For these two options, present worth costs are computed for both with Chula Vista purchases and without Chula Vista purchases.

Table 5-9 indicates the projected recycled water purchases from 2010-2030 from the SBWRP and the proposed Chula Vista MBR plant used for calculations in sub-options A-1, A-3, and A-5. The Chula Vista recycled water availability assumption is 2 MGD in 2020, 4MGD in 2025, and 6 MGD in 2030. Purchases from Chula Vista will reduce the District's recycled water need from the SBWRP to 0.18 MGD in 2025 and zero in 2030.

Table 5-9. Option A-1 – Projected Recycled Water Production Rates from SBWRP and Chula Vista (Sub-options A-1, A-3, A-5)

Recycled	2010	2015	2020	2025	2030
Chula Vista Available [1]	-	-	2.00	4.00	6.00
Chula Vista Purchase	-	-	2.00	4.00	5.07
SBWRP Purchase	2.64	2.93	1.46	0.18	-

[1] Based on City of Chula Vista's Acquisition of Additional Wastewater Capacity Project Final Report April 2012

Table 5-10 indicates projected annual O&M costs and capital costs for sub-option A-1, which includes recycled water purchases from Chula Vista. Individual line items for O&M and capital costs are shown for both wastewater treatment and recycled water. The table assumes a continuing rebate from MWD and the SDCWA for an assumed annual production of 1,120 acre-feet from RWCWRF. The rebate amount offsets a portion of annual costs. Footnotes in the table indicate sources of information for specific cost elements associated with a specific sub-option. Capital costs included in the lower portion of the table are for solids handling facilities at RWCWRF and a new 6 MGD pump station and pipeline to deliver recycled water to the District's existing distribution system. Values in Table 5-10 are used to compute present worth costs shown in subsequent tables.

Table 5-11 shows the resulting calculation of present worth costs for the sum of wastewater treatment and disposal and recycled water use for sub-option A-1. The resulting calculation indicates a combined present worth of about $35M.

Table 5-10. Option A-1 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Chula Vista)	$ -	$ -	$784,000	$1,568,000	$1,987,440
RW Cost (purchase SBWRF)	$1,034,880	$1,148,560	$572,320	$70,560	$ -
MWD/SDCWA Rebate	$ (431,200)	$ (431,200)	$(431,200)	$(224,000)	$(224,000)
Metro Discharge Cost	$2,595,293	$ -	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$56,168	$56,168	$56,168	$56,168
On-Site Solids Handling Chemical Cost [1]	$ -	$42,359	42,359	$42,359	$42,359
Power Cost [2]	$90,100	$90,100	$90,100	$90,100	$90,100
Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Collection/Treatment/Operation [2]	$354,682	$354,682	$354,682	$354,682	$354,682
RWCWRF operating cost	$199,211	$199,211	$199,211	$199,211	$199,211

Capital Costs	2010	2015	2020	2025	2030
On-Site Solids Handling Cost [1]	$ -	$3,345,620	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
Chula Vista Pump Station/Pipeline [3]	$ -	$ -	$3,960,000	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

[3] 6 MGD Pump Station (600 hp), 8000 LF of Pipeline.

Similar tables are used to present annual O&M and capital costs for the sub-options A-2 through A-6, as well as resulting present worth cost calculations. Tables 5-12 and 5-13 provide similar cost data for sub-option A-2, which includes the capital costs for on-site solids handling at RWCWRF. Resulting present worth costs are about $37 M. Tables 5-14 and 5-15 indicate results of cost projections for sub-option A-3. This sub-option presumes contribution by the District to the cost of a Point Loma WWTP upgrade or a Metro alternative which achieves requirements for a continued waiver for advanced primary ocean discharge from the US Environmental Protection Agency. Both capital and increased annual O&M costs are included. The calculated present worth for this sub-option is $84.6 M. Tables 5-16 and 5-17 indicate cost assumptions and calculations for sub-option A-4. This sub-option also includes Point Loma upgrade costs. Total present worth costs are $87M. Tables 5-18 and 5-19 provide costs for sub-option A-5. Present worth is $77M. Results for sub-option A-6 are provided in Tables 5-20 and 5-21. The resulting present worth cost is $79.3 M. Option A present worth costs are generally less than those for all other sub-options for Option B through E. On-site solids handling options are less costly than no on-site solids handling. Purchase of recycled water from Chula Vista shows minor cost improvement over continued purchase from SBWRP due to the take or pay provision.

Table 5-11. Option A-1 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2010	2015	2020	2025	2030
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		742,520	$742,520	$742,520	$742,520
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$3,499,869	$3,499,869	$3,499,869	$742,520
Capital Costs		$3,345,620	$ -	$ -	$ -
Present Worth Amount		$6,845,489	$3,499,869	$3,499,869	$742,520
Wastewater Total	**$14,587,746**				

Present Worth (Recycled)	2010	2015	2020	2025	2030
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$717,360	$925,120	$1,414,560	$1,763,440
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$3,381,276	$4,360,553	$6,667,529	$1,763,440
Capital Costs		$ -	$3,960,000	$ -	$ --
Present Worth Amount		$3,381,276	$8,320,553	$6,667,529	$1,763,440
Recycled Total	**$20,132,798**				
Total	**$34,720,545**				

Table 5-12. Option A-2 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,987,440
MWD/SDCWA Rebate	$(431,200)	$ (431,200)	$(431,200)	$(224,000)	$(224,000)
Metro Discharge Cost	$2,595,293	$-	$ -	$ -	$
PLWWTP Upgrade Cost	$ -	$-	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$56,168	$56,168	$56,168	$56,168
On-Site Solids Handling Chemical Cost [1]	$ -	$42,359	$42,359	42,359	$42,359
Power Cost [2]	$90,100	$90,100	$90,100	$90,100	$90,100
Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Collection/Treatment/Operation [2]	$354,682	$354,682	$354,682	$354,682	$354,682
RWCWRF Operating Cost [2]	$ 199,211	$199,211	$199,211	$199,211	$199,211
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
On-Site Solids Handling Cost [1]	$ -	$3,345,620	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-13. Option A-2 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$742,520	$742,520	$742,520	$742,520
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$3,499,869	$3,499,869	$3,499,869	$742,520
Capital Costs		$3,345,620	$-	$ -	$ -
Present Worth Amount		$6,845,489	$3,499,869	$3,499,869	$742,520
Wastewater Total	**$14,587,746**				

Present Worth (Recycled)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$1,180,200	$1,428,000	$1,791,300	$1,763,440
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$5,562,873	$6,730,878	$8,443,293	$1,763,440
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$5,562,873	$6,730,878	$8,443,293	$1,763,440
Recycled Total	**$22,500,483**				
Total	**$37,088,230**				

Table 5-14. Option A-3 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Chula Vista)	$ -	$ -	$784,000	$1,568,000	$1,987,440
RW Cost (purchase SBWRF)	$1,034,880	$1,148,560	$572,320	$70,560	$ -
MWD/SDCWA Rebate	$(431,200)	$(431,200)	$ (431,200)	$(224,000)	$(224,000)
Metro Discharge Cost	$2,595,293	$2,873,360	$2,996,945	$3,367,701	$3,553,079
PLWWTP Upgrade Cost	$ -	$ -	$151,551	$170,299	$179,673
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$90,100	$90,100	$90,100	$90,100	$90,100
Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Collection/Treatment/Operation [2]	$354,682	$354,682	$354,682	$354,682	$354,682
RWCWRF operating cost	$199,211	$199,211	$199,211	$199,211	$199,211

Capital Costs	2010	2015	2020	2025	2030
On-Site Solids Handling Cost [1]	$ -	$ -	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$5,956,828	$ -	$ -
Chula Vista Pump Station/Pipeline [3]	$ -	$ -	$3,960,000	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

[3] 6 MGD Pump Station (600 hp), 8000 LF of Pipeline.

Table 5-15. Option A-3 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2010	2015	2020	2025	2030
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,517,353	$3,792,489	$4,181,993	$4,376,746
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$16,579,042	$17,875,896	$19,711,826	$4,376,746
Capital Costs		$ -	$5,956,828	$ -	$ -
Present Worth Amount		$16,579,042	$23,832,723	$19,711,826	$ 4,376,746
Wastewater Total	**$64,500,337**				

Present Worth (Recycled)	2010	2015	2020	2025	2030
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$717,360	$925,120	$1,414,560	$1,763,440
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$3,381,276	$4,360,553	$6,667,529	$1,763,440
Capital Costs		$ -	$3,960,000	$ -	$ -
Present Worth Amount		$3,381,276	$8,320,553	$6,667,529	$1,763,440
Recycled Total	**$20,132,798**				
Total	**$84,633,135**				

Table 5-16. Option A-4 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,987,440
MWD/SDCWA Rebate	$(431,200)	$(431,200)	$(431,200)	$(224,000)	$(224,000)
Metro Discharge Cost	$2,595,293	$2,873,360	$2,996,945	$3,367,701	$3,553,079
PLWWTP Upgrade Cost	$ -	$ -	$151,551	$170,299	$79,673
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$90,100	$90,100	$90,100	$90,100	$90,100
Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Collection/Treatment/Operation [2]	$354,682	$354,682	$354,682	$354,682	$354,682
RWCWRF Operating Cost [2]	$199,211	$199,211	$199,211	$199,211	$199,211
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
On-Site Solids Handling Cost [1]	$ -	$ -	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$5,956,828	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-17. Option A-4 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,517,353	$3,792,489	$4,181,993	$4,376,746
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$16,579,042	$17,875,896	$19,711,826	$4,376,746
Capital Costs		$ -	$5,956,828	$ -	$ -
Present Worth Amount		$16,579,042	$23,832,723	$19,711,826	$4,376,746
Wastewater Total	**$64,500,337**				

Present Worth (Recycled)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$1,180,200	$1,428,000	$1,791,300	$1,763,440
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$5,562,873	$6,730,878	$8,443,293	$1,763,440
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$5,562,873	$6,730,878	$8,443,293	$1,763,440
Recycled Total	**$22,500,483**				
Total	**$87,000,820**				

Table 5-18. Option A-5 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Chula Vista)	$ -	$ -	$784,000	$1,568,000	$1,987,440
RW Cost (purchase SBWRF)	$1,034,880	$1,148,560	$572,320	$70,560	$ -
MWD/SDCWA Rebate	$(431,200)	$(431,200)	$(431,200)	$(224,000)	$(224,000)
Metro Discharge Cost	$2,595,293	$2,873,360	$2,996,945	$3,367,701	$3,553,079
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$90,100	$90,100	$90,100	$90,100	$90,100
Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Collection/Treatment/Operation [2]	$354,682	$354,682	$354,682	$354,682	$354,682
RWCWRF operating cost	$199,211	$199,211	$199,211	$199,211	$199,211
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
On-Site Solids Handling Cost [1]	$ -	$ -	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
Chula Vista Pump Station/Pipeline [3]	$ -	$ -	$3,960,000	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

[3] 6 MGD Pump Station (600 hp), 8000 LF of Pipeline.

Table 5-19. Option A-5 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,517,353	$3,640,938	$4,011,694	$4,197,072
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$16,579,042	$17,161,562	$18,909,121	$4,197,072
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$16,579,042	$17,161,562	$18,909,121	$4,197,072
Wastewater Total	**$56,846,797**				

Present Worth (Recycled)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$717,360	$925,120	$1,414,560	$1,763,440
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$3,381,276	$4,360,553	$6,667,529	$1,763,440
Capital Costs		$ -	$3,960,000	$ -	$ -
Present Worth Amount		$3,381,276	$8,320,553	$6,667,529	$1,763,440
Recycled Total	**$20,132,798**				
Total	**$76,979,595**				

Table 5-20. Option A-6 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,987,440
MWD/SDCWA Rebate	$(431,200)	$(431,200)	$(431,200)	$(224,000)	$(224,000)
Metro Discharge Cost	$2,595,293	$2,873,360	$2,996,945	$3,367,701	$3,553,079
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$90,100	$90,100	$90,100	$90,100	$90,100
Chemical Cost [1]	$ -	$ -	$ -	$ -	-$ -
Collection/Treatment/Operation [2]	$354,682	$354,682	$354,682	$354,682	$354,682
RWCWRF Operating Cost [2]	$199,211	$ 199,211	$199,211	$199,211	$199,211

Capital Costs	2010	2015	2020	2025	2030
On-Site Solids Handling Cost [1]	$ -	$ -	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-21. Option A-6 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2010	2015	2020	2025	2030
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,517,353	$3,640,938	$4,011,694	$4,197,072
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$16,579,042	$17,161,562	$18,909,121	$4,197,072
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$16,579,042	$17,161,562	$18,909,121	$4,197,072
Wastewater Total	**$56,846,797**				

Present Worth (Recycled)	2010	2015	2020	2025	2030
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$1,180,200	$1,428,000	$1,791,300	$1,763,440
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$5,562,873	$6,730,878	$ 8,443,293	$1,763,440
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$5,562,873	$6,730,878	$8,443,293	$1,763,440
Recycled Total	**$22,500,483**				
Total	**$79,347,280**				

5.4.2 Present Worth Costs for Option B

Option B includes expansion of the RWCWRF to 2.6 MGD. The wastewater discharge and recycled water use projections indicated in Table 5-22 are different than projections for Option A. This table is for the on-site solids handling sub-option, which negates Metro discharge. The increased RWCWF capacity reduces the need to purchase as much recycled water from the SBWRP. There are three sub-options for this alternative. Tables 5-23 and 5-24 provide cost projections and present worth calculations for sub-option B-1. The present worth is $82.7 M. Sub-options B-2 and B-3 are for the no on-site solids handling facilities, which result in higher present worth costs. Tables 5-25 and 5-26 indicate cost values for sub-option B-2 at a total present worth of $93 M. Tables 5-27 and 5-28 indicate similar results for sub-option B-3. The present worth calculation difference is due to the impact of the Point Loma WWTP upgrade to secondary costs. Option B present worth costs are higher than Option A, but on-site solids handling is more cost-effective than continued discharge to Metro.

Table 5-22. Option B-1 – Projected Wastewater Discharge and Recycled Water Production Rates (MGD)

Wastewater	2010	2015	2020	2025	2030
Total Metro Discharge [1]	0.84	-	-	-	-
Total District WW Flow	1.84	1.93	1.97	2.09	2.15
Recycled	**2010**	**2015**	**2020**	**2025**	**2030**
RWCWRF Production [2]	1.000	2.340	2.340	2.340	2.340
Recycled Demand [3]	3.64	3.93	4.46	5.18	6.07
SBWRF Purchase	2.64	1.59	2.12	2.84	3.73
SBWRF Annual Contract Amount [4]	2.98	4.11	4.74	5.14	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Producing at 77% of Total RWCWRF Capacity in 2010. Producing at 90% of Total RWCWRF Capacity beginning in 2015.

[3] Based on Recycled Water Memo 06-08-12.

[4] Based on Recycled Purchase Agreement between City of San Diego and Otay WD.

Table 5-23. Option B-1 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,462,160
MWD/SDCWA Rebate	$(431,200)	$(1,009,008)	$(1,009,008)	$(524,160)	$(524,160)
Metro Discharge Cost	$2,595,293	$ -	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$112,336	$112,336	$112,336	$112,336
On-Site Solids Handling Chemical Cost [1]	$ -	$84,718	$84,718	$84,718	$84,718
Power Cost [2]	$90,100	$559,263	$559,263	$559,263	$559,263
Chemical Cost [1]	$ -	$30,947	$30,947	$30,947	$30,947
Collection/Treatment/Operation [2]	$354,682	$1,504,221	$1,504,221	$1,504,221	$1,504,221
RWCWRF Operating Cost [2]	$199,211	$844,860	$844,860	$844,860	$844,860
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
On-Site Solids Handling Cost [1]	$ -	$5,483,107	$ -	$ -	$ -
Expansion/Upgrade Cost [1]	$ -	$14,966,588	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$-	$ -	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.
[2] Based on Recycled and Sewer Cost Spreadsheet from the District.

Table 5-24. Option B-1 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,136,346	$3,136,346	$3,136,346	$3,136,346
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$14,783,166	$14,783,166	$14,783,166	$3,136,346
Capital Costs		$20,449,695	$ -	$ -	$ -
Present Worth Amount		$35,232,861	$14,783,166	$14,783,166	$3,136,346
Wastewater Total	**$67,935,538**				

Present Worth (Recycled)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$602,392	$850,192	$1,491,140	$938,000
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$2,839,375	$4,007,380	$7,028,488	$938,000
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$2,839,375	$4,007,380	$7,028,488	$938,000
Recycled Total	**$14,813,243**				
Total	**$82,748,781**				

Table 5-25. Option B-2 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,462,160
MWD/SDCWA Rebate	$(431,200)	$(1,009,008)	$(1,009,008)	$(524,160)	$(524,160)
Metro Discharge Cost	$2,595,293	$803,305	$803,305	$803,305	$803,305
PLWWTP Upgrade Cost	$ -	$ -	$40,622	$40,622	$40,622
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$90,100	$559,263	$559,263	$559,263	$559,263
Chemical Cost [1]	$ -	$30,947	$30,947	$30,947	$30,947
Collection/Treatment/Operation [2]	$354,682	$1,504,221	$1,504,221	$1,504,221	$1,504,221
RWCWRF Operating Cost [2]	$199,211	$844,860	$844,860	$844,860	$844,860
Capital Costs					
On-Site Solids Handling Cost [1]	$ -	$ -	$ -	$ -	$ -
Enhancement/Upgrade Cost [1]	$ -	$14,966,588	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$5,956,828	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-26. Option B-2 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,742,597	$3,783,218	$3,783,218	$3,783,218
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$17,640,729	$17,832,200	$17,832,200	$3,783,218
Capital Costs		$14,966,588	$5,956,828	$ -	$ -
Present Worth Amount		$32,607,317	$23,789,028	$17,832,200	$3,783,218
Wastewater Total	**$78,011,763**				

Present Worth (Recycled)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$602,392	$850,192	$1,491,140	$938,000
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$2,839,375	$4,007,380	$7,028,488	$938,000
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$2,839,375	$4,007,380	$7,028,488	$938,000
Recycled Total	**$14,813,243**				
Total	**$92,825,006**				

Table 5-27. Option B-3 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,462,160
MWD/SDCWA Rebate	$(431,200)	$(1,009,008)	$(1,009,008)	$(524,160)	$(524,160)
Metro Discharge Cost	$2,595,293	$803,305	$803,305	$803,305	$803,305
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$90,100	$559,263	$559,263	$559,263	$559,263
Chemical Cost [1]	$ -	$30,947	$30,947	$30,947	$30,947
Collection/Treatment/Operation [2]	$354,682	$1,504,221	$1,504,221	$1,504,221	$1,504,221
RWCWRF Operating Cost [2]	$199,211	$844,860	$844,860	$844,860	$844,860
Capital Costs					
On-Site Solids Handling Cost [1]	$ -	$ -	$ -	$ -	$ -
Enhancement/Upgrade Cost [1]	$ -	$14,966,588	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-28. Option B-3 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$3,742,597	$3,742,597	$3,742,597	$3,742,597
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$17,640,729	$17,640,729	$17,640,729	$3,742,597
Capital Costs		$14,966,588	$ -	$ -	$ -
Present Worth Amount		$32,607,317	$17,640,729	$17,640,729	$3,742,597
Wastewater Total	**$71,631,372**				

Present Worth (Recycled)	**2010**	**2015**	**2020**	**2025**	**2030**
Interest Rate		2%	2%	2%	2%
Uniform Amount per Interest Period		$602,392	$850,192	$1,491,140	$938,000
Factor Table		4.7135	4.7135	4.7135	1.0000
O&M Present Worth		$2,839,375	$4,007,380	$7,028,488	$938,000
Capital Costs		$ -	$ -	$ -	$ -
Present Worth Amount		$2,839,375	$4,007,380	$7,028,488	$938,000
Recycled Total	**$14,813,243**				
Total	$86,444,615				

5.4.3 Present Worth Costs for Option C

Option C includes expansion of the RWCWRF to 3.9 MGD. The wastewater discharge and recycled water use projections indicated in Table 5-29 are different than projections for Options A and B. This table is for the on-site solids handling sub-option, which negates Metro discharge. The increased RWCWF capacity reduces the need to purchase as much recycled water from the SBWRP. There are three sub-options for this alternative. Tables 5-30 and 5-31 provide cost projections and present worth calculations for sub-option C-1. The present worth is $134.3 M. Sub-options C-2 and C-3 are for the no on-site solids handling facilities, which result in higher present worth costs. Table 5-32 shows the projected wastewater flows and recycled water sources and amounts for sub-option C-2. Tables 5-33 and 5-34 indicate cost values for sub-option C-2 at a total present worth of $146 M. Tables 5-35 and 5-36 indicate similar results for sub-option C-3. The present worth calculation difference is due to the impact of the Point Loma WWTP upgrade to secondary costs. Option C present worth costs are higher than Option A and B, but on-site solids handling is more cost-effective than continued discharge to Metro.

Table 5-29. Option C-1 – Projected Wastewater Discharge and Recycled Water Production Rates (MGD)- On-site Solids Handling

Wastewater	**2010**	**2015**	**2020**	**2025**	**2030**
Total Metro Discharge [1]	0.84	-	-	-	-
Total District WW Flow	1.84	1.93	1.97	2.09	2.15
Recycled	**2010**	**2015**	**2020**	**2025**	**2030**
RWCWRF Production [2]	1.000	3.510	3.510	3.510	3.510
Recycled Demand [3]	3.64	3.93	4.46	5.18	6.07
SBWRF Purchase	2.64	0.42	0.95	1.67	2.56
SBWRF Annual Contract Amount [4]	2.98	4.11	4.74	5.14	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Producing 77% of Total RWCWRF Capacity.

[3] Based on Recycled Water Memo 06-08-12.

[4] Based on Recycled Purchase Agreement between City of San Diego and Otay WD.

Table 5-30: Option C-1 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,003,520
MWD/SDCWA Rebate	($431,200)	($1,513,512)	($1,513,512)	($786,240)	($786,240)
Metro Discharge Cost	$2,595,293	$0	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
On-Site Solids Handling Power Cost [1]	$0	$168,504	$168,504	$168,504	$168,504
On-Site Solids Handling Chemical Cost [1]	$0	$127,077	$127,077	$127,077	$127,077
Power Cost [2]	$90,100	$1,197,130	$1,197,130	$1,197,130	$1,197,130
Chemical Cost [1]	$0	$77,081	$77,081	$77,081	$77,081
Collection/Treatment/Operation [2]	$354,682	$2,999,394	$2,999,394	$2,999,394	$2,999,394
RWCWRF Operating Cost [2]	$199,211	$1,684,638	$1,684,638	$1,684,638	$1,684,638
Capital Costs					
On-Site Solids Handling Cost [1]	$0	$8,324,288	$0	$0	$0
Enhancement/Upgrade Cost [1]	$0	$23,199,403	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-31. Option C-1 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2015**	**2020**	**2025**	**2030**
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$6,253,824	$6,253,824	$6,253,824	$6,253,824
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$29,477,400	$29,477,400	$29,477,400	$6,253,824
Capital Costs	$31,523,691	$0	$0	$0
Present Worth Amount	$61,001,091	$29,477,400	$29,477,400	$6,253,824
Wastewater Total	**$126,209,714**			

Present Worth (Recycled)	**2015**	**2020**	**2025**	**2030**
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$97,888	$345,688	$1,229,060	$217,280
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$461,395	$1,629,400	$5,793,174	$217,280
Capital Costs	$0	$0	$0	$0
Present Worth Amount	$461,395	$1,629,400	$5,793,174	$217,280
Recycled Total	**$8,101,250**			
Total	**$134,310,963**			

Table 5-32. Option C-2 – Projected Wastewater Discharge and Recycled Water Production Rates (MGD)- No On-site Solids Handling

Wastewater	2010	2015	2020	2025	2030
Total Metro Discharge [1]	0.84	0.39	0.39	0.39	0.39
Total District WW Flow	1.84	1.93	1.97	2.09	2.15
Recycled	**2010**	**2015**	**2020**	**2025**	**2030**
RWCWRF Production [2]	1.000	3.510	3.510	3.510	3.510
Recycled Demand [3]	3.64	3.93	4.46	5.18	6.07
SBWRF Purchase	2.64	0.42	0.95	1.67	2.56
SBWRF Annual Contract Amount [4]	2.98	4.11	4.74	5.14	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Producing 77% of Total RWCWRF Capacity.

[3] Based on Recycled Water Memo 06-08-12.

[4] Based on Recycled Purchase Agreement between City of San Diego and Otay WD.

Table 5-33. Option C-2 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,003,520
MWD/SDCWA Rebate	($431,200)	($1,513,512)	($1,513,512)	($786,240)	($786,240)
Metro Discharge Cost	$2,595,293	$1,204,957	$1,204,957	$1,204,957	$1,204,957
PLWWTP Upgrade Cost	$0	$0	$60,933	$60,933	$60,933
On-Site Solids Handling Power Cost [1]	$0	$0	$0	$0	$0
On-Site Solids Handling Chemical Cost [1]	$0	$0	$0	$0	$0
Power Cost [2]	$90,100	$1,197,130	$1,197,130	$1,197,130	$1,197,130
Chemical Cost [1]	$0	$77,081	$77,081	$77,081	$77,081
Collection/Treatment/Operation [2]	$354,682	$2,999,394	$2,999,394	$2,999,394	$2,999,394
RWCWRF Operating Cost [2]	$199,211	$1,684,638	$1,684,638	$1,684,638	$1,684,638
Capital Costs					
On-Site Solids Handling Cost [1]	$0		$0	$0	$0
Enhancement/Upgrade Cost [1]	$0	$23,199,403	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$5,956,828	$0	$0

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-34. Option C-2 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$7,163,200	$7,224,133	$7,224,133	$7,224,133
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$33,763,745	$34,050,951	$34,050,951	$7,224,133
Capital Costs	$23,199,403	$5,956,828	$0	$0
Present Worth Amount	$56,963,148	$40,007,778	$34,050,951	$7,224,133
Wastewater Total	**$138,246,010**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$97,888	$345,688	$1,229,060	$217,280
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$461,395	$1,629,400	$5,793,174	$217,280
Capital Costs	$0	$0	$0	$0
Present Worth Amount	$461,395	$1,629,400	$5,793,174	$217,280
Recycled Total	**$8,101,250**			
Total	**$146,347,260**			

Table 5-35. Option C-3 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,168,300	$1,611,400	$1,859,200	$2,015,300	$1,003,520
MWD/SDCWA Rebate	($431,200)	($1,513,512)	($1,513,512)	($786,240)	($786,240)
Metro Discharge Cost	$2,595,293	$1,204,957	$1,204,957	$1,204,957	$1,204,957
PLWWTP Upgrade Cost	$0	$0	$60,933	$60,933	$60,933
On-Site Solids Handling Power Cost [1]	$0	$0	$0	$0	$0
On-Site Solids Handling Chemical Cost [1]	$0	$0	$0	$0	$0
Power Cost [2]	$90,100	$1,197,130	$1,197,130	$1,197,130	$1,197,130
Chemical Cost [1]	$0	$77,081	$77,081	$77,081	$77,081
Collection/Treatment/Operation [2]	$354,682	$2,999,394	$2,999,394	$2,999,394	$2,999,394
RWCWRF Operating Cost [2]	$199,211	$1,684,638	$1,684,638	$1,684,638	$1,684,638
Capital Costs					
On-Site Solids Handling Cost [1]	$0	$0	$0	$0	$0
Enhancement/Upgrade Cost [1]	$0	$23,199,403	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$5,956,828	$0	$0

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Based on Recycled and Sewer Cost Spreadsheet.

Table 5-36. Option C-3 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$7,163,200	$7,163,200	$7,163,200	$7,163,200
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$33,763,745	$33,763,745	$33,763,745	$7,163,200
Capital Costs	$23,199,403	$0	$0	$0
Present Worth Amount	$56,963,148	$33,763,745	$33,763,745	$7,163,200
Wastewater Total	**$131,653,837**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$97,888	$345,688	$1,229,060	$217,280
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$461,395	$1,629,400	$5,793,174	$217,280
Capital Costs	$0	$0	$0	$0
Present Worth Amount	$461,395	$1,629,400	$5,793,174	$217,280
Recycled Total	**$8,101,250**			
Total	**$139,755,087**			

5.4.4 Present Worth Costs for Option D

Option D includes demolition and abandonment of the RWCWRF in favor of complete reliance on Metro for wastewater disposal and treatment. Present worth costs for the four sub-options in Option D are higher than costs for all other options. The sub-options are differentiated by recycled water supplies (SBWRP or Chula Vista) and District payment of Point Loma upgrade costs or not. The presumed wastewater discharge and indicated recycled water use projections in Table 5-37 are different than projections for Options A, B, and C. This table indicates recycled water purchase from Chula Vista and presumes discharge of all wastewater to Metro. Tables 5-38 and 5-39 provide cost projections and present worth calculations for sub-option D-1. The present worth is $166.1 M. Sub-option D-2 costs are shown in Tables 5-40 and 5-41. The present worth calculation for sub-option D-2 is about $157 M. An alternative projected wastewater flow and recycled water source projection is indicated in Table 5-42 for continued recycled water purchase from SBWRP. Tables 5-43 and 5-44 indicate cost values for sub-option D-3 at a total present worth of $163 M. Tables 5-45 and 5-46 indicate a $10M difference in present worth costs due to the impact of assuming Point Loma upgrade costs. The sub-option D-4 present worth is $153.7 M.

Table 5-37. Option D-1 and D-2 – Projected Wastewater Discharge and Recycled Water Production Rates (MGD) – Includes Chula Vista Recycled Water Purchase

Recycled	2010	2015	2020	2025	2030
Chula Vista Available [1]	-	-	2.00	4.00	6.00
Chula Vista Purchase	-	-	2.00	4.00	6.00
SBWRF Purchase	3.64	3.93	2.46	1.18	0.07

[1] Based on City of Chula Vista's Acquisition of Additional Wastewater Capacity Project Final Report April 2012

Table 5-38. Option D-1 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Chula Vista)	$0	$0	$784,000	$1,568,000	$2,352,000
RW Cost (purchase SBWRF)	$1,426,880	$1,540,560	$964,320	$462,560	$27,440
Metro Discharge Cost	$5,684,927	$5,962,994	$6,086,579	$6,457,335	$6,642,713
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
On-Site Solids Handling Power Cost [1]	$0	$0	$0	$0	$0
On-Site Solids Handling Chemical Cost [1]	$0	$0	$0	$0	$0
Power Cost [2]	$0	$0	$0	$0	$0
Chemical Cost [1]	$0	$0	$0	$0	$0
Collection/Treatment/Operation [2]	$0	$0	$0	$0	$0
RWCWRF Operating Cost [2]	$0	$0	$0	$0	$0
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
Decommission/Demolition cost [1]	$0	$3,955,800	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
Additional Metro Cost [2]	$0	$0	$0	$0	$27,570,000
Chula Vista Pump Station/Pipeline [3]	$0	$0	$3,960,000	$0	$0

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Per discussion with Rita Bell. $22 Million paid to Metro, $8 Million paid to the County.

[3] 6 MGD Pump Station (600 hp), 8000 LF of Pipeline.

Table 5-39. Option D-1 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$5,962,994	$6,394,367	$6,783,872	$6,978,624
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$28,106,570	$30,139,850	$31,975,780	$6,978,624
Capital Costs	$3,955,800	$5,956,828	$0	$27,570,000
Present Worth Amount	$32,062,370	$36,096,678	$31,975,780	$34,548,624
Wastewater Total	**$134,683,453**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$1,540,560	$1,748,320	$2,030,560	$2,379,440
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$7,261,430	$8,240,706	$9,571,045	$2,379,440
Capital Costs	$0	$3,960,000	$0	$0
Present Worth Amount	$7,261,430	$12,200,706	$9,571,045	$2,379,440
Recycled Total	**$31,412,620**			
Total	**$166,096,074**			

Table 5-40. Option D-2 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Chula Vista)	$0	$0	$784,000	$1,568,000	$2,352,000
RW Cost (purchase SBWRF)	$1,426,880	$1,540,560	$964,320	$462,560	$27,440
Metro Discharge Cost	$5,684,927	$5,962,994	$6,086,579	$6,457,335	$6,642,713
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
On-Site Solids Handling Power Cost [1]	$0	$0	$0	$0	$0
On-Site Solids Handling Chemical Cost [1]	$0	$0	$0	$0	$0
Power Cost [2]	$0	$0	$0	$0	$0
Chemical Cost [1]	$0	$0	$0	$0	$0
Collection/Treatment/Operation [2]	$0	$0	$0	$0	$0
RWCWRF Operating Cost [2]	$0	$0	$0	$0	$0
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
Decommission/Demolition cost [1]	$0	$3,955,800	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
Additional Metro Cost [2]	$0	$0	$0	$0	$27,570,000
Chula Vista Pump Station/Pipeline [3]	$0	$0	$3,960,000	$0	$0

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] $22 Million paid to Metro, $8 Million paid to the County per MGD of capacity.

[3] 6 MGD Pump Station (600 hp), 8000 LF of Pipeline.

Table 5-41. Option D-2 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$5,962,994	$6,086,579	$6,457,335	$6,642,713
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$28,106,570	$28,689,090	$30,436,649	$6,642,713
Capital Costs	$3,955,800	$0	$0	$27,570,000
Present Worth Amount	$32,062,370	$28,689,090	$30,436,649	$34,212,713
Wastewater Total	**$125,400,822**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$1,540,560	$1,748,320	$2,030,560	$2,379,440
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$7,261,430	$8,240,706	$9,571,045	$2,379,440
Capital Costs	$0	$3,960,000	$0	$0
Present Worth Amount	$7,261,430	$12,200,706	$9,571,045	$2,379,440
Recycled Total	**$31,412,620**			
Total	**$156,813,443**			

Table 5-42. Option D-3 and D-4 – Projected Wastewater Discharge and Recycled Water Production Rates (MGD)

Wastewater	2010	2015	2020	2025	2030
Total Metro Discharge [1]	1.84	1.93	1.97	2.09	2.15
Total District WW Flow	1.84	1.93	1.97	2.09	2.15
Recycled	**2010**	**2015**	**2020**	**2025**	**2030**
Recycled Demand [2]	3.64	3.93	4.46	5.18	6.07
SBWRF Purchase	3.64	3.93	4.46	5.18	6.07
SBWRF Annual Contract Amount [3]	2.98	4.11	4.74	5.14	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Based on Recycled Water Memo 06-08-12.

[3] Based on Recycled Purchase Agreement between City of San Diego and Otay WD.

Table 5-43. Option D-3 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,426,880	$1,611,400	$1,859,200	$2,030,560	$2,379,440
Metro Discharge Cost	$5,684,927	$5,962,994	$6,086,579	$6,457,335	$6,642,713
PLWWTP Upgrade Cost	$0	$0	$307,788	$326,537	$335,911
On-Site Solids Handling Power Cost [1]	$0	$0	$0	$0	$0
On-Site Solids Handling Chemical Cost [1]	$0	$0	$0	$0	$0
Power Cost [2]	$0	$0	$0	$0	$0
Chemical Cost [1]	$0	$0	$0	$0	$0
Collection/Treatment/Operation [2]	$0	$0	$0	$0	$0
RWCWRF Operating Cost [2]	$0	$0	$0	$0	$0
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
Decommission/Demolition cost [1]	$0	$3,955,800	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$5,956,828	$0	$0
Additional Metro Cost [2]	$0	$0	$0	$0	$27,570,000

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Per discussion with District staff, $22 Million per MGD capacity paid to Metro.

Table 5-44. Option D-3 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	**2015**	**2020**	**2025**	**2030**
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$5,962,994	$6,394,367	$6,783,872	$6,978,624
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$28,106,570	$30,139,850	$31,975,780	$6,978,624
Capital Costs	$3,955,800	$5,956,828	$0	$27,570,000
Present Worth Amount	$32,062,370	$36,096,678	$31,975,780	$34,548,624
Wastewater Total	**$134,683,453**			

Present Worth (Recycled)	**2015**	**2020**	**2025**	**2030**
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$1,611,400	$1,859,200	$2,030,560	$2,379,440
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$7,595,334	$8,763,339	$9,571,045	$2,379,440
Capital Costs	$0	$0	$0	$0
Present Worth Amount	$7,595,334	$8,763,339	$9,571,045	$2,379,440
Recycled Total	**$28,309,158**			
Total	**$162,992,611**			

Table 5-45. Option D-4 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase SBWRF)	$1,426,880	$1,611,400	$1,859,200	$2,030,560	$2,379,440
Metro Discharge Cost	$5,684,927	$5,962,994	$6,086,579	$6,457,335	$6,642,713
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Power Cost [1]	$ -	$ -	$ -	$ -	$ -
On-Site Solids Handling Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Power Cost [2]	$ -	$ -	$ -	$ -	$ -
Chemical Cost [1]	$ -	$ -	$ -	$ -	$ -
Collection/Treatment/Operation [2]	$ -	$ -	$ -	$ -	$ -
RWCWRF Operating Cost [2]	$ -	$ -	$ -	$ -	$ -
Capital Costs	**2010**	**2015**	**2020**	**2025**	**2030**
Decommission/Demolition cost [1]	$ -	$3,955,800	$ -	$ -	$ -
PLWWTP Upgrade Cost	$ -	$ -	$ -	$ -	$ -
Additional Metro Cost [2]	$ -	$ -	$ -	$ -	$27,570,000

[1] Based on Final RWCWRF Capital Cost Assessment 10-29-12.

[2] Per discussion with Rita Bell. $22 Million paid to Metro, $8 Million paid to the County.

Table 5-46. Option D-4 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$5,962,994	$6,086,579	$6,457,335	$6,642,713
Factor Table	4.7135	$5	4.7135	1.0000
O&M Present Worth	$28,106,570	$28,689,090	$30,436,649	$6,642,713
Capital Costs	$3,955,800	$0	$0	$27,570,000
Present Worth Amount	$32,062,370	$28,689,090	$30,436,649	$34,212,713
Wastewater Total	**$125,400,822**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$1,611,400	$1,859,200	$2,030,560	$2,379,440
Factor Table	4.7135	4.7135	4.7135	$1
O&M Present Worth	$7,595,334	$8,763,339	$9,571,045	$2,379,440
Capital Costs	$0	$0	$0	$0
Present Worth Amount	$7,595,334	$8,763,339	$9,571,045	$2,379,440
Recycled Total	**$28,309,158**			
Total	**$153,709,980**			

5.4.5 Present Worth Costs for Option E

Option E includes demolition and abandonment of RWCWRF and partnership with San Diego County in a new conceptualized wastewater treatment and water reclamation plant. There are two sub-options associated with Option E which are for Point Loma upgrade to secondary or not. The new plant is assumed to be a similar treatment process as Chula Vista (MBR) at similar cost per MGD capacity. The plant is presumed to have on-site solids handling in that the concept proposes an NPDES permit to the Sweetwater River. The District's share of the new plant capacity and cost is about 22 percent based on flow projections shown in Table 5-47. Tables 5-48 and 5-49 provide cost projections and present worth calculations for sub-option E-1. The present worth is $154 M. Tables 5-50 and 5-51 indicate cost values for sub-option E-2 at a total present worth of $148 M. The concept and projected costs for Option E carry the most risk, in that details on the proposed new plant are not developed. The present worth calculation difference is due to the impact of the Point Loma WWTP upgrade to secondary costs. Option E present worth costs are higher than Options A, B, and C, but less than complete reliance on Metro.

Table 5-47. Option E-1 and E-2 – Projected Wastewater Discharge and Recycled Water Production Rates (MGD)

Wastewater	2010	2015	2020	2025	2030
Total Metro Discharge [1]	1.84	1.93	-	-	-
Total District WW Flow	1.84	1.93	1.97	2.09	2.15
Recycled	**2010**	**2015**	**2020**	**2025**	**2030**
Joint Project Production	-	-	6.00	8.00	10.00
Joint Project Purchase	-	-	1.97	2.09	2.15
Recycled Demand [2]	3.64	3.93	4.46	5.18	6.07
SBWRF Purchase	3.64	3.93	2.49	3.09	3.92
SBWRF Annual Contract Amount [3]	2.98	4.11	4.74	5.14	-

[1] Otay WD has a 1.231 MGD Metro capacity.

[2] Based on Recycled Water Memo 06-08-12.

[3] Based on Recycled Purchase Agreement between City of San Diego and Otay WD.

Table 5-48. Option E-1 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Joint Project)	$0	$0	$772,240	$819,280	$842,800
RW Cost (purchase SBWRF)	$1,426,880	$1,611,400	$1,859,200	$2,015,300	$1,536,640
Metro Discharge Cost	$5,684,927	$5,962,994	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
Joint Project Cost (22%) [1]	$0	$0	$906,583	$1,530,083	$2,150,000
Capital Costs	**$2,010**	**$2,015**	**$2,020**	**$2,025**	**$2,030**
Total Joint Project Cost [1]	$0	$0	$119,066,667	$34,933,333	$37,466,667
Otay Joint Project Cost (22%) [1]	$0	$0	$25,599,333	$7,510,667	$8,055,333
Decommission/Demolition cost [1]	$0	$3,955,800	$0	$0	$0
Additional Metro Cost [2]	$0	$20,970,000	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$5,956,828	$0	$0
Joint Project Pump Station/Pipeline [3]	$0	$0	$4,440,000	$0	$0

[1] Based on City of Chula Vista's Acquisition of Additional Wastewater Capacity Project Final Report April 2012

[2] Per discussion with District staff, $22 Million paid to Metro and $8 Million paid to the County per MGD of capacity.

[3] 10 MGD Pump Station (900 hp), 7000 LF of Pipeline.

Table 5-49. Option E-1 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$5,962,994	$906,583	$1,530,083	$2,150,000
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$28,106,570	$4,273,181	$7,212,048	$2,150,000
Capital Costs	$24,925,800	$31,556,161	$7,510,667	$8,055,333
Present Worth Amount	$53,032,370	$35,829,342	$14,722,715	$10,205,333
Wastewater Total	**$113,789,760**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$1,611,400	$2,631,440	$2,834,580	$2,379,440
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$7,595,334	$12,403,292	$13,360,793	$2,379,440
Capital Costs	$0	$4,440,000	$0	$0
Present Worth Amount	$7,595,334	$16,843,292	$13,360,793	$2,379,440
Recycled Total	**$40,178,859**			
Total	**$153,968,619**			

Table 5-50. Option E-2 – Annual O&M and Capital Costs

O&M Costs	2010	2015	2020	2025	2030
RW Cost (purchase Joint Project)	$0	$0	$772,240	$819,280	$842,800
RW Cost (purchase SBWRF)	$1,426,880	$1,611,400	$1,859,200	$2,015,300	$1,536,640
Metro Discharge Cost	$5,684,927	$5,962,994	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
Joint Project Cost (22%) [1]	$0	$0	$906,583	$1,530,083	$2,150,000
Capital Costs	**$2,010**	**$2,015**	**$2,020**	**$2,025**	**$2,030**
Total Joint Project Cost [1]	$0	$0	$119,066,667	$34,933,333	$37,466,667
Otay Joint Project Cost (22%) [1]	$0	$0	$25,599,333	$7,510,667	$8,055,333
Decommission/Demolition cost [1]	$0	$3,955,800	$0	$0	$0
Additional Metro Cost [2]	$0	$20,970,000	$0	$0	$0
PLWWTP Upgrade Cost	$0	$0	$0	$0	$0
Joint Project Pump Station/Pipeline [3]	$0	$0	$4,440,000	$0	$0

[1] Based on City of Chula Vista's Acquisition of Additional Wastewater Capacity Project Final Report April 2012

[2] Per discussion with District staff, $22 Million paid to Metro and $8 Million paid to the County per MGD of capacity.

[3] 10 MGD Pump Station (900 hp), 7000 LF of Pipeline.

Table 5-51. Option E-2 – Present Worth of Wastewater and Recycled Water Costs

Present Worth (Wastewater)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$5,962,994	$906,583	$1,530,083	$2,150,000
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$28,106,570	$4,273,181	$7,212,048	$2,150,000
Capital Costs	$24,925,800	$25,599,333	$7,510,667	$8,055,333
Present Worth Amount	$53,032,370	$29,872,514	$14,722,715	$10,205,333
Wastewater Total	**$107,832,933**			

Present Worth (Recycled)	2015	2020	2025	2030
Interest Rate	2%	2%	2%	2%
Uniform Amount per Interest Period	$1,611,400	$2,631,440	$2,834,580	$2,379,440
Factor Table	4.7135	4.7135	4.7135	1.0000
O&M Present Worth	$7,595,334	$12,403,292	$13,360,793	$2,379,440
Capital Costs	$0	$4,440,000	$0	$0
Present Worth Amount	$7,595,334	$16,843,292	$13,360,793	$2,379,440
Recycled Total	**$40,178,859**			
Total	**$148,011,792**			

5.4.6 Summary of Present Worth Costs

A summary of present worth costs for the 18 wastewater management sub-options associated with the five primary options is shown in Table 5-52 below. The summary costs are presented in $ million. The table is broken out into options that indicate District purchase of recycled water from SBWRP and those assuming District purchase of recycled water from Chula Vista when water becomes available. For Option A, present worth is significantly less for on-site solids handling at RWCWRF due to presumed avoidance of significant discharge to Metro and future Point Loma upgrade costs or its Metro alternative. For Options A-C associated with capacity at RWCWRF, the lowest present worth costs are for retaining the RWCWRF at 1.3 MGD capacity and not expanding to 2.6 nor 3.9 MGD. The Options D and E associated with the abandonment of RWCWRF are significantly more costly than RWCWRF retention due to costs associated with increased discharge to Metro, with risks of incurring costs for Point Loma upgrade (D), and cost of a new joint WWTP in partnership with the County.

Table 5-52. Present Worth Cost Summary for Wastewater Management Options ($M)

Option		SBWRP Only No Chula Vista Purchases		Chula Vista WRF Only No SBWRP Purchases	
		No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade	No Point Loma WWTP Upgrade	Point Loma WWTP Upgrade
A	Onsite sludge	$37.1	--	$34.7	--
	No onsite sludge	$79.3	$87.0	$77.0	$84.6
B	Onsite sludge	$82.7	--	--	--
	No onsite sludge	$86.4	$92.8	--	--
C	Onsite sludge	$134.3	--	--	--
	No onsite sludge	$139.8	$146.3	--	--
D		$153.7	$163.0	$156.8	$166.1
E (onsite sludge)		$148.0	$154.0		

Appendix E

Cost Evaluations Excel Workbook

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