Harold Snyder
P.O. Box 926
Nipomo, CA 93444
(805) 929-2455 H

October 29, 2007
Nipomo Community Services District
148 Wilson Street
P.O. Box 326
Nipomo, CA 93444

(805) 929-1133 Phone
(805) 929-1932 Fax

Dear Bruce Buel:

I am requesting a copy of the following studies (or a location on the web where the complete studies can be found):

Task 25 – Screening Evaluation of Potential Recharge Locations of Treated Effluent (Garing Taylor & Associates, January 16, 2007

The resulting study listed on the Board packet agenda Item E8 from Board meeting of 6/13/07 agenda item E8 and the board packet

Boyle's April 2, 2007 "Evaluation of southland WWTF Ground Water Monitoring Data".

May 10, 2007 "Southland WWTF Recharge/Disposal Action Plan"

The resulting study from Board meeting of 6/13/07 agenda item E9 and the board packet with a letter from Fugro West, Inc dated June 4 2007, as outlined in their letter, "**Southland WWTF Discharge Study**"

Technical Memorandum, Yield of Aquifer Storage and Recovery (SAIC, June 2007)

Thank You

Harold Snyder

Email Delivered.

NIPOMO COMMUNITY SERVICES DISTRICT

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148 SOUTH WILSON STREET POST OFFICE BOX 326 NIPOMO, CA 93444 - 0326
(805) 929-1133 FAX (805) 929-1932 Website address: NCSD.CA.GOV

November 8, 2007

Mr. Harold Snyder
P. O. Box 926
Nipomo, CA 93444

SUBJECT: OCTOBER 29, 2007 PUBLIC RECORDS REQUEST RE PRESENTATION SLIDES

Dear Mr. Snyder,

Attached are copies of the 1/16/07 GTA Screening, the 4/2/07 Boyle Evaluation, the 5/10/07 Boyle Action Plan and the 6/07 SAIC Technical Memorandum that you requested in your 10/29/07 Public Records request.

I can not locate any public record that responds to your requests for either "the resulting study ... from 6/13/07 agenda item E8" or "E9". I am willing to look further if you can provide me with the name of the document that you are seeking.

If you have any questions, please don't hesitate to call me.

Sincerely,

NIPOMO COMMUNITY SERVICES DISTRICT

Bruce Buel
General Manager

CC: Public Records Request File
Chronological File

T:\DOCUMENTS\STAFF FOLDERS\BRUCE\LETTERS\071108Snyder.DOC

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Bruce Buel
General Manager
NIPOMO COMMUNITY SERVICES DISTRICT
148 S. Wilson
Nipomo, CA 93444

April 2, 2007
19996.37

Evaluation of Southland WWTF Ground Water Monitoring Data

As requested, we have evaluated the ground water monitoring data at Southland Wastewater Treatment Facility (WWTF). Our objective has been to provide a better understanding of current ground water conditions. We include below a summary of existing ground water data collected from onsite monitoring wells, and from other nearby wells identified by the District. These results are compared to the District's wastewater effluent quality and effluent permit limits. We also include recommendations regarding collecting additional data.

Background

The Regional Water Quality Control Board (Regional Board) prohibited discharge from individual sewage disposal systems (i.e., private septic systems) in 1978[1]. The District began discharging treated wastewater via infiltration basins at the Southland WWTF in 1985[2] under Waste Discharge Requirements adopted in 1984[3]. The plant was rated to treat 0.36 MGD. The treated effluent was initially disposed to ground water through three infiltration basins, later expanded to six basins[4].

Ground water monitoring was required as part of these Waste Discharge Requirements. Three wells were installed and were used to collect the required samples.

In May of 1997 a hydrogeologic analysis[5] of the wells, the geology of the site, and the monitoring data showed the possible presence of a fault separating the monitoring wells, and the likelihood that the wells were sampling different geologic formations. Water quality data showed that the percolated effluent had not degraded two of the three monitoring wells, but that

---

[1] Resolution 78-02, March 17, 1978.

[2] Staff Report for Regional Board Meeting on Order 97-75, August 5, 1997.

[3] Order 84-56, Regional Board.

[4] Final Project Inspection, NCSD Southland WWTF, SRF C-06-4501-110/120, 11/14/2000.

[5] Letter from Cleath & Associates, May 22, 1997.

one of the wells appeared "to have water quality more in line with the percolated effluent." The report concluded that "percolated effluent appears to flow down to the base of the sand dune deposits and then laterally both east and west (possibly over buried faults), where it percolates down to the ground water bearing deposits." This lateral movement before reaching ground water deposits is an indication of two water tables – a shallow aquifer and a deep aquifer.

According to the Regional Board[6], in July 1997 a hydrogeologic study furnished to the Board concluded that "due to poor construction, ground water collected from District monitoring wells is not representative of either the shallow or deep aquifers", and that "no determination of ground water flow direction in the shallow aquifer is possible." (It is not clear if this study is the same 5/22/97 analysis noted above.)

In October 1997 the Regional Board adopted updated Waste Discharge Requirements[8] for the expansion of the Southland WWTF. Its maximum monthly average treatment capacity was permitted to increase from 0.36 MGD to 0.90 MGD. Monitoring requirements contained in that order included the installation of new shallow monitoring wells, determination of ground water flow, and an investigation of impacts caused by the discharge.

The Phase I treatment facility expansion was completed in April 1999 and included headworks expansion and construction of a third aeration lagoon, a plant influent force main, and sludge drying beds. The Phase II expansion was completed in July 2000 and included additional improvements as well as construction of a fourth aerated lagoon and additional infiltration basins, bringing to 8 the total number of infiltration basins, covering an area of 14.4 acres.[9]

New, shallow monitoring wells were installed in January 2000[10] to sample the shallow aquifer and to monitor the effects of WWTF discharge.

Summary of Existing Data

The following summary of existing ground water data collected from onsite monitoring wells, and from other nearby wells identified by the District, is based on the following information:

1. Treatment facility influent quantity, effluent quality, and monitoring well water quality data reported annually to the Regional Water Quality Control Board.
2. Well water surface elevation data occasionally reported to the Regional Water Quality Control Board and also as provided by NCSD staff.

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[6] Letter from Roger Briggs to Doug Jones, October 6, 1999.
[7] Letter from Roger Briggs to Doug Jones, October 6, 1999.
[8] Order 97-75, Adopted October 24, 1997
[9] Final Project Inspection, NCSD Southland WWTF, SRF C-06-4501-110/120, 11/14/2000.
[10] Well driller's report from Doug Elona for monitoring wells installed between 1/24/2000 and 1/28/2000.

3. Official monthly rainfall totals for the City of Santa Maria, furnished by the Santa Barbara County Flood Control District.
4. Graphical displays of water quality data contained in a letter report from Cleath & Associates, dated 5/22/1997, regarding ground water flow from percolation ponds.
5. Water quality and water depth data summarized in a letter to the Regional Board from Garing Taylor & Associates, dated 9/3/1997, regarding additional information in support of proposed Waste Discharge Requirements.
6. Well log and location information provided in a letter from Cleath & Associates, dated 1/13/2000.
7. Hand written well installation notes from January 2000. The locations of the monitoring wells and piezometer were noted on a sketch map. Approximate ground elevations at well head locations were furnished by Garing Taylor & Associates via email.

Shallow Aquifer – Elevation and Gradient

Well installation and test hole records indicate a clay layer at a depth of between 25 and 135 feet, dropping to the west. See Attachment 1 (Figure 1 from Cleath & Associates, 1/13/2000).

See Attachment 2 (Figure 3 from Cleath & Associates, 5/22/1997) for location of monitoring wells (MW1, MW2, and MW3) and piezometer (PZ1).

The gradient in the shallow aquifer is apparently away from the infiltration basins in all directions. (See attachments 14 and 15.) The gradients between the piezometer and all 3 monitoring wells appear to vary between 1% and 3%. The extent and shape of the mounded area are unknown at this time.

Additionally, the data show a higher water table in 2006 than in 2000. Water levels were 5, 8, and 26 feet higher for monitoring wells MW-1, MW-2, and MW-3 respectively, when compared to the single reading reported for 2000. *(Data for years 2001-2004 has not been provided by NCSD, and was therefore not reviewed.)* The piezometer is also showing a steady rise, being approximately 10 feet higher than the values reported in 2000 and 2001. (See Attachment 3.) These changes in ground water level occurred during a time when WWTF flow rates increased from approximately 0.4 MGD to 0.6 MGD. (See Attachment 4.)

Shallow Aquifer – Water Quality

Comparison of water quality data collected from the shallow aquifer monitoring wells installed in 2000 to previously collected data (See Attachment 5) is difficult because:

- Ground water quality data from neighboring wells in the 1980's come from samples collected from wells that showed water levels at 207 and 213 feet depth[11] – presumably

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[11] Garing Taylor & Associates, Letter to Regional Board 9/3/1997.

from the deeper aquifer. (These wells are shown as Ioimo and Egg City wells on Attachment 5 map.)

- Ground water quality data collected in the 1990's from District monitoring wells A, B, and C is not considered to be "representative of either the shallow or deep aquifers"[12] by the Regional Board.

With those limitations in mind, the following observations are made:

Total Dissolved Solids in MW-3 have risen from approximately 400 mg/L to 1200 mg/L. Meanwhile, MW-1 and MW-2 levels have risen from 1000 mg/L to 1200 mg/L. (See Attachment 6.)

Samples collected from the deep aquifer in the 1980's showed average values of 648 and 877 mg/L. District monitoring wells in the 1990's showed values between 200 and 400 mg/L in shallow wells, and between 800 and 1000 mg/L in the deeper well.

Sodium (Na) in MW-3 has risen from approximately 75 mg/L to 200 mg/L. Meanwhile, MW-1 and MW-2 levels have remained fairly steady at approximately 200 mg/L. (See Attachment 7.)

Samples collected from the deep aquifer in the 1980's showed average values of 92 and 102 mg/L. District monitoring wells in the 1990's showed values near 50 mg/L in shallow wells, and near 150 mg/L in the deeper well.

Chlorides (Cl) in all three monitoring wells have risen from approximately 100 mg/L to between 200 and 250 mg/L. MW-1 and MW-2 levels rose to this level in 2000, while MW-3 took an additional 2 years to reach this level. (See Attachment 8.)

Samples collected from the deep aquifer in the 1980's showed average values of 115 and 116 mg/L. District monitoring wells in the 1990's showed values less than 100 mg/L in shallow wells, and near 175 mg/L in the deeper well.

Total Nitrogen (Tot-N) levels appear to be more variable than other constituents, and appear to have risen since 2000. During year 2000, 5 of the 6 samples collected showed levels less than 10 mg/L. However, since January 2002, only 2 of the 30 samples have shown levels less than 10 mg/L. (See Attachment 9.)

Comparison with older data is complicated because prior to 2000 nitrate concentrations were measured, but since 2000 only total nitrogen concentrations have been reported. *(Additionally, at this time we are unsure whether the earlier reported values for nitrate are for "nitrate" or for "nitrate as nitrogen".)* Samples collected from the deep aquifer in the 1980's showed average nitrate values of 11 and 2 mg/L. District monitoring wells in the 1990's showed nitrate values generally between 5 and 12 mg/L in shallow wells, and near 175 mg/L in the deeper well.

---

[12] Letter from Roger Briggs to Doug Jones, October 6, 1999.

Sulfate (SO_4) levels appear somewhat variable. Concentrations in all 3 monitoring wells appear to be approaching a level between 200 and 350 mg/L. Levels in MW-1 and MW-2 have dropped slightly since 2000, while MW-1 levels have risen since that time. (See Attachment 10.)

These recent concentrations reported in the shallow aquifer are similar to samples collected in the 1980's from deeper neighboring wells, and to results from the deep monitoring well sampled in the 1990's.

Boron (B) in MW-3 has risen from approximately 0.05 mg/L to 0.3 mg/L. Meanwhile, MW-1 and MW-2 levels have shown a slight rising trend, currently at a level of approximately 0.40 mg/L. (See Attachment 11.)

These recent concentrations reported in the shallow aquifer are similar to samples collected in the 1980's from deeper neighboring wells, and to results from the deep monitoring well sampled in the 1990's.

Shallow Aquifer – Water Quality vs. Rainfall

No significant correlation between ground water quality and rainfall was observed. Weak positive correlations were found between chlorides in MW-3 and previous 3-month rainfall, and between sulfate levels in MW-3 and previous 3-month rainfall. Therefore, higher chloride and sulfate concentrations may have a slightly increased chance of occurring following times of more rain. (See Attachments 12 and 13.)

Comparison to Effluent Data and Effluent Limits

Effluent Limits in WDR Order No. 97-75:

Parameter (units)	Mean	Maximum
Suspended Solids (mg/L)	60	100
Settleable Solids (mg/L)	0.2	0.5
pH	Within the range 6.5 to 8.4	
Dissolved Oxygen (mg/L)	Minimum 1.0	

None of the water quality constituents noted above were monitored in shallow ground water samples collected between 2000 and present.

Comparison to Ground Water Limitations

Ground water limitations in WDR Order No. 97-75:

> *1. The treatment or discharge shall not cause nitrate concentrations in the ground water down gradient of the disposal facilities to exceed 10.0 mg/L (as N).*
>
> *2. The discharge shall not cause a significant increase of mineral constituent concentrations in underlying ground waters, as determined by comparison of samples collected from wells located up gradient and down gradient of the disposal area.*
>
> *3. The discharge shall not cause concentrations of chemicals and radionuclides in ground water to exceed limits set forth in Title 22, Chapter 15, Articles 4, 4.5, 5 and 5.5 of the California Code of Regulations.*

Nitrate

If the Total Nitrogen (Tot-N) reported in sampled ground water is <u>assumed</u> to consist primarily of nitrate, then it would appear that nitrate levels in ground water are regularly exceeding the 10 mg/L limit for nitrate as nitrogen. (See Attachment 9) However, it is questionable whether these exceedances should be considered a violation, because "ground water" in this case appears to be primarily "perched" plant effluent and may not represent deeper groundwater supplies.

Mineral Constituent Concentrations

Monitoring wells MW-1 and MW-2 were placed adjacent to locations where treated wastewater had been percolating since 1985. Monitoring well MW-3 was installed approximately 1000 feet west of the pre-2000 infiltration basins, and approximately 400 feet west of the current infiltration basins. Therefore, changes in MW-3 may represent changes that are "caused" by District discharges of treated wastewater. If this cause and effect relationship is true, then it appears that Southland WWTF discharges are causing increases in total dissolved solids (TDS), sodium (Na), chlorides (Cl), total nitrogen (Tot-N), sulfate (SO_4), and boron (B) in shallow ground water beneath the infiltration basins.

Title 22 Constituents

Title 22, Chapter 15, Articles 4, 4.5, 5 and 5.5 of the California Code of Regulations set Maximum Contaminant Limits (MCLs) for protection of drinking water for inorganic constituents, organic constituents, trihalomethanes, and radioactive constituents, respectively. Because none of these constituents were measured in ground water samples collected from the shallow aquifer, no assessment of impacts is possible.

Comparison to the Basin Plan

The Regional Board has established water quality guidelines for selected ground waters, including the Lower Nipomo Mesa Sub-area of the Santa Maria ground water sub-basin, where the WWTF is located. The median ground water objectives "are intended to serve as a water quality baseline for evaluating water quality management in the basin."[13] These objectives and recently observed values in the shallow aquifer are listed below.

Region 3 Basin Plan Ground Water Objectives (mg/L)

Constituent	Objective	Levels in Shallow Aquifer years 2005 and 2006
Total Dissolved Solids (TDS)	710	1000 – 1200
Sodium (Na)	90	~ 200
Chlorides (Cl)	95	200 – 275
Nitrogen (N)	5.7	5 – 35
Sulfate (SO4)	250	250 – 350
Boron (B)	0.15	0.3 – 0.5

Constituent levels in the shallow ground water clearly exceed s these water quality objectives.

Conclusions and Recommendations

There are at least two aquifers beneath the plant that have historically had different water quality. Recent data (since 2000) appear to capture only the "shallow" aquifer. Based on the monitoring results presented herein, the shallow aquifer appears to consist of "perched" treatment plant effluent. Impacts to the deeper aquifer are of more concern than impacts to the shallow aquifer, and therefore the deeper aquifer should also be monitored.

We recommend conducting a hydrologeological investigation in order to determine the characteristics of these two aquifers in the vicinity of the plant, and to determine the fate of water from the "shallow" aquifer.

The District should continue monitoring the existing shallow aquifer wells, but should either use the existing nearby deep aquifer wells for additional monitoring or should drill new deep monitoring wells as recommended by a qualified hydrogeologist. (The existing Walsh Windmill and Ioimi wells may be suitable as "deep" aquifer monitoring wells.)

---

[13] Regional Water Quality Control Board, region 3, Basin Plan, Chapter 3.

If new monitoring wells are drilled, we also recommend collecting deep soil samples in the unoccupied southwest portion of the property, in anticipation of future percolation ponds.

The elevation of the reference marks for the existing monitoring wells and piezometer should be determined. This data can then be used to verify the "effluent mounding" which has been previously noted at the WWTF. Sampling for nitrate and nitrite, in ground water should be incorporated into the monitoring program. The present monitoring program includes total nitrogen, nitrate + nitrite, and Kjeldahl nitrogen (the sum of free ammonia and organic nitrogen). Sampling and analysis should be conducted on a quarterly basis, at a minimum.

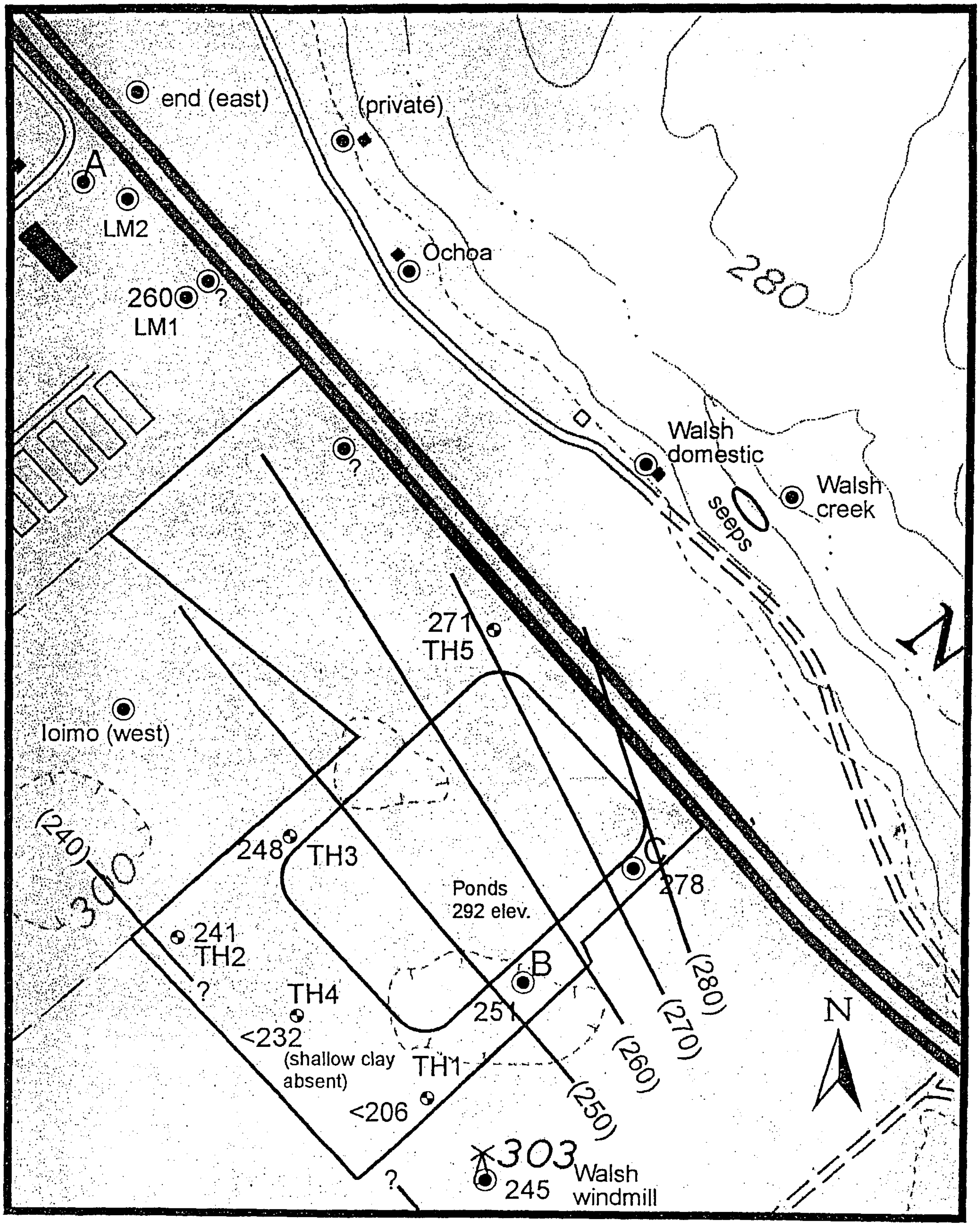
Sampling for the Title 22 drinking water constituents is needed if the District wishes to determine compliance with the Title 22 ground water limitations in WDR Order No. 97-75.

Boyle Engineering Corporation

M. a. McE

Malcolm McEwen, PE
Senior Engineer

Attachment 1



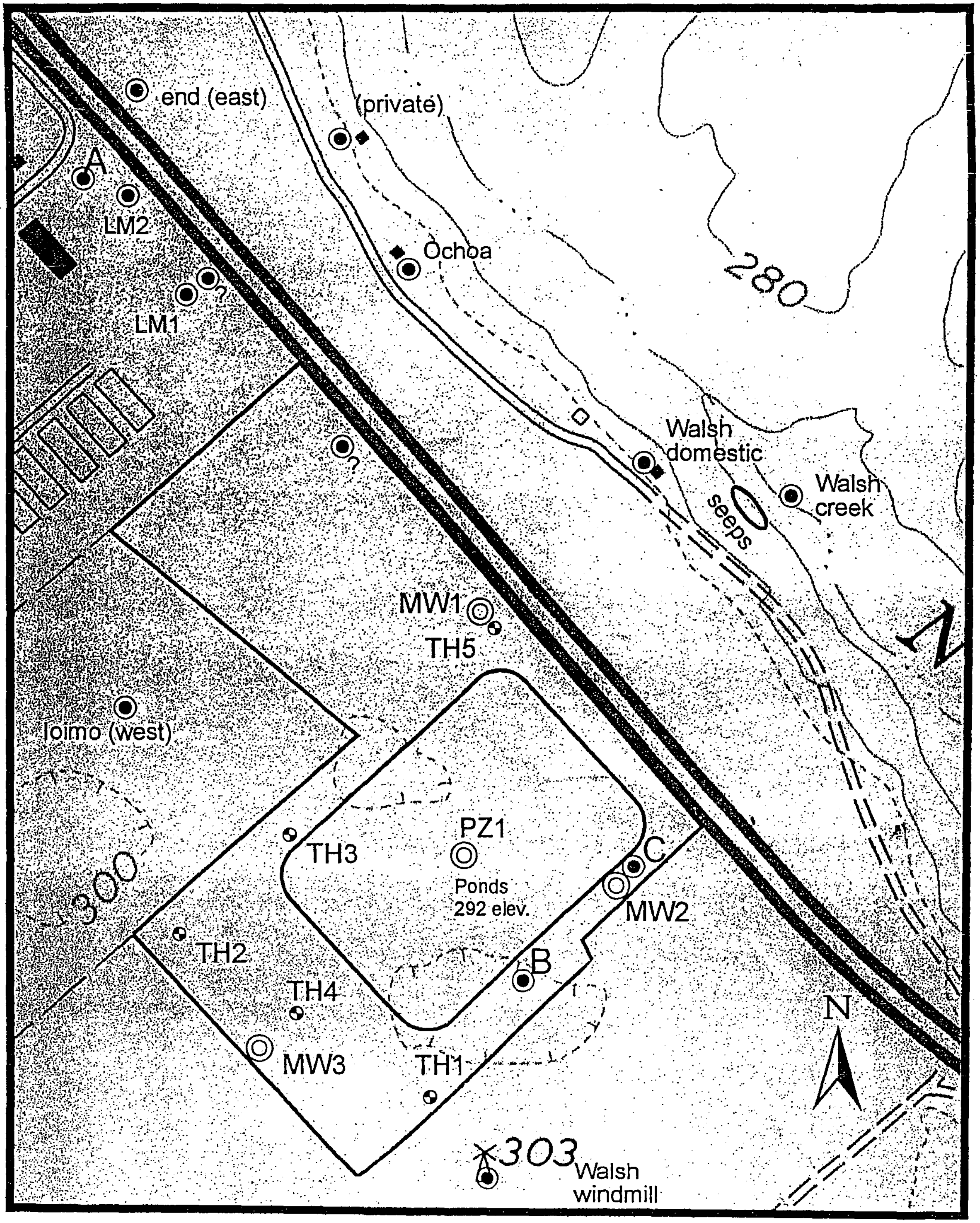
Base map: USGS Topo, Nipomo
Map Scale: 1 inch = 500 feet

Figure 1

Top of first clay
Nipomo CSD Percolation Ponds
Cleath & Associates

(240) ——— Inferred elevation contour on top of first clay in feet above sea level

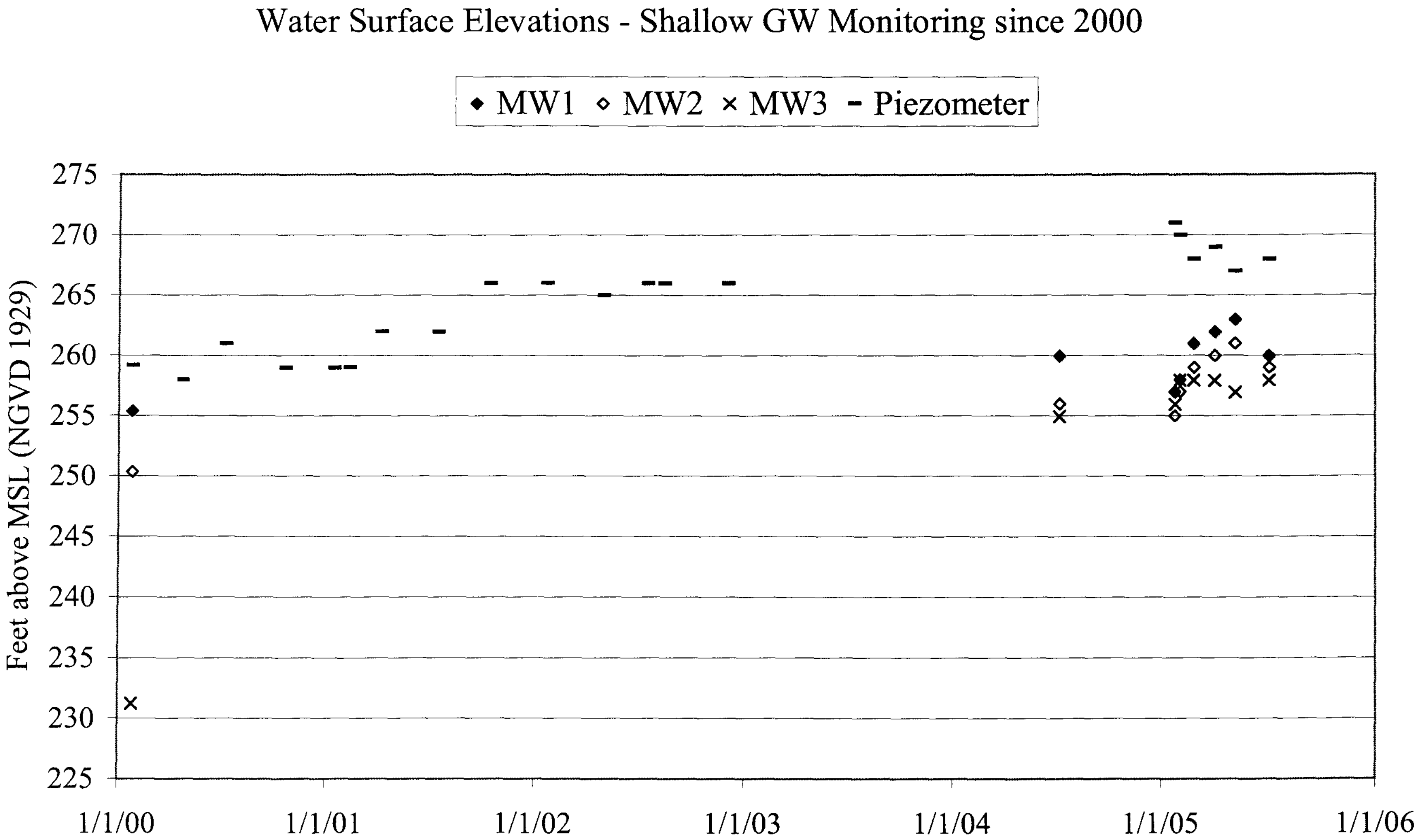
Attachment 2



Base map: USGS Topo, Nipomo
Map Scale: 1 inch = 500 feet

Figure 3

Proposed monitoring well locations
Nipomo CSD Percolation Ponds
Cleath & Associates

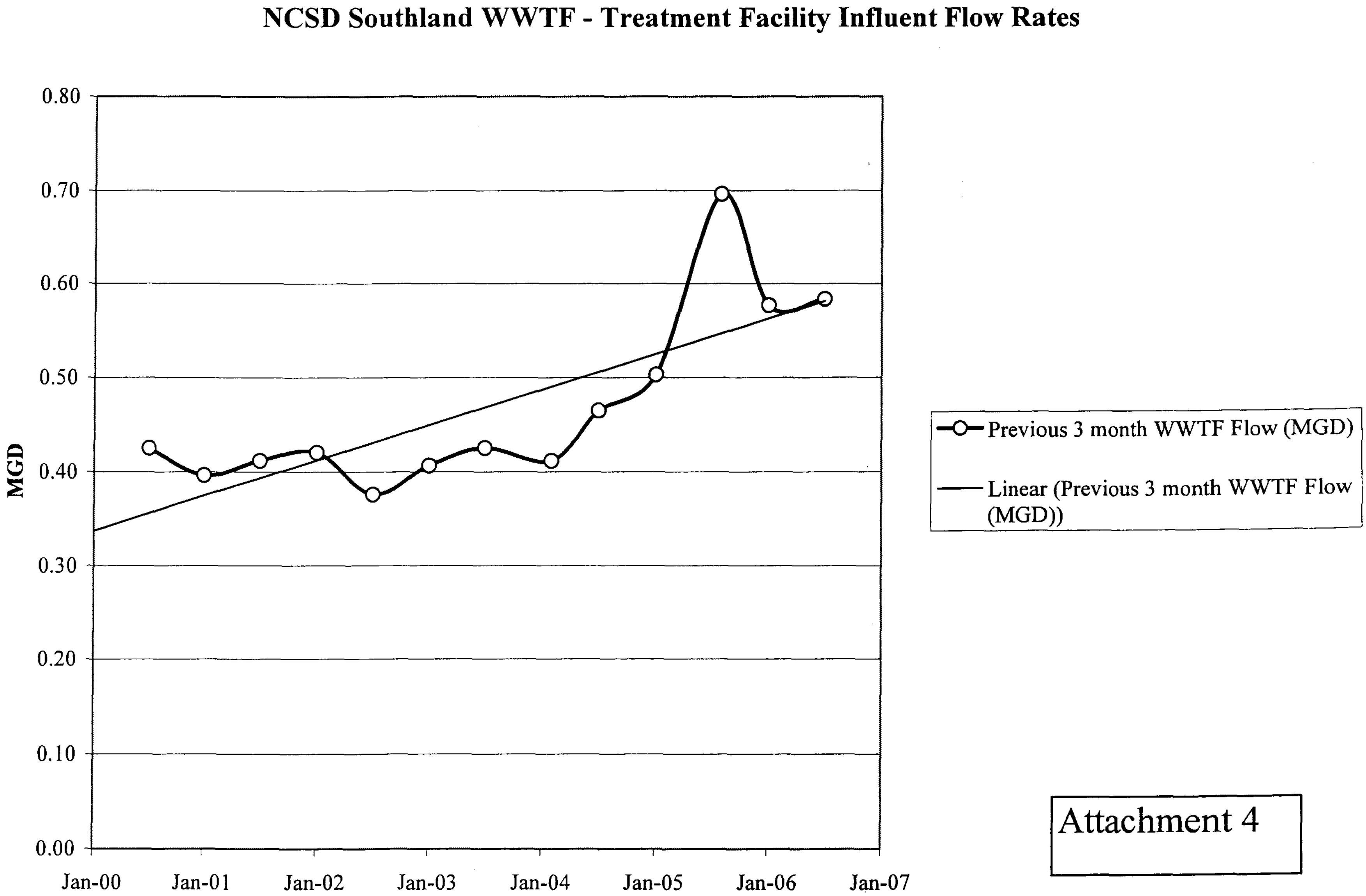


Water Surface Elevations - Shallow GW Monitoring since 2000

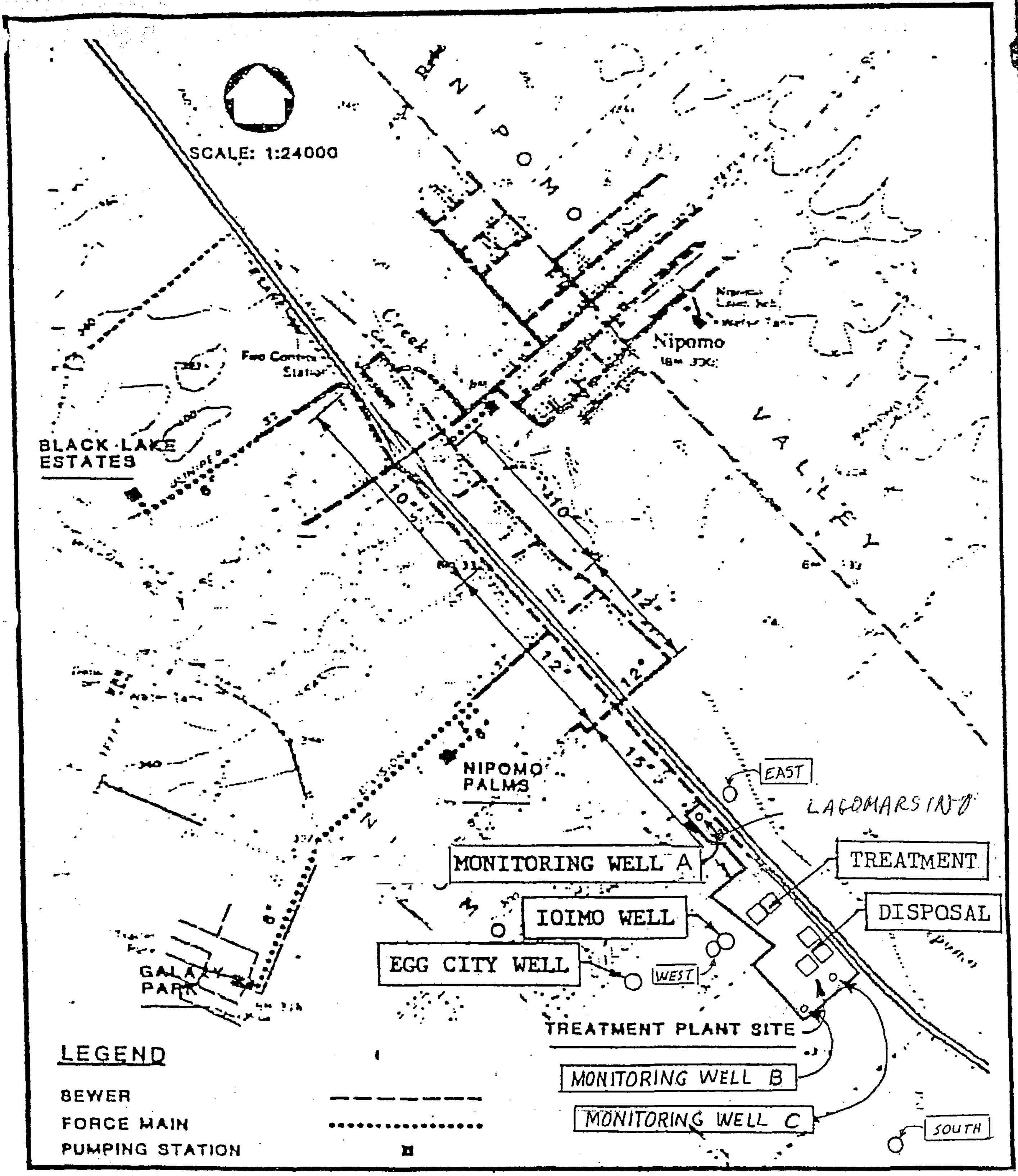
Approximate water surface elevations were calculated from depths reported by NCSD, and by approximate ground elevations at monitoring wells:
MW1: 300 ft, MW2: 300 ft, MW3 302 ft, PZ 298 ft.

Attachment 3

WWTF Flow vs Time



Attachment 4



NIPOMO COMMUNITY SERVICES DISTRICT

Attachment 5

Source: Attachment to Letter from Cleath & Associates to Doug Jones, 5/22/97

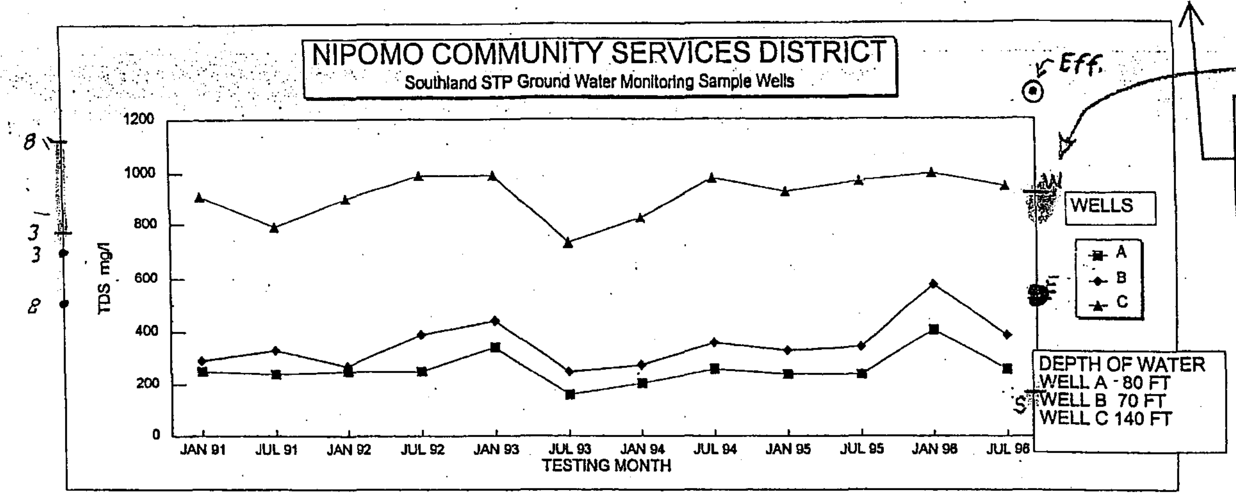
Copy of document found at www.NoNewWipTax.com

IOMIO WELL
• EGG CITY WELL } Sample in 198 ; MARCH(3) ∤ AUG(8).

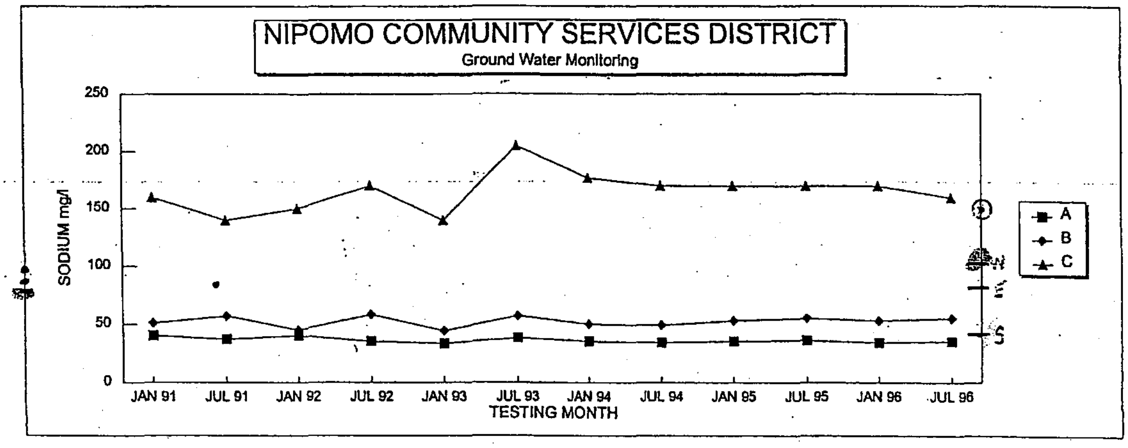
Attachment 5

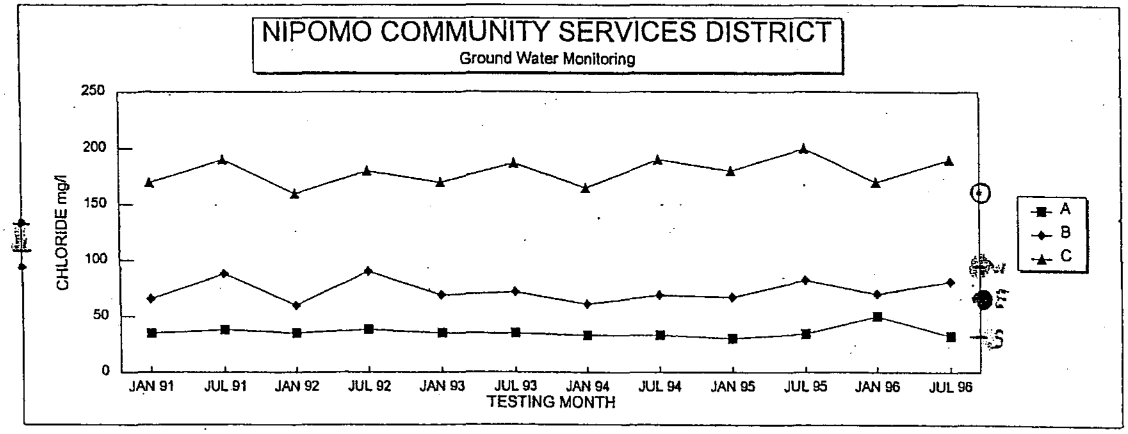
Sample of off site wells
(East, West ∤ South)

See Attachment 5 map


NIPOMO COMMUNITY SERVICES DISTRICT
Southland STP Ground Water Monitoring Sample Wells

DEPTH OF WATER
WELL A - 80 FT
WELL B 70 FT
WELL C 140 FT

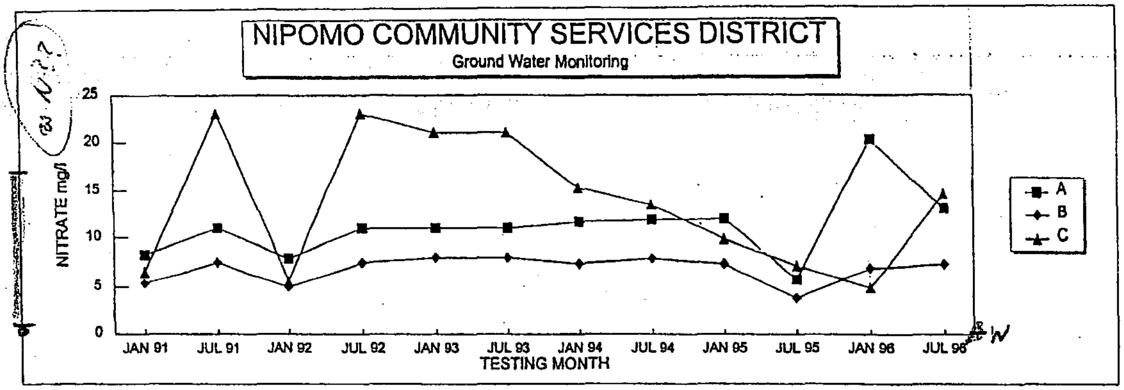

NIPOMO COMMUNITY SERVICES DISTRICT
Ground Water Monitoring

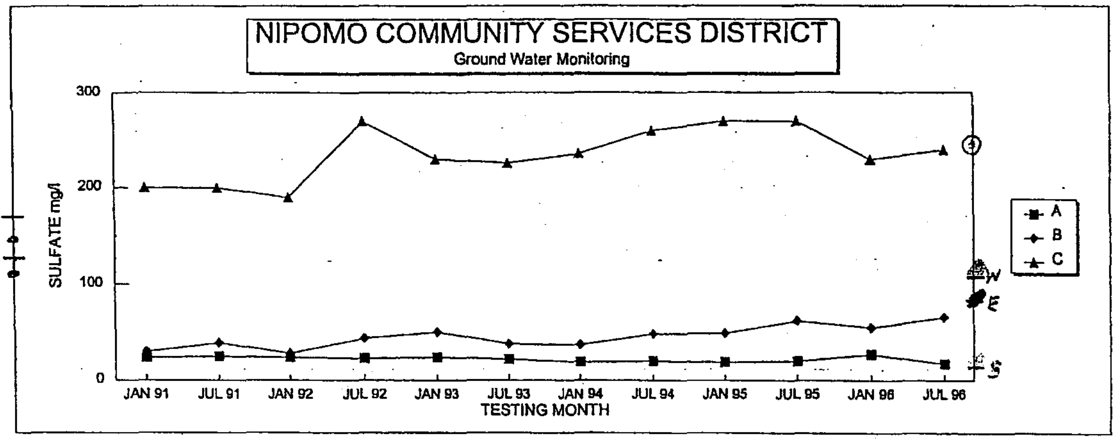

NIPOMO COMMUNITY SERVICES DISTRICT
Ground Water Monitoring

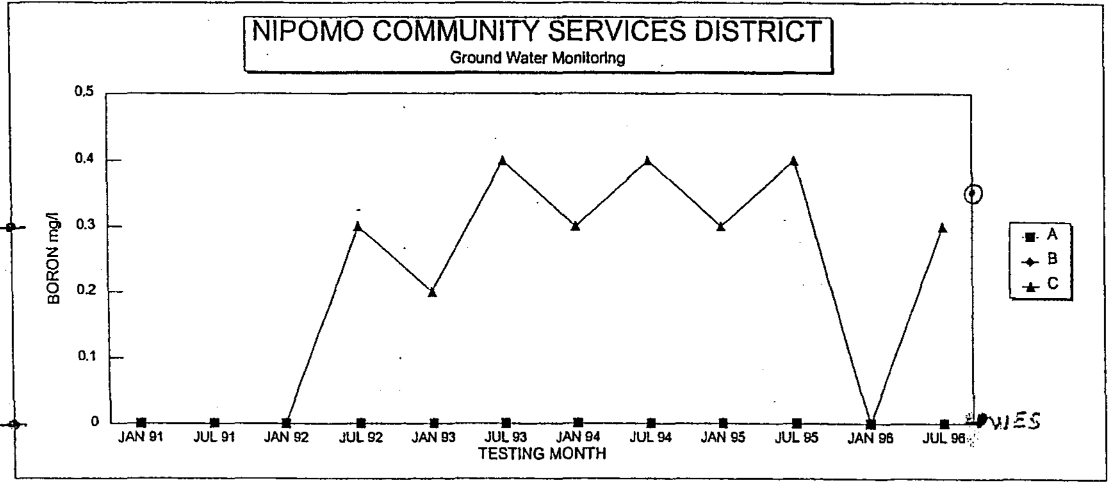
Egg City well

41 S T Eff. (As NO_3)

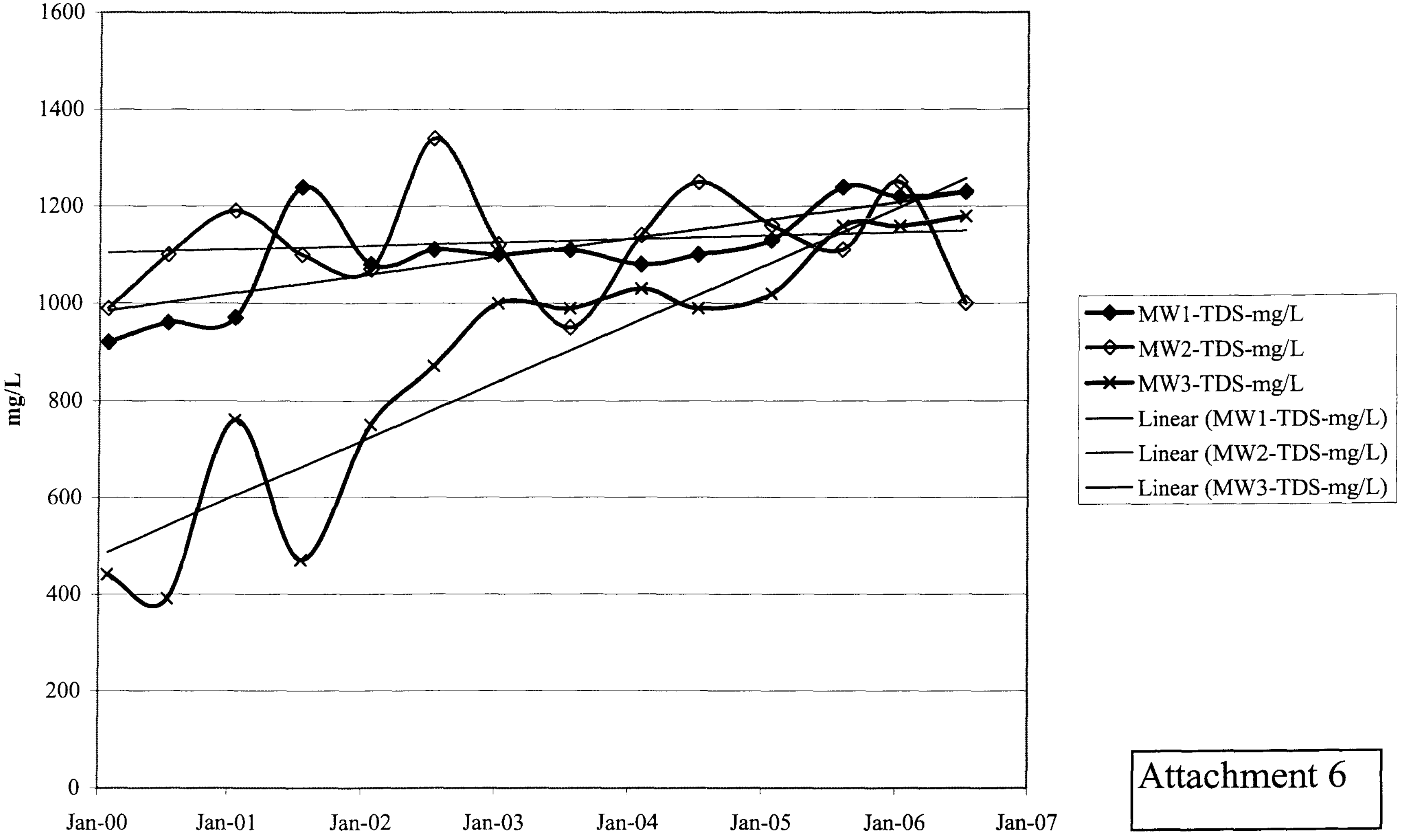
Attachment 5





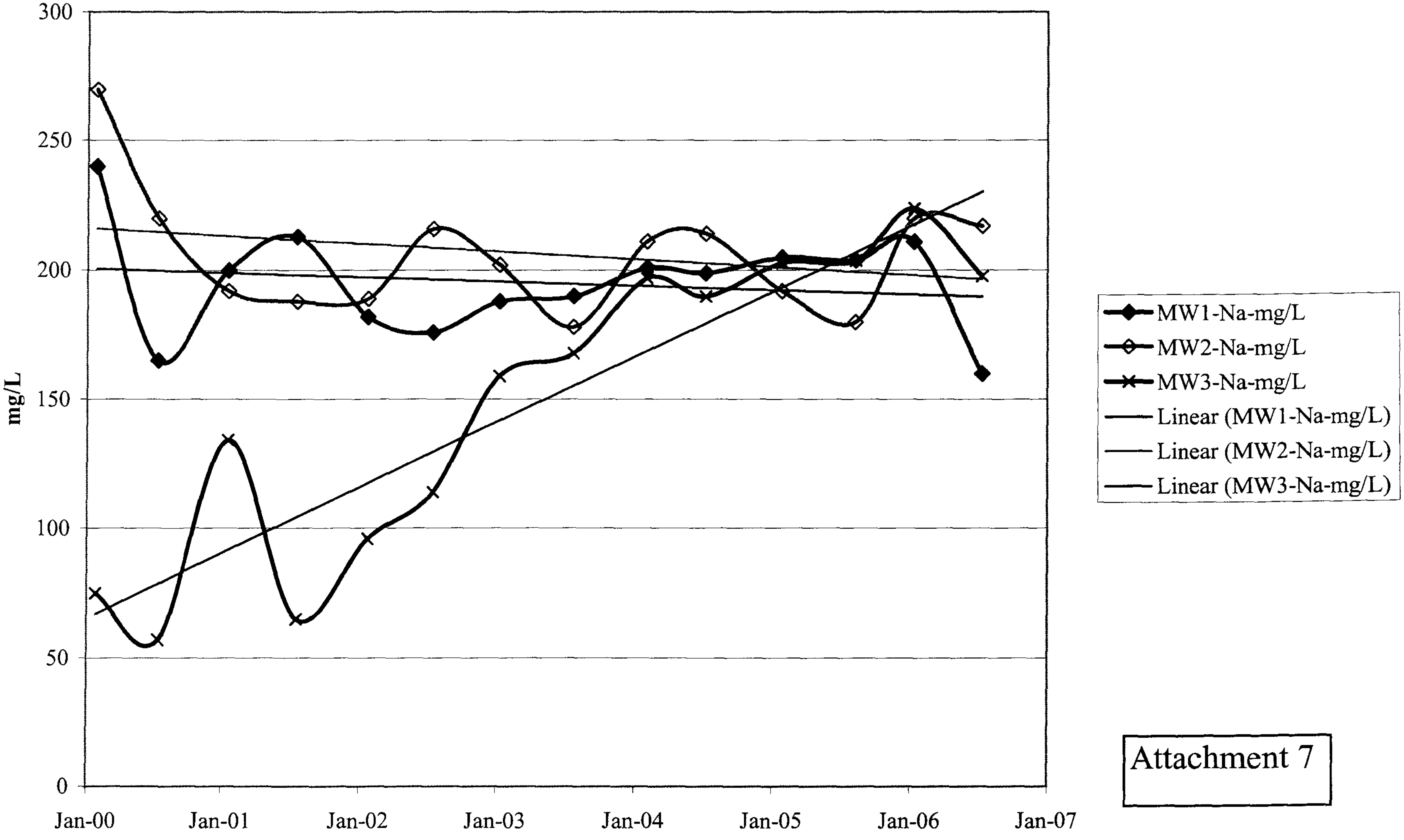


NCSD Southland WWTF - Ground Water Total Dissolved Solids (TDS)



Attachment 6

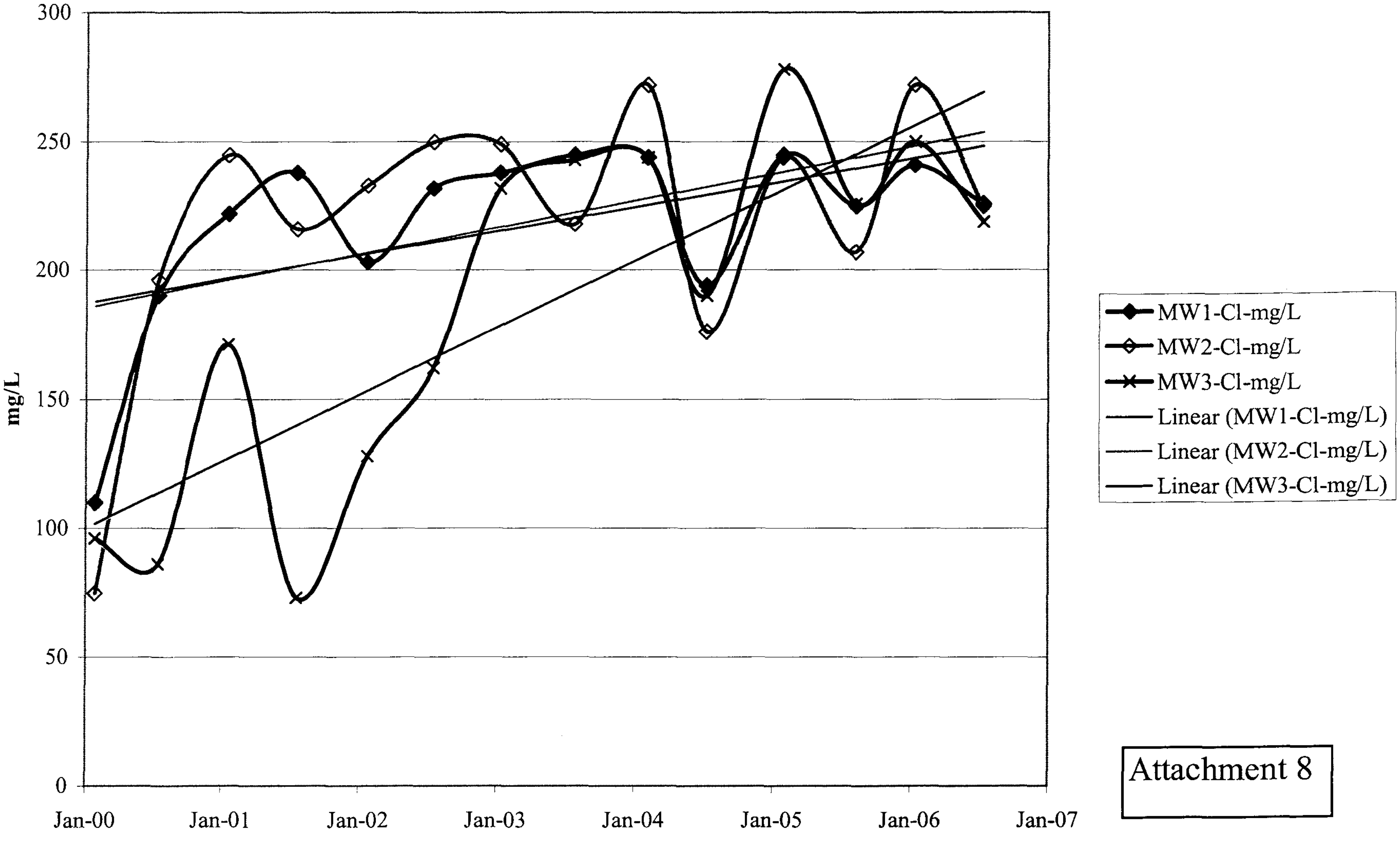
NCSD Southland WWTF - Ground Water Sodium (Na)



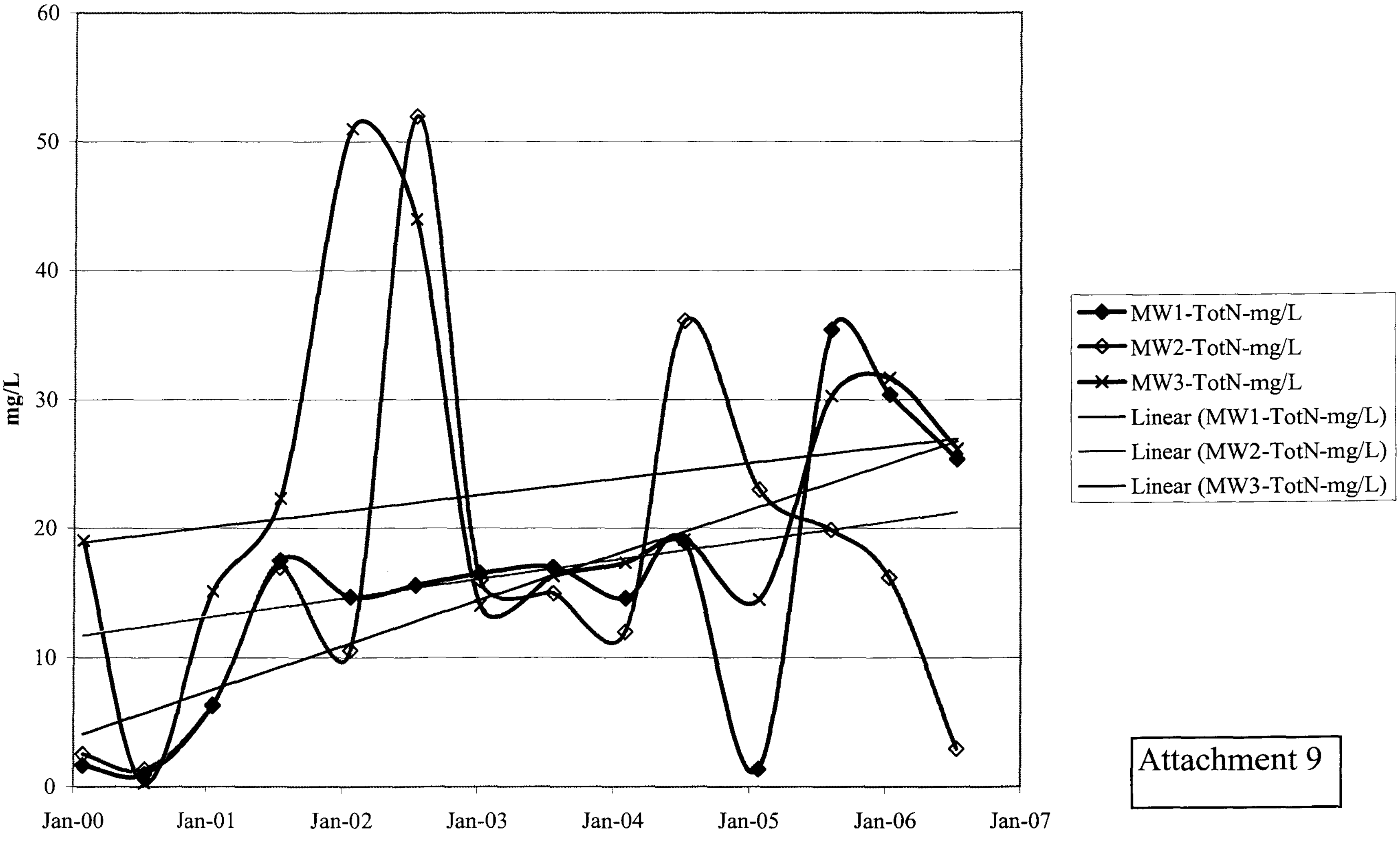
Attachment 7

Attachment 8

NCSD Southland WWTF - Ground Water Chlorides (Cl)

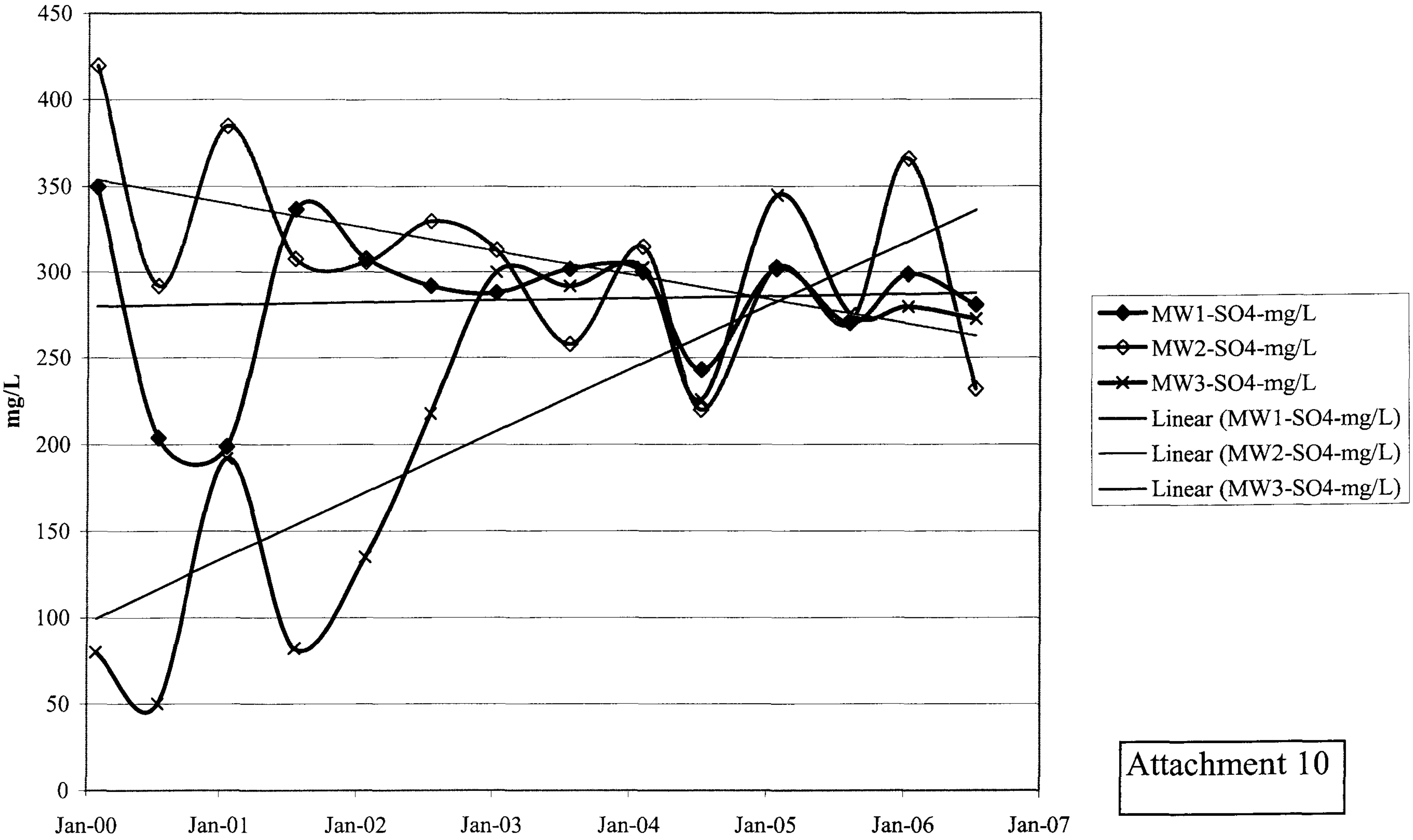


NCSD Southland WWTF - Ground Water Total Nitrogen (TotN)

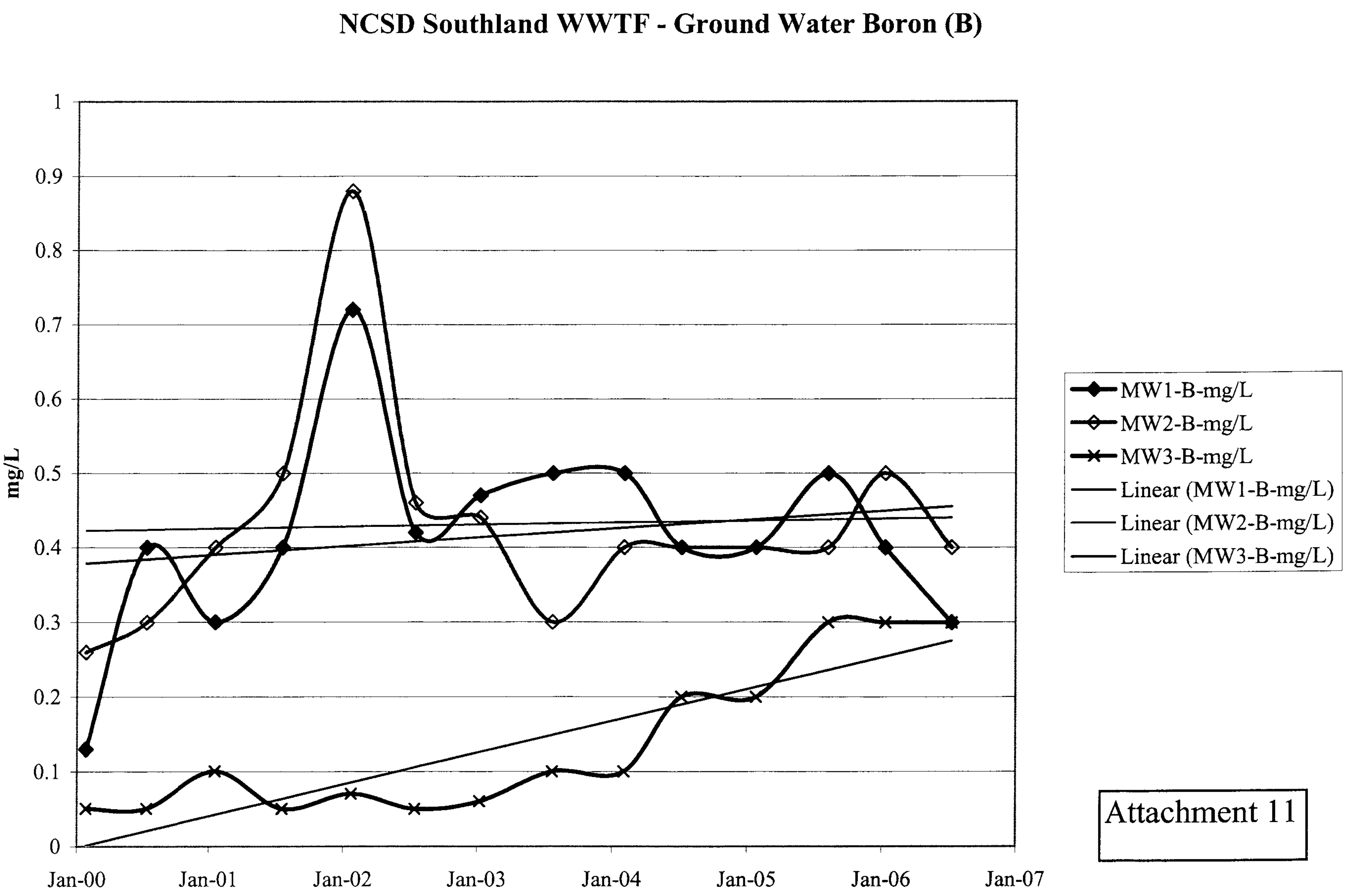


Attachment 9

NCSD Southland WWTF - Ground Water Sulfate (SO_4)



Attachment 10



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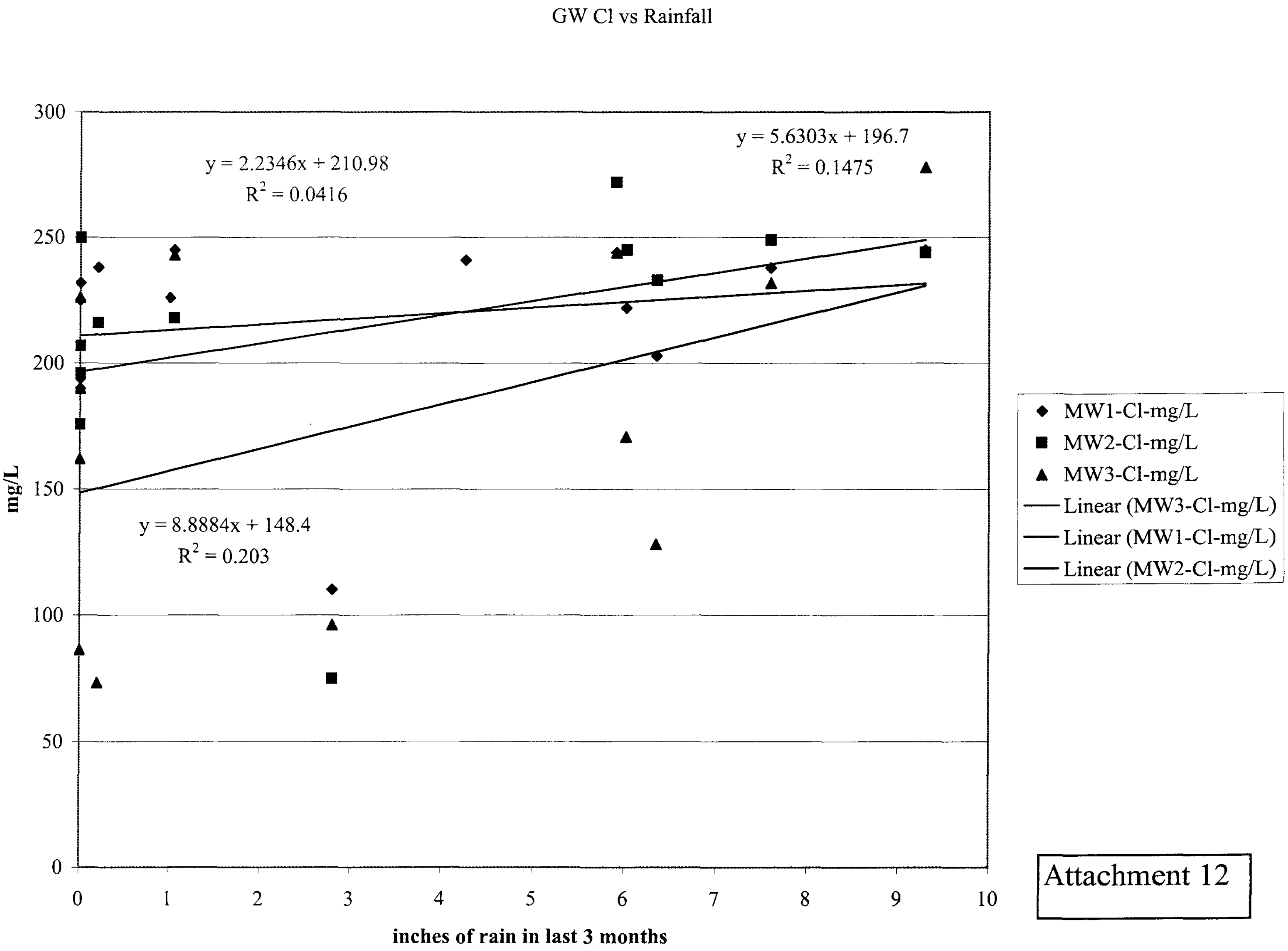
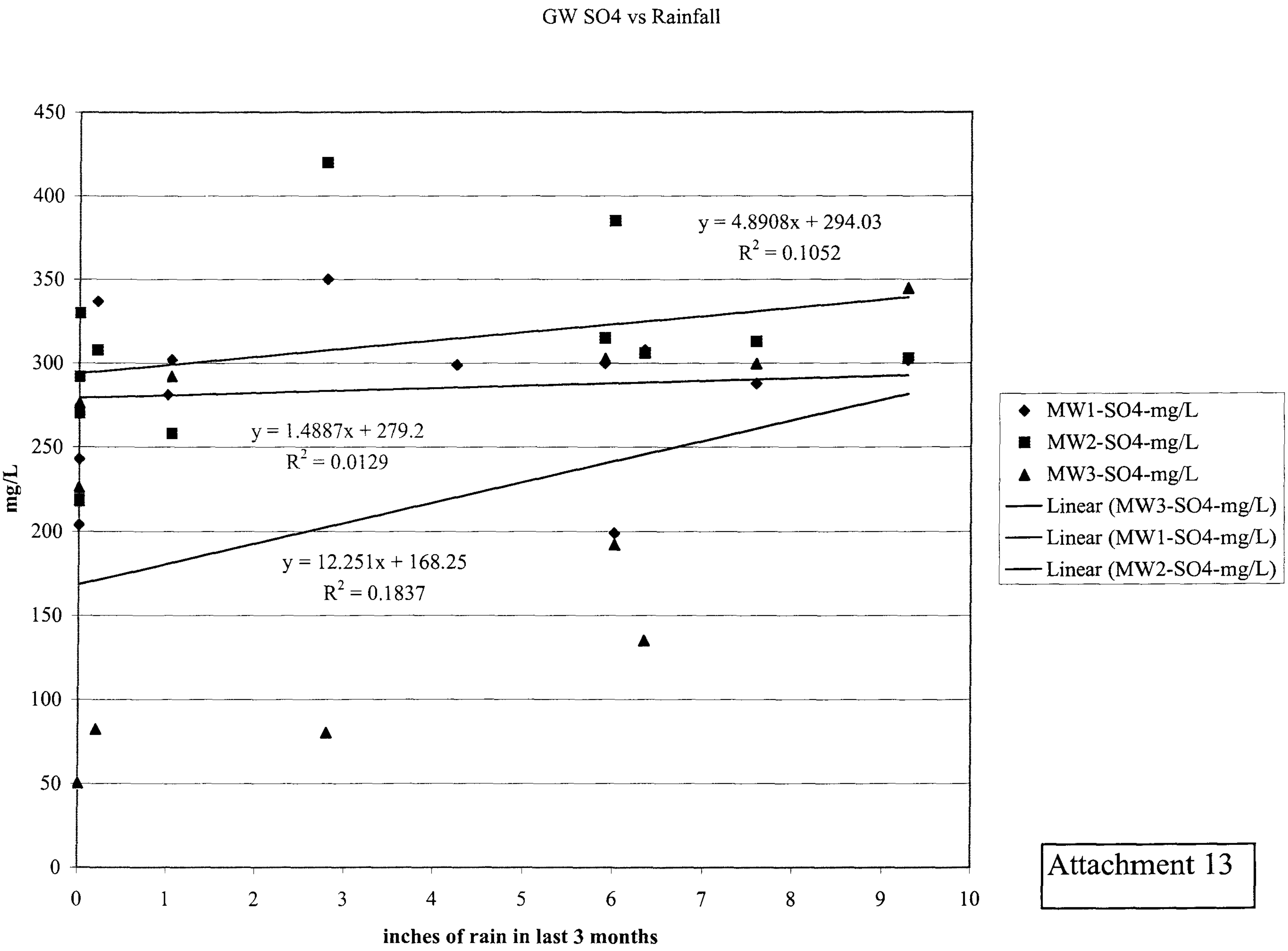


Attachment 12

Copy of document found at www.NoNewWipTax.com



Attachment 13

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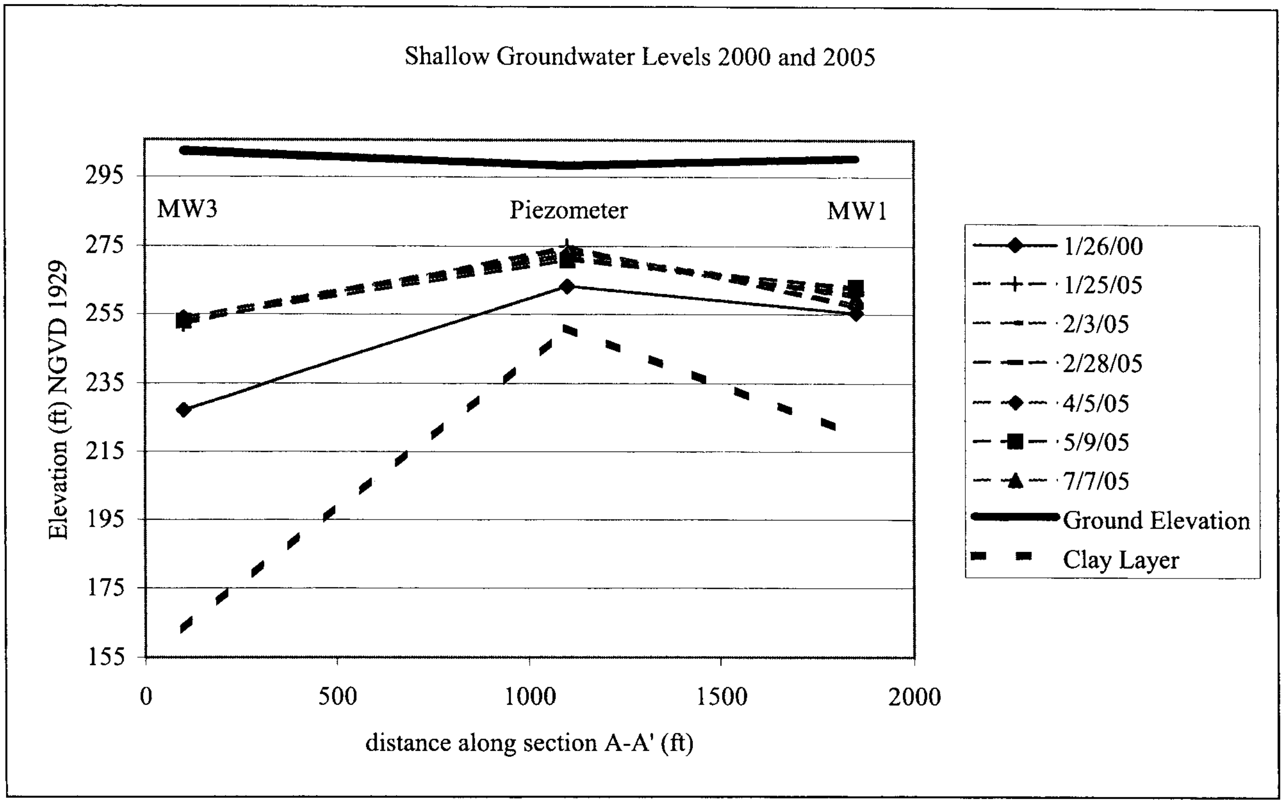
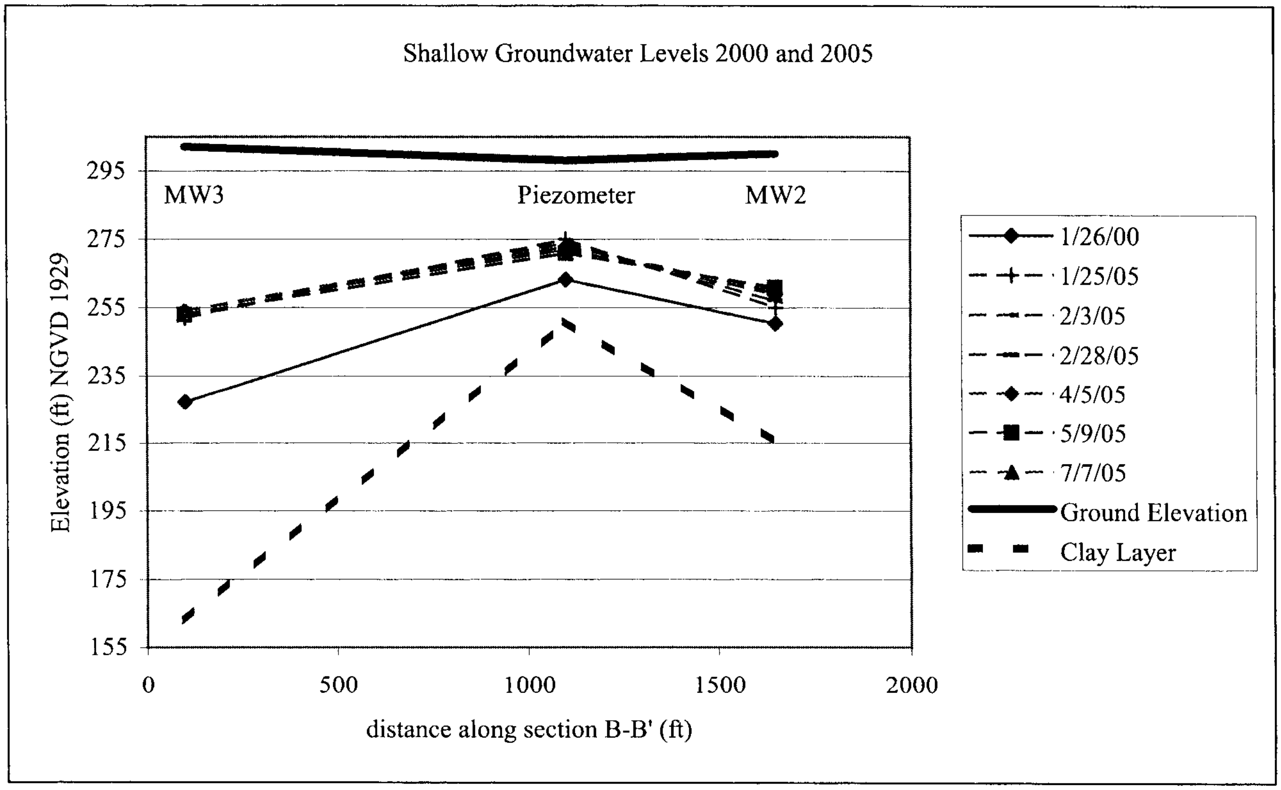
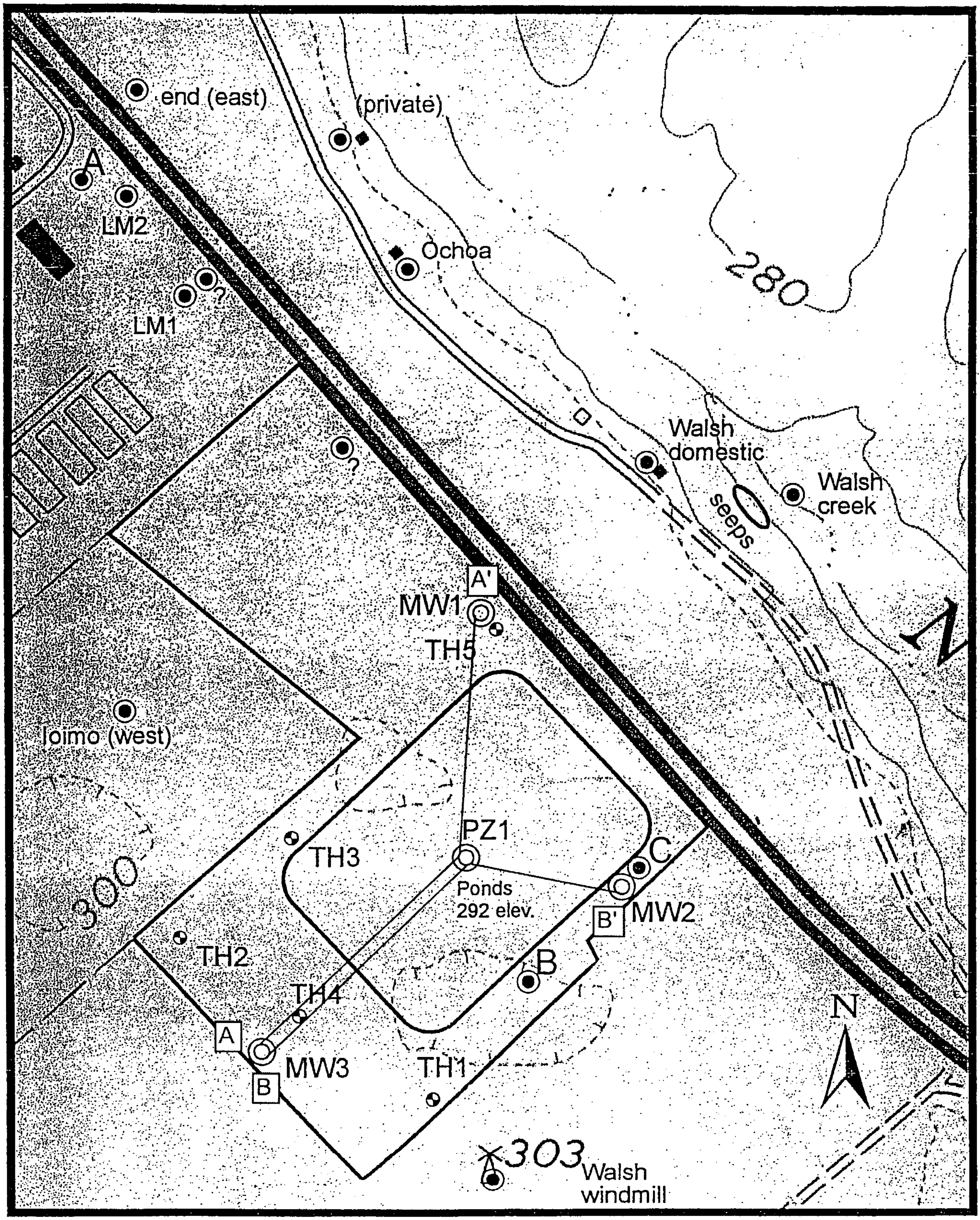
Attachment 14





Attachment 15



Base map: USGS Topo, Nipomo
Map Scale: 1 inch = 500 feet

Figure 3

Section Lines for Displaying Shallow Ground Water Elevations, 2000 and 2005

Proposed monitoring well locations
Nipomo CSD Percolation Ponds
Cleath & Associates

SAIC
From Science to Solutions

SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
WATER RESOURCES ENGINEERING - CARPINTERIA

TECHNICAL MEMORANDUM

TO: Mike Nunely

FROM: Brad Newton, Alex Pappas

RE: Questions 12-17: Yield of Aquifer Storage and Recovery,
SAIC Project Number: 01-0236-00-9785

DATE: June 1, 2007

INTRODUCTION

Programmatic development of an aquifer storage and recovery system requires an overall understanding of the local and regional hydrogeology. The District is currently investigating the opportunities to develop recharge basins on the Nipomo Mesa to augment the native supply of water to the principle production aquifer, typically the unconsolidated alluvial deposits of the Paso Robles Formation. Cause for concern over the lack of geologic understanding of the Nipomo Mesa is warranted, specifically in that recent sentinel monitoring well observations for sea water intrusion at the coast documented artesian conditions for all three well depths. These observations strongly suggest that a confining layer exists, however its depth, location and areal extent is not currently understood. Additionally, the presence of the Santa Maria River Fault has been interpreted to impede the lateral flow of groundwater, however the data reviewed during this investigation does not support nor deny this hypothesis.

On February 13, 2007, SAIC entered a contractual agreement with Boyle Engineering Corporation (Boyle) to provide hydrogeology services related to evaluating alternative water supplies to Nipomo Community Services District (the District). The District's Board requested an assessment of the yield of aquifer storage and recovery for the main production aquifer contained within the Nipomo Mesa Management Area (NMMA). Subsequently, Boyle requested SAIC address specific questions contained in a memorandum dated May 9, 2007. This technical memorandum constitutes a partial deliverable (Questions 12 - 17) to be included in Boyle's TM #1 Constraints Analysis to the District. Provided below and in the attachments herewith is a preliminary assessment of the plausibility of aquifer storage and recovery.

Several independent lines of evidence reviewed and interpreted herein support a proposed conceptual model of the hydrogeology within the NMMA. Groundwater surface elevations above ground surface at the sentinel monitoring well location on the beach support the geologic interpretation of a confining layer west of NMMA. Twitchell Reservoir water releases operational strategy to enhance groundwater recharge of the principal production aquifer supports the geologic interpretation of a confining layer that extends westward from the Bonita School Road crossing within the Santa Maria River corridor. The presence of Black Lake

Canyon supports the interpretation that a confining layer exists from the coastal dunes to the east of the canyon head. Drilling logs and well casing records also support the presence of confining layer from the western area of municipal production to Omiya well where the confining layer abruptly thins. Additional drilling logs and casing records would be needed to strengthen the confidence of the presence and extent of a regional confining layer in the western half of the NMMA.

The proposed conceptual model of the hydrogeology within the NMMA is preliminary and may be changed upon reviewing additional data. For the purposes of this constraints analysis, and foregoing any additional data review, the proposed conceptual model provides the context for evaluating the following questions presented in the Boyle memorandum dated May 9, 2007.

RESULTS

12. How will the use of aquifer storage and recovery change the answers to the previous questions 1-5?

The available space of groundwater storage in the aquifer (approximately 400,000 acre-feet [AF]) is sufficient to accommodate the volume of water obtainable from the SWP to meet the District's target additional maximum supply of 6,300 acre-feet per year (AFY). Therefore, the answers to question 1-5 would not change.

13. How much water can be stored in the aquifer underlying the NMMA?

The aquifer underlying the NMMA has an estimated available storage of 400,000 AF above sea level. However, the proposed conceptual model of the hydrogeology constrains the available area for storage capacity to approximately one-quarter of the total 20,000 acres on NMMA as the target recharge area. This target area is bound by the confining layer to the west, the Black Lake Canyon to the north, the topographic boundary to the south, and the Santa Maria River Fault trace to the east, although little is known regarding lateral flow across the fault. The storage of 6,300 AF of water within 5,000 acres area would likely cause an increase in the groundwater surface elevation by approximately 10 feet over the 5,000 acres.

14. Where are the best places to locate percolation/aquifer storage facilities?

The proposed preliminary target area is east of Omiya well, southwest of Santa Maria River Fault, and north of the mesa topographic boundary. The ideal location of recharge ponds will be places with high percolation rates and no confining layer or low hydraulic conductivity zones at depth. The proposed preliminary target area is bound by the confining layer to the west, the Black Lake Canyon to the north, the topographic boundary to the south, and the Santa Maria River Fault trace to the east.

15. If percolation ponds are used, what area would be required?

Based on a typical percolation rate of 6 inches per day, approximately 50 acres of ponds would be required to recharge 6,300 AFY.

16. How many new wells would be needed to recapture the stored water?

Based on wells currently operated by the Nipomo Community Services District (NCSD) five extraction wells with a production rate of 800 gallons per minute (gpm) would be required to capture 6,300 AFY of water.

17. Where should these wells be installed (location and depth)?

We recommend locating the wells east of Highway 1, south of the Black Lake Canyon, west of Santa Maria River Fault, and north of the Woodlands development. This general area will distribute pumping across the NMMA providing for a more even access to the water resource. These wells should be screened in zones that produce large volumes of high quality water, likely within the Paso Robles Formation.

DISCUSSION

The Paso Robles Formation is overlain by dune sands and younger alluvium, and overlies the Careaga Formation, an accumulation of unconsolidated to well-consolidated, shallow-water marine sands. The Paso Robles Formation is highly variable in color and texture, ranging from gavel and clay, sand and clay, gravel and sand, silt and clay. Most of it is fluvial in origin and in most places correlation between individual beds is not possible. The Careaga Formation is the lower most fresh water bearing formation and water quality is typically poor.

Identifying potential recharge sites on the Nipomo Mesa is contingent upon understanding the geology, the available land for recharge facilities construction, and the existing conveyance facilities or the need for new facility construction. The geologic conditions specific to recharge site identification on the Nipomo Mesa is poorly documented; however, anecdotal information, a few well logs, and existing reports have been reviewed and summarized herein to provide the basis for our current understanding. In general, recharge facilities are constructed over sediments where no confining layer exists in an effort to maximize percolation and therefore recharge to the groundwater aquifer. Set forth below is the summary of document reviews, geologic and topographic map evaluations, site visits, and well logs which indicates the likelihood of a confining layer and location of its inland margin.

Black Lake Canyon is an east-west trending topographic feature resulting from the erosion and transport of unconsolidated sand dune sediments westward to the active dune complex at the ocean. No river exists upstream of the canyon head, and the local surface drainage area at the canyon head is small. Surface water exists along much of the length in the canyon bottom and a terminal lake exists at the canyon mouth in the margin of the active beach dune complex.

No existing reports reviewed during this investigation explained the occurrence or physical processes that created the Black Lake Canyon. However, fine-grained layers in the upper portion of the Paso Robles Formation beneath dune sands are reported to function as a perching layer, and that some of the shallow groundwater that percolates downward within the permeable Nipomo Mesa dune sands is diverted laterally along these low-permeability layers and discharges into Black Lake Canyon and supports Black Lake and other systems of coastal drainages and lakes west of Nipomo Mesa (Papadapolas & Associates, 2004). While not specifically inferred in these reports, the laterally diverted perched shallow groundwater emerging at the ground surface can cause seepage erosion and over time develop a channel head which is likely to migrate up stream. This mechanism may explain the existence of Black Lake Canyon, and substantiate the occurrence of a confining layer above the principle production aquifer.

Santa Maria Valley Water Conservation District releases water stored in Twitchell Reservoir to enhance groundwater recharge by optimizing percolation to the principle production aquifer under the Santa Maria River. Reservoir water is released when there is no water flowing in the Sisquoc River as reported at the gage near Garey. Reservoir water is released at a steady flow rate, typically 300 cubic feet per second (cfs), to maximize groundwater recharge. This flow rate maintains a wetted reach up to but not beyond the Bonita School Road crossing. Anecdotal information suggests that a wetted reach beyond the crossing does not promote groundwater recharge to the principle aquifer because of the occurrence of confining layers at depth.

Drilling logs and well casing documentation may improve the understanding of the subsurface geology. The District provided this information for seven District production wells (Figure 1). Drilling logs were evaluated and correlations were made between well locations in order to identify the existence of a confining layer or sequence of layers. Well completion data documents the depth of the screened interval which is presumably located within the Paso Robles Formation (Table 1). General trends in the lithologies of each drilling log and the position of the screened interval were noted. The occurrence of a sequence of layers with a greater proportion of clay was identified and is interpreted as a confining sequence (Figure 2). The east-west transect of production well log data describes the presence of a confining layer directly above the screened interval in each well, however, the thickness of the confining sequence abruptly thins between the Omiya and Olympic wells. The occurrence of a thin clay layer at the Olympic well may indicate the eastern margin location of the regional confining layer that extends westerly to the ocean.

Drilling logs record the total drilling depth and a description of the lithology. All logs report that drilling ceased upon drilling into a blue clay lithology. This lithology is interpreted as the Franciscan Formation. Well casing is generally installed to total depth with the screened interval at bottom, directly above the Franciscan Formation. The elevation of the top of the Franciscan Formation is 100 feet lower on the west side of the Oceano Fault relative to the east side (Figure 2). The Sundale well is more consistent with the geology west of the Oceano Fault than the geology on the east side of the fault. Reviewing additional drilling logs and casing records may improve the understanding of the vertical offset along the Oceano Fault.

The principle production aquifer under the NMMA has an estimated total storage capacity 500,000 AF of groundwater above sea level (DRW, 2002). Currently, generally 90,000 AF (SAIC, 2007) of water is stored above sea level in the aquifer. Therefore, approximately 400,000 AF of groundwater storage is available in the Nipomo Mesa groundwater basin. The district currently is interested in obtaining at most 6,300 AFY of supplemental water from an alternative water supply. Based on these estimates, there is sufficient available storage to accommodate the 6,300 AFY of supplemental water supply.

The Southland Wastewater Treatment Facility (WWTF) operated 3 recharge basins covering 2.8 acres during the period of 1988 to 1992. The aggregate percolation during this 5 year period was 760 AFY (Lawrance, 1993). This is equivalent to 53.6 AFY per acre or 1.8 inches per day per acre. This includes rotation of the ponds between filling, percolating and drying. Typical long-term percolation rates are on the order of 6 inches per day. It is reasonable to expect effective percolation rates for a recharge facility to be less when considering pond rotations for drying and maintenance, typically 2 of 3 ponds are wet at any time. Approximately 50 acres of recharge ponds would be required in order to bank 6,300 AFY. However, this is programmatically less efficient than to firstly utilize the 6,300 AFY of water in direct deliveries, while reducing pumpage, then secondly, to recharge the un-deliverable water in percolation ponds.

The number of wells needed to capture this volume of water can be estimated from current production data. The three most productive wells operated by the NCSD are the Eureka Well, Sundale Well and the Via Choncha Well. The respective capacity of these wells is 850 gpm, 1000 gpm and 700 gpm (Boyle 2002). Assuming an average capacity per well of 850 gpm, it is expected that a properly install production well will produce 1370 AFY. This value takes into account normal well operations such as downtime and maintenance. It is assumed that similar pumping operations would be implemented. To capture 6,300 AFY of water would require approximately 5 wells.

Geologic features present in the basin will dictate the optimal locations for new extraction wells. The wells should be located seaward of the recharge areas with sufficient distance to allow for mixing and natural filtration of the recharged water. However, wells should be placed far enough away from the coast to avoid causing seawater intrusion. We recommend locating the wells in areas where little pumping currently exists, east of Highway 1, south of the Black Lake Canyon, west of Santa Maria River Fault, and north of the Woodlands development. This general area will distribute pumping across the NMMA providing for a more even access to the water resource. These wells should be screened in zones that produce large volumes of high quality water, likely within the Paso Robles Formation.

REFERENCES:

Boyle Engineering Corporation, (Boyle, 2002), Water and Sewer System Master Plan 2001, prepared for Nipomo Community Services District, update, March 2002.

Department of Water Resources, (DWR, 2002), Water Resources of the Arroyo Grande – Nipomo Mesa Area, 2002.

Lawrance, Fisk & McFarland, INC., (Lawrance, 1993), Engineering Considerations of Groundwater Yields and Rights on the Nipomo Mesa Sub-Area, San Luis Obispo, California, October 20, 1993.

Science Application International Corporation, (SAIC, 2007), Technical Memorandum #4 Update to Groundwater in Storage NMMA, May 23, 2007.

S.S. Papadapolas & Associates, INC., (Papadopulos et al. 2004), Nipomo Mesa Groundwater Resources Capacity Study, San Luis Obispo County, California, prepared for the County of San Luis Obispo, 2004.

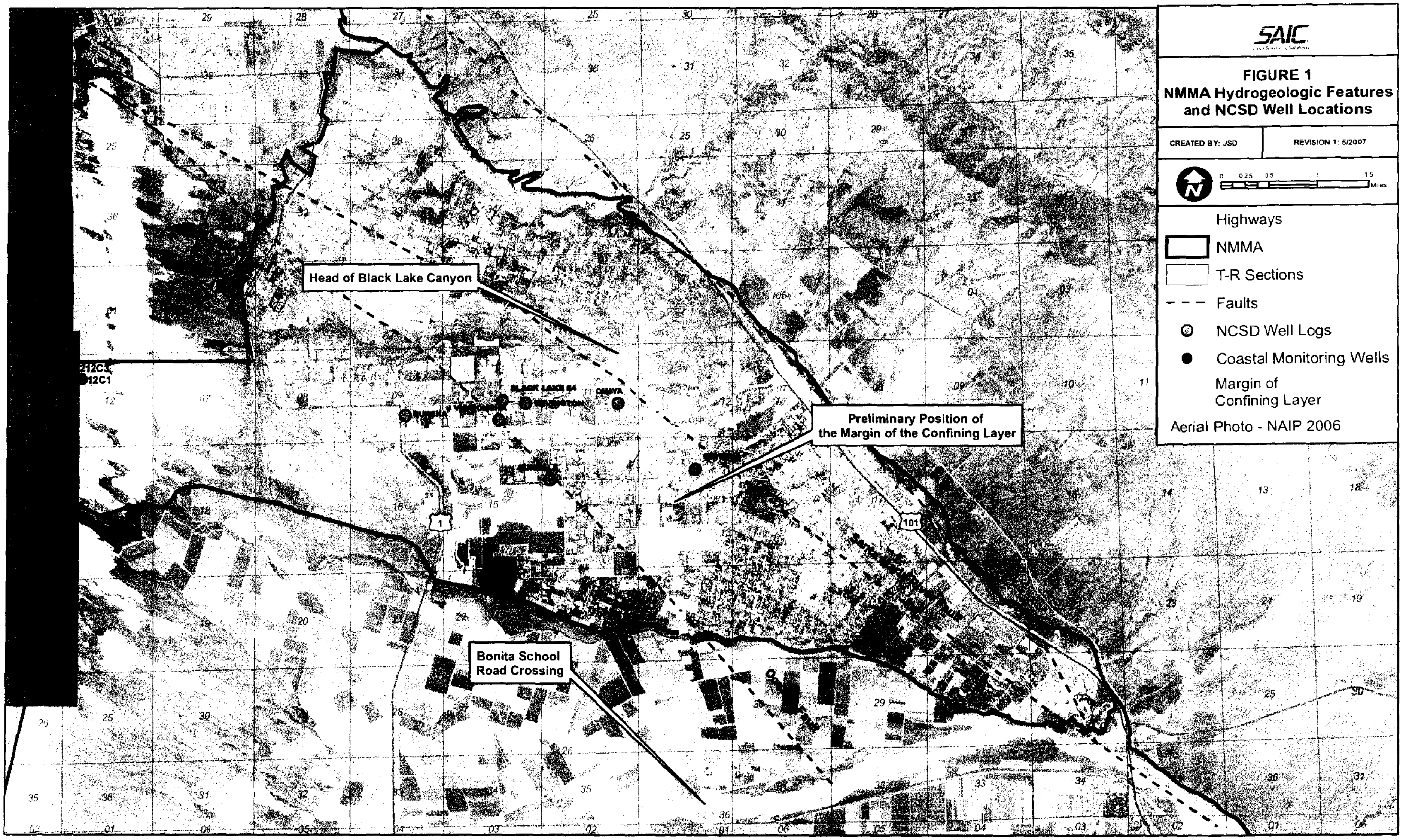


FIGURE 1
NMMA Hydrogeologic Features and NCSD Well Locations

Well Completion Table

Nipomo Mesa Management Area

Well ID	Latitude	Longitude	Ground Surface Elevation (ft msl)	Total Depth (ft msl)	Screen (ft msl)		Screen Interval (ft)	Comments		
								Confining Layer (ft msl)		Confining Layer Interval (ft)
					Top	Bottom		Top	Bottom	
Eureka 11N35W09K05	35° 02' 44.20"	120° 34' 04.93"	174	-546	-46	-401	355	31	-71	102
Via Concha 11N35W10L01S	35° 02' 40.61"	120° 33' 02.26"	264	-464	-126	-426	300	-4	-54	50
Sundale 11N35W15H01S	35° 02' 07.01"	120° 32' 29.11"	251	-459	-129 -379	-329 -419	200 40	-19	-119	100
Black Lake #4	35° 02' 51.19"	120° 32' 59.53"	301	-299	-59	-219	160	207	111	96
Bevington #2 11N35W10J02S	35° 02' 49.57"	120° 32' 43.93"	317	-329	-13	-253	240	47	-93	140
Omiya #2 11N35W11J02S	35° 02' 11.17"	120° 30' 52.05"	390	-260	0	-75	75	255	10	245
Olympic 11N35W13G01S	35° 02' 48.30"	120° 31' 42.57"	346	-129	-19	-109	90	46	28	18

Notes:

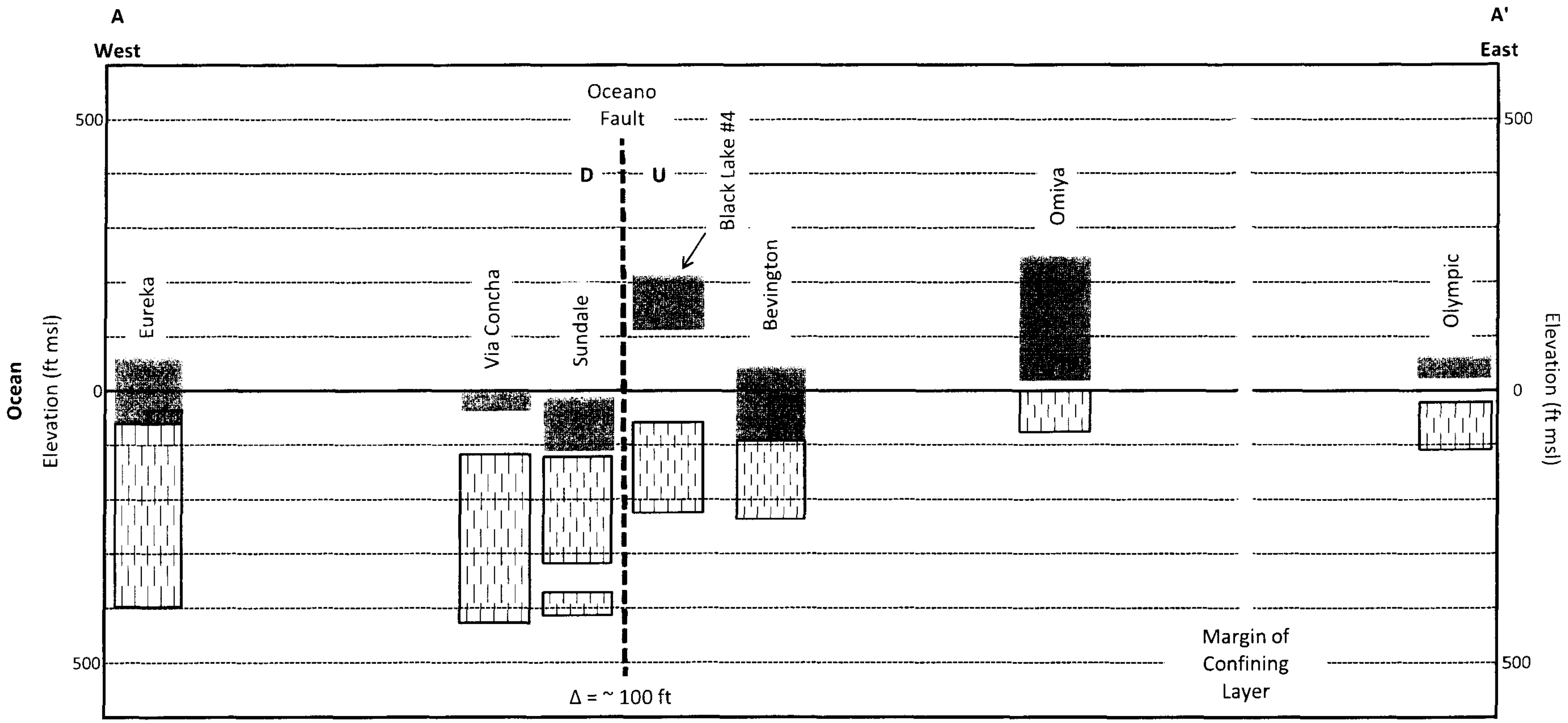
Information based on review of driller logs provided by NCSD

W:\Boyle - NCSD (9785)\Technical\Yield of Aquifer Storage and Recovery\
2007-05-31_Recharge techmemo table I.xlsx

Table 1
6/1/2007

DRAFT

Hydrogeology of Nipomo Mesa Mangement Area
Conceptual Model



▨ Confining Layer Dominate Clay (ft msl)

▥ Screened Interval (ft msl)

Note:

All well data is projected to line (Figure 1)

SAIC
From Science to Solutions

FIGURE 2
DRAFT

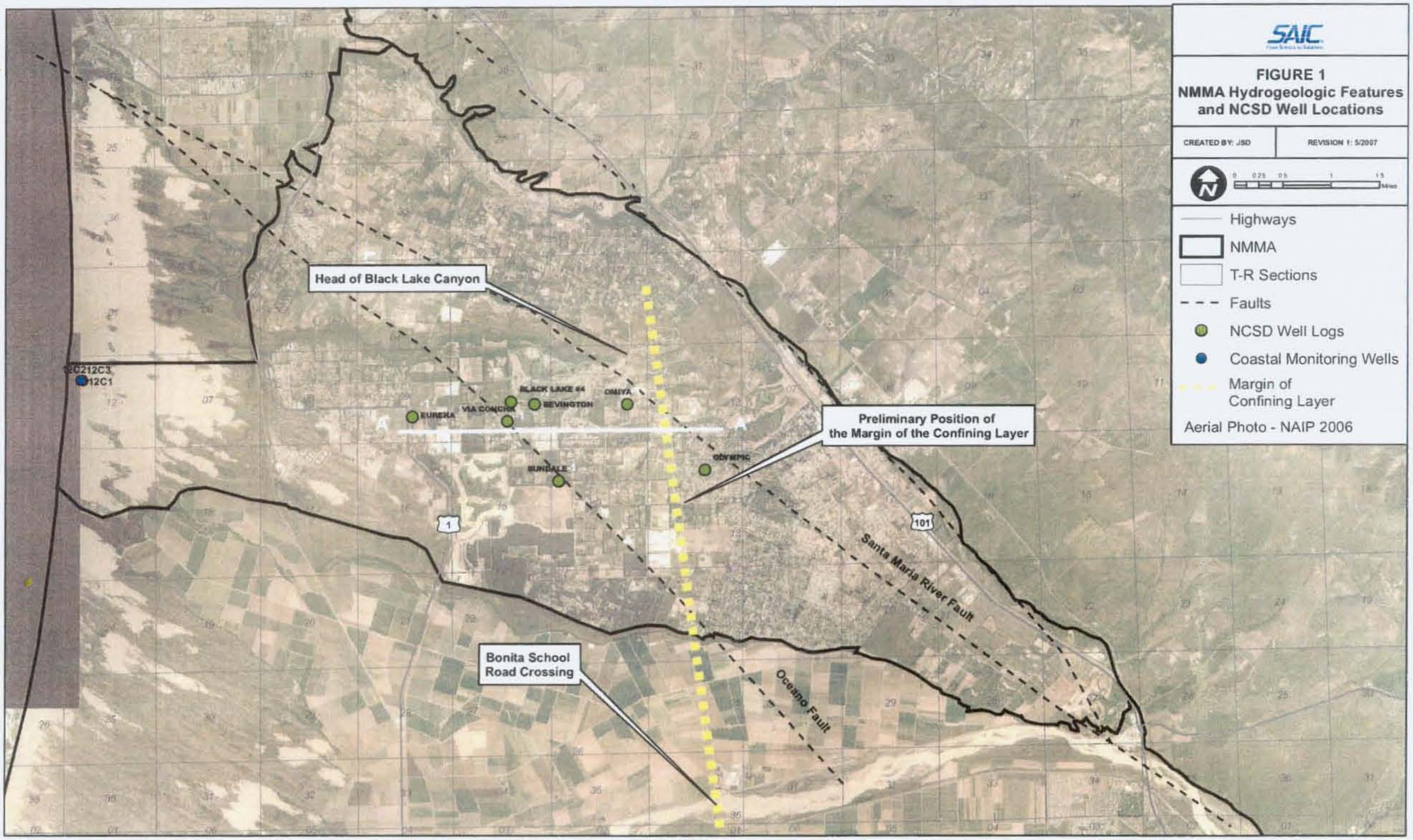


FIGURE 1
NMMA Hydrogeologic Features and NCSD Well Locations

CREATED BY: JSD

REVISION 1: 5/2007

GTA
Garing Taylor
& Associates

Civil Engineering
Surveying
Project Development

Date: January 16, 2007

To: Larry Kraemer, Cannon Associates
From: Malcolm McEwen, Civil Engineer

Subject: Task 25 – Results of Screening Evaluation

Introduction

Task 25 calls for:

- performing a screening evaluation of potential additional up-gradient locations to recharge treated wastewater flows from the Southland WWTF based on ownership, distance from the WWTF and the available geotechnical data (no new testing);

- develop cost allowances for up to six locations for future examination; and

- propose the next steps for such examination.

Based on additional guidance from NCSD staff regarding the geographic scope of interest the initial screening was performed as described below.

Approach

1. Preliminary graphics were developed showing the study area (Figure 1a) and the underlying groundwater elevations in the Spring of 1995 – when a pumping depression was clearly evident (Figure 1b).

2. Parcels located within the study area that met the following criteria (based on public records) were identified:

- Land use was listed as "Vacant, Government" or "Open Space Easement";
- Listed as "0% developed", or "Vacant," or "AG," and 4 acres or larger;
- Appearing on the GIS aerial photos as either vacant or primarily agricultural land use, and 10 acres or larger; or
- Owned by the District and 5 acres or larger.

3. These parcels were plotted on Figure 2. (District staff advised not to present specific parcels in the report. See "blob" version following.)

4. ✓ NRCS Soil mapping data was obtained for the study area. The vast majority (98%) of the study area is mapped as Oceano Sand. This soil has a high infiltration rate ($K_{sat} > 6''/hr$). Therefore, in the absence of site-specific data, infiltration rate should not be a limiting factor.

5. Based on direction from District staff 3 areas were selected for further study, as shown on Figure 3. (This is the "blob" version and is suitable for presentation.)

6. Costs were estimated using the following assumptions:

   MG/Day

   - 0.6 MG of treated wastewater would be pumped to the new infiltration basins from May 1 to October 31 each year for 30 years. ⑤⑥⑦⑧⑨⑩ 6mo = 180 days

     ≈ 2AF x 180 = 331.4AF/yr

   - Treated wastewater would be pumped from a newly installed wet-well located at the southerly end of the Southland WWTP treatment ponds. The wet well and associated pumps and controls would cost $300,000.

- PVC pipe would be installed under existing paved roads with less than 3.5" of asphalt paving. I estimated piping costs as follows:

8"	$106.57/LF;
12"	$124.48/LF;

  complete with paving etc.

- The cost to acquire land was ignored, assuming the land would be dedicated for stormwater detention use.

- Capital costs would be financed with a 30-year bond at 5% annual interest.

- 3 alignments were investigated (Figure 4.)

- Electricity costs would be as listed on the attached rate sheet [Rate schedule E-19 (FTA Rates), effective 9/1/2006 to 12/31/2006].

✓
- Two pumping scenarios were examined: pump 0.6 MGD 24-hours per day, and pump 1.2 MGD 12 hours per day (during non-peak times.)

- Combined motor/pump efficiency was estimated at 50%.

?
- I assumed 80% of the applied water would infiltrate to the District's aquifer. The remainder is lost to evaporation or "leakage" from the targeted aquifer.

- The sensitivity of the results to changes in energy costs was examined by increasing the energy costs by 50% and re-running the analyses.

Results (see attached spreadsheet.)

1. All costs are in 2006 dollars.

2. The least-cost alternative involves 24-hour per day pumping through an 8" pipe to the closest location (Area 3).

3. Capital costs total $2.33 million. Financed with a 30-year bond at 5% this equals $144,000 annually. The largest share of this cost (87%) is for the installation of the pipeline.

4. Energy costs are $5900 annually.

5. Cost of recharged water = $565 per acre-foot.

6. ✓ The most-cost alternative within involves 12-hour per day pumping through a 12-inch pipe to the most distant location (Area 1), with a per-acre-foot cost of $907. Re best cost = 6" 24" to Area →

7. Increasing the energy cost by 50% does not change the choice of least-cost alternative.

Next Steps:

1. ? Select sites in Area 3 based on owner's intention to develop. (Assumption: New developments will be required to build on-site stormwater detention basins.)

2. Contact owners to determine likelihood of cooperation.

3. Perform an environmental assessment of the project. Evaluate hydrogeologic impacts including:

    - Impact to water quality within the aquifer (i.e., How will concentrations of salts, nitrates, and other constituents of concern change as the result of the proposed project?)

    - Potential for "mounding" of groundwater to reduce effectiveness of the "dual use" basins. (i.e., What is a conservative annual rate of treated wastewater application that will not reduce each basin's ability to percolate stormwater?)

Information Sources:

USDA, 2006, Natural Resources Conservation Service, Soil Survey maps created via http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx

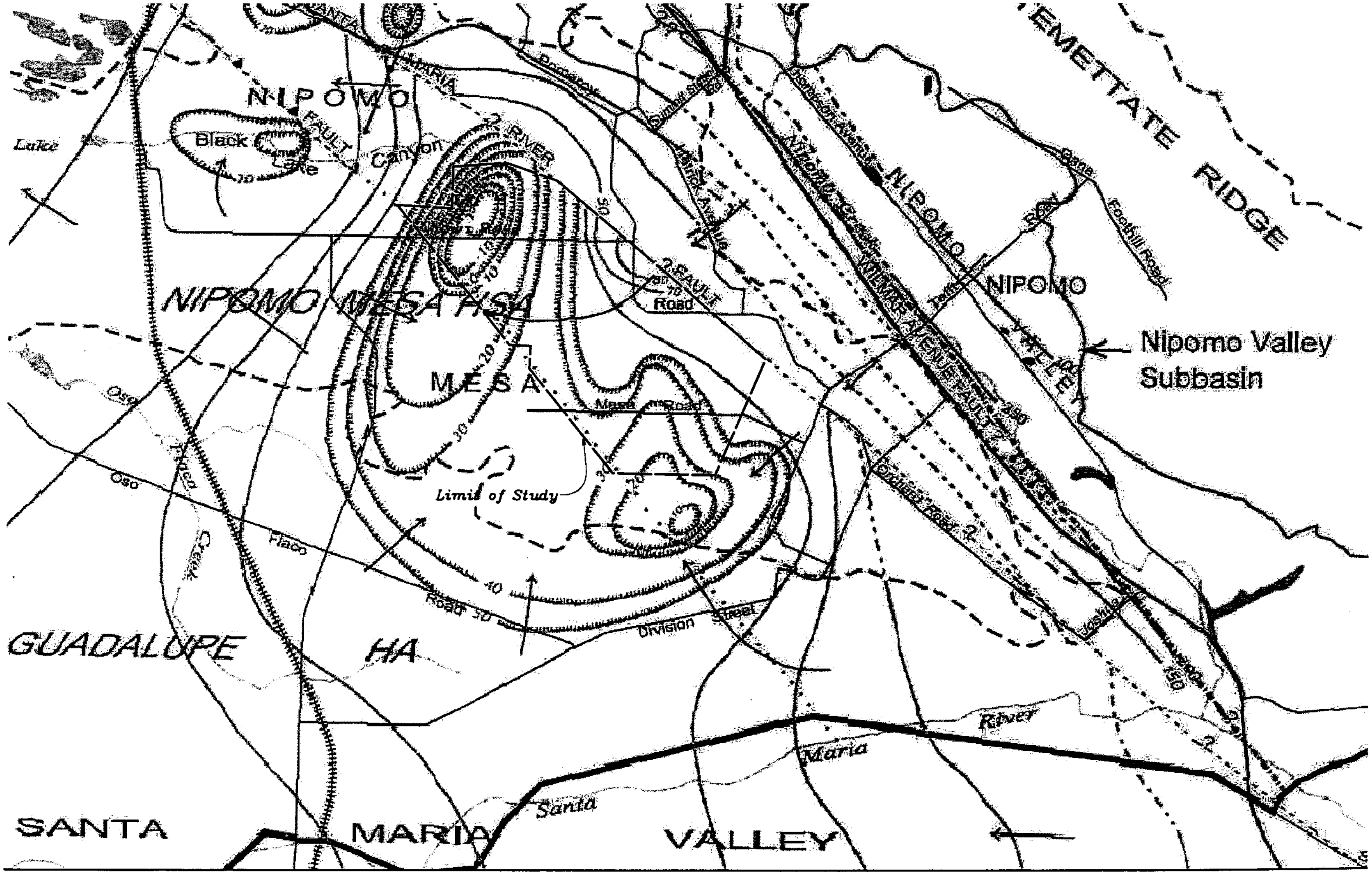
DWR, 2002, Water Resources of the Arroyo Grande - Nipomo Mesa, California Department of Water Resources, Division of Planning and Local Assistance, Southern District, http://www.dpla.water.ca.gov/sd/water_quality/arroyo_grande/arroyo_grande-nipomo_mesa.html

MetroScan, 2006, San Luis Obispo County Assessor's Data accessed through MetroScan (computer application), Version 3.7.0, First American Real Estate Solutions, L.P.

PG&E, 2006, Electrical rates from http://www.pge.com/tariffs/electric.shtml#COMMERCIAL, Comm'l_060901-061231.xls

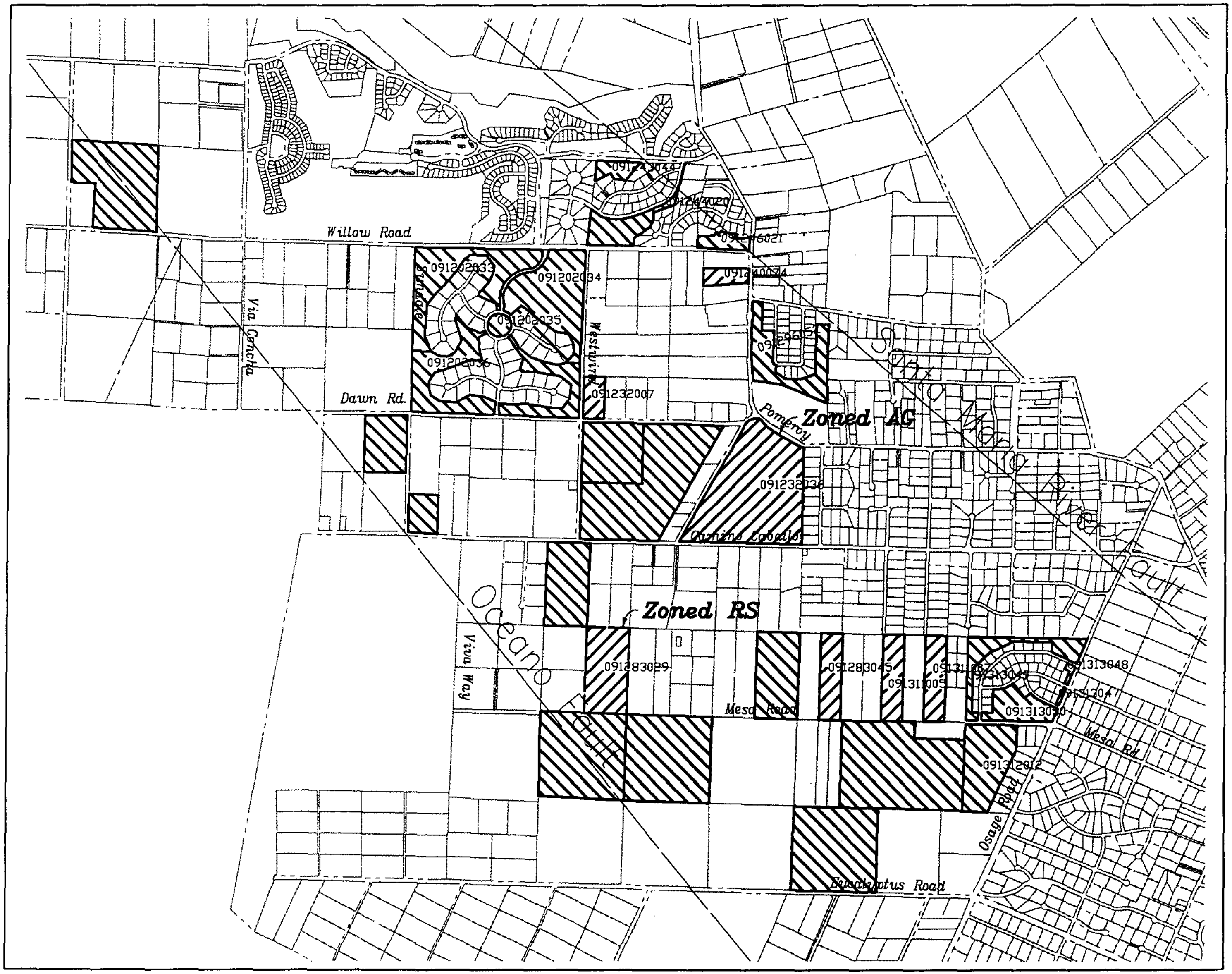
Screening for Additional Locations for Groundwater Recharge
Pipe Alignment Alternatives.

Figure 4.



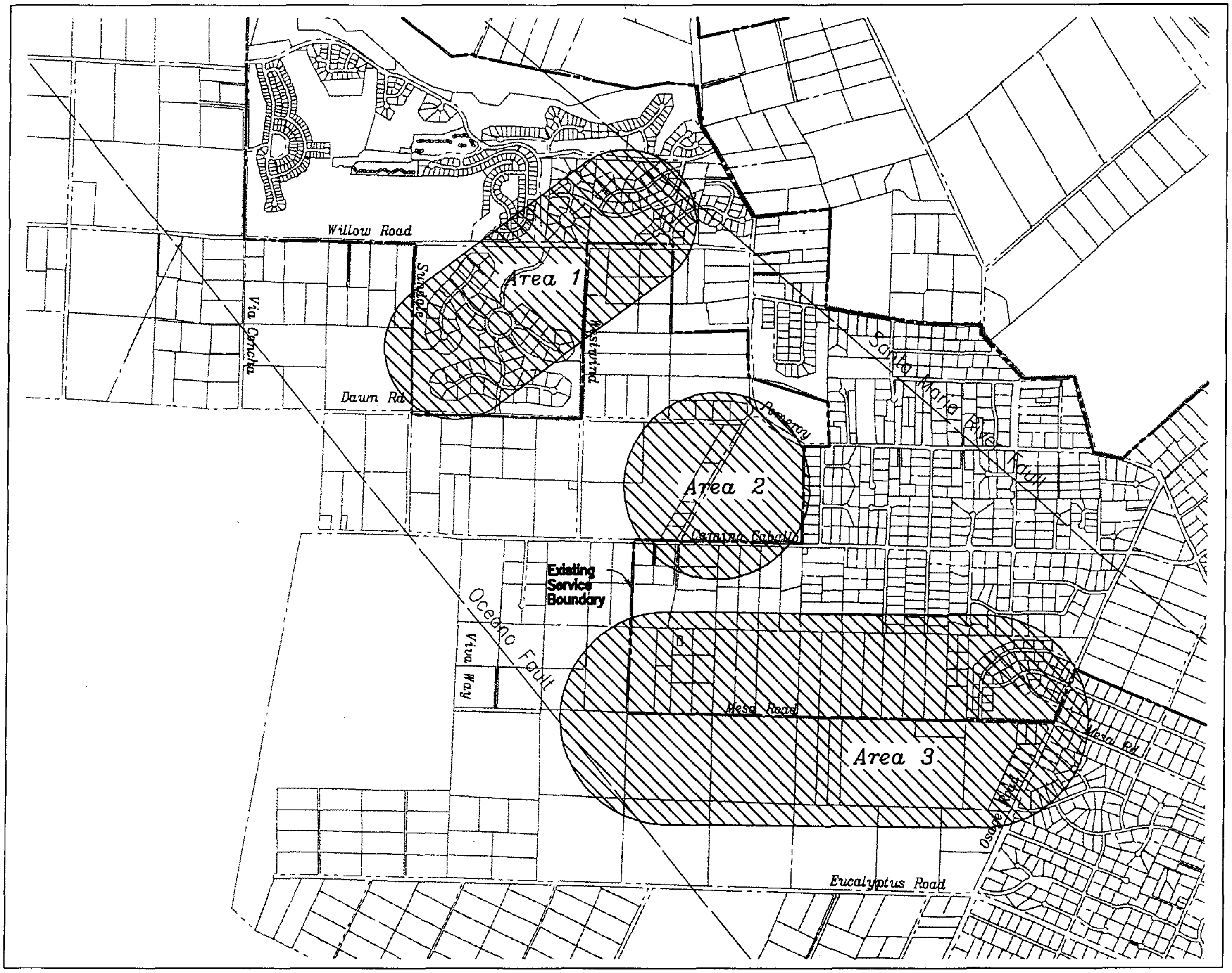
Screening for Additional Locations for Groundwater Recharge
Limit of Study Area in Relation to Spring 1995 Groundwater Elevations

Figure 1b.



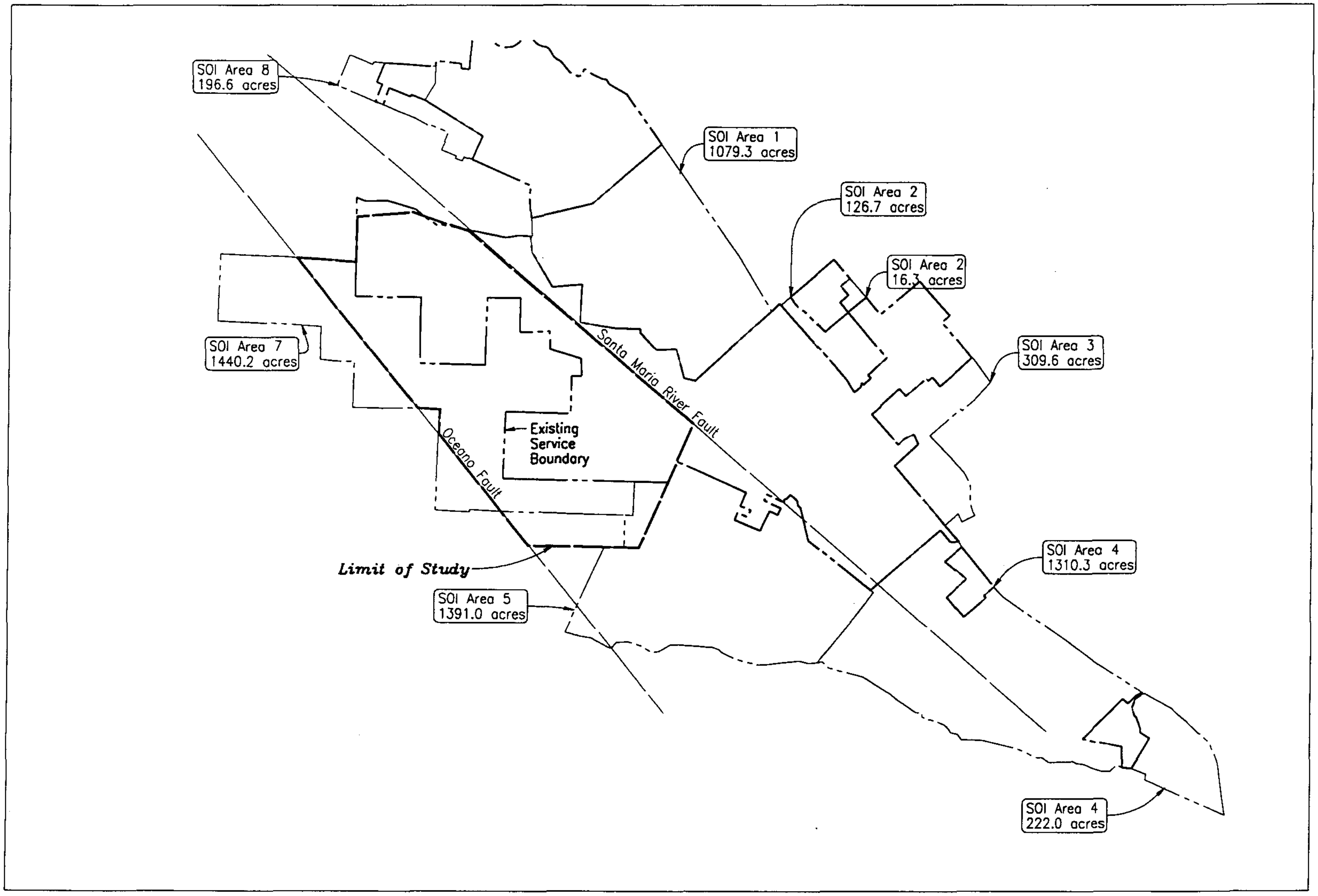
Screening for Additional Locations for Groundwater Recharge
Parcels appearing to satisfy size and land use criteria.

Figure 2.



Screening for Additional Locations for Groundwater Recharge
Locations where parcels appear to satisfy land use and size criteria.

Figure 3.



Screening for Additional Locations for Groundwater Recharge
Limit of Study Area in Relation to Existing Service Boundary and SOI Areas

Figure 1a.

Pacific Gas and Electric Company

Bundled Commercial/General Service Electric Rates at a Glance

Rates Effective:
September 1, 2006, to Present

Rate Schedule	Customer Charge	Optional Meter Data Access Charge	Season	Time-of-Use Period	Demand Charge (per kW)			Time-of-Use Period	Total Energy Charge[1] (per kWh)			Average Total Rate[2] (per kWh)
					Secondary	Primary	Transmission		Secondary	Primary	Transmission	
A-1 Basic general service rate. Generally optimal rate for customers with low electric use and low load factors, with most usage during PG&E's peak and partial peak TOU periods	Single Phase Service per meter/day =$0.26612 Polyphase Service per meter/day =$0.39425		Summer						$0.18349			$0.16727
			Winter						$0.13456			
A-6 Rates vary according to the time of day electricity is used. Typically, the A-6 rate benefits customers who use a significant percentage of their electricity during the off peak period.	Single phase service per meter/day =$0.26612; Polyphase service per meter/day =$0.39425. Plus Meter charge =$0.20107per day for A6 or A6X; =$0.05914 per day for A6W[1]		Summer					On peak	$0.31618			$0.13918
								Part Peak	$0.15738			
								Off Peak	$0.09511			
			Winter					Part Peak	$0.13915			
								Off Peak	$0.10376			
A-10 (Non-FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10. Part of a customer's bill varies according to the customer's maximum monthly electric demand	$3.05215 per meter per day	$0.98563 per meter per day	Summer		$10.83	$10.22	$7.25		$0.12410	$0.12446	$0.11701	$0.14299
			Winter		$5.64	$5.14	$3.31		$0.09423	$0.09381	$0.08998	
A-10 (FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10. Part of a customer's bill varies according to the customer's maximum monthly electric demand			Summer		$10.83	$10.22	$7.25		$0.12899	$0.12935	$0.12190	
			Winter		$5.64	$5.14	$3.31		$0.09912	$0.09870	$0.09487	
A-10 TOU (Non-FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10 TOU. Part of a customer's bill varies according to the customer's maximum monthly electric demand.			Summer		$10.83	$10.22	$7.25	Peak	$0.14300	$0.14280	$0.13619	**Secondary** $0.14305 **Primary** $0.13678 **Transmission** $0.12490
								Part-Peak	$0.13185	$0.13275	$0.12566	
								Off-Peak	$0.10897	$0.10937	$0.10124	
			Winter		$5.64	$5.14	$3.31	Part-Peak	$0.10258	$0.10163	$0.09822	
								Off-Peak	$0.08596	$0.08606	$0.08182	
A-10 TOU (FTA Rates) Customers with high electric use and medium to high load factors generally benefit under Schedule A-10 TOU. Part of a customer's bill varies according to the customer's maximum monthly electric demand.			Summer		$10.83	$10.22	$7.25	Peak	$0.14789	$0.14769	$0.14108	
								Part-Peak	$0.13674	$0.13764	$0.13055	
								Off-Peak	$0.11386	$0.11426	$0.10613	
			Winter		$5.64	$5.14	$3.31	Part-Peak	$0.10747	$0.10652	$0.10311	
								Off-Peak	$0.09085	$0.09095	$0.08671	
E-19 (Non-FTA Rates) Offers demand-metered time-of-use (TOU) service. Customers likely to benefit have high electric use and high load factors and are able to use significant percentages of their electricity during the off-peak period. There are optio	Meter charge: =$3.22956/day for E19 V or X; =$3.08763/day for E19W[3]; =$9.03491/day for E19S mandatory; =$13.14168/day for E19P mandatory; =$34.18086/day for E19T mandatory	$0.98563 per meter per day	Summer	Max. Peak	$14.72	$10.38	$10.46	Peak	$0.13799	$0.12912	$0.09893	**Secondary** $0.13196 **Primary** $0.11630 **Transmission** $0.10818
				Part Peak	$3.51	$2.38	$2.42	Part Peak	$0.10016	$0.09652	$0.08980	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07097	$0.06909	$0.06864	
			Winter	Part Peak	$1.83	$0.75	$0.00	Part Peak	$0.09182	$0.08719	$0.08597	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07442	$0.07228	$0.07175	
E-19 (FTA Rates) Offers demand-metered time-of-use (TOU) service. Customers likely to benefit have high electric use and high load factors and are able to use significant percentages of their electricity during the off-peak period. There are optional			Summer	Max. Peak	$14.72	$10.38	$10.46	Peak	$0.14288	$0.13401	$0.10382	
				Part Peak	$3.51	$2.38	$2.42	Part Peak	$0.10505	$0.10141	$0.09469	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07586	$0.07398	$0.07353	
			Winter	Part Peak	$1.83	$0.75	$0.00	Part Peak	$0.09671	$0.09208	$0.09086	
				Maximum	$7.03	$5.10	$3.58	Off Peak	$0.07931	$0.07717	$0.07664	

[1] Legislated 10% reduction on bill for A-1 and A-6 customers (and some A-10 customers) was discontinued effective January 1, 2006.

[2] Average rates based on estimated forecast. Average rates provided only for general reference, and individual customer's average rate will depend on its applicable kW, kWh, and TOU data.

[3] Effective May 1, 2006, the voluntary TOU one time reprogramming charge of $87 if there is a TOU meter already present, and one time $443 meter installation charge if there is no TOU meter, were eliminated. The lower daily TOU meter charge continues to apply to customers who were on Rate W as of May 1, 2006. Rate X applies to all other customers.

Note: **Summer** Season: May-October **Winter** Season: November-April

This table provided for comparative purposes only. See current tariffs for full information regarding rates, application, eligibility and additional options.

W/O WWTF upgrade ↓
W/O land

Alternatives Amortized Capital

8"@.6 24 hrs/day

8"@1.2" 12 hrs/day

12"@.6 24 hrs/Day

12"@1.2 12 hrs/day

	Alt loc-dia-Q											
Alternative	Alt 1-8-6	Alt 2-8-6	Alt 3-8-6	Alt 1-8-12	Alt 2-8-12	Alt 3-8-12	Alt 1-12-6	Alt 2-12-6	Alt 3-12-6	Alt 1-12-12	Alt 2-12-12	Alt 3-12-12
length (ft)	28150	22529	19016	28150	22529	19016	28150	22529	19016	28150	22529	19016
inlet elevation	302	302	302	302	302	302	302	302	302	302	302	302
outlet elevation	325	310	316	325	310	316	325	310	316	325	310	316
diameter (in)	8	8	8	8	8	8	12	12	12	12	12	12
flow rate (MGD)	0.6	0.6	0.6	1.2	1.2	1.2	0.6	0.6	0.6	1.2	1.2	1.2
kilowatts	17.43	12.735	12.105	98.265	75.615	67.59	6.915	4.155	4.95	22.62	15.375	15.87
hour per day	24	24	24	12	12	12	24	24	24	12	12	12
average energy price	$ 0.10113	$ 0.10113	$ 0.10113	$ 0.07829	$ 0.07829	$ 0.07829	$ 0.10113	$ 0.10113	$ 0.10113	$ 0.07829	$ 0.07829	$ 0.07829
Average demand charge	$ 7.93	$ 7.93	$ 7.93	$ 6.74	$ 6.74	$ 6.74	$ 7.93	$ 7.93	$ 7.93	$ 6.74	$ 6.74	$ 6.74
TDH (ft)	111	81	77	313	241	215	44	27	32	72	49	51
Wet Well Cost	240000	240000	240000	240000	240000	240000	240000	240000	240000	240000	240000	240000
Pump cost	60000	60000	60000	60000	60000	60000	60000	60000	60000	60000	60000	60000
pipe cost ($/foot)	$ 106.57	$ 106.57	$ 106.57	$ 106.57	$ 106.57	$ 106.57	$ 124.48	$ 124.48	$ 124.48	$ 124.48	$ 124.48	$ 124.48
Energy Costs												
energy cost per day	42.30	30.91	29.38	92.32	71.04	63.50	16.78	10.08	12.01	21.25	14.44	14.91
demand cost per month	$ 138.15	$ 100.94	$ 95.94	$ 661.98	$ 509.39	$ 455.33	$ 54.81	$ 32.93	$ 39.23	$ 152.38	$ 103.58	$ 106.91
Annual energy cost	$ 8,443.64	$ 6,169.23	$ 5,864.04	$ 20,589.64	$ 15,843.75	$ 14,162.25	$ 3,349.84	$ 2,012.81	$ 2,397.93	$ 4,739.61	$ 3,221.55	$ 3,325.27
30-year energy cost	$ 253,309.07	$ 185,076.94	$ 175,921.19	$ 617,689.27	$ 475,312.41	$ 424,867.63	$ 100,495.25	$ 60,384.35	$ 71,938.03	$ 142,188.28	$ 96,646.54	$ 99,758.09
Capital Costs												
Pipe	$ 3,000,059.61	$ 2,401,006.85	$ 2,026,612.20	$ 3,000,059.61	$ 2,401,006.85	$ 2,026,612.20	$ 3,504,067.85	$ 2,804,374.58	$ 2,367,081.85	$ 3,504,067.85	$ 2,804,374.58	$ 2,367,081.85
Wet well+Pumps	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00	$ 300,000.00
Total Capital Cost	$ 3,300,059.61	$ 2,701,006.85	$ 2,326,612.20	$ 3,300,059.61	$ 2,701,006.85	$ 2,326,612.20	$ 3,804,067.85	$ 3,104,374.58	$ 2,667,081.85	$ 3,804,067.85	$ 3,104,374.58	$ 2,667,081.85
Bond Interest Rate	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Annual Bond Cost	$204,451.06	$167,337.50	$144,142.35	$204,451.06	$167,337.50	$144,142.35	$235,676.26	$192,327.64	$165,235.72	$235,676.26	$192,327.64	$165,235.72
Total Annual Cost	$ 212,894.70	$ 173,506.73	$ 150,006.39	$ 225,040.70	$ 183,181.24	$ 158,304.60	$ 239,026.10	$ 194,340.45	$ 167,633.65	$ 240,415.87	$ 195,549.19	$ 168,560.99
Total 30-year Cost	$ 6,386,840.89	$ 5,205,201.85	$ 4,500,191.55	$ 6,751,221.08	$ 5,495,437.33	$ 4,749,137.99	$ 7,170,783.04	$ 5,830,213.54	$ 5,029,009.52	$ 7,212,476.07	$ 5,866,475.73	$ 5,056,829.58
Recharge												
30 yr Water Pumped (MG)	3240	3240	3240	3240	3240	3240	3240	3240	3240	3240	3240	3240
30 yr water pumped (af)	9943	9943	9943	9943	9943	9943	9943	9943	9943	9943	9943	9943
percent infiltrated	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%	80%
af infiltrated	7955	7955	7955	7955	7955	7955	7955	7955	7955	7955	7955	7955
cost per acre-foot infiltrated	$ 802.92	$ 654.37	$ 565.74	$ 848.72	$ 690.85	$ 597.03	$ 901.47	$ 732.94	$ 632.22	$ 906.71	$ 737.50	$ 635.72
Minimum Cost			minimum									

Area 1 willow 803
Area 2 cabello 654
Area 3 mesa 566

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May 10, 2007
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Bruce Buel
General Manager
NIPOMO COMMUNITY SERVICES DISTRICT
Nipomo Community Services District
148 S. Wilson
Nipomo, CA 93444

Southland WWTF
Recharge/Disposal Action Plan

The Nipomo Community Services District is beginning to define the objectives of their wastewater program. However, it appears the following may be appropriate "program-level" objectives, based on the District's current planning efforts:

1) Minimize negative impacts on water quality in the groundwater basin;
2) Apply reclaimed wastewater to reduce groundwater depressions and reduce potable water demand within the Nipomo Mesa Management Area; and
3) Develop multiple disposal/recharge options to accommodate treatment plant upsets and wet weather conditions.

Defining program objectives will be important for developing and evaluating various wastewater reuse strategies.

Onsite Percolation

The District has been percolating their treated effluent at the Southland site since the plant was constructed in 1988. The District wishes to continue using onsite percolation as one disposal option, particular during wet weather. At a minimum, continued use will be required in the immediate future as other options are developed.

The critical first step in evaluating onsite disposal options is to assess groundwater conditions underneath the plant. The objective is to develop a "baseline" understanding of local groundwater conditions, since the treatment, disposal, and/or recharge facilities will be designed to minimize impacts to any receiving ground or surface waters.

Knowledge of groundwater conditions beneath the WWTF is limited, and is summarized below:

1. Shallow groundwater – As discussed in our letter report to the District regarding onsite monitoring well data, a mound of "perched" wastewater treatment effluent is located underneath the WWTF site. The extent, and ultimate fate, of this water is not known. It appears to be resting on a clay layer which has low permeability.
2. Deep aquifer – The connectivity of the deep aquifer to shallow groundwater is unknown. Water quality information is limited and the accuracy of the available data is questionable.

Recommendations for Groundwater Evaluation

In order to further evaluate impacts of plant effluent on groundwater, and to predict how changes in wastewater management may affect groundwater, we recommend that the District pursue a groundwater study which addresses the following:

Shallow Conditions:

- Extent of shallow groundwater mound beneath the WWTF;
- Direction, flow (if any), and travel time to Nipomo Creek or to the deep aquifer, if effluent travels to these water bodies;
- Presence of indicator organisms (such as coliform bacteria) in extracted groundwater;
- Optimal location(s) to withdraw groundwater from this mound, in order to prevent offsite migration and to "produce" water for offsite irrigation;
- Maximum allowable inflow and yield, as well as expected recovery efficiency, if the shallow aquifer is used for short-term storage and recovery of reclaimed water for irrigation;
- Maximum effluent loading on the treatment plant site with and without pumping of effluent for irrigation use;
- Monitoring program (short-term and long-term) to evaluate quality and extent of mounded effluent;

Deep aquifer:

- Connectivity (and estimated travel time) to nearby wells, District wells, and mounded plant effluent;
- Water quality and depth;

- Geologic profile extending through plant and including both Santa Maria River and Oceano fault lines;

Possible Findings from Groundwater Evaluation

We anticipate the following possible findings from this study: Groundwater is 1) flowing northeast to Nipomo Creek; 2) flowing laterally in a different direction; 3) relatively stagnant and not moving significantly; 4) flowing vertically to the deeper aquifer; or 5) a combination of these conditions.

Findings	Primary Water Quality Concerns for Onsite Disposal	Recommended Onsite Management Strategy
Groundwater is flowing northeast to Nipomo Creek (Clean Water Act - 303d listed impaired water body)	Pathogens (from 303d list) Nitrogen Salts (Chloride, sodium, sulfate) Toxicity	Salt Management Plan Nitrogen Removal Prevent flow to Creek
Groundwater is flowing laterally away from Nipomo Creek	Nitrogen Salts (Chloride, sodium, sulfate) Impact to neighboring wells	Salt Management Plan Nitrogen Removal Prevent lateral flow
Relatively stagnant, not moving significantly	Nitrogen Salts (Chloride, sodium, sulfate)	Salt Management Plan Nitrogen Removal Prevent lateral flow
Flowing vertically to deep aquifer	Nitrogen Salts (Chloride, sodium, sulfate)	Salt Management Plan Nitrogen Removal

As shown above, water quality concerns (and conceptual treatment goals) will be similar under any of these conditions. However, if flow is moving toward Nipomo Creek, toxicity and pathogens also become issues since the creek is surface water. Two programs affecting surface waters would be of particular concern to the District:

<u>Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (SIP)</u> – This policy requires the establishment of aquatic life-based numerical limits for 23 toxics and human health-based limits for 57 toxics. Pollutants include metals, ammonia, trihalomethanes, and organic compounds such as pesticides. Southland

WWTF may be required to include limits for these pollutants in their Waste Discharge Requirements (WDRs).

Total Maximum Daily Load Program (TMDL) – The TMDL program sets numerical goals for reducing specific pollutants flowing into an impaired water body. The Regional Water Quality Control Board has designated Nipomo Creek as "impaired for beneficial uses" by the presence of pathogens.

Recommended Wastewater Management Strategies

Nitrogen Removal: The proposed wastewater treatment strategy, presented in the Draft Southland WWTF Master Plan, will reduce nitrogen (forms include ammonia, nitrite, nitrate, and organic nitrogen) to below 10 milligrams per liter (mg/L), which is the California Department of Health Services drinking water standard for nitrate.

Prevention of Offsite Flow: Preventing offsite flow is the preferred wastewater management strategy in any of the conditions described above, since it would prevent impacts to neighboring wells or to Nipomo Creek. Implementation would require the development of offsite recharge or reuse facilities.

Salt Management Plan: The objective of a Salt Management Plan is to reduce salt concentrations in wastewater treatment plant effluent by modifying practices which currently add salt to wastewater.

Three (3) basic components are recommended to implement these strategies: onsite wastewater disposal (to be defined after groundwater evaluation is completed); offsite recharge/reuse facilities; and a Salt Management Program.

Offsite Recharge/Reuse Facilities

Offsite recharge/reuse facilities could include groundwater recharge ponds and/or irrigation systems at Blacklake and Woodlands golf courses, as well as County parks. Conceptual recharge and reuse alternatives are being presented in the District's Sewer Master Plan Update and Supplemental Water Alternatives Evaluation. A Recycled Water Study could incorporate the findings from these studies, and would complete the following steps:

- Identify potential users and the quantities of water they would use on a daily, seasonal, and annual basis;
- Evaluate potential groundwater recharge locations (general locations of groundwater depressions will be presented in the District's Sewer Master Plan and Supplemental Water Alternatives Evaluation). This would include estimates of sizes required based on anticipated percolation characteristics of the soils, precipitation, and evaporation rates;

- Determine storage, pumping, and pipeline facilities required to deliver water to these customers and recharge sites; and
- Develop a phased Capital Improvements Plan for constructing these facilities.

Salt Management Plan

Development of a Salt Management Plan would include the following steps:

- Identify sources of salt in wastewater collection system, including possible industrial dischargers and self-regenerating water softeners;
- Develop a public education program to encourage voluntary mitigation measures, such as the use of *offsite* regenerated water softeners;
- Determine strategies for managing water supplies to reduce salt input, including importation of surface water sources and use of wells with lower salt concentrations;
- Predict impact these measures may have on salt concentrations in plant effluent; and
- Monitor program to determine success of these efforts.

Recommendations

As described above, Boyle recommends proceeding with the following tasks:

1) Onsite Disposal Facilities – Perform groundwater characterization

2) Offsite Reuse/Recharge Facilities – Continue with development of a phased Capital Improvements Program for these facilities

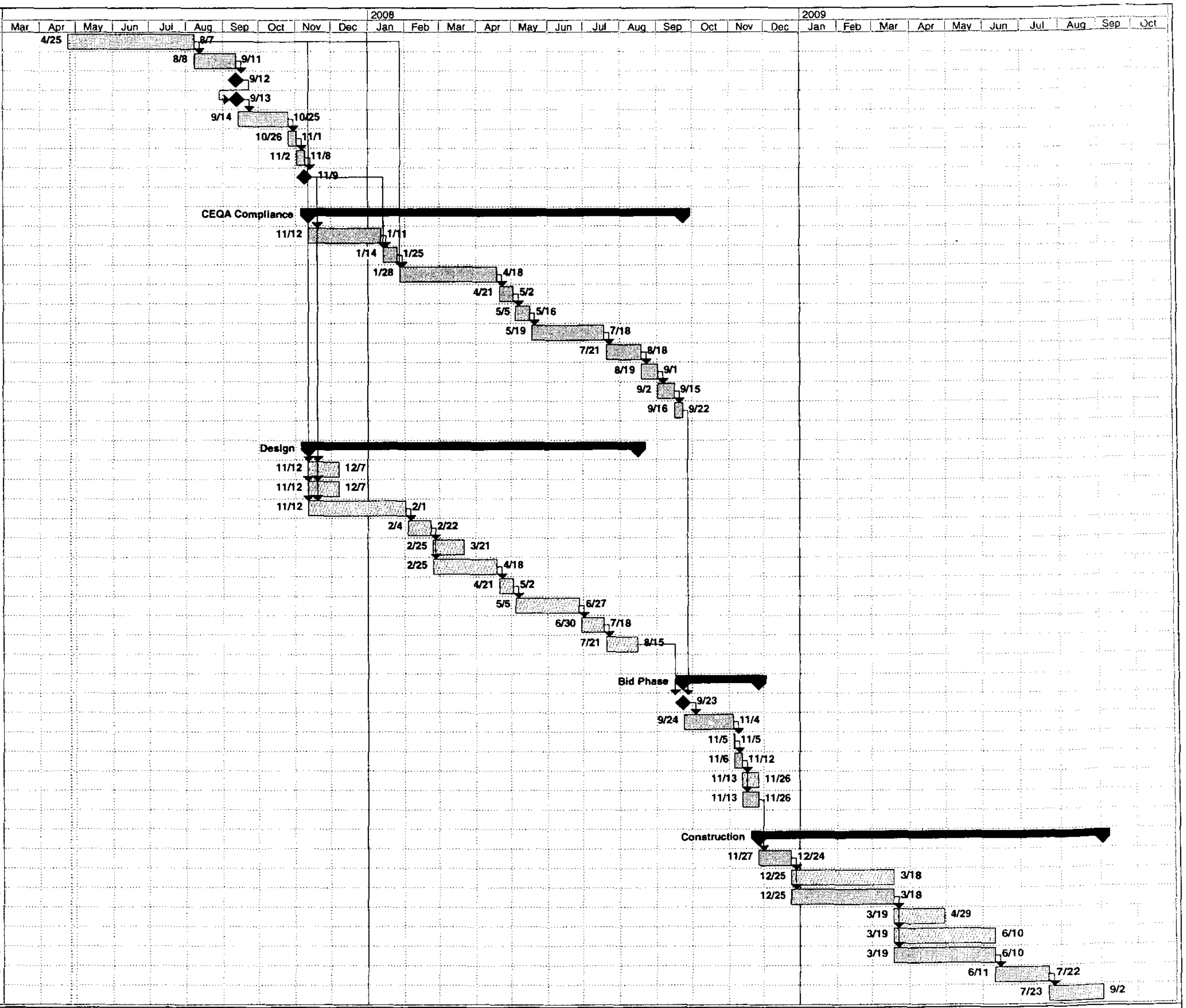
3) Salt Management Plan – Begin development of a program, with elements as outlined above.

Please call if you would like to discuss these further.

Boyle Engineering Corporation

Michael K. Nunley, PE
Managing Engineer

ID	ℹ	Task Name	Duration	Start	Finish
1	▤	Hydrogeological Evaluation	75 days	Wed 4/25/07	Tue 8/7/07
2		Amend Southland WWTP Master Plan	25 days	Wed 8/8/07	Tue 9/11/07
3	▤	Adopt Southland WWTF Master Plan	1 day	Wed 9/12/07	Wed 9/12/07
4	▤	Issue RFP - Design and Environmental	1 day	Thu 9/13/07	Thu 9/13/07
5		Proposal Preparation	30 days	Fri 9/14/07	Thu 10/25/07
6		Interviews	5 days	Fri 10/26/07	Thu 11/1/07
7	▤	Selection of EIR/Design Consultant	5 days	Fri 11/2/07	Thu 11/8/07
8	▤	Board Issues NTP	1 day	Fri 11/9/07	Fri 11/9/07
9					
10		**CEQA Compliance**	**226 days**	**Mon 11/12/07**	**Mon 9/22/08**
11		Initial Study	45 days	Mon 11/12/07	Fri 1/11/08
12		Issue Notice of Preparation	10 days	Mon 1/14/08	Fri 1/25/08
13		Prepare Administrative Draft EIR	60 days	Mon 1/28/08	Fri 4/18/08
14		District Review	10 days	Mon 4/21/08	Fri 5/2/08
15		Prepare Public Draft EIR	10 days	Mon 5/5/08	Fri 5/16/08
16		Public Comment Period	45 days	Mon 5/19/08	Fri 7/18/08
17		Response to Public Comment	21 days	Mon 7/21/08	Mon 8/18/08
18		District Review	10 days	Tue 8/19/08	Mon 9/1/08
19		Prepare Final EIR	10 days	Tue 9/2/08	Mon 9/15/08
20		Board Review and Certification	5 days	Tue 9/16/08	Mon 9/22/08
21					
22		**Design**	**200 days**	**Mon 11/12/07**	**Fri 8/15/08**
23		Survey	20 days	Mon 11/12/07	Fri 12/7/07
24		Geotechnical Investigation	20 days	Mon 11/12/07	Fri 12/7/07
25		Concept Design Report (30%)	60 days	Mon 11/12/07	Fri 2/1/08
26		District Review	15 days	Mon 2/4/08	Fri 2/22/08
27		Prepare Report of Waste Discharge	20 days	Mon 2/25/08	Fri 3/21/08
28		60% PS&E	40 days	Mon 2/25/08	Fri 4/18/08
29		District Review	10 days	Mon 4/21/08	Fri 5/2/08
30		90% PS&E	40 days	Mon 5/5/08	Fri 6/27/08
31		District Review	15 days	Mon 6/30/08	Fri 7/18/08
32		Final PS&E	20 days	Mon 7/21/08	Fri 8/15/08
33					
34		**Bid Phase**	**47 days**	**Tue 9/23/08**	**Wed 11/26/08**
35		Bid Advertisement	1 day	Tue 9/23/08	Tue 9/23/08
36		Bid Period	30 days	Wed 9/24/08	Tue 11/4/08
37		Bid Opening	1 day	Wed 11/5/08	Wed 11/5/08
38		Review of Bid Packages	5 days	Thu 11/6/08	Wed 11/12/08
39		Bid Award	10 days	Thu 11/13/08	Wed 11/26/08
40		Notice to Proceed	10 days	Thu 11/13/08	Wed 11/26/08
41					
42		**Construction**	**200 days**	**Thu 11/27/08**	**Wed 9/2/09**
43		Mobilization	20 days	Thu 11/27/08	Wed 12/24/08
44		Frontage Road Trunk Main	60 days	Thu 12/25/08	Wed 3/18/09
45		Influent Pump Station	60 days	Thu 12/25/08	Wed 3/18/09
46		Headworks Improvements	30 days	Thu 3/19/09	Wed 4/29/09
47		Biolac Installation	60 days	Thu 3/19/09	Wed 6/10/09
48		Site/Yard Piping	60 days	Thu 3/19/09	Wed 6/10/09
49		Sludge Drying Bed Improvements	30 days	Thu 6/11/09	Wed 7/22/09
50		Percolation Ponds	30 days	Thu 7/23/09	Wed 9/2/09



Project: Southland Schedule
Date: Thu 4/26/07

Task	▨	Milestone	◆	Rolled Up Critical Task	▨	Split		Group By Summary	▬
Critical Task	▨	Summary	▬	Rolled Up Milestone	◇	External Tasks	▨	Deadline	⇩
Progress	▬	Rolled Up Task	▨	Rolled Up Progress	▬	Project Summary	▬		