

TO: BOARD OF DIRECTORS  
FROM: MICHAEL S. LEBRUN *MSL*  
GENERAL MANAGER  
DATE: JUNE 7, 2013



## 2013 SPRING GROUNDWATER INDEX

### ITEM

Receive Spring 2013 Groundwater Index Presentation by Brad Newton, PhD, PG of Newton Geo-Hydrology Consulting Services LLC [RECEIVE PRESENTATION]

### BACKGROUND

Mr. Brad Newton is scheduled to summarize the 2013 Spring groundwater index. The report is an independent product of Newton Geo-Hydrology Consulting Services and is not reviewed or recognized by the Nipomo Mesa Management Area Technical group.

### FISCAL IMPACT

Development of this report is included in the contract budget with Newton Geo-Hydrology Consulting Services (Formally of Wagner & Bonsignore).

### STRATEGIC PLAN

Strategic Plan Goal 1.1 – Protect, Enhance and Assess available Water Supplies

### RECOMMENDATION

Staff recommends that the Board receive the report and give direction to staff.

### ATTACHMENTS


- A. 2013 Spring Groundwater Index Technical Memorandum
- B. Presentation Slides

JUNE 12, 2013

ITEM E-10

ATTACHMENT A

1 **TECHNICAL MEMORANDUM**

2  
3 **TO:** NCSD Board of Directors  
4 **FROM:** Brad Newton, Ph.D., P.G.   
5 **RE:** Spring 2013 Groundwater Index  
6 **DATE:** June 06, 2013

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7 **INTRODUCTION**

8 Groundwater surface elevations (GSE) underlying the Nipomo Mesa are regularly  
9 measured at many places (wells) across the mesa. The Spring 2012 Groundwater Index (GWI)  
10 has been computed and presented herein along with historical GWI from 1975 to present based  
11 on these groundwater surface elevation measurements collected during spring and fall across  
12 the Nipomo Mesa. Limited measurements of GSE were available for the years 1982, 1983, 1984,  
13 1994 and 1997, thus precluding a reliable calculation of GWI for those years.

14 **The Nipomo Mesa Management Area (NMMA) Technical Group (TG) has not**  
15 **reviewed this technical memorandum, its findings, or any presentation of this evaluation.**

16  
17 **RESULTS**

18 Spring 2013 GWI is 67,000 acre-feet (AF), a 22,000 AF (25 percent) decline from the Spring  
19 2012 GWI (Table 1, Figure 1). The Key Well Index (KWI) from NMMA 5th Annual Report -  
20 Calendar Year 2012 generally follows the same historical trends as the GWI (Figure 1). With last  
21 year's rainfall being slightly under average and this year's rainfall being less than 50 percent of  
22 average, there is great cause for concern given Spring groundwater elevations have declined  
23 resulting in a GWI Spring 2013 of 67,000 acre-feet (22,000 acre-feet less than that of Spring 2012).  
24

25 **METHODOLOGY**

26 The calculation of spring and fall GWI are based on GSE measurements regularly made by  
27 San Luis Obispo County Department of Public Works (SLO DPW), NCSD, USGS, and  
28 Woodlands. The integration of GSE data is accomplished by using computer software to  
29 interpolate between measurements and calculate GWI within the principal production aquifer  
30 assuming an unconfined aquifer and a specific yield of 11.7 percent. Limited measurements of  
31 GSE were available for the years 1982, 1983, 1984, 1994 and 1997, precluding a reliable  
32 calculation of GWI for those years.

33 **Groundwater Surface Elevation Measurements**

34 Groundwater surface elevation data were obtained from SLO DPW, NCSD, USGS, and  
35 Woodlands. SLO DPW measures GSE in monitoring wells during the spring (April) and the fall

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*Newton Geo-Hydrology Consulting Services, LLC*  
420 E Carrillo Street, Santa Barbara, CA 93101 • (805) 636-6619 • [bnewton@newtongh.com](mailto:bnewton@newtongh.com)

TO: NCS D Board of Directors  
RE: Spring 2013 GWI  
DATE: June 06, 2013  
Page 2 of 5

1 (October) of each year. Woodlands and NCS D measures GSE in their monitoring wells  
2 monthly. For the years 1975 to 1999, available representative GSE data were used to compute  
3 GWI. For the years 2000 to 2011, only GSE data from the same 45 wells were used to compute  
4 GWI.

5 The GSE data was reviewed in combination with well completion reports and historical  
6 hydrographic records in order to exclude measurements that do not accurately represent static  
7 water levels within the principal production aquifer. Wells that do not access the principal  
8 production aquifer or were otherwise determined to not accurately represent static water levels  
9 within the aquifer were not included in analysis.

## 10 **Groundwater Surface Interpolation**

11 The individual GSE measurements from each year were used to produce a GSE field by  
12 interpolation using the inverse distance weighting (IDW) method.

## 13 **Groundwater Index**

14 The GWI is defined as the saturated volume above sea level and bedrock multiplied by the  
15 specific yield of 11.7 percent. The GWI is comprised from approximately 45 ground water  
16 elevation measurements made by the County of San Luis Obispo each April and October. The  
17 value of the groundwater index was computed for an area approximately similar to the NMMA  
18 Boundary. The base of the saturated volume is mean sea level surface (elevation equals zero) or  
19 the bedrock above sea level, whichever is higher. The bedrock surface elevation is based on  
20 Figure 11: Base of Potential Water-Bearing Sediments, presented in the report, Water Resources  
21 of the Arroyo Grande - Nipomo Mesa Area (DWR 2002). The bedrock surface elevation was  
22 preliminarily verified by reviewing driller reports obtained from DWR (Figure 2). The specific  
23 yield is based on the average weighted specific yield measurement made at wells within the  
24 Nipomo Mesa Hydrologic Sub-Area (DWR 2002, pg. 86). The GWI is similar to the Key Well  
25 Index presented in the Nipomo Mesa Management Area Technical Group annual report to the  
26 Court, but is not directly comparable.

## 27 **Key Well Index**

28 The Key Well Index (KWI) was developed by the NMMA Technical Group from eight  
29 inland wells representing the whole of the groundwater basin within the NMMA. The Key  
30 Well Index was defined for each year from 1975 to present as the average of the normalized  
31 spring groundwater data from each well. The lowest value of the Key Well Index could be  
32 considered the "historical low" within the NMMA.

33

## 34 **REFERENCES**

35 Department of Water Resources (DWR). 2002. Water Resources of the Arroyo Grande - Nipomo  
36 Mesa Area, Southern District Report.

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 Page 3 of 5

**Spring and Fall  
 Groundwater Index  
 (GWI)**

Year	Rainfall (inches)	Spring GWI (Acre-Feet)	Number of Wells	Fall GWI (Acre-Feet)	Number of Wells	Spring to Fall Difference (Acre-Feet)
1975	17.29	99,000	54	91,000	54	8,000
1976	13.45	82,000	45	76,000	65	6,000
1977	10.23	64,000	59	54,000	63	10,000
1978	30.66	84,000	62	—	35	—
1979	15.80	72,000	57	77,000	63	(5,000)
1980	16.57	88,000	55	89,000	46	(1,000)
1981	13.39	97,000	46	75,000	47	22,000
1982	18.58	123,000	42	—	31	—
1983	33.21	—	35	95,000	42	—
1984	11.22	—	14	76,000	37	—
1985	12.20	106,000	37	82,000	41	24,000
1986	16.85	98,000	51	67,000	51	31,000
1987	11.29	83,000	48	71,000	52	12,000
1988	12.66	80,000	51	66,000	49	14,000
1989	12.22	59,000	47	47,000	57	12,000
1990	7.12	62,000	55	49,000	53	13,000
1991	13.18	62,000	52	55,000	54	7,000
1992	15.66	61,000	52	35,000	48	26,000
1993	20.17	72,000	54	52,000	61	20,000
1994	12.15	60,000	54	—	36	—
1995	25.87	87,000	35	74,000	52	13,000
1996	16.54	76,000	45	62,000	57	14,000
1997	20.50	—	20	91,000	48	—
1998	33.67	105,000	41	93,000	44	12,000
1999	12.98	106,000	56	88,000	49	18,000
2000	17.07*	108,000	44	84,000	41	24,000
2001	18.52*	118,000	43	85,000	35	33,000
2002	8.87*	96,000	29	79,000	41	17,000
2003	11.39	94,000	37	66,000	42	28,000
2004	12.57	89,000	42	81,000	35	8,000
2005	22.23	98,000	38	79,000	39	19,000
2006	20.83	107,000	44	78,000	41	29,000
2007	7.11	93,000	44	66,000	42	27,000
2008	15.18	83,000	43	65,000	42	18,000
2009	10.31	76,000	44	65,000	43	11,000
2010	20.07	80,000	45	67,000	42	13,000
2011	34.05	87,000	43	81,000	43	6,000
2012	15.35*	89,000	45	65,000	44	24,000
2013	6.48*	67,000	45			

—: Insufficient for evaluation  
 \*: Preliminary value

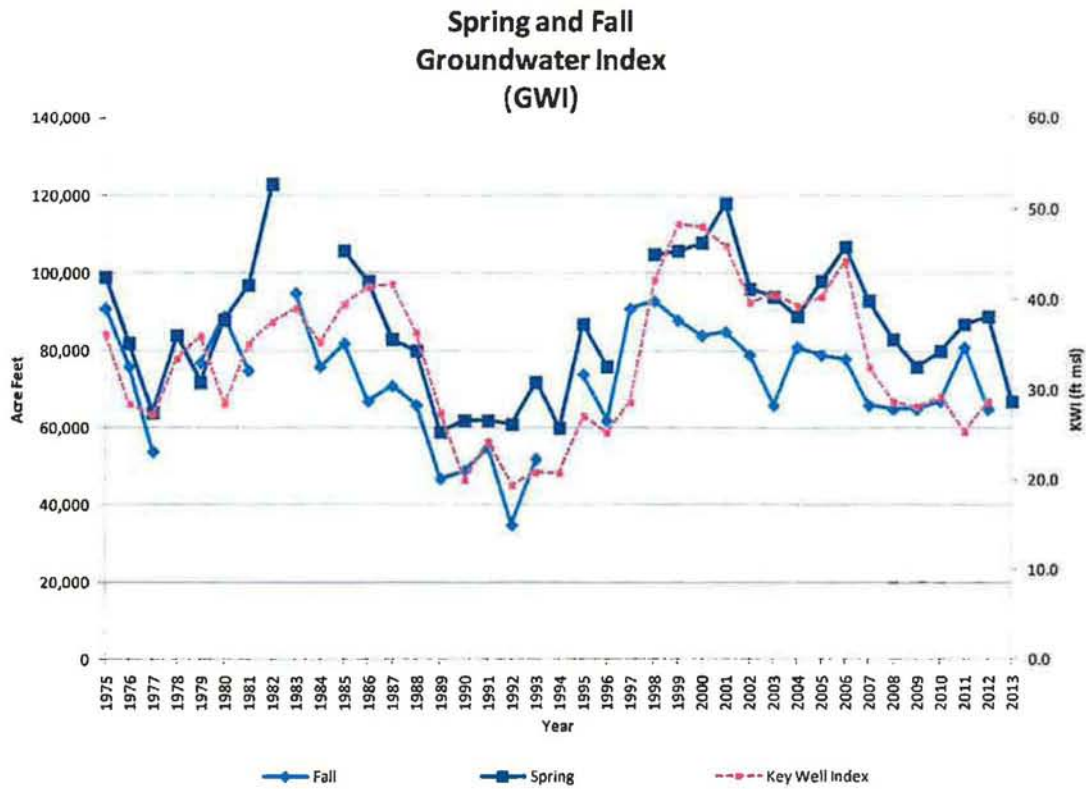
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Table 1: Groundwater Index computed from Spring 1975 to Spring 2013.

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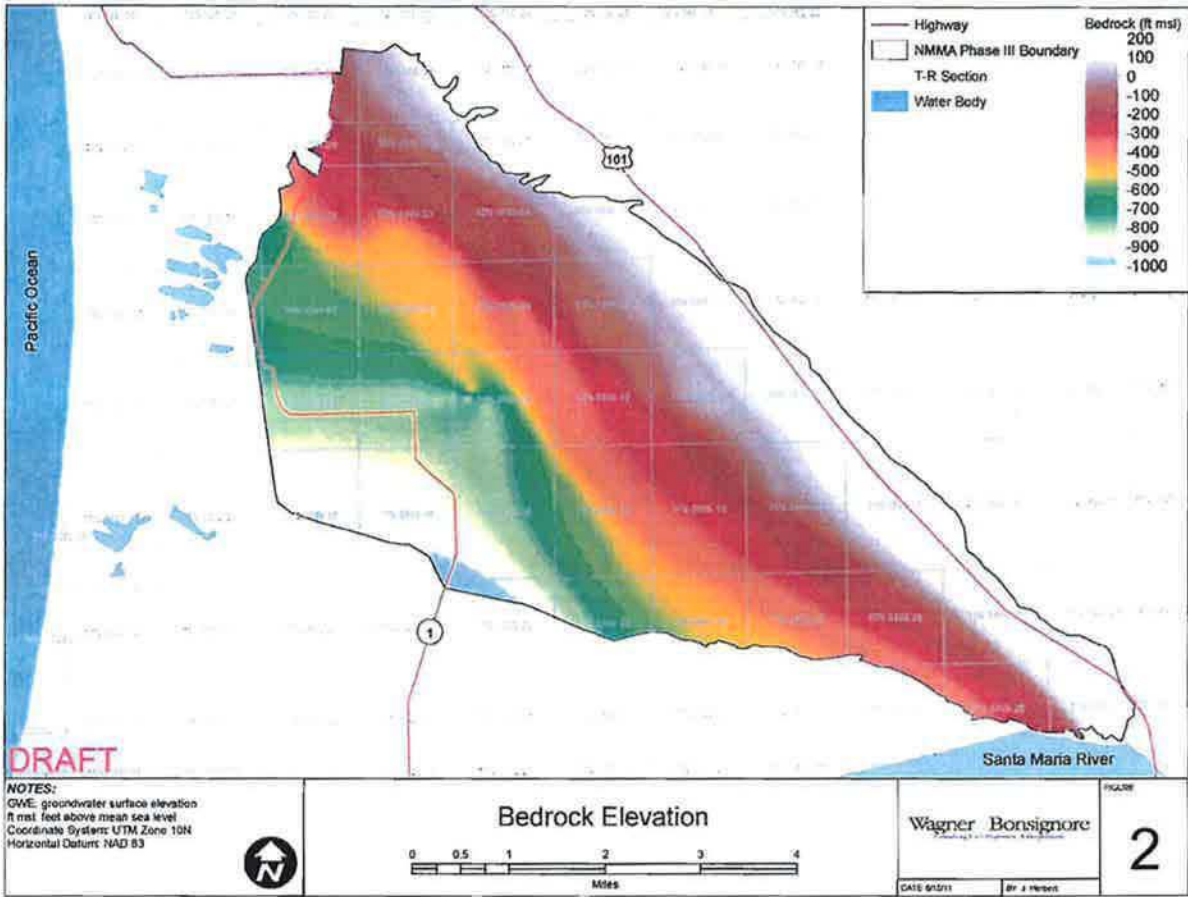
Newton Geo-Hydrology Consulting Services, LLC  
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 Page 4 of 5



1  
 2 Figure 1: Groundwater Index from Spring 1975 to Spring 2013 and the Key Well Index computed from Spring 1975 to Spring  
 3 2012

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 Page 5 of 5



1  
2

Figure 2: Elevation of bedrock underlying the NMMA.

JUNE 12, 2013

ITEM E-10

ATTACHMENT B



An aerial photograph of a rural landscape, likely a farm or agricultural area, with a yellow boundary line drawn around a central portion of the land. The terrain is a mix of green fields, brown soil, and some buildings. The text is overlaid on the right side of the image.

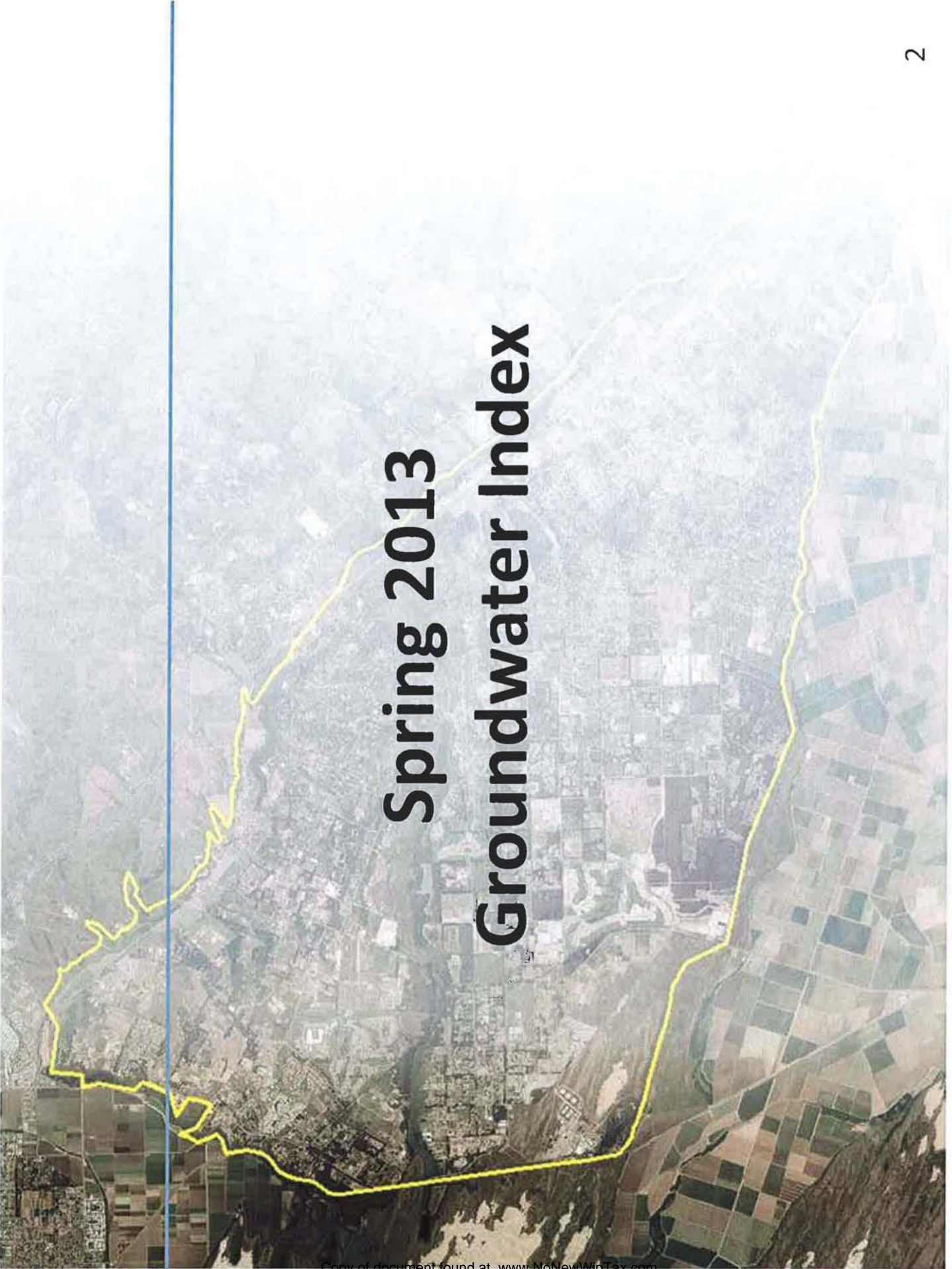
# **Spring 2013 Groundwater Surface Elevations and Rainfall 2013**

Prepared by  
Newton Geo-Hydrology Consulting Services  
June 12, 2013

# Overview

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- Estimate of Spring 2013 Groundwater Index
- Rainfall 2013

An aerial photograph of a rural landscape, likely a valley or basin, showing a mix of agricultural fields in various shades of green and brown, and some built-up areas. A prominent yellow line traces a boundary across the terrain. A solid blue vertical line is positioned on the left side of the image. The text 'Spring 2013 Groundwater Index' is overlaid in the center in a large, bold, black font.

# Spring 2013 Groundwater Index

Spring 2013 GWI

# GWI Estimate

Spring and Fall  
Groundwater Index  
(GWI)

Year	Rainfall (inches)	Spring GWI (Acre-Feet)	Number of Wells	Fall GWI (Acre-Feet)	Number of Wells	Spring to Fall Difference (Acre-Feet)
1975	17.29	99,000	54	91,000	54	8,000
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2008	15.18	83,000	43	65,000	42	18,000
2009	10.31	76,000	44	65,000	43	11,000
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2011	34.05	87,000	43	81,000	43	6,000
2012	15.35*	89,000	45	65,000	44	24,000
2013	6.48*	67,000	45			

1996	16.94	76,000	43	82,000	37	14,000
1997	20.50	—	20	91,000	48	—
1998	33.67	105,000	41	93,000	44	12,000
1999	12.98	106,000	56	88,000	49	18,000
2000	17.07*	108,000	44	84,000	41	24,000
2001	18.52*	118,000	43	85,000	35	33,000
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2004	12.57	89,000	32	81,000	35	8,000
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2010	20.07	80,000	45	67,000	42	13,000
2011	34.05	87,000	43	81,000	43	6,000
2012	15.35*	89,000	45	65,000	44	24,000
2013	6.48*	67,000	45			

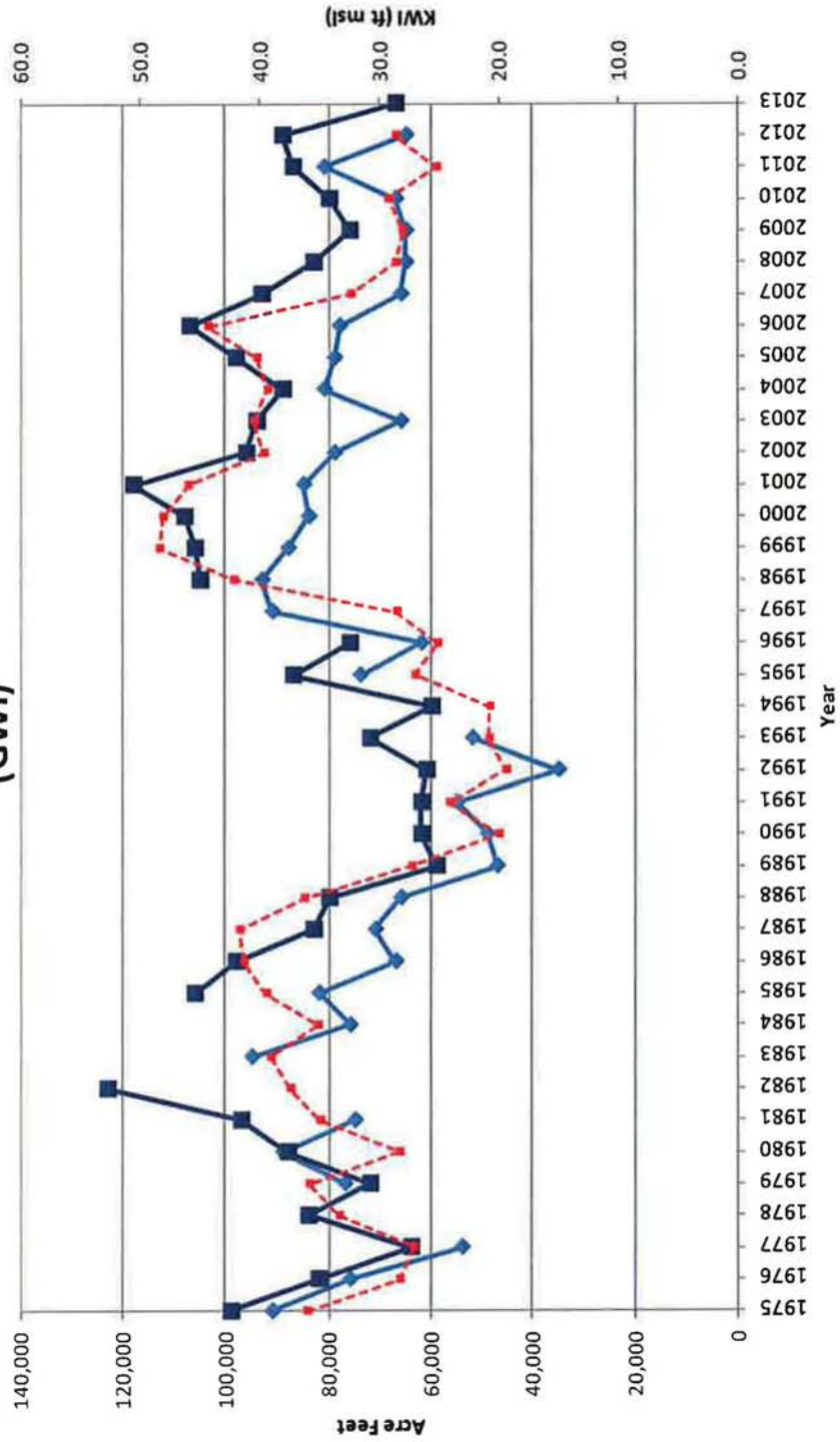
—: Insufficient for evaluation  
\*: Preliminary value

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Spring 2013 GWI

# GWI Estimate

Spring and Fall  
Groundwater Index  
(GWI)



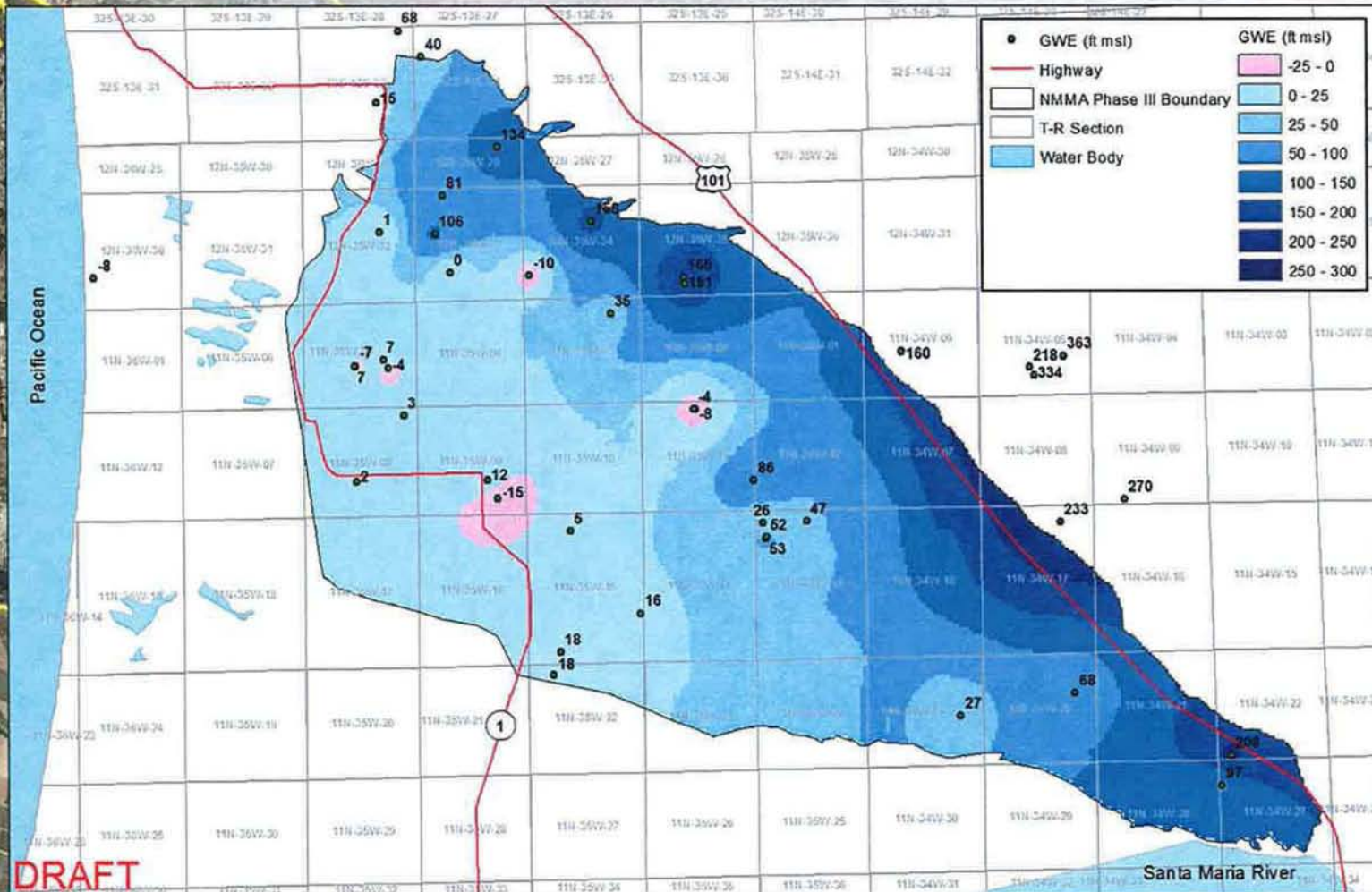
Spring 2013 GWI

# Spatial Distribution

- **Groundwater surface elevations are not uniform**
- **Lowest water levels are in the central and western portion of the Nipomo Mesa**
- **Several GWE are below sea level in the western portion of the Nipomo Mesa**

Spring 2013 GWI

# Groundwater Surface Elevation Map

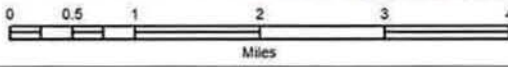


**DRAFT**

**NOTES:**  
 GWE: groundwater surface elevation  
 ft msl: feet above mean sea level  
 Coordinate System: UTM Zone 10N  
 Horizontal Datum: NAD 83



Spring 2008  
 Groundwater Surface Elevations

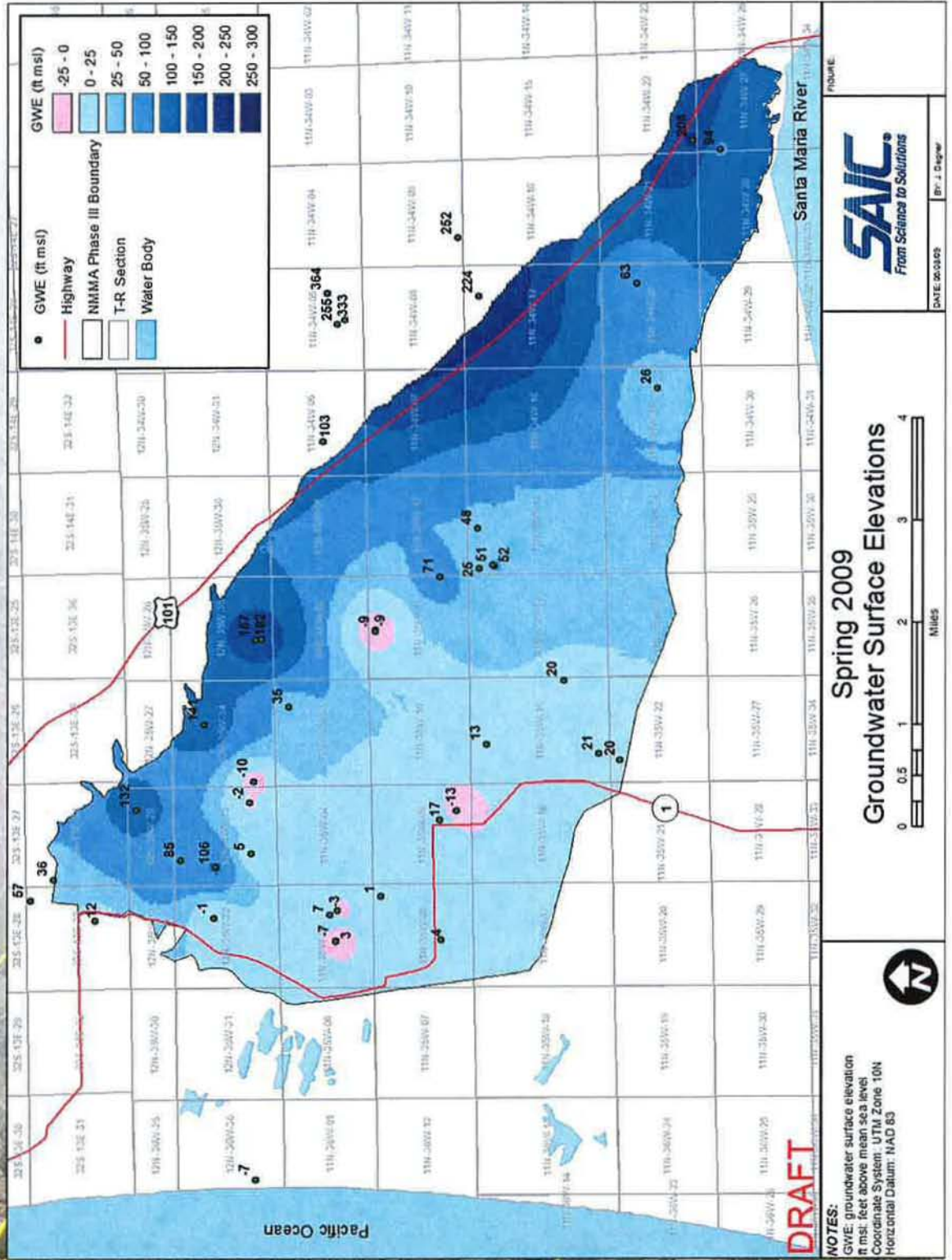


DATE: 06/08/09 BY: J. Cagier

FIGURE:

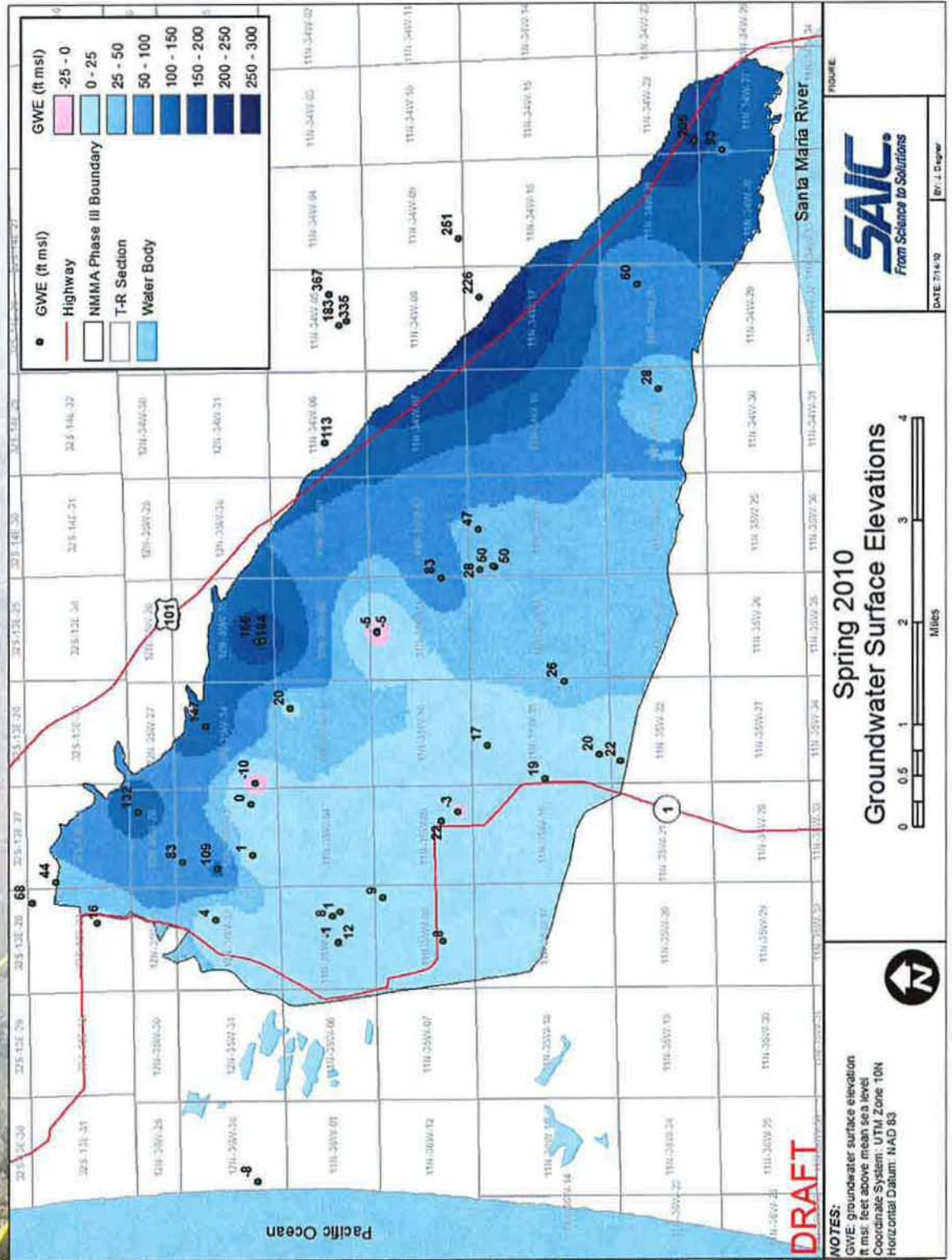
Spring 2013 GWI

# Groundwater Surface Elevation Map



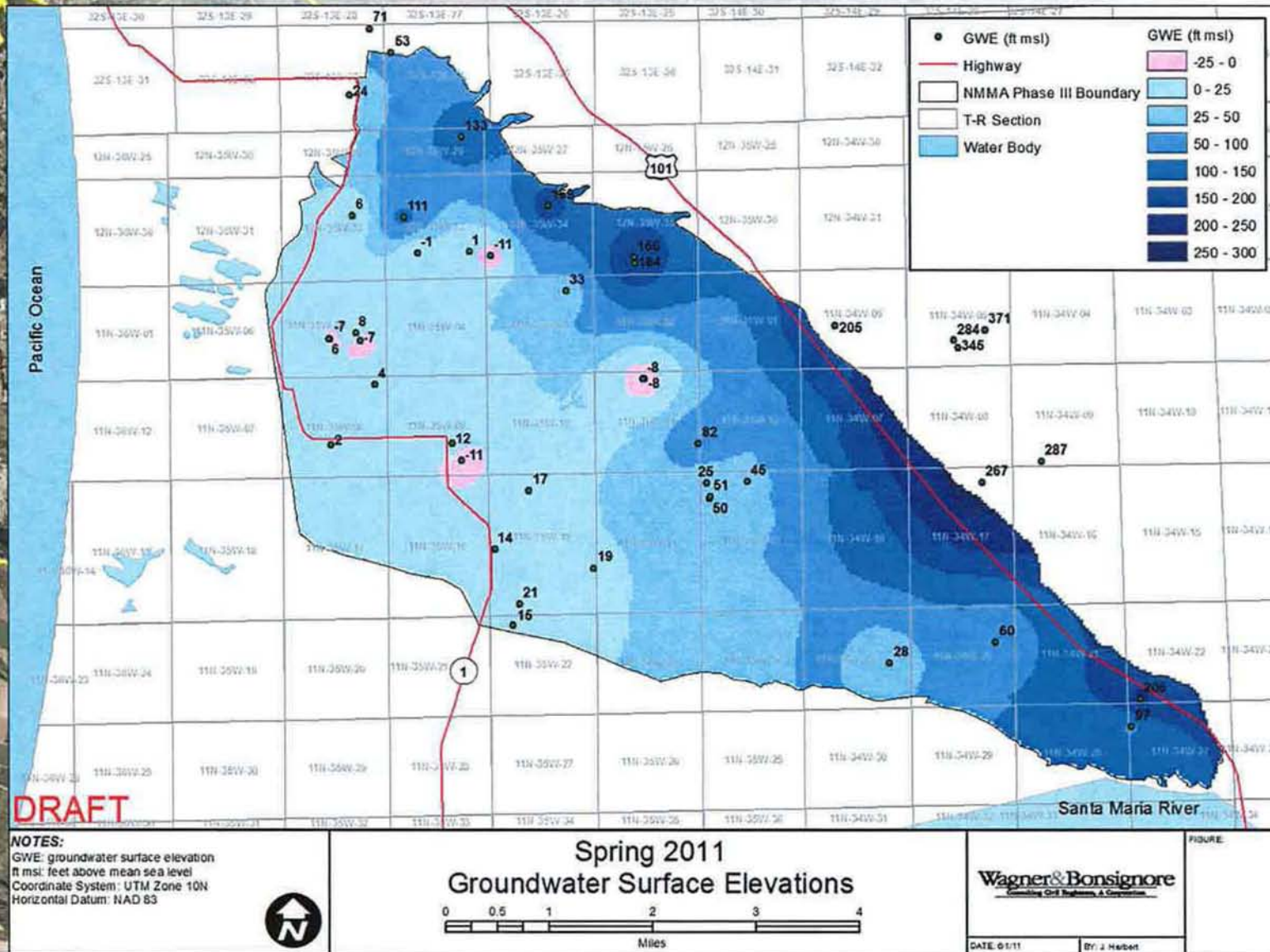


# Groundwater Surface Elevation Map



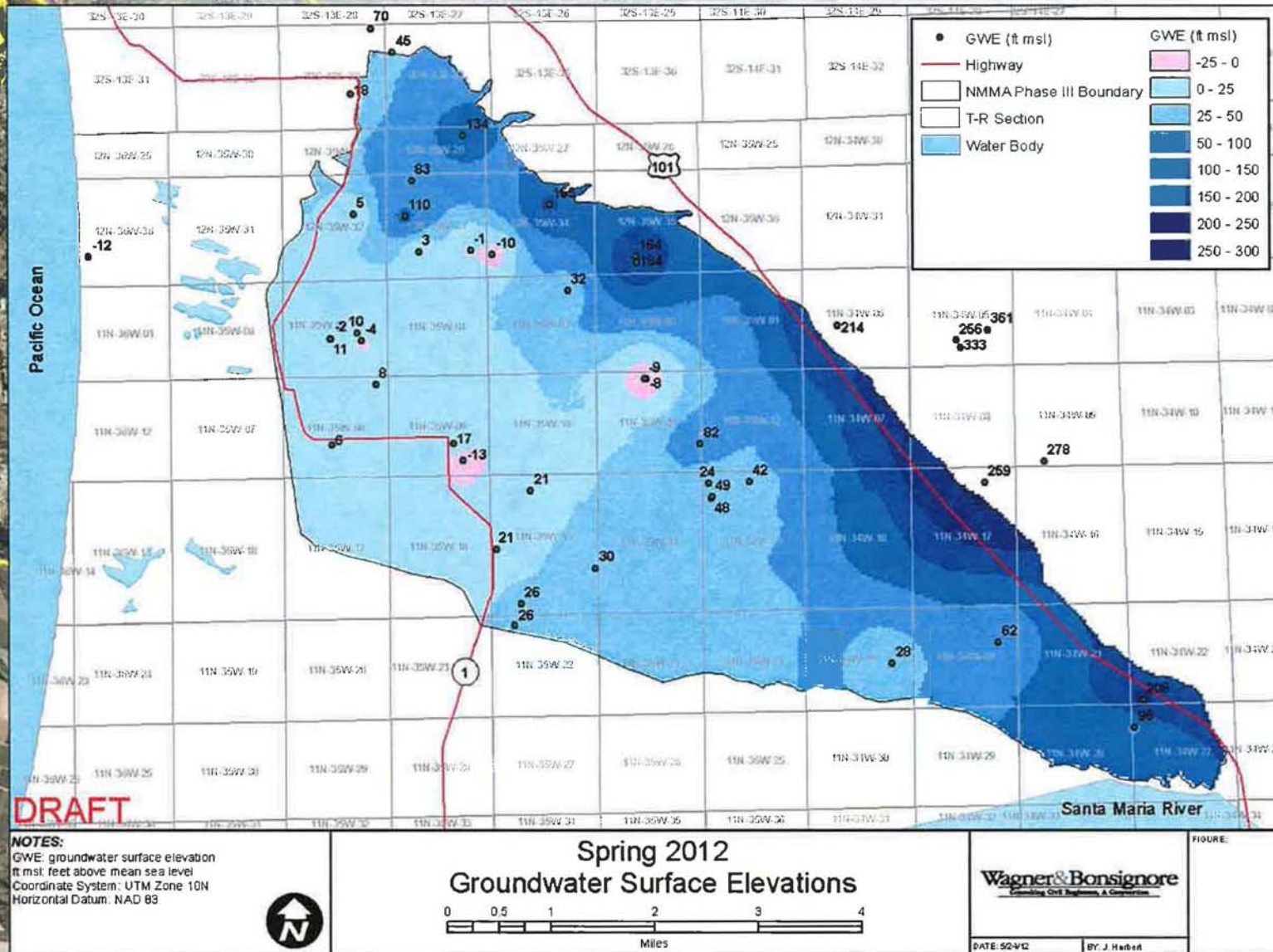
Spring 2013 GWI

# Groundwater Surface Elevation Map



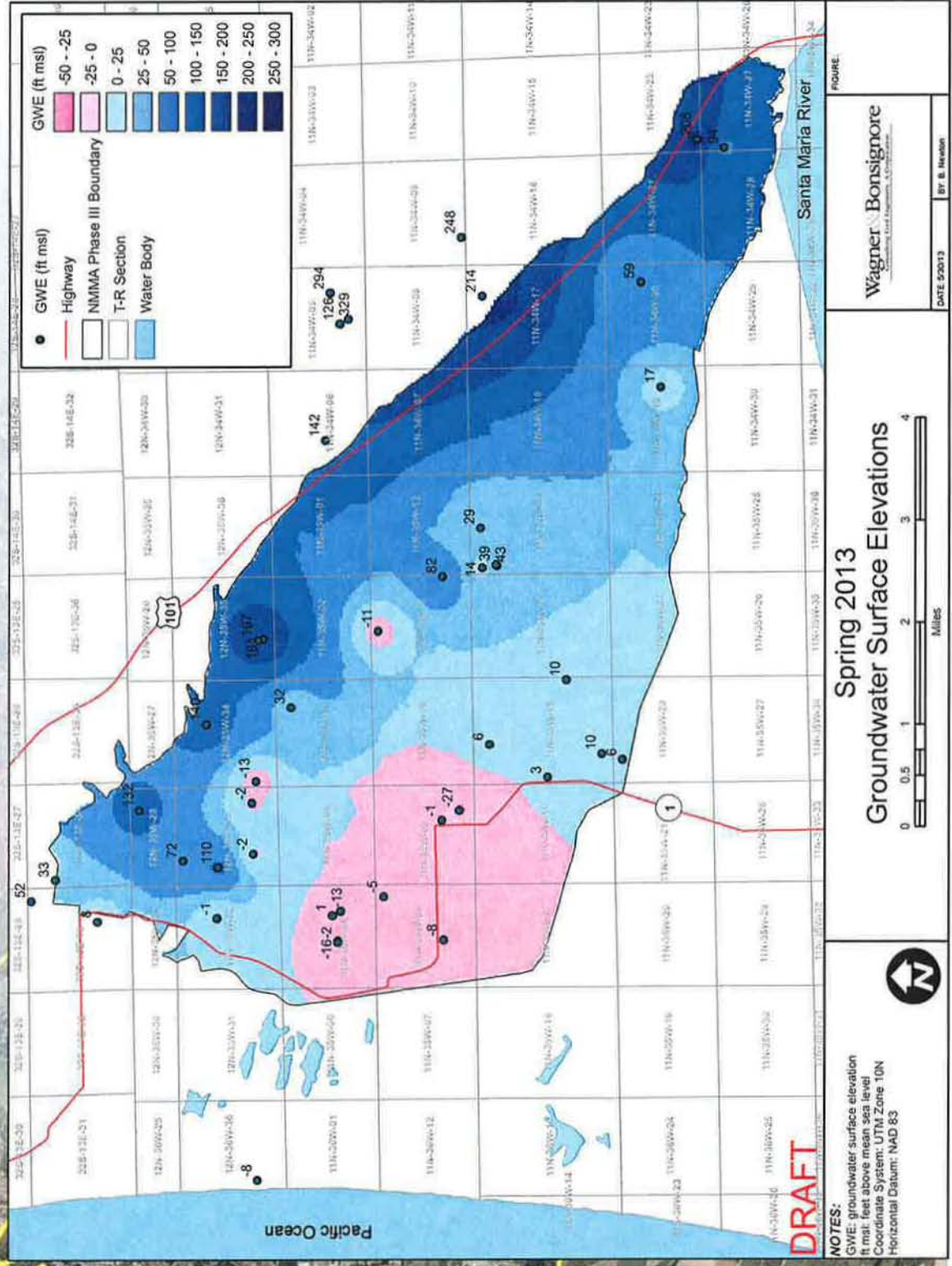
Spring 2013 GWI

# Groundwater Surface Elevation Map



Spring 2013 GW

# Groundwater Surface Elevation Map



**NOTES:**  
 GWE: groundwater surface elevation  
 ft msl: feet above mean sea level  
 Coordinate System: UTM Zone 10N  
 Horizontal Datum: NAD 83

**DRAFT**

Spring 2013  
 Groundwater Surface Elevations

0 0.5 1 2 3 4  
 Miles

Wagner Bonsignore  
 Groundwater Investigation & Consulting  
 DATE: 5/20/13 BY: B. Newton

FIGURE

An aerial photograph of a rural landscape, likely a valley or plain, showing a mix of agricultural fields in various shades of green and brown, and some residential or commercial buildings. A prominent yellow line traces a boundary across the landscape, starting from the bottom left, curving around the center, and extending towards the top right. A thin blue vertical line is positioned on the left side of the image. The text "Rainfall 2013" and "across the Nipomo Mesa" is overlaid on the image in a large, bold, black font.

# Rainfall 2013 across the Nipomo Mesa

Rainfall 2013

# Annual Data

Spring and Fall  
Groundwater Index  
(GWI)

Year	Rainfall (inches)	Spring GWI (Acre-Feet)	Number of Wells	Fall GWI (Acre-Feet)	Number of Wells	Spring to Fall Difference (Acre-Feet)
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1980	16.57	88,000	55	89,000	46	(1,000)
1981	13.39	97,000	46	75,000	47	22,000
1982	18.58	123,000	42	—	31	—
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2011	34.05	87,000	43	81,000	43	6,000
2012	15.35*	89,000	45	65,000	44	24,000
2013	6.48*	67,000	45	—	—	—

—: Insufficient for evaluation  
\*: Preliminary value

**2012-2013**  
Nipomo East (728)  
Currently – 5.90 in.  
  
Nipomo South (730)  
Currently – 6.97 in.  
  
Oceano (795)  
Currently – 6.57 in.

QUESTIONS?