SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
ENVIRONMENTAL PLANNING, ENGINEERING, AND MANAGEMENT DIVISION
SANTA BARBARA

TECHNICAL MEMORANDUM

TO: Bruce Buel, General Manager, Nipomo Community Services District

FROM: Joel Degner, Brad Newton,

RE: Groundwater in storage underneath the Nipomo Mesa Management Area as of April 2006, 01-0236-00-9100

DATE: October 9, 2006

INTRODUCTION

Nipomo Community Services District (NCSD) directed SAIC to (1) determine the amount of groundwater that is in storage within the deep aquifer underneath Nipomo Mesa Management Area (NMMA) based on groundwater elevation data collected April 2006 (2) compare the storage in 2006 to 2000 and (3) compute the above sea level and below sea level volume. The following figures and tables are attached.

Table 2: Well Measurements in April 2006

Figure 1: Well Locations and NMMA Boundaries

Figure 2: NMMA Groundwater Level in 2006

Figure 3: NMMA Groundwater Level in 2000

Figure 4: Change in storage between 2006 and 2000

Figure 5: Water Levels in a Confined Aquifer

RESULTS

Table 1: Groundwater in Storage underneath Nipomo Mesa Management Area

	Volume of groundwater in storage above sea level (AF)			Volume of groundwater in storage below sea level (AF)
Boundary	**April 2006**	**April 2000**	**2000 (DWR)**	**2000, 2006**
Nipomo Mesa Management Area (Phase III)	121,000	124,000	N/A	790,000
Nipomo Mesa Hydrologic Sub-area (DWR)	96,000	99,000	84,000	720,000

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METHODOLOGY

Well Measurements

Groundwater level data were originated from the San Luis Obispo County Department of Public Works (SLO DPW) and from NCSD. SLO DPW measures the groundwater levels in monitoring wells in the spring and the fall of each year. Their most recent data are from April 2006 and were used in this analysis. NSCD measures the levels in its wells monthly. The NCSD data from April 2006 were used in this analysis. Table 1 lists the data from April 2006 and Figure 1 displays the well locations and the measured groundwater elevations. Well data for April 2000 from SLO DPW and NCSD were also used in this analysis for the comparison of water levels in 2000 and 2006.

The groundwater level data were evaluated for accuracy. Well completion records and historical hydrographic records were reviewed to flag data that appeared to be anomalous. Data that did not follow the historical trend in well hydrographs were removed. Data measured from shallow wells were also removed because of concerns that data measured a perched shallow aquifer and did not represent the water level of the deep aquifer that is the subject of this analysis. Table 1 lists the data that were used for the analysis and which data were removed due to data quality concerns.

Well locations were based on the California Department of Water Resources (DWR) records for the wells where available and NCSD well data from earlier SAIC study. When the DWR well locations were compared to other available well locations (SLO DPW, USGS) there were small discrepancies in some well locations. Therefore there is some uncertainty in the accuracy of the locations of the measured wells. The well ground surface elevations were based on DWR records and SLO DPW records. Based on the current analysis and previous analysis by SAIC the well elevations are not accurate and could vary +/- 20 feet.

Groundwater Surface Interpolation

The well measurements were interpolated using an inverse distance weighting method in ArcView 9.1 (Power=2, Number of points = 12). The interpolation was based on the data points and was not interpreted based on assumptions related to structural geology. The representation of the groundwater surface in April 2006 and in April 2000 is shown in Figure 2 and Figure 3 respectively. In their 2002 report, DWR assumed that the Santa Maria River fault acts as a barrier to groundwater flow. This results in a lower estimate of groundwater in storage and explains the difference between the estimate using only the data points (99,000AF) and DWR estimates using an interpretation of the structural geology for 2000 (84,000 AF) (See Table 1).

Groundwater Volume Estimate

The groundwater volume above sea level as shown in Table 1 was estimated by subtracting sea level surface (elevation equals zero) from the representation of the groundwater surface and subtracting the volume of bedrock above sea level. (The bedrock surface originated from Figure 11: Base of Potential Water-Bearing Sediments (DWR 2002)). The groundwater volume below sea level was estimated by subtracting the bed rock surface from the sea level surface. The total volume of the groundwater was multiplied by the specific yield to estimate the amount of groundwater in storage. The specific yield used was 11.7%, based on the average weighted specific yield for the Nipomo Mesa Hydrologic Sub-area estimated by DWR (DWR 2002, pg. 86).

The amount of groundwater in storage under the Nipomo Mesa depends on the boundary that is used to describe the Nipomo Mesa. Figure 1 displays the Nipomo Mesa Hydrologic Sub-area (HSA) boundary that the DWR used in its 2002 Report, the NMMA boundary used in Phase III of the Santa Maria Groundwater Adjudication, and the NMMA boundary provide in Exhibit C of the proposed stipulation in the Santa Maria Groundwater Adjudication. For this analysis, the NMMA from Phase III of the trial was used for continuity with previous analysis that SAIC had done in 2003. The storage was also calculated with the HSA to provide a comparison to previous estimates that were made by the DWR (See Table 1).

Change in Storage Comparison to 2006 and 2000

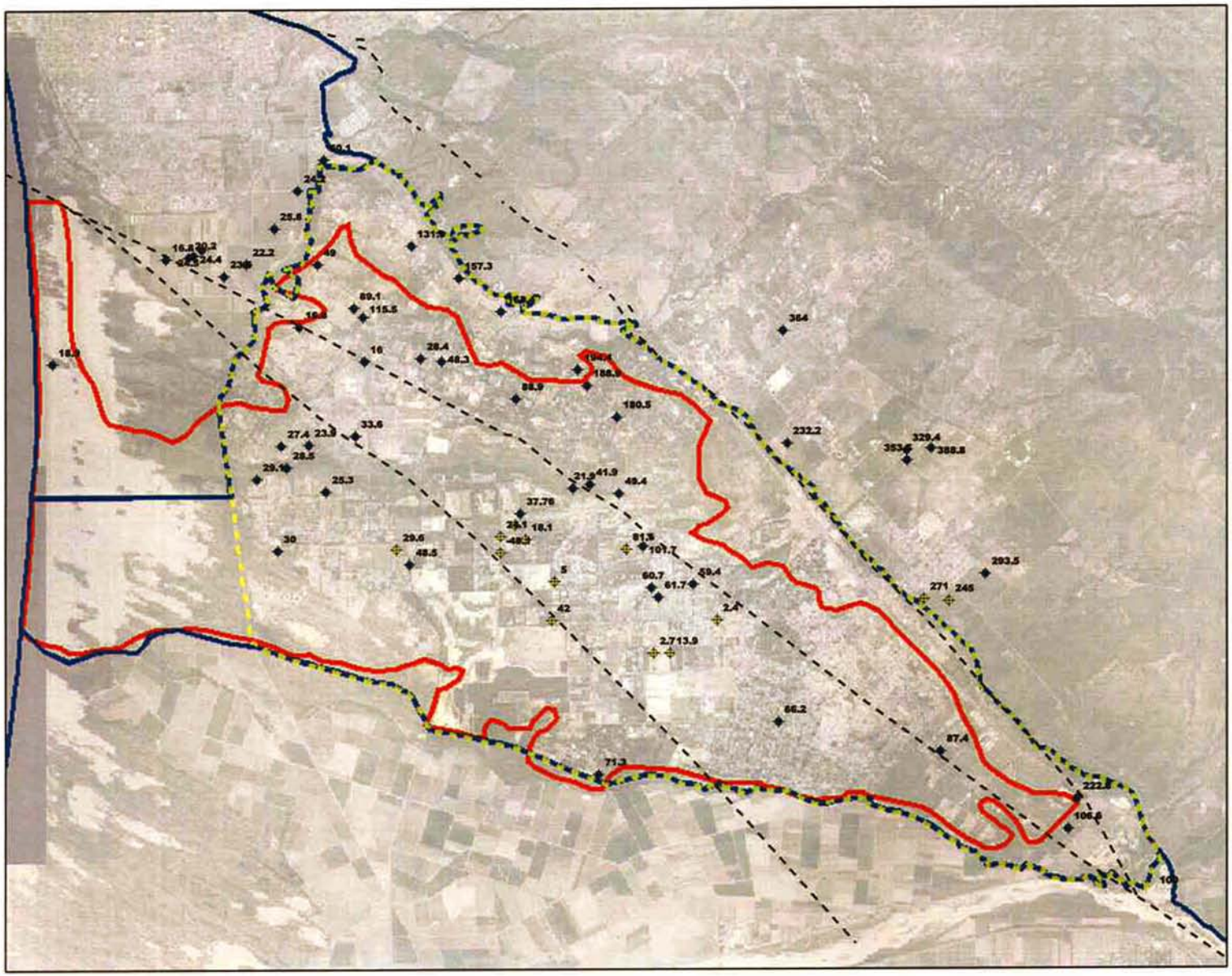
The groundwater in storage in April 2006 was compared to storage levels in April 2000, by subtracting the groundwater elevation surface in 2006 from 2000 (See Figure 4).

Table 2: Measurements in April 2006

State Well Number	Common Name	Production Depth	Reporting Agency	Ground Surface Elevation (ft MSL)	Depth to Water Surface (ft)	Date	Water Surface Elevation (ft MSL)
Measurements used in the analysis							
11N34W27D01	P G & E	Sounded 135'11/74	SLO DPW	295	72.2	4/6/2006	223
11N34W27E01	LAMPHIER - MESA	285' deep	SLO DPW	303	196.5	4/6/2006	107
11N35W02G02	SMITH DOMESTIC	258' depth per owner	SLO DPW	400	219.1	4/18/2006	181
11N35W03B01	FITZPATRICK - FRANKIE	290-310'	SLO DPW	320	231.1	4/18/2006	89
11N35W05G01	ANDREWS - FOWLER LANE	250-265',165'depth	SLO DPW	140	106.4	4/10/2006	34
11N35W05G02	WHITE - FOWLER LANE	140'+ pump	SLO DPW	135	111.1	4/10/2006	24
11N35W05L01	SACKMAN - HWY #1	200' deep,then clay	SLO DPW	108	99.1	4/10/2006	9
11N35W05N02	ALVES - CALLENDER	278' deep	SLO DPW	100	70.4	4/10/2006	29
11N35W05R01	GATES - CALLENDER	240' deep	SLO DPW	139	113.7	4/13/2006	25
11N35W08L01	CDF22		SLO DPW	120	90.0	4/30/2006	30
11N35W09K04	CASANO - HWY#1/WILLOW	274' deep	SLO DPW	182	133.5	4/10/2006	49
11N35W10G01	BLACK LAKE GOLF - EAST	460' deep	SLO DPW	354	316.6	4/10/2006	38
11N35W11B01	NASHOLM - MESA	315-320/366-372	SLO DPW	385	335.6	4/11/2006	49
11N35W11C01	NASHOLM - MESA	210-233/320-324	SLO DPW	261	238.6	4/11/2006	22
11N35W11C02	STRUBLE - MESA	312' deep	SLO DPW	285	243.2	4/11/2006	42
11N35W11J01	CAMACHO - MESA	257-267/287-297/-313	SLO DPW	352	250.3	4/11/2006	102
11N35W13C01	ARLT - POMEROY	500'	SLO DPW	345	285.6	4/11/2006	59
11N35W13D01	KAMINAKA		SLO DPW	330	269.4	4/6/2006	61
11N35W13E02	KAMINAKA - SOUTH	PR form. 430' deep	SLO DPW	305	243.4	4/6/2006	62
11N34W19Q01	BENNY - DIVISION	315' depth	SLO DPW	279	238.8	4/11/2006	40
12N35W27N03	PHALEN CATTLE COMPANY	40-82 3/8"slots	SLO DPW	160	2.7	4/13/2006	157
12N35W28JO2			SLO DPW	180	48.1	4/13/2006	132
12N35W29N01	SILVA - HALCYON		SLO DPW	29	6.3	4/12/2006	22
12N35W29R03	CURRIER - OLD SPILLMAN	300'+ depth	SLO DPW	250	200.5	4/21/2006	49
12N35W30K02	REYAS - CIENEGA VALLEY		SLO DPW	34	9.7	4/13/2006	25
12N35W30K03	IKEDA BROS-CIENEGA VALLEY	40-58/85-87/94-100'	SLO DPW	30	5.6	4/13/2006	24
12N35W30K04			SLO DPW	25	4.8	4/13/2006	20
12N35W30P02	IKEDA BROS-CIENGA VALLEY		SLO DPW	26	2.4	4/13/2006	24
12N35W32G01	COLE - HALCYON	320' depth	SLO DPW	189	172.2	4/19/2006	17
12N35W33E01	RENO - HALCYON		SLO DPW	259	143.0	4/19/2006	116
12N35W33J02	DICK - FERNDALE	443'dp/pump @ 320'	SLO DPW	300	251.8	4/18/2006	48
12N35W33J03	FAGUNDES - FERNDALE	407' deep	SLO DPW	270	241.2	4/18/2006	28
12N35W33L01	JOHNSON - HALCYON		SLO DPW	305	288.5	4/19/2006	16
12N35W34G08	OLIVER - LOS BERROS		SLO DPW	189	25.7	4/13/2006	163
12N35W35P01	JOHNSON - APPLEGATE RANCH	220'	SLO DPW	390	195.7	4/18/2006	194
12N36W36L02	PISMO BEACH - WEST	535-545'	SLO DPW	22	3.4	4/20/2006	19
32S13E33K03	WALLER SEED COMPANY	64-82' 96'deep	SLO DPW	52	27.3	4/13/2006	24
11N34W05J01	C & M NURSERY #2		SLO DPW	396	7.2	4/11/2006	389
11N34W05K01	TODD DOMESTIC		SLO DPW	378	24.5	4/11/2006	354
11N34W05K02	TODD IRRIGATION		SLO DPW	401	71.6	4/11/2006	329
11N34W06L01	MEHLSCHAU		SLO DPW	350	117.8	4/11/2006	232
11N34W09P01	FOOTHILL FARMS		SLO DPW	375	81.5	4/11/2006	294
11N34W20J02	EGG FARM		SLO DPW	316	228.1	4/11/2006	87
11N35W05L03	SACKMAN		SLO DPW	127	98.1	4/10/2006	29
11N35W23L01	BAILEY		SLO DPW	279	207.3	4/11/2006	71
12N34W31F01	FITZGERALD - NIPOMO		SLO DPW	440	76.0	4/11/2006	364
12N35W30M04	22ST./PROCUCE PLACE		SLO DPW	23	5.7	4/29/2006	17

Table 2: Measurements in April 2006

State Well Number	Common Name	Production Depth	Reporting Agency	Ground Surface Elevation (ft MSL)	Depth to Water Surface (ft)	Date	Water Surface Elevation (ft MSL)
12N35W33D01	PHIL BEN		SLO DPW	240	150.9	4/13/2006	89
12N35W35P03	SEVERENCE - DOMESTIC		SLO DPW	410	221.1	4/18/2006	189
32S13E33A06	GARING NEW DOM		SLO DPW	80	29.9	4/13/2006	50
32S13E33L02	TAYLOR #1		SLO DPW	42	16.3	4/13/2006	26
11N35W09K05	Eureka	220-575' Depth 575'	NCSD	174	144.0	4/3/2006	30
11N35W10L01	Via Concha		NCSD	264	312.0	4/3/2006	-48
Unknown	Black Lake #3		NCSD	319	295.0	4/3/2006	24
Unknown	Black Lake #4		NCSD	301	349.0	4/3/2006	-48
Unknown	Sundale		NCSD	251	209.0	4/3/2006	42
11N35W10J02	Bevington		NCSD	317	299.0	4/3/2006	18
Unknown	Knollwood		NCSD	279	274.0	4/3/2006	5
11N35W13M02	Dana #1		NCSD	321	307.0	4/3/2006	14
11N35W14J01	Dana #2		NCSD	308	305.0	4/3/2006	3
Unknown	Omiya		NCSD	390	308.0	4/3/2006	82
Unknown	Olympic		NCSD	346	344.0	4/3/2006	2
Unknown	Savage		NCSD	310	39.0	4/3/2006	271
Unknown	Church		NCSD	300	55.0	4/3/2006	245
Measurements that were removed from the analysis							
11N35W02G01	SMITH OBSERVATION	130' sounded	SLO DPW	400	93.3	4/18/2006	306
Reason: Shallow well, nearby deep aquifer well had a much lower measurement							
11N35W09K02	SCHAEFER HWY#1/WILLOW	356' deep	SLO DPW	190	111.6	4/10/2006	78
Reason: Measurements did not correspond to nearby well measurements							
11N35W13E03	KAMINAKA - NORTH	PR formations	SLO DPW	305	227.1	4/6/2006	78
Reason: 11N35W1302 - Kaminaka South was in the same location. Kaminiaka South was closer to nearby measurements							
12N35W33Q02	LAYMAN - HALCYON ROAD		SLO DPW	339	196.1	4/19/2006	143
Reason: Measurements did not correspond to nearby well measurements, could be a shallow well							
12N35W35P04			SLO DPW	395	131.7	4/18/2006	263
Reason: Measurements did not correspond to nearby well measurements, could be a shallow well							
12N36W36L01	PISMO BEACH - EAST	227-237'	SLO DPW	22	15.2	4/20/2006	7
Reason: Same location as well 12N36W36L02, 36L02 was perforated deeper in the aquifer, so it was used instead							
32S13E33A05	GARING - LOS BERROS	38'deep	SLO DPW	80	9.2	4/13/2006	71
Reason: Shallow well							
11N34W17B04	NCSD SAVAGE #1 OLD		SLO DPW	325	35.2	4/6/2006	290
Reason: Measurements did not correspond to nearby well measurements, but cause unknown							
11N34W18P03	NIPOMO REGIONAL PARK		SLO DPW		119.7	4/6/2006	230
Reason: No ground surface elevation available							



LEGEND

2006 GW Elevations (ft AMSL)

- NCSD Wells
- SLO DPW Wells
- Faults
- NMMA (Phase 3)
- NMMA (Stipulation)
- Nipomo Mesa HSA (DWR)

0 0.5 1 2 Miles

1:60,000

N

UTM - ZONE 10
NAD 1983

SOURCES:
AERIAL PHOTO - NAIP 2006

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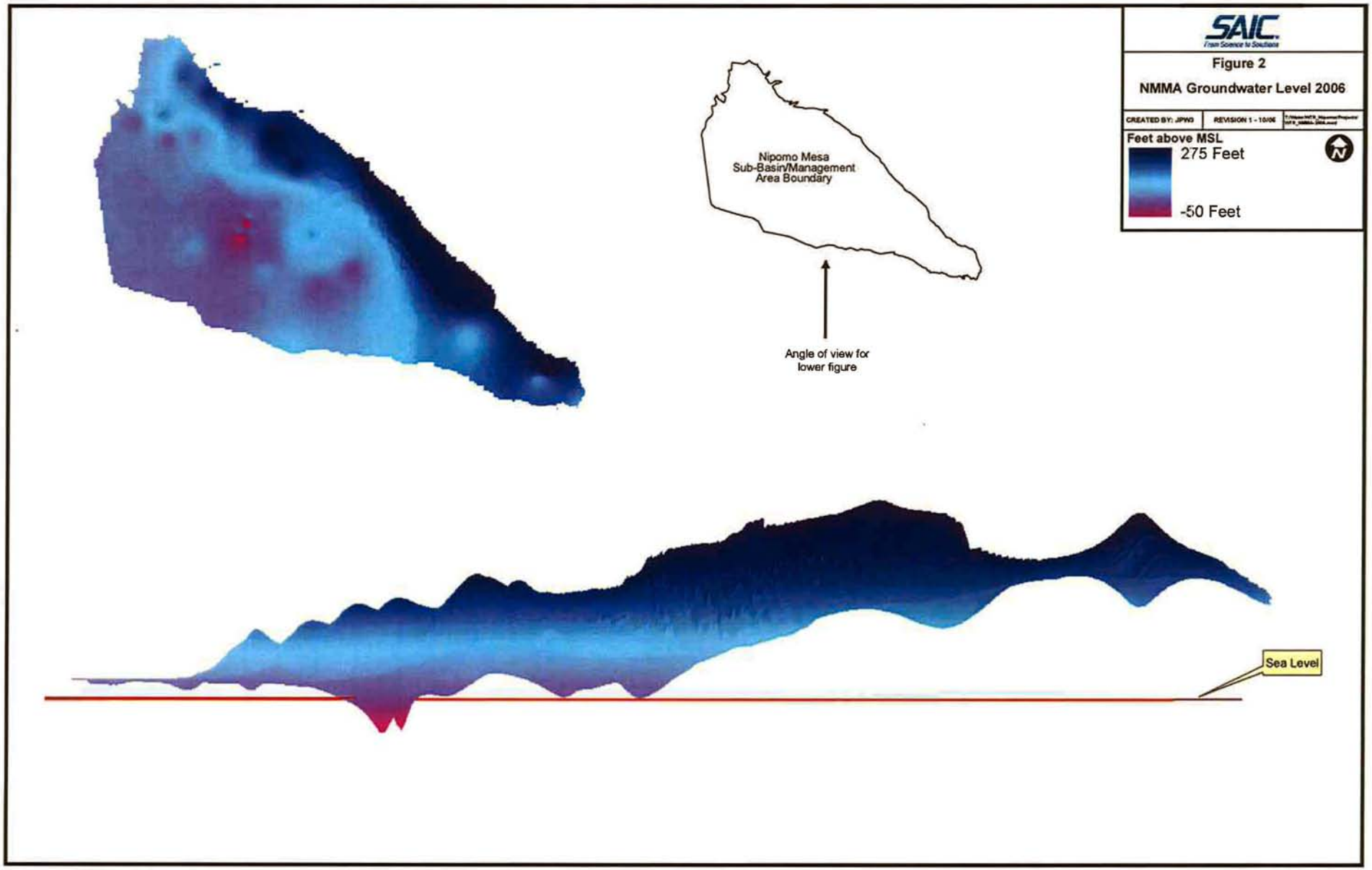
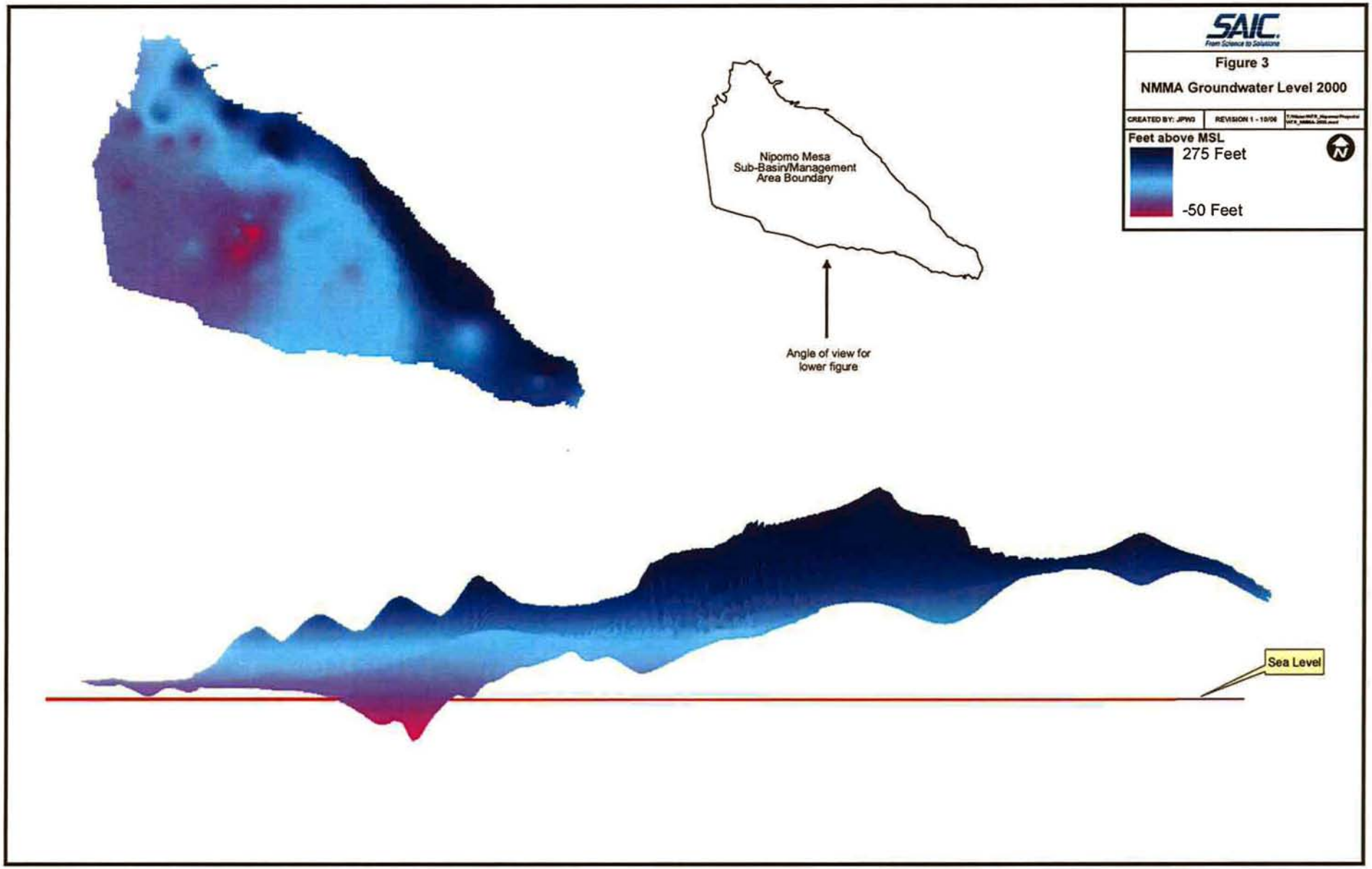
FIGURE 1
WELL LOCATIONS AND NIPOMO MESA BOUNDARIES

DRAWN BY:	CHECKED BY:
JD 10/7/2006	





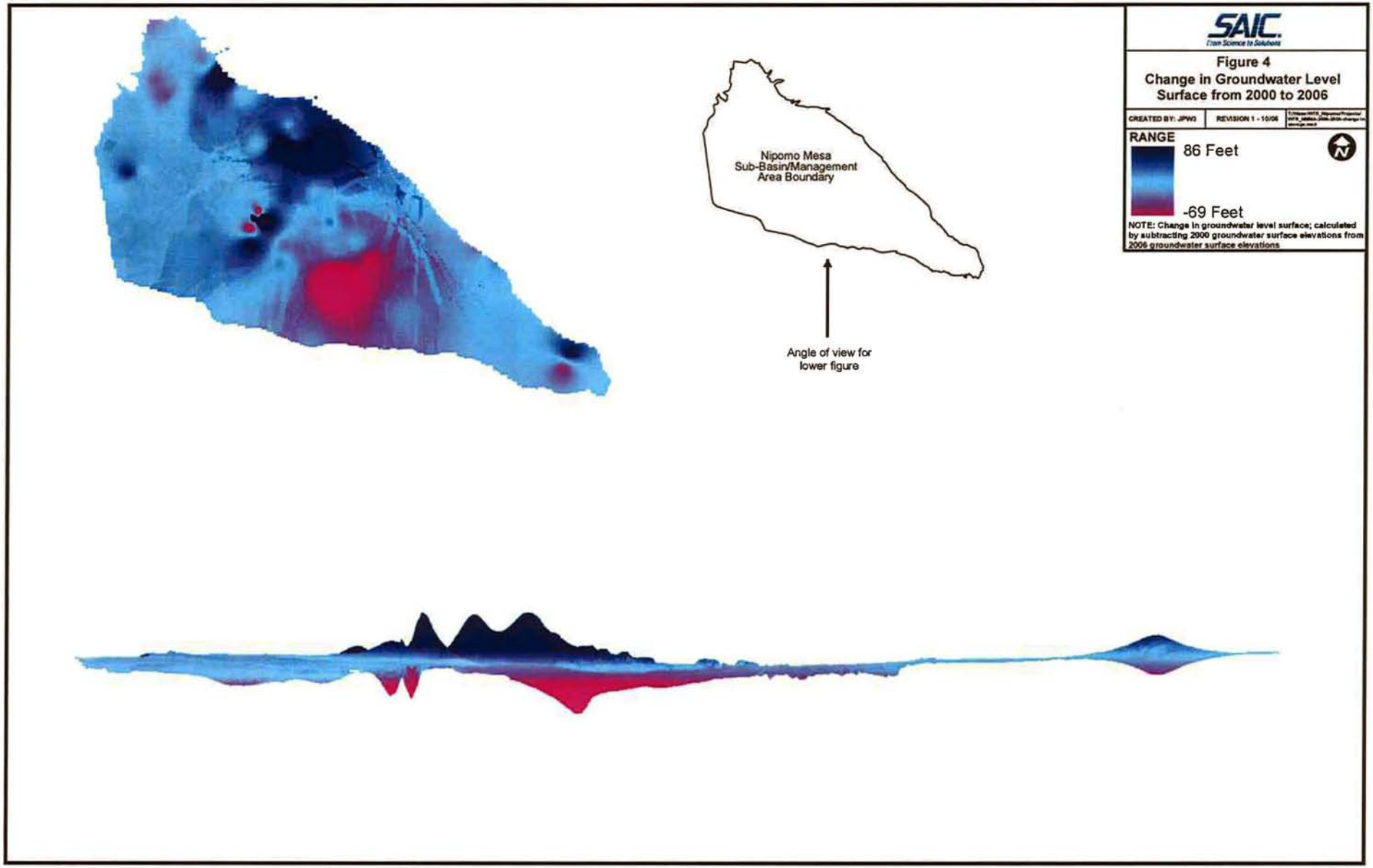
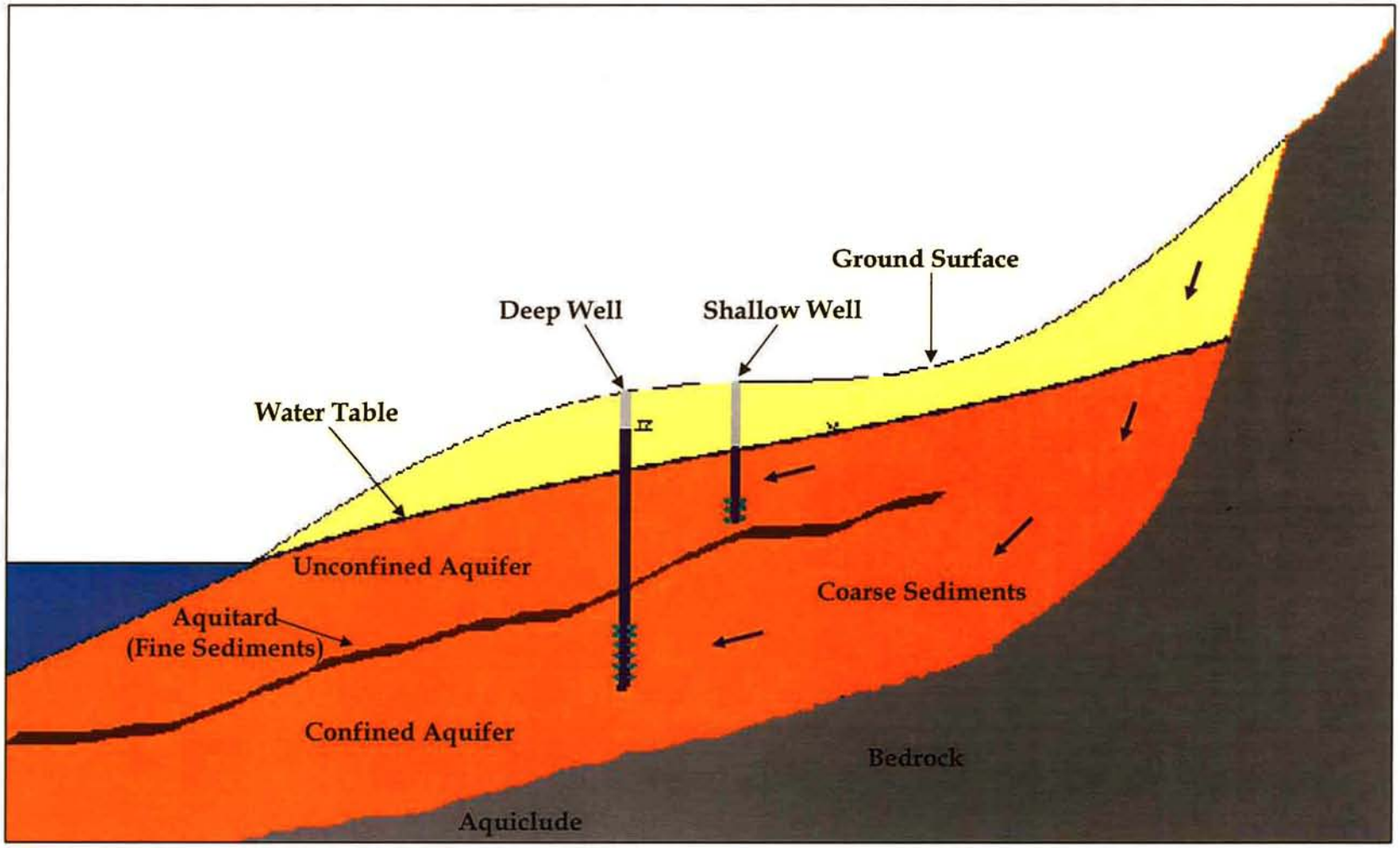


Figure 5: Water Levels in a Confined Aquifer



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