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TO: Michael LeBrun, Interim General Manager, Nipomo Community Services District
FROM: Joel Degner E.I.T., Brad Newton, Ph.D., P.G.
RE: Fall 2009 Groundwater Index
DATE: December 08, 2009

INTRODUCTION

Groundwater surface elevations (GSE) underlying the Nipomo Mesa are regularly measured at many places (wells) across the mesa. The Fall 2009 Groundwater Index (GWI) has been estimated and presented herein along with historical GWI from 1975 to present based on these groundwater surface elevation measurements collected during spring and fall across the Nipomo Mesa. Limited measurements of GSE were available for the years 1982, 1983, 1984, 1994 and 1997, thus precluding a reliable estimate of GWI for those years.

Ground elevation surveys for the key wells were conducted in preparation of the 1st Annual Report - Calendar Year 2008 for the Nipomo Mesa Management Area (NMMA). These updated reference points were not incorporated into the GWI to preserve consistency in the historical calculations and presentations.

The NMMA Technical Group has not reviewed this technical memorandum, its findings, or any presentation of this evaluation.

RESULTS

Estimated Fall 2009 GWI is 65,000 acre-feet (AF), which is equal to the Fall 2008 GWI (Table 1, Figure 1). The Key Well Index from NMMA 1st Annual Report Calendar Year 2008 generally follows the same historical trends as the GWI estimates (Figure 1).

METHODOLOGY

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

Groundwater Surface Elevation Measurements

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

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each year. Woodlands and NCSD measures GSE in their monitoring wells monthly. For the years 1975 to 1999, available representative GSE data were used to estimate GWI. For the years 2000 to 2009, only GSE data from the same 45 wells were used to estimate GWI.

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

Groundwater Surface Interpolation

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

Groundwater Index

The value of the groundwater index was estimated for the boundary determined in Phase III of the trial. The GWI was estimated by subtracting both the mean sea level surface (elevation equals zero) and the volume of bedrock above sea level from the saturated volume. The bedrock surface elevation is based on Figure 11: Base of Potential Water-Bearing Sediments, presented in the report, Water Resources of the Arroyo Grande – Nipomo Mesa Area (DWR 2002). The bedrock surface elevation was preliminarily verified by reviewing driller reports obtained from DWR. The saturated volume above sea level was multiplied by a specific yield of 11.7% to estimate the recoverable amount of GWI. The specific yield is based on the average weighted specific yield for the Nipomo Mesa Hydrologic Sub-Area (DWR 2002, pg. 86).

Key Well Index

The NMMA Technical Group selected the data from eight inland key wells to represent the whole of the NMMA. The average spring groundwater elevation of these key wells is used to calculate the Key Wells Index.

The Key Well Index was calculated annually using Spring GSE measurements from 1975 to 2008. The Key Wells were selected to represent various portions of the groundwater basin within the NMMA. In selecting the eight key wells, the following criteria were applied so that the wells generally represent the NMMA as a whole:

(1) The wells are geographically distributed,

(2) No single well overly influences the Key Well Index.

The first criterion was met in the selection of the wells, such that no well represented a disproportionate area. To meet the second criterion, groundwater elevations from each well were normalized so that any well where elevations were on the average higher or lower than the other wells did not overly influence the magnitude of the Key Well Index. This normalization was accomplished by dividing each spring groundwater elevation measurement by the sum of all the Spring GSE data for that well.

The Key Well Index was defined for each year as the average of the normalized spring groundwater data from each well. The lowest value of the Key Well Index could be considered the "historical low" within the NMMA.

REFERENCES

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

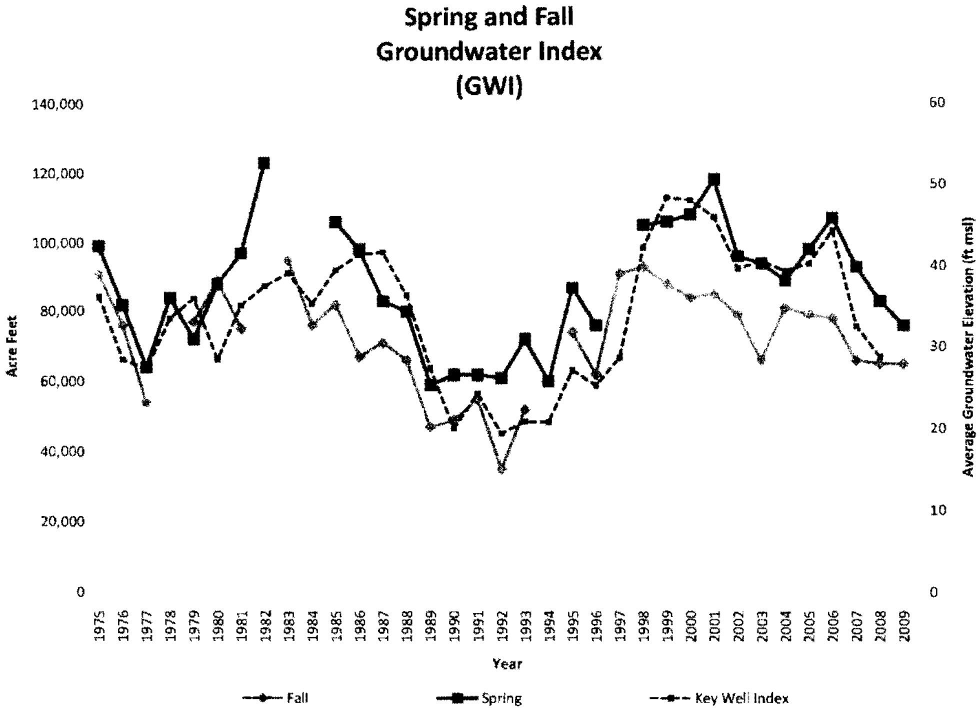
Table 1

**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	13.06	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	25.47	87,000	35	74,000	52	25,000
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	14.47	108,000	44	84,000	41	24,000
2001	18.78	118,000	43	85,000	35	33,000
2002	8.86	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	6.96	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

---: insufficient for evaluation

Figure 1


Spring and Fall
Groundwater Index
(GWI)
Acre Feet
140,000
120,000
100,000
80,000
60,000
40,000
20,000
0
Average Groundwater Elevation (ft msl)
60
50
40
30
20
10
0
1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009
Year
Fall
Spring
Key Well Index

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