Water Resource Analysis

San Miguelito Mutual Water Company

November 18, 2015

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SM15-052

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Executive Summary

Existing Supplies

San Miguelito Mutual Water Company provides water to its customers from 3 wells located near San Luis Obispo Creek and from the State Water Project.

Table 1 Existing Water Sources

Source	Recent Production, 2009-2014 (AFY)	Maximum Annual Yield (AFY)	Water Quality
Existing Wells	28 - 100	189	above average
State Water	95 - 173	275	average
Total	185 - 213	464	

Water Resources Needed at Build-Out

The amount of water needed for build out was estimated by taking the amount of water currently being used and adding the water that is needed for new developments.

Table 2 Water Needed for Build-Out

Water Use	Low Estimate (AFY)	High Estimate (AFY)
Existing Uses (includes unaccounted uses)	189.85	189.85
Convert part-time to Full Time Occupancy	7.39	7.39
Build-out Existing Residential Developments	9.15*	20.16*
Planned Small Non-Residential Developments	4.88*	6.72*
Potential Large Non-Residential Developments	45.09	45.09
Un-metered System Uses (12%)	30.76	32.31
Total Water Needs at Build-Out	**287.12**	**301.52**

* Estimate based on recent actual use.

** Estimate based on SLO County standards.

Additional Water Supplies Needed for Build-Out – Worst Case Scenario

When existing water sources are producing at less than capacity these resources may not be sufficient to serve the needs at build-out. A "worst-case" scenario was examined:

Table 3 Worst-Case Additional Water Resources Needed

	AFY
Well Supply	189.00
State Water Supply – Very Dry Year	
5% Table A	13.75
5% Drought Buffer	13.75
Total Supply	**216.50**
Total Use	**301.52**
Additional Water Resources Needed	**85.02**

Potential Additional Supplies

The following table provides a summary of the quantity, quality, estimated cost of infrastructure (including treatment), and overall risk for the potential water resources.

Table 4 Summary of Potential Additional Water Resources

Source	Quantity Available	Quality Issues	Cost per AFY	Reliability	Threats to Future Use
Hot Water Well	73 AFY	Temperature, odor, iron, manganese, turbidity	$1,000	Good, taps into a deep aquifer.	Uncertainty regarding aquifer volume.
East Harford Canyon Wells - Purchase Option	100 AFY	Hydrogen sulfide	$1,200	Good, taps into a deep aquifer.	Uncertainty regarding aquifer volume.
East Harford Canyon Wells - Temporary Appropriation Option	25 AFY (1 year in 4 using 100 AFY)	Hydrogen sulfide	$3,710	Good, taps into a deep aquifer.	Uncertainty regarding aquifer volume. Available at most 1 year in 4.
New Well	Unknown, assumed 60 to 100 AFY	Unknown	$830 to $1,620	Unknown	Uncertainty regarding aquifer volume.
Golf Course Well #3	100 AFY	Similar to Wells 4A, 5A, and 6A	$570	Moderate, aquifer has limited storage volume.	Extended drought.
Reclaim treated effluent for golf course irrigation	100 AFY	Disinfection	$430	Good.	None identified.
Acquire additional State Water drought buffer	Buying 275 additional AFY yields 31 AFY on average.	Delivered fully treated.	$931/AFY average increase in cost for State Water.	Increases reliability of SWP during critical dry years	Widespread drought, Delta levee failure, court-mandated delivery reductions

Recommendations

- Acquire additional water sources to meet needs under worst-case scenario.
- Protect existing supplies:
    - Insure that flow remains in SLO creek year-round.
    - Urge the SLO County Flood Control District to continue to use its excess allocation of State Water for the benefit of existing subcontractors.
- Adopt policy changes that will require applicants of new development to demonstrate water use will not exceed existing allocations.

Report Scope and Organization

This report is prepared to assist the San Miguelito Mutual Water Company in the orderly development of sufficient water supplies to meet its needs at full build out. It is divided into the following sections:

Section 1 - Existing Supplies
This section summarizes the water resources that are currently being used by the Company. These sources include groundwater (three wells) and surface water (from the State Water Project, delivered via the Lopez Reservoir distribution system). Key factors examined include quantity available, water quality, reliability, and threats to future use.

Section 2 – Additional Water Resources Needed at Build-Out
This section examines existing land-use plans and provides an estimate of the additional water needed by the Company to meet 100% occupancy under build-out conditions under existing approved plans. This section includes (1) an estimate of the additional water needed for conversion of part-time occupancies to full-time occupancies, (2) an estimate of the additional water needed for build-out of currently permitted residential developments, (3) an estimate of the additional water needed for development of two smaller non-residential parcels, and (4) a discussion of the additional water needed to serve larger non-residential developments.

Section 3 – Potential Additional Supplies
This section summarizes the water resources that are potential water sources for the Company. These sources include local groundwater from deep and shallow aquifers, reclaiming treated wastewater for golf course irrigation, and purchasing additional State Water Drought Buffer.

The report concludes with recommendations for options the Company could pursue to obtain additional supplies and to protect its existing supplies.

Part 1 - Existing Supplies

This section summarizes the water resources that are currently being used by the Company. These sources include groundwater (three wells) and surface water (from the State Water Project, delivered via the Lopez Reservoir distribution system). Key factors examined include quantity available, water quality, reliability, and threats to future use

The amount of water taken from each source varies from year to year and month to month, as shown in the following table and figures.

Table 5 Water Sources 2009-2014

Year	State Water (AFY)	Total Well Production (AFY)	Total (AFY)
2009	173	28	201
2010	134	52	187
2011	128	62	190
2012	141	44	185
2013	118	95	213
2014	95	100	195

Note that in recent years the amount of water provided by the State Water Project has decreased. This decrease is due in part to quality/taste issues and the relative cost of the two sources.

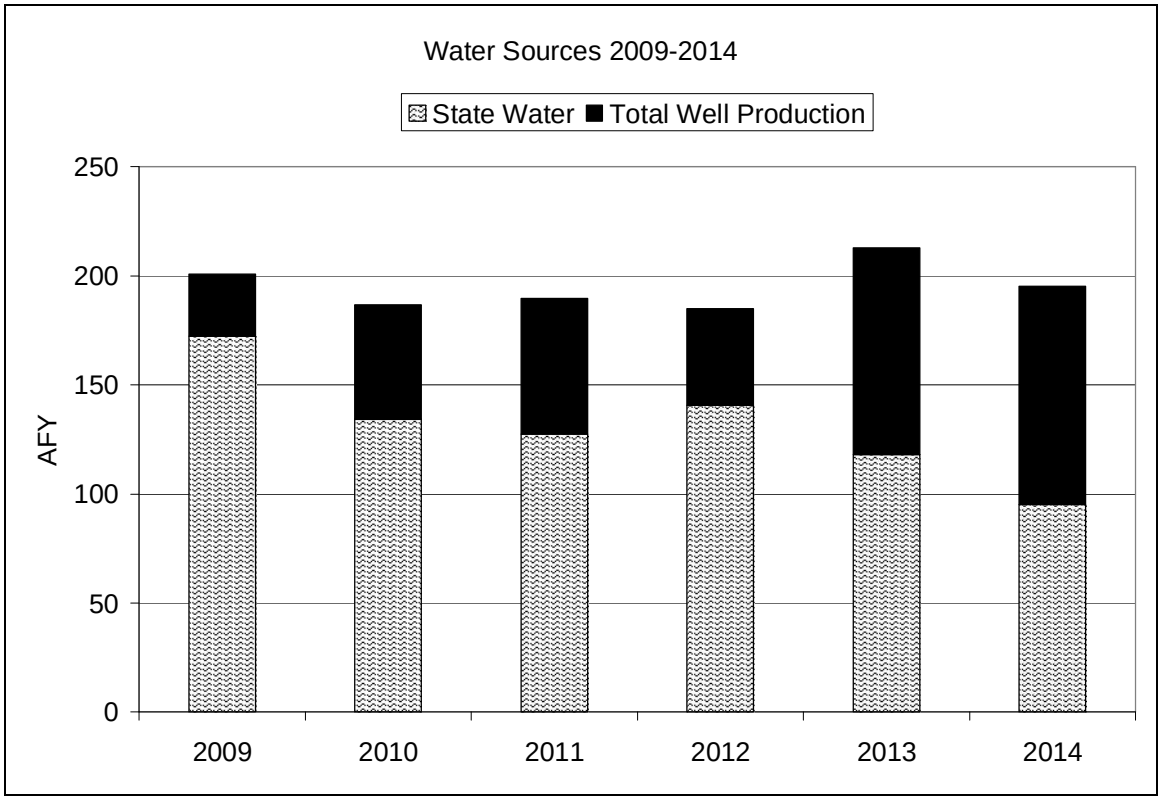

Figure 1Water Sources 2009-2014

In 2009 nearly all of the Company's water came from the State Water Project. However, during November the Company obtained almost all of its water from local wells. This change was necessary in part because of the shut-down of the Coastal Branch of the State Water Project during this time, and in part due to water quality and taste concerns with this source.

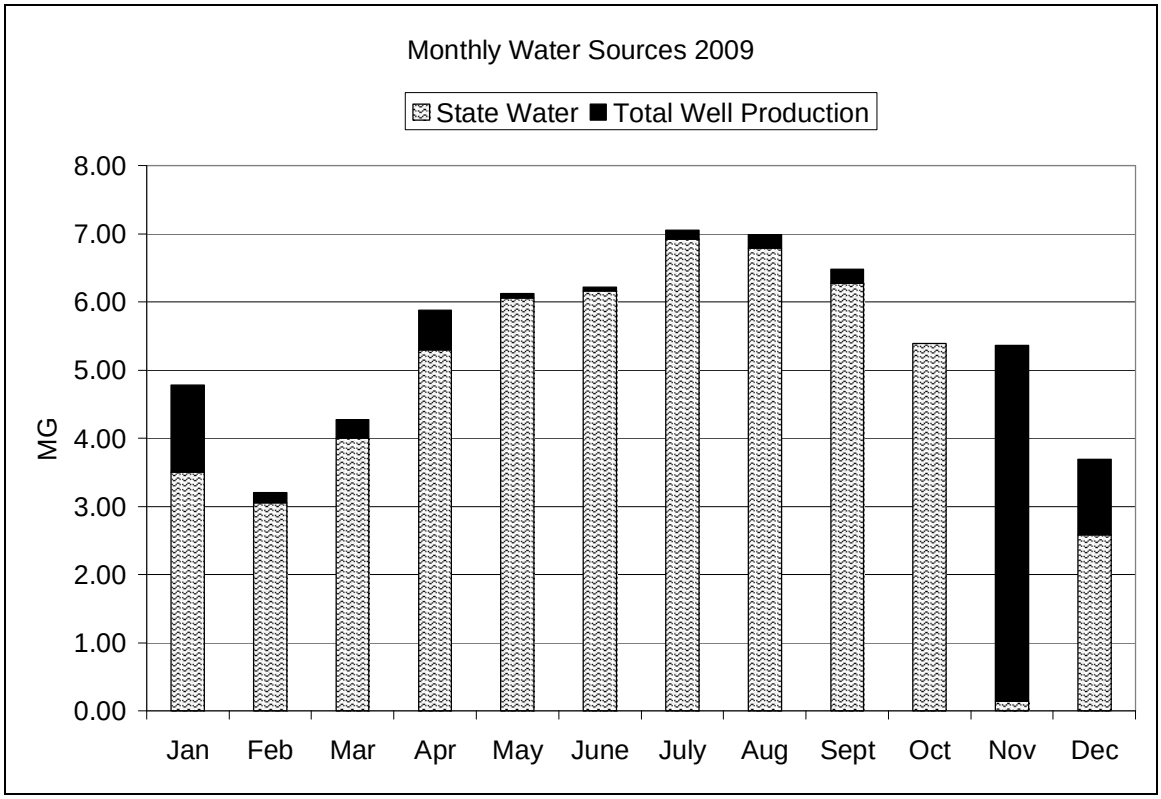

Figure 2 Monthly Water Sources 2009

During 2014 approximately half of the Company's water came from the State Water Project, as shown above. The chart below shows how well production augmented State Water during months of peak use. This choice was made in part due to less water being made available from the State Water project, and also due to water quality, operational, and budgetary concerns.

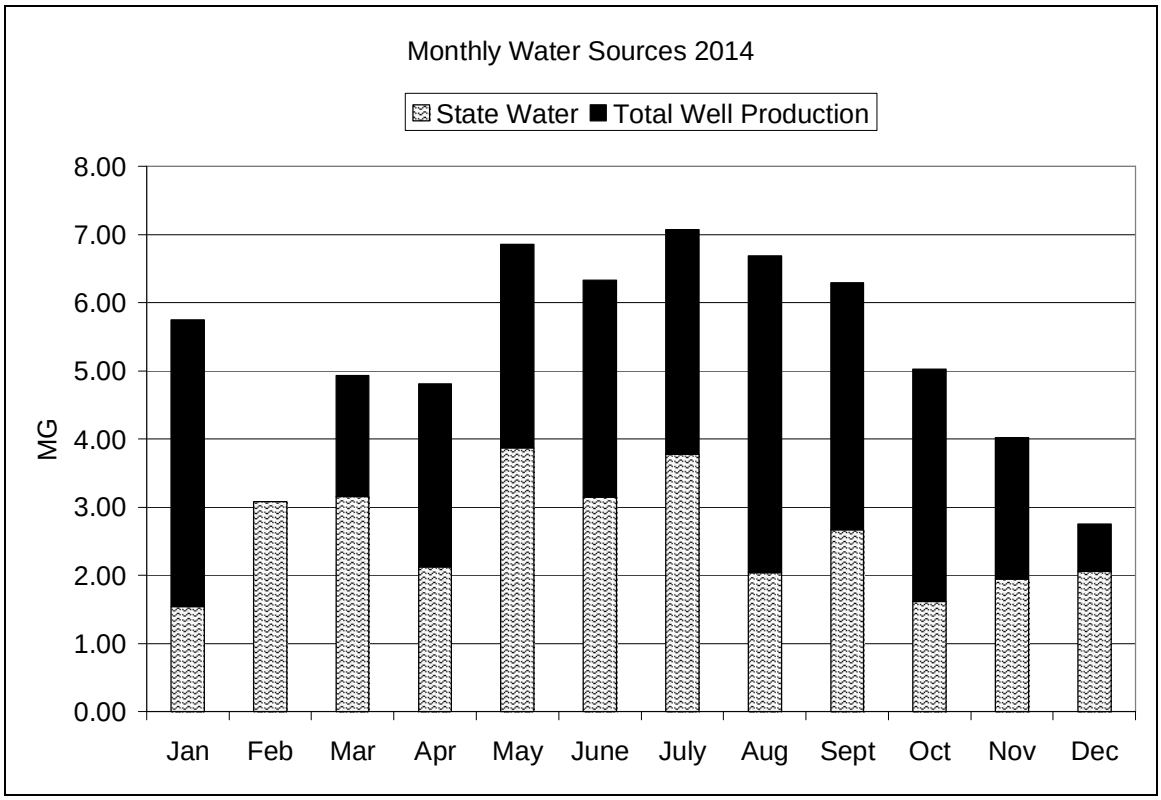

Figure 3 Monthly Water Sources 2014

Wells 4A, 5A, and 6

Within the last six years the Company has extracted between 28 and 100 AFY from wells 4A, 5A, and 6A. Prior to metering all residential units, water use was approximately 189 AFY (GTA, 1995). For example, diversion from these sources was 169 AFY in 1990.[1] The water is treated to remove iron and manganese.

These shallow wells (28 to 35 feet deep) are located near San Luis Obispo Creek. The aquifer receives recharge from rainfall and San Luis Obispo Creek. All the wells are more than 200 feet from the creek and the extracted water is considered "groundwater under the influence" of San Luis Obispo Creek, but is not subject to the Surface Water Treatment Rule.

Production from these wells is very reliable because the wells are located near San Luis Obispo Creek in the narrowest and lowest part of an 82 square mile watershed which is augmented by discharge from the City of San Luis Obispo's wastewater treatment facility. In addition, the Marre weir is located downstream of the Company's wells. This weir prevents surface tidal influence and salt water intrusion into the creek and the aquifer.

Table 6 Existing Groundwater Supplies

Parameter	Value	Information Source
Year of first use	1986	DHS, 1991
Treatment	Iron and manganese removal followed by chlorination	DHS, 1988
Pump Capacity 4A 5A 6A Combined Capacity	 150 gpm 150 gpm 150 gpm 390 gpm	 SWRCB, 1991 GTA, 1995
Safe Yield	Undefined. No historic shortfall. Previous extractions as high as 189 AFY.	ibid
Reliability of continued withdrawals at historic levels	Considered highly reliable.	Discharge requirements on City of SLO Wastewater Treatment Facility ensure water in the creek and aquifer recharge. See discussion below.
Reliability of withdrawals at increased levels	Unknown	The lower San Luis Obispo Creek is "fully appropriated" (SWRCB, 1998).

Creek Flow and Lower San Luis Obispo Creek Aquifer

The aquifer feeding Wells 4A, 5A, and 6A receives recharge from the creek with lesser amounts from direct precipitation and subsurface inflow.[2] During summer months the flows in lower San Luis Obispo Creek are dominated by discharges from the City of San Luis Obispo's Wastewater Treatment Plant. The Marre Weir prevents seawater intrusion and ensures that the aquifer and stream upstream of the weir contain "fresh" water year round.

Numerous users upstream of San Miguelito Mutual Water Company's wells divert surface and groundwater from the system. In 1994 it was estimated that irrigation users diverted 600 AFY of surface water and extracted 400 AFY from the aquifer. Riparian vegetation "use" is estimated to range between 260 and 230 AFY[3].

The aquifer/stream system is considered "fully appropriated" in terms of water rights (SWRCB, 1989).

Under an NPDES permit issued in 2014, The City of San Luis Obispo's wastewater treatment plant's average dry weather daily discharge is limited to 5.1 MGD (7.9 cfs). In addition, minimum discharges are also specified, ranging from 5.0 cfs in January to 1.7 cfs during summer months:

The City recently tried to reduce or eliminate its discharge to the creek but was mandated by Federal resource agencies to continue providing a minimum flow of 2.5 cfs to the creek[4].

Imported Surface Water Resources (State Water)

The Company obtains treated surface water from the California State Water Project (SWP). This water is obtained under a subcontract with the San Luis Obispo County Flood Control and Water Conservation District (SLOCFWCD). In addition to the SLOCFWCD, there are 28 other Contractors to the SWP. This "State Water" is conveyed to the Company via the California Aqueduct, the Coastal Branch of the California Aqueduct, and the Lopez Reservoir distribution system.

The following sections discuss the amount of State Water that is delivered, contractual and infrastructure constraints on the amount and timing of delivery, water quality, and reliability of supply.

SWP – Four Types of Water available to Contractors

Water is available to SWP Contractors through four different programs, as described below.

Table A Water

Each Contractor obtains annual allocations of water based upon an amount shown in "Table A" of its "Water Supply Contract" with DWR. Table A amounts are the maximum amount of SWP water that the State agreed to make available for delivery to a Contractor during any year. The State and SWP Contractors also use Table A amounts to serve as a basis for allocation of some SWP costs among the Contractors.[5] SLOCFCWCD's Table A amount is 25,000 acre feet (AF). The total amount of Table A water in the SWP is 4,171,536 AF.

Each year the DWR determines SWP Allocations - the percent of Table A amount, as determined by DWR, that each SWP Contractor can receive in any one year by using snowpack and precipitation data to predict that year's water supply availability, and by taking into account all of the Contractor requests[6]. If the SWP is unable to deliver 100% of its total Table A water, it will allocate its deliveries based upon each Contractor's Table A amount, so that each Contractor's deliveries are reduced by the same fraction.

Annual allocations of Table A quantities since 1996 are shown below. Note that the SWP hasn't delivered 100% of its Table A since 2006.

Table 7 Historic Table A Allocations

Year	Percent allocated to Contractors requesting full Table A amounts
1996	100%
1997	100%
1998	100%
1999	100%
2000	90%
2001	39%
2002	70%
2003	90%
2004	65%
2005	90%
2006	100%
2007	60%
2008	35%
2009	40%
2010	50%
2011	80%
2012	65%
2013	35%
2014	5%
2015	20%

"Article 21" Water

Under Article 21 of the Water Supply Contract, surplus water may be made available for purchase by Contractors, subject to certain restrictions, including (1) the water cannot be stored in SWP facilities, and (2) the water must be used within the service area of the requesting Contractor.

"Turnback" Water

The Turnback Pool program was set up under Article 56 of the Water Supply Contract. Under this program Contractors with allocated Table A supplies that are in excess of their needs in a given year may turn back that excess supply for purchase by other SWP Contractors that need additional supplies that year. The Turnback Pool can make water available in all types of hydrologic years, although there is generally less excess water turned back in dry years.[7] This water is subject to certain restrictions, including (1) the water cannot be stored in SWP facilities, and (2) the water must be used within the service area of the requesting Contractor.

"Carryover" Water

Carryover water is Table A water that is allocated to a Contractor in a given year, but is unused by the Contractor that year, which is stored for that Contractor in SWP supply reservoirs for use by that Contractor in a following year.[8] Note that carryover water can only be stored in a SWP reservoir when storage space is available. Should the reservoir overtop, carryover water "spills first."

SWP – Four Types of Water Delivered to Contractors

Water deliveries to SWP Contractors in any year are made up of a combination of the four types of water discussed above. Total SWP deliveries of Table A, Article 21, Turnback, and Carryover water to all SWP Contractors between 2005 and 2014 are shown in Figure 4.

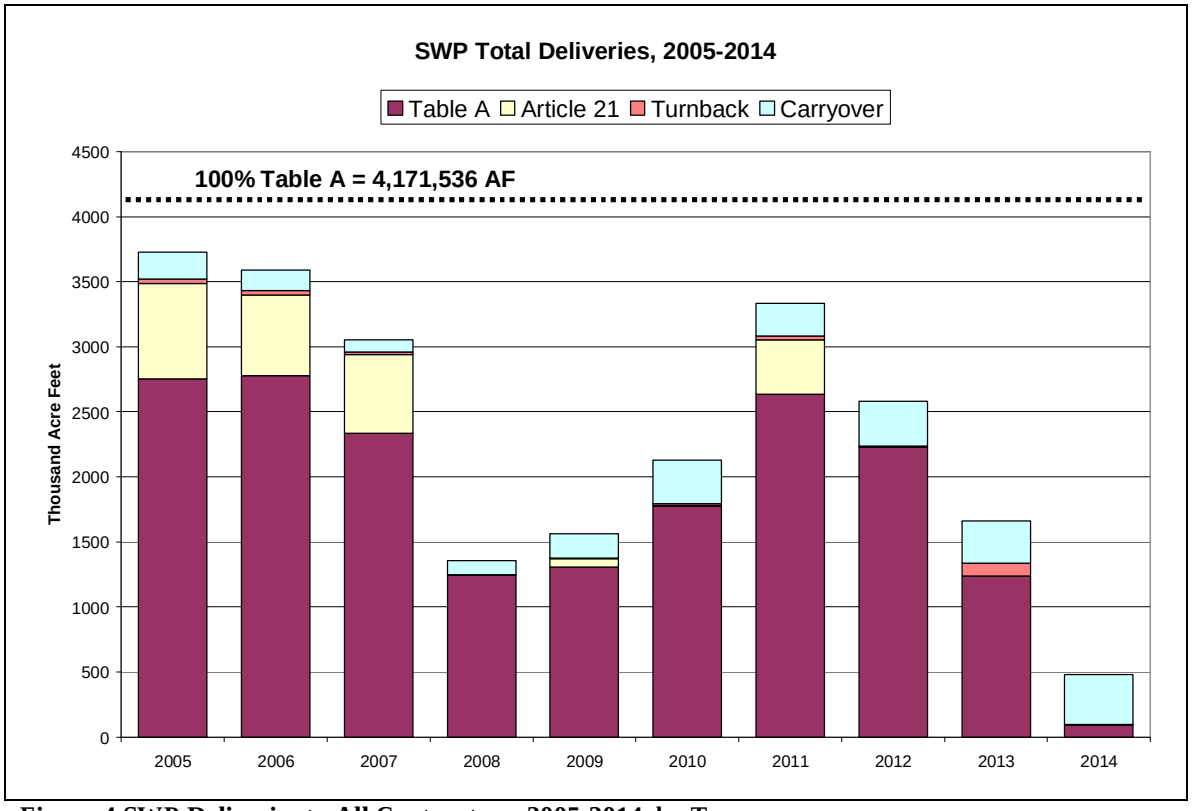

Figure 4 SWP Deliveries to All Contractors, 2005-2014, by Type

SLOCFCWCD supplies water to Subcontractors in SLO County

The San Luis Obispo County Flood Control and Water Conservation District contracted with the DWR for 25,000 acre feet of Table A water. It has entered into agreements with a number of subcontractors in San Luis Obispo County to allocate a total of 9,727 acre feet of its Table A amount, as shown in Table 8. These subcontracts allocate water as "Water Service Amounts" and "Drought Buffer" as shown below.

Table 8 SLOCFCWCD SWP Subcontractors' Allocations [9]

Sub-contractor	Water Service Amount	Drought Buffer	Total Reserved
Chorro Valley Turnout			
City of Morro Bay	1,313	2,290	3,603
CA Men's Colony	400	400	800
County OP Center	425	425	850
Cuesta College	200	200	400
Lopez Turnout			
City of Pismo Beach	1,240	1,240	2,480
Oceano CSD	750	0	750
San Miguelito MWC	275	275	550
Avila Beach CSD	100	0	100
Avila Valley MWC	20	60	80
San Luis Coastal USD	7	7	14
Shandon	100	0	100
TOTAL	**4,830**	**4,897**	**9,727**

"Water Service Amount" Water
This is the portion of SLOCFCWCD's Table A amount that each subcontractor has agreed to purchase, subject to availability.

"Drought Buffer" Water
Drought Buffer refers to an allocation of Table A water that can be used to "buffer" the effect of reduced Table A deliveries from the SWP to SLOCFCWCD. San Miguelito Mutual Water Company has 275 AF drought buffer on top of its 275 AF Water Service amount. Therefore, in years when the SWP is delivering at least 50% of its Table A amounts, the Company would be able to obtain its full Water Service allocation of 275 AF.

"Excess Allocation" Water
The SLOCFCWCD contracted with the DWR for 25,000 AF of Table A water. However, it has only committed 9,727 AF to subcontractors within SLO County. The additional 15,273 AF is considered "excess allocation" water. According to the County's Water resources web page, this excess allocation can be used to:

- to ensure achievement of full allocation in years of low delivery from State (<100%).
- for groundwater banking in and out the of County (currently evaluating in-County).
- for turnback pools (sell to the state or other Contractors).
- for permanent sale.

- for yearly/multi-year sale.
- after expansion of facilities and/or contract negotiation.

According to the County's web site, the Board of Supervisors (Proposed) Policy on Excess State Water Supply, January 2003, prioritizes the use of the excess allocation as shown below:

1. Prior to transferring the excess entitlement for any other use, Contractors of state water entitlement with capacity in Phase II of the Coastal Aqueduct shall have the first right to utilize the excess entitlement for "drought buffer" (reliability) purposes under the terms of a drought buffer agreement.
2. No permanent transfer of the excess entitlement for use outside the District boundary shall be made prior to a final update of the District's Master Water Plan adopted by the Board of Supervisors.
3. No multi-year transfer shall be made with a term in excess of five years prior to a final update to the District's Master Water Plan adopted by the Board of Supervisors.
4. Preference shall be given to local agencies and water purveyors regardless of whether a transfer is on an annual, multi-year, a permanent basis.
5. Out-of-District transfers that provide revenues that recover current costs and some or all of the District's past costs, maintain the District's right to use the water in the future, or which are used for environmental mitigation shall be given preference over other out-of-District transfers.
6. The Public Works Director is authorized to determine the annual amount of the excess entitlement to transfer to the State Water Project "Turnback Pools" established under the existing terms of State Water Agreements. In making that determination, the Public Works Director shall first consider local needs and how the use of the Turnback Pool might impact other potential transfers.[10]

SWP deliveries of Table A, Article 21, Turnback, and Carryover water to the SLOCFCWCD between 2005 and 2014 are shown in Figure 5. This figure shows that the SLOCFCWCD has used its carryover water in recent years to provide full deliveries to its subcontractors, including SMMWC.

Also note that through thoughtful management SMMWC has been able to build up a supply of carryover water. At the time of this report, the Company has 429 acre-feet of carryover water stored in SWP facilities.

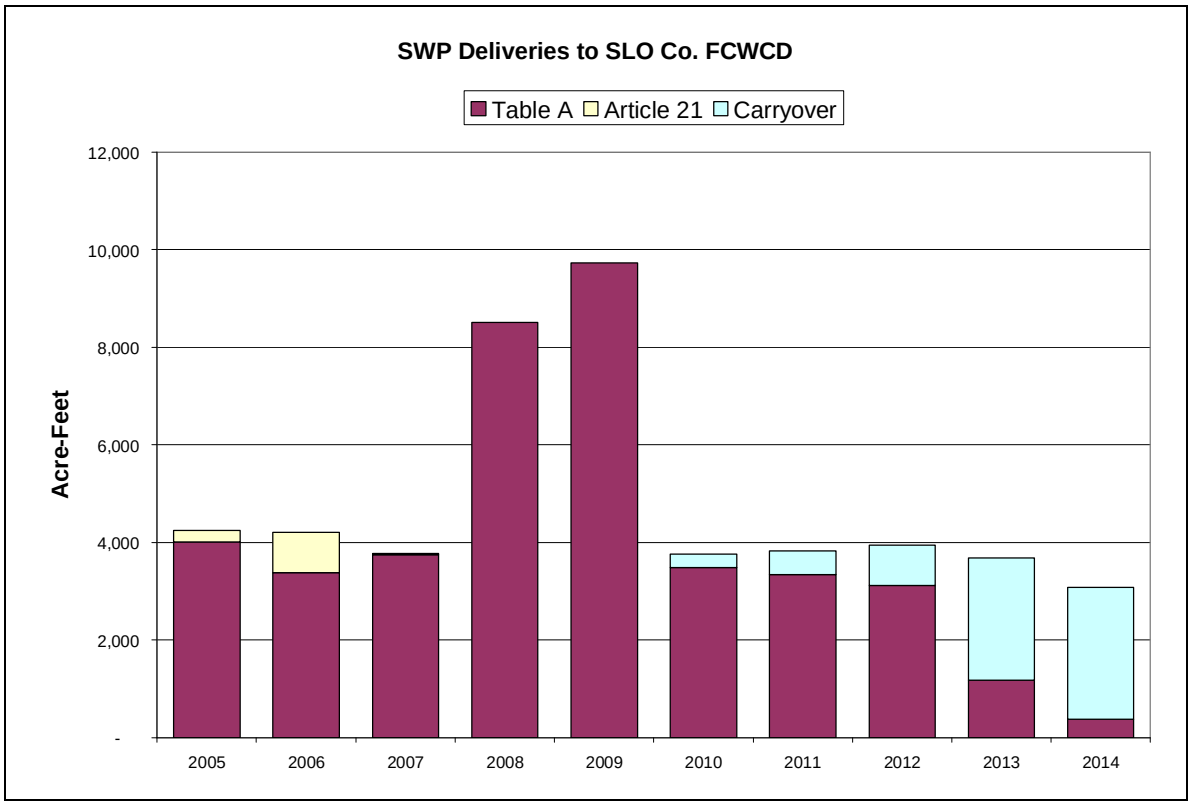

Figure 5 SWP Deliveries to SLOCFCWCD, 2005-2014

Requests for State Water and Reliability of Deliveries

The San Luis Obispo County Flood Control and Water Conservation District typically requests its full Table A quantity. This strategy results in full delivery of the Water Service Amount to its subcontractors in years when the statewide allocation exceeds 19%, as shown below.

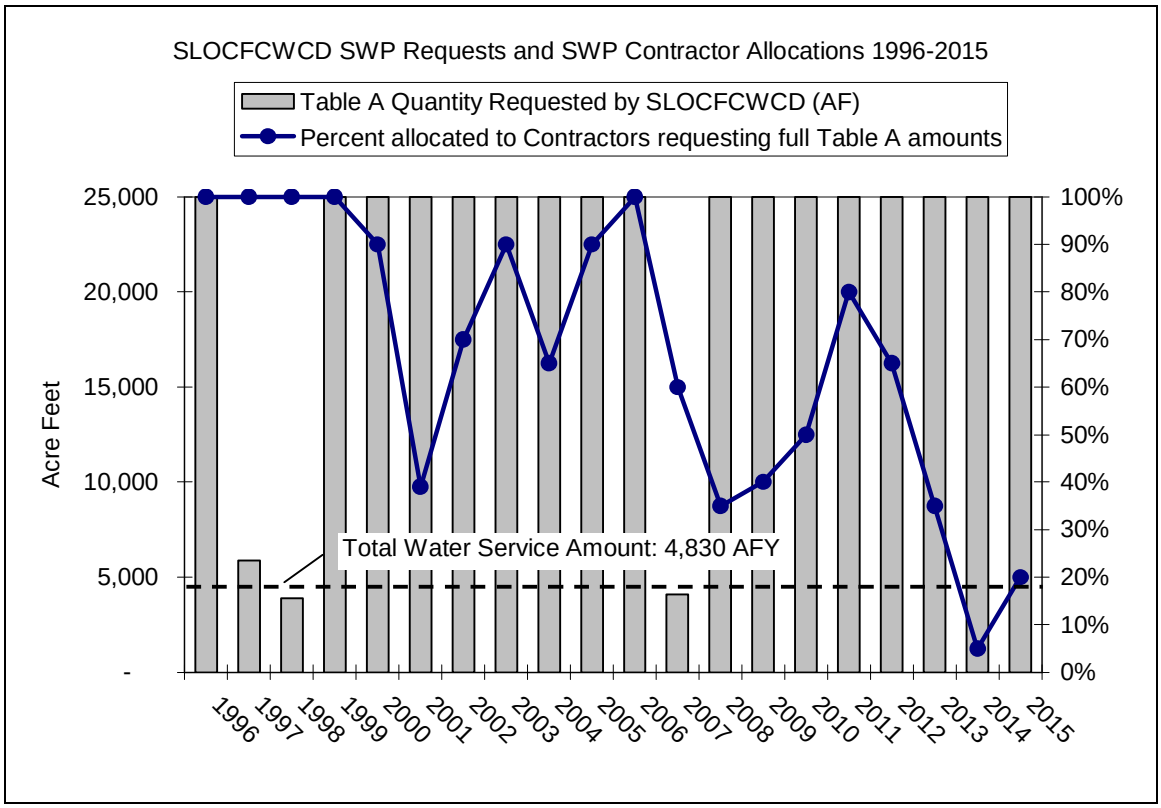

Figure 6 SLOCFCWCD SWP Requests and SWP Contractor Allocations 1996-2015

If we plot the percent allocated to Contractors requesting full Table A amounts in order of that percentage, we obtain a retrospective picture of the probability of receiving a particular allocation percentage, as shown below.

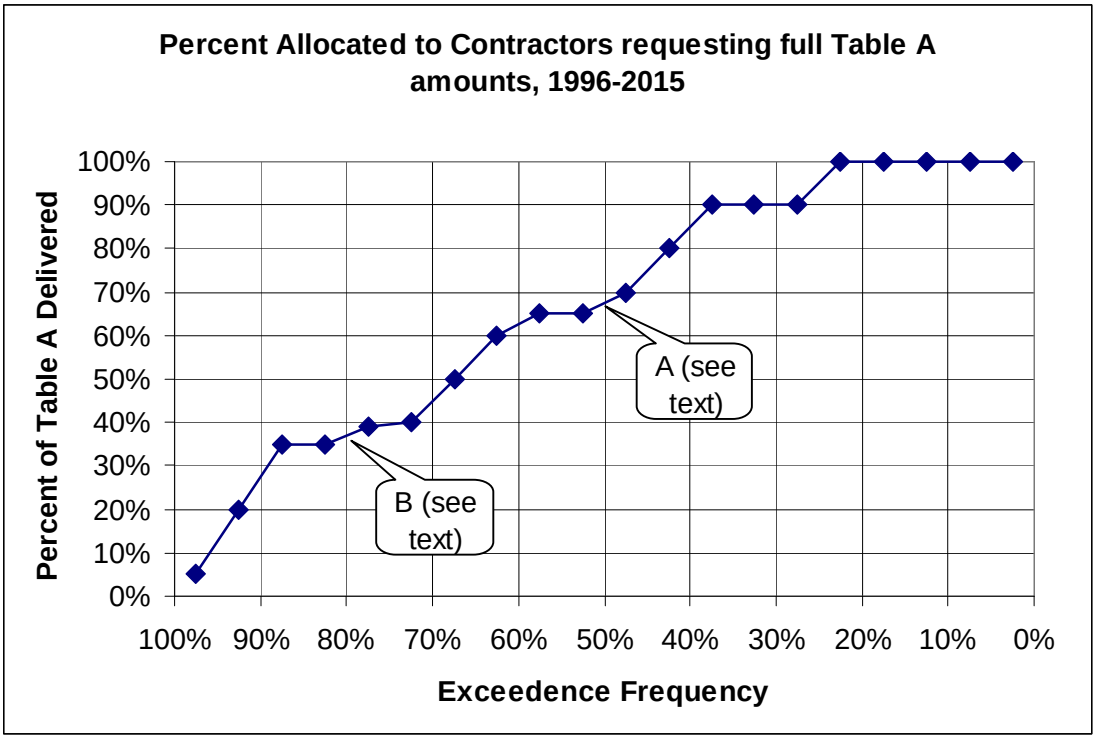

Figure 7 Probability of Exceedence, Percent allocated to SWP contractors requesting full Table A delivery, 1995-2015

What this chart graphically shows is that during the last 20 years (A) half the time the SWP has delivered more than 67% of its Table A amounts, and (B) 80% of the time, it has delivered more than 37% of this amount. (An equivalent "the glass is half empty" way to state this is: During the last 20 years (A) half the time the SWP has delivered less than 67% of its Table A amounts, and (B) 20% of the time, it delivered less than 37% of this amount.)

State Water Project's Estimate of Reliability of Delivery

The Department of Water resources issues a biennial Delivery Capability Report (DCR). The draft 2015 report was issued on April 24, 2015, and predicts the probability of delivery of specified quantities to all the SWP contractors under a number of scenarios. These scenarios include sea-level rise, planned improvements to the system, and possible restrictions on pumping from the delta to support special-status species. (The reader is directed to the DCR report for a more thorough discussion of the scenarios examined, the assumptions used, and the modeling procedures employed.)

As part of that report, the reliability of delivery to SLOCFCWCD is estimated, and is summarized in the following table. Note that the "95% Exceedence" value shows that in 95% of the years it is predicted that even under the worst case scenario the State Water Project will deliver at least 4,000 AFY to San Luis Obispo County, and in 3 of the 5 scenarios studied this value rises to 5,000 AFY. In other words, the SLOCFCWCD has approximately a 95% probability that it will receive its full Water Service Amount (4,830 AFY) in any given year.

Table 9 Predicted Average, Maximum, 95% Exceedence, and Minimum Deliveries to SLOCFCWCD, AFY

Scenario	Existing Conditions	2015 DCR ELT	2015 DCR ECHO	2015 DCR ECLO	2015 DCR Alt 4
Maximum Delivery	25,000	25,000	21,000	21,000	25,000
Average Delivery	16,000	15,000	11,000	13,000	18,000
95% Exceedence Delivery	6,000	5,000	4,000	5,000	4,000
Minimum Delivery	3,000	2,000	2,000	3,000	1,000

A note of caution. The 2015 Delivery Capability Report, and all previous such reports, was based on an analysis that used a set of historical hydrologic conditions (1922 to 2003). While the modeled scenarios assumed the impact of sea level rise, they did not attempt to predict long-term changes in other climate factors such as precipitation patterns and temperatures. Therefore, the Delivery Capability Report may not adequately characterize future water availability if long term climate changes occur.

Another note of caution. The analysis of reliability of delivery to SMMWC makes use of the assumption that the SLO County Flood Control District will continue to use its excess allocation to make full deliveries to all their subcontractors. However, should the San Luis Obispo County Flood Control District find other uses for its excess allocation, the reliability of full delivery will decrease.

SLOCFCWCD Zone 3 transports water to San Miguelito MWC

The San Luis Obispo County Flood Control and Water Conservation District Zone 3 operates the Lopez Reservoir Terminal Reservoir, treatment plant, and distribution pipeline to provide treated water to its members (the cities of Arroyo Grande, Grover Beach, and Pismo Beach, Oceano Community Services District, and County Service Area 12). The Company is not a member of Zone 3, but has contracted with Zone 3 to transport State Water via its distribution pipeline.

State Water Costs

Charges for State Water come from a number of different sources, and are discussed below.

- DWR Charges for State Water – These costs are determined by DWR and passed through SLOCFCWCD. These include fixed and variable components of Capital and O&M costs and are based, in part, on the volume delivered.
- DWR Charges for State Water Drought Buffer – These costs are determined by DWR and passed through SLOCFCWCD. These costs are not based on the volume of water delivered.

- SLOFCWCD Administrative Costs – These costs are divided among suncontractors based on their Water Service Amount (275 AFY for SMMWC).
- CCWA (O&M, Wheeling - State Water Aqueduct to Lopez) – These costs include fixed and variable costs associated with maintenance and operation of the Coast Branch of the California Aqueduct and the Polonio Pass treatment plant.
- SLOFCWCD (O&M, Wheeling - Lopez to SMMWC) – These charges cover the cost of operating and maintaining the Lopez distribution system.

The total charges for State Water since 2005 are listed below. This table shows that costs per acre-foot delivered has generally risen over the last few years.

Table 10 Historical Costs to SMMWC for State Water

Year	Water Delivered in Calendar Year (AF)	Total Paid for State Water	Per Unit Cost of Delivered State Water ($/AF)
2005	166	$284,072	$1,711
2006	161	$250,842	$1,558
2007	176	$246,790	$1,402
2008	164	$263,523	$1,607
2009	173	$305,610	$1,772
2010	134	$265,027	$1,972
2011	128	$339,380	$2,659
2012	141	$274,834	$1,954
2013	118	$310,122	$2,622
2014	95	$313,737	$3,291

The majority of the costs are due to DWR Charges for State Water, as shown in the following table.

Table 11 Recent Per-Acre-Foot Costs to SMMWC for State Water

Year	Total Per Unit Cost of Delivered State Water ($/AF)	DWR Charge / AF	Drought Buffer Charge / AF delivered	CCWA Charge / AF	Zone 3 Charge / AF
2009	$1,772	$1,454	$68	$148	$102
2010	$1,972	$1,462	$134	$202	$170
2011	$2,659	$2,167	$156	$168	$168
2012	$1,954	$1,516	$92	$179	$167
2013	$2,622	$2,016	$198	$230	$179
2014	$3,291	$2,516	$268	$306	$202

The DWR has estimated anticipated future costs for delivery of water as shown below.

Table 12 Estimated Unit Water Charges for 2014 and 2019, Coastal delivery area

	2014 in 2014 dollars	2019 in 2019 dollars
Capital; OM&R ($/AF)	$1,328	$1,302
Power ($/AF)	166	154
Total ($/AF)	$1,494	$1,456

These estimated charges are based on the following assumptions:

> *"The unit rates include costs of existing and future SWP facilities …. The unit water charges are based on the assumption that in 2014 and 2019, the SWP will be able to deliver the entire amount of water requested by each contractor. The unit water charges included are listed both as 2014 dollars and as escalated rates reflecting assumed future inflation of 4.0 percent in 2014, and 4.5 percent from 2015 through 2019."*[11]

Increase in Cost for Drought Buffer

The costs which are allocated to SLO County subcontractors for "drought buffer" are a combination of several different DWR costs. These costs are not dependent on deliveries, but represent capital and minimum O&M costs to maintain facilities needed to convey water through the system. More than half of these charges result from "Delta Water Charges" which are allocated to all users that receive water from the delta. Since 1995 Delta Water Charges have risen by 172%. The current charge for "drought buffer" is approximately $100 per AFY.

State Water – Delivery and Treatment - Infrastructure Constraints

State water is delivered to the Company via a series of aqueducts, reservoirs, pump stations, treatment plants, and pipelines. These components are owned, maintained, and operated by several different agencies, as summarized below.

Table 13 State Water Project Infrastructure

System Componenet(s)	Location and Function	Responsible Agencies
State Water Project including reservoirs, pumping plants, and the California Aqueduct	Provides water to the Coastal Branch of the California Aqueduct at Devil's Den	DWR
Phase 1 of the Coastal Branch of the California Aqueduct	Conveys water from the California Aqueduct in Kings County to the Polonio Pass Water Treatment Plant in San Luis Obispo County	DWR
Polonio Pass Water Treatment Plant	Treats water to meet State drinking water standards	CCWA
Phase 2 of the Coastal Branch of the California Aqueduct	Conveys treated water to turnouts in San Luis Obispo and Santa Barbara Counties	CCWA
Lopez Reservoir and Water Treatment Plant	Provides treated water to the Lopez distribution system	SLOCFCWCD Zone 3
Lopez Distribution Pipeline	Conveys treated water to San Miguelito Mutual Water Company	SLOCFCWCD Zone 3

Phase 2 of the Coastal Branch of the California Aqueduct

The pipeline between Polonio Pass WTP and Lopez Reservoir carries water for SMMWC and other subcontractors of State Water. It was sized to deliver the full "Water Service Amount" to the Chorro Valley and Lopez turnouts, operating 11 months out of the year. Therefore, in order for more than 275 AF of water to be delivered for use by SMMWC, one or more of the other subcontractors would need to be receiving less than their full Water Service Amount.

A recent study of the performance of the pipeline suggests that it may be possible to pass between 1,000 AFY and 9,100 AFY additional water through the pipeline (depending on assumptions made about pipe roughness and delivery option to the various subcontractors).[12]

Part 2 - Additional Water Resources Needed at Build-Out

This section examines existing land-use plans and provides an estimate of the additional water needed by the Company to meet 100% occupancy under build-out conditions under existing approved plans. This section includes (1) an estimate of the maximum amount of water that can reasonably be required for existing metered uses, (2) an estimate of the additional water needed for conversion of part-time occupancies to full-time occupancies, (3) an estimate of the additional water needed for build-out of currently permitted residential developments, (4) an estimate of the additional water needed for development of two smaller non-residential parcels, (5) a discussion of the additional water needed to serve larger non-residential developments, and (6) an estimate of the amount of water needed for un-metered system uses.

Note that the following analysis makes use of occupancy and water consumption from January 2009 through December 2013. This time period was chosen so that representative full calendar years could be analyzed. 2014 and 2015 data was excluded because temporary conservation measures were in effect during the last 3 months of 2014 and all of 2015, and therefore water use during those years would not be representative of long-term use rates.

Water Needed for Existing Metered Uses

An estimate of the maximum amount of water that could reasonably be needed on an annual basis to meet existing uses is found by looking at each category of water use between 2009 and 2013 and taking the highest annual use for each category. The results are shown below.

Table 14 Water Needed for Existing Uses

Water Use (AFY)	2009	2010	2011	2012	2013	Maximum
Residential	**96.62**	89.75	91.11	92.59	96.39	**96.62**
Commercial	**39.01**	35.94	35.24	34.41	36.22	**39.01**
Irrigation	46.34	40.73	38.27	38.70	**47.99**	**47.99**
Construction	0.03	0.00	**0.20**	0.00	0.00	**0.20**
Metered System Use	2.41	3.12	3.43	2.48	**6.03**	**6.03**
Total Metered Use	**184.42**	**169.53**	**168.26**	**168.18**	**186.63**	**189.85**

Water Needed for Part-Time Occupancies to Convert to Full-Time Occupancies

Individual meter data indicate that a significant number of residential units are occupied part-time, as shown below.

Table 15 Part-Time Users in Residential Areas as of December 2013

Residential Users	Full Time (FT) meter	Part Time (PT) meter	Total Meters
Indian Hill	154	8	162
Heron Crest	35	1	36
Heron Crest Custom Lots	22	2	24
Avila Valley Orch.	13	0	13
Misc. Residential	2	0	2
Pelican Point	92	26	118
Skylark Meadows	54	11	65
Mallard Green	46	7	53
Kingfisher Canyon	66	33	99
Quail Canyon	21	1	22
Silver Oaks	6	0	6
Total Residential	**511**	**89**	**600**

To plan for future full-occupancy conditions, the number of "effective" full-time meters for each development was calculated. For example, of the 99 units in Kingfisher Canyon, SMMWC staff reports that 33 are occupied part-time. By assuming that a part-time occupancy uses 50% of the water of a full time occupancy, the number of effective full-time residential meters is calculated to be 82.5, as shown below:

$$EM = FT + (OR)(PT) = 66 + (50\%)(33) = 66 + 16.5 = 82.5 \text{ meters}$$

Where:

EM = number of Effective Meters
FT = number of Full Time connections = 66
PT = number of Part Time connections = 33
OR = Occupancy Rate in part-time units = 50% (assumed value)

To estimate the additional amount of water that will be required to serve these existing residential developments when they are occupied 100% full-time, an estimate of the number of additional effective meters was also calculated, as shown below.

Table 16 Additional Effective Meters needed for 100% Full-Time Occupancy

Existing Residential Users	Total Meters	Total Effective Meters Existing in Dec 2013	Additional Effective Meters needed for 100% Full-Time Occupancy
Indian Hill	162	158.0	4.0
Heron Crest	36	35.5	0.5
Heron Crest Custom Lots	24	23.0	1.0
Avila Valley Orch.	13	13.0	0.0
Misc. Residential	2	2.0	0.0
Pelican Point	118	105.0	13.0
Skylark Meadows	65	59.5	5.5
Mallard Green	53	49.5	3.5
Kingfisher Canyon	99	82.5	16.5
Quail Canyon	22	21.5	0.5
Silver Oaks	6	6.0	0.0
Total Residential	**600**	**555.5**	**44.5**

For these existing residential developments, water use data from 2009-2013 was used to estimate long-term water use rates.

For each subdivision the year with greatest water use was selected. The amount of water used that year was divided by the number of effective meters to arrive at a conservative water use factor that can be used for water resource planning purposes.

This water use factor was then multiplied by the number of additional effective meters that would be needed for 100% full-time occupancy to obtain the amount of water that would be required.

Table 17 Additional Water Needed for 100% Full-Time Occupancy

Existing Residential Users	Max. Year Total Use (AF)	Total Effective Meters	Max. Annual Use Factor per Effective Meter (AFY per)	Additional Effective Meters needed for 100% Full-Time Occupancy	Additional Water Needed for 100% Full-Time Occupancy (AFY)
Indian Hill	28.532	158.0	0.181	4.0	0.722
Heron Crest	19.861	58.5	0.340	1.5	0.510
Avila Valley Orch.	2.774	13.0	0.213	0.0	0.000
Misc. Residential	0.665	2.0	0.332	0.0	0.000
Pelican Point	12.498	105.0	0.119	13.0	1.547
Skylark Meadows	7.909	59.5	0.133	5.5	0.731
Mallard Green	7.524	49.5	0.152	3.5	0.532
Kingfisher Canyon	14.843	82.5	0.180	16.5	2.969
Quail Canyon	4.410	21.5	0.205	0.5	0.103
Silver Oaks	1.870	6.0	0.312	0.0	0.000
Total				**43.5**	**7.394**

These calculations show that approximately 7.4 additional acre feet per year will be required to allow for these existing residential developments to be occupied 100% full-time.

Additional Water Needed for Build-out of Existing Residential Subdivisions

The 1981 San Luis Bay Estates Master Plan (SLBE Master Plan) allowed development of the areas served by the Company. Since 1981 the SLBE Master Plan has been amended from time to time. As part of these amendments the location, size, and number of various uses and the timing of their development have been modified.

The following table presents the total number of residential lots within the SMMWC water service area in 2015 and the total number that have been developed as of December 2013. The difference between these numbers is the number of additional residential units in existing subdivisions that will eventually need to be served by the SMMWC.

Table 18 Potential Future Residential Units

Description/Location	Buildable Residential Lots in Water Service Area	Occupied in Dec 2013	Potential Future Residential Units
Manufactured Homes			
Indian Hill	162	162	0
Manufactured Home Subtotal	**162**	**162**	**0**
Single Family Residential			
Pelican Point	117	117	0
Skylark	65	65	0
Mallard Green	53	53	0
Kingfisher Cyn	130	92	38
Quail Cyn	22	22	0
Silver Oaks Ln	6	6	0
Heron Crest	36	36	0
Heron Crest Custom Lots	30	24	6
Avila Valley Orch.	14	13	1
Single Family Subtotal	**473**	**428**	**45**
Misc. Resid. (Marre House & Yellow House)	2	2	0
Grand Total	**637**	**592**	**45**

Examination of this table shows that the SMMWC will need to provide sufficient water, in excess of the water being provided in 2013, to serve 45 additional residential units.

Recent Residential Use Rates

Records of recent water use in developed residential areas have been analyzed to develop water use rates that can be used for planning purposes. These calculations are based on water use from January 2009 through December 2013, as noted above.

Maximum annual use rates were used in conjunction with the occupancy rate to determine the maximum annual use factor per effective meter for each development. SLO County assessment records were sampled for a number of parcels in each development in order to obtain an estimate of representative lot size for each development. These results are presented below.

Table 19 Representative Lot Size and Maximum Annual Use Factor per Effective Meter, 2009-2013

Residential Subdivision	Representative Lot Size (sq ft)	Max. Annual Use Factor per Effective Meter (AFY per)
Heron Crest	9,844	0.340
Silver Oaks	2,929	0.312
Pelican Point	1,561	0.119
Skylark Meadows	4,396	0.133
Mallard Green	3,577	0.152
Kingfisher Canyon	5,156	0.180
Quail Canyon	7,900	0.205

Examination of this table shows there is considerable variation in use factors between developments. To illustrate this difference, water use versus representative lot size is plotted below.

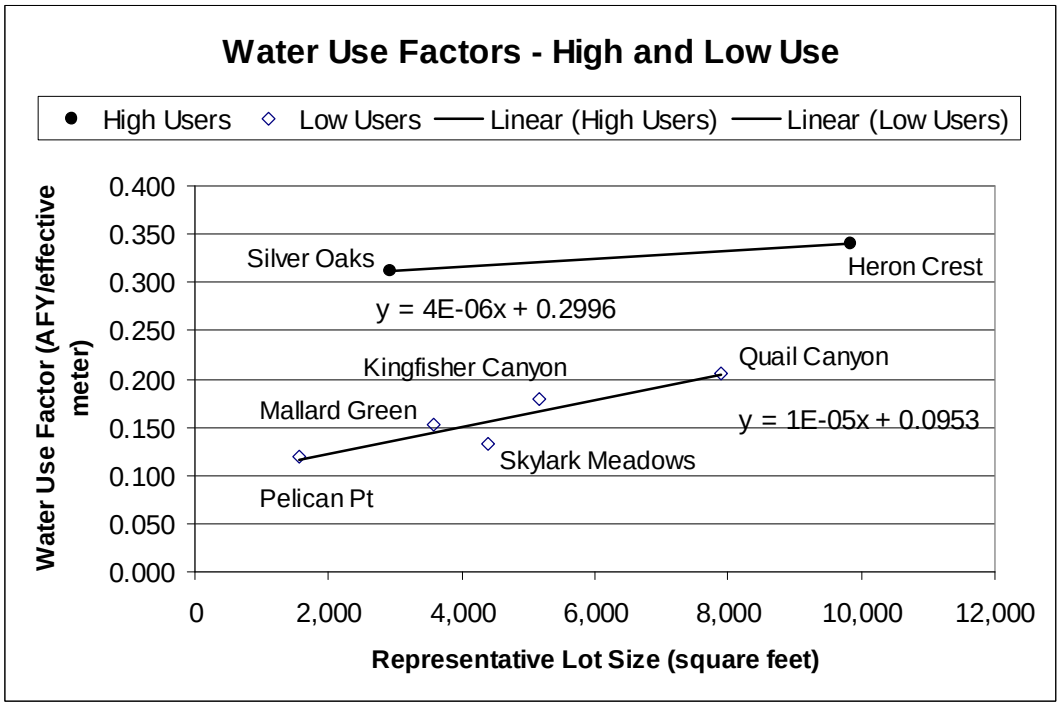

Figure 8 Water Use vs. Lot Size

As can be seen, water use tends to increase with lot size, although the relationship is not exact. Clearly lot size has an effect on water use, but is not the only factor involved. There appear to be two types of water usage, or a range of possible usage rates. The following equations illustrate the relationships shown above.

HUF = (hs)(SF) + BH = (0.00004)(SF) + 0.2996
LUF = (ls)(SF) + BL = (0.00001)(SF) + 0.0953

Where:

HUF = High Water User Factor
LUF = Low Water User Factor
BH = Base use for High Water Users = 0.2996 AFY/effective meter
BL = Base Use for Low Water Users = 0.0953 AFY/effective meter
SF = Lot area in square feet
hs = High User slope of relation = 0.000004 AFY/meter/sq.ft.
ls = Low User slope of relation = 0.000010 AFY/meter/sq.ft.

Additional Water Needs Estimate Based on Recent Residential Use Rates

The 38 undeveloped (as of December 2013) lots in "Kingfisher Canyon" have a typical lot size of 5,150 square feet. We assume that the water use rates in these new lots will be similar to that for the subdivision as a whole. The use rate for the developed lots in this subdivision is 0.18 AFY/meter.

As of December 2013 there were 6 undeveloped lots in the subdivision known as "Heron Crest Custom Lots". These lots have a typical size of 12,580 square feet. Given this lot size, and its relation to an existing "High User" subdivision (Heron Crest), estimating future water use in this subdivision with the "High User" use rates is reasonable. Using the relation between lot size and "High User" use rate, we predict the use rate for these 6 lots will be 0.351 AFY/meter.

As noted above, the maximum annual use factor for the Avila Valley Orchard subdivision is 0.213 AFY per connection.

Using these use rates, the water needed to serve these residential units can be estimated as shown below:

Table 20 Water Needed for Build-out of Existing Residential Subdivisions

Description/Location	Future Residential Units	Use Rate (AFY/unit)	Estimated Use (AFY)
Kingfisher Cyn	38	0.180	6.84
Heron Crest Custom Lots	6	0.350	2.10
Avila Valley Orch.	1	0.213	0.21
Total	**45**		**9.15**

An alternative method of estimating future water needs is provided below.

Additional Water Needs Estimate Based on SLO County Residential Use Rates

San Luis Obispo County 2014 Public Improvement Standards set minimum standards for the amount of water that must be provided for residential and commercial developments as follows:

> *A. Number of Customers. For calculating supply and storage requirements, the number of customers shall be determined as follows:*
>
> > *1. In residential areas, each single family home or lot will be counted as one (1) customer. Each unit of a multi-family dwelling will be counted as one-half (½) customer. …*
>
> *B. Average Demand. To meet customer demand for water in residential and commercial areas, water supply sources must be capable of producing a minimum of 400 gallons per day per customer served.*

Using these minimal County requirements, the water needs of the new residential units discussed above can be estimated as follows:

Q = (# of customers)x(400 gallons per day)x(365 days per year)/(325,829 gal. per acre-ft)

Q = (45 customers)x(400 gallons per day)x(365 days per year)/(325,829 gal. per acre-ft)

Q = 20.16 AFY to serve these 45 additional residential units.

In summary, between 9.15 AFY and 20.16 AFY will be required to serve these 45 additional residential units, depending on the estimation method used.

Additional Water Needed for Planned Development of Non-Residential Lots

Estimates of the water needs of future development of non-residential lots within the SMMWC service area are discussed below. The discussion begins with the probable water needs for development of the smaller existing non-residential lots and concludes with a consideration of the State Water Allocations that are expected to be used to provide sufficient water to allow development of these larger projects.

Additional Water Needed for Development of the Smaller Non-Residential Lots

Avila Village Inn Expansion

In 1981 the San Luis Bay Estates Master Plan envisioned 70,000 square feet of commercial development called "Blue Heron Commercial." As of 2015, almost all of

this area has been developed. Only one parcel (Lot 8) remains with development potential. This 7,897 square foot lot is located next to the Avila Village Inn. An application to build a 3-story building to serve as suites for the Inn with approximately 10,600 sq. ft. total floor area was submitted to SLO County in April 2015. As part of that application an estimate for water use of 1.2 AFY was provided, based on 14 units using 100 gallons per day.

Estimated Use Based on Recent Use Rates

Analyzing the existing Avila Village Inn water use we find that between January 2009 and December 2013 that this 30 unit Inn used on average 4.314 AFY, with a maximum year use of 4.853 AFY. This works out to an average rate of 0.1438 AFY per room, and 0.1617 AFY during a maximum use year. (These values convert to 128 gpd per room on average, and 143 gpd per room in a maximum year.) Using the maximum per room rate, we can estimate the water needs of this proposed development to be:

Q = (143 gpd per room)x(14 rooms)x(365 days/year)/(325,829 gal. per acre-ft)
Q = 2.24 AFY = water needed to serve 14 additional hotel room units.

Estimated Use Based on SLO County Standards Use Rates

Counting each of the 14 rooms as ½ customer and the County's requirement of 400 gpd per customer, we can estimate the water needs of this proposed development to be:

Q = (14 rooms)x(1/2)x(400 gpd)x(365 days per year)/(325,829 gal. per acre-ft)
Q = 3.14 AFY = water needed to serve 14 additional hotel room units.

Lot 69 Proposed Residential Development

In 1991, Tract 1497 created lots 67, 68, and 69 of Tract 1497. Lot 68 now contains the CalFire station, and Lot 67 contains the SMMWC headquarters building. Lot 69 was planned to contain a 4,800 square foot building and two tennis courts, and is currently vacant. The latest development proposal for this parcel was submitted to SLO County Planning in January 2015 and calls for 8 residential lots on this 1.36 acre parcel.

Estimated Use Based on Recent Use Rates

With an average lot size of 7,400 square feet, we can expect a high use rate of 0.330 AFY/meter. With this use rate, the estimated water use for this development would be 3.78 AFY, as shown below:

Q = (0.330 AFY/meter)x(8 meters)
Q = 2.64 AFY = water needed to serve 8 additional residential units.

Estimated Use Based on SLO County Standards Use Rates

Using SLO County Public works requirement (400 gallons per day per customer) would result in a need for 3.58 AFY, as shown below:

Q = (8)x(400 gallons per day)x(365 days per year)/(325,829 gal. per acre-ft)
Q = 3.58 AFY = water needed to serve 8 additional residential units.

In summary, between 4.88 AFY and 6.72 AFY will be required to serve these two projects, depending on the estimation method used, as summarized below.

Table 21 Water Needed for Build-out of Smaller Non-Residential Lots

Description/Location	Estimate Based on Recent Use Rates (AFY)	Estimate Based on SLO County Standards (AFY)
Avila Village Inn Expansion (Lot 8)	2.24	3.14
Lot 69	2.64	3.58
Total	**4.88**	**6.72**

Additional Water Needed for Larger Developments - State Water Surcharge Agreements and Water Use Factors

Many of the properties of the service area are zoned Recreation. Recreation is a fairly open-ended zoning category with options for residential, commercial as well as recreation land uses. Some of these uses, such as event centers, hotels or retail space may require significant water resources.

Water needs at build-out for development of this land use category cannot be quantified without a specific project description/proposal from the landowner.

Given this uncertainty, an appropriate method to estimate water needs is to examine the status of the State Water Surcharge Agreements.

A number of entities who own or hold under long-term lease undeveloped, or underdeveloped, properties within the SMMWC Service Boundary have executed Agreements with the Company regarding State Water Surcharges. These agreements were made: "In order to obtain an adequate supply of State Water to enable the Contractor to develop the Properties, Contractor desires to induce SMMWC to ensure Contractor's access to a specified number of acre-feet per year of State Water…"

Under these agreements a "Designated Amount" of state water is allocated to the Contractor. Until the property in question is developed, pro-rata shares of the Company's State Water fees are passed on to the Contractor, based on the Contractor's Designated. These fees do not cover the costs for actual delivery or treatment of the water.

Upon the sale or occupancy of the property, or a portion of the subdivided property, the Designated Amount used to calculate surcharges is reduced according to a table of water use factors contained in Exhibit E of these agreements. Exhibit E is reproduced below.

Figure 9 Exhibit E from a State Water Surcharge Agreement

EXHIBIT E - WATER USE FACTORS

Use Category	Water Use Factor in acre feet per year	
	with landscaping	w/o landscaping
Commercial		
Bank or S&L	0.2 per 1000 SF	0.06 per 1000 SF
Church	0.14 "	0.06 "
Schools & Day care center	0.18 "	0.09 "
Food Service	"	"
Full service	0.31 "	0.26 "
Fast-food (with on-site prep)	0.67 "	0.54 "
Grocery Store	0.38 "	0.34 "
Hair Salon	0.25 "	0.23 "
Health Club	0.32 "	0.26 "
Motel, Hotel or Inn (without food service)	0.15 per room	0.1 per room
Motel, Hotel or Inn (with food service)	0.43 "	0.3 "
Office		
Non medical	0.11 per 1000 SF	0.06 per 1000 SF
Medical	0.35 "	0.16 "
Retail	0.35 "	0.06 "
General Store	0.11 "	0.03 "
Laundry	0.4 "	0.35 "
Maintenance , Storage & Warehouses	0.07 "	0.06 "
Service Stations	1.2 Facility	0.84 Facility
Residential		
Apartments	0.22 per dwelling	0.13 per dwelling
Condominiums	0.26 "	0.16 "
Mobile Home Park	0.17 "	0.12 "
Single family (< 0.25 acre)	0.37 "	0.22 "
(> 0-.25 acre)	0.75 "	0.23 "
Landscape*		
Zeroscape	.017 -.03 per 1000 S.F. of Landscaping	
Turf	.06 - .08 "	
Conventional - Ornamental using spray irrigation	.034 - .06 "	

*Based on Model Water Efficiency Landscape Ordinance.prepared by The Department of Water Resources

Other Uses As Determined By The Board Of Directors and Their Engineer

A summary of the current status of these agreements is shown below.

Table 22 Status of State Water Surcharge Agreements as of September 2015

Contractor	Project Location and Description	Surcharge Amounts Sept. 2015 (AFY)
Rob Rossi	Blue Heron Commercial - Expansion of existing commercial space	0.03
Rob Rossi	Village Inn - Expansion of existing Inn - Lot 8	0.35
Rob Rossi	Avila Bay Resort	13.50
Rob Rossi	Lot 279	0.14
Robin L Rossi Living Trust	Avila Bay Resort	6.78
Rob Rossi	Parcel 2	0.14
Rob Rossi	Parcel 3	0.14
Beachport Resort LLC	Cottage Parcel	14.00
Pacho LP	Lot Y - Rancho San Miguelito	10.00
Total		**45.09**

One of the properties noted above – the Village Inn expansion - was discussed previously. Note the difference between the amount of water specified in the surcharge agreement (0.35 AFY) and the estimated water use for this project (2.24 AFY or 3.14 AFY, depending on estimation method).

Un-metered System Uses

When accounting for additional water needs, some provision will be needed for the production of water that is not metered when it is used. This water includes backflushing of filters, fire use, and other system requirements. Between 2009 and 2014 these uses were between 9% and 14% of metered use, as shown below. For purposes of predicting future needs for this category of use, we will project that system uses will be approximately 12% of metered uses.

Table 23 Production, Metered Uses, and System Uses 2009-2014

Year	2009	2010	2011	2012	2013	2014	Average
Total Production (AFY)	200.99	186.82	189.75	184.93	212.91	195.33	
Total Metered Uses (AFY)	184.42	169.53	168.26	168.18	186.63	172.12	
Un-metered System Uses (AFY)	16.58	17.28	21.49	16.75	26.28	23.21	
Un-metered System Uses as a fraction of Total Metered Uses	9.0%	10.2%	12.8%	10.0%	14.1%	13.5%	11.6%

Summary of Additional Water Needed for Build-Out

The amount of water needed for build out was estimated by starting with the amount of water needed for existing uses, adding the amount of water needed for the new additional uses, and then applying the un-metered use rate noted above. This estimate is summarized below.

Table 24 Additional Water Needed for Build-Out

Water Use	Low Estimate (AFY)	High Estimate (AFY)
Exiting Metered Uses		
Residential	96.62	96.62
Commercial	39.01	39.01
Irrigation	47.99	47.99
Construction	0.2	0.2
Metered System Use	6.03	6.03
Total Metered Use	**189.85**	**189.85**
Additional Metered Uses		
Convert part-time to Full Time Occupancy	7.39	7.39
Build-out of Existing Residential Subdivisions	9.15*	20.16**
Development of Smaller Non-Residential Lots	4.88*	6.72**
Larger Developments with State Water Surcharges	45.09	45.09
Subtotal Additional Uses	**66.51**	**79.36**
Subtotal Existing plus Additional Uses	**256.36**	**269.21**
Un-metered System Uses (12%)	**30.76**	**32.31**
Total Needed at Build-Out	**287.12**	**301.52**

* Based on recent water use rates.
** Based on SLO County Standards.

Additional Water Supplies Needed for Worst-Case Scenario

The existing water resources of the SMMWC are estimated to be able to produce the following quantities when both sources are producing at capacity:

Table 25 Current Capacity of Existing Water Resources

Source	Current Capacity (AFY)	Reference
Local Groundwater (Wells 4, 5, and 6)	189	GTA, 1995
State Water	275	State Water Contracts
Total	**464**	

Clearly the existing available water resources are sufficient to serve the needs discussed in this report – when these sources are producing at capacity.

To plan for times when water availability is restricted, the following "worst-case" scenario is examined:

Worst Case Scenario

1. Extraction for the existing wells is restricted by a regulatory agency to not exceed historic pumping rates (189 AFY).
2. State Water deliveries are 5% of Table A. SLO County has re-allocated their excess allocation to some other users. With the existing drought buffer, the SMMWC will receive 10% of its Water Service Amount (27.5 AFY).

Note that this scenario is reasonable because:

- It does not include catastrophic failure modes that are possible, such as failure or removal of the Marre weir, or failure of Delta levees thereby shutting down the State Water Project indefinitely.
- The Company has experienced at least one year when deliveries from the State Water Project were capped at 5% of Table A.
- It is reasonable to plan for a time when all of SLO County's "excess allocation" has been reallocated to other users.

Under this worst-case scenario the need for additional water resources can be estimated as shown below.

Table 26 Worst-Case Additional Water Resources Needed

Water Source and Use	**AFY**
Well Supply	189.00
State Water Supply	
5% Table A	13.75
5% Drought Buffer	13.75
Total Supply	**216.50**
Total Use	**301.52**
Additional Water Resources Needed	**85.02**

Therefore, the Company will need approximately 85 AFY more water, in the worst case situation described above, to serve its customers.

The Company should consider developing additional water supplies to increase reliability, as discussed in the following section.

Part 3 - Potential Additional Supplies

The two existing water supply sources of the SMMWC are estimated to be able to produce sufficient water to meet the Company's needs at build-out when both sources are producing at capacity. However, neither source would be able to provide sufficient water if the other source was unavailable for an extended period of time. Therefore, the Company should develop additional sources in order to increase the system's overall reliability.

This section summarizes the water resources that are potential water sources for the Company. These sources include local groundwater from deep and shallow aquifers, reclaiming treated wastewater for golf course irrigation, and purchasing additional State Water Drought Buffer.

Local Groundwater Resources

For purposes of this analysis local groundwater resources can be understood as a series of geologic layers, each with different water-producing potentials, as shown below.

Table 27 Simplified Geology and Well Water Sources

Formation	Member	Thickness	Existing/Proposed Wells
Alluvium		10 – 60 feet	Existing: 4A, 5A, 6A; and Golf course well #3
Pismo	Belleview		
	Gragg	200 – 400 feet	Proposed New Well
	Miguelito	200 – 500 feet	Exist: E. Harford #2 and #5
Monterey		1000+ feet	Exist: Hot Water Well H1

As noted previously wells 4A, 5A, and 6A are shallow wells (28 to 35 feet deep) located in the alluvium near San Luis Obispo Creek. The aquifer receives recharge from rainfall and San Luis Obispo Creek.

Several existing wells draw water from depths of between 200 and 1,200 feet. At this depth the aquifer being tapped may be part of the Pismo Formation. This approximately 1200 ft thick layer relies on fractured sandstone to provide the porosity for water storage. These fractures provide *secondary* porosity, as compared to the *primary* porosity of the sandstone material. Because of this dual porosity, it has been noted that initial yields tend to attenuate over time: "Initial yields tend to release highly-pressurized groundwater from the largest fractures. These yields tend to attenuate over time as the pressure is released and the remnant porosity is yielding water in tandem with the secondary porosity." (Kear, 2014)

The feasibility of tapping into these deeper aquifers is discussed below. Included in this discussion are two existing wells (or well fields) and one proposed well.

Hot Water Well (H1)

The Company has investigated the possibility of developing the "Hot Water Well" as a drinking water source. The Hot Water Well is located under the portico of the Avila Bay

Athletic Club. It is accessible, but future O&M of an active municipal water well at this location will be difficult. This well draws from deep strata (1,240 feet) and produces warm water (97 degF).

To utilize this water source would require treatment to remove iron, manganese, color, turbidity, and odor. A pilot scale study in 1992 showed that blending at a 1: 4 ratio with existing sources would be needed to bring the temperature down to acceptable levels.

Table 28 Hot Water Well Safe Yield and Cost Estimate for Treatment

Parameter	Value	Information Source
Year of first use	1988	DHS, 1988
Pump Capacity	60 gpm	ibid
Safe Yield	73 AFY	GTA, 1995
Well depth and screened interval	Depth: 1240 ft, screened 550-1240 feet	Cleath, 1989b
Rock Type	Shale	Cleath, 1989b
Quality Issues	Hydrogen sulfide High Temperature (97 degF)	Ibid GTA, 1992d
Treatment	Prechlorination followed by heat exchanger, then mixed 1:4 with other well waters, then iron and manganese removal followed by chlorination.	GTA, 1992d
Total Capital Costs	$481,000	This report
Total Annual Cost	$69,000	This report
Cost per AFY	$940/AFY	This report

East Harford Wells (Little #2, Big #5, and #6)

These wells are located in East Harford Canyon. The San Luis Bay Golf Club currently extracts water for irrigation from these wells. Due to high sulfide levels, this water will require treatment prior to municipal use.

Table 29 East Harford Wells Safe Yield and Requirements for Treatment

Parameter	Value	Information Source
Quality Issues	Hydrogen sulfide	GTA, 1991
Treatment	Aeration, detention, filtration, and chemical adjustment.	GTA, 1992c
Capital Cost, including connection to distribution system	$1,030,000 Treated flow rate = 125 gpm = 200 AFY	This report GTA, 1992c
Pump Capacity: #2 #5	80 gpm 200 gpm	 GTA, 1992a

Parameter	Value	Information Source
#6	160 gpm	
Safe Yield #2, #5, and #6 combined	100 AFY	GTA 1992b
Well Depths and screened interval	#2: 640 ft deep, screened 240-640 feet. #5: 600 feet deep, screened 200-600 feet. #6: (unknown depth) screens start at 400 ft depth	Cleath, 1991 GTA, 1992a

These wells were sold to the Golf Club in 2001 and are currently operated by the Golf Club. Annual extractions by the Golf Club are limited to 100 AFY under the Transfer Agreement dated 6/28/2001.

According to that agreement, the SMMWC has the right to temporarily appropriate water from these wells, for a period not to exceed 1 year, and with at least 3 years between the ending of one appropriation period and the beginning of the next. The SMMWC also has the right to terminate the agreement and re-take possession of the wells, but must reimburse the owner of the Golf Club the purchase price for the wells, pumps, and piping ($24,700).

Therefore, two cost analyses were performed. In both cases the capital cost for developing this source is the same. In one case the wells are purchased for $24,700 and used by the Company continuously. In the other case the wells are temporarily appropriated and are used 1 year out of 4.

Table 30 East Harford Wells Safe Yield and Cost Estimate –Purchase and Continuous Use

Parameter	Value	Information Source
Safe Yield #2, #5, and #6 combined	100 AFY	GTA 1992b
Total Annual Cost	$118,000	This report
Cost per AFY	$1,180/AFY	This report

Table 31 East Harford Wells Safe Yield and Cost Estimate –Temporary Appropriation

Parameter	Value	Information Source
Safe Yield #2, #5, and #6 combined	25 AFY (1 year in 4)	GTA 1992b
Total Annual Cost	$93,000	This report
Cost per AFY	$3,710/AFY	This report

New Well

A recent report (Kear, 2014) recommends drilling a deep well near the SMMWC headquarters. The purpose of the well would be to tap into the Squire and Belleview Members of the Pismo Formation. According to the report, this 1200 ft thick section has a good chance of yielding water with an average estimated depth to the base of fresh

water to be 1000 feet, with the top 200 feet being unsaturated. The saturated sandstones that are expected to comprise the bulk of the aquifer were estimated to have a specific yield of at least 8 percent.

This report also included a groundwater recharge analysis assuming recharge of these deep aquifers via infiltration of precipitation, and also taking into account losses through evapotranspiration and discharge to surface streams. The model estimated total median recharge to the entire 25.8 square-mile study area to be 1,620 AFY, or 63 AFY per square mile.

For purposes of this report we have estimated the safe yield for the proposed new well to be 100 AFY. We base this estimate on the following analyses.

Analysis 1: Annual Recharge near the Proposed Well

If we assume a 1,000 foot deep well, we assume the well would be able to utilize groundwater within 3,000 feet of the well. Drawing a circle centered on the proposed well site with a radius of 3,000 feet results in the following modification to one of the figures from the 2014 KEAR Groundwater Report.

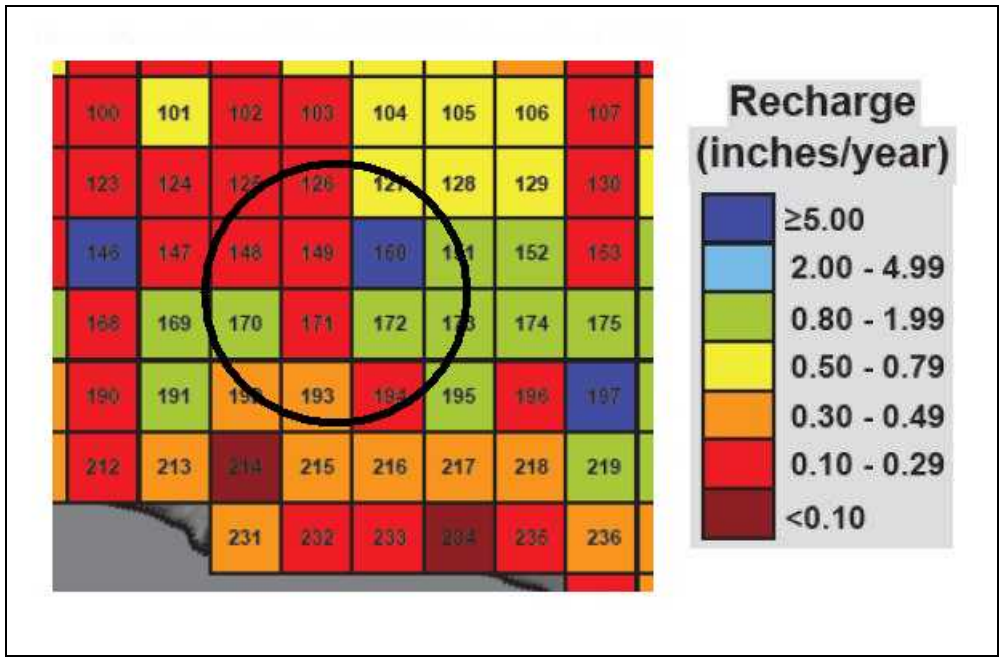

Figure 10 Recharge by Model Cell, Source: Kear, 2014, Figure 3-4.

The range of recharge within the circled area is estimated to be between 0.8 and 1.5 inches per year, as shown below.

Table 32 Recharge Estimating near Headquarters Well

Low end Recharge (in./yr.)	High end Recharge (in./yr.)	Squares within Circled Area	Weighted Average Low End	Weighted Average High End
5.00	7.00	1.0	5.0	7.0
2.00	4.99			
0.80	1.99	2.3	1.8	4.6
0.50	0.79	0.5	0.3	0.4
0.30	0.49	1.2	0.4	0.6
0.10	0.29	4.5	0.5	1.3
Total		**9.5**	**7.9**	**13.9**
Average			**0.8**	**1.5**

The area of the circle is approximately 650 acres, or 1 square mile. The recharge rates shown above would result in annual recharge in this area of between 43 and 80 AFY. These values agree well with the median recharge value for the study area as a whole (63 AFY/sq. mile). In addition, there is an unknown, but certain to occur, recharge of the aquifer from San Luis Obispo and See Canyon Creeks, which could raise the safe yield further. The aquifer is likely to be saturated to the surface in the vicinity of those creeks.

Analysis 2: Accessible Water in Storage near the Well

Following the example of the Kear report, we assume a 1,000 foot deep well, with the top 200 feet unsaturated. With the remaining 800 feet able to produce water at an 8 percent specific yield, we would estimate the total volume of accessible water within the 3,000 foot radius circle noted above to be 41,600 acre feet, as follows:

$V_s = (A)(h_a) = (650 \text{ acres})(800 \text{ feet}) = 520{,}000 \text{ acre feet}$

$V_w = (V_s)(y_s) = (520{,}000 \text{ acre feet})(8\%) = 41{,}600 \text{ acre feet of accessible water in storage}$

Where:

V_s = *volume of bulk aquifer that is assumed to be saturated*
V_w = *volume of water stored within the aquifer that can be extracted with wells*
y_s = *8% = specific yield of aquifer, indicating the volumetric fraction of the bulk aquifer volume that a given aquifer will yield when all the water is allowed to drain out of it under the forces of gravity.*
A = *650 acres = area of aquifer*
h_a = *800 feet = assumed height of saturated portion of the aquifer*

Note that this value is comparable to the overall estimate for 1.3 million acre feet of groundwater in storage within the 25.8 square mile study area, or 50,400 acre foot per square mile.

Synthesis: Safe Yield for the Well

If the well assumed herein were to be built and water was withdrawn from the assumed aquifer at a rate of 100 AFY, withdrawals would exceed local recharge by between 20 and 57 AFY. At 57 AFY it would take over 700 years to deplete the 41,600 acre feet of water in storage in the local aquifer. Depending on other extractions from the same source, additional recharge to the local aquifer could come from horizontal movement of water from nearby areas within the Pismo Formation. With careful monitoring it is reasonable to conclude that a reasonable estimate of safe annual yield could be as high as 100 AFY. Additional monitoring after well development will be needed to further refine this necessarily rough estimation. Note that the Kear report assumed 8% specific yield. If this number turns out to overestimate specific yield, and a lower number such as 2% is the case, the volume of water available from the aquifer would be lower, and the time to recognize a looming shortfall would be shorter.

Unknowns Affecting Cost: Quality and Quantity

Planning for use of water from an un-drilled well is problematic because two key parameters, quantity and quality, are unknown until the well is developed. The only way to find the answers to these questions is to construct a well in the proposed location and test it for capacity and quality. While the Kear report suggests that the water quality will be good, other deep-aquifer wells in the general area such as East Harford and the Hot Well require extensive treatment to be suitable for domestic use. Temperature may also be an issue given that three wells in the region ("Hot Well" 1H, Sycamore Mineral Springs, and Avila Hot Springs) produce water with elevated temperatures.

If a well is developed in this deeper aquifer, it could be considered a more reliable source, as compared to shallow wells which draw from smaller aquifers. However, at the present time there is insufficient information to accurately estimate the aquifer's storage volume.

With these unknown values in mind, a range of costs have been developed to allow for comparison with other potential additional water resources. In a low cost scenario a full 100 AFY is available and no treatment other than chlorination is required. In a high-cost scenario, the yield is much lower, 60 AFY, and the level of additional treatment required is similar to the wells in East Harford Canyon. A medium cost estimate can be made assuming a full 100 AFY yield, but treatment similar to the wells in East Harford Canyon is needed. These considerations are summarized in the following table.

Table 33 New Well – Anticipated Yields and Projected Costs

Scenario	Low Yield – Needs Treatment	High Yield – Chlorination Only Required	High Yield – Needs Treatment
Quality Issues and Treatment	Similar to East Harford Canyon Wells	Chlorination only.	Similar to East Harford Canyon Wells
Capital Cost	$676,000	$351,000	$897,000
Capital Costs Annualized	$54,000	$28,000	$72,000
Annual O&M Costs	$43,000	$55,000	$58,000
Total Annual Costs	$97,000	$83,000	$130,000
Expected Yield	60 AFY	100 AFY	100 AFY
Cost per AFY	**$1,620/AFY**	**$830/AFY**	**$1,300/AFY**

Reclaimed Treated Wastewater and the Golf Course Well

A Mutual Water Use Agreement was made on 12/31/2013 between the SMMWC and ABR Property, LP (the owner/operator of the Avila Beach Golf Resort) regarding use of Lower Harford Canyon Well No. 3 (i.e., the golf course well). As noted in the agreement, the Company intends to use this Company-owned well for its domestic water supply during times of drought and declared water emergencies. The agreement also allows ABR to continue to use the well for irrigation, subject to certain restrictions, during a Stage II water emergency, with the understanding that ABR shall "to the extent available and feasible, first utilize any reclaimed water for irrigation."

This Mutual Water Use Agreement also stipulates that ABR and SMMWC will "work together to diligently pursue the design, permitting and implementation of the necessary infrastructure and improvements" needed to reclaim SMMWC's treated wastewater and use it for irrigation on the golf course. Cost sharing for these improvements is not set forth in the agreement.

The following sections describe the improvements and probable costs for reclaiming the Company's wastewater and transporting it to the golf course, and for treating the well water to domestic standards and connecting this source to the Company's distribution system.

Reclaimed Wastewater

The Company currently treats its wastewater at a facility in Wild Cherry Canyon. Additional improvements will be needed to bring the treated wastewater to suitable standards and transport it to the golf course.

Recent water production and wastewater flows for SMMWC are shown below.

Table 34 Recent Wastewater Production

Calendar Year	Total Water Production (AFY)	Total Wastewater (AFY)	Wastewater as Fraction of Water Produced
2009	184	99	54%
2010	170	88	52%
2011	168	88	52%
2012	168	82	49%
2013	187	75	40%
2014	172	86	50%
Maximum	**187**	**99**	**54%**
Average	**175**	**86**	**49%**
Minimum	**168**	**75**	**40%**

For purposes of water supply planning, these values suggest that at the present time wastewater flows of 75 AFY are available for reclamation, and in future years 40% of SMMWC's total water production could be made available for this re-use. At the maximum production values noted earlier in this report, the Company could be producing as much as 300 AFY of water. If 40% is converted to wastewater, then 120 AFY would be available for reclamation. However, the limiting factor for trading reclaimed treated wastewater for well water would be the safe yield of the golf course well, which is considered to be 100 AFY. Therefore, for planning purposes we estimate costs for building and operating a system capable of treating 100 AFY of effluent and piping this to the golf course for use there.

Table 35 Costs - Reclaimed Treated Effluent Transported to Golf Course Pond

Parameter	Value	Information Source
Treatment Needed	Chlorination	GTA, 1993
Transmission	2800 feet 4"PVC pipe	GTA, 1992
Capital Cost Estimate	$273,000	This report
Annual Cost of Capital Financing and Replacement	$21,840	This report
Annual O&M Costs	$21,450	This report
Total Annual Costs	$43,290	This report
Expected Yield	100 AFY	This report
Reclaimed Water Cost per AFY	$430/AFY	This report

Golf Course Well

The golf course well #3 has produced approximately 26 AFY during the last year, as shown below.

Table 36 Golf Course Well #4 Recent Production

Date	Meter Read (gal)	Pumped since last read (gal)	Pumped since last read (AF)
7/12/2013	1,320,420	Meter installed	
9/9/2013	8,386,610	7,066,190	21.69
9/16/2013	9,096,660	710,050	2.18
9/30/2013	10,209,760	1,113,100	3.42
10/29/2013	10,565,650	355,890	1.09
1/1/2014	10,947,732	382,082	1.17
2/1/2014	11,471,468	523,736	1.61
3/14/2014	11,616,556	145,088	0.45
9/3/2014	12,801,220	meter reset from being repaired	
9/30/2014	14,510,610	1,709,390	5.25
10/8/2014	14,899,121	388,511	1.19
10/31/2014	15,324,245	425,124	1.30
12/3/2014	15,377,150	52,905	0.16
3/1/2015	15,487,342	110,192	0.34
4/1/2015	16,180,600	693,258	2.13
5/6/2015	17,234,855	1,054,255	3.24
5/29/2015	17,907,825	672,970	2.07
6/30/2015	18,874,200	966,375	2.97
7/31/2015	19,881,740	1,007,540	3.09
9/1/2015	21,302,460	1,420,720	4.36
9/25/2015	23,114,850	1,812,390	5.56
Latest Year Summarized			
9/3/2014	12,801,220		
9/1/2015	21,302,460	8,501,240	26.09

Infrastructure improvements will be needed to treat the well water to domestic standards and to deliver it to the SMMWC distribution system. These costs are summarized below.

Table 37 Golf Course Well

Parameter	Value	Information Source
Treatment	Similar to Wells 4A, 5A, 6A – Chlorination and filtration	GTA, 1993
Well Production	240 gpm	Company Records
Recent Pumping Rates	26 AFY	Company Records
Safe Yield Estimate	100 AFY	GTA, 1995
Total storage in Lower Harford Canyon aquifer	250 AF	Cleath, 1990
Aquifer Characteristics	Alluvial aquifer up to 100 feet deep.	Cleath, 1989a
Well Depth	Less than 100 feet	Cleath, 1989a

Note that with only 250 AF of available storage, in a severe drought where there is little or no recharge to the aquifer, it would be possible to completely use up this resource in 2½ years.

Estimated costs to develop this well as a domestic water source are summarized below

Table 38 Costs - Golf Course Wells Treated to Domestic Water Standards

Parameter	Value	Information Source
Treatment	Similar to Wells 4A, 5A, 6A – Chlorination and filtration	Company Records
Capital Cost Estimate for 100 AFY Treatment Plant	$403,000	This report
Annual Cost of Capital Financing and Replacement	$32,240	This report
Annual O&M Costs	$24,318	This report
Total Annual Costs	$56,558	This report
Expected Yield	100 AFY	This report
Domestic Water Cost per AFY	$570/AFY	This report

Acquiring Additional State Water Drought Buffer

Acquiring additional drought buffer water would benefit the Company in two ways. It would directly increase the amount of water delivered to the Company in years with low delivery rates from the State Water Project, and it would allow the Company greater opportunities to bank carryover water for use in dry years.

If the Company were to acquire an additional 275 AFY of drought buffer, the reliability of State Water would increase as follows. In some years – the wetter years – this additional drought buffer would not affect the amount of water the Company received because capacity concerns limit deliveries to 275 AFY. However, in the long term, this

275 AFY of additional drought buffer would yield and average of 31 AFY based on the worst-case delivery forecast scenario "Existing Conveyance High Outflow" (ECHO) published by the California Department of Water Resources in 2015. See discussion above regarding the State Water Project for more information.

The current cost of acquiring additional State Water drought buffer is $105/AFY, according to SLO County Public Works staff. Therefore, purchasing 275 AFY would cost $28,875 per year, and would yield 31 AFY on average, for an average cost of $931/AFY. Note that this value is for the additional cost for "reserving" the water and excludes the costs to transport and treat.

To quantify the benefits of acquiring additional drought buffer in a "worst-case" year the following scenario is presented:

1. The SLOCFCWCD has reallocated its entire excess Table A water to other users in SLO County.
2. A worst-case drought year is encountered as noted above: State Water deliveries are 5% of Table A. With the existing drought buffer, the SMMWC will therefore receive 10% of its Water Service Amount (27.5 AFY).
3. The purchase of an additional 275 AFY of drought buffer would yield an additional 13.75 AF of deliveries that year.
4. At an annual cost of $28,875, the additional cost for this water (excluding the costs to transport and treat) would be $2,100/AFY.

Another benefit would be the increased opportunity to bank carryover water from wet years to dry years, thereby further increasing the reliability of State Water deliveries. However, because this benefit is harder to quantify, its valuation is not included in this report.

Summary of Potential Additional Water Resources

The following table provides a summary of the quantity, quality, estimated cost of infrastructure (including treatment), reliability, and threats to future use for the potential water resources discussed in this section.

Table 39 Summary of Potential Additional Water Resources

Source	Quantity Available	Quality Issues	Cost per AFY	Reliability	Threats to Future Use
Hot Water Well	73 AFY	Temperature, odor, iron, manganese, turbidity	$1,000	Good, taps into a deep aquifer.	Uncertainty regarding aquifer storage volume.
East Harford Canyon Wells 2, 5, and 6 – Purchase Option	100 AFY	Hydrogen sulfide	$1,200	Good, taps into a deep aquifer.	Uncertainty regarding aquifer storage volume.
East Harford Canyon Wells 2, 5, and 6 – Temporary Appropriation Option	25 AFY (1 year in 4 using 100 AFY)	Hydrogen sulfide	$3,710	Good, taps into a deep aquifer.	Uncertainty regarding aquifer storage volume. Available at most 1 year in 4.
New Well	Unknown, assumed 60 to 100 AFY	Unknown	$830 to $1,620	Unknown	Uncertainty regarding aquifer storage volume.
Golf Course Well #3	100 AFY	Similar to Wells 4A, 5A, and 6A	$350	Moderate, shallow aquifer has limited storage volume.	Extended drought.
Reclaim treated effluent for golf course irrigation	100 AFY	Disinfection	$230	Good.	None identified.
Acquire additional State Water drought buffer	Buying 275 additional AFY yields 31 AFY on average; depends on SWP allocation.	Delivered fully treated.	$931/AFY average increase in cost for State Water.	Increases reliability of SWP during critical dry years	Widespread drought, Delta levee failure, court-mandated delivery reductions

Recommendations

The analysis presented in this report indicates that the Company will not have sufficient water resources to supply its users under existing approved land use plans. Therefore, we recommend acquiring additional water sources. A strategic comparison of the water resources discussed in this report is provided below.

Table 40 Strategic Consideration of Additional Water Resource Options

Source	Advantages	Disadvantages
Hot Water Well	Relatively low cost. Considered a reliable source.	High temperature requires blending. Uncertainty regarding aquifer storage volume.
East Harford Canyon Wells – Purchase Option	Relatively low cost. Well yield is known and reliability is considered good.	Needs treatment. Uncertainty regarding aquifer storage volume.
East Harford Canyon Wells – Temporary Appropriation	Well yield is known and reliability is considered good.	Relatively higher cost. Can only be used in one year out of 4.Uncertainty regarding aquifer storage volume.
New Well	No agreement to restrict use. Not the most expensive source.	Water quality, costs, and well yield are unknown until the well is developed.
Golf course Well	Relatively low cost. Well yield is known and reliability is considered good.	Need to coordinate use with golf course.
Reclaim treated effluent for golf course irrigation	Relatively low cost. Reliability is good.	New treatment process and permitting required.
Acquire additional State Water drought buffer	No additional infrastructure is needed.	Future costs and reliability of State Water Project are unknown.

We also recommend that the Company take efforts to protect its existing supplies.

- We recommend that the Company continue to monitor regulations affecting water use in lower San Luis Obispo Creek to insure that flow remains in the creek year-round, thereby insuring recharge of the aquifer that feeds the Company's wells.
- We also recommend that the Company continue to urge the Board of the SLO County Flood Control and Water Conservation District to continue to use its excess allocation of State Water for the benefit of existing subcontractors. If the Board intends to assign the excess allocation to other users, the Company should consider purchasing additional drought buffer to enhance the reliability of this resource.

We also recommend that the Company adopt policy changes that will require applicants of new development to demonstrate water use will not exceed existing allocations.

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Attachments – Maps

- Water Distribution System
- Wastewater Collection System
- Groundwater Resources
- Lots with Development Potential

NORTH

SERVICE AREA BOUNDARY

TANK

PRESSURE REFLIEF

BOOSTER

CSA 12 LINE

TANK

HOT WATER WELL

GOLF COURSE WELL #3

TANK

TANK

MARRE WEIR

WELLS #4, 5, & 6

CONNECTION TO LOPEZ WTP VIA CSA 12

Avila Beach

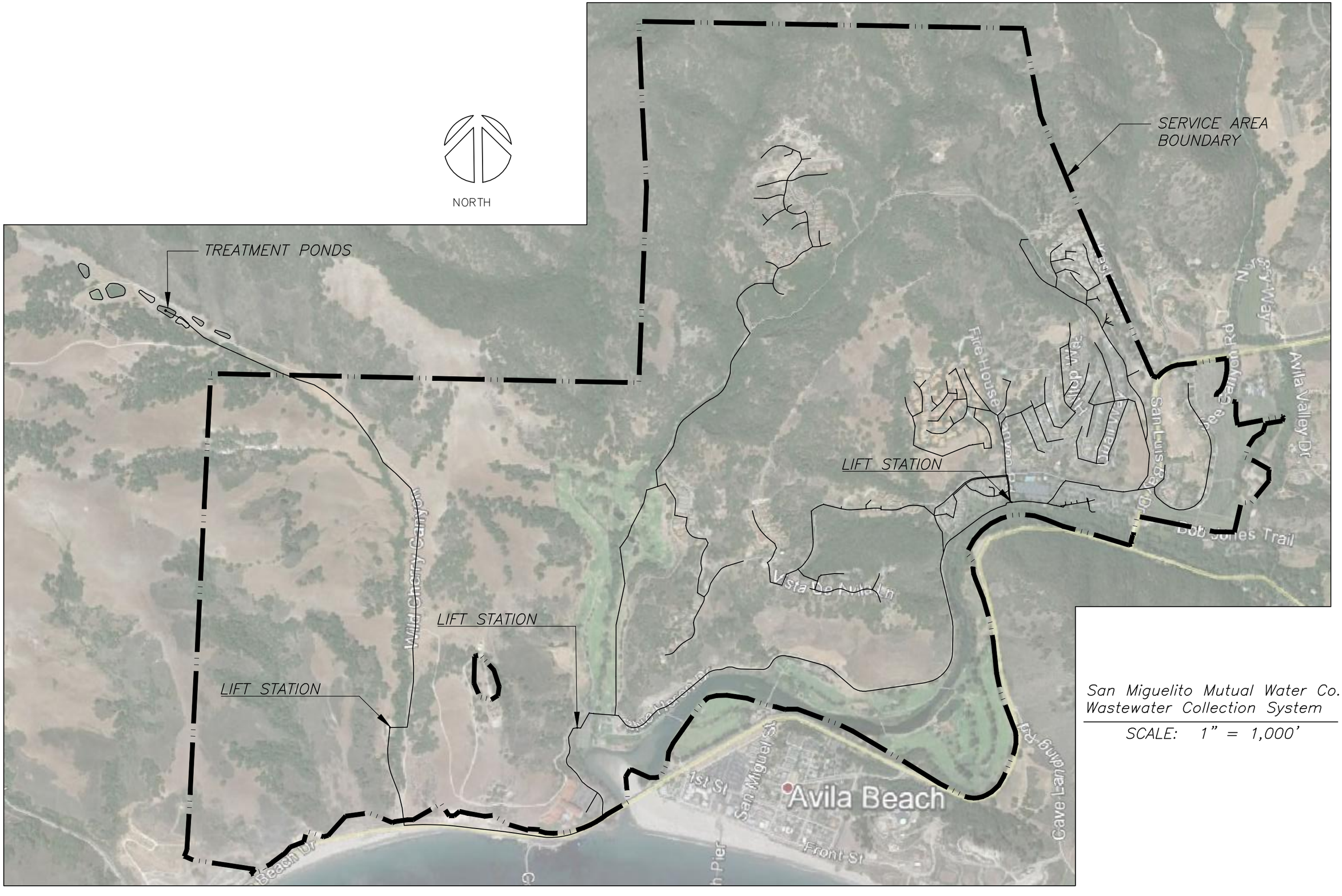
San Miguelito Mutual Water Co.
Water Distribution System

SCALE: 1" = 1,000'

WELL FIELD

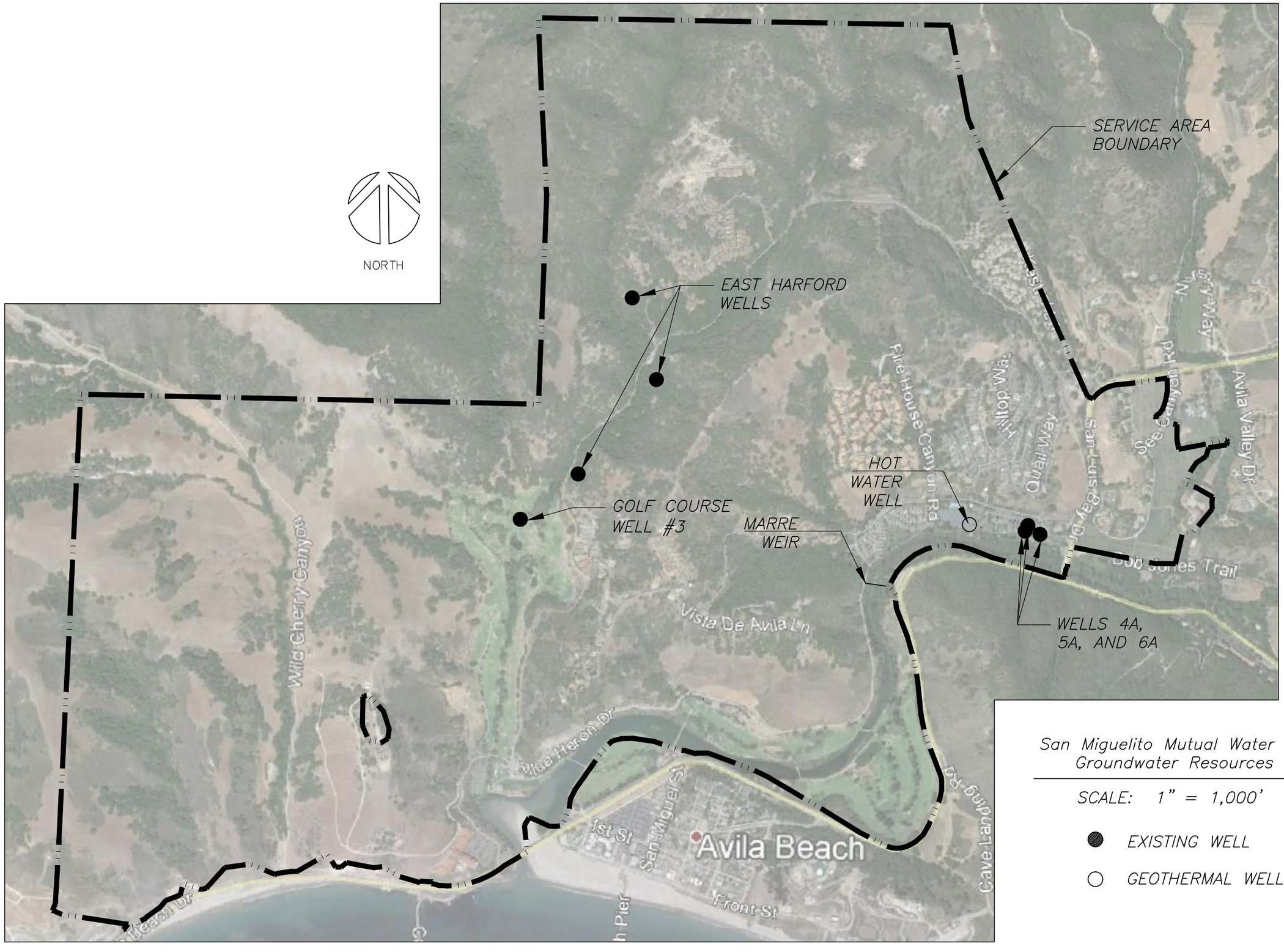
WELL

GEOTHERMAL WELL



San Miguelito Mutual Water Co.
Wastewater Collection System

SCALE: 1" = 1,000'

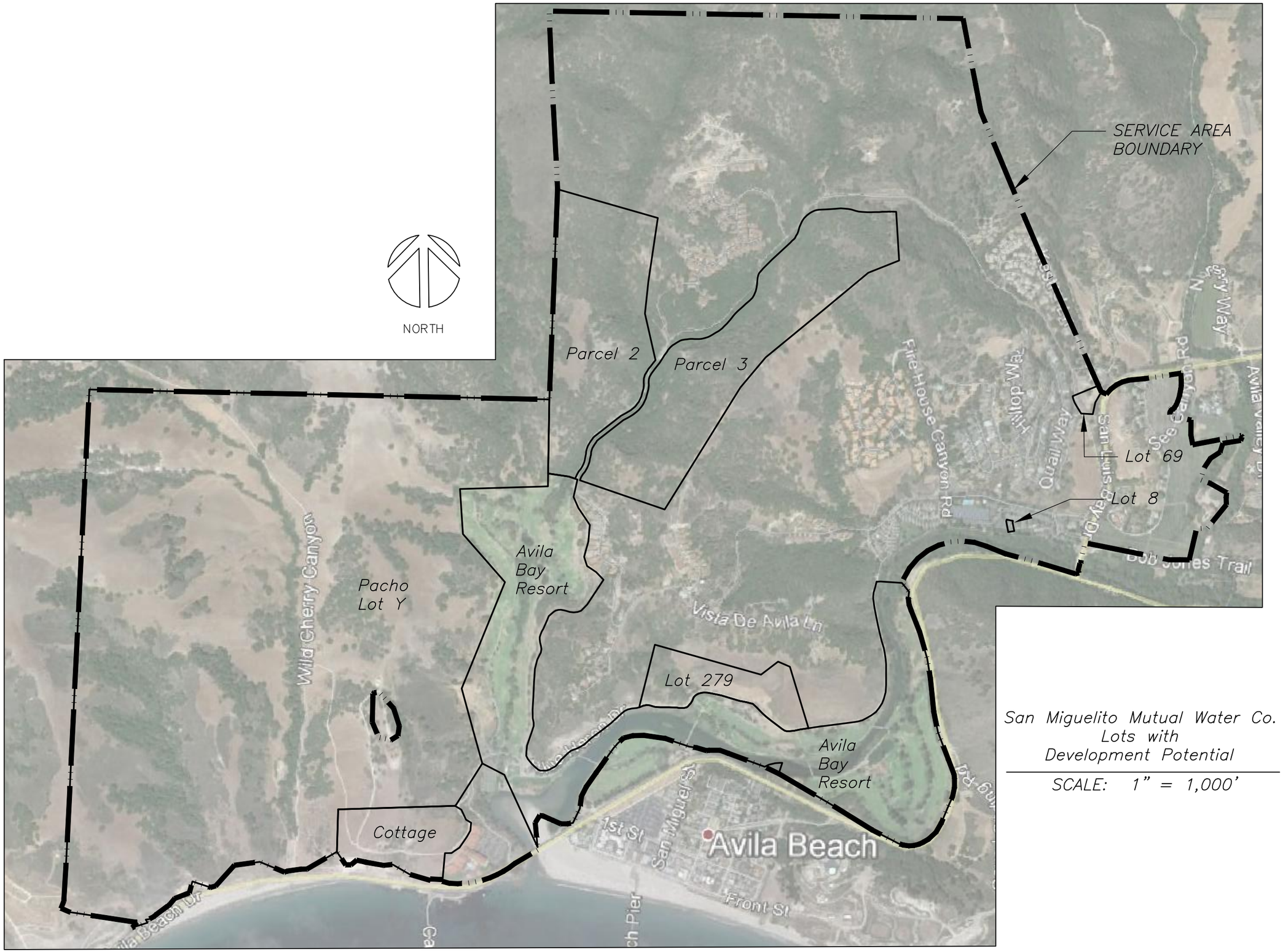


San Miguelito Mutual Water Co.
Groundwater Resources

SCALE: 1" = 1,000'

● EXISTING WELL

○ GEOTHERMAL WELL



San Miguelito Mutual Water Co.
Lots with
Development Potential

SCALE: 1" = 1,000'

Appendix A: Cost Projections

Cost Est.- Treatment Facility for Hot Water Well

Item			Original Cost Basis 1992	2015 Cost Basis	2015 Projected Cost
		Treatment Facility - Removal of metals and/or Sulfides, plus Chlorination - 73 AFY	64 AFY Treatment plant in AG bid in 2015 for $284,000	$320,000	$320,000
		6" PVC - 400 LF		$100	$40,000
		Misc. Well Site Piping and Equip.		$30,000	$30,000
		General Electrical		$20,000	$20,000
	Subtotal				**$410,000**
	Engineering & Surveying		$32,000	15%	$61,500
	Contingency		15%	15%	$61,500
	Total Capital Costs				**$533,000**
	Annualized cost of Capital Costs			**8%**	**$42,640**
	Annual O&M Costs				
	Subt	Labor Costs		1 hours per day 5 days per week @ $75/hr	$19,500
		Pumping Costs for 73 afy		300 ft lift, 50% efficiency, $0.15/hp-hr	$9,592
		Chemicals and Supplies		10% of Pumping Cost	$959
	Total Annual O&M Costs				**$30,051**
	Grand Total Annual Costs				**$72,691**
	Expected Yield (AFY)				**73**
	Cost per AFY				**$1,000**

Cost Est.- Treatment Facility and Distribution piping for East Harford Wells 2, 5, and 6
Purchase and Continuous Use Option

Item			Original Cost Basis 1992	2015 Cost Basis	2015 Projected Cost
		Clearing & Grubbing	$2,000	$10,000	$10,000
		Site Preparation	$10,000	$50,000	$50,000
		12" PVC - 1730 LF	$30 / LF	$75	$130,000
		6" PVC - 600 LF	$22 / LF	$50	$30,000
		4" PVC - 2300 LF	$12 / LF	$45	$100,000
		Treatment Facility - 100 AFY	$200,000	64 AFY Treatment plant in AG bid in 2015 for $284,000	$440,000
		Misc. Well Site Piping and Equip.	$6,000	$30,000	$30,000
		General Electrical	$4,000	$20,000	$20,000
	Subtotal				**$810,000**
	Engineering & Surveying		12%	15%	$121,500
	Contingency		15%	15%	$121,500
	Total Capital Improvement Costs				**$1,053,000**
	Purchase Price				**$24,700**
	Total Capital Cost				**$1,077,700**
	Financing				
		Purchase Price Financing		6%	$1,482
		Capital Improvements Financing and Replacement		8%	$84,240
		Annualized cost of Capital Costs			**$85,722**
	Annual O&M Costs				
		Labor Costs		1 hours per day 5 days per week @ $75/hr	$19,500
		Pumping Costs for 100 afy		300 ft lift, 50% efficiency, $0.15/hp-hr	$13,140
		Chemicals and Supplies		10% of Pumping Cost	$1,314
	Total Annual O&M Costs				**$33,954**
	Grand Total Annual Costs				**$119,676**
	Expected Yield (AFY)				**100**
	Cost per AFY				**$1,200**

Cost Est.- Treatment Facility and Distribution piping for East Harford Wells 2, 5, and 6
Temporary Appropriation Option

Item			Original Cost Basis 1992	2015 Cost Basis	2015 Projected Cost
		Clearing & Grubbing	$2,000	$10,000	$10,000
		Site Preparation	$10,000	$50,000	$50,000
		12" PVC - 1730 LF	$30 / LF	$75	$130,000
		6" PVC - 600 LF	$22 / LF	$50	$30,000
		4" PVC - 2300 LF	$12 / LF	$45	$100,000
		Treatment Facility - 100 AFY	$200,000	64 AFY Treatment plant in AG bid in 2015 for $284,000	$440,000
		Misc. Well Site Piping and Equip.	$6,000	$30,000	$30,000
		General Electrical	$4,000	$20,000	$20,000
	Subtotal				**$810,000**
	Engineering & Surveying		12%	15%	$121,500
	Contingency		15%	15%	$121,500
	Total Capital Improvement Costs				**$1,053,000**
	Annual Cost of Financing and Replacement			8%	**$84,240**
	Average Annual O&M Costs				
		Labor Costs		1 hours per day 5 days per week @ $75/hr 1 year in 4	$4,875
		Pumping Costs for 25 afy		300 ft lift, 50% efficiency, $0.15/hp-hr	$3,285
		Chemicals and Supplies		10% of Pumping Cost	$329
	Total Annual O&M Costs				**$8,489**
	Grand Total Annual Costs				**$92,729**
	Expected Yield (AFY)			100 AFY 1 year in 4	**25**
	Cost per AFY				**$3,710**

Cost Est.- New Deep Well plus Treatment Facility

Item			Cost Basis	2015 Projected High Cost	2015 Projected Low Cost	2015 Projected Medium Cost
	Deep Well					
		deep well	lump sum	$250,000	$250,000	$250,000
		100 AFY estimated Yield				
		Treatment Facility - Removal of metals and/or Sulfides, plus Chlorination - 60 AFY	64 AFY Treatment plant in AG bid in 2015 for $284,000	$270,000		
		Treatment Facility - Removal of metals and/or Sulfides, plus Chlorination - 100 AFY	64 AFY Treatment plant in AG bid in 2015 for $284,000			$440,000
		Treatment Facility - Chlorination only - 100 AFY			$20,000	
	Subtotal			**$520,000**	**$270,000**	**$690,000**
	Engineering & Surveying		15%	$78,000	$40,500	$103,500
	Contingency		15%	$78,000	$40,500	$103,500
	Total Capital Costs			**$676,000**	**$351,000**	**$897,000**
	Annualized cost of Capital Costs		**8%**	**$54,000**	**$28,000**	**$72,000**
	Annual O&M Costs					
		Labor Costs	1 hours per day 5 days per week @ $75/hr	$19,500	$19,500	$19,500
		Pumping Costs for 60 afy	800 ft lift, 50% efficiency, $0.15/hp-hr	$21,024		
		Pumping Costs for 100 afy	800 ft lift, 50% efficiency, $0.15/hp-hr		$35,040	$35,040
		Chemicals and Supplies	10% of Pumping Cost	$2,102		$3,504
		Chemicals and Supplies	2% of Pumping Cost		$701	
	Total Annual O&M Costs (rounded to thousands)			**$43,000**	**$55,000**	**$58,000**
	Grand Total Annual Costs			**$97,000**	**$83,000**	**$130,000**
	Expected Yield (AFY)			**60**	**100**	**100**
	Cost per AFY			**$1,620**	**$830**	**$1,300**

Cost Est.- Treat and Transport Reclaimed Wastewater to Golf Course for Irrigation

Item			Original Cost Basis	2015 Cost Basis	2015 Projected Cost
Reclaimed Water for Golf Course Irrigation					
Capital Costs					
	Treated Effluent Transmission and Chlorination				
		Inlet structure modifications and tie-in	$5,000 in 1993	$25,000	$25,000
		2800 LF 4" PVC gravity transmission line	$10/LF in 1993	$50/LF	$140,000
		Chlorination Facility	$15,000 in 1993	$45,000	$45,000
	Subtotal Transmission and Chlorination Equipment				**$210,000**
	Engineering		15%	15%	$31,500
	Contingency		15%	15%	$31,500
	Total Capital Cost				**$273,000**
Annual Costs					
	Financing				
		Replacement Funding		8% of Capital Cost	**$21,840**
	Averaged Annual O&M Costs				
		Labor Costs		1 hour per day 5 days per week @ $75/hr	$19,500
		Chemicals and Supplies		10% of Pumping Cost	$1,950
	Total Average Annual O&M Costs				**$21,450**
	Total Annual Cost for Reclamation				**$43,290**
	Expected Yield (AFY)			100 AFY	**100**
	Reclamation Cost per AFY				**$430**

Cost Est.- Treatment Facility for Golf Course Well

Item			Original Cost Basis	2015 Cost Basis	2015 Projected Cost
Drinking Water from Existing Golf Course Well					
Capital Costs					
	Chlorination and Filtration Facility - 100 AFY capacity		$70,00 est in 1993	x3	$210,000
	4" PVC Transmission Piping		$10/LF in 1993	$50/LF	$90,000
		1800 LF + or - to connect to ex. System			
		Includes valves, fittings, etc.			
	4" Backwash Disposal Line		$10/LF in 1993	$50/LF	$10,000
		200 LF to existing sewer			
	Subtotal				**$310,000**
	Engineering		15%	15%	$46,500
	Contingency		15%	15%	$46,500
	Subtotal Treatment Equipment Costs				**$403,000**
Annual Costs					
	Financing				
		Replacement Funding		8% of Capital Cost	**$32,240**
	Averaged Annual O&M Costs				
		Labor Costs		1 hour per day 5 days per week @ $75/hr	$19,500
		Pumping Costs for 100 afy		100 ft lift, 50% efficiency, $0.15/hp-hr	$4,380
		Chemicals and Supplies		10% of Pumping Cost	$438
	Total Average Annual O&M Costs				**$24,318**
	Total Annual Cost for Water Production				**$56,558**
	Expected Yield (AFY)			100 AFY	**100**
	Drinking Water Cost per AFY				**$570**

Notes

[1] SWRCB, 1991, Statement of Water Diversion and Use, State Water Resources Control Board, 9/4/1991
[2] SLO Creek Groundwater Model, Stetson Engineering, 1994
[3] SLO Creek Groundwater Model, Stetson Engineering, 1994
[4] City of San Luis Obispo Draft-Final Water Master Plan, April 2015, Wallace Group
[5] Glossary and Abbreviations, Draft Environmental Impact Report, Monterey Plus, October 2007, http://www.water.ca.gov/environmentalservices/docs/mntry_plus/DEIR%20-%20Volume%201/00%20glossary-abbrev.pdf

[6] Glossary and Abbreviations, Draft Environmental Impact Report, Monterey Plus, October 2007, http://www.water.ca.gov/environmentalservices/docs/mntry_plus/DEIR%20-%20Volume%201/00%20glossary-abbrev.pdf

[7] Glossary and Abbreviations, Draft Environmental Impact Report, Monterey Plus, October 2007, http://www.water.ca.gov/environmentalservices/docs/mntry_plus/DEIR%20-%20Volume%201/00%20glossary-abbrev.pdf
[8] Glossary and Abbreviations, Draft Environmental Impact Report, Monterey Plus, October 2007, http://www.water.ca.gov/environmentalservices/docs/mntry_plus/DEIR%20-%20Volume%201/00%20glossary-abbrev.pdf
[9] http://www.slocountywater.org/site/Major%20Projects/State%20Water%20Project/
[10] http://www.slocountywater.org/site/Major%20Projects/State%20Water%20Project/pdf/swp_excess_entitlement_policies_january.pdf
[11] Bulletin 132-13 Management of the California State Water Project
[12] Pipeline System Modeling, Tank 1 to Santa Ynez Pump Facility, Definition of Available Extra Capacity, June 2005, Central Coast Water Authority, Pennfield and Smith.