

**California Regional Water Quality Control Board
Santa Ana Region**

April 24, 2009

Item: 9*

Subject: Consideration of Approval of Workplan Submitted by the San Timoteo Watershed Management Authority and the City of Beaumont to Determine the Ambient TDS and Nitrogen Quality, and Plans and Schedule to Reduce Discharge of Recycled Water to Unlined Portion of San Timoteo Creek, as Required in the Total Dissolved Solids and Nitrogen Management Plan Specified in the Water Quality Control Plan for the Santa Ana River Basin - Resolution No. R8-2009-0035

DISCUSSION

On January 22, 2004, the Regional Board adopted Resolution No. R8-2004-0001, amending the Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) to incorporate a revised Total Dissolved Solids (TDS) and Nitrogen Management Plan. The revised Total Dissolved Solids and Nitrogen Management Plan addresses total dissolved solids (TDS) and nitrogen in both surface waters and groundwaters throughout the Santa Ana River basin. A Maximum Benefit Implementation Plan for Salt Management for the Beaumont and San Timoteo Management Zones (Maximum Benefit Implementation Plan) is included as part of the TDS and Nitrogen Management Plan. The Maximum Benefit Implementation Plan identifies the actions necessary to implement maximum benefit water quality objectives for TDS and nitrate-nitrogen that apply to the Beaumont and San Timoteo Management Zones. These objectives apply provided that San Timoteo Watershed Management Authority (STWMA) and the City of Beaumont (the City) implement specific plans and projects, including periodic determination of ambient groundwater TDS and nitrate-nitrogen quality, and removal/reduction of discharges of recycled water to San Timoteo Creek.

Pursuant to the Maximum Benefit Implementation Plan, Section B.2 A6, STWMA and the City were required to submit by July 1, 2005, and every three years thereafter, a determination of ambient TDS and nitrate-nitrogen quality in the San Timoteo and Beaumont Management zones. STWMA and the City have joined the Basin Monitoring Program (BMP) Task Force to accomplish this requirement. The BMP Task Force has conducted the ambient TDS and nitrogen quality computation for most management zones, including the Beaumont Management Zone. The latest computation was completed in June 2008 (for the period 1987 to 2006). However, the ambient TDS and nitrate-nitrogen quality for San Timoteo Management Zone was not determined due to lack of groundwater data.

On October 30, 2008, STWMA and the City submitted a workplan and schedule, titled "San Timoteo Management Zone Monitoring Network Development Workplan (Workplan)" (October 30, 2008). The Workplan calls for the installation of three monitoring wells in the San Timoteo Management Zone. The proposed Workplan is attached to Resolution No. R8-2009-0035. Board staff reviewed the Workplan and find that the location of the three monitoring wells and the schedule for implementation of the Workplan are appropriate. These three wells, together with existing wells, will provide necessary data for computation of the ambient water quality for the San Timoteo Management Zone during the calculation period of 1993 to 2012 (to be completed in June 2014), thus satisfying the Maximum Benefit Implementation Plan requirement.

**California Regional Water Quality Control Board
Santa Ana Region**

RESOLUTION NO. R8-2009-0035

Resolution Approving the Workplan Submitted by the San Timoteo Watershed Management Authority and the City of Beaumont to Install Monitoring Wells in the San Timoteo Groundwater Management Zone to Collect Necessary Data to Determine the Ambient TDS and Nitrogen Quality, and Plan and Schedule to Reduce Discharges of Treated Wastewater to Unlined Portion of San Timoteo Creek, as Required in the Total Dissolved Solids and Nitrogen Management Plan Specified in the Water Quality Control Plan for the Santa Ana River Basin

WHEREAS, the California Regional Water Quality Control Board, Santa Ana Region (hereinafter Regional Board), finds that:

1. An updated Water Quality Control Plan for the Santa Ana River Basin (Basin Plan) was adopted by the Regional Board on March 11, 1994, approved by the State Water Resources Control Board (SWRCB) on July 21, 1994, and approved by the Office of Administrative Law (OAL) on January 24, 1995.
2. Amendments to the Basin Plan to incorporate a revised Total Dissolved Solids and Nitrogen Management Plan into the 1995 Basin Plan were approved by the Regional Board on January 22, 2004, by the State Water Resources Control Board on October 1, 2004 and by the Office of Administrative Law on December 23, 2004. The surface water standards components of the amendments were approved by the U. S. Environmental Protection Agency (EPA) on June 20, 2007.
3. The revised Total Dissolved Solids and Nitrogen Management Plan addresses total dissolved solids (TDS) and nitrogen in both surface waters and groundwaters throughout the Santa Ana River basin.
4. The revised TDS and Nitrogen Management Plan includes a Maximum Benefit Implementation Plan for Salt Management in the San Timoteo and Beaumont Management Zones (hereinafter, Maximum Benefit Implementation Plan). The Maximum Benefit Implementation Plan identifies the actions necessary to implement maximum benefit water quality objectives for TDS and nitrate-nitrogen that apply to the San Timoteo and Beaumont Management Zones. These objectives apply provided that the San Timoteo Watershed Management Authority (hereinafter, STWMA) and the City of Beaumont (hereinafter, the City) implement specific plans and projects, including periodic determination of ambient groundwater TDS and nitrate-nitrogen quality, and removal/reduction of discharge of treated wastewater effluent to San Timoteo Creek.
5. Pursuant to the Maximum Benefit Implementation Plan, Section B.2 A6, STWMA and the City were required to submit by July 1, 2005, and every three years thereafter, a determination of ambient TDS and nitrate-nitrogen quality in the San Timoteo and Beaumont Management zones. STWMA and the City have joined the Basin Monitoring Program (BMP) Task Force to accomplish this requirement. The BMP Task Force has conducted the computation for most management zones, including the Beaumont Management Zone.

Pursuant to the Maximum Benefit Implementation Plan, Section B.2 A9, STWMA and the City were required to submit by June 23, 2005, a proposed plan and schedule to remove/reduce the discharge of recycled water to the unlined reach of San Timoteo Creek. In the October 30, 2008 submittal, STWMA and the City proposed a timeline of actions to reduce, by 2010, recycled water discharges to Cooper's Creek, a tributary to San Timoteo Creek. The requirement to reduce recycled water discharges to the Creek will be incorporated in water recycling requirements issued to the City of Beaumont.

STAFF RECOMMENDATION

Adopt Resolution No. R8-2009-0035, approving the "San Timoteo Management Zone Monitoring Network Development Workplan", and the plan and schedule to reduce discharges of recycled water to San Timoteo Creek, as shown in the attachment to the Resolution.

However, the ambient TDS and nitrate-nitrogen quality for San Timoteo Management Zone has not been determined due to lack of data.

6. On October 30, 2008, STWMA and the City proposed the "San Timoteo Management Zone Monitoring Network Development Workplan" (October 30, 2008) (Workplan) to install three monitoring wells in the San Timoteo Management Zone. These monitoring wells, together with the existing wells, will provide sufficient data for computation of ambient TDS and nitrogen quality for San Timoteo Management Zone by June 30, 2014.
7. Pursuant to the Maximum Benefit Implementation Plan, Section B.2 A9, STWMA and City were required to submit by June 23, 2005, a proposal plan and schedule to remove/reduce the discharge of recycled water to the unlined reach of San Timoteo Creek. On October 30, 2008, STWMA and the City proposed a timeline of actions to reduce, by 2010, recycled water discharges to Cooper's Creek, a tributary to San Timoteo Creek. This requirement for reduction of recycled water discharges to the Creek will be incorporated in water recycling requirements issued to the City of Beaumont.
8. The Workplan for the computation of ambient water quality for San Timoteo Management Zone, as well as the schedule to reduce the discharge of recycled water to San Timoteo Creek, must be implemented by STWMA and the City. The Maximum Benefit Implementation Plan requires that these programs be implemented prior to the recharge of recycled water in either the San Timoteo Management Zone or the Beaumont Management Zone.

NOW, THEREFORE, BE IT RESOLVED THAT:

The Regional Board approves the attached proposed Workplan for installation of monitoring wells, and the plan and schedule to reduce discharge of treated wastewater to San Timoteo Creek as submitted by the STWMA and the City on October 30, 2008.

I, Gerard J. Thibeault, Executive Officer, do hereby certify that the foregoing is a full, true and correct copy of a resolution adopted by the California Regional Water Quality Control Board, Santa Ana Region, on April 24, 2009.

Gerard J. Thibeault
Executive Officer

STWMA PROJECT COMMITTEE NO. 1

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October 30, 2008

Mr. Gerard Thibeault
Executive Officer
Regional Water Quality Control Board
3737 Main Street, Suite 500
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Subject: Maximum Benefit Commitment Status

Dear Mr. Thibeault:

The San Timoteo Watershed Management Authority (STWMA) and the City of Beaumont (City) received and reviewed your letter dated August 22, 2008, regarding the STWMA's and the City's Maximum Benefit Commitment Status, which sets forth the following requirements for the STWMA and the City to continue to operate under the maximum benefit program:

- 1) Develop a workplan and schedule for the installation of monitoring wells in the San Timoteo Management Zone that will provide adequate data for the calculation of the ambient groundwater quality
- 2) Provide an engineering plan to reduce recycled water flows into Cooper's Creek, and an analysis and evaluation of water quality impacts related to the use of recycled water in the Beaumont and San Timoteo Management Zones

The following details how the STWMA and the City propose to address each of these requirements.

Workplan and Schedule for a the Installation of Monitoring Wells in the San Timoteo Management Zone

Wildermuth Environmental, Inc. (WEI) prepared a workplan for the installation of monitoring wells in the San Timoteo Management Zone (STMZ). WEI has identified three monitoring areas with alternative well sites at each. The plan is to construct a total of three monitoring wells to augment the existing wells that are available for monitoring in the STMZ. The plan in sum is to construct three new boreholes and to convert them to monitoring wells. The lithologic and hydrologic information obtained from these new wells will be used to determine ~~some existing wells can be used for~~ the ambient water quality monitoring plan and the need for additional new wells.

The well completion reports for wells along the creek indicate that some wells were completed in the upper parts of the San Timoteo Formation as well as in the younger alluvium. The three new monitoring wells will be constructed to depths of about 400 feet. Spinner tests will be performed to determine the productivity and relative yield of the San Timoteo Formation and the younger alluvium. Zone testing for water quality will be done. A composite water quality sample will be collected at each well and used as the first data point in the maximum benefit monitoring plan for the STMZ. The locations of the well site areas for the three new wells are shown in Figure 2-3 of the draft workplan. Similar testing will be

completed for one well at the Fisherman Retreat in the eastern part of the STMZ. WEI will interpret the lithologic, production, and water quality data from these wells and submit its findings and recommendations to the Regional Board for their review, comments, and approval.

The cost to construct these monitoring wells and to perform the tests and monitoring is estimated to be about \$473,000. Work will start immediately after the Regional Board approves the workplan which we have assumed will be January 2, 2009. All preparatory work will be completed by June 30, 2009. Construction will start in July 2009 and be completed by October 31, 2009. Monitoring will be start immediately after the new wells are completed. The proposed timeline is:

October 31, 2008	Submit STMZ Monitoring Well Master Plan Workplan to Regional Board
January 2, 2009	Regional Board approves Workplan and directs STWMA to implement
June 30, 2009	STWMA acquires access to sites, completes well design, selects contractor(s)
October 31, 2009	Phase 1 wells construction completed and monitoring begins
December 31, 2009	Well Completion Monitoring Report submitted to Regional Board

Engineering Plan for Removal of Effluent from the Unlined Portion of San Timoteo Creek

In our April 30, 2008 response to your January 15, 2008 *Maximum Benefit Deliverables* letter, we outlined the Recycled Water Diversion projects that will help the STWMA and the City achieve removal of the City's Wastewater Treatment Plant effluent from STMZ. Since the April 30, 2008 letter, the State Board notified the Beaumont-Cherry Valley Water District (District) that their State Revolving Fund (SRF) financing package was approved. This funding will be used to complete the District's non-potable water system. The State Board has completed their review of the plans and specifications for the first construction phase (referred to as a "priority" in the SWRCB funding grant) of this project, which includes the construction of a pipeline and reservoir in the northern part of the City of Beaumont. This will eventually make recycled water recharge possible. Construction will start in December 2008. The construction of pipelines, a reservoir, and a pump station to divert recycled water from the City's recycling plant into the District's non-potable system will commence in September 2009 and be completed in July 2010. Recycled water diversions to the District's nonpotable system will likely begin in July 2010. The facility plan for the non-potable water system loan and grant is included on the enclosed CD. The implementation schedule for the project is included in the attached letter from the State Board, dated September 15, 2008. The completed system will allow for recycled water from the Beaumont Treatment Plant to be removed from Cooper's Creek. The proposed timeline is:

September 30, 2009	Regional Board adopts an order approving the Districts Master Recycling Permit
July 1, 2010	Complete construction on the non potable system improvements required to divert recycled water into the District's non potable system
July 1, 2010	City's wastewater change petition is approved by the State Board. With this approval, the discharge of recycled water to Coopers Creek will be reduced to the minimum amount to support the riparian vegetation in Coopers Creek upstream of San Timoteo Creek with the remainder discharged to an unnamed tributary of Marshall Creek and thence to San Timoteo Creek where the discharge will be used to support riparian vegetation in San Timoteo Creek and to augment groundwater supplies in the Beaumont Management Zone.
August 1, 2010	Recycled water discharged by the City of Beaumont to the STMZ will either cease or be reduced to di minimis levels.

Status of Permits

Figure 1 shows the location of the City's recycled water plant, existing and proposed points of discharge, creek system and management zone boundaries. Coopers Creek is a small tributary to San Timoteo

Creek. Its confluence with San Timoteo Creeks occurs near where both creeks enter the STMZ. Above its confluence with San Timoteo Creek, the area tributary to Coopers Creek is about 3.8 square miles. In contrast, the drainage area of San Timoteo Creek upstream of this confluence is about 24.9 square miles or about 6.5 times greater. From the Coopers Creek confluence, San Timoteo Creek flows about 12 miles across the STMZ and crosses into the Bunker Hill B Management Zone. San Timoteo Creek flows about 5 miles further, reaching its confluence with the Santa Ana River.

Under dry-weather conditions, discharge from the City's treatment plant to Coopers Creek flows over the Beaumont South Basin (part of the Beaumont Management Zone) without contributing to groundwater recharge. Shallow groundwater in this reach rejects the recharge of surface discharge. Upon entering the STMZ, surface discharge gradually declines over about six miles, and the creek is often dry just upstream of the YVWD point of recycled water discharge, indicating that surface discharge completely infiltrates the San Timoteo Basin under most dry-weather conditions. The inorganic chemistry of the discharge changes in this reach indicating that the discharge has both native groundwater and recycled water. Below the YVWD point of discharge, surface discharge also declines but ultimately reaches the confluence with the Santa Ana River.

When the District was preparing the SRF grant and loan application described above, the State Board and the US Fish and Wildlife Service approved of the District taking all but 1.8 mgd of the recycled water discharged to Coopers Creek leaving the remainder to support riparian resources. The letter from the US Fish and Wildlife Service authorizing the District to reduce the recycled water discharged to Coopers Creek is included on the attached CD. The District has the ability to use the remaining water virtually all the of the time except for a few days per year when it must shut down its system for scheduled and unscheduled maintenance.

Table 1 and Figure 2 illustrate the City's historical recycled water discharge to Coopers Creek from 1972 to the present. In 1972, the discharge was only 0.1 mgd or about 113 acre-ft/yr. By 1990, almost 20 years later, recycled water discharge grew to 1.00 mgd. By 2005, it had grown to 1.8 mgd, and by 2007, it reached 2.60 mgd. Currently, discharges range between 2.4 and 2.5 mgd and should remain within this range for the next few years while the housing slump and general economic downturn run their courses. Given the completion of the District's non-potable system in 2010, about 0.6 to 0.7 mgd of recycled water will be diverted from the historical point of discharge on Coopers Creek to the District's non-potable system, reducing discharge to Coopers Creek to 1.8 mgd.

The District has applied for a master recycling permit that will include the use of recycled water for irrigation in the City of Beaumont and the recharge of recycled water. There will be an agreement between the City and District for the transfer of ownership of the recycled water as needed.

The City has filed a Wastewater Change Petition, pursuant to WCS 1211, with the State Board to reduce its discharge to Coopers Creek to the minimum discharge that meets riparian demands and to divert the remaining discharge to an unnamed tributary of Marshall Creek. From this new point of discharge, the effluent will completely and incidentally recharge the Beaumont Management Zone, thereby augmenting natural and other supplemental water recharge. The intent is to eliminate the discharge of recycled water to the STMZ. This regulatory review process was just initiated. We are confident that this petition will be processed in an expeditious manner given that permission to reduce discharge was already granted by the State Board and the US Fish and Wildlife Service. The City's proposed discharge plan has been included in the wasteload allocation studies being conducted for the Basin Monitoring Task Force, and if the updated wasteload allocation is included in the pending Basin Plan amendment, the City's proposed discharge plan will be consistent with the Basin Plan.

These permits and their statuses are described below.

- **Master Recycling Permit.** The District recently submitted an application for a master recycling permit to use recycled and state project water for irrigation and groundwater recharge in the

Beaumont Management Zone. Currently, the STWMA is preparing a Title 22 Engineering Report to support groundwater recharge with recycled water pursuant to the August 2008 Draft Title 22 Regulations for recycled water recharge and anticipate obtaining approvals from the Department of Public Health in late 2009. Concurrent with this effort, the STWMA, the City and the District are working with DPH to obtain approval for the use of recycled water for irrigation uses. Approval from the DPH is expected in the next few months. Once said approval is obtained, the Regional Board can prepare permits that we believe will be similar to the recent IEUA recycling permits. The STWMA, District staff, and WEI will work diligently with DPH and Regional Board staffs to move this process along with the hope of obtaining these permits by the end 2009.

- Wastewater Change Petition. The City will submit a wastewater change petition pursuant to Water Code Section 1211 before November 15, 2008. City and WEI staffs will work diligently with the State Board and Regional Board staffs to move this process along with the hope of receiving approval before July 1, 2010.

We would like to meet with you as soon as practical after you have reviewed this letter.

Please call us if you have any questions or concerns.

Very truly yours,

**San Timoteo Watershed
Management Authority**

City of Beaumont



J. Andrew Schlange
General Manager



Deepak Moorjani
City Engineer

cc: Hope Smythe, Cindy Li, Mark Wildermuth

Encl: CD with District's approved facility plans, SRF funding commitment letter to the District, US Fish and Wildlife letter authorizing reductions in recycled water discharge to Coopers Creek, and CEQA Documents for the non-potable system.



Produced by:
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*Petition for Change
 Discharge Location Map*

- Beaumont's WWTP No. 1
- BCVWD's Recharge Facility
- Rivers/Streams
- Proposed Beaumont WWTP Discharge Point
- BCVWD's Nonpotable Pipeline
- Proposed Conveyance Pipeline
- Proposed Conveyance Facility



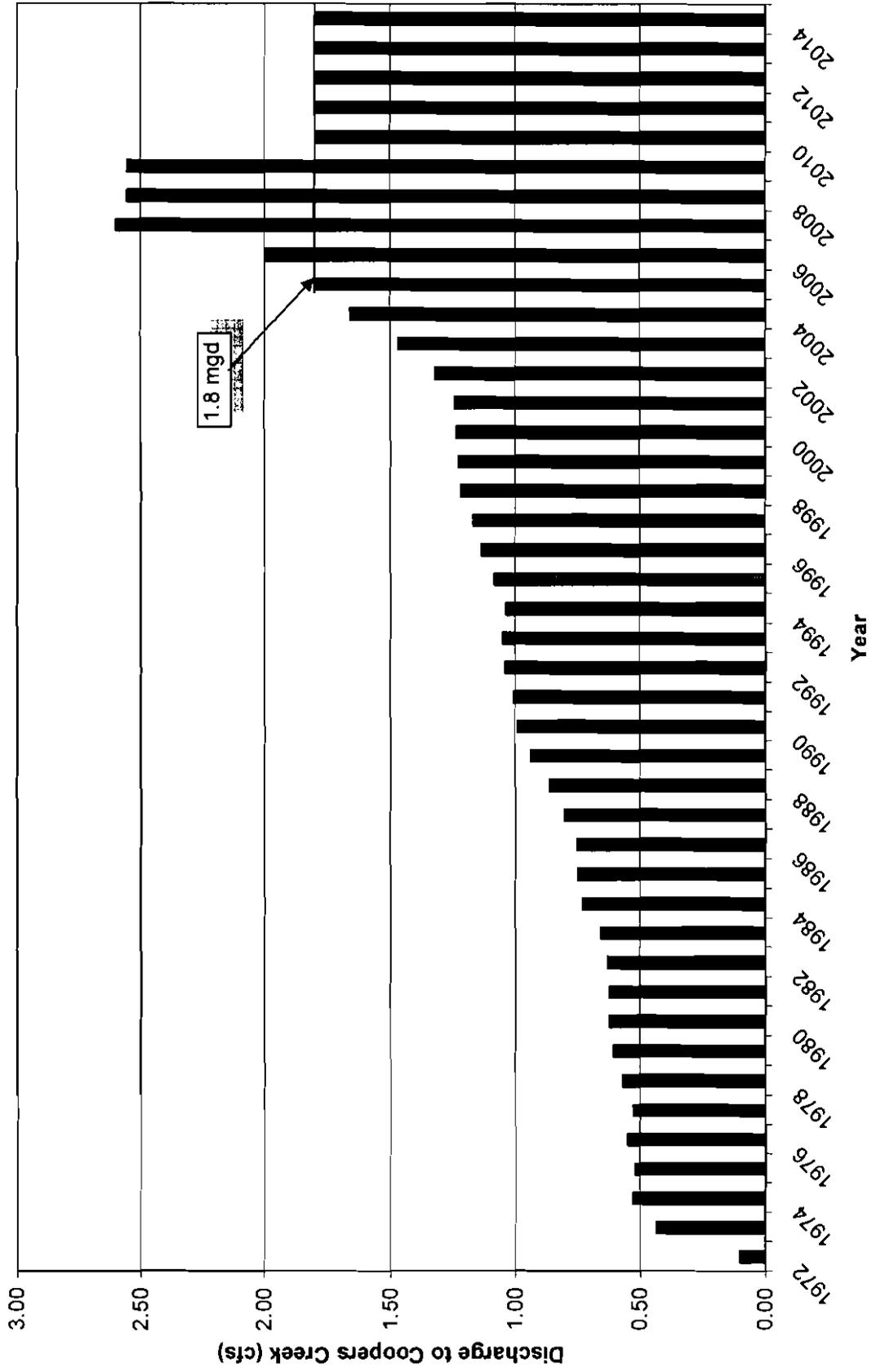
Figure 1

Table 1
Historic and Projected Beaumont Recycled Water
Discharges to Cooper's Creek

Year	Discharge	
	(mgd)	(acre-ft/yr)
1972	0.10	113
1973	0.44	488
1974	0.53	592
1975	0.52	583
1976	0.55	612
1977	0.53	590
1978	0.56	633
1979	0.60	675
1980	0.62	692
1981	0.62	693
1982	0.63	703
1983	0.65	733
1984	0.73	812
1985	0.75	835
1986	0.75	835
1987	0.80	895
1988	0.86	965
1989	0.94	1,048
1990	0.99	1,105
1991	1.01	1,128
1992	1.04	1,161
1993	1.05	1,173
1994	1.03	1,158
1995	1.08	1,208
1996	1.13	1,268
1997	1.16	1,302
1998	1.21	1,357
1999	1.22	1,369
2000	1.23	1,378
2001	1.24	1,388
2002	1.31	1,471
2003	1.46	1,641
2004	1.66	1,858
2005	1.79	2,008
2006	2.00	2,237
2007	2.60	2,910
2008	2.55	2,857
2009	2.55	2,857
2010	1.80	2,016
2011	1.80	2,016
2012	1.80	2,016
2013	1.80	2,016
2014	1.80	2,016

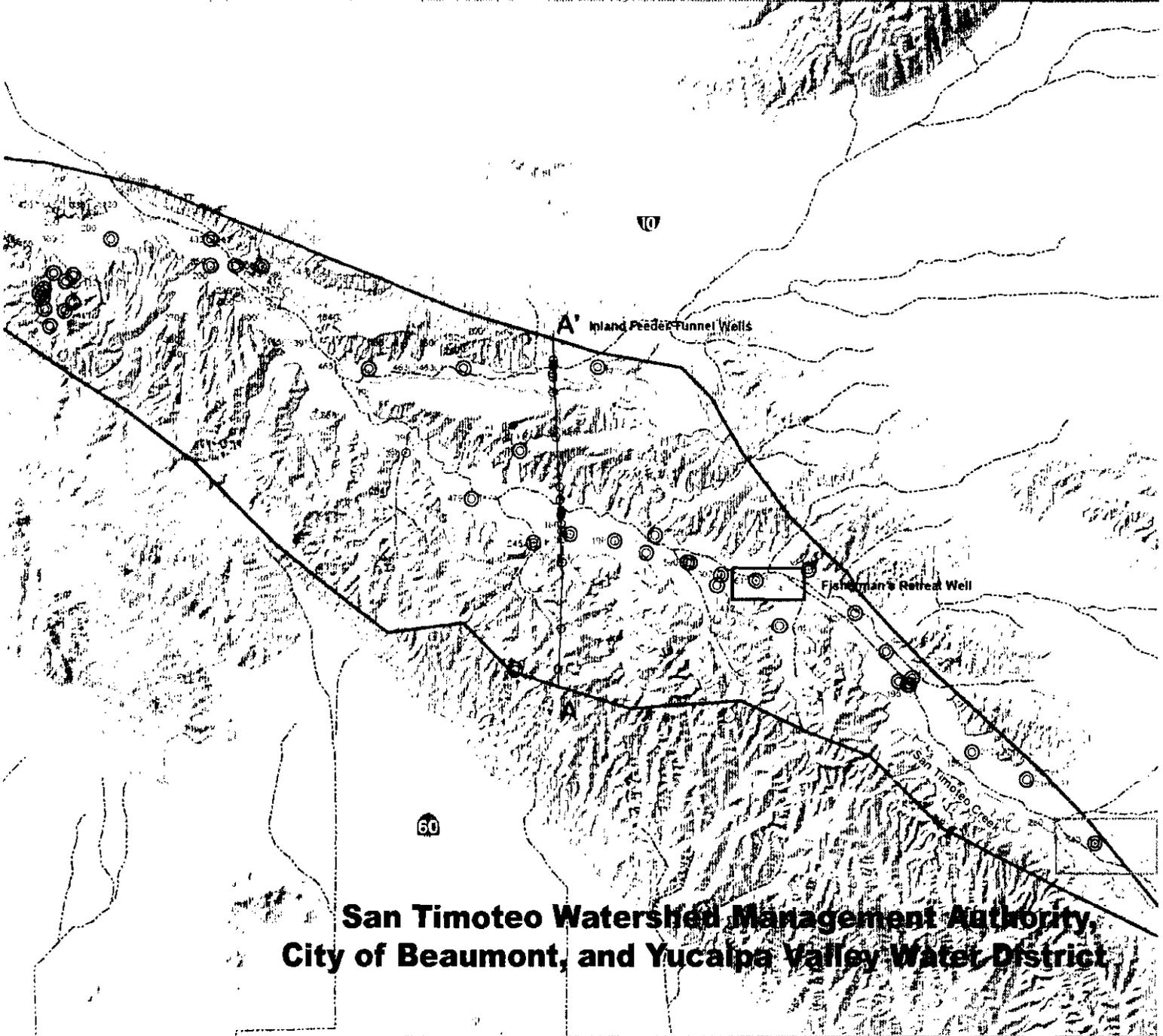
Sources: City of Beaumont and the Santa Ana River Watermaster

Figure 2 Historical and Projected Discharge to Cooper's Creek



San Timoteo Management Zone Monitoring Network Development Workplan

October 2008



**San Timoteo Watershed Management Authority,
City of Beaumont, and Yucaipa Valley Water District**



WILDERMUTH™
ENVIRONMENTAL INC.

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Acronyms, Abbreviations, and Initialisms

Amendment	Basin Plan Amendment
Basin Plan	Water Quality Control Plan
bgs	below ground surface
CEQA	California Environmental Quality Act
City	The City of Beaumont
DWR	California Department of Water Resources
GWMP	Groundwater Monitoring Program
mg/L	milligrams per liter
MWD	Metropolitan Water District of Southern California
Regional Board	Santa Ana Regional Water Quality Control Board
STMZ	San Timoteo Management Zone
STWMA	San Timoteo Watershed Management Authority
TDS	total dissolved solids
WEI	Wildermuth Environmental, Inc.
YVWD	Yucaipa Valley Water District



Section 1 – Introduction

1.1 Background

In January 2004, the Santa Ana Regional Water Quality Control Board (Regional Board) amended the Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin to incorporate an updated total dissolved solids (TDS) and nitrogen management plan (RWQCB, 2004). The Basin Plan Amendment (Amendment) included revised groundwater management zones, revised TDS and nitrate-nitrogen water quality objectives for groundwater, revised TDS and nitrogen wasteload allocations, revised reach designations, and revised TDS and nitrogen objectives and beneficial uses for specific surface waters. The technical work supporting the Amendment was directed by the Nitrogen/TDS Task Force (Task Force) and is summarized in *TIN/TDS Study (Phase 2A) of the Santa Ana Watershed, Final Technical Memorandum* (WEI, 2000).

In addition to the updated antidegradation water quality objectives set forth by the Amendment, alternative maximum benefit objectives were specified for certain groundwater management zones, including the Beaumont, San Timoteo, and Yucaipa Management Zones (Table 1-1). These “maximum benefit” objectives, which provide assimilative capacity for TDS and nitrate-nitrogen, are based on demonstrations that beneficial uses will continue to be protected and that water quality consistent with the maximum benefit to the people of the State of California will be maintained.

As stated in the Amendment, the maximum benefit objectives for said management zones are contingent upon commitments made by the City of Beaumont (City), the San Timoteo Watershed Management Authority (STWMA), and the Yucaipa Valley Water District (YVWD). Specifically, these commitments relate to the implementation of programs to monitor the effects of the maximum benefit objectives on ground and surface water and to address salt management. The STWMA and the City are responsible for the Beaumont Management Zone commitments, and they share responsibility for the San Timoteo Management Zone (STMZ) commitments with the YVWD. The YVWD is responsible for the Yucaipa Management Zone commitments. Tables 1-2 (Table 5-10a in the Amendment) and 1-3 (Table 5-9a in the Amendment) identify the maximum benefit commitments made to the Regional Board by the STWMA and the City and by the YVWD, respectively.

In fulfillment of commitments (1) and (2), the STWMA (in conjunction with the City) and the YVWD submitted proposed ground and surface water monitoring programs for their respective management zones (WEI, 2004; YVWD, 2004). On April 15, 2005, the Regional Board adopted resolutions R8-2005-065 and R8-2005-066, approving the YVWD’s and the STWMA and the City’s monitoring programs, respectively.

The objective of the groundwater monitoring program (GWMP) is to collect sufficient groundwater quality data such that the triennial recomputation of ambient water quality can be performed (see commitment 6). During the 2004 recomputation, ambient TDS and nitrate-nitrogen concentrations could not be calculated for the STMZ due to insufficient data. Thus, one of the goals of the GWMP’s well canvass effort was to locate existing wells in the STMZ

that could be included in the monitoring program.

In March 2007, the two-year well canvass of the region was completed. Figure 1-1 shows the key wells selected for continued monitoring of the Beaumont, Yucaipa and San Timoteo Management Zones. Only five wells were identified for inclusion in the STMZ GWMP. While there are numerous wells in the STMZ, many private well owners either restricted access to their property or chose not to participate in the GWMP.

To date, the key wells were sampled for water quality in November 2006 and November 2007 and are scheduled for another round of sampling in November 2008. Despite the recent data collection efforts, sufficient data was not available for the 2007 ambient water quality recomputation, and therefore, a determination could not be made. Accordingly, in the 2007 Maximum Benefit Monitoring Program Annual Reports submitted by the STWMA and the City and by the YVWD, this lack of data was recognized, and the parties proposed to prepare a workplan to construct new monitoring wells in the STMZ.

1.2 Maximum Benefit Commitment Compliance Status

It is assumed that maximum benefit is demonstrated and that the maximum benefit TDS and nitrate-nitrogen objectives apply to their respective management zones so long as the schedules presented in Tables 1-2 and 1-3 are being met by the STWMA, the City, and the YVWD. If the Regional Board were to determine that the maximum benefit program is not being implemented in accordance with these schedules, they could conclude that the maximum benefit is not being demonstrated and reinstate the antidegradation TDS and nitrate-nitrogen objectives. Were this to occur, the Regional Board would require retroactive mitigation for TDS and nitrate-nitrogen discharges affecting these management zones in excess of the antidegradation objectives.

The Regional Board recently addressed the maximum benefit commitment status of the STWMA and the City and of the YVWD in correspondences dated August 22, 2008 and August 13, 2008, respectively. These letters have been included as Appendix A of this workplan. In these correspondences, the Regional Board declared that the STWMA, the City, and the YVWD have not satisfactorily completed the following tasks:

- 1) Ambient Groundwater Quality Determination (Commitment 6 in Tables 1-2 and 1-3)
- 2) Remove/Reduce the Discharge of Effluent from the Unlined Portion of San Timoteo Creek (Commitment 9 in Tables 1-2 and 1-3)

In order to continue to operate under the Maximum Benefit Program, the Regional Board has set forth the following requirements for the committed agencies, to be completed no later than October 31, 2008:

- 1) Develop a workplan and schedule for the installation of monitoring wells in the San Timoteo Management Zone that will provide adequate data for the calculation of ambient groundwater quality

- 2) Provide an engineering plan to reduce recycled water flows into Coopers Creek and an analysis and evaluation of water quality impacts related to the use of recycled water in the Beaumont and San Timoteo Management Zones

This report is in fulfillment of the first requirement and contains a plan and schedule for the installation of new wells to augment the existing groundwater monitoring program in the STMZ.

1.3 STMZ Monitoring Program Expansion Objectives

In response to the lack of sufficient groundwater level and groundwater quality data needed to determine ambient water quality in the STMZ, the STWMA, the City, and the YVWD have prepared this workplan to augment the STMZ groundwater monitoring network. The goals of the GWMP expansion are as follows:

- To determine the location, number, and construction details for a network of new monitoring wells in the STMZ
- To improve the understanding of the spatial and vertical variability of water quality in the STMZ
- To collect the requisite data to perform an ambient water quality determination in the STMZ by the 2012 recomputation

1.4 Report Organization

Section 1 Introduction: This section describes the project background, summarizes the workplan objectives, and provides an outline for this workplan.

Section 2 Monitoring Well Program Design: Section 2 details the analysis of existing information used to design the monitoring well program and determine site selection criteria for new well construction.

Section 3 Well Construction: Section 3 details the steps that will be taken to execute the construction of the new monitoring wells proposed in the STMZ.

Section 4 Implementation Plan: Section 4 provides the construction and monitoring plan cost opinion, financing information, and a schedule for implementation.

Section 5 References: Section 5 provides references for the sources consulted in the development of this workplan.

**Table 1-1
Maximum Benefit and Antidegradation Objectives for TDS and Nitrate-Nitrogen**

Management Zone	TDS Objectives (mg/L)		Nitrate-Nitrogen Objectives (mg/L)	
	Maximum Benefit	Antidegradation	Maximum Benefit	Antidegradation
Beaumont	330	230	5	1.5
San Timoteo	400	300	5	2.7
Yucaipa	370	320	5	4.2

**Table 1-2
STWMA and City of Beaumont Maximum Benefit Commitments**

Description of Commitment	Compliance Date – as soon as possible, but no later than
<p>1. Surface Water Monitoring Program</p> <ul style="list-style-type: none"> a. Submit Draft Monitoring Program to Regional Board b. Implement Monitoring Program c. Quarterly data report submittal d. Annual data report submittal 	<ul style="list-style-type: none"> a. February 24, 2005 b. Within 30 days from date of Regional Board approval of monitoring plan c. April 15, July 15, October 15, January 15 d. April 15th
<p>2. Groundwater Monitoring Program</p> <ul style="list-style-type: none"> a. Submit Draft Monitoring Program to Regional Board b. Implement Monitoring Program c. Annual data report submittal 	<ul style="list-style-type: none"> a. February 24, 2005 b. Within 30 days from date of Regional Board approval of monitoring plan c. April 15th
<p>3. Desalter(s) and Brine Disposal Facilities</p> <ul style="list-style-type: none"> a. Submit plan and schedule for construction of desalter(s) and brine disposal facilities. Facilities are to be operational as soon as possible but no later than 7 years from date of Regional Board approval of plan/schedule. b. Implement the plan and schedule 	<ul style="list-style-type: none"> a. Within 6 months of either of the following: <ul style="list-style-type: none"> i. When Beaumont's effluent 5-year running average TDS exceeds 480 mg/L; and/or ii. When volume weighted average concentration in the Beaumont MZ of TDS exceeds 320 mg/L b. Within 30 days from date of Regional Board approval of monitoring plan
<p>4. Non-potable water supply</p> <p>Implement non-potable water supply system to serve water for irrigation purposes. The non-potable supply shall comply with a 10-year running average TDS concentration of 390 mg/L or less</p>	<p>January 24, 2015</p>

**Table 1-2
STWMA and City of Beaumont Maximum Benefit Commitments**

Description of Commitment	Compliance Date – as soon as possible, but no later than
<p>5. Recycled water recharge</p> <p>The recharge of recycled water in the Beaumont or San Timoteo Management Zones shall be limited to the amount that can be blended with other recharge sources to achieve a 5-year running average equal to or less than the "maximum benefit" objectives for TDS and nitrate-nitrogen for the relevant Management Zone(s).</p> <p>a. Submit baseline report of amount, locations, and TDS and nitrogen quality of stormwater/imported water recharge.</p> <p>b. Submit documentation of amount, TDS and nitrogen quality of all sources of recharge and recharge locations. For stormwater recharge used for blending, submit documentation that the recharge is the result of City of Beaumont/STWMA enhanced recharge facilities/programs.</p>	<p>Compliance must be achieved by end of 5th year after initiation of recycled water use/recharge operations.</p> <p>a. Prior to initiation of construction of basins/other facilities to support enhanced stormwater/imported water recharge.</p> <p>b. Annually, by January 15th, after initiation construction of facilities/implementation of programs to support enhanced recharge.</p>
<p>6. Ambient groundwater quality determination</p>	<p>July 1, 2005 and every 3 years thereafter</p>
<p>7. Replace denitrification facilities</p> <p>(necessary to comply with TIN wasteload allocation specified in Table 5-5)</p>	<p>Compliance with 6 mg/L TIN limitation to be achieved by (*3 years from effective date of this Basin Plan amendment*)</p>
<p>8. City of Beaumont recycled water quality improvement plan and schedule</p> <p>a. Submit plan and schedule</p> <p>b. Implement plan and schedule</p>	<p>a. 60 days after the TDS 12-month running average effluent quality equals or exceeds 490 mg/L for 3 consecutive months and/or the 12-month running average TIN concentration equals or exceeds 6 mg/L in any month (once replacement denitrification facilities are in place)</p> <p>b. Upon approval by Regional Board</p>
<p>9. Remove/reduce the discharge of Beaumont's effluent from the unlined portion of San Timoteo Creek</p> <p>a. Submit proposed plan/schedule</p> <p>b. Implement plan and schedule</p>	<p>a. (*6 months from effective date of this Basin Plan amendment)</p> <p>b. Upon Regional Board approval</p>

**Table 1-3
Yucaipa Valley Water District Maximum Benefit Commitments**

Description of Commitment	Compliance Date – as soon as possible, but no later than
<p>1. Surface Water Monitoring Program</p> <p>a. Submit Draft Monitoring Program to Regional Board</p> <p>b. Implement Monitoring Program</p> <p>c. Quarterly data report submittal</p> <p>d. Annual data report submittal</p>	<p>a. (*30 days from date of approval of this amendment*)</p> <p>b. Within 30 days from date of Regional Board approval of monitoring plan</p> <p>c. April 15, July 15, October 15, January 15</p> <p>d. February 15th</p>
<p>2. Groundwater Monitoring Program</p> <p>a. Submit Draft Monitoring Program to Regional Board</p> <p>b. Implement Monitoring Program</p> <p>c. Annual data report submittal</p>	<p>a. (*30 days from date of approval of this amendment*)</p> <p>b. Within 30 days from date of Regional Board approval of monitoring plan</p> <p>c. February 15th</p>
<p>3. Desalter(s) and Brine Disposal Facilities</p> <p>a. Submit plan and schedule for construction of desalter(s) and brine disposal facilities. Facilities are to be operational as soon as possible but no later than 7 years from date of Regional Board approval of plan/schedule.</p> <p>b. Implement the plan and schedule</p>	<p>a. Within 6 months of either of the following:</p> <p>i. When YVWD's effluent 5-year running average TDS exceeds 530 mg/L; and/or</p> <p>ii. When volume weighted average concentration in the Yucaipa MZ of TDS exceeds 360 mg/L</p> <p>b. Within 30 days from date of Regional Board approval of monitoring plan</p>
<p>4. Future desalters plan and schedule submittal</p>	<p>October 1, 2005 Implement plan and schedule upon Regional Board approval</p>

**Table 1-3
Yucaipa Valley Water District Maximum Benefit Commitments**

Description of Commitment	Compliance Date – as soon as possible, but no later than
<p>5. Recycled water recharge</p> <p>The recharge of recycled water in the Yucaipa or San Timoteo Management Zones shall be limited to the amount that can be blended with other recharge sources to achieve a 5-year running average equal to or less than the "maximum benefit" objectives for TDS and nitrate-nitrogen for the relevant Management Zone(s).</p> <p>a. Submit baseline report of amount, locations, and TDS and nitrogen quality of stormwater/imported water recharge.</p> <p>b. Submit documentation of amount, TDS and nitrogen quality of all sources of recharge and recharge locations. For stormwater recharge used for blending, submit documentation that the recharge is the result of YVWD enhanced recharge facilities/programs.</p>	<p>Compliance must be achieved by end of 5th year after initiation of recycled water use/recharge operations.</p> <p>a. Prior to initiation of construction of basins/other facilities to support enhanced stormwater/imported water recharge.</p> <p>b. Annually, by January 15th, after initiation construction of facilities/implementation of programs to support enhanced recharge.</p>
<p>6. Ambient groundwater quality determination</p>	<p>July 1, 2005 and every 3 years thereafter</p>
<p>7. Replace denitrification facilities</p> <p>(necessary to comply with TIN wasteload allocation specified in Table 5-5)</p>	<p>New facilities shall be operational no later than (*3 years from effective date of this Basin Plan amendment*)</p>
<p>8. YVWD recycled water quality improvement plan and schedule</p> <p>a. Submit plan and schedule</p> <p>b. Implement plan and schedule</p>	<p>a. 60 days after the TDS 12-month running average effluent quality equals or exceeds 530 mg/L for 3 consecutive months and/or the 12-month running average TIN concentration equals or exceeds 6 mg/L in any month (once replacement denitrification facilities are in place)</p> <p>b. Upon approval by Regional Board</p>
<p>9. Remove/reduce the discharge of YVWD effluent from the unlined portion of San Timoteo Creek</p> <p>a. Submit proposed plan/schedule</p> <p>b. Implement plan and schedule</p>	<p>a. (*6 months from effective date of this Basin Plan amendment)</p> <p>b. Upon Regional Board approval</p>
<p>10. Construct the Western Regional Interceptor for Dunlap Acres</p> <p>a. Submit proposed construction plan and schedule. The schedule shall assure the completion of construction as soon as possible but no later than January 1, 2010.</p> <p>b. Implement plan and schedule</p>	<p>a. (*6 months from effective date of this Basin Plan amendment)</p> <p>b. Upon Regional Board approval</p>



Key Groundwater Quality Monitoring Program

Wells Monitored for Groundwater Quality

Management Zone Labeling Key

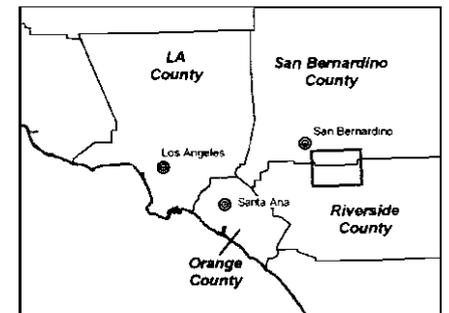
- Management Zone Name
- 330 TDS Maximum Benefit Objective
- 5.0 Nitrate-Nitrogen Maximum Benefit Objective
- Management Zone Boundary

Other Features

- Recycled Water Discharge Location
- Rivers and Streams

Geology

- Unconsolidated Sediments**
 - Quaternary Alluvium
- Semi-consolidated Sediments & Consolidated Bedrock**
 - Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks



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STWMA/City of Beaumont & YVWD
 Maximum Benefit Monitoring Program
 STMZ Monitoring Well Workplan

Water Quality Key Wells
 Groundwater Quality Monitoring Program

Figure 1-1

Section 2 – Monitoring Well Site Selection

2.1 Review of Existing Information

The STMZ is underlain by alluvial sediments and the San Timoteo Formation. The recent Holocene alluvium consists of unconsolidated clay, silt, sand, and gravel. The San Timoteo Formation consists of older, Pliocene-Pleistocene age unconsolidated to consolidated, occasionally cemented clay, silt, sand, and gravel. The outcrop of the San Timoteo Formation along San Timoteo Canyon forms high, sharp hills on both sides of the canyon, which is bisected by the San Timoteo Wash from southeast to northwest. In general, the porosity and permeability of the San Timoteo Formation is less than that of the alluvium.

There are relatively few high quality logs for wells constructed in the STMZ that provide a deeper understanding of the basin. Figure 2-1 shows the complete distribution of known wells (determined through the review of well logs on file with the California Department of Water Resources [DWR] and various well canvassing exercises) as well as information regarding well construction, water quality, and water levels. Most wells are constructed to a depth of less than 400 feet below ground surface (bgs), and the limited¹ data provided in the DWR well logs suggest that specific capacity and yields are highly variable down the canyon (Table 2-1).

The wells that were recently constructed by the Metropolitan Water District of Southern California (MWD) during the design of their Inland Feeder Tunnel provide a unique source of high quality data pertinent to the hydrogeology of the STMZ. Figure 2-2 provides a cross-section through the canyon along the line of the Inland Feeder Tunnel wells. The work performed by the MWD revealed the following:

- Groundwater inflows (after grouting) to the section of the Inland Feeder Tunnel within San Timoteo Canyon are exceptionally low (estimated at < 20 gallons per minute for the length of the cross-section). In particular, inflows are lower where the tunnel passes through the San Timoteo Formation, compared to the sections that pass through the alluvium (see Figure 2-2).
- During tunnel construction, the dewatering operation failed to lower the groundwater level below the level of the tunnel invert. This was probably due to the low permeability of the alluvial sediments.
- Packer testing of the boreholes constructed in the San Timoteo Formation indicated low hydraulic conductivity values.
- The depth of alluvial sediments at the cross-section is less than 150 feet.

¹ DWR records have a field for reporting pump tests. This field consists of yield, drawdown, and test duration. However, further information is rarely reported, and it is not possible to determine the method of testing (i.e. if it was a step test, a constant rate test, or simply pumping for development).

Based on the general geology, it would seem reasonable to conclude that the alluvium, being less consolidated than the San Timoteo Formation, forms a better aquifer. And, inflows to the Inland Feeder Tunnel, as well as the aquifer's response to the MWD's dewatering operation, seem to further support that the San Timoteo Formation is of limited use as an aquifer.

Nevertheless, drillers' experiences in the STMZ seem to suggest otherwise. The logs of both the Inland Feeder Wells and the Fisherman's Retreat Well show the depth of alluvial sediments to be less than 150 feet. However, given that the majority of wells in the unit were drilled to depths between 150 to 400 feet bgs seems to indicate that at least part of the San Timoteo Formation is useful as an aquifer.

Furthermore, the depth of alluvial sediments at the Heartland production well is only 35 feet, yet it is screened between 160 and 540 feet bgs. The fact that the San Timoteo Formation is only found beneath the alluvium in this area (the outcrop of the San Timoteo Formation is not observed near the Heartland Well) indicates greater consolidation and cementation of the formation in the San Timoteo Canyon, compared to other nearby areas.

Based on the findings of the MWD study, the variability in depth of alluvial sediments between the Heartland Well and the central section of the STMZ, and the variability of yields and specific capacities found in DWR logs, it is reasonable to conclude that the lithology and yields in both the alluvium and San Timoteo Formation are variable—both spatially and vertically—throughout the STMZ. Although the Heartland, Fisherman's Retreat, and MWD well logs (included as Appendix B of this workplan) provide further insight into the hydrogeology of the STMZ, the fact remains that beyond existing well depths, very little is known about the hydrogeology of the eastern and western sections of the STMZ. Construction of new monitoring wells in these areas will improve the overall understanding of the active aquifer system and provide the data needed to compute the ambient water quality of the STMZ.

2.2 Approach to Monitoring Network Expansion

Figure 2-3 shows the distribution of existing wells in the monitoring network. This network includes the five wells identified in the initial well canvass for the GWMP and three additional wells discovered during field canvassing efforts related to the creation of this workplan. While it is tempting to fill the remaining spatial gaps of the GWMP through additional well canvassing, lithological data from new construction (discussed in Section 3.1) is considered to be extremely important in improving aquifer characterization, especially in the western half of the STMZ. It is highly unlikely that the information provided by this new construction can be obtained from existing wells, especially given the historical difficulty in obtaining cooperation from private well owners. A new construction approach, coupled with a year of intensive groundwater monitoring (see Section 3.3), will allow for a more accurate determination of the lateral and vertical variability of water quality within the STMZ.

2.3 Site Selection Criteria for New Wells

The following criteria were used to propose locations for the construction of new monitoring wells:

- Sites should aim to fill existing spatial gaps in the monitoring network.
- Wells should yield water quality samples from the active aquifer, and therefore, sites should be located centrally within the alluvium of San Timoteo Canyon.
- Sites should have an area suitable to accommodate the footprint of well drilling equipment.
- Sites should be easily accessible due to frequent visits required by the GWMP.
- Sites on publicly owned land are preferred to those on privately owned land as it is typically easier to negotiate an easement for temporary use of the land for construction.
- Sites should be located on land that is already disturbed by existing activities in order to minimize damage to environmental resources.

A GIS overlay analysis of existing well sites, surface geology, aerial photography, and parcel data from the San Bernardino and Riverside County Assessor's Offices was used to select monitoring well locations according to the aforementioned criteria. Based on the overlay analysis, the three wells will be sited in the following locations:

1. One well will be sited in the relatively wide alluvial plain near the northwest mouth of the canyon where the aquifer is considered poorly characterized. This area also likely represents one of the larger areas of alluvial storage in the canyon and is the best place to characterize water flowing out to the Bunker Hill Management Zone.
2. One well will be sited at the confluence of Live Oak Canyon and San Timoteo Canyon. There are relatively few wells in the area, and a well placed in this location will aid in characterizing any subsurface flow from Live Oak Canyon.
3. One well will be sited in the southeast part of the canyon to fill the spatial gap between the Fisherman's Retreat Well and the Heartland Well.

Figure 2-3 indicates the conceptual location of the proposed wells within the broad areas indicated above. Given the visual detail of the GIS information used in the overlay analysis, a large map containing these data has been included as Appendix C. Site visits were conducted to confirm the suitability of these sites, and notes and photographs from these reconnaissance efforts have been included as Appendix D.

**Table 2-1
Specific capacity and yields of wells in the STMZ**

WEID	Yield	Drawdown	Specific Capacity
	gpm	ft	gpm/ft
1003049	900	169	5.3
1201608	750		
1201582	540	120	4.5
1201615	300		
1003109	250	102	2.5
1201611	200		
1201612	200		
1003079	165	74	2.2
1201613	150	123	1.2
1201591	100		
1201592	100		
1201593	75		
1003080	55	170	0.3
1201599	40		
1201617	40		
1201602	30		
1201610	25	81	0.3
1003048	20	80	0.3
1201594	20		
1201598	20		
1201603	20		
1201595	18		
1201601	10		

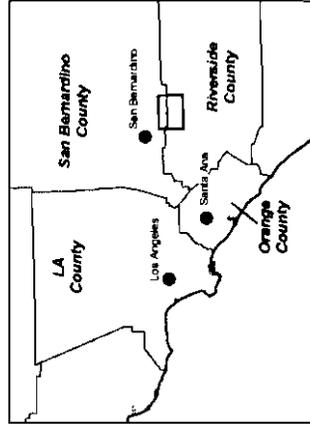
Key to Well Construction Details

- Well**
- In well casing:
 - 32.5" dia. Median TDS mg/L (No. of measurements)
 - 18" dia. Median OML ft and (ft log)
 - Max perf depth:
 - 359
 - Has lithological log:
 - In sampling program

- San Timoteo Management Zone Boundary
- Line of Cross Section (Figure 2-2)

Geology

- Unconsolidated Sediments
 - Quaternary Alluvium
- Semi-Consolidated Sediments & Consolidated Bedrock
 - Undifferentiated Pre-Tertiary to Early Pleistocene Igneous, Metamorphic, and Sedimentary Rocks



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 Date: 2/20/00
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STWMA/City of Beaumont & YVWD
 Minimum Beneficial Monitoring Program
 STWZ Monitoring Well Program

Distribution of Known Wells in the San Timoteo Management Zone
 Figure 2-1

Horizontal Scale
0 ft 500 ft

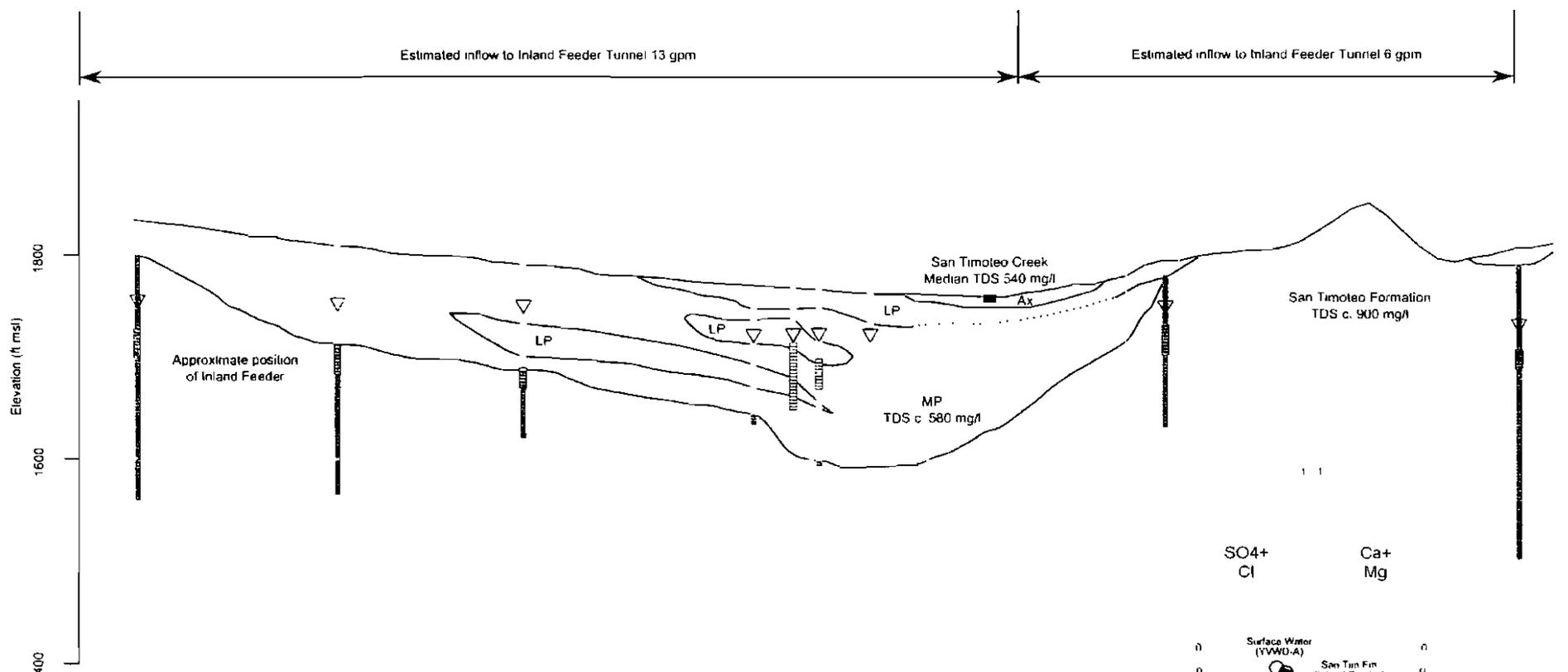
Vertical Exaggeration X2

San Timoteo
Badlands
South
A

Live Oak
Canyon
North
A'

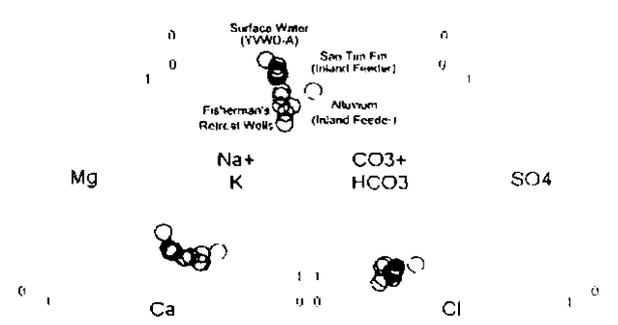
Estimated inflow to Inland Feeder Tunnel 13 gpm

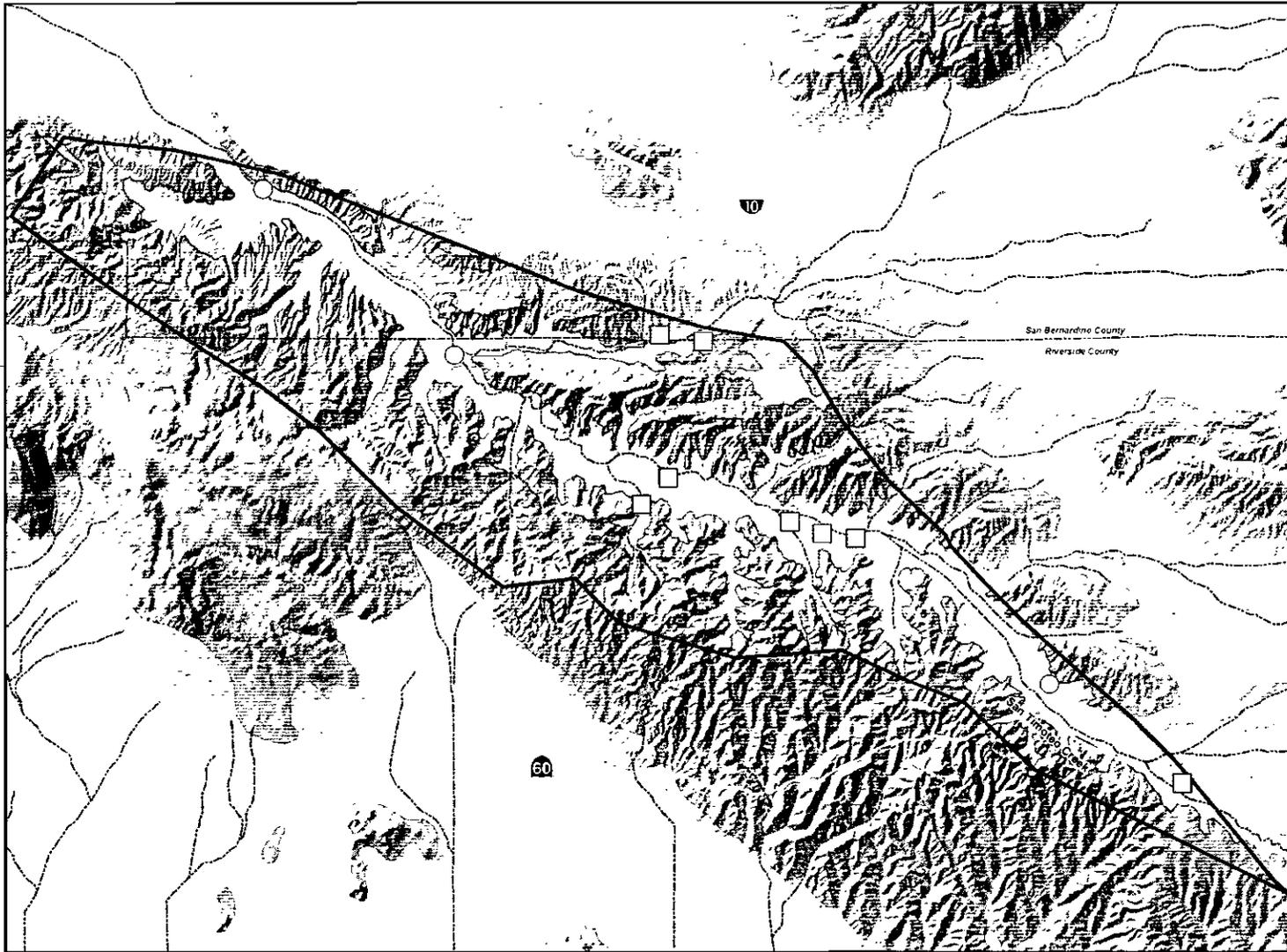
Estimated inflow to Inland Feeder Tunnel 6 gpm



Note that TDS values marked on this cross section are taken from Inland Feeder Wells.

- | | | |
|----|-----------------------|---|
| SM | GW/GM/GP | Groundwater Level |
| SW | CH/CL/ML/MH | MP More permeable material |
| SP | San Timoteo Formation | LP Limited permeability material |
| SC | Screened Interval | Ax Extent of Axial Channel Deposits as mapped by USGS |
- Unscreened borings were measured at the end of drilling.
- All borings completed into the San Timoteo Formation were packer tested for hydraulic conductivity. Modal value of k is < 0.4 cm/d





- Existing Wells added to program in 2008
- Existing Wells added to Program in 2008
- Proposed New Construction in 2009
- ▭ San Timoteo Management Zone Boundary

Geology

Unconsolidated Sediments
 Quaternary Alluvium

Semi-Consolidated Sediments & Consolidated Bedrock

Undifferentiated Pre-Tertiary to Early Pleistocene
 Igneous, Metamorphic, and Sedimentary Rocks



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 File: Figure 2-3.mxd



STWMA/City of Beaumont & YWDA
 Maximum Benefit Monitoring Program
 STMZ Monitoring Well Workplan

Proposed Groundwater Monitoring Network
Groundwater Quality Monitoring Program

Figure 2-3

Section 3 – Well Construction

3.1 Planning

3.1.1 Site Acquisition

For the purposes of site acquisition, the wells will be owned by the STWMA. The STWMA will contact the property owner—as determined from Assessor’s Office parcel data—and negotiate an easement to allow for well construction. The STWMA will also secure any necessary permits for the temporary occupation and use of land or roadways and for the discharge of water during construction.

3.1.2 CEQA

As required by the California Environmental Quality Act (CEQA), the STWMA will carry out an *Initial Study*, as defined by CEQA, to identify the environmental impacts of the construction project and determine whether any identified impacts are "significant." If the impacts are "significant," solutions to mitigate these impacts will be explored in order to satisfy a Mitigated Negative Declaration. Otherwise, a new site will be proposed within the general vicinity of the proposed locations. CEQA site assessments will be repeated, and if environmental impacts are unavoidable at the selected construction sites, an Environmental Impact Report will be prepared.

3.1.3 Initial Investigations

A more detailed investigation of existing wells will reduce some of the hydrogeologic uncertainty identified in Section 2.1. To make an assessment of the relative contributions of the alluvium and San Timoteo Formation to the productive aquifer, an investigation will be carried out to identify the source of water in the Fisherman’s Retreat Well. The Fisherman’s Retreat Well was selected for this analysis as it is likely that it is screened across both the alluvium and the San Timoteo Formation. At a minimum, the investigation will consist of a video survey and a spinner test to refine the depths of the newly constructed wells. Rehabilitation and redevelopment of this well will be considered if the screen is in poor condition.

3.2 Well Construction

The STWMA will engage contractors to prepare plans and specifications for the construction of the new wells and will undertake construction management. The plans and specifications will be used to obtain bids for well construction and to select a contractor to carry out construction. Wells will be constructed in compliance with the latest edition or supplement of the Californian Water Well Standards (DWR 1981, 1991) and other applicable standards.

The three new wells will be constructed to a depth of up to 400 feet to reflect the current use of the aquifer. Lithological and geophysical data obtained during construction will be used to decide the completion depth of each well. Wells will be completed with a 4-inch diameter in order to allow for low-flow water quality sampling. The well casing will consist of Schedule 80 PVC and screening materials. The screen length is anticipated to be 40 feet; although, this may vary, depending on data gathered during drilling.

After drilling and prior to construction, the following geophysical surveys will be run: long normal and short normal resistivity, SP, and natural gamma logs.

Following construction, the wells will be developed by swabbing and bailing as well as airlift, a video log will be run to verify screen condition, and a bladder pump and water level transducer will be permanently installed in each well for use in the sampling program.

A well completion report with findings and conclusions will be submitted to the Regional Board by December 31, 2009

3.3 Groundwater Quality Monitoring

3.3.1 Ambient Water Quality Monitoring Requirements

The goal of the tasks laid out in this workplan is to produce the data necessary to make a determination of the ambient groundwater quality in the STMZ. The ambient water quality of a groundwater management zone is measured using a rigorous statistical method (20-year running averages) devised by the Nitrogen/TDS Task Force. This methodology is documented in *TIN/TDS Study – Phase 2A Final Technical Memorandum* (WEI, 2000).

To compute ambient water quality, TDS and nitrate-nitrogen measurements are averaged for each calendar year. That is, where more than one observation occurs during any given year, only one value—the annual average—is used in the computation. A well may have up to 20 annualized averages; however, a minimum of 3 annualized averages is required for inclusion in the determination.

In addition to the TDS and nitrate-nitrogen data needed for the ambient water quality computation, a series of quality control checks must be performed to ensure the integrity of the data used in the analysis. Table 3-1 lists the minimum chemical parameters required for the computation of ambient water quality.

3.3.2 Monitoring Program Plan

Since the inception of the GWMPs, all wells have been sampled on an annual basis until there are enough annual samples to include a given wells in the ambient groundwater quality determinations. However, given that an understanding of the spatial and vertical variability of water quality in the STMZ is an important element to understanding the active aquifer, all

wells within the STMZ will be sampled on a quarterly basis for one year.

In 2009, when construction is complete, there will be 11 water quality monitoring wells in the STMZ. The first quarterly samples will be collected upon the completion of construction, which is planned for September 2009. Thereafter, the remaining quarterly samples will be collected in December 2009, March 2010, and June 2010. Each well will be sampled according to the ambient water quality data requirements listed in Table 3-1 and results will be reported with the Quarterly Maximum Benefit Monitoring Program reports. Subsequent to the completion of the four quarterly samples, all wells in the STMZ will be sampled annually in accordance with the ambient water quality computation requirements described in Section 3.3. There will be sufficient data from all wells in the GWMP to compute the ambient groundwater quality of the STMZ by the 2012 recomputation.

If upon completion of three new monitoring wells, coupled with a year of quarterly groundwater quality monitoring, the uncertainty regarding the character of the active aquifer remains, the STWMA, the City, and the YVWD will propose further augmentation of the GWMP.

**Table 3-1
Analyses Required for
Ambient Water Quality Determination**

Analytes of Interest
Alkalinity, Total (as CaCO ₃)
Bicarbonate
Calcium
Carbonate
Chloride
Electrical Conductivity (Specific Conductance)
Fluoride
Magnesium
Nitrate as NO ₃ or Nitrate as N
pH
Potassium
Silica
Sodium
Sulfate
Total Dissolved Solids

Section 4 – Implementation Plan

4.1 Cost Opinion

Table 4-1 shows a work breakdown structure and cost opinion for the implementation of the STMZ Well Construction and Monitoring Plan. The cost opinion follows the tasks of the workplan, with Task 1 being completed in fiscal 2008/09 and Tasks 2 through 5 being completed in fiscal 2009/10. The total cost, including construction and monitoring, is approximately \$472,000. This includes a recommended contingency of ten percent and contains no deductions for outside funding sources that may be available. About 65 percent (\$280,000) of the cost is related to well construction, lab costs, and other non-labor direct costs. The remaining 35 percent (\$149,000) consists of consultant labor costs for planning, designing, and supervising construction, and for the STMZ GWMP during this period. The total cost share for each party (STWMA/City and YVWD) is \$236,000.

4.2 Financing

To assist in the financing of the monitoring well program, the STWMA, the City, and the YVWD will apply for grant funding through the DWR's Local Groundwater Assistance program. This program is for local public agencies with management responsibility over groundwater resources to carry out groundwater data collection, modeling, monitoring, and other basin management tasks, including the construction of new monitoring networks. Applications will be submitted in March 2009, and if awarded, funding will be available in FY2010. Local Groundwater Assistance grants typically award up to \$250,000 to selected projects. If received, this grant will cover approximately one half of the total project cost.

4.3 Implementation Schedule

Table 5-2 details the schedule for implementing the steps outlined in this workplan. These steps are summarized below.

- January 2, 2009: The Regional Board approves the workplan and directs the STWMA to implement
- March 2009: Submit DWR Local Groundwater Assistance Program application
- June 30, 2009: The STWMA acquires access to sites, completes well design, and selects contractor(s) for monitoring well construction
- September 30, 2009: Construction is completed and groundwater monitoring begins
- December 31, 2010: Well completion report, detailing findings and conclusions, is submitted to the Regional Board
- June 30, 2013: Assessment of ambient water quality in the STMZ is completed

**Table 4-1
Work Breakdown Structure and Fee Estimate for Groundwater Monitoring Program Expansion**

Phase and Task Descriptions	Labor		Other Direct Charges						Total Costs		
	Person Days	Cost	Travel	New Equipment	CEQA Consultant	Drilling Contractors	Laboratory	Reproduction	Total ODCs	Subtask	Task
Task 1 Planning - Fiscal Year 2008/09											
1.1 Perform CEQA Analysis	1	\$1,200			\$16,500				\$16,500	\$17,700	\$46,560
1.2 Prepare AB-303 Grant Application	19	\$25,040	\$500					\$500	\$1,000	\$26,040	
1.3 Meet With and Assist STWMA/YVWD with Well Site Acquisition	2	\$2,720	\$100						\$100	\$2,820	
Task 2 Initial Investigation - Fiscal Year 2009/10											
2.1 Fisherman's Retreat Well Spinner Test	3	\$3,600	\$100			\$10,000			\$10,100	\$13,700	\$17,453
2.2 Well Survey	3	\$3,600	\$153						\$153	\$3,753	
Task 3 Construct Monitoring Wells - - Fiscal Year 2009/10											
3.1 Plans and Specifications for Monitoring Wells	8	\$9,520								\$9,520	\$295,992
3.2 Obtain Permits	2	\$2,160	\$200						\$200	\$2,360	
3.3 Assist Agencies to Prepare Bid Package, Select Contractor, and Negotiate Contract	7.5	\$9,860								\$9,860	
3.4 Drill Boreholes and Construct, Develop, and Equip Wells (1 wells to 400')	17.5	\$15,880	\$7,348	\$9,000		\$225,774	\$1,250		\$238,372	\$274,252	
Task 4 Prepare Well Completion Report - - Fiscal Year 2009/10											
4.1 Prepare Draft Report	13.25	\$14,170								\$14,170	\$23,950
4.2 Review Draft Report with YVWD and STWMA	2.5	\$3,540	\$100						\$100	\$3,640	
4.3 Prepare Final Report	5	\$5,140						\$1,000	\$1,000	\$6,140	
Task 5 Intensive monitoring of STMZ wells - Fiscal Year 2009/10	35	\$32,400	\$2,204				\$10,000		\$12,864	\$45,264	\$45,264
Subtotal											\$429,219
Contingency at 10%											\$42,922
Total	138.75	\$148,830	\$5,765	\$9,000	\$16,500	\$235,774	\$11,850	\$1,500	\$280,389		\$472,140

**Table 4-2
Workplan Implementation Schedule**

Completion Date	Task
October 31, 2008	The STWMA, the City, and the YVWD submit Workplan for the STMZ GWMP
January 2, 2009	The Regional Board approves Workplan and directs the agencies to implement
March 31, 2009	Submit Local Groundwater Assistance Program application to acquire funding for construction and monitoring
June 30, 2009	The STWMA acquires access to sites, completes well design, and selects contractors for well construction
September 30, 2009	Monitoring well construction is completed and quarterly groundwater monitoring begins
December 31, 2009	Well Completion Report, detailing findings and conclusions, is submitted to the Regional Board for review
June 30, 2013	The STWMA, the City, and the YVWD submit an Ambient Water Quality determination for the STMZ

Section 5 – References

- California Department of Water Resources. (1991). *California Well Standards, Bulletin 74-90*.
- California Department of Water Resources. (1981). *California Well Standards, Bulletin 74-81*.
- California Regional Water Quality Control Board, Santa Ana Region. (2004). *Resolution No. R8-2004-0001—Resolution Amending the Water Quality Control Plan for the Santa Ana River Basin to Incorporate an Updated Total Dissolved Solids (TDS) and Nitrogen Management Plan for the Santa Ana Region Including Revised Groundwater Subbasin Boundaries, Revised TDS and Nitrate-Nitrogen Quality Objectives for Groundwater, Revised TDS and Nitrogen Wasteload Allocations, and Revised Reach Designations, TDS and Nitrogen Objectives and Beneficial Uses for Specific Surface Waters*.
- California Regional Water Quality Control Board, Santa Ana Region. (2005). *Resolution No. R8-2005-0065—Resolution Approving the San Timoteo and Yucaipa Management Zones Maximum Benefit Surface Water and Groundwater Monitoring Program Proposals as Required in the Total Dissolved Solids and Nitrogen Management Plan Specified in the Water Quality Control Plan for the Santa Ana River Basin*.
- California Regional Water Quality Control Board, Santa Ana Region. (2005). *Resolution No. R8-2005-0066—Resolution Approving the San Timoteo and Beaumont Management Zones Maximum Benefit Surface Water and Groundwater Monitoring Program Proposals as Required in the Total Dissolved Solids and Nitrogen Management Plan Specified in the Water Quality Control Plan for the Santa Ana River Basin*.
- Wildermuth Environmental, Inc. (2000). *TIN/TDS Phase 2A: Tasks 1 through 5, TIN/TDS Study of the Santa Ana Watershed, Technical Memorandum*.
- Wildermuth Environmental, Inc. (2004). *San Timoteo Watershed Management Program Draft Maximum Benefit Monitoring Plan*.
- Yucaipa Valley Water District. (2004). *Monitoring Program for the Yucaipa Management Zone and San Timoteo Management Zone*.

Appendix A

Regional Board Letters



California Regional Water Quality Control Board

Santa Ana Region



Linda S. Adams
Secretary for
Environmental Protection

3737 Main Street, Suite 500, Riverside, California 92501-3348
Phone (951) 782-4130 • FAX (951) 781-6288 • TDD (951) 782-3221
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Arnold Schwarzenegger
Governor

August 13, 2008

Mr. Joe Zoba, General Manager
Yucaipa Valley Water District
12770 Second Street
Yucaipa, CA 92399

MAXIMUM BENEFIT COMMITMENT STATUS

Dear Mr. Zoba:

On January 15, 2008, I wrote to you to inquire about Yucaipa Valley Water District's (YVWD) progress toward meeting the maximum benefit commitments specified for YVWD in the Basin Plan. On February 12, 2008, you responded to my inquiry with a letter, which provided an update on the status of implementation of YVWD's commitments. In addition, by a letter dated April 15, 2008 your consultant, Wildermuth Environmental, Inc. (WEI), submitted the 2007 Annual Report for the Maximum Benefit Monitoring Program. My staff have reviewed both of these submittals and have determined that YVWD has met most of the maximum benefit commitments. However, as discussed below, YVWD has not satisfactorily completed the following two tasks: 1) Ambient Groundwater Quality Determination, and 2) Remove/Reduce the Discharge of YVWD Effluent from the Unlined Portion of San Timoteo Creek. This places YVWD's maximum benefit program in jeopardy. As you know, the failure to implement maximum benefit commitments will result in significant water quality and regulatory consequences, so it is imperative that these commitments be addressed immediately. Specifically, YVWD must take action to address the following:

- 1) Beginning in 2005 and every three years thereafter, YVWD is required to recalculate the ambient groundwater quality for the Yucaipa, and San Timoteo groundwater Management Zones¹. The recalculation was conducted by WEI for Yucaipa Management Zone in 2005 and in 2008. However, the re-calculation was not performed for the San Timoteo Management Zone in both years due to insufficient data. This issue was raised in prior discussions with you and at N-TDS/Basin Monitoring Task Force meetings. A review of the above-referenced 2007 Annual Report and the recalculation reports confirms that water quality data, and monitoring

¹ In addition to YVWD, responsibility for recalculation of ambient groundwater quality for the San Timoteo Management Zone also rests with the San Timoteo Watershed Management Authority and the City of Beaumont pursuant to their maximum benefit implementation program.

wells necessary to provide these data, are inadequate in the San Timoteo Management Zone.

In order to continue to operate under the maximum benefit program, including waste discharge limitations based on the maximum benefit objectives, YVWD is hereby required to develop a workplan and schedule for the installation of monitoring wells in the San Timoteo Management Zone that will provide adequate data for calculation of the ambient groundwater water quality. This workplan and schedule must be submitted to the Regional Board Executive Officer for approval by October 31, 2008 and is to be implemented upon his approval. Regional Board staff will evaluate the proposed workplan to ensure that proposed monitoring well locations are adequately spaced within the San Timoteo Management Zone. Our expectation is that the proposed schedule for this effort will result in completion of the well installation program as soon as possible. In short, the proposed workplan and schedule must be well justified.

- 2) YVWD's maximum benefit implementation plan specifies that by June 23, 2005, YVWD is to develop a plan and schedule to remove/reduce the discharge of effluent to the unlined portion of San Timoteo Creek. To date, we have not received a plan and schedule from YVWD. Your February 12, 2008 letter indicates that YVWD is working with the resource agencies to complete the environmental documentation and that YVWD has previously submitted an "...adaptive management plan [proposal]..." to the Regional Board in 1996 and 2001. However, these documents do not constitute the required plan and schedule for reduction/removal of effluent from San Timoteo Creek.

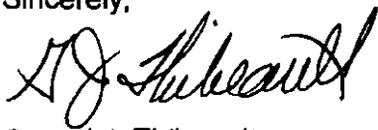
While we understand that negotiations are continuing and appreciate the difficulty that may be encountered in securing compliance with the California Environmental Quality Act and the National Environmental Policy Act (NEPA), we believe that specific plans and schedules can be developed taking these and other considerations into account. A critical path and schedule can be identified, along with alternative scenarios that will be implemented if necessitated by circumstances, such as the inability to achieve CEQA/NEPA compliance. Again, this plan and schedule is long overdue. Therefore, a proposed plan and schedule must be submitted to the Regional Board Executive Officer for review and approval as soon as possible, but no later than October 31, 2008.

Finally, since most of the monitoring required of YVWD overlaps with that being conducted by San Timoteo Watershed Management Authority/City of Beaumont as part of their maximum benefit program, we request that the annual report prepared and submitted on behalf of YVWD by your consultant be combined with the report for San Timoteo Watershed Management Authority/City of Beaumont. We believe it is more appropriate and useful to present and summarize the data for each management zone, rather than for each agency.

A similar issue with respect to implementation of maximum benefit commitments exists for Chino Basin Watermaster (Watermaster)/Inland Empire Utilities Agency (IEUA). To address the Watermaster/IEUA issues, I have scheduled an item at the September 5, 2008 Regional Board meeting for the Watermaster/IEUA to provide information to the Board on the status of their maximum benefit commitments. I may also schedule a similar presentation at a future Regional Board meeting to review the status of YVWD's maximum benefit status, including the option of scheduling a hearing to consider whether the application of the maximum benefit objectives continues to be appropriate.

If you have any questions about these comments or the maximum benefit requirements, please feel free to contact me at (951)782-3284. You may also contact Hope Smythe at (951)782-4493 (hsmythe@waterboards.ca.gov), or Cindy Li at (951)782-4906 (cli@waterboards.ca.gov).

Sincerely,



Gerard J. Thibeault
Executive Officer

cc:

Mark Wildermuth, Wildermuth Environmental, Inc.,
mwildermuth@wildermuthenvironmental.com

Mark Norton, Santa Ana Watershed Project Authority, mnorton@sawpa.org

J. Andrew Schlange, San Timoteo Watershed Management Agency, jas921@aol.com

Deepak Moorjani, City of Beaumont, dmoorjani@ci.beaumont.ca.us



**California Regional Water Quality Control Board
Santa Ana Region**



Linda S. Adams
*Secretary for
Environmental Protection*

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Arnold Schwarzenegger
Governor

August 22, 2008

RECEIVED
AUG 25 2008

BY:.....

Mr. J. Andrew Schlange
General Manager
San Timoteo Watershed Management Authority
560 Magnolia Avenue
Beaumont, CA 92223

Mr. Deepak Moorjani
City Engineer
City of Beaumont
550 East 6th Street
Beaumont, CA 92223

MAXIMUM BENEFIT COMMITMENT STATUS

Dear Messrs. Schlange and Moorjani:

On January 15, 2008, I wrote to you to inquire about the progress that the San Timoteo Watershed Management Authority (STWMA) and the City of Beaumont (City) have made toward meeting the maximum benefit commitments as specified by the Basin Plan Amendment (Regional Board Resolution R8-2004-0001). On April 15, 2008, I sent you a follow-up letter requesting an update on the status of meeting the commitments. On April 30, 2008 you responded to my inquiry with a letter, which provided an update on the status of implementation of STWMA's and the City's commitments. In addition, by a letter dated April 15, 2008, your consultant, Wildermuth Environmental, Inc. (WEI), submitted the 2007 Annual Report for the Maximum Benefit Monitoring Program. My staff have reviewed both of the submittals and have determined that STWMA and the City have met most of the maximum benefit commitments. However, as discussed below, STWMA and the City have not satisfactorily completed the following two tasks: 1) Ambient Groundwater Quality Determination; and 2) Remove/Reduce the Discharge of City's Effluent from the Unlined Portion of San Timoteo Creek. This places STWMA's and the City's maximum benefit program in jeopardy. As you know, the failure to implement maximum benefit commitments will result in significant water quality and regulatory consequences, so it is imperative that these commitments be addressed immediately. Specifically, STWMA and the City must take action to address the following:

- 1) Beginning in 2005 and every three years thereafter, STWMA and the City are required to recalculate the ambient groundwater quality for the Beaumont and San Timoteo Groundwater Management Zones¹. The recalculation was conducted by WEI for the

¹ In addition to STWMA and City, responsibility for recalculation of ambient groundwater quality for the San Timoteo Management Zone also rests with the Yucaipa Valley Water District pursuant to their maximum benefit implementation program.



Beaumont Management Zone in 2005 and in 2008. However, the re-calculation was not performed for the San Timoteo Management Zone in either year due to insufficient data. This issue was raised at N-TDS/Basin Monitoring Task Force meetings. A review of the above-referenced 2007 Annual Report and the recalculation reports confirms that water quality data, and monitoring wells necessary to provide these data, are inadequate in the San Timoteo Management Zone.

In order to continue to operate under the maximum benefit program, including waste discharge limitations based on the maximum benefit objectives, STWMA and City are hereby required to develop a workplan and schedule for the installation of monitoring wells in the San Timoteo Management Zone that will provide adequate data for calculation of the ambient groundwater water quality. This workplan and schedule must be submitted to the Regional Board Executive Officer for approval by October 31, 2008 and is to be implemented upon the Executive Officer's approval. Regional Board staff will evaluate the proposed workplan to ensure that proposed monitoring well locations are adequately spaced within the San Timoteo Management Zone. Our expectation is that the proposed schedule for this effort will result in completion of the well installation program as soon as possible. In short, the proposed workplan and schedule must be well justified.

- 2) STWMA's and the City's maximum benefit implementation plan specifies that by June 23, 2005, STWMA and the City are to develop a plan and schedule to remove/reduce the discharge of effluent to the unlined portion of San Timoteo Creek. Your April 30, 2008 letter indicates that STWMA and the City plan to leave 1.8 mgd of recycled water in Coopers Creek, a tributary to San Timoteo Creek, by 2010. We understand that this amount of continuing recycled water discharge was required by the State Water Resources Control Board and US Fish and Wildlife Service to protect beneficial uses and support the riparian resources developed downstream of the discharge point. The current (2008) discharge of recycled water is 3.0 mgd. It is not clear how STWMA and the City will accomplish the reduction to 1.8 mgd. Further, you need to provide recent modeling analysis to evaluate the impact of the continuing recycled water discharge on water quality in the San Timoteo Groundwater Management Zone. We believe that wasteload allocation analyses conducted by WEI in 2003 assumed a recycled water discharge of 2.3 mgd to the Creek by the City of Beaumont, and that no adverse impacts on the San Timoteo Groundwater Management Zone were identified. This analysis should be updated based on current knowledge and assumptions. The updated wasteload allocation analysis being conducted by WEI for discharges to the Santa Ana River system as a whole may suffice for the analysis of the effects of the 1.8 mgd discharge by the City, since a higher rate (3.0 mgd), is being assumed in the WEI analysis. Please provide the engineering plan for reduction of recycled water to Coopers Creek, and the modeling analysis to evaluate the impact of the continuing recycled water discharge on the water quality of the San Timoteo Groundwater Management Zone, by October 31, 2008.



Finally, since most of the monitoring required of STWMA and the City overlaps with that being conducted by Yucaipa Valley Water District as part of their maximum benefit program, we request that the annual report prepared and submitted on behalf of STWMA and the City by your consultant be combined with the report for Yucaipa Valley Water District. We believe it is more appropriate and useful to present and summarize the data for each management zone, rather than for each agency. For your information, we have made this request known to the Yucaipa Valley Water District.

A similar concern with respect to implementation of maximum benefit commitments exists for Chino Basin Watermaster (Watermaster)/Inland Empire Utilities Agency (IEUA). To address the Watermaster/IEUA issues, I have scheduled an item at the September 5, 2008 Regional Board meeting for the Watermaster/IEUA to provide information to the Board on the status of their maximum benefit commitments. I may also schedule a similar presentation at a future Regional Board meeting to review the status of STWMA's and City's maximum benefit status, including the option of scheduling a hearing to consider whether the application of the maximum benefit objectives continues to be appropriate.

If you have any questions about the requirements, please contact me or my staff, Hope Smythe, Senior Environmental Scientist, at (951) 782-4493, hsmythe@waterboards.ca.gov, or Cindy Li, Engineering Geologist, at (951) 782-4906, cli@waterboards.ca.gov.

Sincerely,



Gerard J. Thibeault
Executive Officer

cc: Mark Wildermuth, Wildermuth Environmental, Inc.,
mwildermuth@wildermuthenvironmental.com
Joe Zoba, Yucaipa Valley Water District, jzoba@yvwd.dst.ca.us
Mark Norton, Santa Ana Watershed Project Authority, mnorton@sawpa.org



Appendix B

Well Logs of Selected Wells in the STMZ

Project: Riverside Badlands Tunnel Segment

Log of Boring BH-19

Location: Riverside and San Bernardino Counties, CA

Sheet 1 of 10

Date(s) Drilled	9/28/94 - 9/30/94	Logged By	M. Siem	Checked By	D. Streiff
Drilling Method	Hollow-stem auger 0-15 ft; wireline core 16-155 ft	Drill Bit Size/Type	10-in. Pengo drag bit; 3.78-in. Longyear HQ3 Series 1	Total Depth Drilled (feet)	155.0
Drill Rig Type	CME 75	Drilled By	Tri-County Drilling	Inclination from Horizontal/Bearing	90°
Groundwater Level and Date Measured	44.6 ft bgs on 7/12/95	Coordinate Location	N 2302485 E 6295861	Surface Elevation (feet)	1783.0
Diameter of Hole (inches)	10; 3.78	Diameter of Well (inches)	4	Type of Well Casing	Schedule 40 PVC
Type of Sand Pack	#3 Monterey sand	Type/Thickness of Seal(s)	Bentonite pellets 30-26 ft; bentonite-cement grout 26 ft to ground surface		
Comments	Alignment Sta 1334 + 11.14 W 28.41. Hole took approx. 20 gallons drilling fluid per 5-ft run from 55-155 ft.				

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE							MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R O D, %	Fracture Drawing/Number	Lithology					
0		M-1	12°											1257	
2															
	1780														
4															
6		M-2	25°											1306	
8															
	1775														
10		M-3	16°											1315	
12															

◊ indicates MC sampler blow count multiplied by 0.8 to correlate with SPT sampler blow count

Project: Riverside Badlands Tunnel Segment

Log of Boring BH-19

Location: Riverside and San Bernardino Counties, CA

Sheet 2 of 10

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE						MATERIAL DESCRIPTION	Wall or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS	
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R O D, %	Fracture Drawing/Number						Lithology
12															
	1770														
14															
		M-4	28	1	1	58		N/A							
16															
18	1765														
20															
22															
24	1760														
26															
28															

DMJM

Woodward-Clyde Consultants

Project: Riverside Badlands Tunnel Segment
Location: Riverside and San Bernardino Counties, CA

Log of Boring BH-19
 Sheet 3 of 10

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE						MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS		
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R Q D, %	Fracture Drawing/Number						Lithology	
28	-1755															
30				4		20								1503 1510		
32																
	-1750															
34																
				5		16								1519 1534		
36																
38	-1745															
40				6		100								1545 1604		
42																
	-1740			7		68								1607 1618		
44																

Project: Riverside Badlands Tunnel Segment
Location: Riverside and San Bernardino Counties, CA

Log of Boring BH-19

Sheet 4 of 10

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE					Lithology	MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R Q D, %						
44										Moist, light olive brown, elastic SILT (MH) (continued).				No core recovery 44.1-45.0 ft.
				8		46								1624 9/28/94.
														0733 Resumed drilling on 9/29/94.
46										Moist, light to moderate brown, SILTY SAND (SM), fine- to medium-grained.			(50)	
														No core recovery 47.3-50.0 ft.
48	1735													
50				9		80								0739 0746
52										Interbaddad moist, yellowish gray to dusky yellow, poorly graded SAND (SP), coarse-grained, and SILTY SAND (SM), fine- to medium-grained.				
54	1730					2								At 53.0 ft: SA(19) WC = 1
														No core recovery 54.0-55.0 ft.
56										With trace (< 1%) gravel to 2 in.				0755 0759
										Becomes black.				
										Increasing gravel content to < 5%.				(43)
														No core recovery 56.3-60.0 ft; matrix washing out, only gravel recovered.
58	1725													
60														0806

Project: Riverside Badlands Tunnel Segment
Location: Riverside and San Bernardino Counties, CA

Log of Boring BH-19

Sheet 6 of 10

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE						Lithology	MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R O D, %	Fracture Drawing/Number						
76											Soft, moist, olive gray, fat CLAY (CH); laminated (continued).			(14)	
78	1705			15		0	N/A	N/A			Moist, light olive gray, SILTY SAND with GRAVEL (SM). ~15% gravel typically <0.75 in.; interbedded with olive gray to light olive gray, poorly graded SAND with SILT (SP-SM), fine- to medium-grained, and lean CLAY (CL).		0908 0916	No core recovery 77.5-80.0 ft.	
							N/A		NR					(38)	
80				16		48	N/A	N/A					0920 0925		
							N/A							(38)	Lab Sample #6 80.8-81.2 ft. SA(8) WC = 23
82				17		28	N/A	N/A					0929 0936	No core recovery 81.2-82.5 ft.	
	1700						N/A							(21)	No core recovery 83.2-85.0 ft.
84				18		92	N/A	N/A					0943 0948		
							N/A				Moist, pale olive, SILT (ML) and lean CLAY (CL); finely laminated and interbedded; trace black organics.			(30)	
86				19		52	N/A	N/A					0953 0959	No core recovery 85.9-87.3 ft. No core recovery 87.3-87.5 ft.	
	1695						N/A							(15)	No core recovery 88.8-90.0 ft.
88				20		28	N/A	N/A					1008 1012		
							N/A				Moist, pale olive, SILTY SAND (SM), fine- to medium-grained; 1- to 2-in.-thick interbeds of CLAYEY SAND (SC) and gravel.			(30)	No core recover 90.7-92.5 ft.
90							N/A								
92							N/A								

Project: Riverside Badlands Tunnel Segment
Location: Riverside and San Bernardino Counties, CA

Log of Boring BH-19
 Sheet 7 of 10

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE					MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R Q D, %					
92	-1690			21	16	N/A	N/A	NR	Moist, olive gray, SANDY SILT (ML) and SANDY lean CLAY (CL); fine-grained sand; finely laminated, interbedded.			1017	No core recovery 92.9-95.0 ft.
						N/A		NR				(25)	
94						N/A		NR	Moist, olive gray, SILT with SAND (ML); interbeds of poorly graded SAND with GRAVEL (SP), medium- to coarse-grained.			1028	Lab Sample #8 95.0-95.4 ft. SA/HQ(80) WC = 34
				22	16	N/A	N/A	NR				(25)	
96						N/A		NR	Moist, pale olive, SILTY GRAVEL with SAND to SILTY SAND with GRAVEL (GM/SM); recovered only clasts 0.25 in. to >3 in., matrix washed out, friable(?).			1047	No core recovery 97.5-100.0 ft.
				23	0	N/A	N/A	NR				(30)	
98	-1685					N/A		NR				1056	No core recovery 100.0-102.5 ft.
				24	0	N/A	N/A	NR				(30)	
100						N/A		NR				1110	No core recovery 102.5-105.0 ft.
				25	0	N/A	N/A	NR				(25)	
102	-1680					N/A		NR				1126	Changed 5-ft-long drill rod for 10-ft.
				26	0	N/A	N/A	NR				(14)	
104						N/A		NR				1206	No core recovery 107.5-110.0 ft.
				27	0	N/A	N/A	NR				(14)	

Project: Riverside Badlands Tunnel Segment
Location: Riverside and San Bernardino Counties, CA

Log of Boring BH-19
 Sheet 8 of 10

Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE					Lithology	MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS		
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R O D, %							Fracture Drawing/Number	
108	1675									Moist, pale olive, SILTY GRAVEL with SAND to SILTY SAND with GRAVEL (GM/SM); recovered only clasts 0.25 in. to >3 in., matrix washed out, friable(?) (continued).			(12)	No core recovery 107.5-110.0 ft. Rig chatter.		
110				28		0		N/A	NR				1238 1258	No core recovery 110.0-115.0 ft.		
								N/A						(30)	Slight rig chatter	
112								N/A	NR							
	1670							N/A								
114								N/A								
								N/A								
116				29		33		N/A			Moist, pale olive, SILTY GRAVEL with SAND (GM); granodiorite gravel typically 1 in., occasionally to 1.5 in., matrix washed out, friable(?).			1308 1323	Rig chatter.	
								N/A	NR						(13)	No core recovery 116.0-118.0 ft.
								N/A								
118	1665			30		15		N/A		3.5-in. cobble.				1337 1346	No core recovery 118.3-120.0 ft.	
								N/A	NR				(30)	Heavy rig chatter. Pulled HQ3 rod to check bit condition.		
120				31		20		N/A					1350 1456			
								N/A					(18)	Intermittent slight rig chatter.		
122								N/A	NR					No core recovery 121.6-125.0 ft; coarse-grained sand in cuttings.		
124	1660							N/A								

Project: Riverside Badlands Tunnel Segment
Location: Riverside and San Bernardino Counties, CA

Log of Boring BH-19

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Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE						MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS	
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R Q D, %	Fracture Drawing/Number						Lithology
124															
				32	3	30		N/A		NR					
								N/A						1513	
								N/A						1525	
126								N/A						(23)	
								N/A							Rig chatter.
								N/A							No core recovery 126.5-130.0 ft.
128	1655							N/A		NR					
								N/A							
								N/A							
130				33		26		N/A						1538	
								N/A						1541	
								N/A							
								N/A							(14) Slight rig chatter.
								N/A							No core recovery 131.3-135.0 ft.
132								N/A		NR					
								N/A							
								N/A							
134	1650							N/A		NR					
								N/A							
								N/A							
136				34		0		N/A						1603	
								N/A						1612	No core recovery 135.0-140.0 ft.
								N/A							
								N/A							(50) Decreased rig chatter; faster drilling.
								N/A		NR					
138	1645							N/A							
								N/A							
								N/A							
140								N/A						1618	

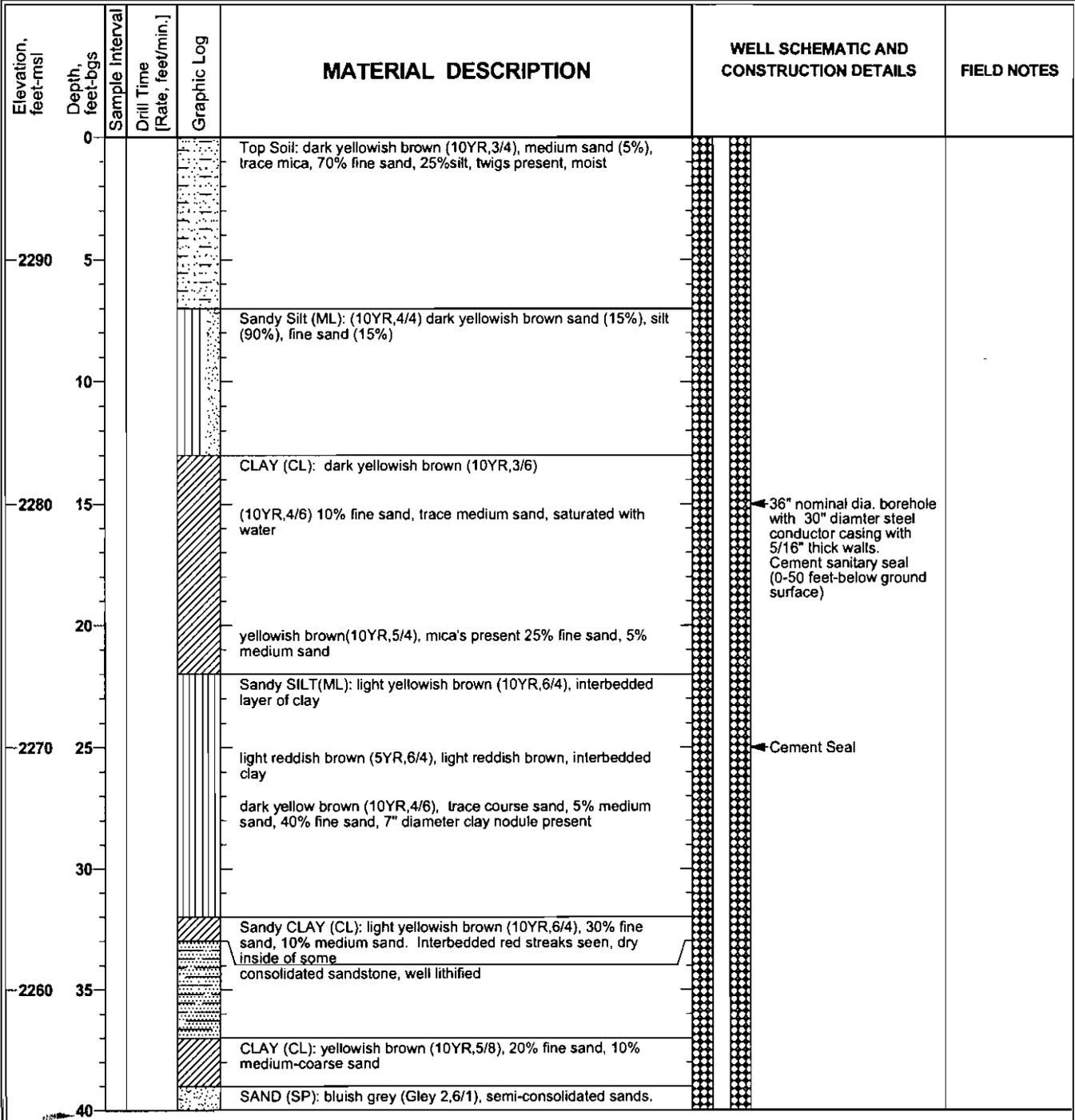
Depth, feet	Elevation, feet	SOIL SAMPLES		ROCK CORE					Lithology	MATERIAL DESCRIPTION	Well or Hole Completion	Packer Tests	Drill Time, 24-hr (Rate, ft/hr)	FIELD NOTES AND LAB TESTS
		Type Number	Blows/ft	Run No.	Box No.	Recovery, %	Frac. Freq.	R Q D, %						
140				35		2B		N/A				Moist, pale olive, SILTY GRAVEL with SAND to SILTY SAND with GRAVEL (GM/SM), fine-grained; recovered material is ~40-50% clasts to 3 in.	1624	
142							N/A			(30)			No core recovery 141.4-145.0 ft.	
144	1640						N/A	NR						
146				36		26		N/A					1634 1639	
148	1635						N/A						(21)	No core recovery 146.3-150.0 ft.
150				37		68		N/A			1653 1703			
152							N/A				(25)	Lab Sample #9 151.3-151.7 ft.		
154	1630						N/A						No core recovery 153.4-155.0 ft. End drilling for 9/29/94. On re-entering hole on 9/30/94, hole had caved to 56 ft.	
156							N/A	NR				1715		
Bottom of boring at 155.0 feet.														

Project Name: STWMA PC-1
Project Location: Beaumont, California
Project Number: 050-003-001
Client: BCVWD/STWMA

Boring Log / H-1

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Date Started	8/10/06	Date Finished	8/16/06	Borehole Depth	818.0 feet	Drilling Contractor	Best Drilling
Lat.	33° 56' 11"	Long.	117° 2' 4"	Drill Bit Size/Type	24-inch Tri-cone	Driller	Mike Kennedy
Ground Surface Elevation	2295.0 feet	Screened Interval(s)	160-360, 390-540	Drill Rig Type	Failing Jed-A		
Top of Casing Elevation	2295.0 feet	Depth to Groundwater	6'/08-10-06	Drilling Method	Flooded Reverse Circulation		
Logged By	T.Rolfe	Reviewed By	B. Laever, PG, CHG	Sampling Method	Grab		



Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
Project Number: 050-003-001
Client: BCVWD/STWMA

Boring Log / H-1

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
	40				Mica;s, quartz and plagioclase present		
					Clayey SAND (SW): light olive brown (2.5YR,5/6)		
					Clayey SAND (SW): yellowish brown (10YR,5/8), gravel		
	45						
					Clay with SAND (CL): dark yellowish brown (10YR,4/6), medium gravel present, angular to sub-angular		
2240							
	50				CLAY (CL): light olive brown (2.5Y,5/4), interbedded with fine sandstone and gravel clasts.		
					Silty CLAY (ML): yellowish brown (10YR,5/4), fine, poorly graded sand		
					CLAY (CH): light olive brown (2.5Y,5/4)		
					CLAY (CH): clay with sand		
	55						
					Clayey SAND (SC): light olive brown (2.5Y,5/4)		
2230					Gravelly CLAY (GC): yellowish brown (10YR,5/4), medium sand, fine gravel		
	60				Sandy CLAY (SC): light olive brown (2.5Y,5/4), fine to medium sand		
					SAND (SW): light yellowish brown (2.5Y,6/4), 70% fine sand, 20% medium sand, 10% coarse sand		
	65				light brown (7.5YR,6/4), 15% fine sand, 25% medium sand, 20% coarse sand, quartz, feldspar with gravel, sub-angular to sub-rounded.		
2220							
	70				CLAY (CL): light olive brown (2.5Y,5/6)		
					Sand with GRAVEL (SW): light grey (10YR,7/1)		
	75						
2210							
	80				Clay with SAND (CH): light olive brown (2.5Y,5/6)		
					Clay with Gravel and SAND (CH): olive (5Y,5/4) subrounded minerals (quartz & feldspar) and granite clasts		
	85						



Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
Project Number: 050-003-001
Client: BCVWD/STWMA

Boring Log / H-1

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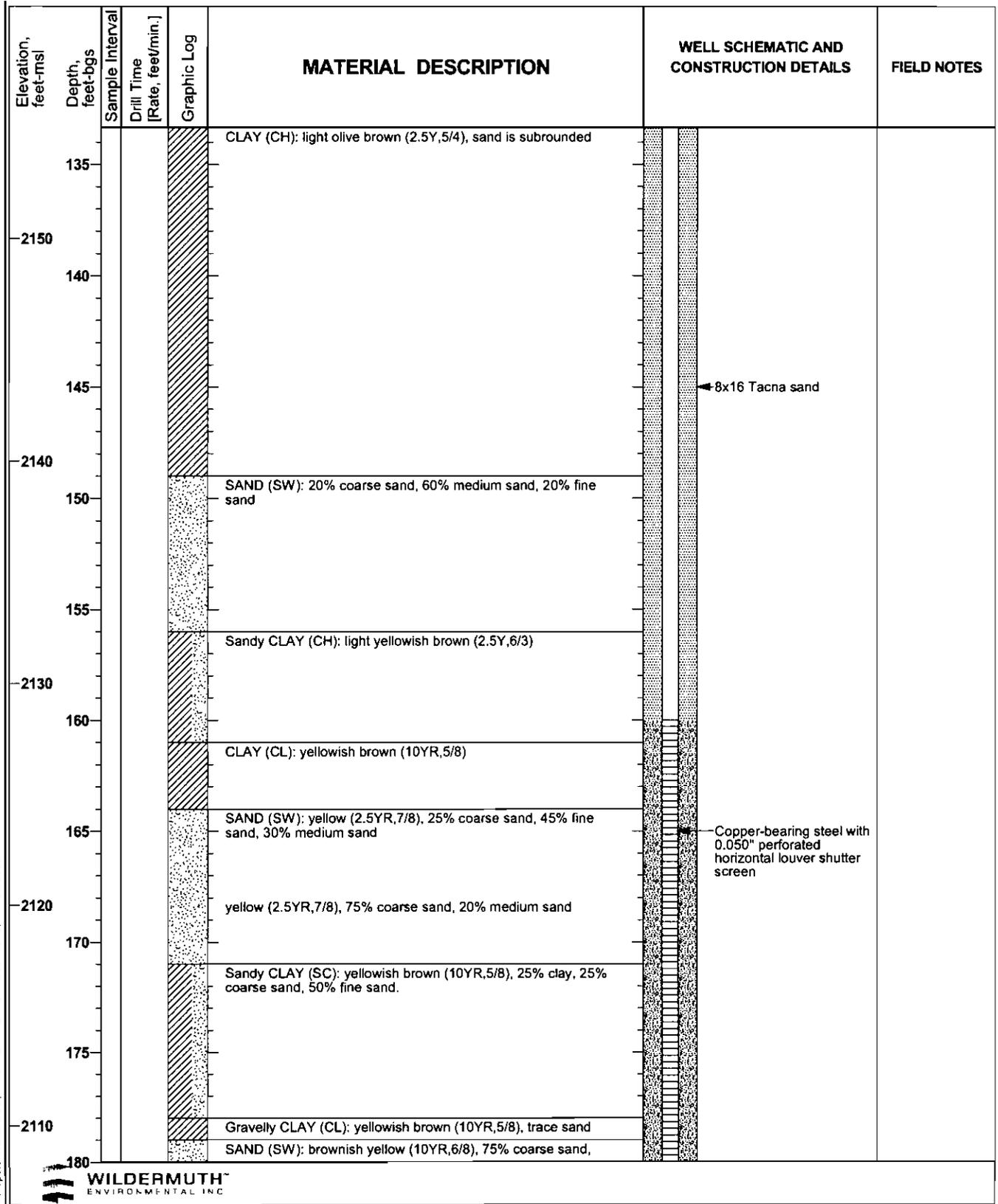
Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
2200	90				SAND (SW): pale olive (5Y,6/3), 30% gravel, 20% sand, 40% medium sand, 10% fine sand		
	95				Sandy CLAY (CH): olive (5Y,5/4), medium to coarse sand		
2190	100				SAND (SW): pale brown (10YR,6/3), 70% medium sand, 20% coarse sand, 10% fine sand, trace gravel		
	105				Clay with Gravel and SAND (CH): light olive brown (2.5Y,5/4), sub-rounded clasts (2mm-2") in size		
2180	110				Clayey GRAVEL (CG): light yellowish brown (2.5Y,6/4), sub rounded granite		
	115				Clayey GRAVEL (CH): light olive brown (2.5Y,5/3), sub-rounded clasts		
2170	120				SAND (SW): light brownish grey (2.5Y,6/2), gravel is sub-angular to sub-rounded, sand is fine to coarse		
	125				CLAY (CH): light olive brown (2.5Y,5/4), trace fine gravel, well rounded		
	130				CLAY with SAND (CH): light olive brown (2.5Y,5/4), sub-angular sand (med-coarse)		
2160	130				SAND (SW): light grey (10YR,7/2), 15% coarse sand, 65% medium sand, 15% fine sand, 5% fine gravel. Epidote present, interbedded clay and sand lenses		

Report WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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Report WELL LOG, File, HEARTLAND WELL 1.GPJ, 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
Project Number: 050-003-001
Client: BCVWD/STWMA

Boring Log / H-1

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
180					sub-angular to angular, 15% fine sand, trace gravel, 5% clay		
					CLAY (CH): very pale brown (10YR,7/4), 5% coarse sand, 5% medium sand		
185					olive (5Y,5/4)		
					olive (5Y,5/4), coarse sand		
2100							
190					Sandy CLAY (SC): olive grey (5YR,4/2), 25% fine sand, 25% medium sand		
					pale yellow (10YR,7/4), 30% fine sand		
					yellowish brown (10YR,5/4), coarse sand		
195					light olive brown (2.5YR,5/4), coarse sand, trace gravel		
					yellow (10YR,7/8), trace gravel		
2090							
200					yellowish brown (10YR,5/4), trace medium sand		
					yellowish brown (10YR,5/6), 5% medium to coarse sand, angular to subangular		
					olive (5Y,5/4), trace medium sand		
205					very dark grayish brown (2.5YR,3/2), medium to coarse sand, trace gravel		
					very dark grayish brown (2.5YR,3/2), medium sand		
2080							
210					olive brown (2.5YR,3/2), 10% medium sand		
					light yellowish brown (10YR,6/4), fine sand		
					light yellowish brown (10YR,6/4), fine sand		
215					light olive brown (2.5YR,5/4), fine sand		
					light brownish grey (2.5Y,6/2), fine sand		
2070							
220					yellowish brown (2.5Y,6/2), fine to medium sand		
					yellowish brown (10YR,5/8), fine sand		
225					olive brown (2.5Y,4/3), some fine sand		

8x16 Tacna sand

Copper-bearing steel with 0.050" perforated horizontal louver shutter screen

Report: WELL LOG; File: HEARTLAND WELL 1 G.P.J. 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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Client: BCVWD/STWMA

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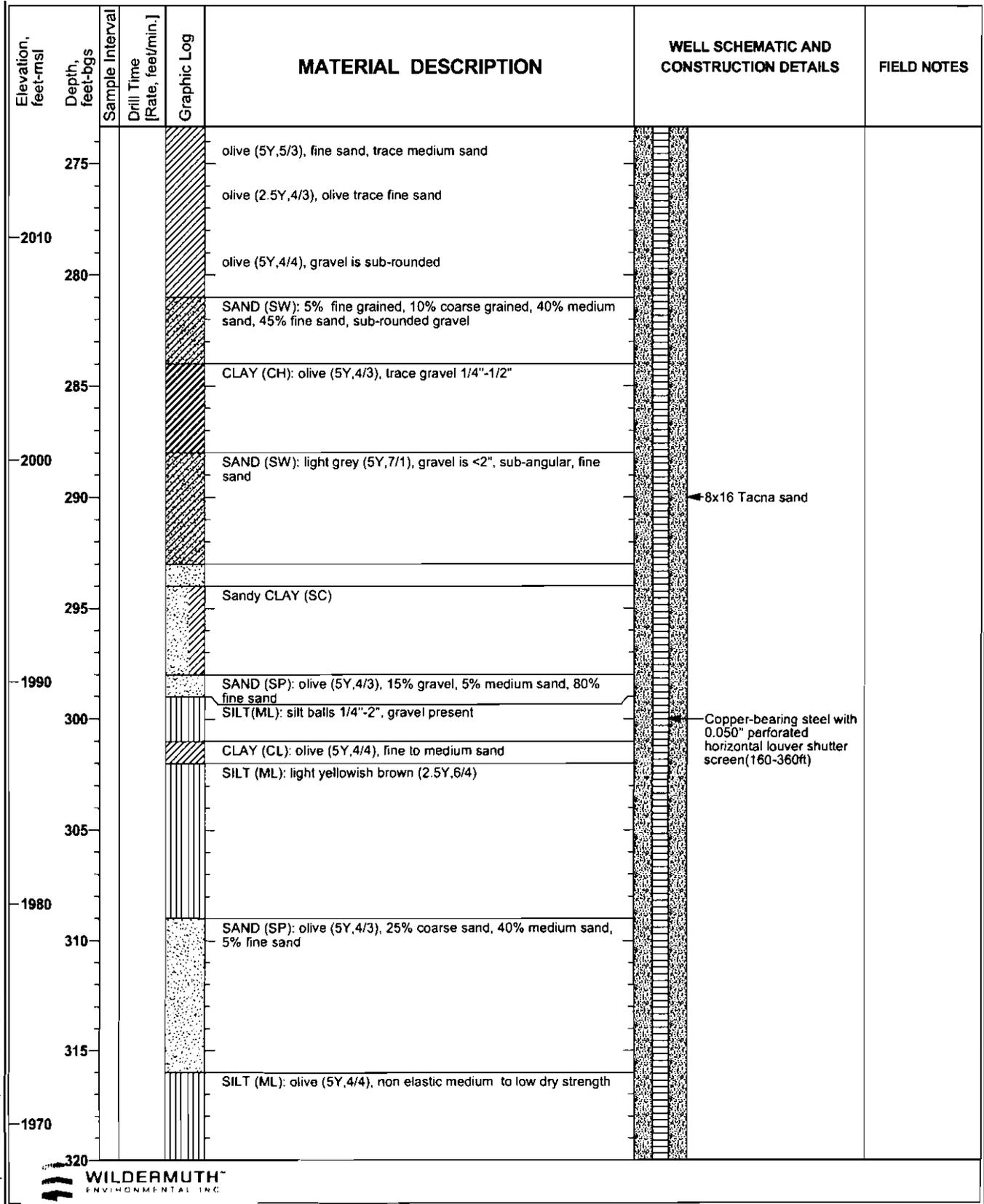
Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
-2060	230				olive brown (2.5Y,4/3), fine to medium sand		
					yellowish brown (10YR,6/8)		
	235				yellow (10YR,7/6), fine to medium sand		← 8x16 Tacna sand
					yellowish brown (10YR,5/6), medium to fine sand		
-2050	240				SAND (SW): olive brown (2.5Y,4/4), 90% medium sand, 6% coarse sand		
					olive brown (2.5Y,8/4), 95% medium sand, 4% coarse sand		
	245				Clayey SAND (SC): olive (5Y,5/4) 50-60% medium to coarse sand, trace gravel		
					SAND (SW): olive (5Y,4/3), 70% medium sand, 20% fine sand, 10% coarse sand, trace gravel		
-2040	250				light olive brown (2.5Y,5/4), 80-95% fine to coarse sand, trace gravel		
					olive (5Y,4/3), 55-60% medium sand, 30% fine sand. Gravel is sub-rounded-sub-angular.		
					light olive brown (2.5Y,5/4), 25% medium sand, 50% coarse sand. Gravel is sub-rounded, sub-angular		
	255				Clayey SAND (SC): light olive brown (2.5Y,5/3), 60% coarse sand, 20% medium to fine sand, trace gravel		← Copper-bearing steel with 0.050" perforated horizontal louver shutter screen(160-360ft)
					Sandy CLAY (SC): pale brown (10YR,6/3), pale brown 20% fine to medium sand, 10% coarse sand, some gravel		
-2030	260				CLAY (CL): pale brown (10YR,6/3), coarse sand, trace gravel		
					Sandy CLAY (SC): dark grey (5Y,4/1), medium to coarse sand, trace gravel		
	265				SAND (SW): dark grayish brown (2.5YR,4/2), 55% medium sand, 40% coarse sand, gravel is sub-rounded to angular		
-2020	270				olive brown (2.5YR,4/4), 70% medium sand, 20% coarse sand, gravel is sub-rounded to angular		
					CLAY (CL): olive (5Y,4/4), coarse sand, some gravel (sub-rounded to sub-angular)		

Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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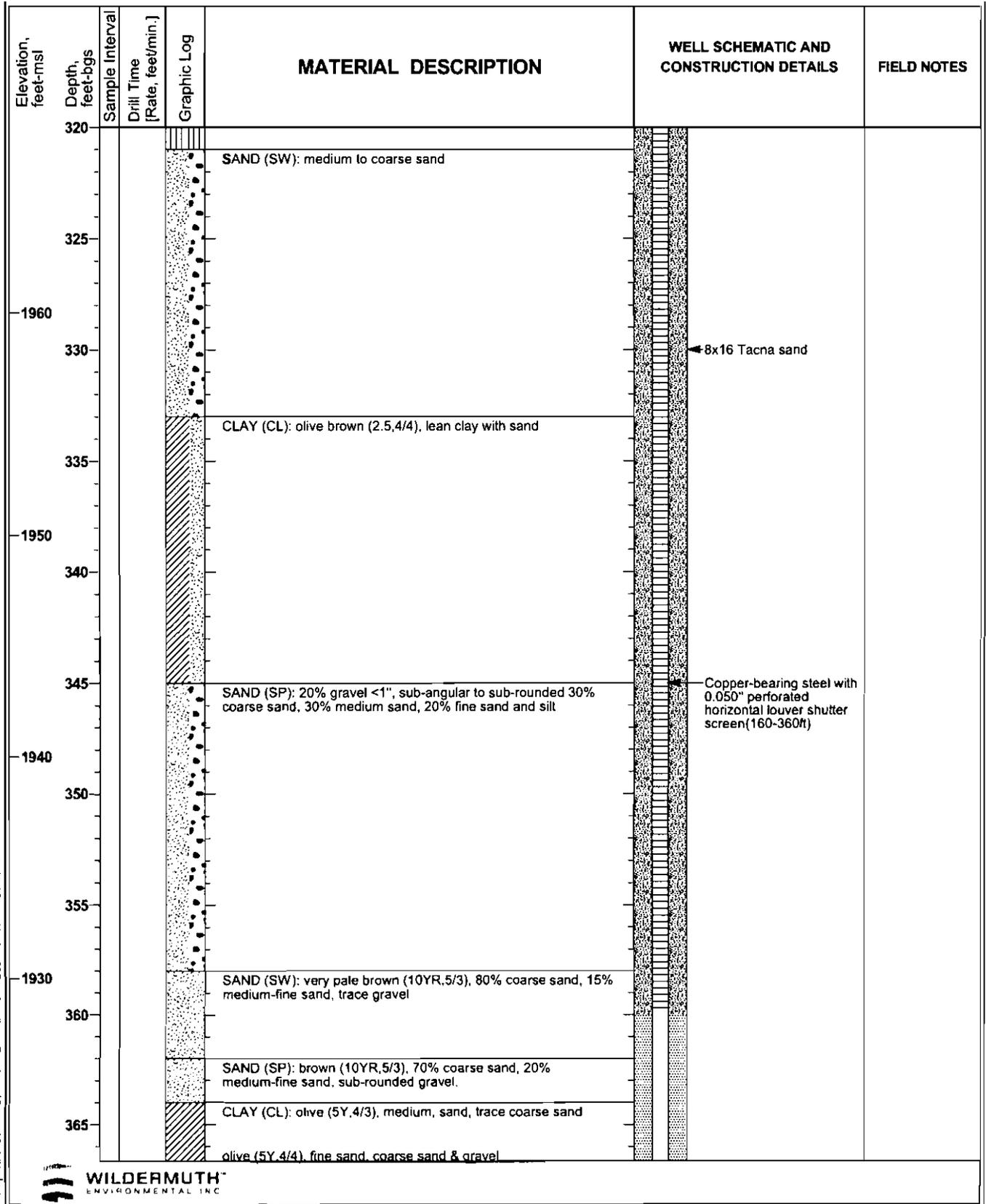


Report WELL LOG, File: HEARTLAND WELL 1.GPJ, 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
Project Number: 050-003-001
Client: BCVWD/STWMA

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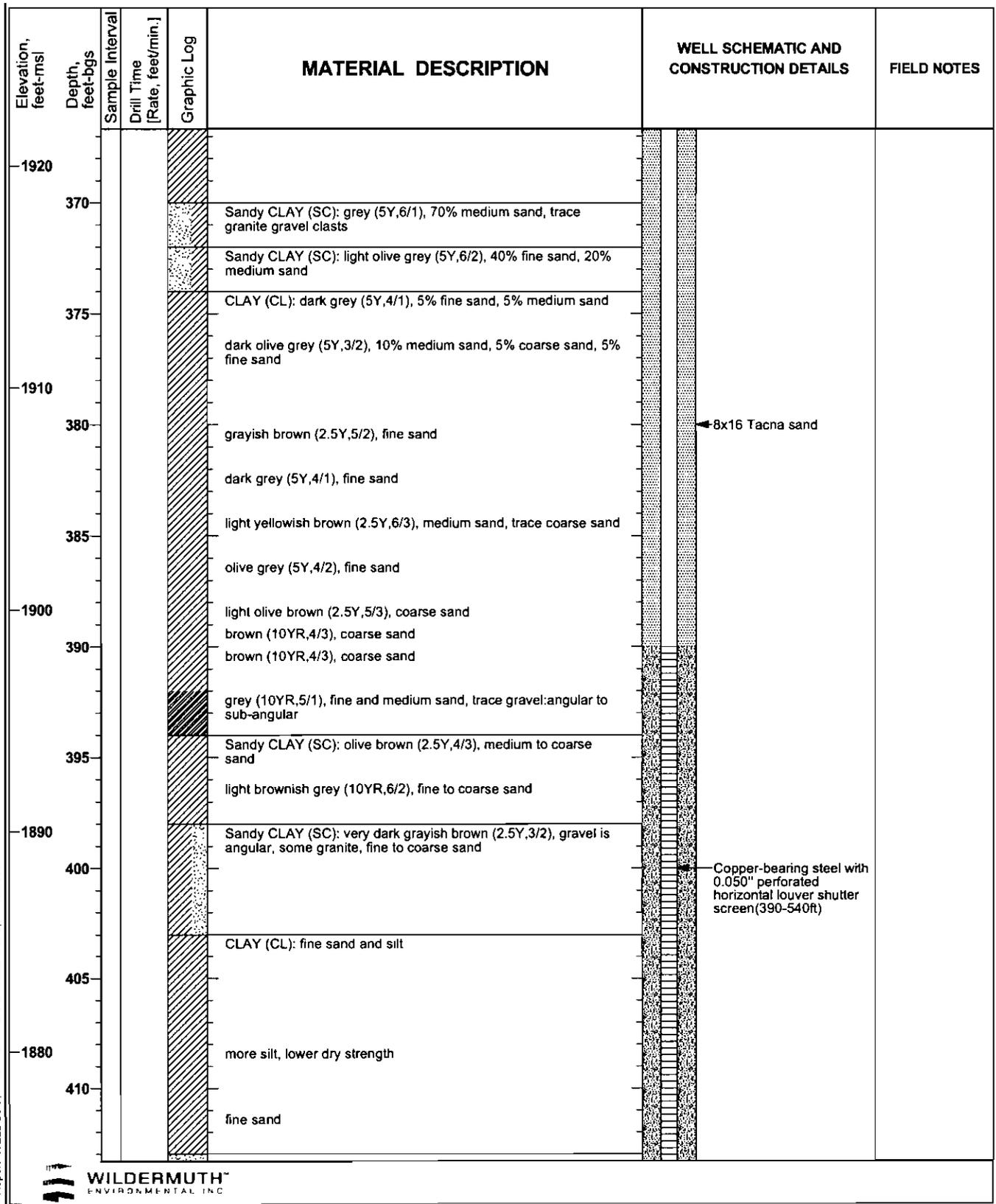


Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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Client: BCVWD/STWMA

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Project Location: Beaumont, California
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Client: BCVWD/STWMA

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
415					SAND (SP): poorly graded, mostly medium sand		
1870							
420							
425							
1860							
430							
435						Copper-bearing steel with 0.050" perforated horizontal louver shutter screen (390-540ft)	
1850							
440							
445							
1840							
450					grades to clay	8x16 Tacna sand	
455					CLAY (CL): olive brown (2.5Y, 4/4), lean clay with sand, medium sand		
1830							
460					SAND (SP): olive (5Y, 5/4), 90% fine sand, 10% medium sand		

Report WELL LOG: File: HEARTLAND WELL 1.GPJ: 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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Client: BCVWD/STWMA

Boring Log / H-1

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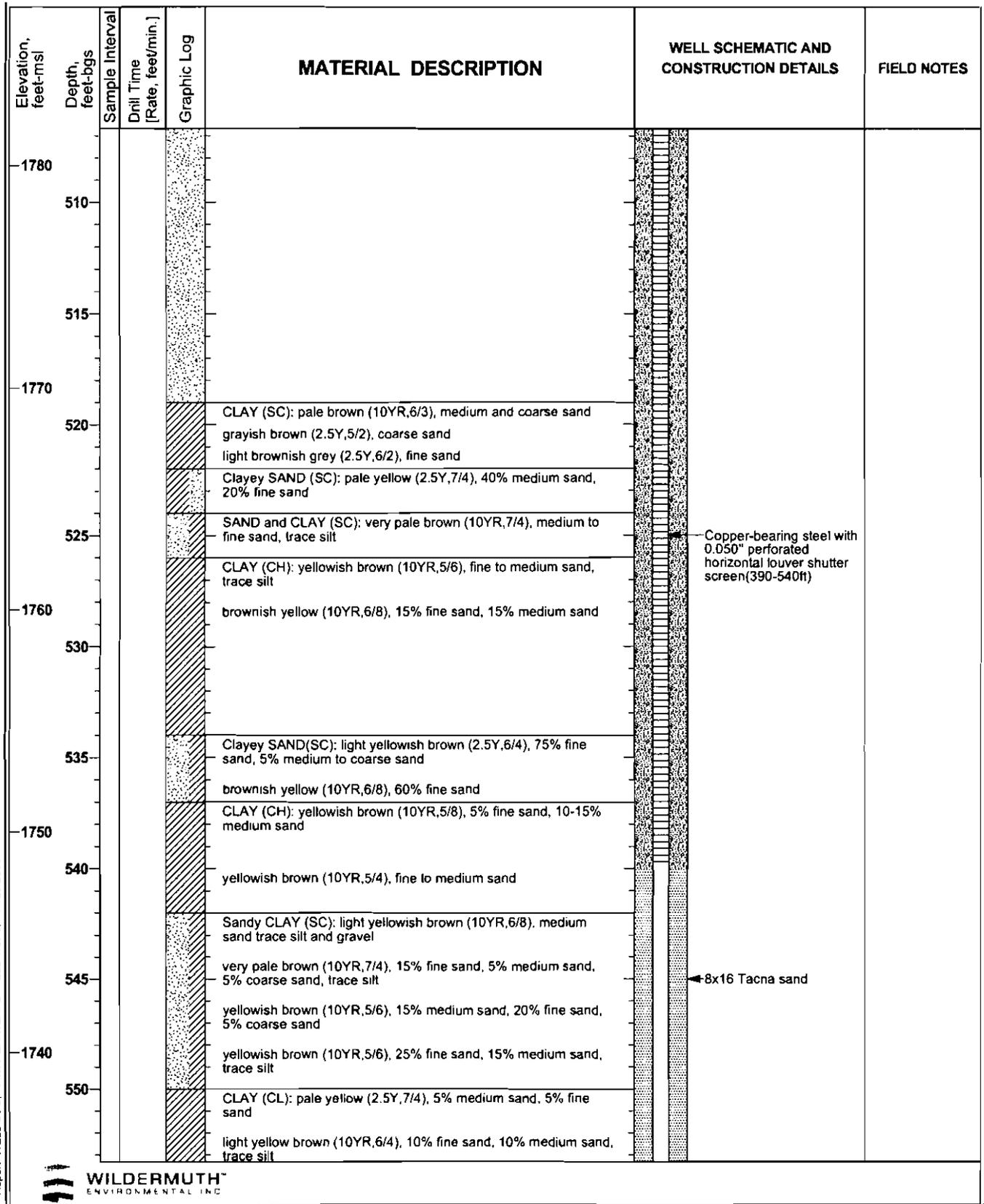
Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
					light olive grey (5Y,6/2), fine gravel, sub-rounded		
465							
1820					CLAY (CL): olive (5Y,4/3), clay is stiff, coarse sand, trace of fine gravel		
470						← 8x16 Tacna sand	
475					CLAY (CL): olive (5Y,4/3), medium to coarse sand		
1810							
480					SAND (SP): light olive grey (5Y,6/2), mostly fine sand, some medium sand, very uniform with silt	← Copper-bearing steel with 0.050" perforated horizontal lower shutter screen (390-540ft)	
485							
1800					CLAY (CL): light olive brown (2.5Y,5/3)		
490					SAND (SP): light brownish grey		
					CLAY (CH): light brownish grey (2.5Y,6/2)		
495							
1790					light olive brown (2.5Y,5/4), trace of coarse sand		
500							
					SAND (SP): light olive brown (2.5Y,5/3), with clay		
505					SAND (SP): olive (5Y,5/3), with fine gravel		

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Report WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
555					Clayey SAND (SC): light yellowish brown (2.5Y,6/4), 30% fine sand, 20% medium sand, trace silt	<p>8x16 Tacna sand</p> <p>end cap</p>	
1730					light olive brown (2.5Y,5/3), coarse sand, sub-rounded gravel, feldspar, granite, gravel pieces light yellow brown (10YR,6/4), medium to coarse sand		
560					brown (10YR,5/3), fine to medium sand		
565					Clayey Gravelly SAND (CGS): very pale brown (10YR,8/3), sub-angular gravel, medium to coarse sand		
565					Sand with CLAY (SC): light olive brown (2.5Y,5/4), fine to medium sand, 10% coarse sand, trace silt		
1720					pale yellow (2.5Y,7/4), 25% fine sand, 25% medium sand, trace silt		
570					light yellowish brown (2.5Y,7/4), sub-angular to sub-rounded gravel, fine coarse sand		
570					brownish yellow (10YR,6/6), 40% fine sand		
575					very pale brown (10YR,7/3), very pale brown 20% medium to coarse sand, 20% fine sand, trace gravel		
575					SAND (SW): light yellowish brown (10YR,6/4), 70% fine sand, 10% medium to coarse sand, sub-rounded gravel		
1710					yellowish brown (10YR,5/6), 60% fine sand, 30% medium sand, angular gravel		
580							
585					CLAY (CH): light yellowish brown (10YR,6/4), fine to medium sand		
585					Clayey SAND (SC): light olive brown (2.5Y,5/6), 40% medium sand, 20% fine sand, trace gravel		
585					CLAY (CH): light olive brown (2.5Y,5/6), 15% fine sand, 5% medium sand		
1700					light olive brown (2.5Y,5/6), light olive brown 10% fine sand, 5% coarse sand, 5% medium sand		
590					Sandy CLAY (SC): yellowish brown (10YR,5/4), 30% fine sand, 10% medium to coarse sand		
590					yellowish brown (10YR,5/6), fine sand		
595					CLAY(CL): pale yellow (2.5Y,7/3), fine sand		
595					yellowish brown (10YR,6/6), fine to medium sand		
595					yellowish brown (10YR,5/4), fine sand		
1690					Sandy Silty CLAY (SMC): olive brown (2.5Y,4/4), some silt, fine sand		
600							

Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
600					Sandy CLAY (SC): light to olive brown (2.5Y,5/6), medium to coarse sand, some silt		
					Sandy Silty CLAY (SMC): olive (5Y,5/4), medium coarse sand		
605					CLAY (CH): light olive brown (2.5Y,5/4), fine to medium sand, some silt		
1680					yellowish brown (10YR,5/6), medium coarse sand		
610					light yellowish brown (2.5Y,6/3), medium sand		
					yellowish brown (10YR,5/8), fine to medium sand		
615					Sandy CLAY (SC): brownish yellow (10YR,6/6), fine sand, trace gravel & silt		
					dark yellowish brown (10YR,4/4), 20% medium sand, 15% fine to coarse sand, some silt		
1670					SAND (SW): olive brown (2.5Y,4/3), 20% fine sand, 40% medium sand, 30% coarse sand, some silt and gravel		
620					Clayey SAND (SC): light olive grey (5Y,6/2), 40% medium to fine sand, 30% coarse sand		
					light yellowish brown (2.5Y,6/4), fine sand, trace coarse sand, some silt		
625					Silty Sandy CLAY (MSC): light olive brown (2.5Y,5/4), medium sand		
					Silty SAND (MS): yellowish brown (10YR,6/4), 30-50% fine to medium sand, trace gravel		
1660					Clayey Silty SAND (CMS): olive (5Y,5/4), 30% fine to medium sand, 15-30% coarse sand		
630					Sandy Silty CLAY (SMC): light olive brown (2.5Y,5/4), fine to coarse sand		
					Silty Sandy CLAY (MSC): light olive brown (2.5Y,5/4), fine to medium sand		
635					olive brown (2.5Y,4/3), fine sand		
					olive brown (2.5Y,4/4), fine to medium sand		
1650					SAND (SP): light yellow brown (2.5Y,6/4), fine sand, silt		
640					Silty SAND (MS): olive yellow (2.5Y,6/6), fine to medium sand		
645					light yellowish brown (2.5Y,6/3), fine to medium sand		

Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
-1640					Clayey SILT (ML): light olive brown (2.5Y,5/6), fine to medium sand		
	650				Clayey SILT (ML): light olive brown (2.5Y,5/6), fine sand		
					Sandy CLAY (SC): olive yellow (2.5Y,6/6), fine to medium sand		
					Silty CLAY (MC): yellow (10YR,7/6), fine sand		
	655				CLAY (CL): light yellowish brown (10YR,6/4), fine to medium sand		
-1630							
	660				SAND (SP): olive (5Y,4/3), 50% fine sand, 10% medium sand		
					Silty SAND (ML/SW): olive grey (5Y,5/2), 50% fine sand, 10-15% medium sand		
	665						
					Silty Sandy CLAY(MSC): light olive brown (2.5Y,5/3), 25% medium sand, 25% light yellowish brown (2.5Y,6/4)		
-1620							
	670				Sandy CLAY (SC): light yellowish brown (2.5Y,6/3)		
					light yellowish brown (2.5Y,6/4), fine sand		
					olive brown (2.5Y,4/3), fine to medium sand		
	675						
					CLAY (CH): light olive brown (2.5Y,5/4), fine to medium sand		
-1610							
	680				olive (5Y,5/6), fine to medium sand, sub-rounded		
	685						
-1600							
	690						

Report WELL LOG, File: HEARTLAND WELL 1.GPJ, 11/29/2006

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Project Location: Beaumont, California
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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
695							
1590					CLAY (CH): olive (5Y,5/6)		
700							
705							
1580					olive (5Y,4/3), some well rounded sand		
710							
715					SAND (SW): some well graded sand		
1570							
720							
725					SAND (SW): pale olive (5Y,6/3), sub-rounded sand with trace gravel		
1560							
730							
735					CLAY (CH): fat clay with sand		
1550							
740							

Report: WELL LOG; File: HEARTLAND WELL 1.GPJ; 11/29/2006

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Project Location: Beaumont, California
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Boring Log / H-1

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Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
745					SAND (SW): well graded sand, trace silt		
					CLAY with SAND(SC): light olive brown (2.5Y,5/4)		
1540							
750							
755							
1530							
760							
765							
1520							
770					SAND (SW): yellowish brownish grey (2.5Y,6/2), well graded sand		
					CLAY with SAND (SC): light olive brown (2.5Y,5/4)		
775					SAND with CLAY (SC): light olive brown (2.5Y,5/3)		
1510							
780					CLAY (CH): light olive brown (2.5Y,5/6), fine to medium sand		
785							

Report WELL LOG: File: HEARTLAND WELL 1 GP.J, 11/29/2006

Project Name: STWMA PC-1
Project Location: Beaumont, California
Project Number: 050-003-001
Client: BCVWD/STWMA

Boring Log / H-1

Sheet 18 of 18

Elevation, feet-msl	Depth, feet-bgs	Sample Interval	Drill Time [Rate, feet/min.]	Graphic Log	MATERIAL DESCRIPTION	WELL SCHEMATIC AND CONSTRUCTION DETAILS	FIELD NOTES
-1500	790				SILT (ML): light yellowish brown (2.5Y,6/3)		
					CLAY (CH): olive brown (2.5Y,4/4), fine to medium sand		
	795						
	800						
	805						
-1480	810				CLAY (CH): brown (7.5YR,5/4), some fine sand		
	815				SAND (SW): light olive brown (2.5Y,5/4), fine to coarse sand, sub-rounded		
-1470	820						
	825						
-1460	830						

Report: WELL LOG, File: HEARTLAND WELL 1.GPJ, 11/29/2006

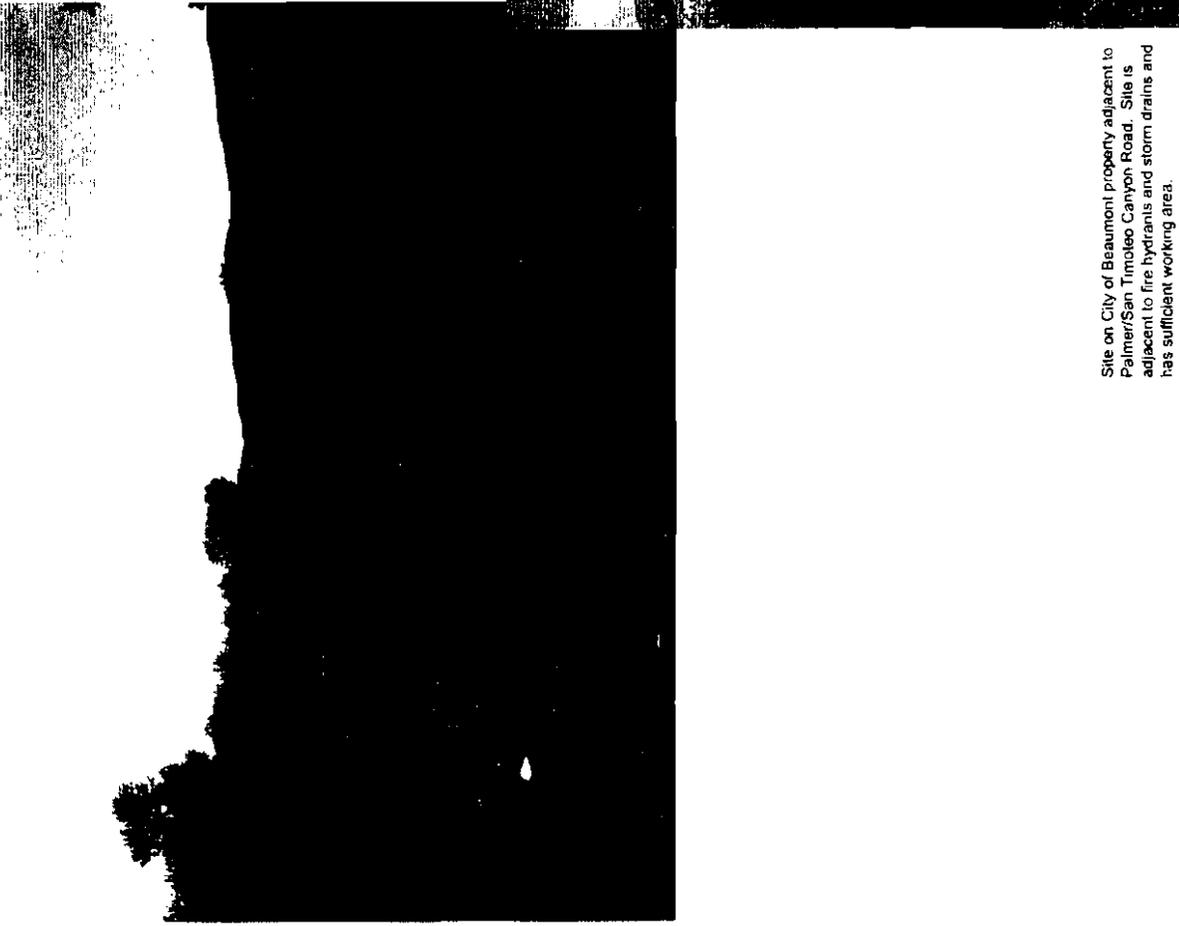
Appendix C

Map of the STMZ

Appendix D

Well Site Investigation Photographs

Road side site in the upper canyon



Site on City of Beaumont property adjacent to Palmer/San Timoteo Canyon Road. Site is adjacent to fire hydrants and storm drains and has sufficient working area.

Potential Well Site Alternatives (Upper Canyon)
 San Timoteo Management Zone
 Appendix D



Site on turnout adjacent to road. Restricted area means that it may be necessary to occupy part of the field adjacent during construction

Produced by

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Author: MKC
Date: 20081029
File: 07040801 well_site 2.svg

Potential Well Site Alternatives (Upper Canyon)
San Timoteo Management Zone

Appendix D