Appendix K

Hydrogeological Study

HOPKINS GROUNDWATER CONSULTANTS, INC.

PRELIMINARY HYDROGEOLOGICAL STUDY

SANTA MARGARITA RANCH AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION (TENTATIVE TRACT 2586) WATER SUPPLY STUDY SAN LUIS OBISPO COUNTY, CALIFORNIA

Prepared for:
County of San Luis Obispo

On Behalf of:
Rincon Consultants, Inc.

June 2006

HOPKINS GROUNDWATER CONSULTANTS, INC.
THE WATER RESOURCE SPECIALISTS

September 29, 2006
Project No. 05-012-01

Rincon Consultants, Inc.
1530 Monterey Street, Suite D
San Luis Obispo, California 93401

Attention: Mr. Richard Daulton
Project Manager

Subject: Preliminary Hydrogeological Study, Santa Margarita Ranch Agricultural Residential Cluster Subdivision (Tentative Tract 2586) Water Supply Study, San Luis Obispo County, California, June 2006.

Dear Mr. Daulton:

Hopkins Groundwater Consultants, Inc. is pleased to provide this final report which summarizes the findings and conclusions developed from the preliminary hydrogeological study on the proposed water supply for the Agricultural Residential Cluster Subdivision. As indicated in the report, the groundwater resources beneath the Santa Margarita Ranch may not be sufficient to support the existing land uses and the proposed Agricultural Residential Cluster Subdivision project and/or the Future Development Program without resulting in potentially significant impacts. We recommend mitigation measures be considered for the water supply component of the Agricultural Residential Cluster Subdivision project.

If you have any questions, please give us a call.

Sincerely,

HOPKINS GROUNDWATER CONSULTANTS, INC.

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One (1) Electronic Copy

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CONTENTS

Page

INTRODUCTION 1
GENERAL 1
AGENCIES CONTACTED 1
REPORT REVIEW AND DATA ANALYSIS 1
PROPOSED WATER SUPPLY 2
FINDINGS 3
WATER DEMAND 3
Existing Ranch Water Demands 3
Proposed Ranch Development Water Demands 6
Consumptive Water Use 7
EXISTING CONDITIONS 9
Hydrological Setting 9
Climate 9
Precipitation 9
Evaporation 10
Watersheds 10
Stream Gauge Stations 12
Groundwater Resources 13
Geology 13
Groundwater Occurrence and Movement 14
Historical Groundwater Development 16
Established Groundwater Uses 17
Santa Margarita Ranch 17
County Service Area No. 23 17
Garden Farms Water District 18
Atascadero Mutual Water Company 19
Water Budget 19
Groundwater Storage 20
WATER SUPPLY AVAILABILITY 24
Groundwater 24
Imported Water 25
POTENTIAL WATER SUPPLY IMPACTS 25
Stream Flow and Surface Water Depletion 26
Groundwater Overdraft 26
Groundwater Quality 27
Well Interference 27
Ground Subsidence 28

Cumulative Impacts 28
CONCLUSIONS 29
MITIGATION MEASURES 30
Water Resources Monitoring 30
Groundwater Resources 30
Surface Water Resources 31
Water Conservation Measures 32
Water Supply Importation 35
Nacimiento Water Project 35
State Water Project 36
Recycled Water Use 36
Project Phase Development Conditions and Limitations 37
Retention/Recharge Basins 37
CLOSURE 38
REFERENCES 38

TABLES

Page

Table 1 – Santa Margarita Ranch Water Demands 4
Table 2 – Local Water Consumption 8
Table 3 – Watershed Survey Summary 11
Table 4 – Summary of Watershed Rainfall Estimates 13
Table 5 – Regional Geologic Units 16
Table 6 – Water Level Elevation Changes 21
Table 7 – Average Annual Well Yield 23
Table 8 – Summary of Adjusted Water Demands 33

PLATES

Plate

Residential Subdivision Location Map 1
Water Supply Study Project Components Map 2
Watershed Location Map 3
Dibblee Geological Map 4
Well Location Map 5
Water Well Production Map 6

2000 Groundwater Elevation Contour Map 7
2006 Groundwater Elevation Contour Map 8
Bedrock Well Hydrographs 9
Alluvial Well Hydrographs 10

GLOSSARY OF HYDROGEOLOGICAL TERMS

APPENDICES

APPENDIX A – SANTA MARGARITA RANCH PROJECT DESCRIPTION

APPENDIX B – WATER DEMAND ESTIMATION FACTORS

APPENDIX C – PRECIPITATION AND EVAPORATION DATA

APPENDIX D – STREAM FLOW MEASUREMENTS

APPENDIX E – RANCH WELL PRODUCTION TEST DATA

APPENDIX F – GROUNDWATER HYDROGRAPHS AND CUMULATIVE WELL PRODUCTION DATA

APPENDIX G – CSA 23 WELL DATA

APPENDIX H – GARDEN FARMS WELL DATA

APPENDIX I – ANNUAL WELL YIELD ESTIMATES

INTRODUCTION

GENERAL

The Santa Margarita Ranch, LLC has proposed to continue rural development of the Santa Margarita Ranch property (the Ranch) and has applied to the County of San Luis Obispo for approval to construct an Agricultural Residential Cluster Subdivision (Tentative Tract 2586). Plate 1 – Residential Subdivision Location Map shows the location of the residential development proposed in the project application. It is our understanding that the Environmental Impact Report (EIR) for "the project" must include an evaluation of the impacts associated with both the Tentative Tract Map and Conditional Use Permit application (presently under review) and the conceptual components of the Future Development Program that would occur if Ranch development proceeds. A project description that generally describes the proposed phases of residential development and the envisioned components of future Ranch development is provided in Appendix A – Santa Margarita Ranch Project Description.

For this study the project water supply assessment has been organized by reviewing water requirements for; a) existing land uses, b) the proposed Agricultural Residential Cluster Subdivision land uses, and c) envisioned Future Development Program land uses. Plate 2 – Water Supply Study Project Components Map shows the geographical location of the three water demand components that are separated for the purpose of this study.

AGENCIES CONTACTED

As part of this water supply study, Hopkins Groundwater Consultants, Inc. (Hopkins) contacted existing water suppliers that are primarily located downgradient of the proposed Ranch project(s) to develop an understanding of specific agency concerns. These agencies include the County Public Works Department (County), County Service Area Number 23 (CSA 23), the Garden Farms Water District (Garden Farms), and the Atascadero Mutual Water Company (AMWC). Information obtained from these agencies was compiled and utilized to focus the study and identify potential impacts to these existing water purveyors.

REPORT REVIEW AND DATA ANALYSIS

As part of this study Hopkins obtained and reviewed historical reports that have evaluated water resources in the vicinity of the Ranch and included studies performed by consultants, the County, and State agencies. The following groundwater studies were comprehensively reviewed:

- "Groundwater Resources of CSA 23-Santa Margarita Technical Memorandum", prepared for the County of San Luis Obispo, by Todd Engineers, October 27, 2004

- "Groundwater Supply Impacts Study, Agricultural Cluster Development, Tentative Tract Map 2586 at Santa Margarita Ranch" prepared for the Santa Margarita Ranch, by Cleath & Associates, January 2004
- "Water Well and Hydrologic Data, Santa Margarita Ranch, Santa Margarita, San Luis Obispo County, California" prepared for Kirk Consulting, by Rick Hoffman and Associates, May 10, 2006

Our review found that past studies have not identified the safe yield/perennial yield of the groundwater basin/aquifer system(s) in the vicinity of the Ranch and that prior to agricultural development groundwater data were scarce. It is our understanding that the Ranch presently operates approximately 20 wells from which historical groundwater data have been collected since 1999. These data, which include measurements of groundwater levels, well production, well performance, and water quality test results, were provided in a summary report that documented groundwater conditions through April 2006 (RHA, 2006). This compilation of Ranch well data largely forms the basis from which the impacts of historical groundwater use can be reviewed and the availability of groundwater to supply the project can be estimated.

PROPOSED WATER SUPPLY

Portions of the Ranch overlie the Paso Robles Groundwater Basin, the Santa Margarita and Vaqueros bedrock aquifers, and shallow alluvial aquifers. Reportedly, over twenty groundwater wells have been drilled on the Ranch since 1994. Numerous existing water supply wells are located throughout the Ranch and provide water for the existing domestic and agricultural uses. In addition to onsite wells, the Ranch participated in the planning phases of the Nacimiento Water Project and on May 18, 2004, the Board of Supervisors approved a policy to consider a cooperative arrangement between the Ranch and CSA 23 (which provides water service to the town of Santa Margarita) if CSA 23 participates in the State Water Project.

As proposed, the project would construct and utilize the Santa Margarita Ranch Mutual Water Company to provide a supply for residential water uses. A draft groundwater supply study assumed the water demand for the proposed residential uses associated with the Agricultural Residential Cluster Subdivision would be approximately 0.9 acre-feet per year (afy) per parcel which totals approximately 100 afy for the proposed 112 single family residences (Cleath, 2004). The report also concluded that use of groundwater by the proposed residential cluster could potentially lower groundwater levels and production capacity in other wells in the vicinity, and that the use of wells near streams and riparian vegetation could influence stream flow and the water supply available for riparian vegetation (Cleath, 2004). The report concluded that the project water supply could be provided by the installation of additional wells, by Nacimiento Water Project deliveries, and (through a cooperative agreement with CSA 23) by State Water Project deliveries.

The applicant proposes to construct facilities for the newly formed Santa Margarita Mutual Water Company and/or establish other onsite groundwater sources to serve the proposed future development scenario. The Nacimiento Water Project and, through a cooperative agreement with CSA No. 23, the State Water Project may be an alternative source of water supply for both components of the project.

FINDINGS

WATER DEMAND

Existing Ranch Water Demands

Existing water uses in the project area include domestic and agricultural Ranch uses. Table 1 – Santa Margarita Ranch Water Demands indicates the estimated amount of annual water supply demand that is attributed to the existing and the proposed future land uses on the Ranch property. The itemized water demands presented in Table 1 were calculated using the standard water demand estimation factors provided by the County for domestic and municipal land uses. A list of water demand factors that are used by the County and were used in this study are provided in Appendix B – Water Demand Estimation Factors. In addition to the County data, an irrigation demand of 2.0 afy per acre (afy/ac) was used for landscaping and turf watering and is believed reasonable given average annual rainfall and evaporation rates measured in the area.

The existing water uses are solely provided by groundwater supplies. The Santa Margarita Farms residential development is in the process of being constructed and it is our understanding that each lot will have a private well for domestic use. The water demand projection for this development is approximately 52 afy and is based on a 1.44 afy/ac water duty factor (see Table 1).

Although historical water supply and demand studies have used higher water duty factors including 2.5 afy/ac for vineyard irrigation (Fugro, 2003), this study utilized a factor of 1.6 afy/ac (as projected in the final EIR for the State Water Project Coastal Branch, Phase II project [DWR, 1991]) for vineyard irrigation in San Luis Obispo County (see Appendix B). This water duty factor is believed to account for the local climate and the best management practices reportedly being applied on the Ranch (RHA, 2006).

Table 1 – Santa Margarita Ranch Water Demands

PROJECT ELEMENT	PROJECT CHARACTERISTICS	WATER USE FACTOR (ACRE-FEET/UNIT)	ANNUAL WATER DEMAND (ACRE-FEET)
EXISTING SANTA MARGARITA RANCH PROPERTY WATER USES			
36 RESIDENTIAL CLUSTERED LOTS (SANTA MARGARITA FARMS)	1.0 TO 2.5 ACRES IN SIZE (128 ACRES)	1.44/LOT	51.84
1 RESIDENTIAL LOT	1.0 ACRE IN SIZE	1.44/LOT	1.44
7 FARM SUPPORT HOUSING UNITS	1.0 ACRE IN SIZE OR LESS	0.9/LOT	6.3
6 MISSION ERA STRUCTURES			
400 SEAT EQUESTRIAN CENTER ARENA			
STABLES AND BOARDING FACILITIES			
4 PRIVATE CABINS	1.0 ACRE IN SIZE OR LESS	0.9/LOT	3.6
AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION IRRIGATION OF MARGARITA VINEYARD	973.9 ACRES	1.6 AFY/ACRE	1,558.24
EXISTING RANCH WATER USE TOTAL			**1,621.42**
AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION TRACT 2586			
111 RESIDENTIAL CLUSTERED LOTS	1.0 TO 2.5 ACRES IN SIZE (128 ACRES)	1.44/LOT	159.84
1 DWELLING UNIT AT HEADQUARTERS PARCEL, PARCEL 42	1.0 TO 2.5 ACRES IN SIZE (1 ACRE)	1.44/LOT	1.44
40-FOOT WIDE PRIVATE EASEMENTS (RESIDENTIAL) AND 30-FOOT WIDE DRIVEWAY EASEMENTS	16 ACRES (NON IRRIGATED)	0	0
40-FOOT WIDE PRIVATE EASEMENTS (RESIDENTIAL AND AGRICULTURAL)	19.1 ACRES (NON IRRIGATED)	0	0
PAVED ROADS	(NON IRRIGATED)	0	0
AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION TOTAL			**161.28**

Table 1 – Santa Margarita Ranch Water Demands (continued)

PROJECT ELEMENT	PROJECT CHARACTERISTICS	WATER USE FACTOR (ACRE-FEET/UNIT)	ANNUAL WATER DEMAND (ACRE-FEET)
FUTURE DEVELOPMENT PROGRAM			
REMAINDER OF THE 550 RESIDENTIAL UNITS ALLOWABLE UNDER THE SALINAS RIVER AREA PLAN (MINUS 36 RESIDENTIAL UNITS IN TRACT 1, AND 112 UNITS ON TRACT 2586)	402 RESIDENTIAL LOTS, APPROXIMATELY 400 ACRES (INCLUDES 50 AFFORDABLE WORKFORCE UNITS)	1.44/LOT	578.8
GUEST RANCH, LODGE, AND RESTAURANT	150 TO 250 UNITS, 40 TABLES/200 PATRONS, 100 ACRES	0.15/ROOM	37.5
RESTAURANT	40 TABLES/ 200 PATRONS	0.022/SEAT	4.4
BED AND BREAKFAST	12 ROOMS	0.15/ROOM	1.8
PRIVATE GOLF COURSE, CLUB HOUSE, SHOP	27 TO 36 HOLES / 220 TO 280 ACRES	2 AFY/ACRE	560
CAFÉ	20 TABLES/ 100 PATRONS	0.022/SEAT	2.2
AMPHITHEATER	200 TO 600 SEATS	0.022/SEAT	13.2
CRAFT STUDIOS, GALLERIES, AND SHOPS	6,000 SQUARE FEET	0.11/1000 SF	0.66
INTERPRETIVE CENTER AND GIFT SHOPS	3,000 SQUARE FEET	0.11/1000 SF	0.33
NINE WINERIES, TASTING ROOMS, AND SPECIAL EVENTS	8 @ 20,000 TO 40,000 SQUARE FEET EACH, 1 @ 80,000 SQUARE FEET / 42 EVENTS PER YEAR PER FACILITY: SIX EVENTS WITH 1,000 PEOPLE; SIX EVENTS WITH 500 PEOPLE; SIX EVENTS WITH 300 PEOPLE; TEN EVENTS WITH 200 PEOPLE, AND; FOURTEEN EVENTS WITH 100 PEOPLE	0.17/1,000 SF	68
FIVE RANCH/FARM HEADQUARTERS	2.5 ACRES EACH	1.44/LOT	7.2
LIVESTOCK SALES YARD AND CAFÉ	20 ACRES / ONE SATURDAY PER MONTH WITH 80 TO 100 PEOPLE /75 PATRONS	0.022/SEAT	1.65
HORSE RANCH	30 (+) HORSES	0.1/HORSE	3
THREE PLACES OF WORSHIP	2,000 TO 5,000 SQUARE FEET EACH	0.17/1,000 SF	2.55
40 YEAR WILLIAMSON ACT PARCELS (VARIOUS AGRICULTURAL USES)	3,600 ACRES (NON IRRIGATED)	0	0
OAKENSHAW RETREAT CENTER	16 TO 24 UNITS ON 30 ACRES WITH LODGE AND RESIDENCE	0.15/ROOM	3.6

Table 1 – Santa Margarita Ranch Water Demands (continued)

PROJECT ELEMENT	PROJECT CHARACTERISTICS	WATER USE FACTOR (ACRE-FEET/UNIT)	ANNUAL WATER DEMAND (ACRE-FEET)
FUTURE DEVELOPMENT PROGRAM (CONTINUED)			
NEIGHBORHOOD PARKLAND AND SWIMMING POOL	5 ACRES EAST OF SANTA MARGARITA COMMUNITY	2 AFY/ACRE	10
DEDICATION OF LAND FOR FUTURE SEWAGE TREATMENT PLANT	LOCATION TO BE DETERMINED: 10 ACRES (NON IRRIGATED)	0	0
DEDICATION OF LAND FOR EXPANSION OF CEMETERY	5 ACRES	2 AFY/ACRE	10
PUBLIC HIKING / EQUESTRIAN TRAILS	VARIOUS LOCATIONS TO BE DETERMINED UPON FUTURE NONAGRICULTURAL DEVELOPMENT (NON IRRIGATED)	0	0
FUTURE DEVELOPMENT PROGRAM TOTAL			1,304.89
RANCH WATER SUPPLY DEMAND TOTAL			3,087.59

Water demand calculations using the discrete unit factors shown in Table 1 result in estimating that the average annual groundwater production required to satisfy the established or approved Ranch land uses is approximately 1,620 afy (see Table 1). Review of available data indicates that the estimated irrigation demand may be high. Reportedly the Ranch has irrigated the existing 800 acres of established vineyards with an average of approximately 275 afy (RHA, 2006). This volume is equivalent to approximately 1/3 or 0.33 afy/ac of irrigated land and is substantially lower than the estimated irrigation requirement based on comparable crops in this type of terrain and climate (about 20 percent of the 1.6 afy/ac). However, it was noted in the well study that not all meters were working and that produced sand in well discharge may have caused a malfunction (lower measurement of discharge) of some of the Ranch meters (RHA, 2006). In addition, we note that averaging the water use over the 6-year period does not account for the progressive planting of the vineyards and that the demand in later years 2005-2006 is likely higher than the demand was in 2000 and 2001 (given the same climatic conditions).

Proposed Ranch Development Water Demands

The draft ground water supply impacts study (Cleath, 2004) assumed that the water demand for the proposed residential uses associated with the Agricultural Residential Cluster Subdivision would be 0.9 afy per parcel which totals approximately 100 afy for 112 single family residences. This lower water duty factor may be appropriate for smaller lots or residential use in less affluent communities, however, the proposed gated community development will

likely include substantial landscaping, swimming pools, etc., and demand water in accordance with the City of Santa Barbara water use factor (used by the County of San Luis Obispo) of 1.44 afy/ac which is assigned for lots between 1 acre and 2.5 acres. The corresponding water demand is approximately 160 afy (see Table 1).

The Future Development Program demands are estimated at approximately 1,305 afy. Combining the estimated demand of the Future Development Program with the Agricultural Residential Cluster Subdivision project groundwater demand and existing demands the sum total water supply demand at Ranch build-out is estimated at 3,087 afy. Because the water supply presently identified for all components of Ranch development is groundwater, the annual totals shown in Table 1 will be utilized to evaluate the potential impact of each component of Ranch development to the local groundwater and surface water resources.

Consumptive Water Use

Proposed residential water uses include both in-house and outdoor water demands. Typical in-house water uses will result in virtually all water being discharged into the proposed onsite septic systems. A component of this discharge will be removed through evapotranspiration processes that occur in the shallow soils around the leach lines while another component will return to groundwater as deep percolation below the root zone.

Typical outdoor residential uses include landscape irrigation, recreational (swimming pools and spas), and minor wash water. While a large component of outdoor water use will be consumed in evapotranspiration processes, a portion of the applied irrigation water will result in deep percolation that provides groundwater recharge. Other regional studies have estimated groundwater recharge that results from rural residential water uses is approximately 40 percent of the total water use (Fugro-McClelland, 1993). As indicated in Table 1, approximately 52 afy of groundwater is estimated to be pumped to satisfy existing residential water demands on the Ranch at the Santa Margarita Farms development. Multiplying this demand by 40 percent indicates that about 21 afy will become groundwater recharge while approximately 31 afy will be consumed by existing residential uses.

Existing agricultural water supply demands are estimated to total 1,558 afy for vineyard irrigation. Using a 32 percent return flow (Fugro-McClelland, 1993) indicates that approximately 499 afy returns to groundwater as recharge and that 1,059 afy will be removed by crop evapotranspiration. Table 2 – Local Water Consumption lists the reported and estimated annual water supply demand values for existing and proposed water users that are locally provided by groundwater. As shown, the reported annual consumption for existing Ranch agricultural uses (285 afy) is substantially lower than the projected amount (see Table 2). This may be attributed to the young age of the vineyard plantings. Reportedly vineyards take approximately 4 years to mature and other studies have utilized crop water use factors of 20 percent, 60 percent, and 80 percent of the mature crop water use (Fugro, 2002) for crops that are

1 year, 2 years, and 3 years old, respectively. This indicates that the present demand is proportionally some fraction of what the mature vineyard demand will be.

Utilizing this method of calculation and multiplying the estimated groundwater demand for the Agricultural Residential Cluster Subdivision project (approximately 160 afy) by a return flow factor of 40 percent indicates that 64 afy will return to groundwater as recharge and that an annual domestic consumptive use will be on the order of 96 afy. The same groundwater return flow factors were applied to the envisioned Future Development Program components of water supply demand (580 afy for irrigation, and 725 afy for residential/commercial uses) and resulted in 475 afy becoming groundwater recharge and the remaining 830 afy being consumed by overlying land uses (see Table 2).

Table 2 – Local Water Consumption

WATER PRODUCER	PRESENT ANNUAL CONSUMPTION (AFY)	PROJECTED FUTURE CONSUMPTION (AFY)
ATASCADERO	162[1]	676[1]
GARDEN FARMS	28[1]	32[1]
SANTA MARGARITA (CSA 23)	116[1]	164[1]
TOTAL FOR ESTABLISHED WATER SYSTEMS	**306[1]**	**872[1]**
EXISTING RANCH DOMESTIC USES	31[2]	31[2]
EXISTING RANCH AGRICULTURAL USES	285[3]	1,059[2]
TOTAL FOR ESTABLISHED RANCH USES	**316**	**1,090[1]**
RANCH RESIDENTIAL CLUSTER	0	96[2]
RANCH FUTURE DEVELOPMENT PROGRAM	0	830[2]
TOTAL FOR PROPOSED RANCH USES	**0**	**926[2]**
CUMULATIVE TOTAL	**622**	**2,888**

1 – VALUES PROVIDED BY FUGRO-McCLELLAND, 1993 AND BASED ON 40% RESIDENTIAL AND 32% AGRICULTURAL RETURNS TO GROUNDWATER AS DEEP PERCOLATION RECHARGE
2 – WATER CONSUMPTION VALUES ESTIMATED FROM WATER DEMAND VALUES IN TABLE 1
3 – METER READINGS REPORTED BY THE RANCH (RHA, 2006)

For the purpose of this study the net consumptive use is the amount of groundwater that will be removed from the local aquifer system and require average annual replenishment for this source of water supply to be considered reliable. Because the reported Ranch irrigation water

demand (RHA, 2006) is believed low (compared to similar use at other locations and reported meter failure or reading errors), the entire amount of water is assumed to have been consumed by evapotranspiration (ET) process. Future crop demands will likely be substantially higher.

EXISTING CONDITIONS

Hydrological Setting

Climate

The study area's climate is characterized by dry, warm summers and cool, rainy winters with occasional snow. High temperatures and low precipitation occurs from approximately May through October. The months from November through April typically have cooler temperatures and heavy rains that are caused by low-pressure depressions in the atmosphere. The winters are typically mild however; colder winds from inland regions can bring snow and lead to short-term cold periods in the area. Both summer and winter temperatures are moderated by the oceanic influences on the project area. Rainfall averages range between 21.06 and 32.79 inches per year for rain gauges located east and west of the valley, respectively.

Precipitation

Data provided by three rainfall gauging stations were reviewed for this study: the Santa Margarita Booster Station, the Salinas Dam, Santa Margarita Union Oil Company (UOC) No. 60 Station. A summary of these data are provided in Appendix C – Precipitation and Evaporation Data. The Santa Margarita Booster Station has a record extending from 1949 to 2005 and was recorded by calendar year. The average annual rainfall from the 57 years of record is 32.79 inches. Annual rainfall varies from a minimum of 11.1 inches in 1961 to a maximum of 58.28 inches in 1982. The Salinas Dam Station has a record extending from 1943 to 2005 and was recorded by water year (July to June). The average annual rainfall calculated from the 63 year-monitoring period is 22.44 inches. Annual rainfall varies from a low of 8.65 inches in 1977 to a high of 50.42 inches in 1969. The Santa Margarita UOC Station has a record extending from 1909 to 1980 and was recorded by water years. The average annual rainfall from the 72-year-period is 22.01 inches. Annual rainfall varied from a minimum of 7.37 inches in 1976 to a high of 53.84 inches in 1911. The National Oceanic and Atmospheric Administration (NOAA) Santa Margarita Station reportedly has a record extending from 1946 to 1975. The average annual rainfall from the 29-year record is 29.17 inches. Annually rainfall was observed to vary from a minimum of 9.94 in 1947 to a maximum of 49.55 inches in 1969 (Todd, 2004). The average annual rainfall in the study area estimated by using data from all four weather stations is approximately 26.25 inches. This figure is comparable but slightly lower than other estimates that only considered the use of the NOAA station data. The lower rainfall average is likely more representative of the range of conditions that occur across the study area and accounts for the lower precipitation received on the east side of the valley.

Evaporation

Average evaporation rate measured at the Salinas Reservoir is 79.6 inches per year over a 68 year period, (October 1936 to September 2003) (SLO County, 2005). A summary of these records is included in Appendix C. Evapotranspiration (ET) includes both direct evaporation (caused by solar/wind energy) and transpiration from vegetation. Studies on ET have typically determined that the ET values are less than direct pan evaporation measurements. This component of the water budget is probably one of the most difficult to estimate and varies regionally based on climate, topography, soil type, and vegetation. In general, ET is a primary component water outflow in a watershed and may account for up to 85 percent of the total rainfall in arid regions. However, given that the average evaporation rate is 2 to 3 times higher than the average annual rainfall and that stream flow data indicate a substantial component of direct precipitation results in runoff, the natural ET rate from native plants is believed to be substantially lower in the study area. The 6-month average evaporation rate from the beginning of November till the end of April is 20.98 inches which is about 26 percent of the annual total. This suggests that the ET rate of soil moisture removal is lowest during the native vegetation primary growing season. The following 6 months (May through October), when the rain has stopped replenishing the soil moisture, approximately 74 percent of the annual evaporation occurs. These conditions indicate that ET is likely considerably lower in the natural portions of the watersheds than in developed portions where non-natives are planted and irrigated through the dry season. There are no data to directly correlate evaporation rates and ET rates for agricultural land uses (vineyards) in the study area.

Watersheds

The study area drains into the Salinas Hydrologic Unit, as defined by the Central Coast Regional Water Quality Control Board. The Santa Margarita Ranch overlies an area that is divided by four sub-watersheds that feed into the Salinas River and are listed below:

- Santa Margarita Creek Watershed
- Yerba Buena Creek Watershed
- Trout Creek Watershed
- Rinconada Creek Watershed

The approximate boundaries of these watersheds are depicted in Plate 3 – Watershed Location Map. While some of the creeks in the sub-watersheds have minor culverted sections, they are mostly unlined along their entire lengths. As part of this study the surface area of each watershed was measured with a self-compensating polar planimeter. A summary of the results is provided in Table 3 – Watershed Survey Summary.

The Santa Margarita Creek Watershed forms the western boundary of the Ranch study area and drains approximately 10,840 acres north of the Cuesta Pass. The watershed is comprised mainly of open space and residential uses in Santa Margarita. Downstream, the creek roughly parallels Yerba Buena Creek prior to merging and flowing into the Salinas River.

The Yerba Buena Creek Watershed is primarily situated south/southeast of the Santa Margarita Creek watershed and flows eastward across the northern portion of the Ranch project area before turning north and flowing through the town of Santa Margarita. The Yerba Buena Creek drains approximately 3,580 acres of the mountains east of Cuesta Pass and the valley area known as Miller Flat. The watershed is comprised mainly of open space and residential uses in Santa Margarita and Garden Farms. North of Santa Margarita, the Yerba Buena Creek alignment roughly parallels Santa Margarita Creek. The confluence of Yerba Buena and Santa Margarita Creek is located in the vicinity of Garden Farms (see Plate 3).

Table 3 – Watershed Survey Summary

WATERSHED	LAND SURFACE AREA			
	SQUARE MILES		ACRES	
	TOTAL	ABOVE STREAM GAUGE	TOTAL	ABOVE STREAM GAUGE
SANTA MARGARITA CREEK	16.9	9.6	10,840	6,144
YERBA BUENA CREEK	5.59	4.5	3,579	2,880
TROUT CREEK	13.9	NA	8,920	NA
RINCONADA CREEK	14.8	NA	9,498	NA

The Trout Creek Watershed drains the central and eastern portion of the Ranch study area. Trout Creek drains approximately 8,920 acres which includes the northern flank of Black Butte and the eastern flank of Chalk Hill. The watershed is comprised mainly of open space and agricultural acreage that is established as vineyards on the Ranch. Downstream of Chalk Hill, Trout Creek roughly parallels Santa Margarita Creek and then merges approximately 1,000 feet prior to the confluence of Santa Margarita Creek and the Salinas River.

The Rinconada Creek Watershed flows across the southern boundary of the Ranch study area and drains approximately 9,500 acres which includes the eastern flank of Black Butte and the foothills west of Santa Margarita Lake along Pozo Road. The watershed is comprised mainly of open space, including large areas of native oak woodland, and intermittent agricultural uses.

The confluence of Rinconada Creek and the Salinas River is located approximately 4.2 miles down stream of the Salinas Dam which is located east of the study area.

Stream Gauge Stations

The watersheds for which stream gauge data are available in our study area include the Santa Margarita and Yerba Buena Creeks. The watershed area above the Santa Margarita Creek stream gauge encompasses 9.6 square miles (mi^2) or 6,144 acres which is roughly double the size of the 4.5-mi^2 or 2,880-acre watershed area above the Yerba Buena Creek stream gauge (County, 1976).

The Santa Margarita Creek Station, located near the intersection of State Highways 101 and 58, has a record for the time period from 1961 to 2000. Appendix D – Stream Flow Measurements contains select wet and dry year hydrographs of daily readings with accompanying monthly summary tables and annual summary tables of stream flow at each station. The average annual stream flow calculated from the 35 years of complete data within the 40-year-period of record is 7,681 afy. Annual stream discharge volumes vary from a minimum of 277 acre-feet (af) in 1990 to a maximum of 32,347 af in 1995.

The Yerba Buena Creek gauge station, located near the intersection of State Highway 58 and H-Street, has a record period from 1965 to 1985. The average annual stream flow calculated from the 18 years of complete data during the 21-year period of record is 1,643 afy. Annual stream discharge was observed to vary from a minimum volume of 39 af in 1977 to maximum volume of 6,530 af in 1969. Where the stream flow records overlap between 1979 and 1985 the data provide a good correlation between the two stations. In comparison, Yerba Buena Creek typically has approximately 25 to 35 percent of the stream flow of Santa Margarita Creek and likely results from the steeper topography in the Santa Margarita Creek watershed and a higher rainfall average.

As shown graphically in Appendix D, both streams typically stop flowing during the period between May and November of each year (see Plates D1 to D5). Plates D1 and D2 show typical dry-year creek flows that indicate that runoff peaks subside quickly and the stream base flows typically stay below 2 cubic feet per second (cfs) during drier years. Plates D3 to D5 show typical wet-year creek flows where base flow in the streams can be considerably higher and is likely controlled by the intensity and duration of the winter storms in each watershed above the gauging station.

The amount of rainfall received by each watershed in the study area was calculated using the average annual rainfall total of 26.25 inches per year. Table 4 – Summary of Watershed Rainfall Estimates indicate the average annual volume of water deposited on each respective watershed. The estimated values of this study (see Table 4) are comparable to other estimates of average annual rainfall above the gauging stations of 6,965 afy and 17,988 afy for the Yerba Buena Creek and the Santa Margarita Creek watershed, respectively (Todd, 2004).

Table 4 – Summary of Watershed Rainfall Estimates

WATERSHED	WATERSHED AREA (ACRES)		AVERAGE ANNUAL RAINFALL (ACRE-FEET)	
	TOTAL	ABOVE STREAM GAUGE	TOTAL	ABOVE STREAM GAUGE
SANTA MARGARITA CREEK	10,840	6,144	23,712	13,444
YERBA BUENA CREEK	3,579	2,880	7,829	6,300
TROUT CREEK	8,920	NA	19,512	NA
RINCONADA CREEK	9,498	NA	20,777	NA

Comparing the estimated total rainfall received above each stream flow gauge with the average annual volume of flow measured to pass through the gauges indicates that approximately 57 percent of the estimated rainfall above the Santa Margarita Creek Station becomes surface flow while only 26 percent of the estimated rainfall received in the Yerba Buena Creek water exits as surface flow. The difference between the actual rainfall and the amount of runoff measured as stream flow is the amount of water that is removed from the soil by evapotranspiration processes or percolates downward to become groundwater.

Although there are no stream flow gauges on Trout Creek or Rinconada Creek we estimate that the magnitude to be 18,895 afy and 20,119 afy, respectively, and anticipate similar outflow curves that peak in the winter and are dry in the summer.

Groundwater Resources

Geology

For this study we have utilized the detailed mapping of the regional geology of the Ranch study area that was provided by Thomas W. Dibblee and is included as Plate 4 – Dibblee Geological Map. The west side of the Ranch lies on top of the Nacimiento Fault Zone, which is a northwest trending thrust fault which roughly parallels the San Andreas Fault. The northwest-trending Rinconada Fault is a strike-slip fault that virtually lies beneath the Ranch eastern boundary and juxtaposes younger Miocene age bedrock against the older Cretaceous granitic basement rocks. The proposed Agricultural Residential Cluster Subdivision lies directly above the northwest trending Santa Margarita Syncline which is centrally located within the valley (see Plate 4).

The geology in the Ranch study area consists primarily of eleven geologic units. The geologic units, from oldest to youngest, include the: 1) Franciscan Assemblage, 2) Toro

Formation, 3) Granitic Basement Rocks, 4) Atascadero Formation, 5) Simmler Formation, 6) Monterey Formation, 7) Santa Margarita Sandstone, 8) Vaqueros Formation, 9) Paso Robles Formation, 10) older alluvium, and 11) younger alluvium. The location and distribution of these materials at the land surface is shown on Plate 4 along with a brief description of the exposed formations. The steep dipping fault planes on each side of the valley bound the folded sedimentary bedrock that lies in between. These sedimentary bedrock materials along with shallow alluvial deposits are the primary water bearing units that have historically supplied groundwater to existing Ranch wells and proximate historical groundwater uses.

Younger and older alluvial deposits primarily occur along the presently active stream channels and along the down-dropped side adjacent the Rinconada Fault. Where present, these deposits consist of unconsolidated clay, silt, sand, and gravel which can form local shallow aquifers that may contain and transmit groundwater at an advantageous rate for well production.

The Paso Robles Formation (or equivalent unit) in this area reportedly consists of unconsolidated to moderately well consolidated sand and gravel deposits (RHA, 2006) that range in thickness up to 300 to 400 feet (CDMG, 1976). The Paso Robles Formation may be found at depths in the range of 400 to 500 feet below ground surface (bgs) along the eastern portion of the Ranch property (CDMG, 1976) and locally may consist of a non-marine conglomerate that is often found in the basil portion of the formation. The Paso Robles Formation, where present, likely forms the primary aquifer zone from which the higher yielding wells on the Ranch produce.

The Santa Margarita Formation is typically a poorly stratified sandy, marine sequence that conformably overlies the Monterey Formation which likely defines the effective base of fresh water under much of the Ranch property. The Santa Margarita Formation contains thick beds of fine- to coarse-grained arkosic sandstone that is locally calcareous. Available data indicate it likely ranges up to 1,000 feet thick (CDMG, 1976). Reportedly the Santa Margarita sandstone forms a poor to moderate aquifer for groundwater production and likely contributes to the yield in a number of the existing Ranch wells.

Groundwater Occurrence and Movement

The Paso Robles Groundwater Basin (Paso Robles Basin) and the more permeable bedrock aquifers of the Santa Margarita, and Paso Robles Formations underlie portions of the Ranch study area. The Paso Robles Basin is the primary source of groundwater in the region. It receives a substantial component of its recharge from the Salinas River and its tributary streams. As delineated by past study, the Paso Robles Basin boundary encroaches into the northern portion of the Ranch property which includes the Chalk Hill area (Fugro, 2002). It is our understanding that direct extraction from the Paso Robles Basin is not being proposed as a groundwater source for the Ranch Agricultural Residential Cluster Subdivision. The primary aquifer units that supply existing wells on the property reportedly consist of Paso Robles

Formation sand and gravel deposits, an undefined or stratigraphic equivalent to the Paso Robles Formation (RHA, 2006), and the Santa Margarita Formation.

Under natural undisturbed conditions, groundwater divides are usually assumed to coincide with land-surface watershed boundaries (see Plate 3) and groundwater flow is assumed toward the lower elevations in the watershed. Groundwater movement through the local bedrock is likely controlled by bedding planes and lateral variations in bedrock permeability, secondary porosity resulting from fault induced fracture systems, lateral barriers to flow caused by fault gouge or juxtaposition of impermeable rocks, and the elevation of the notch points formed by local stream channels.

In the proximity of the Ranch, the Salinas River channel lies on top of crystalline granitic rock that is dense and virtually impermeable to the flow of groundwater except perhaps through localized fracture zones. The river is separated from the Ranch property by numerous splays of the Rinconada Fault zone that parallels the northwesterly flow of the river. Because of the impermeable geological materials underlying the river and the numerous barriers that are likely formed by the Rinconada Fault between the Ranch and the river, groundwater underflow is not believed to occur between the Ranch property and the river.

Groundwater underflow was estimated by past studies (Todd, 2004; Fugro 2005) which typically concluded that relatively low volumes of subsurface flow were annually moving northward through the valley. The low flow estimates largely resulted from low formation transmissivity values and relatively flat groundwater gradients (0.0121 to 0.011, ft/ft). The amount of groundwater estimated to flow through the Santa Margarita and Yerba Buena watersheds was approximately 200 afy (Todd, 2004). Assuming a similar out flow for the Trout Creek watershed, groundwater underflow from the valley beneath the Ranch property may be on the order of 600 afy. Available groundwater elevation data indicate that underflow from the Rinconada Creek watershed could move through the sedimentary bedrock aquifer and flow into the Trout Creek and Yerba Buena Creek watersheds, however; the apparent barriers to subsurface flow on the eastside of the valley likely allows negligible underflow of groundwater. Groundwater migration to the east likely rises and emerges as stream flow which empties into the Salinas River at its confluence.

Given that the average stream flow for Santa Margarita Creek and Yerba Buena Creek at the gauging stations is 7,874 afy and 1,643 afy, respectively, groundwater underflow represents between 3 percent (Santa Margarita Creek) and 12 percent (Yerba Buena Creek) of the average water outflow from these watersheds. Although there are not gauging data available it is likely that the proportional outflow of water from the Trout and Rinconada Creek watersheds may be similar in magnitude between groundwater and stream flow discharge.

Historical Groundwater Development

Historical well data available for past study indicated that the higher producing wells in the area were completed in the coarse-grained alluvial materials adjacent the Santa Margarita and Yerba Buena Creek beds. The relative permeability of available aquifer materials has been inferred from the performance of existing wells and is summarized in Table 5 – Regional Geologic Units, along with the range of specific capacity values provided from available production data from wells constructed in these units.

These units have been categorized based on permeability which qualitatively ranges from very low to high and was derived from hydraulic data summarized from consultant reports and Department of Water Resources (DWR) Water Well Drillers Reports for the area (Todd, 2004). The analysis of the relative permeability of local geologic units utilized specific capacity data which is calculated from the yield of a well divided by the drawdown in the well while pumping. This value is typically directly proportional to the transmissivity (saturated thickness times the hydraulic conductivity) of the aquifer materials being produced. High specific capacities indicate aquifers with greater permeability while low specific capacities indicate poor aquifers or inefficient wells.

Table 5 – Regional Geologic Units

PERMEABILITY	GEOLOGIC UNIT	HISTORICAL WELL SPECIFIC CAPACITY RANGE (GPM/FT)[1]
VERY LOW	FRANCISCAN MELANGE	NEGLIGIBLE
	TORO FORMATION/VAQUEROS SANDSTONE	
LOW	ATASCADERO FORMATION	0.01 TO 5
	MONTEREY FORMATION	
	SANTA MARGARITA FORMATION	
	PASO ROBLES FORMATION	
HIGH	OLDER ALLUVIUM	0.68 TO 80
	YOUNGER ALLUVIUM	

FROM (TODD, 2004)
[1]- GALLONS PER MINUTE PER FOOT OF DRAWDOWN

Established Groundwater Uses

Santa Margarita Ranch

Information available for this study indicates that wells have been drilled primarily along the east side of the Ranch property along the west side of Pozo Road. Plate 5 – Well Location Map shows the location of wells within and proximate to the study area. Well performance test data for the Ranch wells is included in Appendix E – Ranch Well Production Test Data. These data indicate that many of the newer Ranch wells produce groundwater at rates that exceed rates provided by older Ranch wells (RHA, 2006) and that they are likely producing from localized deposits of coarser-grained aquifer materials (older alluvium or Paso Robles Formation) located along the east side of the Ranch. Individual well yields typically range between 200 and 400 gallons per minute (gpm) with some wells capable of rates of up to 1,000 gpm (RHA, 2006).

It is estimated that minor residential and livestock water uses on the Ranch likely require approximately 10 to 15 afy (RHA, 2006) and that historical irrigation demand for the vineyards has been about 275 afy. Accordingly, recent groundwater use is reportedly on the order of 290 afy or higher (see discussion in water demand section above). Cumulative groundwater production from each Ranch well has been routinely recorded (RHA, 2006) and is provided in Appendix F – Groundwater Hydrographs and Cumulative Well Production Data. The total amount of groundwater produced by the Ranch wells over the 2000 to 2006 production period is presented along with CSA 23 and Garden Farms well production on Plate 6 – Water Well Production Map.

County Service Area No. 23

Located within the central portion of the Ranch is the rural community of Santa Margarita (see Plate 2). Santa Margarita is the closest community to the Agricultural Residential Cluster Subdivision site that depends on groundwater for its potable supply. The town is virtually surrounded by Ranch property that is designated as part of the Future Development Program. The water supply for the town of Santa Margarita is provided by CSA 23 and is produced solely from water wells in the vicinity of the town. Groundwater production records indicate that the annual groundwater demand is on the order of 200 afy with a maximum system demand of 216 afy. The water supply that has been projected to satisfy the demand of the Santa Margarita community at build-out is approximately 293 afy (SLO County, 2003).

The CSA 23 groundwater supply is primarily provided by Well No. 4 which extracts from the shallow alluvial aquifer. A backup and supplemental supply is provided by Well No. 3 which is completed in the low-permeability Santa Margarita Formation and can provide a discharge of about 100 gpm with 300 feet of drawdown. Historically Well No. 4 has supplied about 85 percent of the water to the system from the Santa Margarita watershed (174 afy) while Well No. 3 provides the remaining average 31 afy from the Yerba Buena watershed (Todd,

2004). Some years however, virtually the entire system supply has been provided by Well No. 4. Well Nos. 1 and 2 are presently maintained as an emergency supply.

Wells 1, 2, and 4 tap the high-permeability younger alluvium and have discharges of 200 to 250 gpm with less than 6 feet of drawdown. The alluvial aquifer is characterized by substantially higher permeability than the underlying bedrock formations. The alluvial aquifer is relatively shallow and thin (approximately 13 feet thick) with its base at a depth of approximately 50 feet bgs. During the rainy season the static water level in the CSA 23 alluvial wells is near ground surface. During an average rainfall year the water levels fluctuate by about 20 feet between high and low static conditions. The low water level conditions result in reduced well yields, particularly in late summer and early fall. Seasonal rains typically fully recharge the aquifer by early January. Hydrographs of water level fluctuations in the CSA 23 wells are provided in Appendix G – CSA 23 Well Data. During extended droughts, water levels may decline to depths of up to 30 feet below ground surface and severely reduce the available drawdown and the yield of the shallow wells (Todd, 2004). Because of the low permeability of local bedrock formations, well yields are relatively low and achieved only with substantial drawdown. As a result, Well No. 3 cannot replace the primary alluvial sources of water to CSA 23 which leaves the system vulnerable during drought conditions.

Reportedly other groundwater pumping exists in the vicinity of Santa Margarita (e.g., the high school well) but is assumed to be respectively small compared to the overall community demand (Todd, 2004). Plate 6 shows the production of CSA 23 over the 6-year period (approximately 1,200 af) and indicates that CSA 23 is proportionally the largest producer of groundwater in the vicinity of the Ranch.

Garden Farms Water District

Garden Farms is located in the central portion of the valley at the north end of the Ranch property. Garden Farms is the next closest water district to the proposed Agricultural Residential Cluster Subdivision (see Plate 2). Garden Farms has provided a potable supply of water to its water service area since 1955. Reportedly the district has 3 shallow alluvial wells but is presently only using 2 of them. Well No. 1 produces at a rate of approximately 155 gpm and provides about 85 percent of the total water supply. Well No. 2 produces at a rate of about 30 gpm and provides the remaining 15 percent of supply. Annually Garden Farms produces between 40 and 50 af of groundwater with a 5-year total (2001 to 2005) of approximately 225 af.

Groundwater levels in the wells oscillate seasonally on the order of 5 to 10 feet with peaks that occur during February and March. The lowest static water levels occur typically between July and November. Water level hydrographs that present available data from the Garden Farms wells are provided in Appendix H – Garden Farms Well Data. The relative magnitude of groundwater production from the Garden Farms wells over the 2000 to 2006 time period is also provided on Plate 6.

Atascadero Mutual Water Company

Further to the north the next community that relies on groundwater for its supply is Atascadero. Atascadero is supplied by the AMWC which derives its entire supply from a well field located in the Paso Robles Basin (Fugro, 2002). The AMWC well field is located within the Atascadero subbasin and produces water that is considered either groundwater or Salinas River water (direct hydraulic communication with surface water flow). The AMWC reportedly pumped 5,456 af of water in 1993 with approximately 68 percent taken from the Salinas River and 32 percent from groundwater (SLO County, 2003). In 1997 AMWC produced 6,317 afy (Fugro, 2002) and has reportedly produced on the order of 6,000 afy to satisfy its system demands. Well field production at the Ranch will not directly interfere with the operation of wells in the Atascadero subbasin. However, to the extent underflow or surface flows that recharge the basin are diminished the yield of the basin would be proportionally reduced.

Water Budget

A water budget analysis considers all water inflows, outflows, and change in storage of a watershed to estimate an approximate water supply. The water budget equation is simply a statement of the conservation of mass in the hydrologic system as expressed in the equation below:

Inflow = Outflow ± Change in Storage

Water inflow to the groundwater system in each watershed can be from sources that include rainfall, surface water infiltration, and groundwater inflow, irrigation and septic system return flows, and water importation. Water outflow from the groundwater system typically includes evapotranspiration, stream flow (both storm runoff and base flow), groundwater outflow, groundwater production/consumption, and water exportation. Groundwater production is partially offset by irrigation or septic system return flows. Changes in groundwater storage over a designated study period are reflected in changes in surface water outflow (from base flow) and groundwater elevations. As previously discussed stream flow gauging stations are not established on Rinconada and Trout Creeks and predevelopment or post-development data are not available to assess if there are changes in surface water flows.

The study period provided by the Ranch's operation and monitoring of its well field is over the 6-year period between spring of 2000 and spring of 2006. The data collected during this study period represents system responses during a relatively average rainfall period. At the time of this study rainfall data are not available for the 2006 water year, however, we believe the year will end as an average or above average rainfall year. Available data from the Salinas Dam and the Santa Margarita Booster Station gauges indicate that the 2000, 2001, 2004, and 2005 are slightly above average years with 2002 and 2003 as below average years (see Appendix C).

A vast majority of the Ranch wells are located in the Trout Creek watershed (16 total) which includes the 2 bedrock wells (see Plate 5, Well Nos. 17 and 18) which are in the mountains west of the valley floor. Six of the Ranch wells are located in the Rinconada Creek watershed. The magnitude of Ranch groundwater extraction from each of these watersheds over the 2000 to 2006 study period was reportedly 1,174 af from Trout Creek, and 894 af from Rinconada Creek which equates to approximately 57 percent and 43 percent, respectively, of the total 6-year Ranch demand (2,068 af). If we average the production over 6 years the resulting groundwater production has been about 345 afy. While these data are useful, reportedly the readings underestimate the actual amount of groundwater extraction by the Ranch by an unknown amount (RHA, 2006). However, observed groundwater system responses to Ranch extractions are evident in the water level data provided by Ranch well monitoring and are discussed in the following report section.

As previously discussed in this report, groundwater outflow is estimated at approximately 200 afy from each of the Santa Margarita and Yerba Buena watersheds (Todd, 2004). While we have assumed that the Trout Creek groundwater outflow is comparable, water level gradient data are insufficient in the northern portion of the study area to allow an accurate calculation of this outflow.

Because of a lack of pertinent data, an accurate water budget analysis could not be conducted for the study area to estimate available groundwater supply under existing conditions. These data deficiencies include; inaccurate groundwater extraction records, no annual evapotranspiration rates in the valley (and vineyard irrigation season rates), incomplete rainfall data (for the period of water level records), a lack of groundwater level data in the northern half of the Ranch (north of the Agricultural Residential Cluster Subdivision), a lack of groundwater data in dry years, and no stream flow data for the two watersheds that are presently providing groundwater for Ranch uses.

Groundwater Storage

While an accurate water budget for the Ranch could not be derived by this study, available data indicate that a depletion of groundwater storage occurred over the study period. Groundwater storage depletion is evident in both the well production test data (see Appendix E) and in the long term water level monitoring data (see Appendix F). The well production test data were largely evident of groundwater storage depletion that in many cases persisted several days after pumping ceased (up to 4 and 5 days) (see Appendix E). Several well recovery test periods were abbreviated and do not indicate the aquifers response to cessation of pumping. The long term water level monitoring data were combined with cumulative well production data to produce a correlation between groundwater extraction and the resulting water level decline (see Appendix F). As indicated by many of these graphs the local water levels are directly relational to the magnitude of groundwater produced from the well or proximate well in the same area of the groundwater basin.

Utilizing water level data available from the Ranch wells in April 2000 (near the beginning of Ranch groundwater production) the elevation of the groundwater surface was contoured and is presented on Plate 7 – 2000 Groundwater Elevation Contour Map. The basin wide monitoring event conducted in April 2006 (RHA, 2006) measured most wells and provided the data used to contour the present groundwater levels beneath the Ranch. The resulting groundwater gradients are shown on Plate 8 – 2006 Groundwater Elevation Contour Map. A summary of the change in groundwater elevations between the 2000 and 2006 measurements is provided in Table 6 – Water Level Elevation Changes.

Table 6 – Water Level Elevation Changes

RANCH WELL MAP DESIGNATION NUMBER[1]	GROUND SURFACE/WELL HEAD ELEVATION (MSL)	2000 WATER LEVEL ELEVATIONS (MSL)	2006 WATER LEVEL ELEVATIONS (MSL)	WATER ELEVATION DECLINE
1	1,140	1,127.1	1,080.3	46.8
2	1,128	1,115.7	1,073.3	42.4
3	1,122	1,108.2	1,083.5	24.7
4	1,160	1,129.7	1,077.1	52.6
5	1,200	1,150.0	NA	NA
6	1,160	1,109.3	NA	NA
7	1,126	1,122.2	1,068.3	53.9
8	1,115	1,109.2	1,084.7	24.5
9	1,115	1,115.0	1,087.5	27.5
10	1,085	1,048.2	NA	NA
11	1,085	1,073.0	NA	NA
12	1,084	1,074.1	1,048.8	25.3
13	1,080	1,078.6	1,080.0	-1.4
14	1,106	1,066.0	1,070.0	-4.0
15	1,075	1,066.2	1,069.0	-2.8
16	1,150	NA	1,092.0	NA
17	2,160	2,040.0	NA	NA
18	2,040	1,985.0	NA	NA
19	1,180	1,155.2	1,146.8	8.4
20	950	NA	936.2	NA
21	930	915.0	920.9	-5.9
22	1,160	NA	1,062.4	NA

[1] – WELL NUMBER FROM (RHA, 2006)

As shown, water level elevations have declined over the study period by approximately 50 feet in the south-central portion of the Ranch (compare data for Well Nos. 4 and 7). These

water level changes appear to correlate closely to the magnitude of groundwater extracted over the study period from wells in these areas (see Plate 6). While there were not sufficient data to allow contouring of the water level surface outside of the valley, the bedrock wells located west/southwest of the Agricultural Residential Cluster Subdivision (Well Nos. 17 and 18) follow a similar trend. Water level measurements for these wells were not collected during April 2006, however, historical changes are provided in Appendix F (see Plates F17 and F18).

Historical fluctuations in groundwater elevations over the 2000 to 2006 study period are shown on the hydrographs of individual Ranch wells that are provided in Appendix F. The recorded static water level fluctuations result from a combination of factors that include; seasonal recharge, recent well activity, well interference, subsurface barriers to flow, and the overall distribution of Ranch extractions. In general, the distribution of Ranch pumping (see Plate 6) appears to have resulted in groundwater levels that may be stabilizing (reaching a steady state with the present rate of recharge) at levels that range between 25 and 50 feet below historical levels (see Table 6). Several wells that have provided historical data were not sounded during the 2006 monitoring event and as such this study was limited by the available data. Select bedrock well hydrographs are included on Plate 9 – Bedrock Well Hydrographs to provide a visual correlation between well location and water level changes. As anticipated, wells located near the primary areas of extraction show the greatest decline in water levels and indicate the areas of greatest depletion of groundwater from storage.

Data from Well Nos. 1, 3, 4, 7, 17, and 18 were utilized to estimate the average annual groundwater production that occurred between measurements of similar water level readings (indicating no net change in storage). The calculations are provided in Appendix I – Annual Well Yield Estimates and summarized in Table 7 – Average Annual Well Yield.

Because Ranch data collection was inconsistent, this type of analysis could not be conducted on all the wells. As shown, these data indicate that after initial aquifer storage depletion occurred, induced recharge may be capable of sustaining annual well yields that range between 27 and 112 afy. While the monitoring period does not include drought and extreme wet year conditions, available data provide some indication that the aquifer(s) being produced were capable of substantial yields during the monitoring period.

Ranch Well No. 15 however, shows virtually no impact from historical well operations (see Plate 9) and is substantiated by the water levels recorded in Well Nos. 13 and 14 (RHA, 2006) (see Appendix F). These wells indicate that groundwater pumping from the southeastern portion of the Ranch has not impacted groundwater levels located midway between the primary area of Ranch groundwater production and the town of Santa Margarita.

Water level hydrographs are available for a short 1 ½-year period of time for the bedrock wells located in the mountains west of the valley. These wells are designated as Well Nos. 17 and 18 (RHA, 2006) and indicate that bedrock wells may provide a viable source of water for

development. These two wells provided about 244 af of water over the 2001 and 2002 monitoring period. The resulting static water levels were measured at approximately 40 feet and 50 feet lower at the end of the period which indicates that groundwater storage had been depleted by this magnitude of pumping. Comparing data between April and June of 2001, and April and July of 2002 indicates that over 150 af had been produced between the wells with apparently little change in water levels over this period. Data review indicates that water levels may have been stabilizing; however, the monitoring period is too short to draw any conclusions about dry cycle availability or if there would be any impact of pumping on the down gradient wells located along the lower reaches of the Trout Creek watershed.

Table 7 – Average Annual Well Yield

RANCH WELL NUMBER	MEASUREMENT DATES	DEPTH TO WATER LEVEL (FEET)	METERED PRODUCTION (ACRE-FEET)	AVERAGE ANNUAL PRODUCTION (ACRE-FEET)[1]	WATER LEVEL CHANGE (FEET)
1	JUNE 2003 APRIL 2006	56.1 59.7	80.6	26.9	-3.6
3	SEPTEMBER 2000 APRIL 2006	35.0 38.5	237.4	43.2	-3.5
4	SEPTEMBER 2002 APRIL 2006	69.0 82.9	166.6	47.6	-13.9
7	JUNE 2003 APRIL 2006	54.0 57.7	139.6	46.5	-3.7
17	MAY 2001 JULY 2002	162.0 159.0	55.7	55.7	3.0
18	JUNE 2001 MAY 2002	109.5 112.0	111.6	111.6	-2.5

[1] – SEE CALCULATIONS IN APPENDIX I

Water level hydrographs for shallow alluvial wells are presented on Plate 10 – Alluvial Well Hydrographs. These data indicate no apparent decrease in water levels that could be associated with the present Ranch extractions. Since the alluvial aquifers refill nearly every winter due to annual precipitation, the net change in alluvial groundwater storage is zero (Todd, 2004). Since the Agricultural Residential Cluster Subdivision is not proposing to extract groundwater from the Yerba Buena or the Santa Margarita watersheds, the shallow alluvial groundwater in those watersheds will not be depleted.

WATER SUPPLY AVAILABILITY

The water demand estimates were utilized along with available information on local groundwater conditions to assess the availability of water supplies for the project. As part of this assessment, the availability of both on-site and potential off-site water supplies was considered.

Groundwater

The present onsite water supply consists of groundwater produced from conventional wells. The feasibility of installing additional onsite wells or sharing the use of existing wells as proposed by the project will ultimately depend on the perennial yield of the groundwater basin. The perennial yield will be realized over years of use during extreme wet and dry climatic cycles. Based on available data, the present annual demand on the Ranch may be as high as 350 to 400 afy (given reported discharge meter inaccuracies). This demand has been developed over a time period where rainfall has been slightly above average. During this time the basin water levels have steadily declined. Although some well water levels have stabilized or risen slightly, we believe this has resulted from shifting pumping stresses among the Ranch wells. As shown on Plate 9, a number of the trend lines indicate a general continued downward trend in the area of greatest groundwater production. These data indicate that the existing pumping of groundwater during average years for the established Ranch uses may need to be spread over a larger area to prevent local overdraft conditions. Data are not available to indicate how the aquifers will respond to extreme dry years or extended dry periods where little or no groundwater recharge occurs.

The instantaneous capacity of the entire Ranch well field has been estimated at a rate of 6,500 gpm (RHA, 2006). While this may be a total of short-term well performance data, the operational capacity of a water system (long-term pumping) is likely considerably lower than this value (which does not account for well interference and climate induced changes in basin conditions). However, these data indicate that the proposed demand rates of the Agricultural Residential Cluster Subdivision can likely be accommodated by development of groundwater on the Ranch by the Santa Margarita Ranch Mutual Water Company. Groundwater development could be accomplished by drilling additional wells or by using the unutilized capacity of existing wells that are appropriately constructed for domestic use. The proposed Agricultural Residential Cluster Subdivision will require an estimated 96 afy of groundwater supply to satisfy the consumptive demand (see Table 3). The magnitude of this additional demand is a 25 to 35 percent increase in groundwater production over the reported and assumed Ranch production in the range of 285 afy and 400 afy, respectively.

The envisioned Future Development Program will require an estimated 830 afy of groundwater supply to satisfy the projected consumptive demand (see Table 3). The magnitude of this additional demand is a 100 to 190 percent increase in groundwater production over the reported and assumed existing Ranch production in the range of 285 afy and 400 afy,

respectively. Data are not available to substantiate the long-term reliability or the impacts associated with development of water for the Future Development Program. Available data indicate that the long-term capability of the groundwater basin is likely insufficient to provide adequate quantities of water for the Future Development Program without creating significant impacts to existing and/or other local planned water uses, or natural riparian habitats. The establishment and maintenance of a competent data collection program will be a key component to refining our understanding of the available groundwater resources for the Future Development Program on the Ranch.

Imported Water

The feasibility of using alternative sources of water for Ranch development including the State Water Project (up to 100 afy) (DWR, 1991) and Nacimiento Water Project (up to 200 afy) (MRS, 2003) supplies was reviewed by this study. While the importation of these supplies will augment existing onsite water sources, the projected magnitude of the future demand can not be met solely by these sources. The findings of this study indicate that importation of water from these sources, or a portion thereof, may be necessary to mitigate future shortfalls of existing supplies to meet existing demand, or the proposed demand of the Agricultural Residential Cluster Subdivision.

POTENTIAL WATER SUPPLY IMPACTS

Previous study has concluded that use of groundwater by the proposed project or other future projects would potentially lower groundwater levels and possibly reduce the production capacity of other wells in the vicinity of increased groundwater extraction (Todd, 2004). Use of wells near streams and riparian vegetation can influence stream flow and water supply available for riparian vegetation (Cleath, 2004).

Additional groundwater developed by the Ranch (or other pumpers in the vicinity of the Ranch), or redistribution of pumping on the Ranch property would be anticipated to impact the groundwater levels in the aquifers being produced. Over the long-term, increases in groundwater pumping would most likely be accompanied by impacts to the outflow components (stream flow and subsurface outflow) of the watershed being produced. The actual impact on these outflows would depend on the amount, location, and timing of pumping.

Changes in the groundwater gradient(s) induced by an increase in groundwater pumping could accordingly affect subsurface outflow. The subsurface outflow from the Ranch area through the aquifers beneath the Santa Margarita, Yerba Buena, and Trout Creek watersheds contributes to groundwater supplies down gradient, including the Santa Margarita and Garden Farms areas, Atascadero subbasin, and ultimately Paso Robles Basin as a whole.

Stream Flow and Surface Water Depletion

Local stream flow is intermittent and largely represents winter-time runoff. Additional groundwater extraction will likely induce percolation and recharge of groundwater by preventing mounding beneath the active stream channels. The anticipated impacts to surface water flows will be directly related to the location and magnitude of future groundwater extraction. Increased extraction within the Trout and Rinconada Creek watersheds is not anticipated to impact stream flow within the Santa Margarita Creek or Yerba Buena Creek as long as groundwater recharge is satisfied by rainfall within the watersheds being produced. However, surface water flows have likely been reduced to some degree in the Trout Creek and Rinconada Creek watersheds as a result of streambed infiltration that has been induced by lower groundwater levels. Additional impacts may be associated with diminished base flows that occur along potentially gaining reaches of these creeks. Base flows are sustained by high groundwater levels that seep upward into the river and stream channels and supports flow when surface runoff has ceased. This component of flow is apparent in the Santa Margarita and Yerba Buena Creeks during an approximate 5- to 7-month-period of the year. There are no available data to assess historical stream flows in the Trout and Rinconada Creek watersheds and the inferred impacts of existing uses. Additional groundwater production for the Agricultural Residential Cluster Subdivision will require a greater annual replenishment of the aquifer system that is proposed for use to provide its supply. The additional demands of the proposed Agricultural Residential Cluster Subdivision and the envisioned Future Development Program has the potential to significantly impact surface flows in the watersheds which are used to provide the groundwater supply.

Groundwater Overdraft

The perennial yield of a groundwater basin is the average quantity of water that can be extracted from an aquifer system or groundwater basin over a period of time without causing undesirable results. Undesirable results include permanently lowered groundwater levels, land surface subsidence, or degradation of water quality in the aquifer. If water management in a basin changes (distribution of pumping or increased recharge from imported sources), the yield of the basin may change over time. The basin yield is the average amount of groundwater that can be produced annually when averaged over an extended period of time. Pumping in individual years will vary based on demand that is higher than the long-term average yield in dry years and lower in wet years. If the perennial yield is exceeded and undesirable results occur, the basin or aquifer system is considered to be in overdraft.

To evaluate whether falling groundwater levels are likely to cause an undesirable result (i.e., whether the basin is in overdraft), the groundwater levels in a basin are evaluated over at least one complete hydrologic cycle of representative wet and dry years to establish a trend (generally several decades). Because available groundwater level and production data have been collected intermittently and have not been collected over a complete hydrologic cycle, the

available groundwater data from the Ranch are not sufficient to determine the long-term impacts of existing groundwater pumping. In addition, the projection of proposed increases in pumping can not be sufficiently accomplished to determine if the impacts will be significant or not. Although water levels in some wells continue to decline, the water level in other wells have stabilized or risen. Available data do not directly indicate that the aquifer system beneath the Ranch is in overdraft, however; they do indicate a direct response to increased pumping stress.

Groundwater Quality

Available data indicate that water quality impacts due to the proposed increased groundwater extractions will likely be minimal. Groundwater degradation from upwelling of brackish water sources is not documented in the area and not anticipated on the Ranch. Groundwater production has only been conducted for a short period of time and no water quality trend can be developed from available data. Water quality impacts of the project are anticipated to primarily result from overlying land use and the quality and amount of groundwater return flows. The anticipated nitrate loading from the Agricultural Residential Cluster Subdivision will cause minor degradation to the groundwater quality and is not considered significant.

Well Interference

Using the local groundwater which is identified as the primary source of water to supply the proposed Agricultural Residential Cluster Subdivision might have a potential to create adverse impacts on other existing water users in the vicinity of the Ranch. Based on available data, we have estimated the magnitude of well drawdown interference anticipated from the production of groundwater from the well facilities proposed for the project and determined that well interference is not a significant impact for existing off site facilities.

The potential impacts of the proposed Agricultural Residential Cluster Subdivision will include lowering groundwater levels over a greater portion of the Ranch and/or adding to the pumping trough that has developed from existing pumping. The impacts of a lowered water table in the Trout Creek and Rinconada Creek watersheds on other existing groundwater facilities in the vicinity of the Ranch (CSA 23 and Garden Farms) are considered less than significant. Impacts from additional Ranch groundwater extractions will likely be tolerable to existing Ranch operations if pumping is appropriately distributed and perennial yield is not exceeded. Should the location of extraction become concentrated in one area, the impacts could become significant. This potential impact to existing Ranch well facilities could be mitigated through redistribution of pumping (adequate well spacing). If the perennial yield of the basin or aquifer system is exceeded, then the impacts of additional groundwater production would be significant and only mitigated by developing a supplemental water supply or reducing overall Ranch water use.

Ground Subsidence

Groundwater extraction from loose, unconsolidated, fine-grained sediment can result in ground surface subsidence. The potential for subsidence in the consolidated Paso Robles and Santa Margarita Formation is considered very low. These bedrock sediments were compressed through burial prior to tectonic uplift, which has placed the formations at their present elevations. Historical pumping by the Garden Farms and CSA 23 wells in the unconsolidated to loosely consolidated alluvial materials that overlie the consolidated bedrock has not caused any observed or reported subsidence in the area near these active wells. These deposits are relatively coarse-grained and thin (to depths of approximately 50 feet) and have already been subjected to low water level conditions while historically being produced during times of drought. If these materials had been susceptible to subsidence, consolidation would have occurred. Because of the physical nature of the alluvial and bedrock aquifers that will be produced for the proposed water supply, the impact from the Ranch well operations under both the residential project and the Future Development Program is less than significant.

Cumulative Impacts

The cumulative impacts of the project water demands will be contingent on the potential for increased water use by neighboring properties that could be associated with land use change such as, agricultural intensification, expansion of mining activities, and urban growth. The cumulative impacts of the Agricultural Residential Cluster Subdivision and Future Development Program are anticipated to occur if groundwater is produced within or adjacent to the northern portion of the Ranch. The increased groundwater production in this area is anticipated to create potential long-term water supply availability impacts to the shallow alluvial aquifer that provide water to CSA 23 and Garden Farms water systems as well as the Atascadero subbasin which supplies water to the AMWC.

Although future water shortages or projected growth demands of these existing water districts are planned to be provided by imported sources (MRS, 2003), the present groundwater supply used by these districts is not planned to be replaced or reduced. A reduction in the availability of the groundwater resources utilized by these districts would be a significant impact, particularly during a drought when historically water rationing has been required.

CONCLUSIONS

Based on the findings of this study we conclude that historical groundwater uses on the Ranch have had an observable impact on the local groundwater resources. Established groundwater users downstream of the Ranch have experienced supply limitations during dry climatic periods and have conducted historical studies to determine the availability of the underlying resource that supplies their systems. Numerous studies have been conducted in the past to estimate the availability of groundwater for overlying Ranch uses, however; this is the first study that has received data on groundwater production and the corresponding groundwater basin water level responses to annual pumping stresses for Ranch property uses.

As indicated in the findings of this study, the 2000 to 2006 data collection period is short and generally falls within an average or above average (wet) hydrologic period. Additionally, these data were only periodically obtained, collected by several sources (with no quality control program or oversight agency involved), lacked pertinent observations or confirmatory readings, and often randomly collected across the Ranch during any given monitoring event. The limited nature of the available data develops an inherent uncertainty that will accompany any interpretation and the subsequent conclusions that are based on these data.

With this understanding the County is attempting to estimate the total annual water supply that may be available from the aquifers beneath the Ranch property. The apparent average annual well yields listed in Table 7, indicate that individual well facilities may potentially provide an average of 55 afy under the climatic conditions observed during the base period. This type of annual average would require approximately 20 active wells to distribute pumping impacts and cumulatively provide the consumptive demand of existing Ranch uses that are indicated in Table 2 (1,090 afy). Another 2 wells would subsequently be required to accommodate the projected consumptive use of the proposed Agricultural Residential Cluster Subdivision (95 afy) which would cumulatively provide a theoretical annual yield of 1,185 afy. The projected consumptive demand represents an approximate 400 percent increase in groundwater extraction over the presently reported annual production of less than 300 afy. Although additional groundwater may be available from beneath the Ranch property, it is highly unlikely that development of a supply to meet the projected demand of current uses (1,185 afy) is sustainable.

Available data indicate that the average annual yield of the groundwater basin beneath the ranch may ultimately prove to be in the range of between 400 and 600 afy. There are not enough data available to fully assess the long-term impacts of this magnitude of groundwater production on local surface water flows or existing groundwater users. However, we believe this basin yield estimate is reasonable for the present planning effort and should be used until data collected over a complete hydrologic cycle better define the availability of local groundwater resources. The projected consumptive demand of the existing (recently established) Ranch uses

indicates that the estimated annual groundwater supply will be fully utilized and a reliable source of groundwater may not be available for the proposed Agricultural Residential Cluster Subdivision or the Future Development Program.

MITIGATION MEASURES

The potential impacts identified by this water supply study have been evaluated to develop potentially feasible mitigation measures which could be incorporated into the proposed Agricultural Residential Cluster Subdivision project and/or the Future Development Program to minimize impacts related to groundwater and water supply availability. Potential mitigation measures related to the water resource impacts identified by this study includes:

1. Establishing a comprehensive groundwater monitoring program that collects well production and semiannual groundwater levels from all available wells and water quality testing of key constituents of potential concern (i.e., nitrate)
2. Establishing a comprehensive stream flow monitoring program that includes new stations on Trout Creek and Rinconada Creek
3. Implementing water conservation measures, in-home and for irrigation
4. Importing foreign water supplies
5. Using recycled water for irrigation uses
6. Placing limitations on the Future Development Program size
7. Limiting the Agricultural Residential Cluster Subdivision by phase
8. Directing surface water runoff from residentially developed areas to retention basins located in areas that promote percolation and groundwater recharge

Water Resources Monitoring

Groundwater Resources

This mitigation measure should at a minimum consist of routine water level measurements and groundwater production metering of all existing and future wells and be a condition of all Agricultural Residential Cluster Subdivision phases and Future Development Program components. Because the groundwater resources that are vital to sustaining the existing and proposed project phases and components are not well defined, a groundwater monitoring program must be implemented and maintained to develop an understanding of limitations and allow proper management and protection of its natural supply. Each phase or component of

development should be conditioned to provide additional facilities as necessary to monitor the anticipated impacts of the groundwater resources based on the proposed location of extraction.

At this point in time monitoring is only conducted using existing production wells; however, up gradient and down gradient monitoring locations should be established and the complexity of the geological structures should be considered to prevent misplacing facilities and misinterpretation of data. The Ranch monitoring program should be reliable and routine whereby the groundwater production is reported annually, the groundwater basin levels are measured semi-annually (spring and fall/April and October), and "key" water quality constituents of concern (i.e., nitrate) are tested biannually (at a minimum).

The Ranch groundwater monitoring program should be conducted by the County Public Works Department or at a minimum under its supervision. Annual review of these data should be conducted by the County and should be considered as a condition of approval for subsequent construction of Ranch project phases or program components. The type of remedial action that may be required (e.g., importation of additional water supply or water rationing) should be developed based on the significance of the adverse conditions documented by the future groundwater monitoring program and subsequently implemented as practicable.

Surface Water Resources

Surface water resources have been monitored routinely for 2 of the 4 watersheds on the Ranch. Mitigation to protect project impacts to surface water flows should include establishing a comprehensive stream flow monitoring program that includes new stream flow monitoring stations on Trout Creek and Rinconada Creek. Each of these creeks is tributary to the Salinas River which provides water resources to established downstream users. Each of these creeks supports a riparian corridor that depends on a naturally established supply provided by creek flow. Water quality monitoring should also be included in the creek monitoring program to ensure that new development (residential and agricultural) is conducting best management practices (e.g., water conservation measures, organic fertilizer application and minimized chemical application) which prevent the introduction of harmful nutrients or chemicals in the natural drainages.

The Ranch surface water monitoring program should be conducted by the County Public Works Department or at a minimum under its supervision. Annual review of these data should be conducted by the County and should be considered as a condition of approval for subsequent construction of Ranch project phases or program components. The type of remedial action that may be required (e.g., importation of additional water supply or water rationing) should be developed based on the significance of the adverse conditions documented by the future surface water monitoring program and subsequently implemented as practicable.

Water Conservation Measures

Apparent water supply limitations in the area of proposed development will require the implementation of prudent water conservation measures that are practical and easily implemented for residential and agricultural uses. These measures may include the required use of available and proven technologies and equipment that provide adequate performance with a substantial water savings (e.g., high water efficiency washing machines and ultra-low flush toilets, and micro sprinklers or drip tape for domestic and agricultural irrigation).

All residential uses should include metering of individual properties to allow future determination if efficient water use is being conducted and if mitigation is effective. Water sales may include tiered commodity rates that increase with higher water usage to financially encourage each resident to conduct water conservation. Planned residential development should be required to install high efficiency washing machines and ultra-low flush toilets during construction.

Metered water systems allow for water audit and survey programs to be conducted on residential water uses to determine the effectiveness of past mitigation measures. Ranch water audit and survey programs should be conducted by the County Public Works Department or at a minimum under its supervision. Review of audit or survey data should be conducted by the County and should be considered as a condition of approval for subsequent construction of Ranch project phases or program components. The type of remedial action that may be required or development restrictions should be based on the significance of the water audit or survey program results. The type of remedial action or future development restrictions that may be required should be developed based on the significance of the water audit or survey program results and implemented as practicable.

All publicly landscaped areas greater than 0.1 acre should be required to establish low water use landscaping that is equipped with low water use irrigation methods. All Ranch agricultural land uses should be encouraged to operate on an irrigation efficiency that promotes best management practices. A combination of these mitigation measures is anticipated to result in the ability to achieve the reduced water use factors presented in Table 8 - Summary of Adjusted Water Demands which is based on lower water use factors provided in Appendix B when water conservation measures are applied.

Application of these measures is anticipated to reduce the overall water system demand for the Agricultural Residential Cluster Subdivision from an estimated 161.28 afy to approximately 139.94 afy (about 13 percent), and for the Future Development Program from an estimated 1,305 afy to approximately 1,072 afy (about 18 percent). The resulting reduction in consumptive water use for the estimate demand of the Agricultural Residential Cluster Subdivision 12.5 afy (from 96 afy to 83.5 afy) and of the Future Development Program is about 150 afy (from 830 afy to 680 afy).

Table 8 – Summary of Adjusted Water Demands

PROJECT ELEMENT	PROJECT CHARACTERISTICS	WATER USE FACTOR (ACRE-FEET/UNIT)	ANNUAL WATER DEMAND (ACRE-FEET)
EXISTING RANCH WATER USES			
36 RESIDENTIAL CLUSTERED LOTS	1.0 TO 2.5 ACRES IN SIZE (128 ACRES)	1.26/LOT	45.36
AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION IRRIGATION OF VINEYARDS	973.9 ACRES	1.6 AFY/ACRE	1,558.24
EXISTING RANCH WATER USE TOTAL			**1,603.60**
AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION TENTATIVE TRACT 2586			
111 RESIDENTIAL CLUSTERED LOTS	1.0 TO 2.5 ACRES IN SIZE (128 ACRES)	1.26/LOT	139.86
1 DWELLING UNIT AT HEADQUARTERS PARCEL, PARCEL 42		0.08/LOT	0.08
40-FOOT WIDE PRIVATE EASEMENTS (RESIDENTIAL) AND 30-FOOT WIDE DRIVEWAY EASEMENTS	16 ACRES	0	0
40-FOOT WIDE PRIVATE EASEMENTS (RESIDENTIAL AND AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION)	19.1 ACRES	0	0
PAVED ROADS		0	0
AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION RESIDENTIAL CLUSTER TOTAL			**139.94**
FUTURE DEVELOPMENT PROGRAM			
REMAINDER OF THE 550 RESIDENTIAL UNITS ALLOWABLE UNDER THE SALINAS RIVER AREA PLAN (MINUS 36 RESIDENTIAL UNITS IN TRACT 1, AND 112 UNITS ON TRACT 2586)	402 RESIDENTIAL LOTS, APPROXIMATELY 400 ACRES (INCLUDES 50 AFFORDABLE WORKFORCE UNITS)	1.26/LOT	506.52
GUEST RANCH, LODGE, AND RESTAURANT	150 TO 250 UNITS, 40 TABLES/200 PATRONS, 100 ACRES	0.110/ROOM	27.5
RESTAURANT	40 TABLES/ 200 PATRONS	0.013/SEAT	2.6
BED AND BREAKFAST	12 ROOMS	0.110/ROOM	1.32
PRIVATE GOLF COURSE, CLUB HOUSE, SHOP	27 TO 36 HOLES / 220 TO 280 ACRES	2 AFY/ACRE	440[1]

Table 8 – Summary of Adjusted Water Demands (continued)

PROJECT ELEMENT	PROJECT CHARACTERISTICS	WATER USE FACTOR (ACRE-FEET/UNIT)	ANNUAL WATER DEMAND (ACRE-FEET)
FUTURE DEVELOPMENT PROGRAM (CONTINUED)			
CAFÉ	20 TABLES/ 100 PATRONS	0.013/SEAT	1.3
AMPHITHEATER	200 TO 600 SEATS	0.013/SEAT	7.8
CRAFT STUDIOS, GALLERIES, AND SHOPS	6,000 SQUARE FEET	0.060/1000 SF	0.36
INTERPRETIVE CENTER AND GIFT SHOPS	3,000 SQUARE FEET	0.060/1000 SF	0.18
NINE WINERIES, TASTING ROOMS, AND SPECIAL EVENTS	8 @ 20,000 TO 40,000 SQUARE FEET EACH, 1 @ 80,000 SQUARE FEET / 42 EVENTS PER YEAR PER FACILITY: SIX EVENTS WITH 1,000 PEOPLE; SIX EVENTS WITH 500 PEOPLE; SIX EVENTS WITH 300 PEOPLE; TEN EVENTS WITH 200 PEOPLE, AND; FOURTEEN EVENTS WITH 100 PEOPLE	0.14/1,000 SF	52
FIVE RANCH/FARM HEADQUARTERS	2.5 ACRES EACH	1.26/LOT	6.3
LIVESTOCK SALES YARD AND CAFÉ	20 ACRES / ONE SATURDAY PER MONTH WITH 80 TO 100 PEOPLE /75 PATRONS	0.013/SEAT	0.975
HORSE RANCH	30 (+) HORSES	0.022/HORSE	0.66
THREE PLACES OF WORSHIP	2,000 TO 5,000 SQUARE FEET EACH	0.14/1,000 SF	2.1
40 YEAR WILLIAMSON ACT PARCELS (VARIOUS AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION USES)	3,600 ACRES	0	0
OAKENSHAW RETREAT CENTER	16 TO 24 UNITS ON 30 ACRES WITH LODGE AND RESIDENCE	0.110/ROOM	2.64
NEIGHBORHOOD PARKLAND AND SWIMMING POOL	5 ACRES EAST OF SANTA MARGARITA COMMUNITY	2 AFY/ACRE	10
DEDICATION OF LAND FOR FUTURE SEWAGE TREATMENT PLANT	LOCATION TO BE DETERMINED: 10 ACRES	0	0
DEDICATION OF LAND FOR EXPANSION OF CEMETERY	5 ACRES	2 AFY/ACRE	10
PUBLIC HIKING / EQUESTRIAN TRAILS	VARIOUS LOCATIONS TO BE DETERMINED UPON FUTURE NONAGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION DEVELOPMENT	0	0

Table 8 – Summary of Adjusted Water Demands (continued)

PROJECT ELEMENT	PROJECT CHARACTERISTICS	WATER USE FACTOR (ACRE-FEET/UNIT)	ANNUAL WATER DEMAND (ACRE-FEET)
FUTURE DEVELOPMENT PROGRAM (CONTINUED)			
		FUTURE DEVELOPMENT PROGRAM TOTAL	1,072.255[1]
		RANCH WATER SUPPLY DEMAND TOTAL	2,815.795[1]

[1] – ASSUMED GOLF COURSE DEVELOPMENT LIMITED TO A 27-HOLE-COURSE

All publicly landscaped areas greater than 0.1 acre should be required to establish low water use landscaping that is equipped with low water use irrigation methods. All Ranch agricultural land uses should be encouraged to operate on an irrigation efficiency that promotes best management practices. A combination of these mitigation measures is anticipated to result in the ability to achieve the reduced water use factors presented in Table 8 - Summary of Adjusted Water Demands which is based on lower water use factors provided in Appendix B when water conservation measures are applied.

Application of these measures is anticipated to reduce the overall water system demand for the Agricultural Residential Cluster Subdivision from an estimated 161.28 afy to approximately 139.94 afy (about 13 percent), and for the Future Development Program from an estimated 1,305 afy to approximately 1,072 afy (about 18 percent). The resulting reduction in consumptive water use for the estimate demand of the Agricultural Residential Cluster Subdivision 12.5 afy (from 96 afy to 83.5 afy) and of the Future Development Program is about 150 afy (from 830 afy to 680 afy).

Water Supply Importation

This study reviewed the feasibility of using alternative sources of water including the State Water Project (SWP) and Nacimiento Water Project (NWP) water supplies. These 2 water sources were included by the project applicant as alternatives to the use of existing wells or the installation of additional wells on the Ranch.

Nacimiento Water Project

The NWP objectives include providing a reliable supplemental source of water for a variety of uses within San Luis Obispo County by supplementing local groundwater and surface water supplies with a new surface water source. The objectives also include increasing the reliability of water deliveries, to improve water quality, and to lessen the extent of future

groundwater pumping to existing residents. By providing these benefits the NWP allows for better management of the available water resources throughout the County. During development of the NWP the water need identified for the Ranch was 200 afy (MRS, 2003). This need was based on development plans that included residential, recreational, and Agricultural Residential Cluster Subdivision water demands. The stated purpose was to provide reliable good quality water for potable needs throughout the Ranch. This supply would be reliable and satisfy a portion of project demands while potentially supplementing irrigation and residential effluent return flows which contribute to groundwater recharge.

The timing of water availability from the NWP source is uncertain. It may not be available at the anticipated time of Agricultural Residential Cluster Subdivision Phase 1 implementation (2007-2008). If the water supply from the NWP is available at the time of project implementation the water supply impacts to groundwater would be less than significant because the amount of supply available from this source exceeds the demand of the Agricultural Residential Cluster Subdivision project. However, due to the uncertainty regarding the timing and availability of this source of imported water, additional water supply cannot be assured. In addition, the NWP water is a "raw" water (untreated surface water) source that would require treatment prior to distribution for potable uses. Alternatively, the Ranch may consider using the supply for groundwater recharge or providing NWP water for Ranch irrigation uses in exchange for a groundwater supply that may satisfy significantly lower treatment standards.

State Water Project

The community of Santa Margarita has been projected to require a supply of up to 300 afy at build-out (MRS, 2003). The reliable annual supply of groundwater produced by CSA 23 has been estimated in the range of 185 to 210 afy. At the present time CSA 23 has an entitlement of SWP water of 100 afy, however, it is not certain if this source of water could be used by the Ranch as an off-site supply. Cooperative use of this imported supply is being explored to determine if this alternative is possible. An agreement would be necessary and would require that CSA 23 have full use of the supply when groundwater resources from its wells are insufficient. The remaining unused supply during wet years could possibly be used by the Ranch to offset groundwater sources and allow basin recovery to occur.

Alternatively we understand that San Luis Obispo County Service Area No. 16 in Shandon may be seeking to sell its SWP allocation which could theoretically provide a source of water to the Ranch for future uses. While this source of SWP supply is not certain, the SWP water is treated to potable standards and would allow flows to be conveyed directly to the proposed project distribution system on the Ranch.

Recycled Water Use

The proposed project does not include the collection and treatment of domestic waste water. The proposed septic treatment and leach field disposal does not provide a concentrated

source for direct reuse. However, a component of percolation from the leach fields will provide direct recharge to groundwater which is a positive water supply impact. Should the Future Development Program require installation of a municipally operated sanitary sewer and treatment plant, reuse of the treated effluent could supply irrigation demands (i.e., golf course irrigation) and offset the use of potable supplies.

Project Phase Development Conditions and Limitations

The proposed Agricultural Residential Cluster Subdivision will be constructed in phases. The proposed project and the envisioned Future Development Program may be conditioned in a manner that allows review of data and implementation of mitigation measures at the time impacts occur. Mitigation would be prior to initiation of the next development phase or program component. Additionally, future phased development could include installation of one program component that provides a water supply for the next land use component (i.e., effluent treatment plant installed during residential phases to provide water for subsequent golf course development, or NWP water connection installed during initial phase so water is available for subsequent residential development without creating groundwater overdraft). If NWP water is available for the Agricultural Residential Cluster Subdivision, this level of monitoring will not be necessary until implementation of the Future Development Program.

Mitigation during phased development could require downsizing of proposed program components (i.e., 18-hole versus 27-hole golf course or less residential development and more open space). A limitation on the pace or timing of development could be incorporated to allow a project review process that could keep pace with the data collected from the impact monitoring programs. The timing could allow for a water supply impacts assessment that would limit the intensity of future development based on the remaining available water supply. If NWP water is available for the Agricultural Residential Cluster Subdivision, this level of monitoring will not be necessary until implementation of the Future Development Program.

Retention/Recharge Basins

During typical residential developments impermeable surfaces are constructed that typically channel rainfall runoff and prevent natural infiltration. Often storm water runoff requirements will include the installation of retention basins for purposes of removing sediment and providing natural treatment of runoff from developed surfaces prior to allowing it into the natural stream channels. Should any portion of the proposed development phases include the requirement for retention basins, mitigation of reduced groundwater recharge from induced runoff should include basins that are located and designed to promote percolation and recharge of groundwater.

CLOSURE

This report has been prepared for the exclusive use of the County of San Luis Obispo and its agents for specific application to the Santa Margarita Ranch proposed Agricultural Residential Cluster Subdivision and the Future Development Program water supply study. The findings, conclusions, and recommendations presented herein were prepared in accordance with generally accepted hydrogeological engineering and planning practices. No other warranty, express or implied, is made.

□

REFERENCES

Brennan, W. J. (2005), *2005 Urban Water Management Plan,* Prepared for Central Coast Water Authority, Dated December.

California Department of Water Resources (DWR, 2003), *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001,* Dated October.

California Department of Water Resources (DWR, 1991), *Final Environmental Impact Report, State Water Project Coastal Branch, Phase II, Volumes One and Two,* Dated May.

California Department of Water Resources (DWR, 1958), *San Luis Obispo County Investigation, Bulletin No. 18, Volume I: Text and Plates, Volume II Appendices., State Water Project,* Dated May.

California Division of Mines and Geology (CDMG, 1976), *Basic Geology of the Santa Margarita Area, San Luis Obispo County, California, Bulletin 199*, prepared by Earl W. Hart.

Cleath & Associates (Cleath, 2004), *Ground Water Supply Impacts Study, Agricultural Residential Cluster Subdivision Cluster Development, Tentative Tract Map 2586 at Santa Margarita Ranch*, Dated January.

Cleath & Associates (Cleath, 2000), *Ground Water Supply Impacts Study, Santa Margarita Farms at Santa Margarita Ranch*, Dated November.

Dibblee, Jr., T.W. (1976), *The Rinconada and Related Faults in the Southern Coast Ranges, California, and Their Tectonic Significance*, U.S. Geological Survey Professional Paper 981.

Dibblee, Jr., T.W. (2004), *Geologic Map of the Atascadero Quadrangle*, Map No. DF-132.

Dibblee, Jr., T.W. (2004), *Geologic Map of the Lopez Mountain Quadrangle*, Map No. DF-130.

Dibblee, Jr., T.W. (2004), *Geologic Map of the San Luis Obispo Quadrangle*, Map No. DF-129.

Dibblee, Jr., T.W. (2004), *Geologic Map of the Santa Margarita Quadrangle*, Map No. DF-133.

Envicom Corporation (1994), *Santa Margarita Ranch Environmental Constraints Analysis*, Dated March.

Fugro West, Inc. et al (2005), *Final Report, Paso Robles Groundwater Basin Study Phase II, Numerical Model Development, Calibration and Application*, Prepared for County of San Luis Obispo, Dated August.

Fugro West, Inc. (2002), *Final Report, Paso Robles Groundwater Basin Study*, Prepared for County of San Luis Obispo, Dated February.

Fugro-McClelland (West) Inc. (1993), *Final Program Environmental Impact Report for the Draft Salinas River Area Plan*, Prepared for County of San Luis Obispo, Office of the Environmental Coordinator, Dated June.

Johnson, A.I. (1967), *Specific Yield – Compilation of Specific Yields for Various Materials,* U.S. Geological Survey Water-Supply Paper 1662-D.

Marine Research Specialists (MRS, 2003), *Nacimiento Water Project Environmental Impact Report,* Prepared for San Luis County Department of Planning and Building, Dated December.

Rick Hoffman and Associates (RHA, 2006), *Water Well & Hydrologic Data, Santa Margarita Ranch, Santa Margarita, San Luis Obispo County, California,* Dated May 10.

San Luis Obispo County Engineering Department (County, 1976), *Hydrologic & Climatological Data, Seasons of 1972-73 & 1973-74*, Dated December.

San Luis Obispo County Flood Control and Water Conservation District (County WCD, 2005), *San Luis Obispo County Integrated Regional Water Management Plan*, Dated December.

San Luis Obispo County Public Works Department (SLO County, 2005), *Hydrologic Report, Water Years 2001-02 and 2002-03*, Dated May 16.

San Luis Obispo County Public Works Department (SLO County, 2004 a), Santa Margarita Water Supply, Presentation for Community Meeting, Dated March.

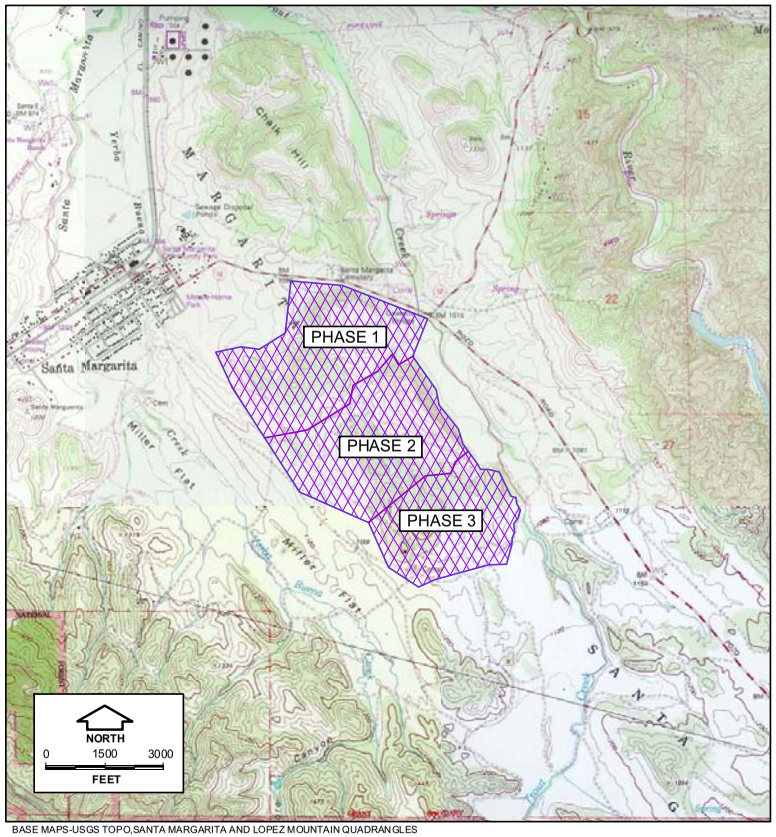
San Luis Obispo County Public Works Department (SLO County, 2004 b), *Water System Master Plan 2003, County Service Area 23 Santa Margarita, California*, Dated January 29.

San Luis Obispo County (SLO County, 2003), *Salinas River Area Plan,* adopted by the San Luis Obispo County Board of Supervisors September 22, 1980 – Resolution 80-350, updated January 2 1996 – Resolution 96-24, revised Dated January 1.

Todd Engineers (2004), *Groundwater Resources of CSA 23 - Santa Margarita Technical Memorandum*, Dated October 27.

Vaughan Surveys, Inc. (2000), *Map of Stock Ponds, Vineyard Irrigation System & Selected Wetlands on the Santa Margarita Ranch, County of San Luis Obispo*, Prepared for the California State Water Resources Control Board, Last Revised 5/28/01, Dated December 28.

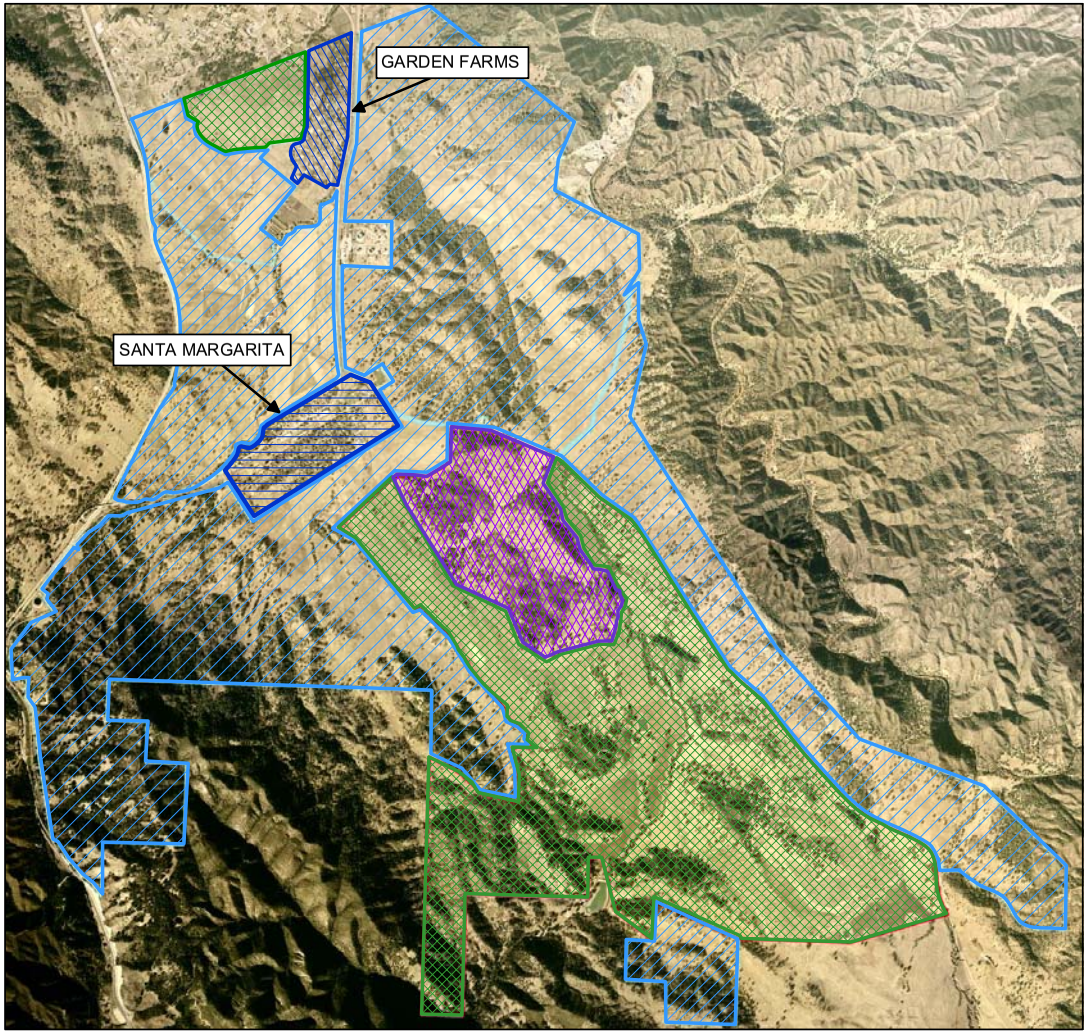
PLATES



BASE MAPS-USGS TOPO,SANTA MARGARITA AND LOPEZ MOUNTAIN QUADRANGLES

RESIDENTIAL SUBDIVISION LOCATION MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita,California

PLATE 1



LEGEND

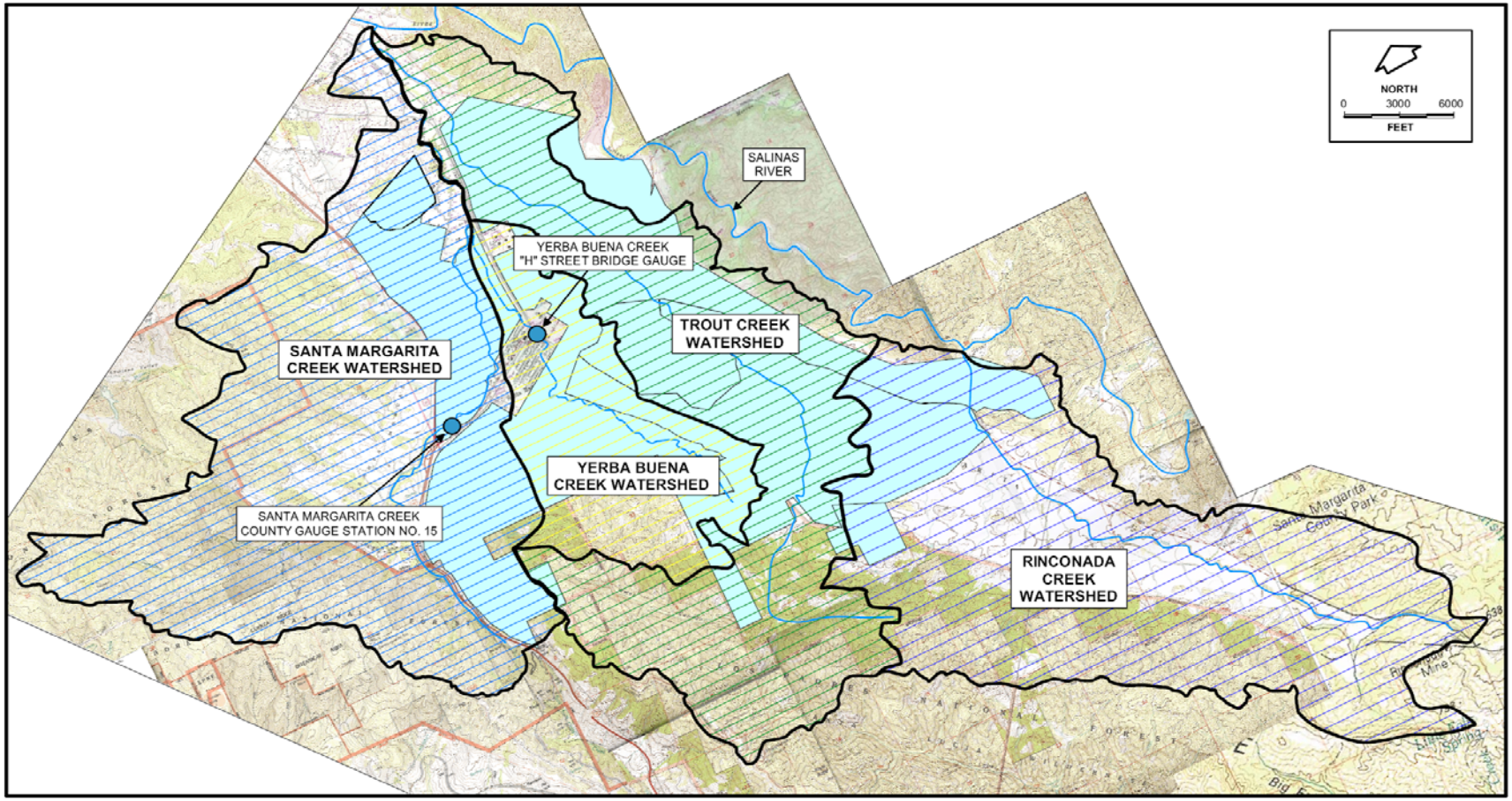
EXISTING LAND USES

PROPOSED AGRICULTURAL RESIDENTIAL CLUSTER

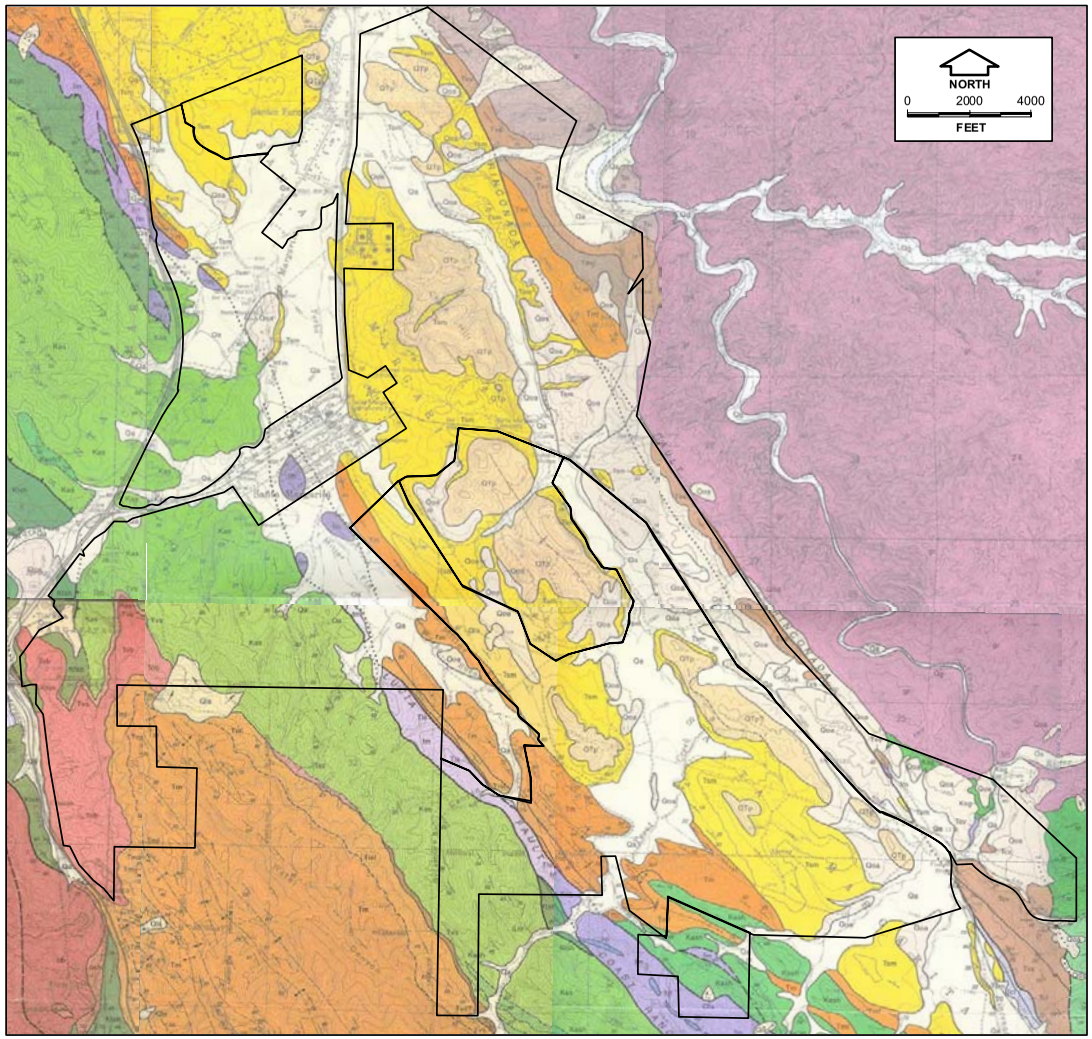
PROPOSED FUTURE DEVELOPMENT PROGRAM

NORTH
0 2000 4000
FEET

WATER SUPPLY STUDY
PROJECT COMPONENTS MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



WATERSHED LOCATION MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



QUATERNARY
- HOLOCENE
- PLEISTOCENE

TERTIARY
- MIOCENE
- OLIGOCENE

JURASIC AND CRETACEOUS
- CRETACEOUS

Qa / Qg	**SURFICIAL SEDIMENTS -** **Qa** - valley and floodplain deposits of silt, sand and gravel; **Qg** - stream channel deposits of gravel, sand and silt
Qoa	**OLDER ALLUVIUM**
Qls	**LANDSLIDE DEBRIS**
QTp	**PASO ROBLES FORMATION -** white siliceous shale from Monterey Formation in a matrix of sand and clay
Tvs	**VAQUEROS FORMATION -** light brown sandstone
Tsm	**SANTA MARGARITA SANDSTONE-** white, massive, arkosic, semi-friable, locally calcareous
Tm / Tml / Tmc	**MONTEREY SHALE - Tm -** upper shale unit, brown, weathers white, thin, platy, porcellaneous; **Tml -** lower shale unit, siliceous, fissile shale and dolomite layers; **Tmc -** Rincon Formation (?) claystone, gray, soft, crumbly
Tsi	**SIMMLER (?) FORMATION -** gray, conglomerate breccia of unsorted granitic detritus
Kas	**ATASCADERO FORMATON -** hard, tan arkosic sandstone minor micaceous clay shale
gr	**GRANITIC BASEMENT ROCKS -** granitic rocks, massive, medium-grained, somewhat incoherent where weathered
Ktsh	**TORO FORMATION -** dark gray micaceous clay shale
fm	**FRANCISCAN ASSEMBLAGE -** melange of dark claystone, greywacke-sandstone and other Franciscan rocks

(Geology by THOMAS W. DIBBLEE, 2004 GEOLOGIC MAP OF THE SANTA MARGARITA, LOPEZ MOUNTAIN, SAN LUIS OBISPO AND ATASCADERO QUADRANGLES)

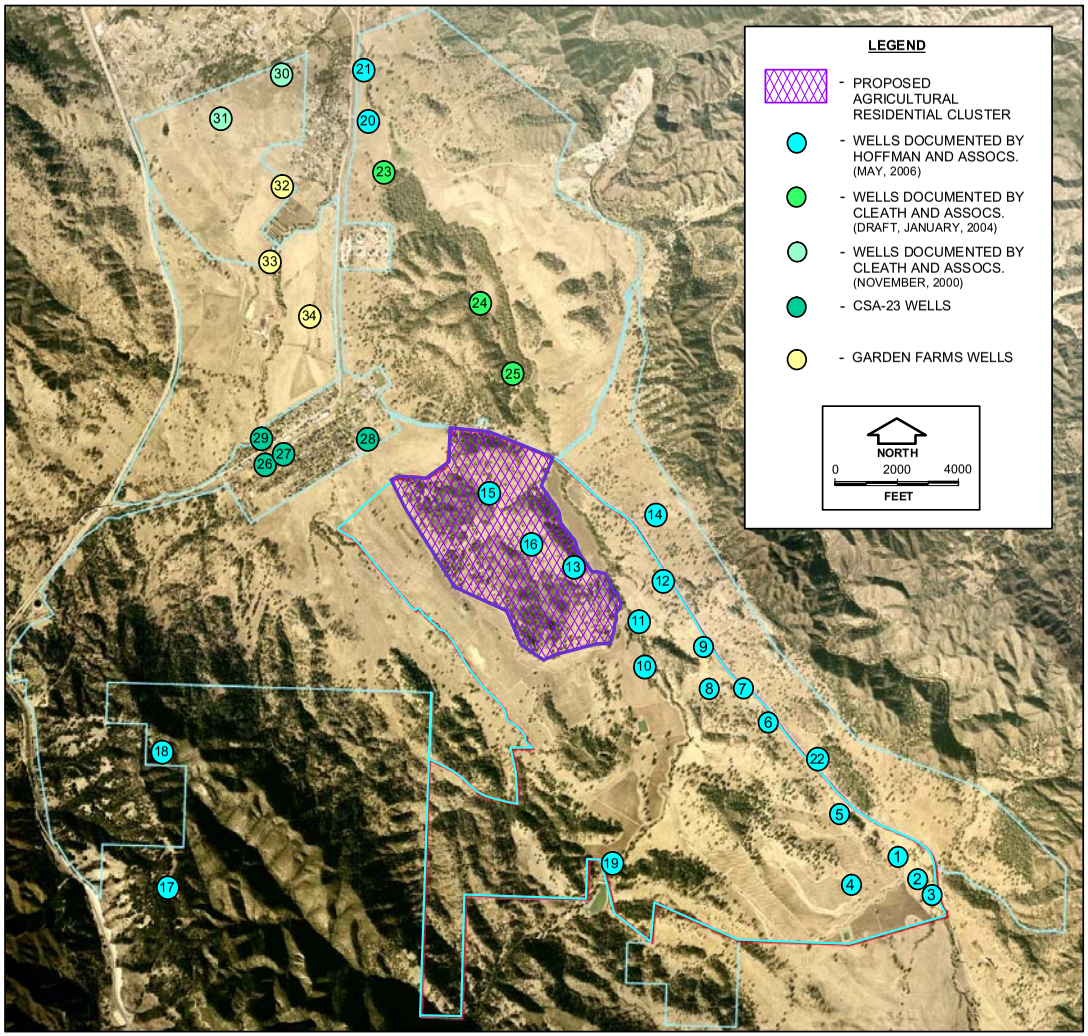
SYMBOLS

- Formation contact - dashed where inferred or indefinite
- Anticline - arrow on axis indicates direction of plunge
- Syncline - arrow on axis indicates direction of plunge
- Fault - dashed where indefinite or inferred, dotted where concealed

Strike and dip of stratified rocks:
- 45 — inclined (approximate)
- 26
- 49 — overturned bedding
- vertical bedding

DIBBLEE GEOLOGICAL MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE 4

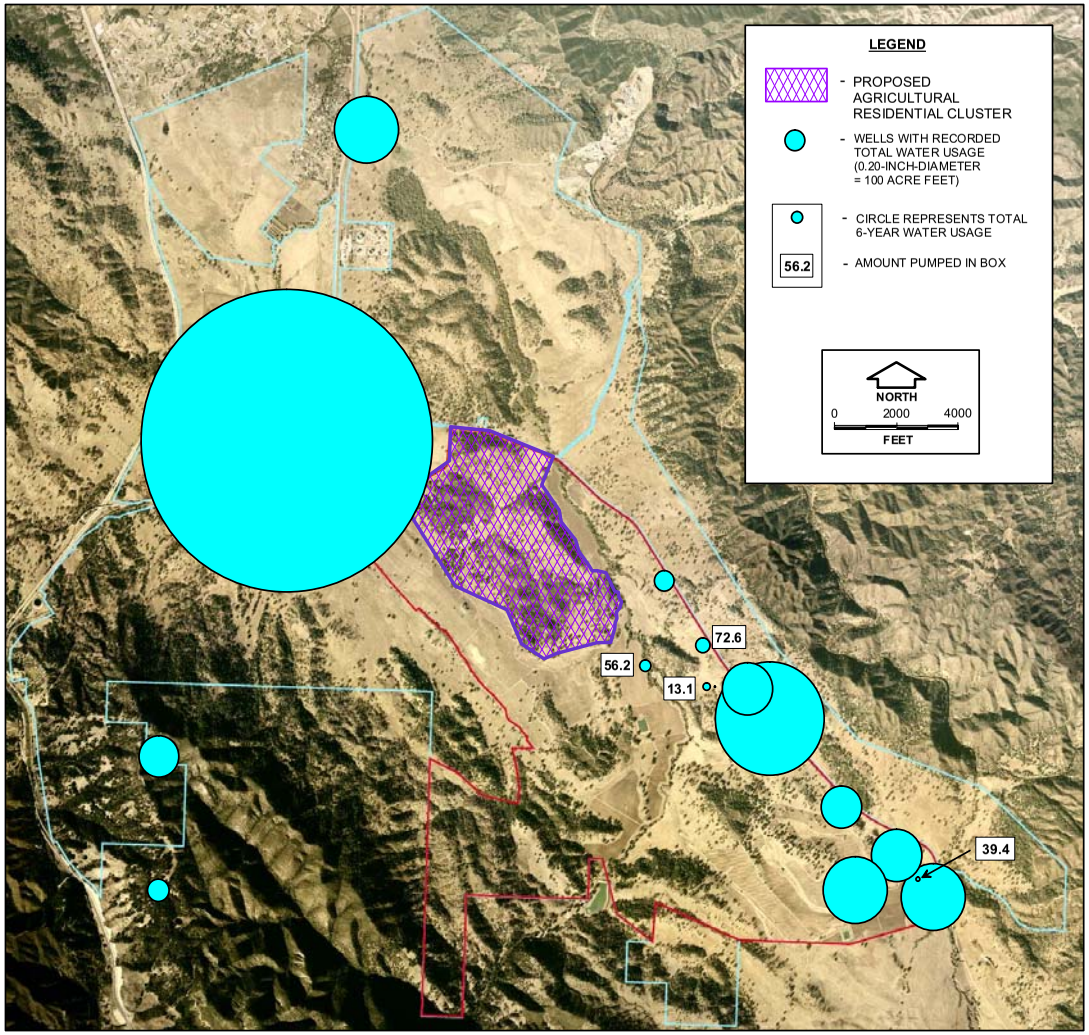


MAP DESIGNATION NUMBER	STATE WELL NUMBER	WELL NAME	REPORTED PRODUCTION RATE (GPM)	ALTERNATE WELL DESIGNATION
1	29S/13E-35R	CUESTA F&T WELL NO. 1	200	---
2	30S/13E-01D	CUESTA WELL "F"	500	---
3	30S/13E-01E	CUESTA WELL "E"	200	30S/13E-01D1
4	30S/13E-02B	CUESTA WELL "SR-2A"	200	
5	29S/13E-35L	CUESTA WELL "Q"	500	29S/13E-35K
6	29S/13E-35D01	CUESTA WELL "P"	800	---
7	29S/13E-27R	CUESTA WELL "H1"	250	---
8	29S/13E-27Q	CUESTA MH WELL 27 R	50	29S/13E-27R1
9	29S/13E-27K	CUESTA WELL "K"	180	---
10	29S/13E-27P	CUESTA WELL "J"	300	---
11	29S/13E-27L	CUESTA WELL "L-4"	30	29S/13E-27K
12	29S/13E-27F	CUESTA WELL "L"	180	---
13	29S/13E-28H	CUESTA WELL "G"	30	---
14	29S/13E-22P	CUESTA WELL "R"	300	---
15	29S/13E-21P	CUESTA F&T WELL NO. 2	80	29S/13E-21Q
16	NA	PARCEL E WELL NO. 2	30	---
17	30S/13E-06F02	MOUNTAIN WELL NO. 1	300	---
18	29S/13E-031F	MOUNTAIN WELL NO. 2	300	---
19	30S/13E-03D	TROUT CREEK WELL NO. 1	950	---
20	29S/13E-08K	CHINA GARDENS WELL NO. 1	135	---
21	30S/13E-08C	CHINA GARDENS WELL NO. 2	250	---
22	29S/13E-35F	HERTEL AGRICULTURAL	700	---
23	29S/13E-08Q	---	80	---
24	29S/13E-16L	---	50	---
25	29S/13E-16Q	---	150	---
26	29S/13E-19H02	CSA23-WELL NO. 1	265	---
27	29S/13E-19H03	CSA23-WELL NO. 2	265	---
28	29S/13E-20G1	CSA23-WELL NO. 3		
29	29S/13E-19H04	CSA23-WELL NO. 4	500	---
30	29S/13E-07A	NORTE NO. 1	15	---
31	29S/13E-07K	NORTE NO. 2	35	---
32	29S/13E-08N	GARDEN FARMS WELL NO. 1	---	---
33	29S/13E-18H	GARDEN FARMS WELL NO. 2	---	---
34	29S/13E-17M2	GARDEN FARMS WELL NO. 3	---	---

CSA23 - COUNTY SERVICE AREA NO. 23

WELL LOCATION MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

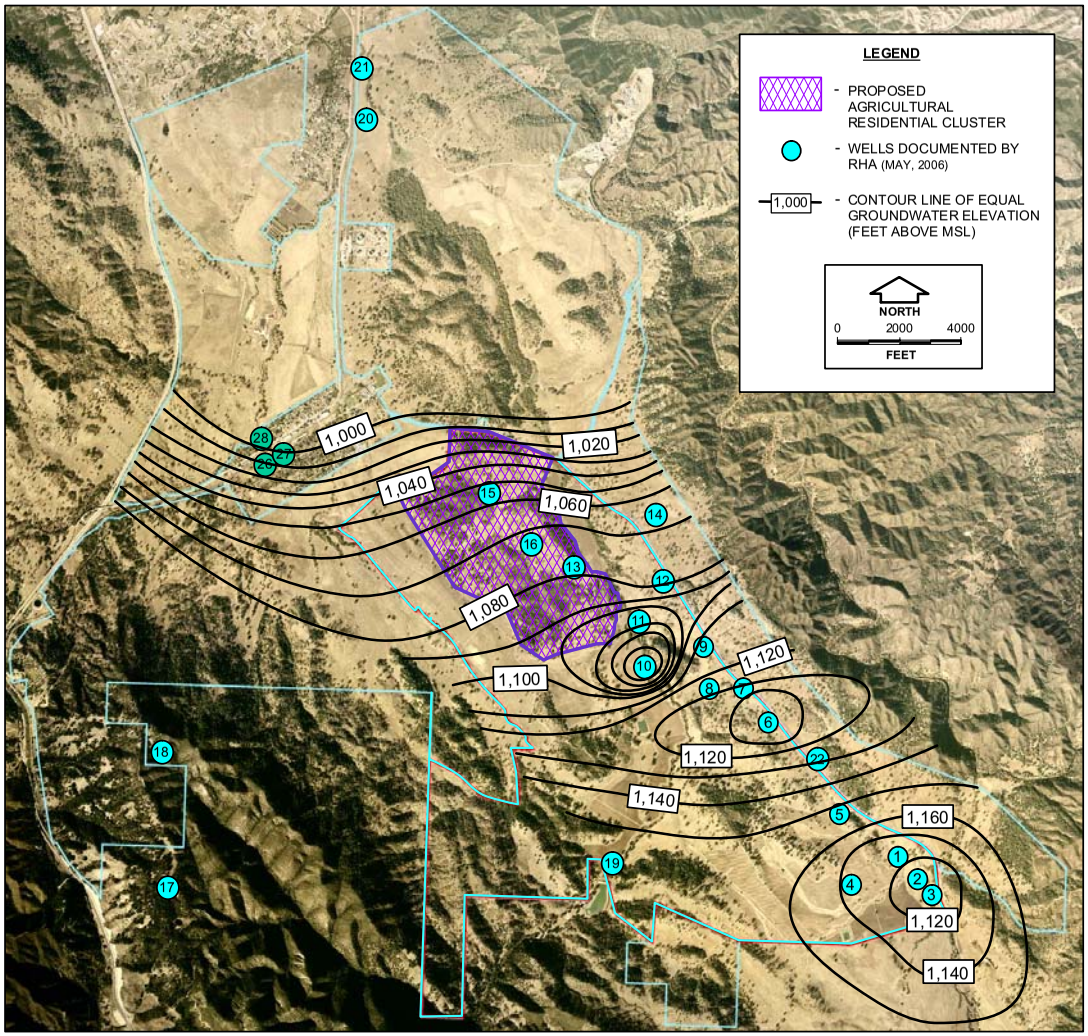
PLATE 5



RANCH WELL MAP DESIGNATION NUMBER[1]	6-YEAR WATER PRODUCTION TOTAL 2000 to 2006 (AF)
1	191
2	39.4
3	251.5
4	262.1
5	149.8
6	477.2
7	212.4
8	13.1
9	72.6
10	56.2
11	NA
12	98.5
13	NA
14	NA
15	NA
16	NA
17	79.1
18	164.8
19	NA
20	NA
21	NA
22	NA

[1] - NUMBER FROM (RHA,2006)

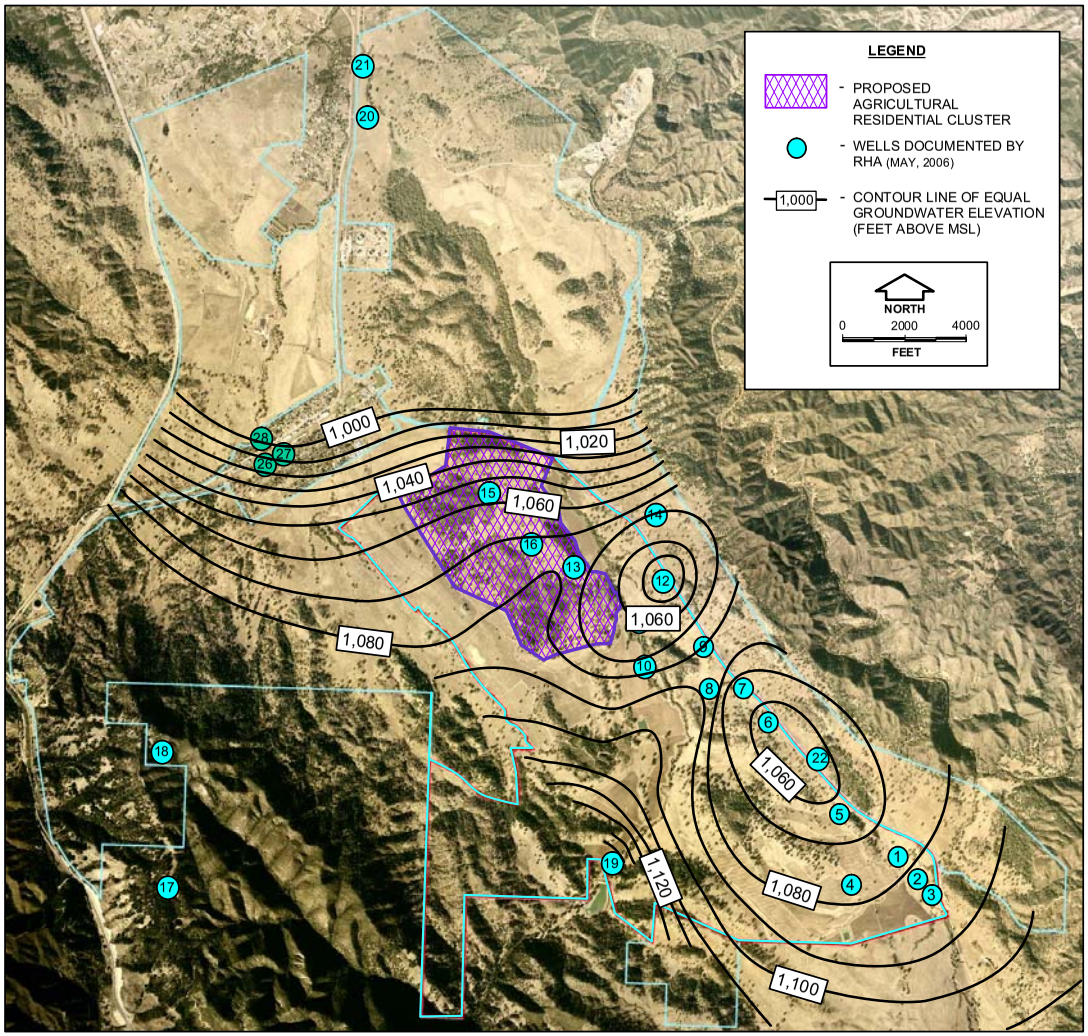
WATER WELL PRODUCTION MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



RANCH WELL MAP DESIGNATION NUMBER[1]	SURFACE ELEVATION (MSL)	DATE OF MEASUREMENT	WATER LEVEL ELEVATIONS (MSL)
1	1,140	5/8/2000	1,127.1
2	1,128	4/21/2000	1,115.7
3	1,122	4/21/2000	1,108.2
4	1,160	4/21/2000	1,129.7
5	1,200	10/9/2000	1,150.0
6	1,160	10/3/2000	1,109.3
7	1,126	6/19/2000	1,122.2
8	1,115	9/27/2000	1,109.2
9	1,115	7/26/2000	1,115.0
10	1,085	6/20/2000	1,048.2
11	1,085	6/5/2000	1,073.0
12	1,084	7/31/2000	1,074.1
13	1,080	5/8/2000	1,078.6
14	1,106	10/24/2000	1,066.0
15	1,075	4/21/2000	1,066.2
16	1,150	NA	NA
17	2,160	1/29/2001	2,040.0
18	2,040	1/29/2001	1,985.0
19	1,180	9/27/2000	1,155.2
20	950	7/1/2000	906.0
21	930	7/11/2000	915.0
22	1,160	NA	NA

[1] - NUMBER FROM (RHA,2006)

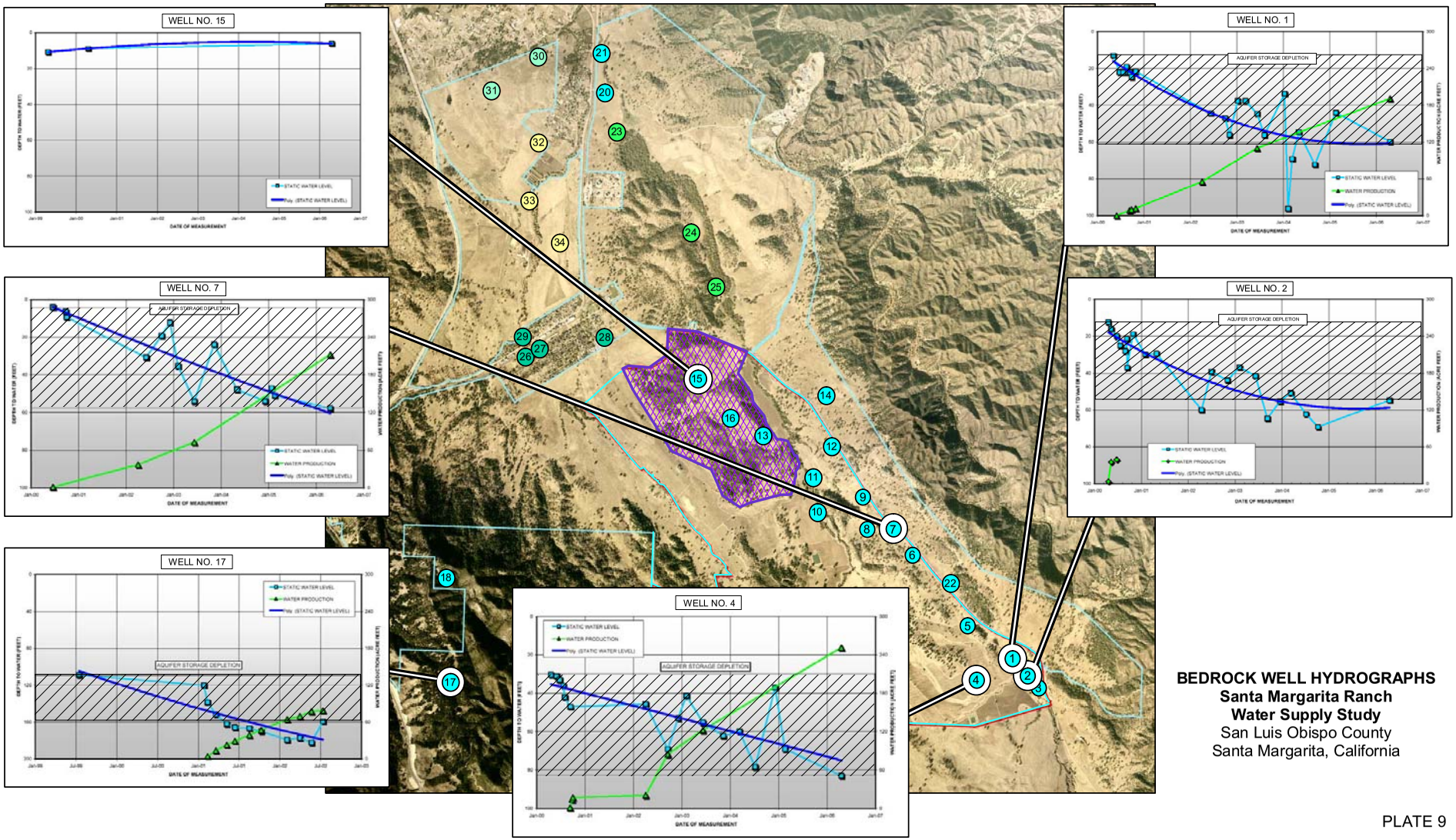
2000 GROUNDWATER ELEVATION CONTOUR MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



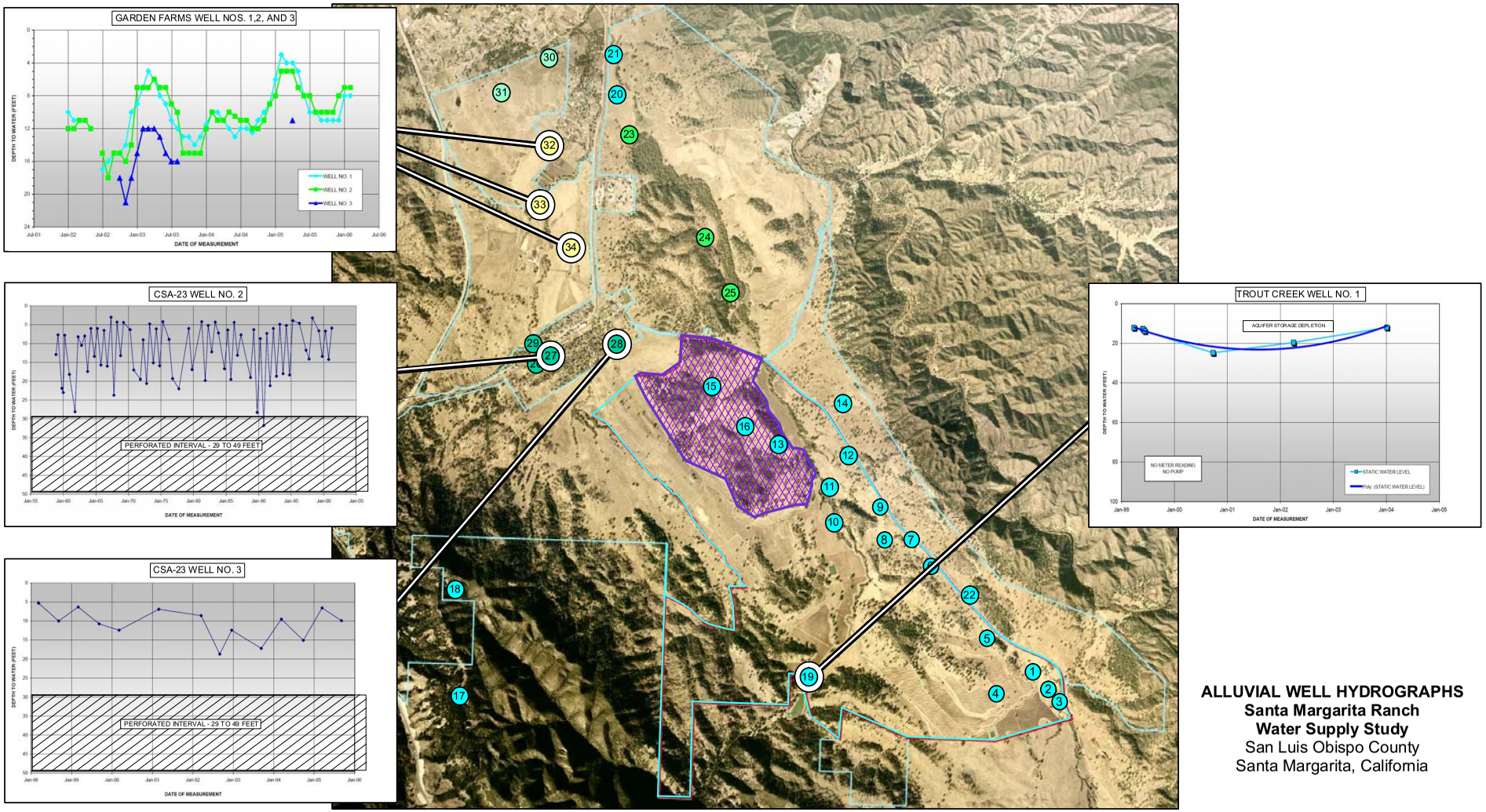
RANCH WELL MAP DESIGNATION NUMBER[1]	SURFACE ELEVATION (MSL)	DATE OF MEASUREMENT	WATER LEVEL ELEVATIONS (MSL)
1	1,140	4/20/2006	1,080.3
2	1,128	4/20/2006	1,073.3
3	1,122	4/20/2006	1,083.5
4	1,160	4/21/2006	1,077.1
5	1,200	4/20/2006	NA
6	1,160	4/20/2006	NA
7	1,126	4/20/2006	1,068.3
8	1,115	4/20/2006	1,084.7
9	1,115	4/20/2006	1,087.5
10	1,085	NA	NA
11	1,085	NA	NA
12	1,084	4/20/2006	1,048.8
13	1,080	4/20/2006	1,080.0
14	1,106	4/21/2006	1,070.0
15	1,075	4/20/2006	1,069.0
16	1,150	4/20/2006	1,092.0
17	2,160	NA	NA
18	2,040	NA	NA
19	1,180	4/20/2006	1,146.8
20	950	4/21/2006	936.2
21	930	4/21/2006	920.9
22	1,160	4/21/2006	1,062.4

[1] - NUMBER FROM (RHA,2006)

2006 GROUNDWATER ELEVATION CONTOUR MAP
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



BEDROCK WELL HYDROGRAPHS
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



ALLUVIAL WELL HYDROGRAPHS
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

GLOSSARY OF HYDROGEOLOGICAL TERMS

GLOSSARY OF HYDROGEOLOGICAL TERMS

Acre: A unit of measurement for area, 1 acre is equivalent to an area of 43,560 square feet

Acre-Foot: The volume of water that would cover 1 acre of land a depth of 1 foot. This volume is equivalent to 325,851 gallons. One acre-foot is typically enough water to supply a family of four for 1 year.

Adsorption: The assimilation of gas, vapor, or dissolved matter by the surface of a solid.

Advection: The process by which solutes are transported by the movement of groundwater.

Alkaline: Any of various soluble mineral salts found in natural water and arid soils that elevate the pH to greater than 7. In water analysis, alkalinity represents the carbonates, bicarbonates, hydroxides, and occasionally the borates, silicates, and phosphates concentrations in the water.

Alluvial: Deposition of sediment by a stream, river, or running water.

Alluvial Fan: An outspread gently sloping mass of alluvium deposited where a mountain stream flows from canyon onto a valley floor.

Alluviation: The deposition of alluvium along a stream or river channel.

Alluvium: A general term for sedimentary deposits ranging from clay to boulder sized material that are unconsolidated and emplaced during comparatively recent geologic time by a stream or other body of running water.

Anion: A negatively charged ion.

Anisotropic: Having some physical property that varies with direction.

Aquiclude: A geologic formation through which virtually no water moves.

Aquifer: A formation, group of stratigraphic layers, or fractured bedrock system that contains transmits, and yields a sufficient quantity of water to wells and springs for economical use by humans.

Aquifer Test: A test involving the extraction of measured quantities of water from or injection into a well and the measurement of the resulting changes in head in the aquifer at varying times and/or distances from the point of discharge or injection.

Aquitard: A saturated, but poorly permeable bed, formation, or group of formations that does not yield water freely to a well or spring. However, an aquitard may transmit appreciable water to or from adjacent aquifers.

Artesian Well: A well deriving its water from a confined aquifer in which the water level stands above the ground surface, synonymous with flowing artesian well.

Artificial Recharge: Recharge at a rate greater than natural, resulting from deliberate actions of man.

Bedrock: A general term for the rock, usually solid, that underlies soil or other unconsolidated material.

Bentonite: Colloidal clay largely made up of the mineral sodium montmorillonite, a hydrated aluminum silicate.

Biodegradation: The process of decomposition caused by micro-organisms

Caliche: A zone of calcium carbonate or other carbonates in soils of semi-arid regions; often referred to as hardpan.

Capillary Fringe: The zone at the bottom of the vadose zone where groundwater is drawn upward by capillary force.

Carbonate: A sediment or deposit formed by the organic or inorganic precipitation from aqueous solution of carbonates of calcium, magnesium, or iron.

Cation: An ion having a positive charge.

Cation Exchange: Ion exchange process in which cations in solution are exchanged for other cations from an ion exchanger.

cfs (cubic feet per second): A measured rate of flow, equivalent to 448.8 gallons per minute.

Chert: A hard, dense microcrystalline sedimentary rock composed predominantly of silica.

Coefficient of Permeability: An obsolete term that has been replaced by the term hydraulic conductivity and represents the rate of flow of water through a cross-section of aquifer under a hydraulic gradient

Clasts: Grains or fragments of sedimentary rock.

Coefficient of Storage: The volume of water an aquifer releases from or takes into storage per unit surface area of the aquifer per unit change in head.

Cone of Depression: A depression in the groundwater table or potentiometric surface that has the shape of an inverted cone and develops around a well or point of extraction from an aquifer and defines the area of influence of a well.

Confined Aquifer: A formation in which the groundwater is isolated from the atmosphere by an impermeable geologic formation or confining layer and the potentiometric surface lies above the confining layer.

Connate: Water trapped in the void spaces of sedimentary deposits at the time the formation was deposited.

Contamination: The degradation of natural water quality from the result of man's activities. There is no implication of a specific limit, since the degree of permissible contamination is relative to the impairment of the historically beneficial uses of the water body or supply.

Contour: A line on a map that connects points of equal value.

CSMT: Controlled-source audiomagnetotellurics.

Darcy's Law: An equation for fluid flow derived on the assumptions that the flow is laminar and that inertia can be neglected.

Deep Percolation: The penetration of moisture below the depths from which it may be used by plants; it represent that part of absorbed water that exceeds the field capacity of the soil within the depth of root development. Deep percolation is water which moves downward from ground surface to the water table.

Deposition: The laying-down of rock-forming material, the mechanical settling of sediments from suspension in air or water.

Desalination: To remove salts and other constituents from water.

Drainage Basin: A region of land whose drainage converges to a single stream or water body.

Drawdown: The distance between the static water level and the dynamic water level defined by the surface of the cone of depression in an aquifer or the water surface in a well.

Drilling Fluid: A water-based fluid used in the water well drilling process to remove cuttings from the hole, clean and cool the drill bit, reduce friction between the drill string and the sides of the hole, and seal the borehole to prevent water loss and formation damage.

Effluent: A liquid waste from human activities that is discharged into the environment in its natural state or either partially or completely treated.

Electrical Conductance: A measure of the ease with which a conducting current flows through a material under the influence of an applied electric field. It is the reciprocal of electrical resistivity and is typically measured in mhos per centimeter.

Electrical Resistivity: The property of a material which resists the flow of electrical current and is typically measured in the unit of ohms.

Equipotential Line: A contour line on the water table or potentiometric surface that connects points of equal pressure head of groundwater in an aquifer. Fluid flow is normal to these lines and travels away from areas of high head and in the direction of decreasing fluid potential.

Estuarine: Pertaining to/or formed in an estuary.

Estuary: A partially enclosed coastal body of water where the ocean tide meets the current of a fresh water stream.

Evapotranspiration: Loss of water from a land area through transpiration of plants and evaporation of water from the land or water body surface.

Fault: A large fracture or a zone of fractures through large land masses and along which there has been displacement of the opposing sides.

Field Capacity: The maximum amount of capillary water that can be held in a freely drained soil zone, measured as the ratio of weight of water retained by the soil to the weight of the dry soil.

Floodplain: The portion of a river valley adjacent to a river channel that becomes inundated with water when the river overflows its banks. It is comprised largely of fine grained alluvium carried by the river during floods and deposited in the sluggish water beyond the influence of the swiftest currents.

Fluvial: Pertaining to/or produced by the action of a stream or river.

Forebay: An area of unconfinement where water may percolate through the underlying soils to recharge groundwater supplies in a confined aquifer.

Geophysical Exploration: The use of electric, magnetic, seismic, radiological, or thermal detection techniques to gather information.

Ground Truth: A reference or point of known value defined for correlation to values collected by a geophysical study.

Groundwater Table: The surface that defines the boundary between the zone of saturation and the zone of aeration in an unconfined aquifer.

Hardness: A property of water with elevated concentrations of calcium and magnesium ions that causes formation of an insoluble residue when the water is used with soap.

Hardpan: A hard mineralized zone in a soil profile that generally forms beneath the root zone; also referred to as caliche.

Head: Energy or relative pressure contained in a water mass that is produced by a difference in elevation.

Hydraulic Conductivity: Permeability coefficient; the rate of flow of water in gallons per day through a cross-section of 1 square foot under a unit hydraulic gradient.

Hydraulic Gradient: The slope of the groundwater surface or potentiometric surface expressed in elevation change over distance.

Hydrodynamic Dispersion: The process by which groundwater containing a solute is diluted with uncontaminated groundwater as it migrates through an aquifer.

Hydrogeologic: The factors that pertain to subsurface waters and related geologic aspects of surface waters.

Hydrostratigraphic: Grouping of rock, sediment, or soil based on the capacity to transmit water.

Hyporheic Zone: The zone of exchange where stream water is influenced by groundwater or groundwater is influenced by stream water.

Igneous Rocks: Rocks that solidified during cooling of molten or partly molten earth materials known as magma.

Interference: The influence of one water well on another while pumping from the same aquifer.

Inundation: Covered with water, as with a flood or rising sea level.

Ion: An electrically charged atom or group of atoms.

Isochlor: Line connecting points of equal concentration of chloride ions.

Isotropic: A medium whose properties are the same in all directions.

Lithic: Pertaining to/or made of stone.

Lithology: A description of the physical character of rocks, such as color, grain size, and mineral composition.

Maximum Contaminant Level (MCL): The threshold concentration for contaminants in drinking water as determined by the California State Department of Health Services, concentrations of constituents above the MCL present a risk to the health of humans when continually used for drinking water or culinary (domestic) purposes.

MBAS: Methylene Blue Active Substances.

MCL: Maximum Contaminant Level.

MGD: Million gallons per day.

mg/l: Milligrams per liter

MSL: Mean sea level; the average height of the sea between high and low tides.

Naturally Developed Well: A well in which the screen is placed in direct contact with the aquifer materials without the use of a select sand or gravel filter pack.

Nitrate: An ion in water composed of one nitrogen atom and three oxygen atoms. Nitrate is a primary standard for drinking water, at 10 mg/l (reported as Nitrogen-N; 45 mg/l (reported as Nitrate-NO_3).

Observation Well: A well drilled in a selected location for the purpose of observing water level or water quality changes.

Overbank Deposit: Fine-grained silt or clay deposit left on a flood plain by flood waters.

Oxidation: The combining of an element with oxygen; also a chemical reaction in which a compound loses electrons.

Perched Water: Unconfined groundwater separated from an underlying main body of groundwater by an aquitard or aquiclude and an unsaturated zone.

Percolate: The act of water seeping or filtering into the soil.

Permeability: The property or capacity of a porous rock, sediment, or soil for transmitting a fluid; it is a measure of the relative ease of fluid flow under unequal pressure.

pH: A measure of the acidity or alkalinity of a solution, numerically equal to 7 for neutral solutions, increasing with increasing alkalinity and decreasing with increasing acidity. pH originally stood for the words "potential of hydrogen".

Porosity: The percentage of the bulk volume of a rock or soil that is occupied by interstitial spaces, whether isolated or connected.

Porcelaneous Chert: Hard, opaque chert having a smooth surface and china-white appearance.

Pumping Test: A test that produces groundwater from a well and is conducted to determine aquifer or well characteristics.

Quaternary: A period of geologic time that began 2- to 3-million years ago and extends to the present.

Radius of Influence: The radial distance from the center of a groundwater extraction facility to the point where there is no lowering of the water table or potentiometric surface (the edge of its cone of depression).

Recharge: The addition of water to the zone of saturation (verb); also, the amount of water added (noun).

Residual Drawdown: The difference between the original static water level and the depth to water at a given instant during the post pumping test recovery period.

RWQCB: Regional Water Quality Control Board.

Sandstone: A sedimentary rock composed of abundant (>50%) rounded or angular fragments of sand and more or less firmly consolidated and often united by a cementing material

Seawater Intrusion: Displacement of fresh water in an aquifer by the advancement of salt water from the ocean.

Sedimentary Rock: Any layered rock resulting from the consolidation of sediment.

Shale: A fine-grained sedimentary rock, formed by the consolidation of clay and silt. It is characterized by a finely laminated structure and is sufficiently indurated so that it will not fall apart on wetting.

Soil Moisture Deficiency: The depth of water in inches required at the beginning of the rainy season to bring the soil up to field capacity.

Sonde: An elongate cylindrical tool assembly used in a borehole to acquire geophysical data of subsurface materials.

Sorption: The process of being sorbed or to gather on a surface either by adsorption or absorption or a combination of both processes.

Specific Capacity: The rate of discharge of water well per unit of drawdown, commonly expressed in gallons per minute per foot of drawdown. The value of specific capacity will vary with the duration and rate of discharge.

Specific Retention: The ratio of the volume of water that a body of rock or soil will hold against the pull of gravity to the volume of the body itself. It is usually expressed as a percentage.

Specific Yield: The ratio of the volume of water that a given mass of saturated rock or soil will yield by gravity to the volume of that mass. This ratio is stated as a percentage.

Static Water Level: The level of water in a well that is not being affected by withdrawal of groundwater.

Strata: Layers of sedimentary rock or soil.

Stratigraphy: The study of rock strata, especially of their distribution, deposition, and age.

Tertiary: A Period of geologic time covering the span of time between 2-million years ago and 65-million years ago.

Total Dissolved Solids (TDS): The quantity of dissolved material in a sample of water, either measured by the residue that remains upon evaporation when dried at 356°F (180°C) or, for many waters that contain more than about 1,000 mg/l, the sum of the chemical constituents.

Transgression: The rise and spread of oceans or sea over land areas.

Transmissivity: The rate at which water is transmitted through a unit width of an aquifer under a unit hydraulic gradient over a 1 day period. Transmissivity values are generally expressed in gallons per minute per day and represent the flow through a vertical section of an aquifer one foot wide and extending the full saturated height of an aquifer under a hydraulic gradient of 1; in the International System, transmissivity is given in cubic meters per day through a vertical section of an aquifer one meter wide and extending the full saturated height of an aquifer under a hydraulic gradient of 1.

Transpiration: The evaporative process of plants that facilitates absorption and movement of water through the plant tissues, transpiration is generally accomplished by evaporation of water into the atmosphere from a plants leafy tissue.

Unconfined Aquifer: An aquifer where the water table is exposed to the atmosphere through openings in the overlying materials.

USGS: United States Geological Survey

Vadose Zone: The subsurface zone containing soil moisture, intermediate vadose water, and capillary water and lies between the land surface and the surface of the zone of saturation, that is, the water table.

Water Shed: A drainage basin.

Water Table: The top surface of the zone of saturation of a body of unconfined groundwater.

Well Yield: The rate at which a well can produce water, generally expressed in gallons per minute or cubic meters per day.

APPENDIX A
SANTA MARGARITA RANCH
PROJECT DESCRIPTION

HOPKINS
GROUNDWATER
CONSULTANTS

PROJECT DESCRIPTION

The proposed project, known as the Santa Margarita Ranch Agricultural Cluster Subdivision Project and Future Development Program, includes two components: 1) an Agricultural Residential Cluster Subdivision (Tentative Tract 2586), for which an application has been filed with the County, and 2) a Future Development Program, for which no application has been filed. Despite its status, the Future Development Program is evaluated in the EIR because of a settlement agreement between the community group Santa Margarita Area Residents Together (SMART), the County, and the applicant (Santa Margarita Ranch, LLC). This agreement required that the applicant submit a Future Development Program for the Ranch at the time of any specific entitlement request (such as the proposed Tentative Tract Map and Conditional Use Permit). The settlement agreement also required that as part of the CEQA evaluation of the project-specific application, the EIR document examine the long range effects of full buildout of the ranch (Future Development Program) in addition to the near term effects of proposed Cluster development. Therefore, the "project" reviewed by this EIR includes both the Agricultural Residential Cluster and Future Development Program components. For the proposed Agricultural Residential Cluster Subdivision, the EIR will serve as a Project EIR pursuant to Section 15161 of the *CEQA Guidelines,* and evaluate the specific proposed development characteristics. For the Future Development Program, the EIR will serve as a Program EIR at a more conceptual level of detail. Since only generalized Future Development Program land use locations are available at this time, and no site plans or other project-level details have been provided by the applicant, this EIR evaluates and mitigates a reasonable worst-case scenario of potential impacts associated with the Future Development Program. Since project-level information and active applications for the Future Development Program components have not been provided, future development in accordance with the program will likely require additional environmental review, pursuant to the requirements of CEQA.

The Santa Margarita Ranch property (hereinafter, "the Ranch") encompasses approximately 14,000 acres and is located immediately east of U.S. Highway 101, and surrounds the community of Santa Margarita. The proposed Agricultural Residential Cluster Subdivision includes 3,778 acres near the middle of the Ranch, southeast of the community of Santa Margarita, while the Future Development Program occurs in various locations throughout the balance of the 14,000-acre property (refer to Plate 1 and 2; Plate 1 shows the location of the agricultural residential cluster project site, while Plate 2 shows the site within its local context). The proposed subdivision also includes a 2,417 acre remainder lot that is not proposed for development at this time.

The proposed Agricultural Cluster Subdivision site is located southeast of the community of Santa Margarita, west of Pozo Road. The proposed agricultural cluster development includes 111 clustered homesites and one ranch headquarters unit (located on Lot 42), with development area totaling 145 acres, with the remaining 3,633 acres placed in agricultural conservation

easements (ACEs). The agricultural cluster subdivision includes transportation infrastructure, water service improvements, underground wire utilities, and on-site septic systems. The proposed residential units would be clustered in the north-central portion of the site, west of Pozo Road, to be constructed in three phases, each with independent services, infrastructure, and respective agricultural/conservation dedications. Proposed lot sizes range from between 1.0 to 2.5 acres and comprise approximately 128 acres, with approximately 16 acres for roadways, driveways and other improvements.

The Future Development Program occurs throughout the portions of the Santa Margarita Ranch property generally outside the boundaries of the Agricultural Residential Cluster Subdivision, east of Highway 101 and surrounding both the community of Santa Margarita and the proposed Agricultural Residential Cluster Subdivision (refer to Plate 2). The Future Development Program includes the balance of the 550 single-family residential units allowable pursuant to the Salinas River Area Plan (approximately 402 residences; see Table A1 below) and the additional following uses: private golf course, club house and pro shop; guest ranch, lodge, and restaurant; 12-room bed and breakfast; cafe; amphitheater; crafts studios, galleries and shops; interpretive center and gift shops; nine wineries with tasting rooms and permitted special events; neighborhood park and swimming pool; five ranch/farm headquarters; one livestock sales yard and café; three places of worship; and a retreat center. The Future Development Program contemplates two of the contemplated wineries and two of the contemplated ranch headquarters within the Agricultural Conservation Easements (ACEs) associated with the proposed Agricultural Residential Cluster Subdivision.

The specific characteristics of the project, including the project application, proposed structures, and project objectives, are described below.

Table A1 - Summary of Existing, Project, and Program Residential Development Potential

RESIDENTIAL DEVELOPMENT COMPONENT	NUMBER OF DWELLING UNITS
EXISTING DEVELOPMENT (MARGARITA FARMS)	36
PROPOSED AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION	
SINGLE-FAMILY HOMES	111
RANCH HEADQUARTERS UNIT	1
SUBTOTAL (AGRICULTURAL RESIDENTIAL CLUSTER SUBDIVISION) 112	112

Table A1 (continued)

RESIDENTIAL DEVELOPMENT COMPONENT	NUMBER OF DWELLING UNITS
FUTURE DEVELOPMENT PROGRAM	
MARKET-RATE SINGLE FAMILY HOMES	352
WORKFORCE (AFFORDABLE) HOUSING	50
SUBTOTAL (FUTURE DEVELOPMENT PROGRAM)	402
SUBTOTAL PROPOSED PROJECT (CLUSTER PLUS PROGRAM)	514
TOTAL (EXISTING, PLUS CLUSTER, PLUS PROGRAM)	550
MAXIMUM ALLOWED UNDER SALINAS RIVER AREA PLAN	550

APPENDIX B
WATER DEMAND ESTIMATION FACTORS

EXCERPTED FROM "CITY OF SANTA BARBARA WATER DEMAND FACTOR & CONSERVATION STUDY 'USER GUIDE' (Aug., 1989)
Use RED numbers!!
EXHIBIT 1
Adjusted Water Consumption

Land Use	Average Use Rate (AFY)	Total Fraction Savings w/ Retro Program	Total Savings w/ Retrofit Program	Adjusted Water Consumption (AFY)
Auto Repair and Auto Body Shop	0.110 /1000 sf	0.443	0.050	0.060 /1000 sf
Bank	0.170 /1000 sf	0.432	0.070	0.100 /1000 sf
Church	0.170 /1000 sf	0.204	0.030	0.140 /1000 sf
Church w/School	0.180 /1000 sf	0.273	0.050	0.130 /1000 sf
Condominium	0.280 /unit	0.218	0.060	0.220 /unit
Convalescent Hospital	0.110 /bed	0.195	0.020	0.090 /bed
Gas Station	0.290 /1000 sf	0.336	0.100	0.190 /1000 sf
Gas Station/Mini Market	0.490 /1000 sf	0.464	0.230	0.260 /1000 sf
General office	0.100 /1000 sf	0.443	0.040	0.060 /1000 sf
Grocery Store	0.420 /1000 sf	0.413	0.170	0.250 /1000 sf
Health Club	0.320 /1000 sf	0.348	0.110	0.210 /1000 sf
Hotel/Motel	0.130 /room	0.311	0.040	0.090 / room
Hotel/Motel/Restaurant	0.150 /room	0.271	0.040	0.110 /room
Industrial Assembly and Manufacturing	0.090 /1000 sf	0.460	0.040	0.050 /1000 sf
Industrial R&D	0.150 /1000 sf	0.363	0.050	0.100 /1000 sf
Medical Office	0.150 /1000 sf	0.429	0.060	0.090 /1000 sf
Mixed Medical/Dental	0.230 /1000 sf	0.496	0.110	0.120 /1000 sf
Multi-Family Apartment	0.240 /unit	0.218	0.050	0.190 /unit
Restaurant, 24 Hour	0.040 /seat	0.318	0.010	0.030 /seat
Restaurant, Fast Food	1.260 /1000 sf	0.363	0.460	0.800 /1000 sf
Restaurant, Sit Down	0.022 /seat	0.393	0.009	0.013 /seat
Retail, Large- over 20,000 sf.	0.070 /1000 sf	0.464	0.030	0.040 /1000 sf
Retail, Small- under 20,000 sf.	0.110 /1000 sf	0.464	0.050	0.060 /1000 sf
Retirement Facility	0.100 /room	0.195	0.020	0.080 /room
School-Elementary	0.020 /student	0.189	0.004	0.016 /student
School-Junior High	0.330 /student	0.265	0.090	0.240 /student
Senior Apartment	0.120 /unit	0.195	0.020	0.100 /unit
SFR - small, up to 9,999 sf. lot	0.330 /unit	0.186	0.060	0.270 /unit
SFR - medium, 10,000-22,000 sf. lot	0.510 /unit	0.155	0.080	0.430 /unit
SFR - Large, 22,001 sf.-1 Acre lot	0.850 /unit	0.124	0.110	0.740 /unit
SFR, over 1 acre lot	1.440 /unit	0.142	0.180	1.260 /unit
Theater	0.005 /seat	0.443	0.002	0.003 /seat
Warehouse/Industrial Storage	0.070 /1000 sf	0.443	0.030	0.040 /1000 sf

TABLE 9

Agricultural water duty factors in Santa Barbara County.
Compiled by Cooperative Extension, University of California,
Santa Barbara County (9-16-91)

IRRIGATION WATER USE BY CROPS IN SANTA BARBARA COUNTY (AFY/acre)

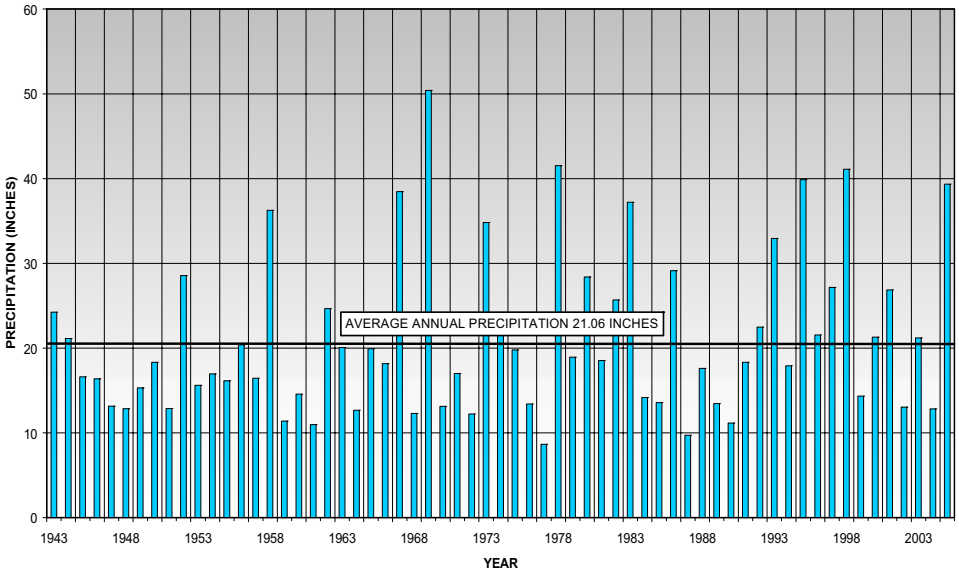
	South Coast Area		Santa Maria & Lompoc Valleys		Santa Ynes, Los Alamos, & Sisquoc Valleys		Cuyama Valley	
CROP	Range	Ave	Range	Ave	Range	Ave	Range	Ave
Field Crops								
Beans			.5-1.3	1.0	.9-1.5	1.3	1.0-1.7	1.5
Corn, field			1.5-2.2	1.8	2.0-2.8	2.2	2.4-3.2	2.8
Grain, irrigated			.3- .7	0.5	.6-1.0	.8	1.0-1.8	1.5
Sugar Beets			2.6-3.2	3.0	3.0-3.6	3.2	3.6-4.6	4.0
Forages & pastures								
Alfalfa			2.6-3.3	3.0	3.0-4.0	3.5	4.0-4.6	4.3
Pasture/irrigated			2.8-3.3	3.0	3.3-4.0	3.7	4.0-4.6	4.3
Sudangrass			1.0-1.8	1.5	1.3-2.0	1.7	2.0-3.0	2.5
Ornamentals								
Cut Flowers/field	1.5-2.3	1.8	1.5-2.3	1.8				
Flower seeds			1.5-3.0	2.3	2.0-3.5	2.7		
Greenhouse-								
-Carnations	2.0-3.0	2.5						
-Mums, pompom	3.0-4.5	4.0						
-Mums, potted	4.5-5.5	5.5						
Turfgrass	2.5-2.8	2.7	2.5-2.8	2.7	3.0-4.0	3.5	3.5-4.5	4.0
Trees and Vines								
Avocados	1.0-2.0	1.6	1.1-2.1	1.7				
Deciduous Fruits			1.2-2.0	1.7	1.5-3.0	2.5	3.0-4.5	3.8
Grapes			.7-1.8	1.2	1.0-3.0	2.0		
Lemons	.8-1.8	1.5	1.0-2.0	1.6				
Walnuts	1.0-2.0	1.5	1.3-2.5	1.8	2.0-3.5	3.3		
Vegetables								
Broccoli/Cabbage			1.3-1.5	1.4 *	1.5-2.0	1.7		
Cauliflower			1.5-2.0	1.7 *	2.0-3.0	2.5		
Carrots			1.5-3.0	2.3	2.0-2.5	2.2	2.5-3.5	3.0
Celery			2.0-2.5	2.2 *	2.0-2.5	2.2		
Lettuce			1.0-1.3	1.1 *	1.0-2.0	1.5		
Potatoes			1.5-2.0	1.7	2.0-3.0	2.5		
Strawberries	2.5-3.5	3.0	2.5-3.0	2.7				
Tomatoes	1.0-2.0	1.5	1.5-2.0	1.7				

* Average two crops per year in Santa Maria Valley (multiply factor shown by 2 to obtain AFY/acre)

Table 3. Projected Irrigated Acreages and Applied Water Use By Detailed Analysis Units for San Luis Obispo County

	1985			2000			2010			2035		
Crop Type	Acres[1]	Unit Use	Acre-feet	Acres[1]	Unit Use	Acre-feet	Acres[1]	Unit Use	Acre-feet	Acres[1]	Unit Use	Acre-feet
DAU 65 Upper Salinas												
Alfalfa	10,900	4.0	43,600	8,200	3.7	30,300	8,200	3.7	30,300	8,200	3.7	30,300
Pasture	3,480	3.8	13,200	2,000	3.7	7,400	2,000	3.5	7,000	2,000	3.5	7,000
Grains	530	1.0	500	360	1.0	400	290	1.0	300	290	1.0	300
Other field	1,580	2.7	4,300	830	2.0	1,700	790	1.9	1,500	790	1.9	1,500
Vegetable/nursery	340	2.6	900	450	2.4	1,100	500	1.5	800	500	1.5	800
Citrus	0	2.5	0	0	2.4	0	0	2.0	0	0	2.0	0
Deciduous	790	3.4	2,700	1,080	3.2	3,500	1,300	2.8	3,600	1,300	2.8	3,600
Vineyard	5,630	2.5	14,100	8,110	2.2	17,800	9,730	2.0	19,500	9,730	2.0	19,500
Subtotal	23,250	3.4	79,300	21,030	3.0	62,200	22,810	2.8	63,000	22,810	2.8	63,000
DAU 67 San Luis Obispo												
Alfalfa	60	3.0	200	50	2.8	100	50	2.7	100	50	2.7	100
Pasture	1,140	2.7	3,100	800	2.7	2,200	650	2.7	1,800	650	2.7	1,800
Grains	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0
Other field	610	1.7	1,000	560	1.6	900	560	1.3	700	560	1.3	700
Vegetable/nursery	2,630	1.7	4,500	380	2.3	900	3,000	1.6	4,800	3,000	1.6	4,800
Citrus	870	2.0	1,700	1,230	1.9	2,300	900	1.9	1,700	900	1.9	1,700
Deciduous	180	2.6	500	3,200	2.4	7,700	180	2.4	400	180	2.4	400
Vineyard	900	2.0	1,800	1,100	1.8	2,000	1,100	1.6	1,800	1,100	1.6	1,800
Subtotal	6,390	2.0	12,800	7,320	2.2	16,100	6,440	1.8	11,300	6,440	1.8	11,300
DAU 68 Arroyo Grande												
Alfalfa	0	3.0	0	0	2.8	0	0	2.7	0	0	2.7	0
Pasture	390	2.7	1,100	300	2.7	800	250	2.7	700	250	2.7	700
Grains	0	0.5	0	0	0.5	0	0	0.5	0	0	0.5	0
Other field	10	1.4	0	10	1.3	0	10	1.3	0	10	1.3	0
Vegetable/nursery	6,400	1.7	10,900	7,410	1.5	11,100	7,410	1.5	11,100	7,410	1.5	11,100
Citrus	700	2.0	1,400	800	1.9	1,500	800	1.9	1,500	800	1.9	1,500
Deciduous	50	2.6	100	50	2.4	100	50	2.4	100	50	2.4	100
Vineyard	350	2.0	700	350	1.8	600	350	1.6	600	350	1.6	600
Subtotal	7,900	1.8	14,200	8,920	1.6	14,100	8,870	1.6	14,000	8,870	1.6	14,000
DAU 70 Santa Maria												
Alfalfa	120	3.1	400	80	2.9	200	60	2.9	200	60	2.9	200
Pasture	370	2.7	1,000	180	2.7	500	140	2.7	400	140	2.7	400
Grains	220	0.5	100	250	0.5	100	250	0.5	100	250	0.5	100
Other field	530	1.5	800	400	1.3	500	400	1.3	500	400	1.3	500
Vegetable/nursery	15,910	1.7	27,000	19,480	1.7	33,100	20,480	1.5	30,700	20,480	1.5	30,700
Citrus	1,230	2.0	2,500	1,560	1.9	3,000	1,560	1.9	3,000	1,560	1.9	3,000
Deciduous	0	2.6	0	0	2.5	0	0	2.3	0	0	2.3	0
Vineyard	180	2.0	400	180	1.7	300	180	1.6	300	180	1.6	300
Subtotal	18,560	1.7	32,200	22,130	1.7	37,700	23,070	1.6	35,200	23,070	1.5	35,200
DAU Total	56,100	2.5	138,500	59,400	2.2	130,100	61,190	2.0	123,500	61,190	2.0	123,500
County Total	63,380	2.5	160,800	66,400	2.2	147,400	67,910	2.1	139,500	67,910	2.1	139,500

[1] Crop acres from DWR, Southern District. Includes double-cropped acres.



SALINAS DAM ANNUAL PRECIPITATION
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE C1

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

HOPKINS
GROUNDWATER
CONSULTANTS

APPENDIX C
PRECIPITATION AND EVAPORATION DATA

SANTA MARGARITA BOOSTER STATION ANNUAL PRECIPITATION
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

HOPKINS
GROUNDWATER CONSULTANTS

PLATE C2

RAINFALL TOTAL - SALINAS DAM

STATION	YEAR	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	ANNUAL
94	1943	0	0.01	0	0.39	1.58	1.96	12.58	1.85	5.18	0.71	0	0	**24.26**
94	1944	0	0	0	0.57	0.3	3.59	1.84	10.44	1.73	2.19	0.48	0	**21.14**
94	1945	0	0	0	0.03	4.12	1.83	0.16	5.54	4.78	0.11	0.03	0	**16.6**
94	1946	0	0	0	1.34	0.57	5.64	0.3	2.25	5.37	0.69	0.07	0	**16.23**
94	1947	0.14	0.01	0	0.61	6.24	2.46	0.6	1.09	1.52	0.45	0.11	0.08	**13.31**
94	1948	0	0	0.01	0.53	0.16	1.24	0	1.99	4.72	3.42	0.8	0	**12.87**
94	1949	0	0	0	0.12	0	4.67	1.68	2.75	5.26	0.15	0.68	0	**15.31**
94	1950	0	0	0	0	2.35	3.57	3.71	3.24	2.21	2.52	0.06	0	**17.66**
94	1951	0.67	0	0	2.45	2.77	1.95	2.69	1.23	0.56	1.18	0.1	0	**13.5**
94	1952	0	0	0	0.07	0.87	6.86	2.52	0.47	1.46	0.06	0.06	0.06	**20.61**
94	1953	0	0	0	0	2.99	6.86	9.21	1.71	1.74	0.17	0.05	0	**25.62**
94	1954	0	0	0	0.04	2.7	0.12	5.28	3.97	4.85	0	0	0	**16.96**
94	1955	0	0	0	0	2.26	2.8	5.8	1.84	0.26	1.98	1.19	0	**16.13**
94	1956	0	0.01	0	0	1.4	9.14	4.89	0.97	0.04	3.22	0.73	0	**20.4**
94	1957	0	0	0	0.85	0	0.55	4.91	2.7	1.09	4.05	2.1	0.2	**16.45**
94	1958	0	0	0	0.74	0.42	5.17	4.8	7.53	7.66	8.61	0.45	0	**35.38**
94	1959	0	0.04	0.82	0	0.19	0.2	3.15	6.44	0	0.82	0	0	**11.66**
94	1960	0	0	0.61	0	0	0.53	4.4	5.33	1.36	2.93	0.02	0	**15.18**
94	1961	0	0	0	0.29	4.08	1.93	1.8	0.4	1.62	0.62	0.24	0	**10.98**
94	1962	0	0	0	0	4.13	3.09	3.27	11.84	2.27	0	0.03	0.02	**24.65**
94	1963	0	0	0	1.03	0.02	1.09	2.72	5.89	4.43	3.69	0.6	0.03	**19.5**
94	1964	0	0.2	0.38	1.21	3.62	0.1	3.3	0.18	1.96	1.26	0.71	0.16	**13.08**
94	1965	0	0	0.16	1.15	3.94	4.8	3.36	0.48	2.66	3.54	0	0	**20.09**
94	1966	0	0	0	0.01	10.15	4.24	1.62	0.74	0.14	0.08	0	0.02	**17**
94	1967	0.05	0	1.13	0	3.23	10.91	7.31	1	7.1	7.25	0.15	0.4	**38.53**
94	1968	0	0	1.11	0.04	3.14	1.8	1.65	1.02	3.2	1.25	0.2	0	**13.41**
94	1969	0	0	0	1.83	1.55	2.73	22.87	17.29	1.1	3.04	0.01	0	**50.42**
94	1970	0	0	0	0.34	1.32	0.65	5.27	1.57	3.98	0.01	0	0	**13.14**
94	1971	0	0	0	0	0.12	5.7	7.22	1.86	0.2	0.58	0	0	**16.91**
94	1972	0	0	0.08	0.1	1.55	7.86	1.4	0.55	0	0.63	0.05	0.03	**12.25**
94	1973	0	0	0.06	2.42	9.99	1.72	8.95	10.74	3.93	0	0	0.03	**34.84**
94	1974	0	0	0.04	1.46	3.93	3.42	6.96	0.13	6.29	1.45	0	0	**23.48**
94	1975	0	0	0	0.98	0.49	4.12	0.19	6.9	4.72	2.42	0	0	**19.8**
94	1976	0	1.04	4.36	1.16	0.03	0.1	0.09	3.64	2.01	0.92	0	0.05	**8**
94	1977	0	0	0	0.14	0.66	1.59	1.83	0.13	1.62	0	2.66	0	**14.03**
94	1978	0.02	0	0	0.09	0.32	7.2	9.46	9.02	9.8	4.43	0.07	0	**40.41**
94	1979	0	0	1.13	0	2.42	1.67	4.98	4.79	5	0.04	0	0	**20.03**
94	1980	0	0	0.04	0.6	1.15	2.91	6.69	11.33	4.12	0.88	0.52	0	**28.24**
94	1981	0.2	0	0	0.09	0.01	1.86	6.19	1.4	8.28	0.7	0	0	**18.73**
94	1982	0	0	0	1.18	2.22	1.32	5.17	1.26	7.3	6.06	0.01	0.09	**24.61**
94	1983	0	0.1	0.98	1.73	7.75	0.6	9.51	1.43	9.72	4.72	0.77	0.02	**37.33**
94	1984	0	0.91	0.05	0.16	4.46	7.2	0.21	0.63	0.83	0.7	0	0	**15.15**
94	1985	0	0	0	1.14	3.56	3.7	0.7	2.13	2.19	0.11	0	0	**13.53**
94	1986	0.03	0	0.01	0.78	5	1.46	2.47	10.81	7.62	0.3	0	0	**28.48**
94	1987	0.05	0	0.64	0	0.38	0.82	2.17	2.16	3.97	0.11	0.09	0.04	**10.43**
94	1988	0	0	0	1.8	2.04	4.14	2.85	2.01	1.85	2.87	0.06	0	**17.62**
94	1989	0	0	0	0	1.61	5.28	0.75	1.99	1.46	0.98	0.05	0	**12.12**
94	1990	0	0	1.34	1.45	0.9	0	2.62	3.44	0.59	0.23	0.91	0	**11.48**
94	1991	0	0	1.02	0	0.21	0.29	0.68	2.57	14.17	0.18	0	0.18	**19.3**
94	1992	0	0.04	0	0.63	0.35	5.94	2.39	10.38	2.77	0.03	0	0	**22.53**
94	1993	0	0	0	2.38	0	6.71	11.64	8.07	3.73	0.14	0.04	0.23	**32.94**
94	1994	0	0	0	0.14	1.75	1.87	2.09	6.32	1.74	1.08	0.96	0	**16.95**
94	1995	0	0	1.96	1.22	2.24	0.97	3.75	1.86	14.16	0.23	1.3	0.38	**41.82**
94	1996	0	0	0	0	0.18	2.87	1.85	9.56	3.01	1.14	1.14	0	**21.15**
94	1997	0	0	0	2.3	2.71	2.97	3.2	0	1.7	0	0	0	**17.9**
94	1998	0	0	0.04	0	4.65	4.22	4.75	17.02	3.5	3.18	3.55	0	**40.91**
94	1999	0	0	0.22	0.27	1.45	1.22	3.32	1.94	3.68	2.43	0	0.02	**14.55**
94	2000	0	0	0	0	1.15	0.08	3.91	11.37	1.64	2.84	0.14	0.12	**21.25**
94	2001	0	0	0.06	2.42	0.03	0.1	7.3	7.5	6.41	3.06	0	0	**26.88**
94	2002	0.04	0	0	0.56	4.8	3.32	0.97	0.85	1.78	0.61	0.14	0	**13.07**
94	2003	0	0	0	0	5.1	7.05	0.1	2.49	3.07	1.7	1.63	0	**21.14**
94	2004	0.07	0	0	0	2.07	2.95	0.94	6.21	0.66	0	0	0	**12.9**
94	2005	5.86	1.62	10.32	9.49	5.83	3.74	1.58	0.88	0	0	0	0	**38.32**
													AVERAGE	**21.06**

SANTA MARGARITA BOOSTER, CALIFORNIA

Monthly Total Precipitation (inches)

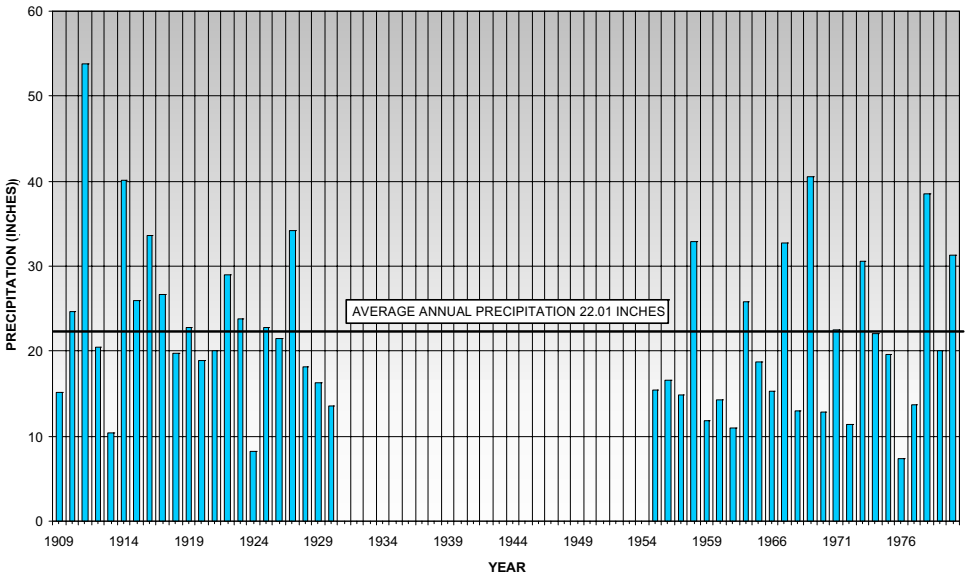
(047933)

File last updated on May 5, 2006
*** Note *** Provisional Data *** After Year/Month 200601
a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present
Long-term means based on columns; thus, the monthly row may not
sum (or average) to the long-term annual value.
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1948	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00	0.00	0.00	0.29	0.00	5.55	5.84
1949	4.13	6.09	7.30	0.18	0.85	0.07	0.00	0.00	0.00	0.00	3.39	4.97	26.98
1950	6.60	4.93	4.23	2.81	0.13	0.00	0.91	0.00	0.00	3.87	8.80	4.56	36.84
1951	4.80	3.27	1.51	2.35	0.36	0.00	0.00	0.00	0.05	1.62	3.64	13.13	30.73
1952	14.26	0.99	9.51	1.46	0.08	0.03	0.00	0.00	0.00	0.02	4.91	9.94	41.20
1953	4.39	0.00	3.90	4.49	0.15	0.00	0.00	0.00	0.00	0.02	4.44	0.52	17.91
1954	8.60	5.19	7.83	1.89	0.36	0.03	0.00	0.00	0.00	0.00	3.69	4.59	32.18
1955	6.48	3.83	0.11	3.38	0.98	0.01	0.00	0.02	0.00	0.00	1.97	16.63	33.41
1956	8.89	1.80	0.08	5.86	1.49	0.00	0.00	0.00	0.00	1.86	0.00	1.31	21.29
1957	6.94	5.64	1.82	4.42	5.80	0.20	0.00	0.00	0.05	2.14	0.86	8.36	36.23
1958	8.15	11.72	11.38	9.60	0.36	0.00	0.00	0.00	1.19	0.00	0.22	0.71	43.33
1959	3.40	11.37	0.08	0.93	0.02a	0.00	0.00	0.00h	2.78b	0.00e	0.00	0.47	19.05
1960	5.60	10.24	2.44	2.59	0.05	0.00	0.00d	0.00	0.00	0.25	5.71	3.71	30.59
1961	2.92	0.60	2.33	0.58	0.44	0.00	0.00	0.00	0.00i	0.00	5.42f	4.23d	11.10
1962	7.48	19.12	4.05	0.02	0.01	0.09	0.00	0.00	0.00	2.53	0.03	3.08	36.41
1963	4.48	9.87	5.32	5.42	0.72	0.15	0.00	0.01	0.33	1.59	6.48	0.35	34.72
1964	3.93	0.09	3.92	1.76	0.89	0.64	0.01	0.00	0.11	1.73	5.49	9.08	27.65
1965	5.39	1.26	3.85	5.50	0.00	0.00	0.00	0.02	0.05	0.02	12.99	5.13	34.21
1966	2.45	1.18	0.46	0.26	0.00	0.04	0.14	0.00	0.61	0.01	5.56	15.94	26.65
1967	8.92	0.98	8.79	9.93	0.29	0.43	0.00	0.00	1.32	0.20	4.33	3.32	38.51
1968	3.31	1.89	4.05	1.49	0.20	0.00	0.00	0.00	0.00	2.94	3.06	5.63	22.57
1969	26.62	16.64	1.80	3.90	0.01	0.01	0.00	0.00	0.06	1.50	1.32	3.15	55.01
1970	11.67	1.68	4.29	0.15	0.00	0.04	0.00	0.00	0.00	0.31	8.86	8.63	35.63
1971	2.72	0.47	1.97	1.67	1.52	0.00	0.00	0.00	0.09	0.17	2.24	8.86	19.71
1972	1.17	1.14	0.00	1.84	0.11	0.00	0.01	0.00	0.02	4.07	7.35	2.59	18.30
1973	13.56	12.19	6.05	0.01	0.00	0.02	0.00	0.00	0.05	2.89	6.47	5.09	46.33
1974	10.81	0.48	9.45	2.18	0.00	0.01	0.01	0.00	0.00	2.17	1.18	5.29	31.58
1975	0.27	10.85	7.73	3.05	0.00	0.00	0.00	0.01	0.00	2.50	0.04	0.35	24.80
1976	0.04	4.47	4.08	1.13	0.01	0.04	0.00	1.75	4.27	0.16	1.03	2.33	19.31
1977	3.08	0.45	2.33	0.00	3.46	0.00	0.00	0.00	0.03	0.28	1.27	10.52	21.42
1978	16.11	10.65	9.04	0.00z	0.00z	0.05	0.00	0.00z	1.07	0.00z	4.10	2.43	43.45
1979	5.86	6.41	5.26	0.45	0.00	0.00z	0.00	0.00	0.04	1.91	1.53	5.14	26.60
1980	12.85	15.61	4.65a	1.26	0.83	0.00	0.24	0.00	0.00	0.15	0.01	2.31	37.91
1981	8.47	2.11	10.42	0.00z	0.00	0.00	0.00	0.00	0.00	2.81	3.82	4.91	32.54
1982	7.54	2.19	9.24	9.17	0.01	0.09	0.00	0.02	1.67	2.43	11.82	7.65	51.83
1983	12.92	9.42	12.43	4.61	0.25	0.00	0.00	1.01	0.04	2.50	7.22	7.88	58.28
1984	0.32	1.12	1.70	0.88	0.00	0.00	0.00	0.04	0.00	2.96	4.17	4.32	15.51
1985	0.92	4.97	5.97	0.31	0.00	0.00	0.03	0.00	0.04	0.93	7.13	1.98	22.28
1986	4.10	16.47	10.23	0.25	0.00	0.00	0.03	0.00	1.81	0.00	0.29	1.94	35.12
1987	3.18	5.27	5.83	0.43	0.04	0.05	0.00	0.00	0.00	2.28	2.20	6.12	25.40
1988	3.59	3.17	1.22	4.34	0.53	0.09	0.00	0.00	0.00	0.00	4.43	10.14	27.51
1989	1.82	2.56	3.38	0.51	0.00z	0.00	0.00	0.00	1.54	2.12	1.13	0.03	13.09
1990	5.14	4.02	0.62	0.00z	1.39	0.00	0.00	0.00	0.79	0.00	0.49	0.74	13.19
1991	1.14	2.64	18.94	0.53	0.00	0.88	0.00	0.03	0.00	1.85	1.01	4.66	31.68
1992	3.55	14.01	4.01	0.05	0.00	0.05	0.53	0.00	0.00	5.65	0.02	9.67	37.54
1993	15.03	10.22	5.05	0.49	0.20	0.49	0.00	0.00	0.00	0.21	2.09	2.86	36.64
1994	3.42	6.19	1.60	1.93	0.97	0.00	0.00	0.00	2.63	1.61	2.91	1.64	22.90
1995	23.76	2.71	21.39	0.82	0.95	0.79	0.00	0.00	0.00	0.01	0.35	4.31	55.09
1996	9.60	14.22	2.83	2.26	1.47	0.01	0.00	0.00	0.00	3.84	8.11	13.59	55.93
1997	16.96	0.02	0.01	0.00	0.00	0.00	0.01	0.04	0.00	0.01	7.48	5.32	29.85
1998	10.03	19.81	5.14	4.68	4.78	0.06	0.00	0.00	0.18	0.26	2.87	1.92	49.73
1999	6.27	4.23	6.14	2.44	0.00	0.11	0.00	0.00	0.17	0.00	2.20	0.05	21.61
2000	5.04	18.33	2.32	3.34	0.24	0.35	0.00	0.00	0.24	3.25	0.05	0.12	33.28
2001	10.04	11.26	0.00z	3.13	0.00	0.00	0.00	0.00	0.00	1.27	6.17	5.20	37.07
2002	1.32	0.86	3.25	0.56	0.47	0.00	0.00	0.00	0.09	0.00	8.79	8.72	24.06
2003	0.44	4.26	3.70	2.73	1.95	0.00	0.07	0.00	0.00	0.00	2.69	5.61	21.45
2004	0.00d	9.19	0.88	0.00	0.00	0.00	0.00	0.00	0.00	8.59	3.22	12.94	34.82
2005	13.12	7.77	5.91	2.14	1.46	0.04	0.00	0.00	0.02	0.14	0.55	3.68	34.83
2006	10.44	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	0.00z	10.44

Period of Record Statistics

MEAN	6.97	6.28	5.03	2.34	0.62	0.09	0.03	0.05	0.37	1.37	3.55	5.24	32.79
S.D.	5.63	5.60	4.34	2.41	1.13	0.19	0.14	0.27	0.83	1.69	3.18	4.06	10.81
SKEW	1.30	0.83	1.61	1.52	3.02	2.84	5.11	5.53	2.83	1.76	0.90	0.94	0.67



SANTA MARGARITA UOC ANNUAL PRECIPITATION
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER CONSULTANTS

PLATE C3

MAX	26.62	19.81	21.39	9.93	5.80	0.88	0.91	1.75	4.27	8.59	12.99	16.63	58.28
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	15.51
NO YRS	58	57	56	54	55	56	58	56	57	57	57	58	49

San Luis Obispo County Public Works

Volunteer Precipitation Gauge Station

MONTHLY PRECIPITATION REPORT

Station Name and no. Santa Margarita UOC # 60

*** All units are in inches ***

Water Year	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
1979-1980	0.00	0.00	0.10	0.73	1.04	4.08	7.37	12.30	4.07	0.96	0.63	0.00	31.28
1978-1979	0.00	0.20	1.06	0.00	2.97	1.93	5.71	4.37	3.66	0.08	0.00	0.00	19.98
1977-1978	0.02	0.00	0.00	0.18	0.27	6.43	11.75	9.54	6.38	3.89	0.00	0.00	38.46
1976-1977	0.00	0.92	3.47	0.05	0.88	2.32	1.70	0.17	1.86	0.65	1.66	0.00	13.68
1975-1976	0.00	0.00	0.00	1.18	0.00	0.20	0.00	4.22	0.99	0.76	0.00	0.02	7.37
1974-1975	0.00	0.00	0.00	1.28	0.40	3.21	0.20	7.16	5.22	2.16	0.00	0.00	19.63
1973-1974	0.00	0.00	0.05	1.32	6.25	1.17	7.46	0.18	5.24	0.44	0.00	0.00	22.11
1972-1973	0.07	0.00	0.04	3.25	4.87	1.24	8.24	8.95	3.88	0.00	0.02	0.00	30.56
1971-1972	0.00	0.00	0.06	0.17	1.07	6.53	0.99	1.49	0.00	1.00	0.03	0.02	11.36
1970-1971	0.00	0.00	0.00	0.09	5.33	12.84	1.77	0.29	1.17	0.96	0.05	0.00	22.50
1969-1970	0.02	0.00	0.00	0.42	0.79	0.74	6.18	2.57	2.08	0.09	0.00	0.00	12.89
1968-1969	0.00	0.00	0.00	1.80	1.37	3.34	18.32	13.13	0.42	2.16	0.00	0.00	40.54
1967-1968	0.00	0.00	0.75	0.07	3.83	1.87	2.11	0.88	2.33	1.17	0.00	0.00	13.01
1966-1967	0.00	0.00	0.46	0.00	2.99	11.27	4.61	0.75	6.19	5.89	0.23	0.31	32.70
1965-1966	0.00	0.00	0.00	0.00	8.78	4.08	1.38	0.69	0.12	0.20	0.00	0.04	15.29
1964-1965	0.00	0.00	0.00	1.36	3.51	4.09	2.78	0.77	2.63	3.60	0.00	0.00	18.74
1961-1962	0.00	0.00	0.00	0.00	3.54	2.47	3.64	13.47	2.66	0.00	0.00	0.00	25.78
1960-1961	0.00	0.00	0.00	0.19	4.28	2.17	2.05	0.11	1.36	0.26	0.58	0.00	11.00
1959-1960	0.00	0.00	0.71	0.00	0.00	0.41	2.88	7.07	1.50	1.65	0.03	0.00	14.25
1958-1959	0.00	0.00	0.83	0.00	0.17	0.21	2.53	7.55	0.00	0.56	0.00	0.00	11.85
1957-1958	0.00	0.00	0.00	0.40	0.28	4.89	4.55	8.65	7.69	6.11	0.31	0.00	32.88
1956-1957	0.00	0.00	0.00	1.19	0.00	0.55	3.99	3.52	0.47	2.75	2.26	0.14	14.87
1955-1956	0.00	0.09	0.00	0.00	1.47	4.56	5.43	0.91	0.00	3.17	0.97	0.00	16.60
1954-1955	0.00	0.00	0.00	0.00	2.34	2.77	5.18	2.85	0.06	2.29	0.00	0.00	15.49
1929-1930	0.00	0.00	0.00	0.00	0.00	0.27	6.47	2.53	4.22	0.00	0.00	0.00	13.49
1928-1929	0.00	0.00	0.00	0.00	3.92	5.50	2.01	2.34	1.95	0.49	0.11	0.00	16.32
1927-1928	0.00	0.00	0.00	2.18	1.49	2.71	0.21	5.93	4.87	0.48	0.29	0.00	18.16
1926-1927	0.00	0.00	0.00	0.31	14.16	1.40	2.55	11.74	2.69	1.12	0.00	0.17	34.14
1925-1926	0.00	0.00	0.00	0.38	0.08	3.07	3.11	9.16	0.77	4.85	0.00	0.00	21.42
1924-1925	0.00	0.00	0.00	1.11	3.90	3.30	1.35	3.17	3.89	2.37	3.55	0.12	22.76
1923-1924	0.00	0.00	0.28	0.13	0.47	0.13	1.65	0.47	4.65	0.50	0.00	0.00	8.28
1922-1923	0.00	0.00	0.00	0.58	7.35	5.85	4.17	1.11	0.16	4.61	0.00	0.00	23.83
1921-1922	0.00	0.00	0.46	0.08	0.00	9.64	5.07	9.83	3.33	0.00	0.63	0.00	29.04
1920-1921	0.00	0.00	0.00	1.10	1.92	3.15	7.42	1.59	2.82	0.54	1.55	0.00	20.09
1919-1920	0.00	0.00	0.39	0.00	0.00	8.47	1.08	1.46	5.46	2.04	0.00	0.00	18.90
1918-1919	0.00	0.00	0.00	0.78	5.37	1.71	1.00	9.98	3.89	0.00	0.00	0.00	22.73
1917-1918	0.00	0.00	0.00	0.00	0.48	0.00	0.46	12.73	6.06	0.00	0.00	0.00	19.73
1916-1917	0.00	0.00	0.98	2.07	0.00	11.15	0.99	11.54	0.00	0.00	0.00	0.00	26.73
1915-1916	0.00	0.00	0.00	0.00	0.25	4.45	23.96	2.83	1.87	0.20	0.00	0.00	33.56
1914-1915	0.00	0.00	0.00	0.00	0.00	6.60	5.63	9.92	0.87	1.57	1.38	0.00	25.97

San Luis Obispo County Public Works

Volunteer Precipitation Gauge Station

MONTHLY PRECIPITATION REPORT

Station Name and no. Santa Margarita UOC # 60

*** All units are in inches ***

Water Year	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	Total
1913-1914	0.00	0.00	0.00	0.00	4.08	5.05	25.59	3.57	1.25	0.51	0.00	0.00	40.05
1912-1913	0.00	0.00	0.00	0.00	0.49	0.28	5.80	2.52	1.10	0.24	0.00	0.00	10.43
1911-1912	0.00	0.00	0.00	0.00	0.80	3.05	1.85	0.05	8.71	3.88	2.07	0.00	20.41
1910-1911	0.00	0.00	0.00	0.00	0.00	1.00	22.18	8.27	20.89	1.50	0.00	0.00	53.84
1909-1910	0.86	0.00	0.00	0.00	2.21	13.29	4.68	0.06	3.32	0.25	0.00	0.00	24.67
1908-1909	0.00	0.00	0.00	0.00	0.00	0.00	0.40	9.56	5.22	0.00	0.00	0.00	15.18

SALINAS RESERVOIR
PAN EVAPORATION DATA
UNIT: INCHES

YEAR		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1935	-36	5.36	2.29	6.31	1.66	2.32	3.80	7.66	7.92	9.01	11.40	10.94	7.75	76.42
1936	-37	5.76	2.51	1.28	1.33	2.25	0.00	4.85	7.80	8.96	11.24	10.98	7.84	64.80
1937	-38	5.73	2.55	1.44	1.72	2.36	0.00	4.98	7.69	8.69	11.11	10.70	7.88	64.85
1938	-39	5.51	2.38	1.42	1.66	2.17	6.89	5.40	7.89	8.78	11.09	10.99	7.93	72.11
1939	-40	5.56	2.56	1.43	1.79	2.55	7.14	5.26	8.27	9.20	11.15	10.76	7.40	73.07
1940	-41	5.72	2.45	1.50	1.79	2.60	6.89	5.18	8.16	8.64	11.03	10.66	7.23	71.85
1941	-42	5.37	2.62	1.41	1.74	2.31	6.53	5.14	7.77	8.86	11.34	10.76	7.52	71.37
1942	-43	5.73	2.59	1.40	1.54	1.09	3.50	2.79	9.22	9.39	10.11	10.24	7.76	65.36
1943	-44	5.34	3.01	1.25	1.63	1.88	10.31	5.11	7.19	7.88	10.41	11.32	7.82	73.15
1944	-45	5.42	1.58	1.24	1.82	2.36	6.30	6.04	7.93	8.80	11.45	11.11	7.86	71.91
1945	-46	5.20	2.24	1.40	2.13	2.36	4.00	5.62	7.80	9.48	11.12	11.28	7.77	70.40
1946	-47	5.52	2.00	1.20	1.82	2.26	10.80	6.24	9.30	9.68	11.65	10.63	8.30	79.40
1947	-48	5.38	2.68	1.61	2.39	3.11	6.72	4.85	6.95	8.25	11.21	10.54	8.36	72.05
1948	-49	5.46	3.26	1.03	1.52	2.42	6.43	6.03	7.31	9.82	11.11	10.19	8.07	72.65
1949	-50	5.81	2.78	1.70	1.25	2.32	8.26	6.26	8.08	8.83	11.07	10.75	7.25	74.36
1950	-51	5.49	2.37	1.40	1.56	2.80	8.70	4.81	7.85	8.64	11.18	11.32	8.06	74.18
1951	-52	6.18	2.52	0.98	1.04	2.67	3.48	4.53	7.97	7.40	10.07	10.07	7.59	64.50
1952	-27	5.42	2.16	0.90	1.39	3.43	8.38	5.08	7.15	7.60	11.32	10.34	7.48	70.65
1953	-54	6.29	2.65	2.23	1.82	2.89	8.10	5.74	8.94	10.38	12.45	10.88	8.62	80.99
1954	-55	6.63	2.73	1.68	1.52	3.36	6.83	6.28	8.09	9.52	12.21	12.87	9.37	81.09
1955	-56	7.00	3.38	1.02	1.28	3.02	12.27	4.91	7.43	10.35	11.83	11.30	9.22	83.01
1956	-57	5.13	4.12	2.66	1.59	1.43	8.17	5.84	8.33	11.17	12.92	12.23	8.35	81.94
1957	-58	4.88	2.72	1.78	2.00	2.06	7.82	5.74	8.48	9.98	11.90	11.67	9.04	78.07
1958	-59	7.00	3.61	2.85	2.24	2.48	19.01	7.03	9.33	11.29	14.05	12.20	7.60	98.69
1959	-60	7.16	3.97	2.40	1.51	2.77	11.89	7.02	9.57	11.69	13.53	13.04	9.89	94.44
1960	-61	6.72	1.96	1.64	2.31	3.65	7.50	7.36	9.12	11.83	13.82	12.59	8.76	87.26
1961	-62	7.46	3.27	1.16	1.81	1.55	11.70	7.23	8.84	10.03	12.31	12.13	8.52	86.01
1962	-63	5.40	3.13	2.06	2.44	2.71	12.77	4.59	7.16	9.24	12.38	12.08	8.23	82.19
1963	-64	5.48	2.22	1.89	2.10	3.88	14.78	7.01	8.35	10.65	13.11	12.73	8.18	90.38
1964	-65	7.87	2.39	1.45	2.08	3.90	8.37	5.18	10.21	8.31	11.25	12.42	7.62	81.05
1965	-66	7.97	2.56	1.70	1.94	2.20	4.61	6.65	7.70	10.10	11.28	12.17	7.75	76.63
1966	-67	5.93	2.53	1.45	2.58	2.81	3.07	2.32	7.53	7.80	12.17	12.44	8.23	68.86

NOTE: THIS FILE MUST BE PROOFED BEFORE USING, THEN REMOVE THIS NOTE
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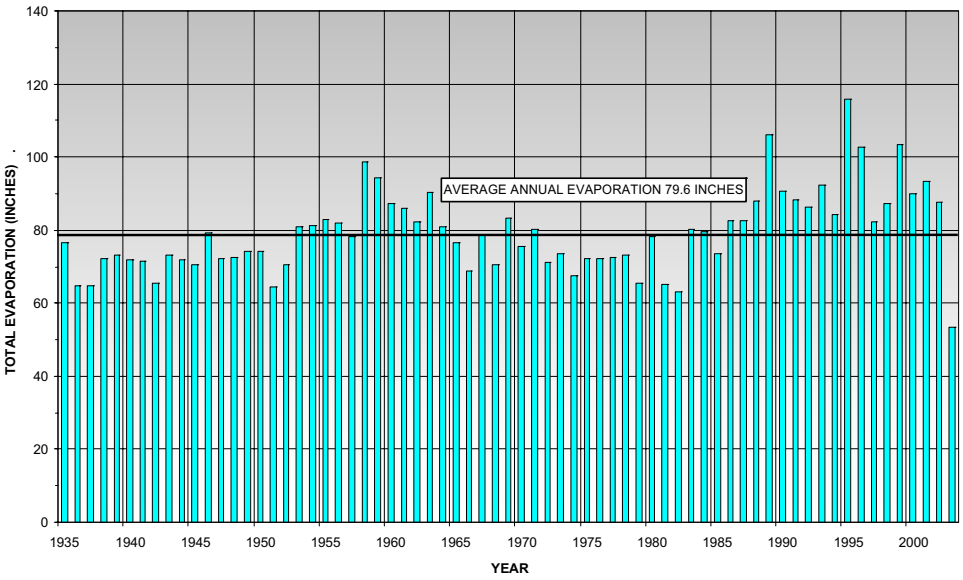
FILE: V/BASIC DATA/EVAPORATION/MONTHLY



SALINAS DAM ANNUAL PAN EVAPORATION
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE C4

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
Average	6.04	2.97	1.93	1.88	2.51	5.79	5.90	8.44	10.22	12.55	12.32	9.06	79.60

NOTE: DATA FROM 1935-1965(MAY) WAS ADJUSTED FROM GROUND PAN TO STANDARD PAN

0.00

NOTE: THIS FILE MUST BE PROOFED BEFORE USING, THEN REMOVE THIS NOTE
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FILE: V/BASIC DATA/EVAPORATION/MONTHLY

YEAR		OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	TOTAL
1967	-68	6.79	3.18	1.94	1.89	2.08	4.72	6.84	8.40	11.57	12.12	10.26	8.87	78.66
1968	-69	5.06	2.50	1.60	0.91	1.51	4.24	6.02	8.14	7.95	11.32	12.43	8.93	70.61
1969	-70	5.84	3.37	1.98	1.83	3.24	4.71	6.74	9.97	10.19	13.45	12.05	9.81	83.18
1970	-71	5.99	2.97	1.18	1.81	2.95	4.99	5.83	6.84	9.20	12.60	12.05	9.25	75.66
1971	-72	6.64	3.64	1.43	2.09	2.90	6.38	7.09	9.14	10.57	12.03	10.85	7.33	80.09
1972	-73	4.51	2.56	1.73	1.39	2.17	3.23	6.43	8.72	11.04	11.34	10.51	7.38	71.01
1973	-74	5.86	2.68	1.63	1.56	2.97	3.25	5.94	8.24	10.29	11.37	10.65	9.02	73.46
1974	-75	5.28	2.74	1.93	2.37	2.12	3.62	4.10	7.93	8.87	10.55	9.61	8.35	67.47
1975	-76	5.11	3.55	2.69	3.33	2.66	4.70	5.41	8.73	10.65	11.28	7.95	6.20	72.26
1976	-77	4.13	2.71	2.38	1.48	3.18	4.34	7.13	6.13	9.86	12.15	10.82	7.99	72.30
1977	-78	6.32	3.93	2.22	1.45	1.24	4.12	5.68	8.81	9.00	11.39	10.47	7.88	72.51
1978	-79	6.42	2.40	1.67	1.29	1.87	3.11	5.80	8.02	10.72	11.96	10.57	9.30	73.13
1979	-80	5.35	2.62	3.09	1.38	1.80	3.62	5.23	6.45	8.72	10.39	9.64	7.30	65.59
1980	-81	6.88	4.17	2.17	2.09	2.53	2.77	5.50	8.07	11.62	12.18	11.45	8.91	78.34
1981	-82	5.30	2.61	1.68	2.44	2.42	2.23	4.75	6.98	7.55	10.87	10.99	7.15	64.97
1982	-83	6.19	1.70	1.76	1.79	1.96	2.29	3.34	7.53	8.78	10.27	9.35	8.13	63.09
1983	-84	4.94	2.14	1.43	1.93	3.04	5.23	5.90	11.11	10.89	12.72	11.25	9.77	80.35
1984	-85	5.29	3.11	3.70	1.83	2.96	3.39	7.05	8.50	11.76	13.53	11.18	7.22	79.52
1985	-86	5.85	2.83	1.86	2.05	1.80	4.30	5.70	8.83	10.41	10.74	12.20	6.90	73.47
1986	-87	5.90	4.60	2.10	1.80	2.40	3.70	7.72	8.51	11.18	11.95	12.37	10.41	82.64
1987	-88	6.05	2.08	1.54	1.67	3.39	5.78	5.73	9.04	10.40	14.88	11.76	10.35	82.67
1988	-89	6.30	2.51	1.81	1.63	2.15	4.25	6.59	8.58	11.24	15.03	15.20	12.75	88.04
1989	-90	5.87	3.85	2.67	2.23	2.50	4.56	7.84	10.16	13.95	19.19	19.85	13.54	106.21
1990	-91	7.96	4.63	2.39	2.34	4.14	2.80	6.90	9.13	10.30	14.05	13.15	12.77	90.56
1991	-92	7.39	3.77	2.47	2.00	2.47	2.83	7.44	9.06	9.97	11.63	12.46	16.92	88.41
1992	-93	5.88	3.46	1.72	1.42	1.74	4.13	6.75	10.39	12.69	12.62	15.07	10.46	86.33
1993	-94	6.13	3.74	2.12	2.26	2.22	4.54	6.42	7.81	13.44	15.83	17.01	10.68	92.20
1994	-95	5.77	2.65	1.55	0.98	2.65	2.50	5.20	6.98	11.77	15.41	16.80	11.97	84.23
1995	-96	7.88	4.08	2.69	2.39	1.96	4.66	7.29	11.44	13.66	20.54	24.66	14.62	115.87
1996	-97	7.52	2.66	1.71	1.42	3.4	7.14	10.75	13.27	12.78	14.47	15.77	11.97	102.86
1997	-98	7.73	4.53	2.78	2.22	1.56	3.89	4.56	5.18	5.93	10.69	19.85	13.2	82.12
1998	-99	5.37	3.2	2.73	3.29	3.23	3.47	4.85	3.93	13.51	18.56	16.12	9.17	87.43
1999	-00	8.17	3.58	3.22	2.94	2.06	4.75	7.24	12.38	14.89	16.81	17.89	9.42	103.35
2000	-01	4.12	5.48	3.39	2.49	1.92	4.84	5.32	11.88	14.97	12.49	13.58	9.59	90.07
2001	-02	7.3	2.68	1.47	1.81	2.73	4.37	6.73	10.3	13.58	17.82	13.33	11.07	93.19
2002	-03	6.68	3.59	1.87	2.99	2.54	5.18	4.79	8.05	10.72	15.02	14.16	11.98	87.57

NOTE: THIS FILE MUST BE PROOFED BEFORE USING, THEN REMOVE THIS NOTE
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FILE: V/BASIC DATA/EVAPORATION/MONTHLY

APPENDIX D
STREAM FLOW MEASUREMENTS

HOPKINS
GROUNDWATER
CONSULTANTS

SANTA MARGARITA CREEK STREAM FLOW	
YEAR	TOTAL (AF)
1961	1,318
1962	12,197
1963	4,975
1964	1,786
1965	4,858
1966	4,170
1967	14,524
1968	1,350
1969	17,256
1970	3,475
1971	2,070
1972	640
1973	11,515
1974	7,902
1975	6,352
1976	686
1977	287
1978	15,055
1979	1,370
1980	9,181
1981	3,277
1982	18,244
1983	23,038
1984	1,692
1985	2,320
1986	16,811
1987	1,060
1988	1,537
1989	2,444
1990	277
1991	4,096
1992	7,349
1993	19,900
1994	1,308
1995	32,347
1996	9,795
1997	20,316
1998	20,497
1999	4,562
2000	9,089
MIN	277
MAX	32,347.0
AVERAGE	8,023.1

SANTA MARGARITA CREEK STREAM FLOW	
YEAR	TOTAL (AF)
1961	1,318
1962	12,197
1963	4,975
1964	1,786
1965	4,858
1966	4,170
1967	14,524
1968	1,350
1969	17,256
1970	3,475
1971	2,070
1972	640
1973	11,515
1974	7,902
1975	6,352
1976	686
1977	287
1978	15,055
1981	3,277
1982	18,244
1985	2,320
1987	1,060
1988	1,537
1989	2,444
1990	277
1991	4,096
1992	7,349
1993	19,900
1994	1,308
1995	32,347
1996	9,795
1997	20,316
1998	20,497
1999	4,562
2000	9,089
MIN	277
MAX	32,347.0
AVERAGE	7,681.0

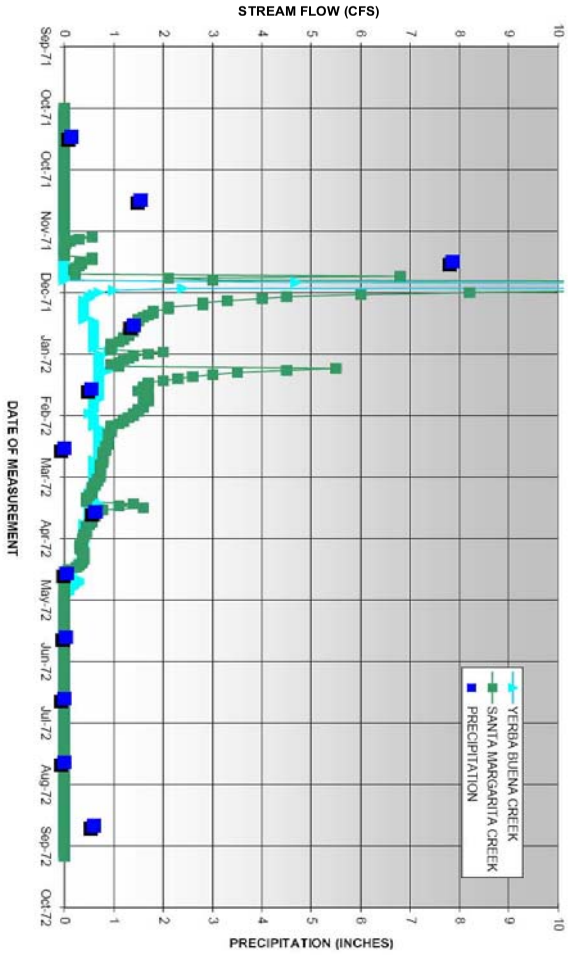
NOTE: PARTIAL DATA FOR YEARS 1979, 1980, 1983, 1984 AND 1986 WERE NOT USED IN AVERAGE

YERBA BUENA CREEK STREAM FLOW	
YEAR	TOTAL (AF)
1965	957
1966	542
1967	4163
1968	96
1969	6530
1970	806
1971	805
1972	298
1973	2904
1974	1378
1975	940
1976	44
1977	39
1978	3691
1980	3535
1981	722
1982	1874
1985	259
MIN	39
MAX	6,530
AVERAGE	1,643.5

NOTE: PARTIAL DATA FOR YEARS 1979, 1983 AND 1984 WERE NOT USED IN AVERAGE

YERBA BUENA CREEK STREAM FLOW	
YEAR	TOTAL (AF)
1965	957
1966	542
1967	4163
1968	96
1969	6530
1970	806
1971	805
1972	298
1973	2904
1974	1378
1975	940
1976	44
1977	39
1978	3691
1979	527.25
1980	3535
1981	722
1982	1874
1983	6346
1984	587
1985	259
MIN	39
MAX	6,530
AVERAGE	1,764.0

PLATE D1



STREAM FLOW VERSUS PRECIPITATION DRY YEAR 1971-1972
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

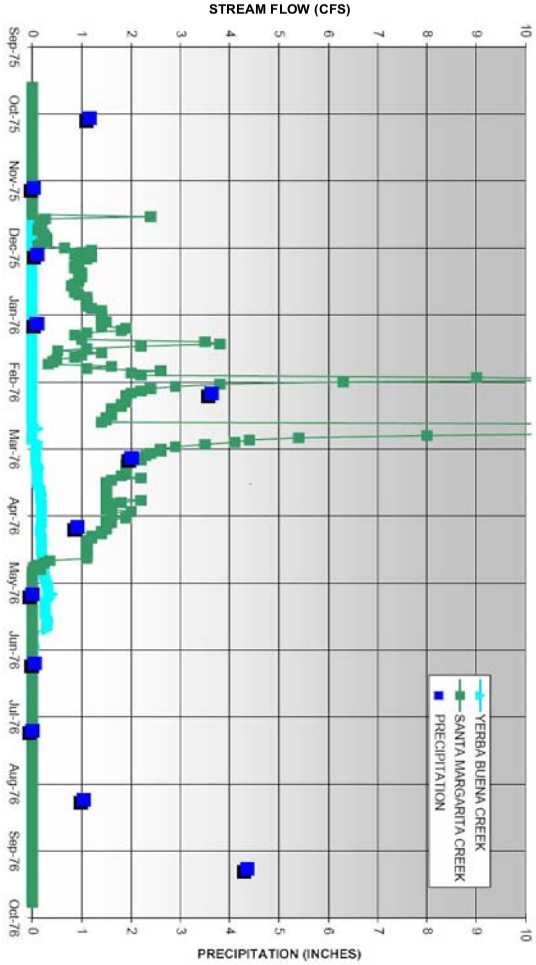
Santa Margarita Creek 1971-1972 Dry Year (12.23 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	0.20	5.95	0.00
DECEMBER	1.00	59.50	324.00
JANUARY	1.70	101.16	109.00
FEBRUARY	1.30	77.36	111.00
MARCH	0.75	44.63	52.00
APRIL	0.30	17.85	36.00
MAY	0.00	0.00	8.40
JUNE	0.00	0.00	0.00
JULY	0.00	0.00	0.00
AUGUST	0.00	0.00	0.00
SEPTEMBER	0.00	0.00	0.00
OCTOBER	0.00	0.00	0.00
	TOTAL	306.45	640.40
		BASE FLOW PERCENT OF TOTAL FLOW	48%
		TOTAL RAINFALL ON WATERSHED	6,261.76

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

Yerba Buena Creek 1972 Dry Year (12.23 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	0	0.00	0.00
DECEMBER	0.6	35.70	154.00
JANUARY	0.7	41.65	34.00
FEBRUARY	0.67	39.87	39.00
MARCH	0.5	29.75	40.00
APRIL	0.2	11.90	30.00
MAY	0	0.00	1.40
JUNE	0	0.00	0.00
JULY	0	0.00	0.00
AUGUST	0	0.00	0.00
SEPTEMBER	0	0.00	0.00
OCTOBER	0	0.00	0
	TOTAL	158.88	298.40
		BASE FLOW PERCENT OF TOTAL FLOW	53%
		TOTAL RAINFALL ON WATERSHED	2,935.20

Santa Margarita Creek 1975-1976 Dry Year (13.4 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	0.30	8.93	5.70
DECEMBER	1.00	59.50	41.00
JANUARY	1.60	95.21	84.00
FEBRUARY	1.75	104.13	174.00
MARCH	1.70	101.16	297.00
APRIL	0.80	23.80	83.00
MAY	0.00	0.00	0.99
JUNE	0.00	0.00	0.00
JULY	0.00	0.00	0.00
AUGUST	0.00	0.00	0.00
SEPTEMBER	0.00	0.00	0.00
OCTOBER	0.00	0.00	0.00
	TOTAL	392.73	685.69
		BASE FLOW PERCENT OF TOTAL FLOW	57%
		TOTAL RAINFALL ON WATERSHED	6,860.80



STREAM FLOW VERSUS PRECIPITATION DRY YEAR 1975-1976
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE D2

STREAM FLOW VERSUS PRECIPITATION WET YEAR 1966-1967
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE D3

Yerba Buena Creek 1975 Normal Year (19.8 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	0	0.00	0.00
DECEMBER	0	0.00	4.50
JANUARY	0	0.00	0.00
FEBRUARY	0.6	35.70	297.32
MARCH	1.3	77.36	479.86
APRIL	1	59.50	141.20
MAY	0.2	11.90	14.30
JUNE	0.1	5.95	3.41
JULY	0	0.00	0.28
AUGUST	0	0.00	0.00
SEPTEMBER	0	0.00	0.00
OCTOBER	0	0.00	0
	TOTAL	190.41	940.87
BASE FLOW PERCENT OF TOTAL FLOW			20%
TOTAL RAINFALL ON WATERSHED			4,752.00

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

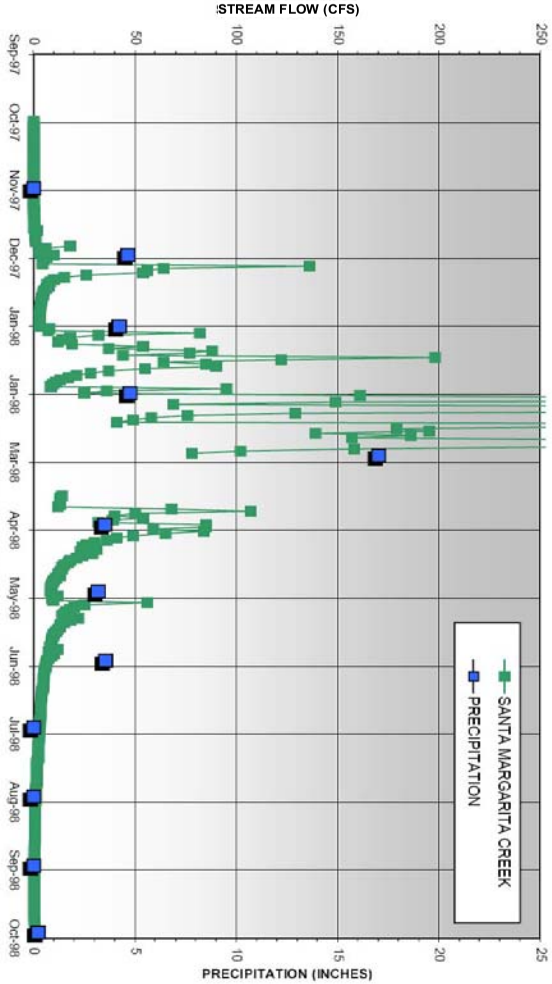
Santa Margarita Creek 1966-1967 Wet Year (38.46 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	5.00	198.35	91.00
DECEMBER	16.00	952.07	5,006.00
JANUARY	14.00	833.06	2,460.00
FEBRUARY	12.00	714.05	939.00
MARCH	17.00	1,011.57	2,274.00
APRIL	17.00	1,011.57	2,810.00
MAY	7.50	446.28	825.00
JUNE	2.00	119.01	218.00
JULY	0.00	0.00	10.00
AUGUST	0.00	0.00	0.00
SEPTEMBER	0.00	0.00	0.00
OCTOBER	0.00	0.00	0.00
	TOTAL	5,285.95	14,633.00
		BASE FLOW PERCENT OF TOTAL FLOW	36%
		TOTAL RAINFALL ON WATERSHED	19,691.52

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

Yerba Buena Creek 1967 Wet Year (38.46 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	1.5	44.63	0
DECEMBER	2	119.01	1212
JANUARY	4	238.02	528
FEBRUARY	3	178.51	165
MARCH	8	476.03	696
APRIL	3	178.51	1288
MAY	2	119.01	170
JUNE	0	0.00	104
JULY	0	0.00	0.00
AUGUST	0	0.00	0.00
SEPTEMBER	0	0.00	0.00
OCTOBER	0	0	0
	TOTAL	1353.72	4163.00
		BASE FLOW PERCENT OF TOTAL FLOW	33%
		TOTAL RAINFALL ON WATERSHED	9,230.40

Santa Margarita Creek 1997-1998 Wet Year (41.09 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	1.50	89.26	92.81
DECEMBER	7.50	446.28	927.47
JANUARY	12.50	743.80	2,796.50
FEBRUARY	14.00	833.06	12,739.83
MARCH	13.00	773.55	1,096.86
APRIL	11.00	654.55	1,600.07
MAY	8.50	505.79	836.43
JUNE	4.00	238.02	251.31
JULY	1.75	104.13	109.92
AUGUST	0.55	32.73	32.75
SEPTEMBER	0.20	11.90	13.43
OCTOBER	0.00	0.00	0.00
	TOTAL	4,433.06	20,497.37
BASE FLOW PERCENT OF TOTAL FLOW			22%
TOTAL RAINFALL ON WATERSHED			21,038.08

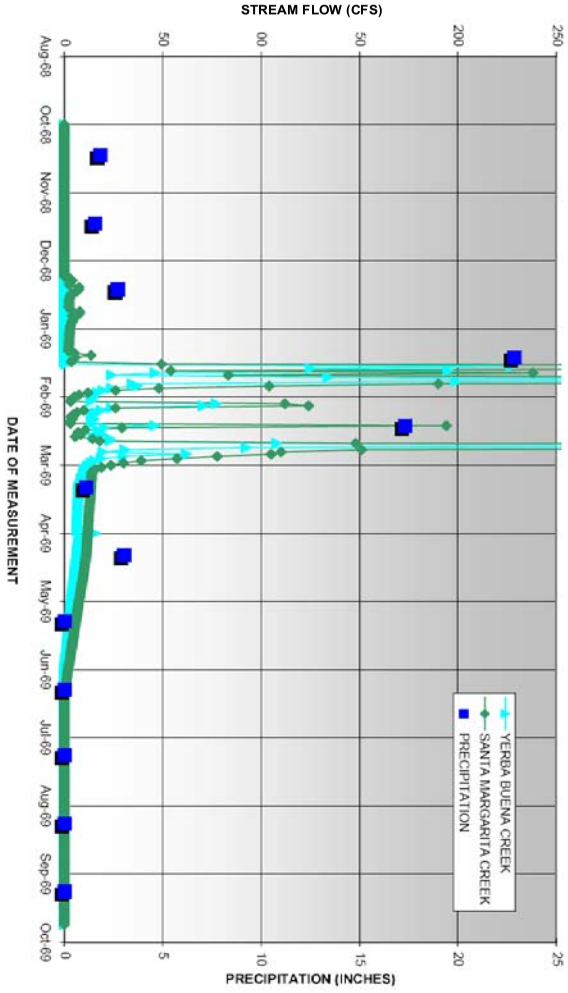


STREAM FLOW VERSUS PRECIPITATION WET YEAR 1997-1998
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE D4

Santa Margarita Creek 1968-1969 Wet Year (50.42 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	0.00	0.00	0.00
DECEMBER	2.50	148.76	177.00
JANUARY	4.00	238.02	8,694.00
FEBRUARY	10.00	595.04	6,215.00
MARCH	12.00	714.05	1,143.00
APRIL	8.00	476.03	634.00
MAY	3.00	178.51	347.00
JUNE	0.00	0.00	46.00
JULY	0.00	0.00	0.00
AUGUST	0.00	0.00	0.00
SEPTEMBER	0.00	0.00	0.00
OCTOBER	0.00	0.00	0.00
	TOTAL	2,350.41	17,256.00
BASE FLOW PERCENT OF TOTAL FLOW			14%
TOTAL RAINFALL ON WATERSHED			25,815.04

PLATE D5



STREAM FLOW VERSUS PRECIPITATION WET YEAR 1968-1969
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

Yerba Buena Creek 1969 Wet Year (50.42 Inches)			
CREEK FLOW PERIOD	AVERAGE CREEK FLOW (CFS)	TOTAL BASE FLOW VOLUME (AF)	TOTAL RECORDED VOLUME (AF)
NOVEMBER	0	0.00	0
DECEMBER	0	0.00	0
JANUARY	16	952.07	2921
FEBRUARY	13	773.55	2463
MARCH	7	416.53	582
APRIL	3	178.51	396
MAY	1	19.83	163
JUNE	0	0.00	5
JULY	0	0.00	0.00
AUGUST	0	0.00	0.00
SEPTEMBER	0	0.00	0.00
OCTOBER	0	0	0
	TOTAL	2340.50	6530.00
		BASE FLOW PERCENT OF TOTAL FLOW	36%
		TOTAL RAINFALL ON WATERSHED	12,100.80

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APPENDIX E
RANCH WELL PRODUCTION TEST DATA

SANTA MARGARITA RANCH WELL SUMMARY
(partial listing of wells)

WELL #	WELL NAME Township/Range/Sec#	CASING DIAMETER & MATERIAL	WELL DEPTH (feet)	PERFORATED INTERVAL (feet)	ESTIMATED PUMPING RATE (gpm)	PUMP SETTING (feet)	WATER QUALITY (TDS)	TRANS-MISSIVTY	SPECIFIC CAPACITY
	Rinconada Creek Area								
1	Cuesta F&T Well "1"	8" PVC	460	180-290	200	160	683	1,100	2.33
	29S/13E-35R			misc. zones					
2	Cuesta Well "F"	10" PVC	520	140-340	500	120	360	28,932	20.50
	30S/13E-1D2			450-510					
3	Cuesta Well "E"	10" PVC	195	95-175	200	120	548	30,481	5.15
	30S/13E-1D1								
4	Cuesta Well "SR-2A"	8" PVC	730	140-180	200	240	336	2,299	1.94
	30S/13E-2B			misc. zones					
5	Cuesta Well "Q"	10" PVC	380	180-370	500	160	168	162,462	18.20
	29S/13E-35K								
	SUB-AREA FLOW RATE TOTAL				***1600***				
	Portuguese Corral Area								
6	Cuesta Well "P"	12" PVC	460	200-450	800	180	273	211,200	85.10
	29S/13E-35D1								
7	Cuesta Well "H1"	8" PVC	490	115-175	250	100	259	22,628	13.30
	29S/13E-27-R2			misc. zones					
8	Cuesta MH Well 27R	8" PVC	300	120-280	50	160	250	675	1.70
	29S/13E027-R1								
9	Cuesta Well "K"	10" PVC	360	185-355	180	180	553	4,950	3.16
	29S/13E-27K								
10	Cuesta Well "J"	10" PVC	375	95-155	300	180	343	7,920	9.26
	29S/13E-27P			misc. zones					
11	Cuesta Well "L-4"	8" PVC	125	65-115	30	120	No data	No data	No data
	29S/13E-27K								
12	Cuesta Well "L"	8" PVC	460	260-350	180	240	319	1,650	1.10
	29S/13E-27F			misc. zones					
	SUB-AREA FLOW RATE TOTAL				***1790***				
	One-Mile Bridge Area								
13	Cuesta Well "G"	10" PVC	440	120-220	30	no test	No data	No data	No data
	29S/13E-28H			250-430					
14	Cuesta Well "R"	12" PVC	550	295-445	300		363	2,750	3.49
	29S/13E-22P			465-540					
15	Cuesta F&T Well 2	12" PVC	110	40-100	80		429	9,850	8.59
	29S/13E-21Q								
16	Parcel E Well 2	8" PVC	455	215-455	30		No data	No data	No data
	SUB-AREA FLOW RATE TOTAL				***410***				
	Other Areas on Ranch Property								
17	Mountain Well #1	8" PVC	520	misc. zones	300		370		
18	Mountain Well #2	8" PVC	440	misc. zones	300	220	260		
19	Trout Creek Well #1	12" PVC	95	35-95	950	80	310	250k +	>500
20	China Gardens #1	8" PVC	720	misc. zones	200				
21	China Gardens #2	8" PVC	160	50-150	250				
22	Hertel Agricultural	12" PVC	320	misc. zones	700	210	170	168k	51.1
	SUB-AREA FLOW RATE TOTAL				***2700***				
	TOTAL-AREA FLOW RATE in GPM				***6500***				

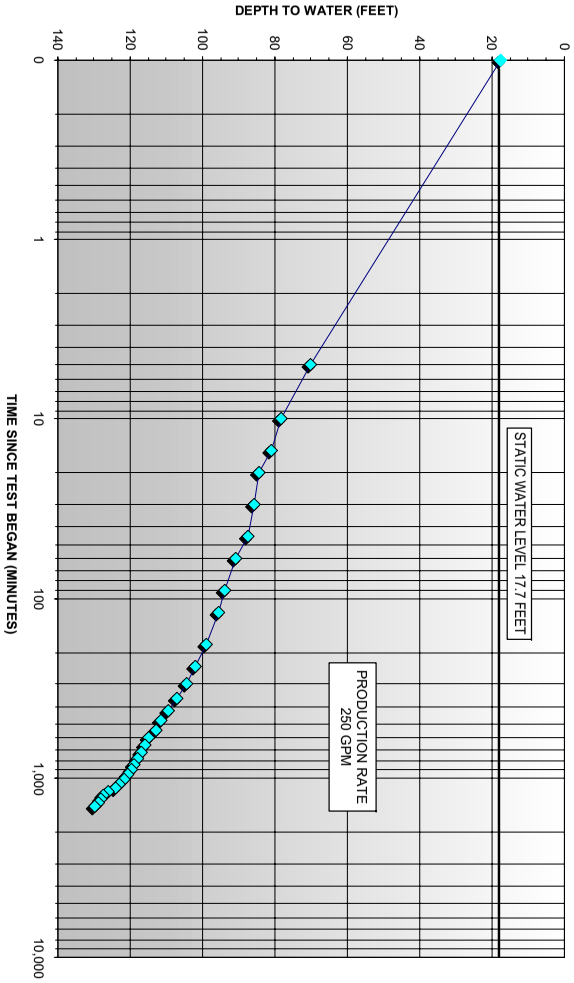
NOTE: Partial listing of wells. There are other wells & well drilling sites on the Ranch for future development

WellYieldSum 5/11/2006

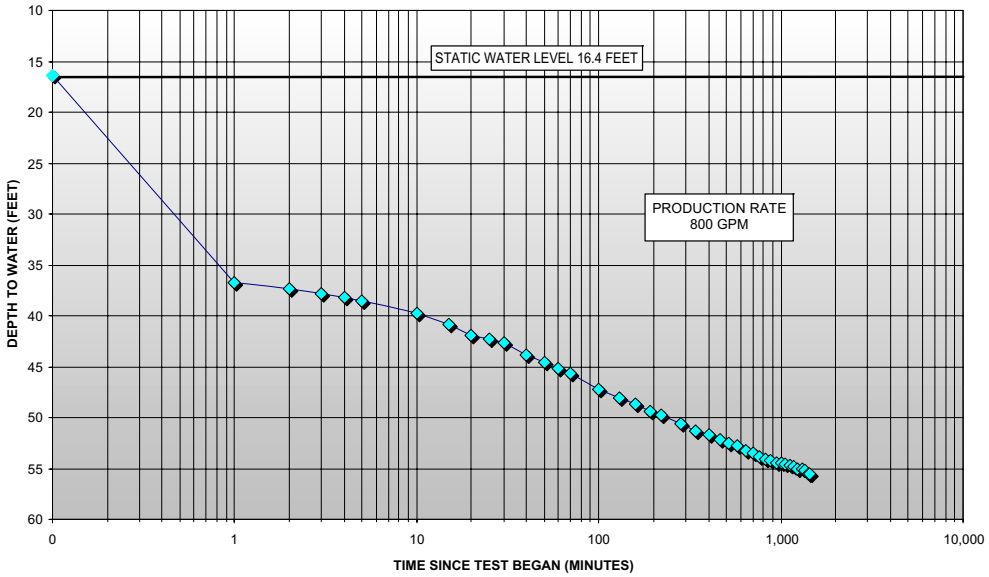
SANTA MARGARITA RANCH WELL SUMMARY
RICK HOFFMAN AND ASSOCIATES, MAY 10, 2006
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E1

PLATE E2



CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-35R (Cuesta F&T Well "1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California



CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 30S/13E-01D (Cuesta Well "F")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E4

June 2006
Project No. 05-012-01

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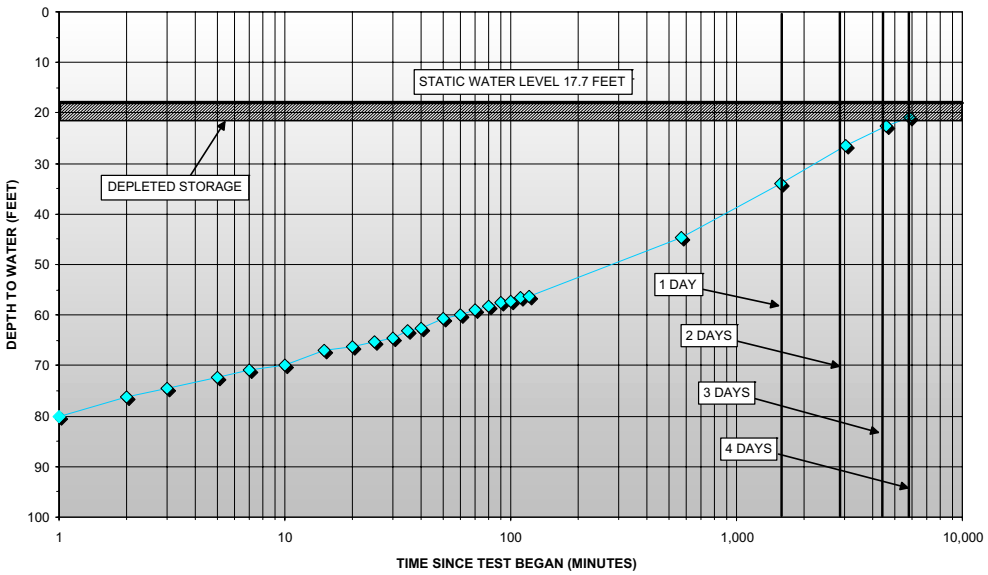
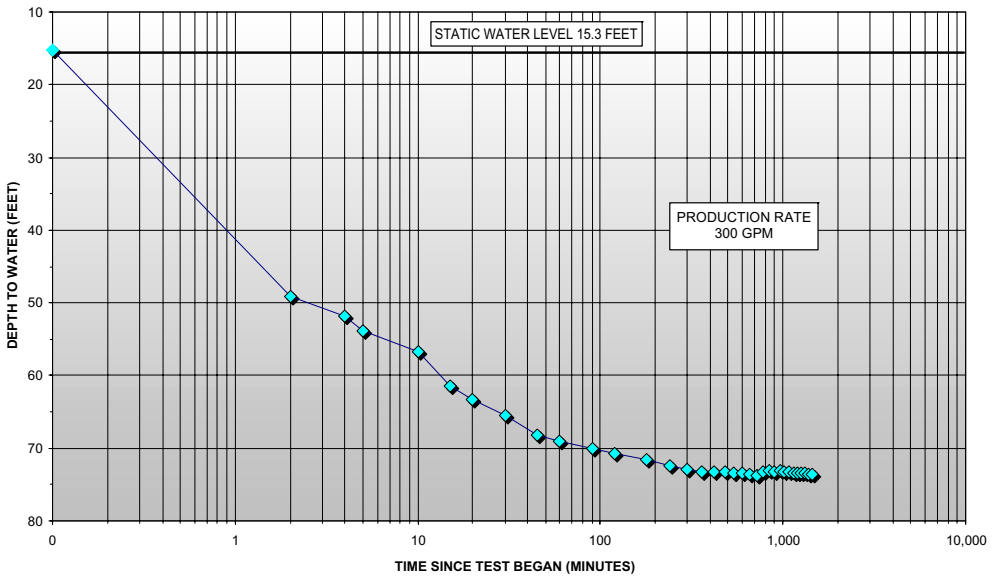


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-35R (Cuesta F&T Well "1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E3

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

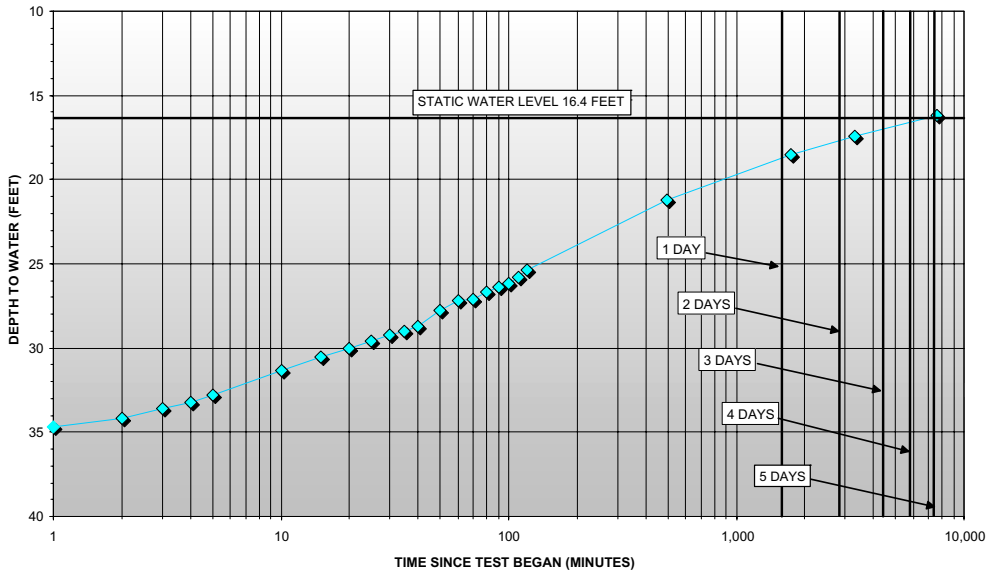


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 30S/13E-01E (Cuesta Well "E")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E6

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

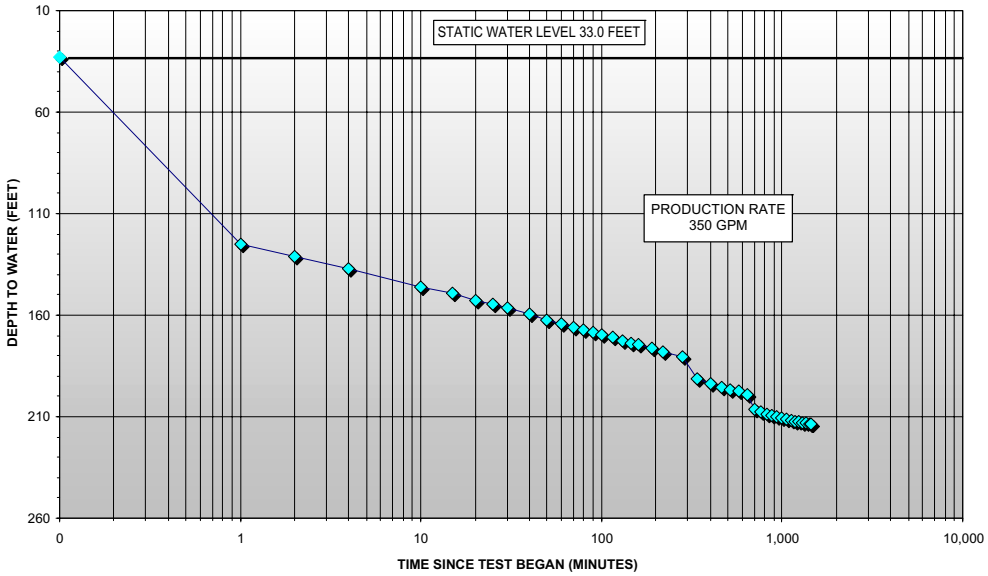


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 30S/13E-01D (Cuesta Well "F")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E5

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

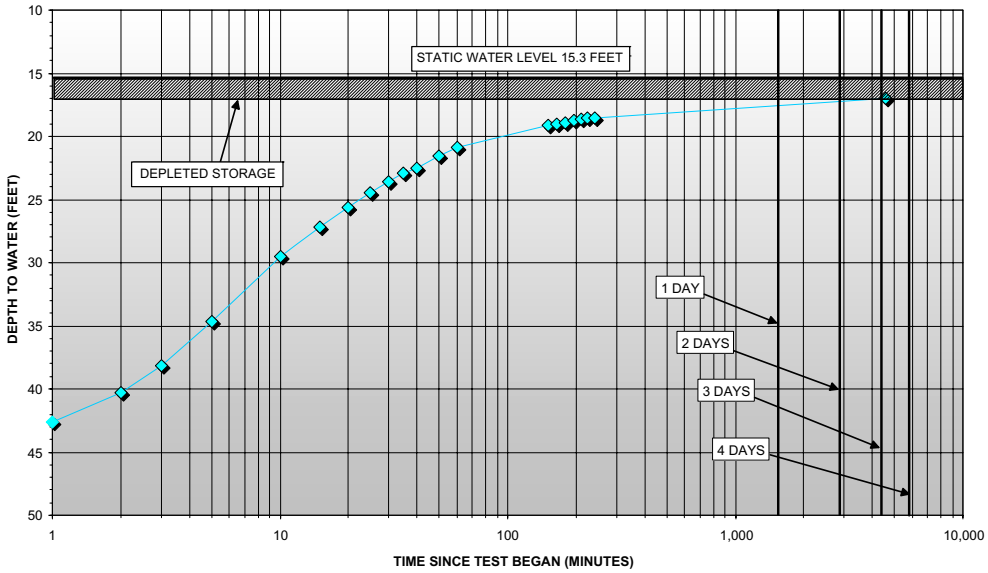


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 30S/13E-02B (Cuesta Well "SR-2A")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E8

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

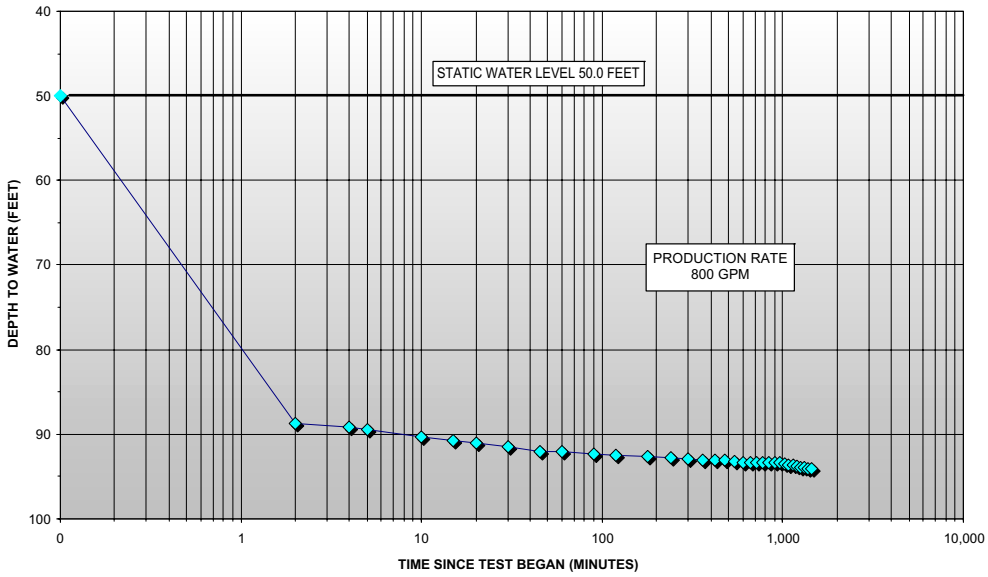


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 30S/13E-01E (Cuesta Well "E")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E7

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

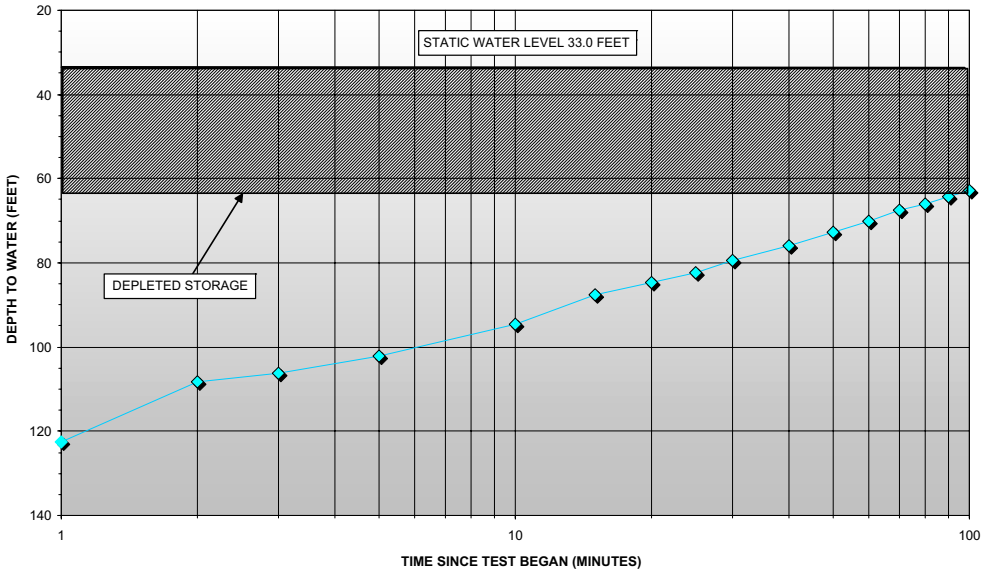


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-35L (Cuesta Well "Q")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E10

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

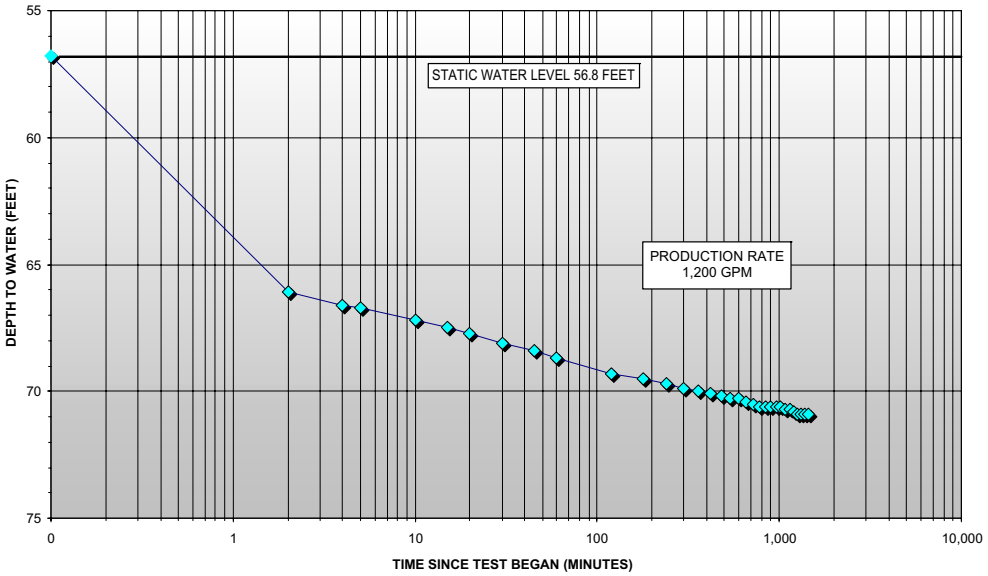


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 30S/13E-02B (Cuesta Well "SR-2A")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E9

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

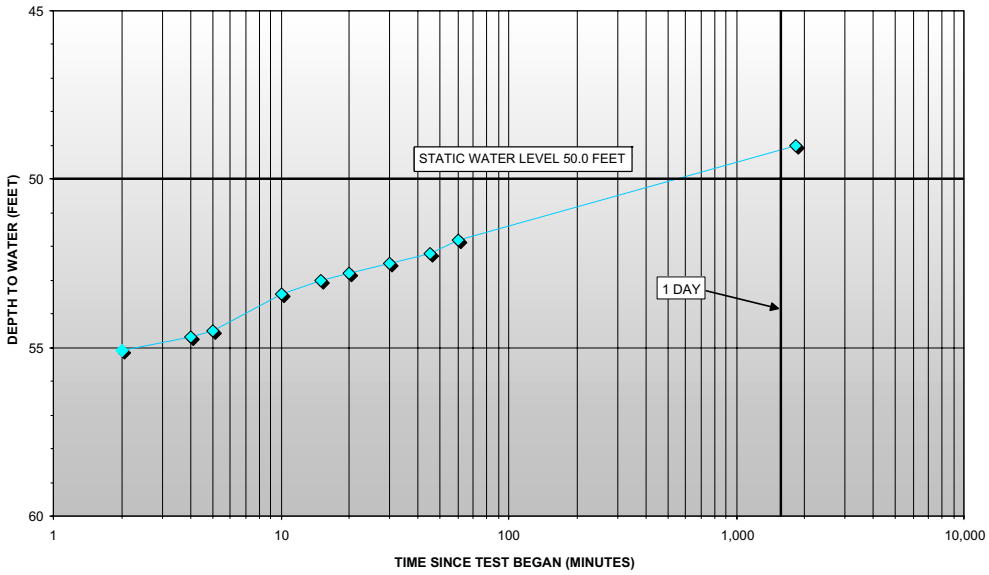


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-35D01 (Cuesta Well "P")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E12

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

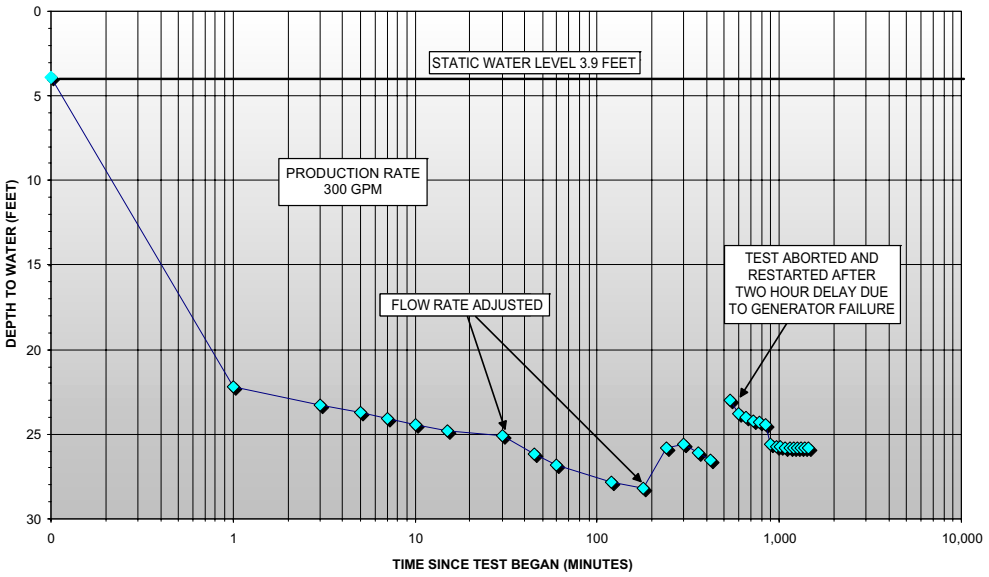


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-35L (Cuesta Well "Q")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E11

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

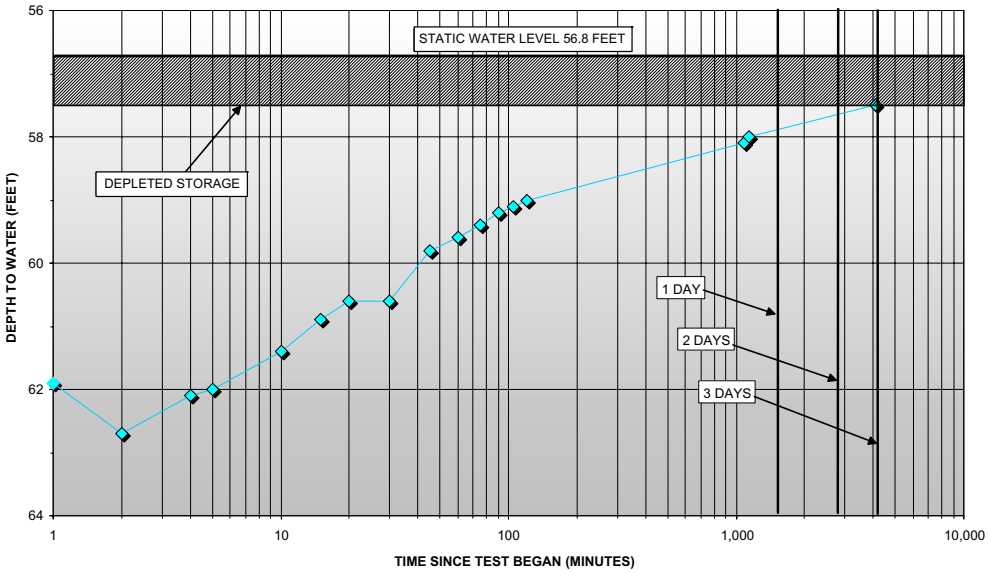


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-27R (Cuesta Well "H1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E14

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

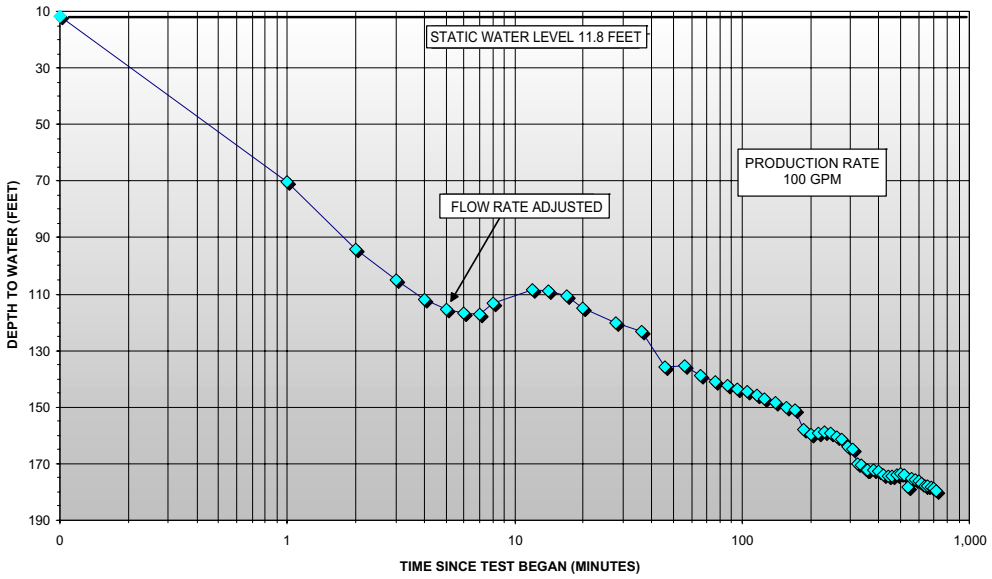


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-35D01 (Cuesta Well "P")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E13

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

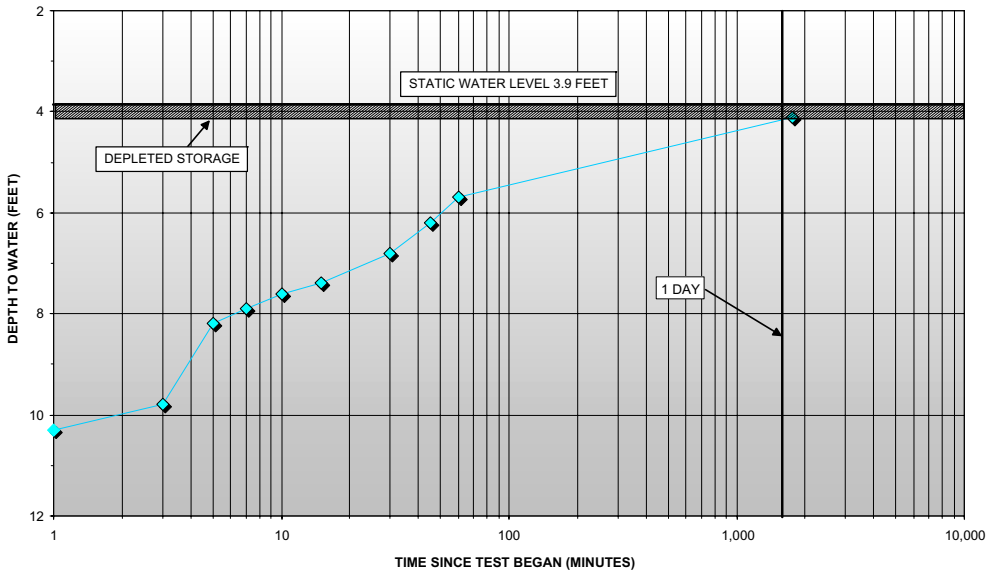


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-27Q (Cuesta MH Well 27R)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E16

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

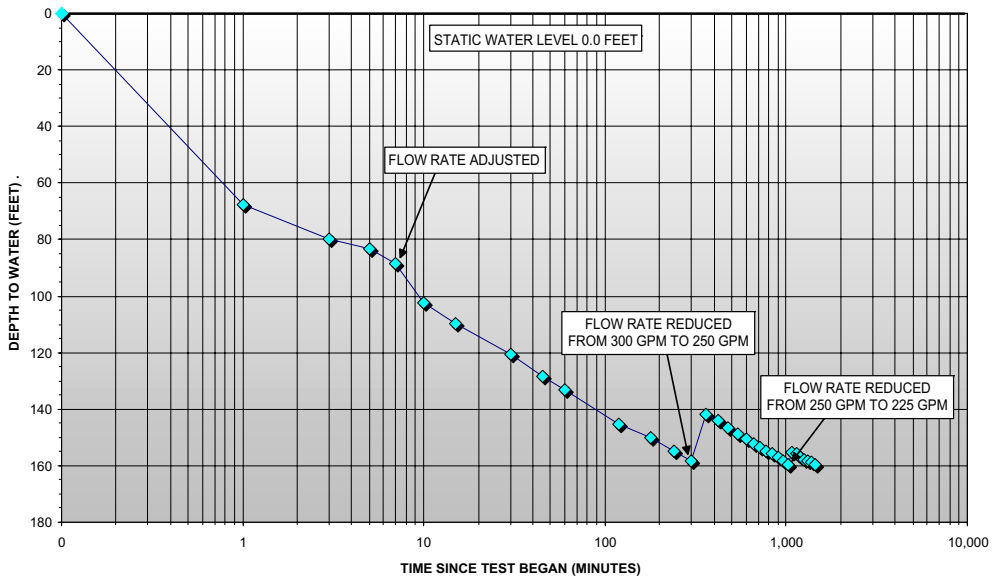


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-27R (Cuesta Well "H1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E15

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

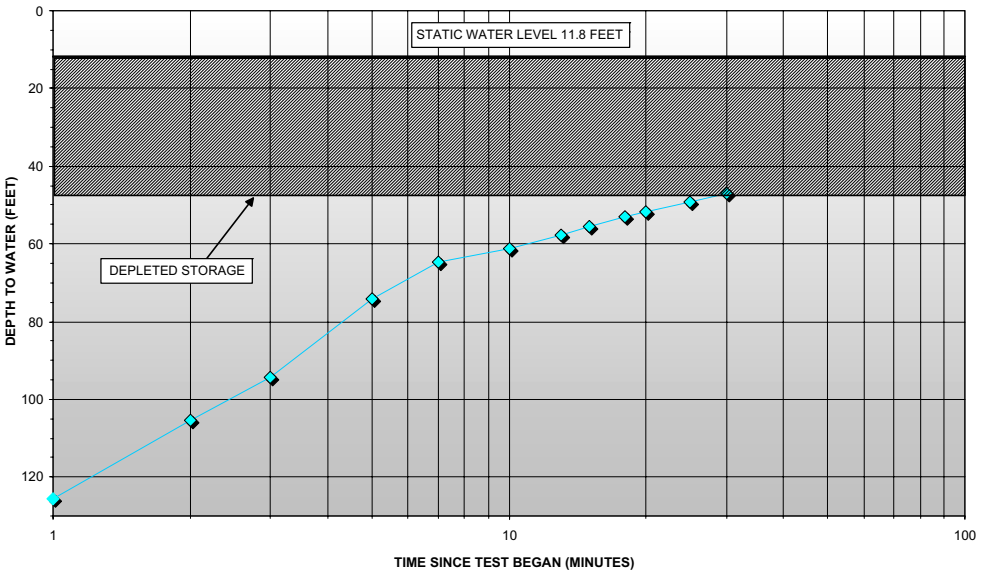


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-27K (Cuesta Well "K")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E18

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

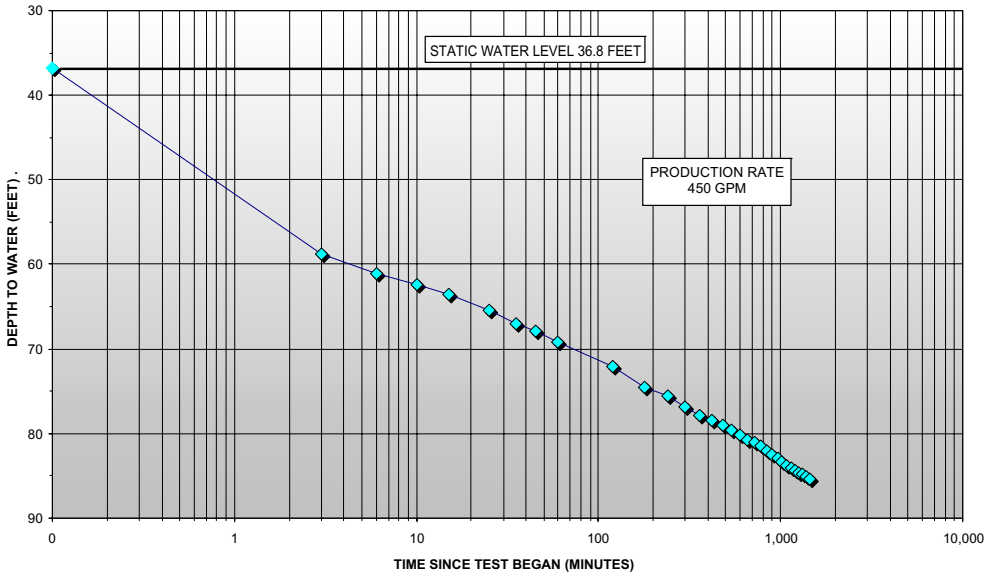


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-27Q (Cuesta MH Well 27R)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E17

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

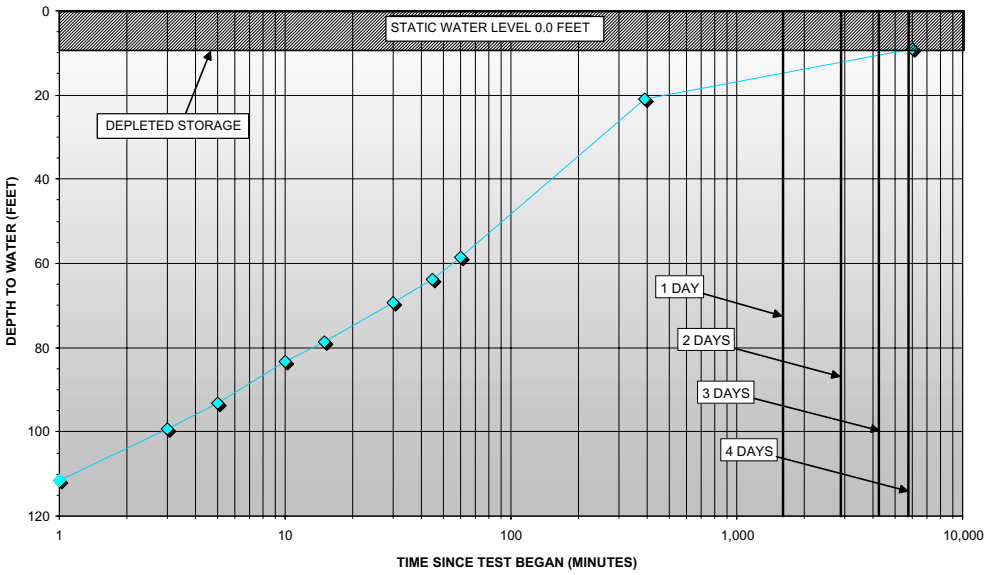


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-27P (Cuesta Well "J")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E20

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

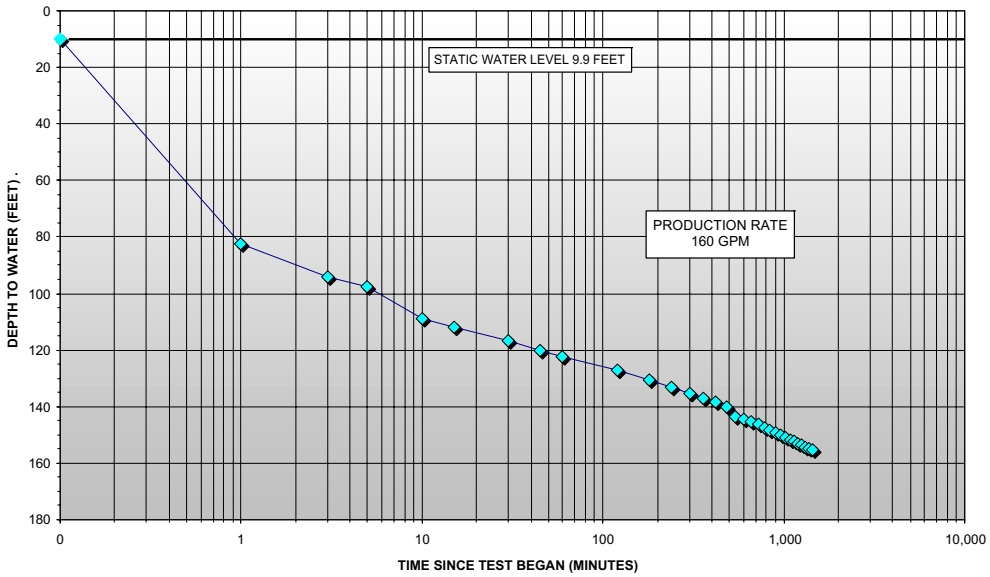


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-27K (Cuesta Well "K")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E19

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

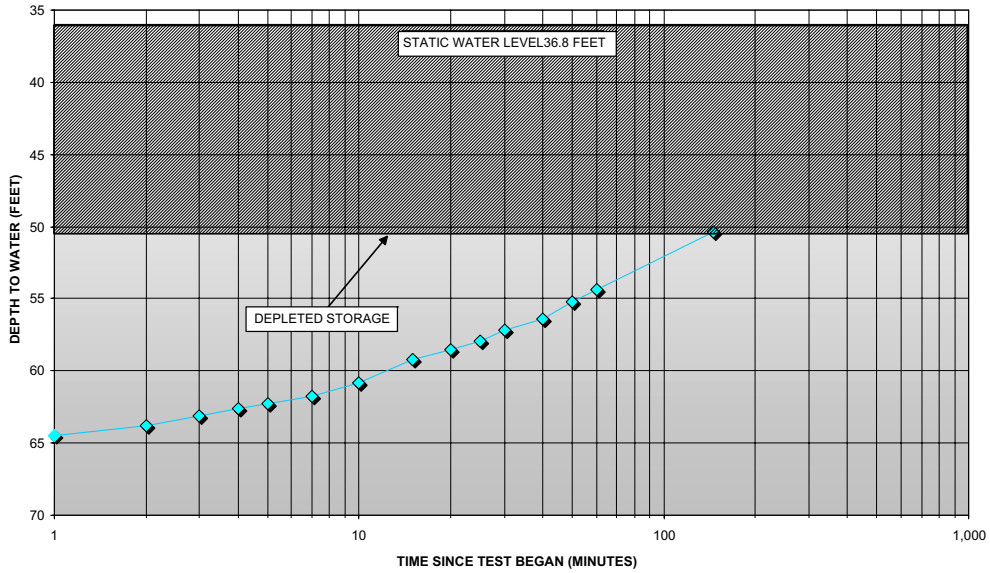


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-27F (Cuesta Well "L")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E22

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

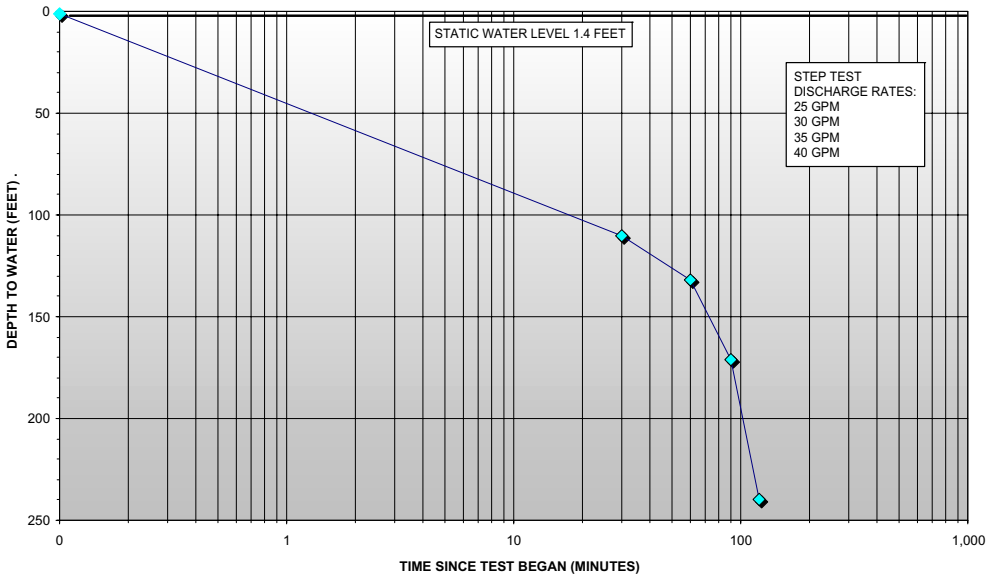


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-27P (Cuesta Well "J")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E21

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

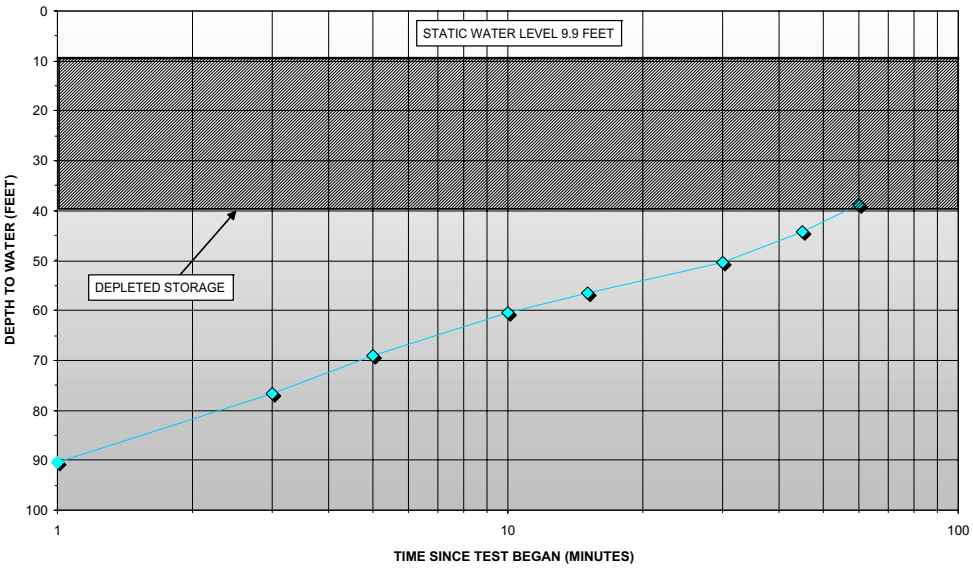


VARIABLE RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-28H (Cuesta Well "G")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E24

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

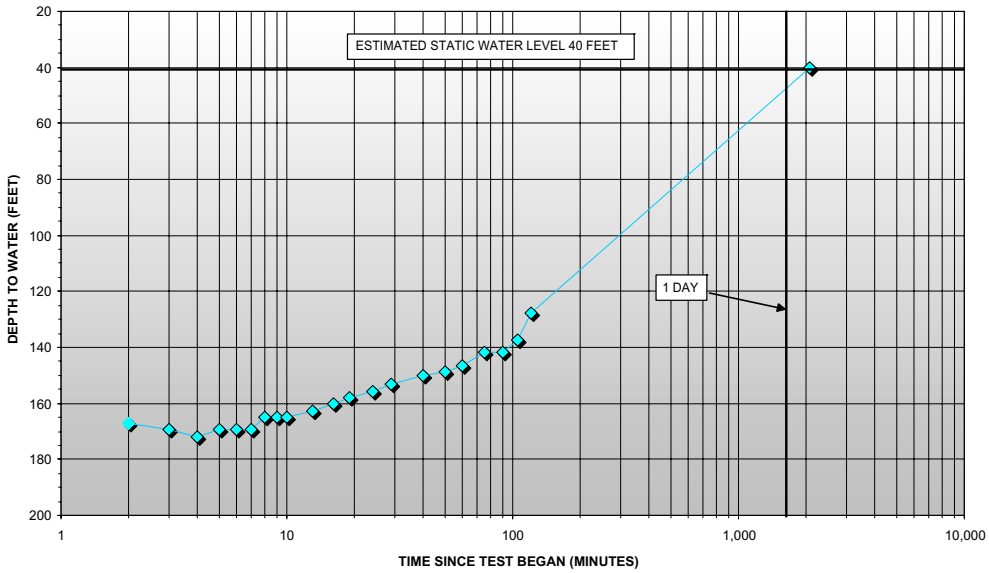


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-27F (Cuesta Well "L")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E23

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS



TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-22P (Cuesta Well "R")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E26

June 2006
Project No. 05-012-01

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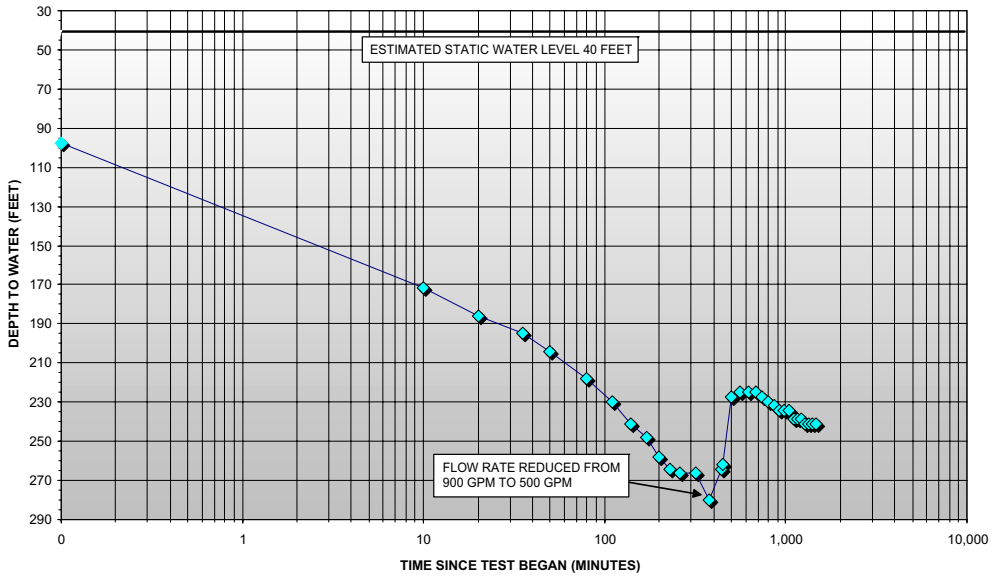
GROUNDWATER
CONSULTANTS

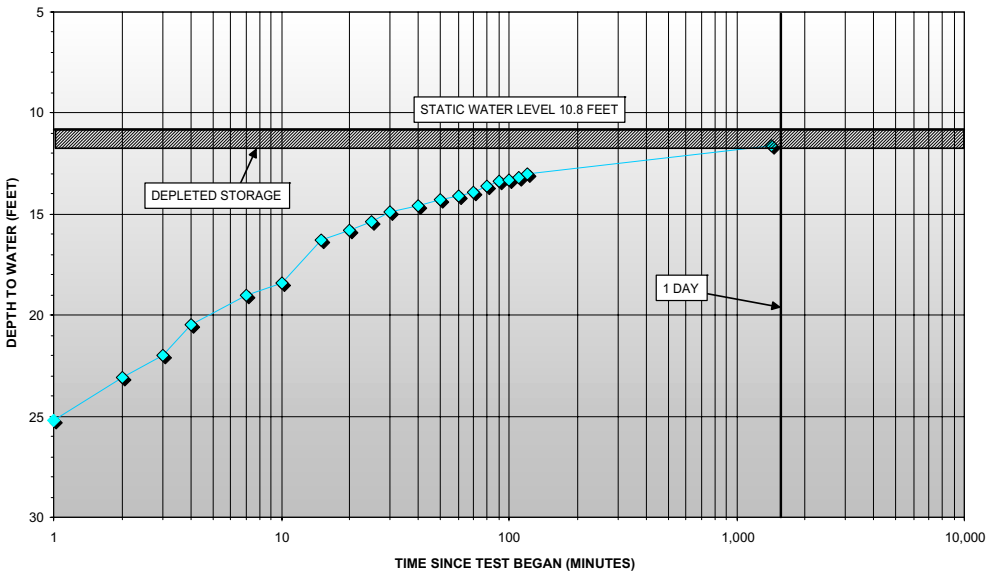


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-22P (Cuesta Well "R")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E25

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

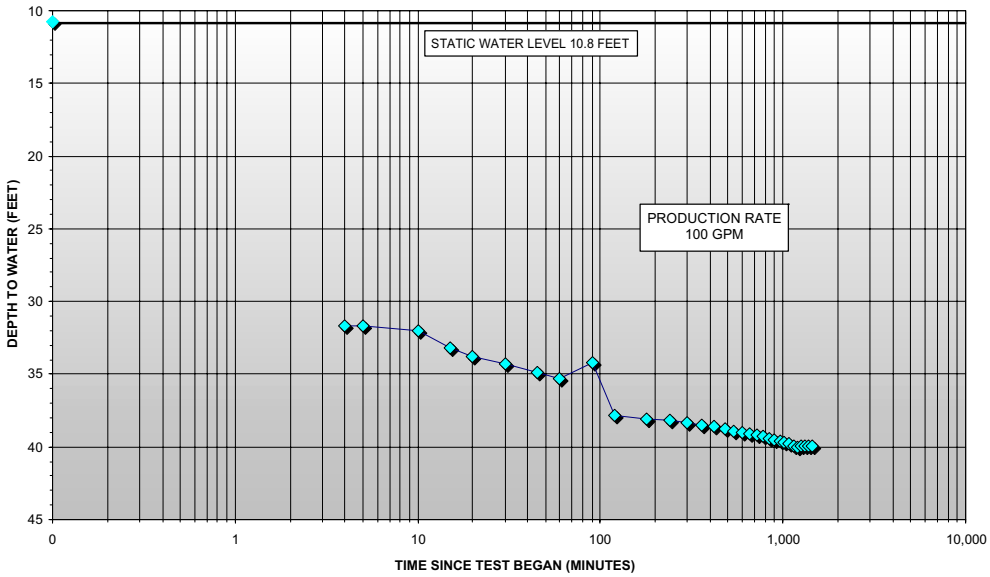


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-21P (Cuesta F&T Well "2")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E28

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

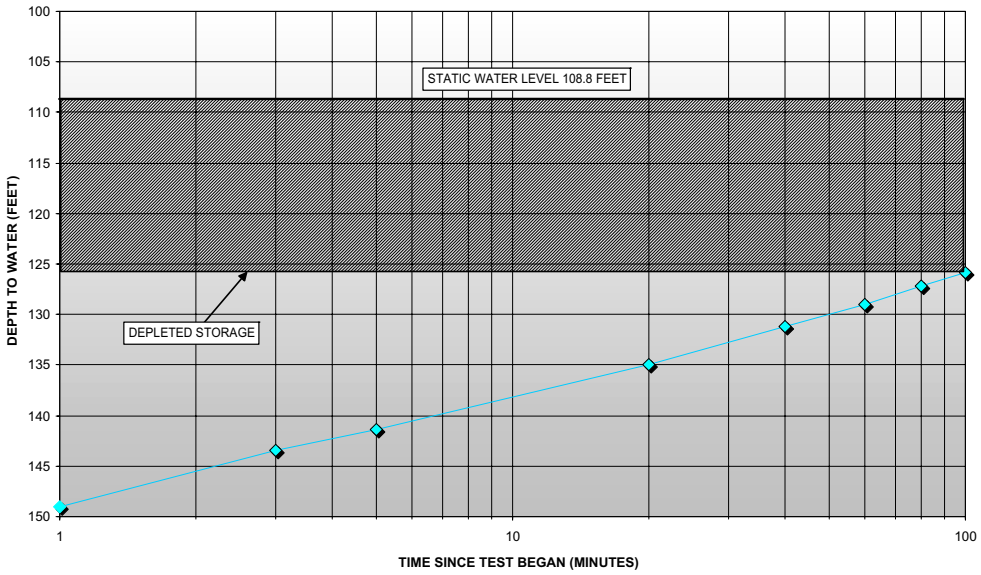


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-21P (Cuesta F&T Well "2")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E27

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

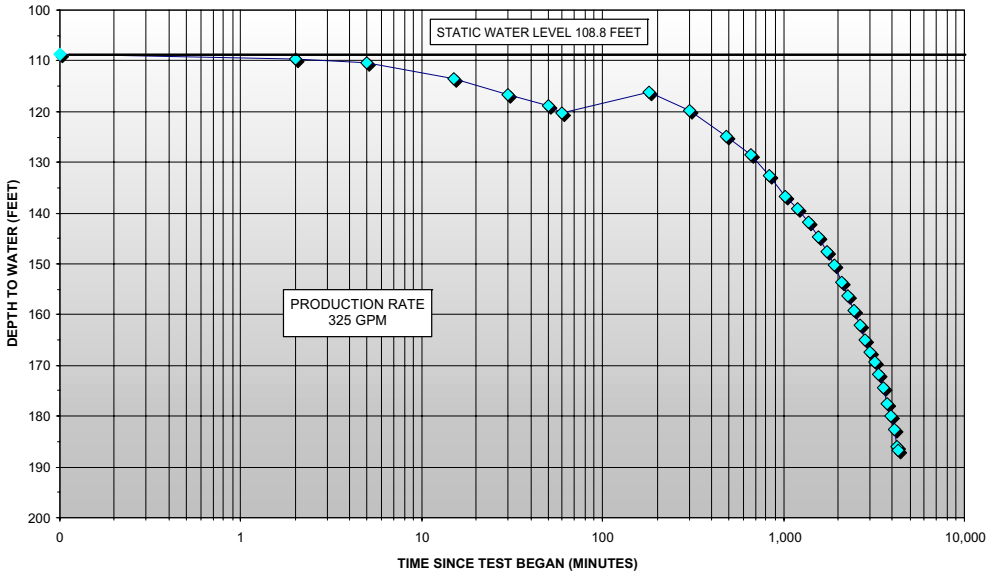


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 30S/13E-06F02 (Mountain Well No. 1)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E30

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

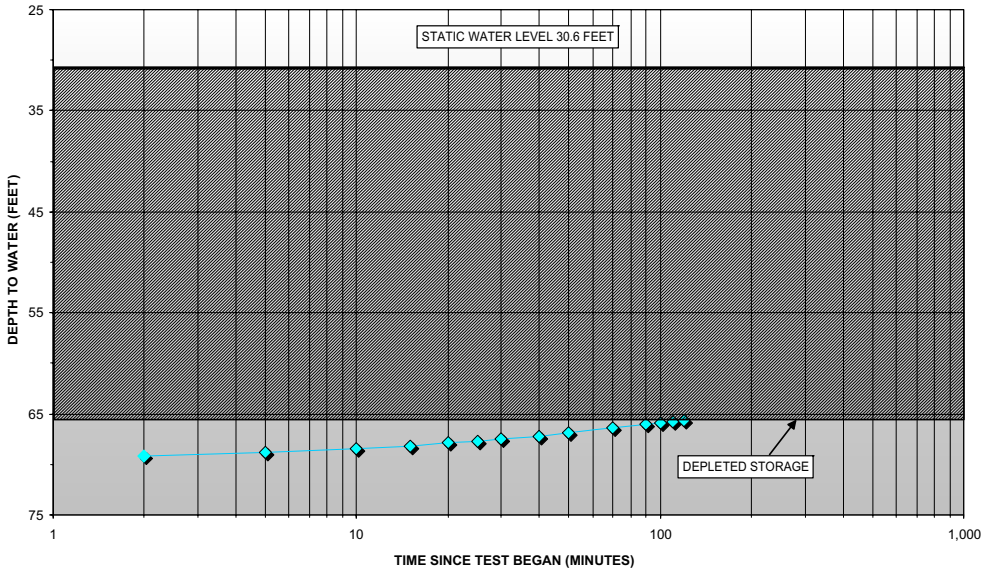


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 30S/13E-06F02 (Mountain Well No. 1)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E29

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

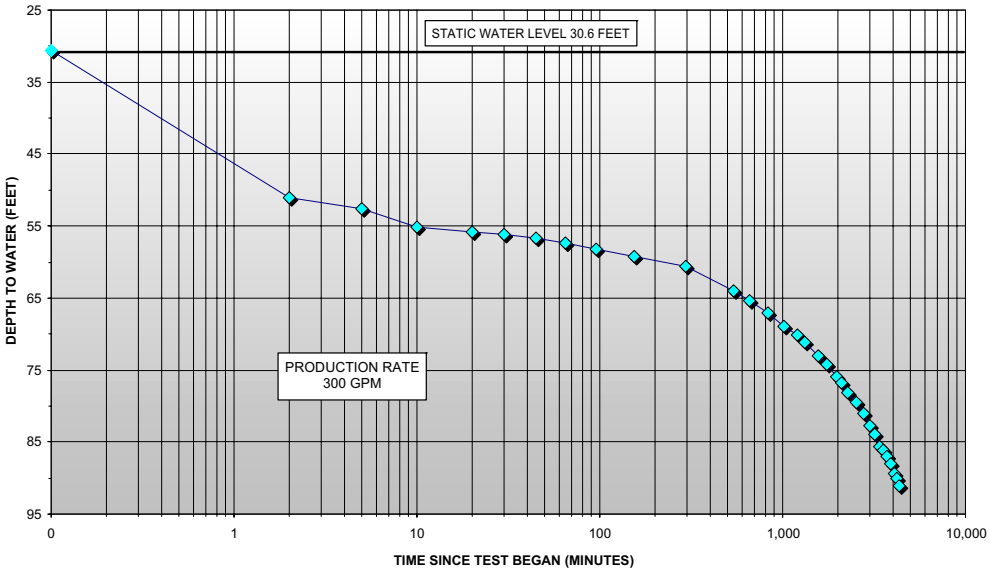


TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-31F (Mountain Well No. 2)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E32

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

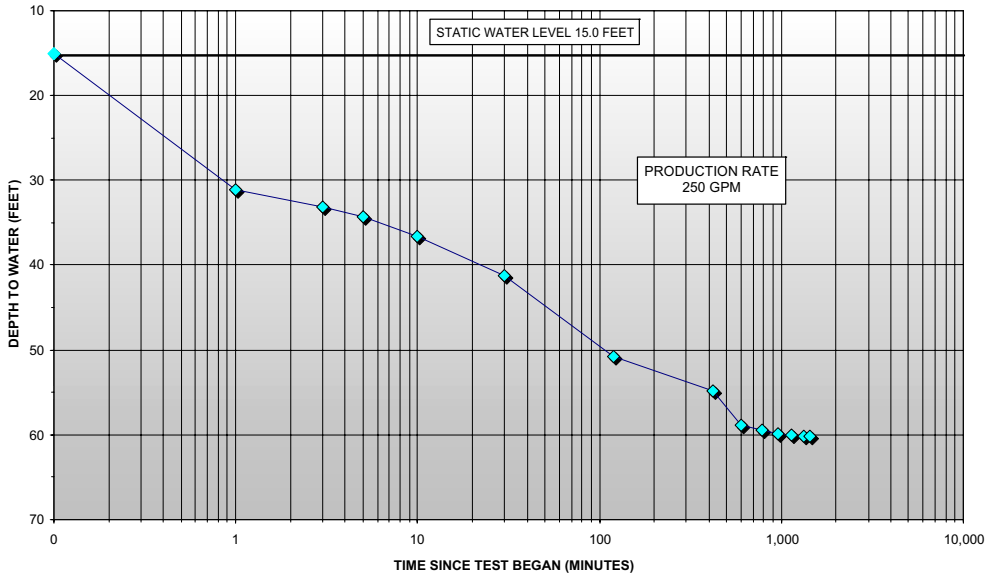


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-31F (Mountain Well No. 2)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E31

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

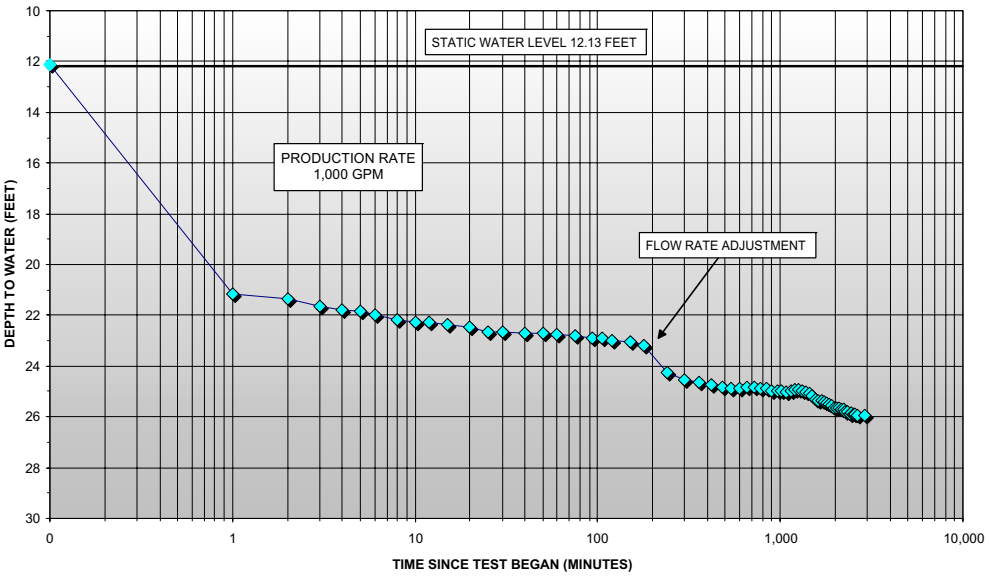


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 30S/13E-08C (China Gardens Well No. 2)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E34

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

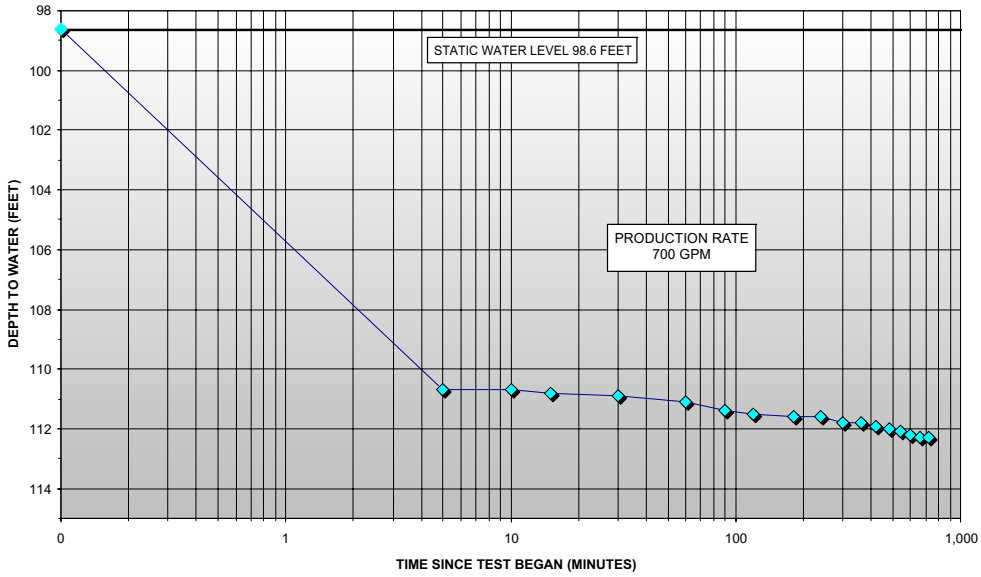


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 30S/13E-03D (Trout Creek Well No. 1)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E33

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

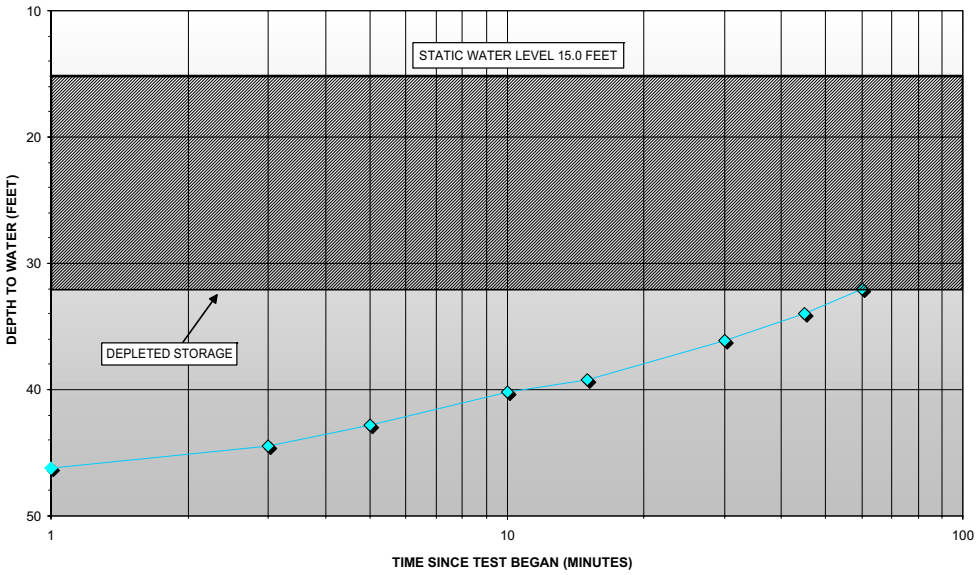


CONSTANT RATE DISCHARGE TEST HYDROGRAPH
STATE WELL NUMBER 29S/13E-35F (Hertel Agricultural)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E36

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS



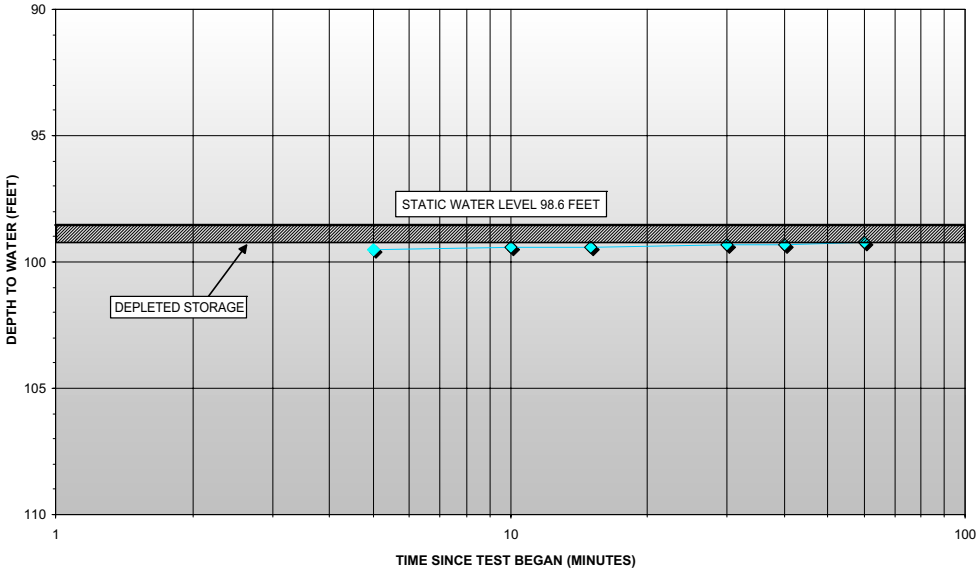
TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 30S/13E-08C (China Gardens Well No. 2)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE E35

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

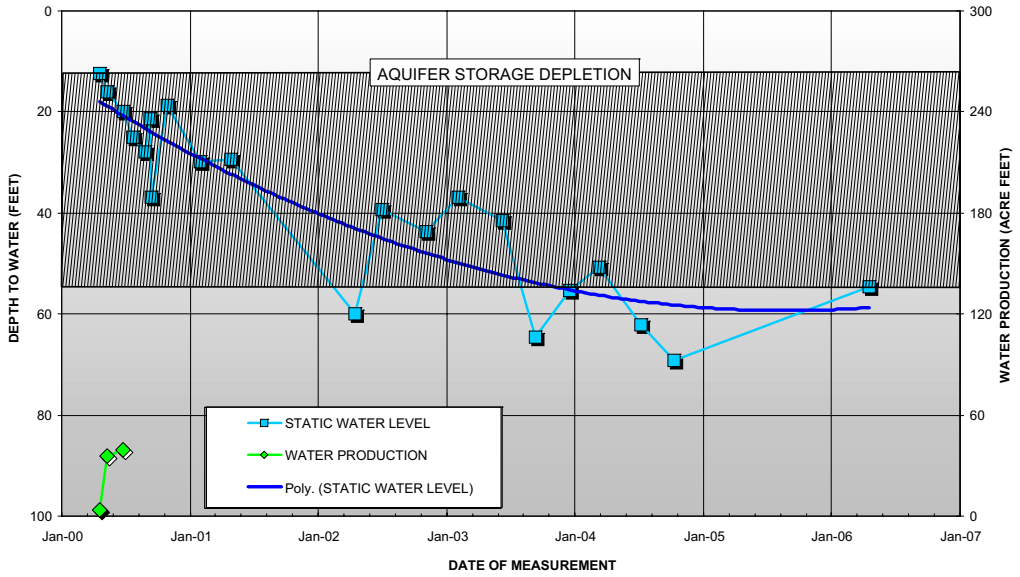
APPENDIX F
GROUNDWATER HYDROGRAPHS AND
CUMULATIVE WELL PRODUCTION DATA



TEST RECOVERY HYDROGRAPH
STATE WELL NUMBER 29S/13E-35F (Hertel Agricultural)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

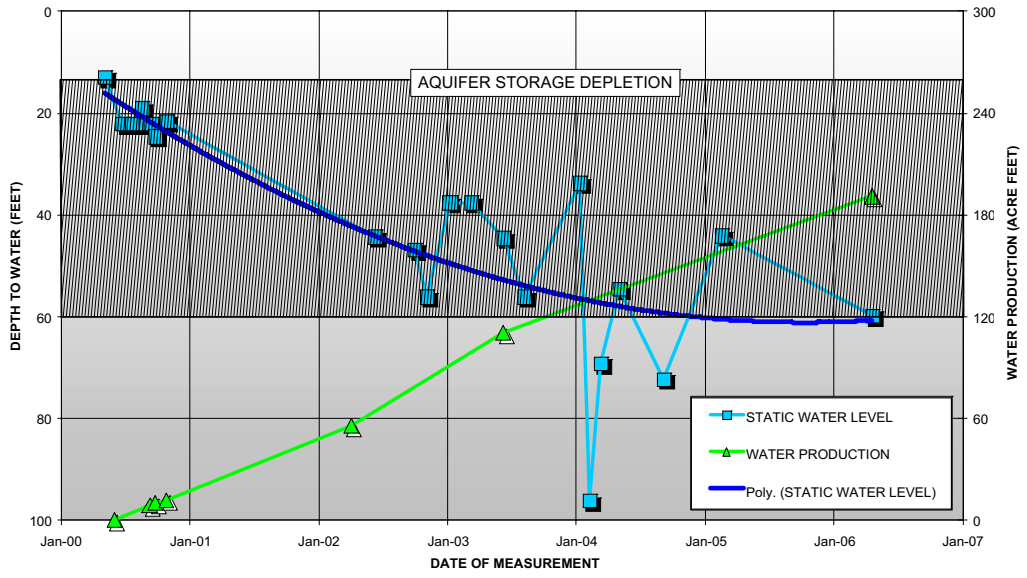


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-01D (Cuesta Well "F")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F2

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

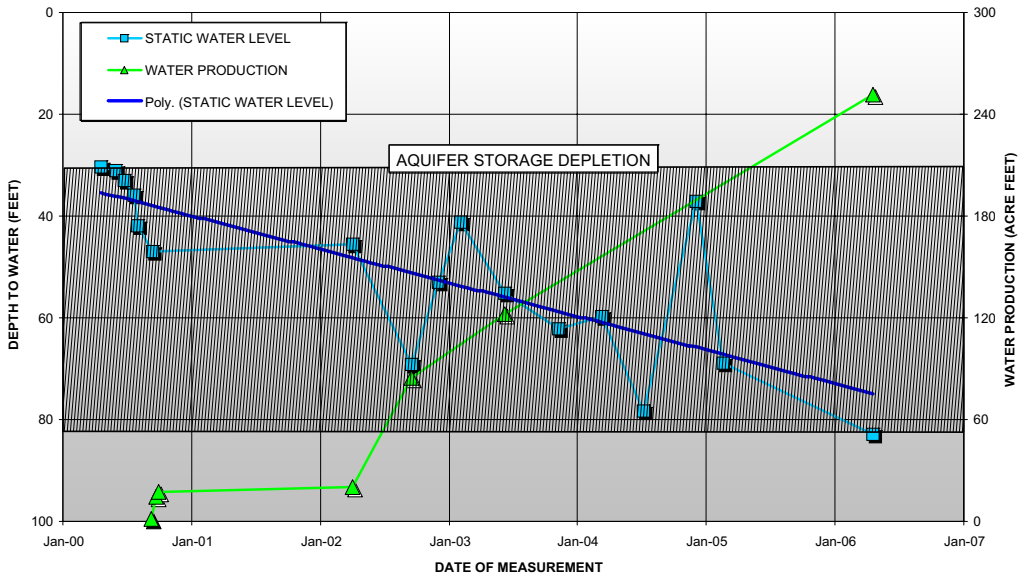


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-35R (Cuesta F&T Well "1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F1

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

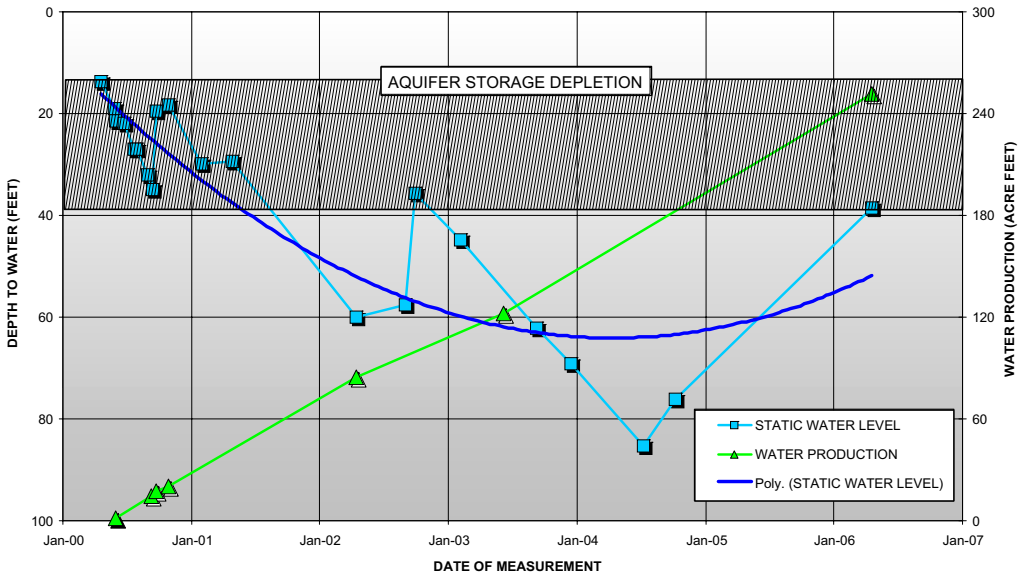


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-02B (Cuesta Well "SR-2A")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F4

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

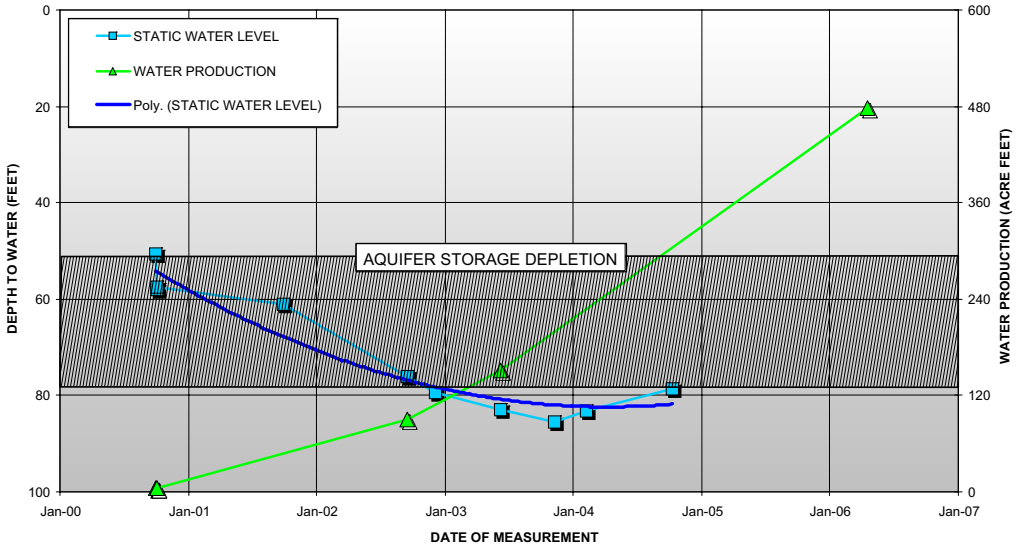


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-01E (Cuesta Well "E")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F3

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

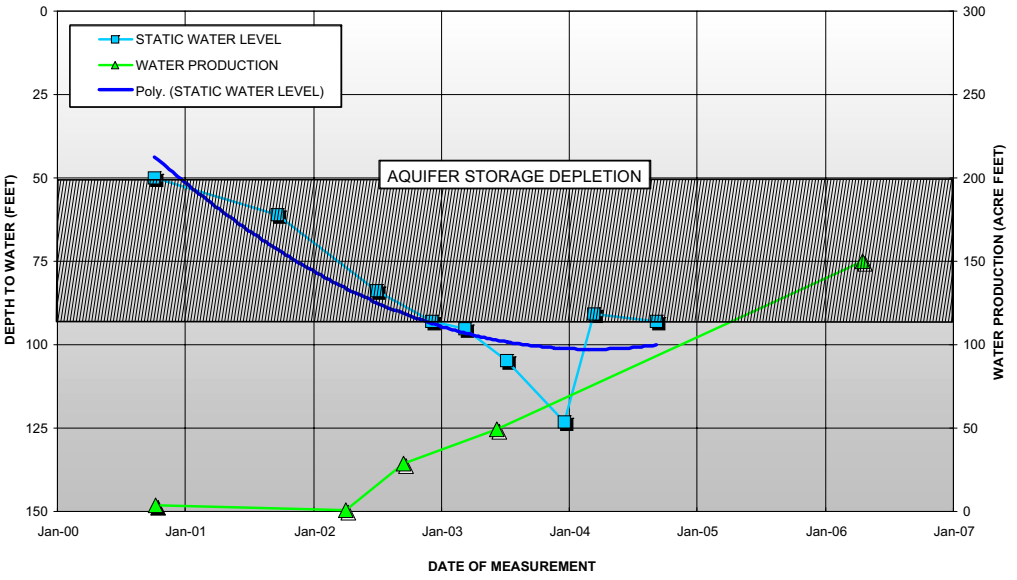


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-35D01 (Cuesta Well "P")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F6

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

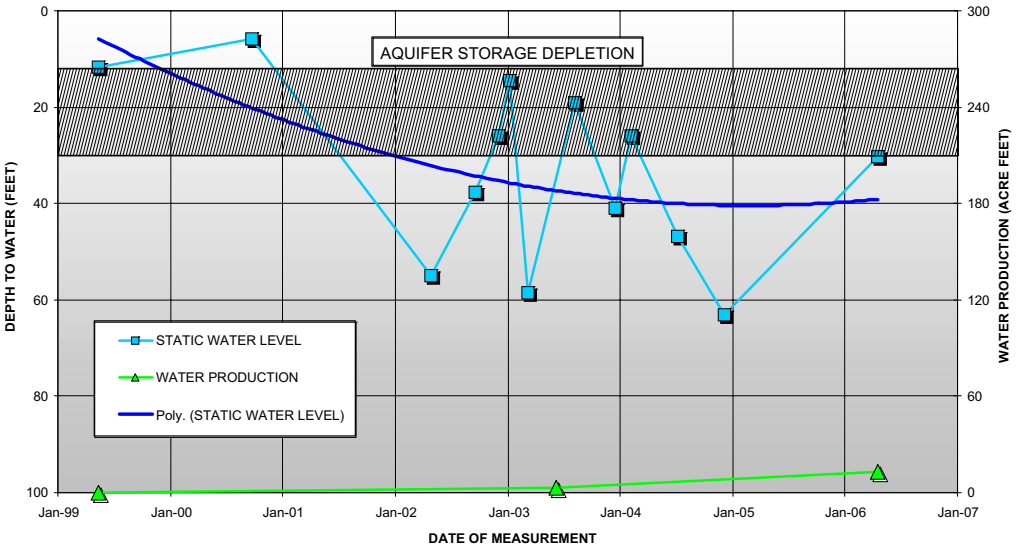


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-35L (Cuesta Well "Q")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F5

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

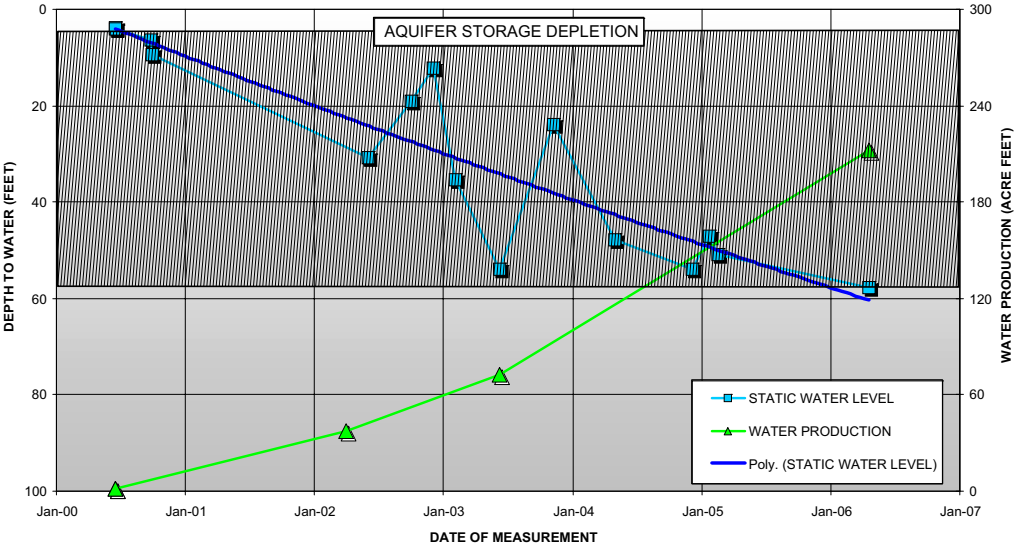


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-27Q (Cuesta MH Well 27R)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F8

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

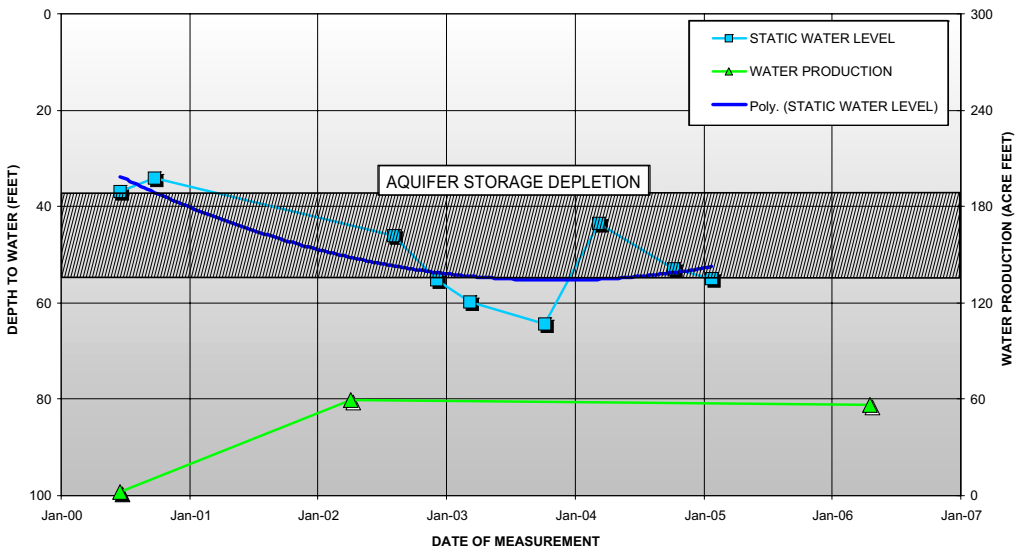


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-27R (Cuesta Well "H1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F7

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

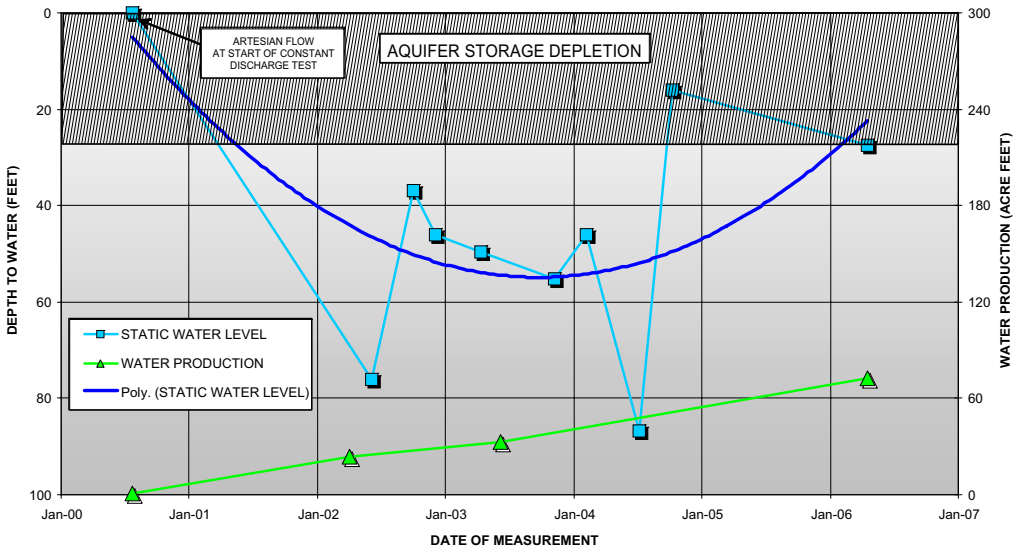


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-27P (Cuesta Well "J")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F10

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER CONSULTANTS

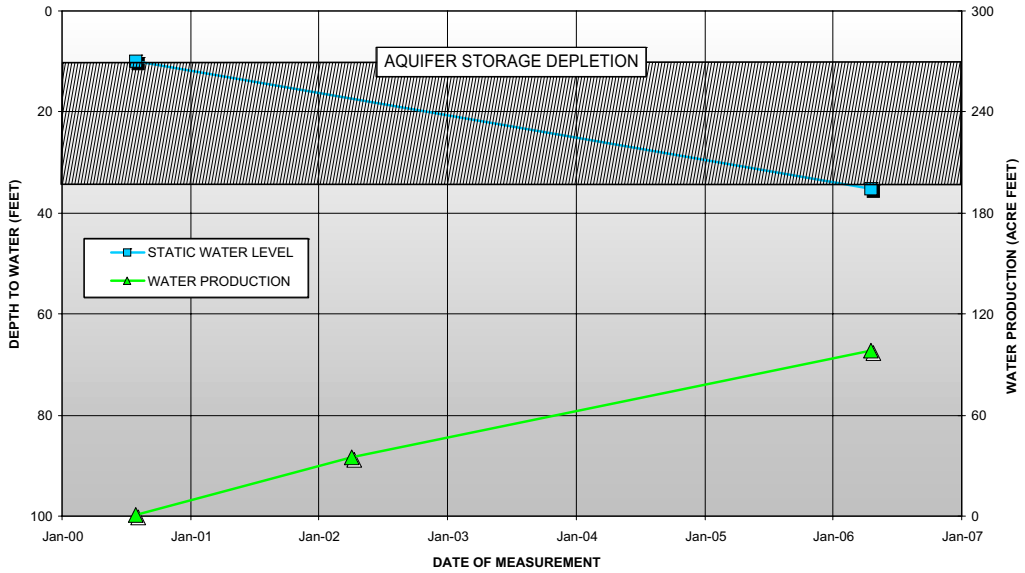


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-27K (Cuesta Well "K")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F9

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER CONSULTANTS

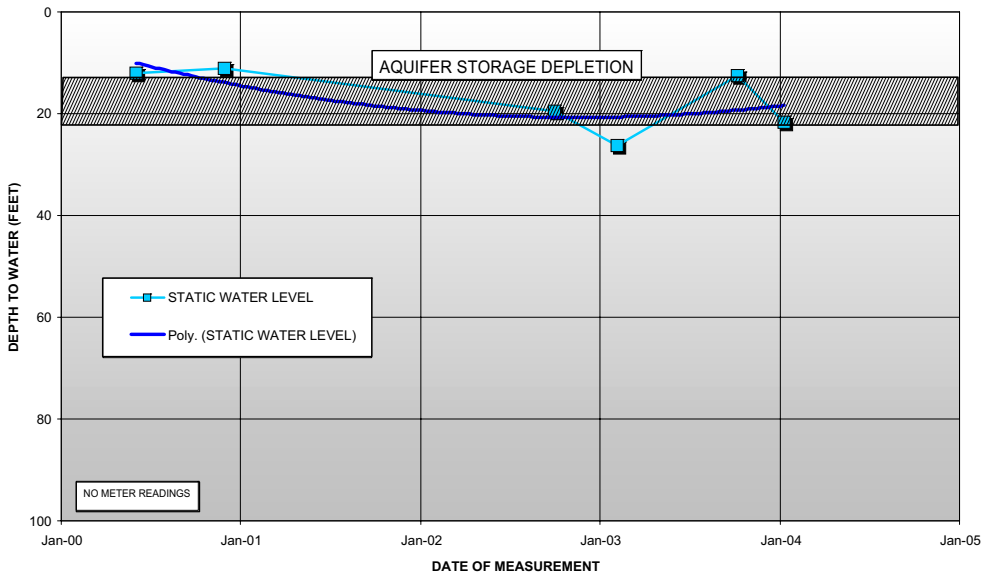


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-27F (Cuesta Well "L")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F12

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER CONSULTANTS

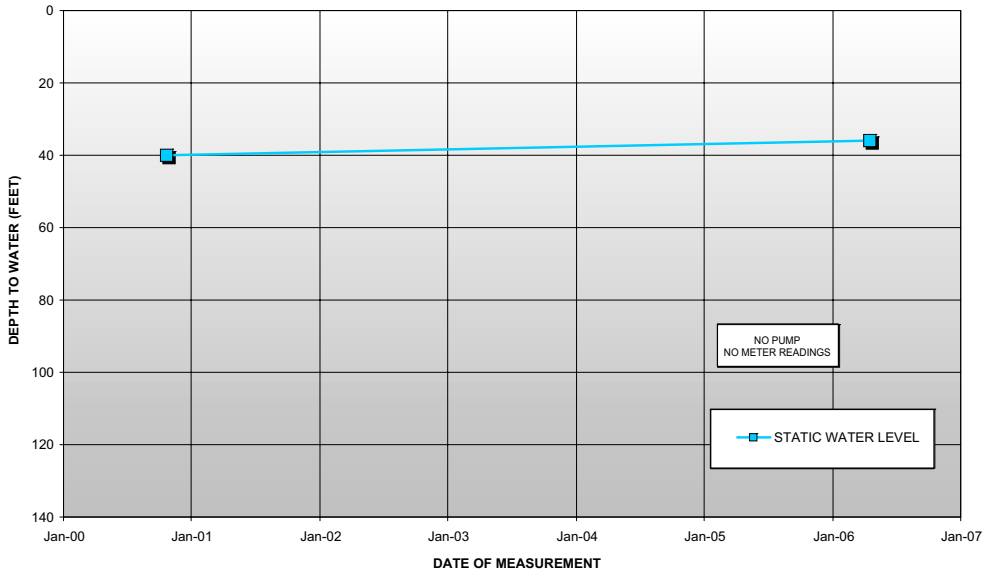


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 29S/13E-27L (Cuesta Well "L-4")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F11

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER CONSULTANTS

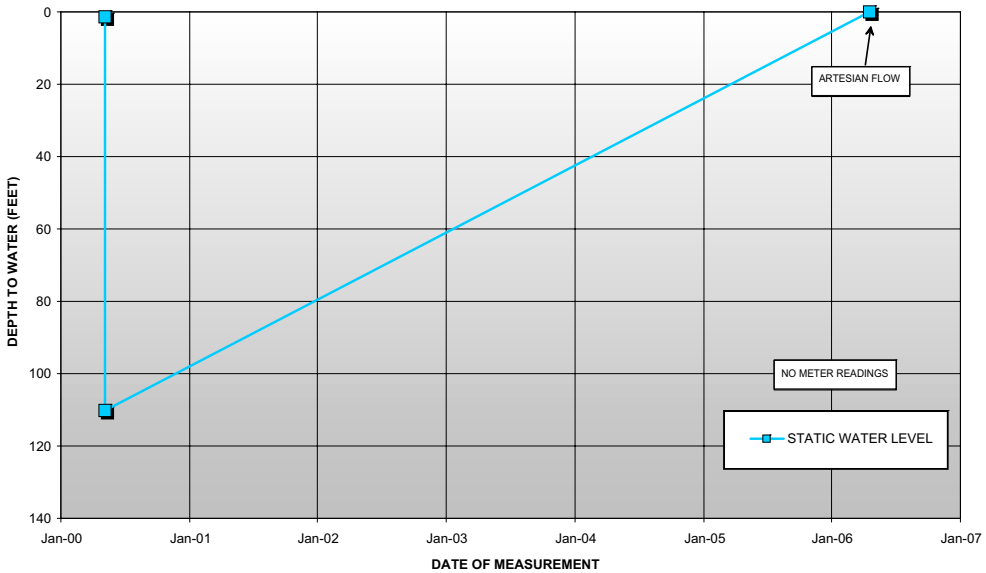


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 29S/13E-22P (Cuesta Well "R")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F14

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

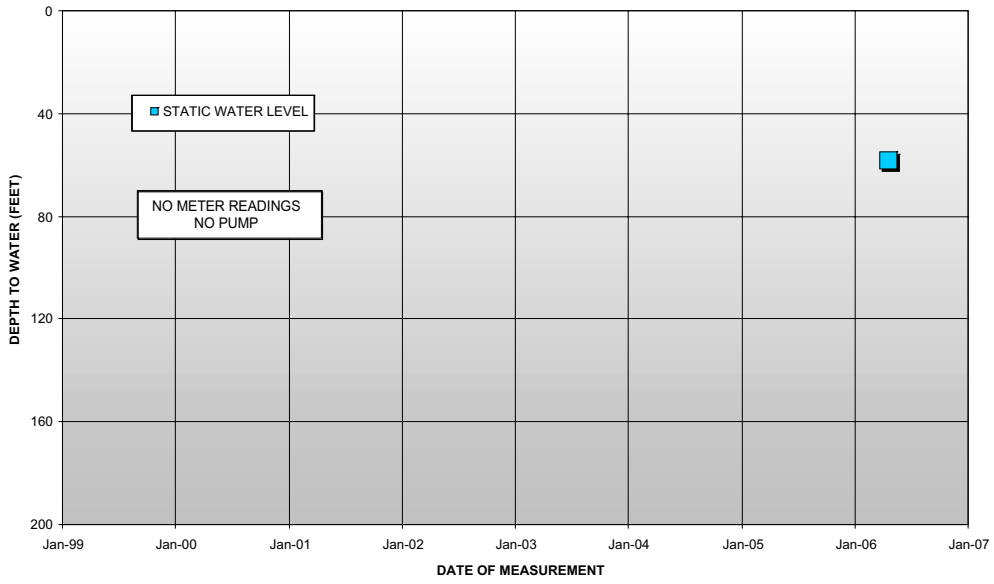


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 29S/13E-28H (Cuesta Well "G")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F13

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

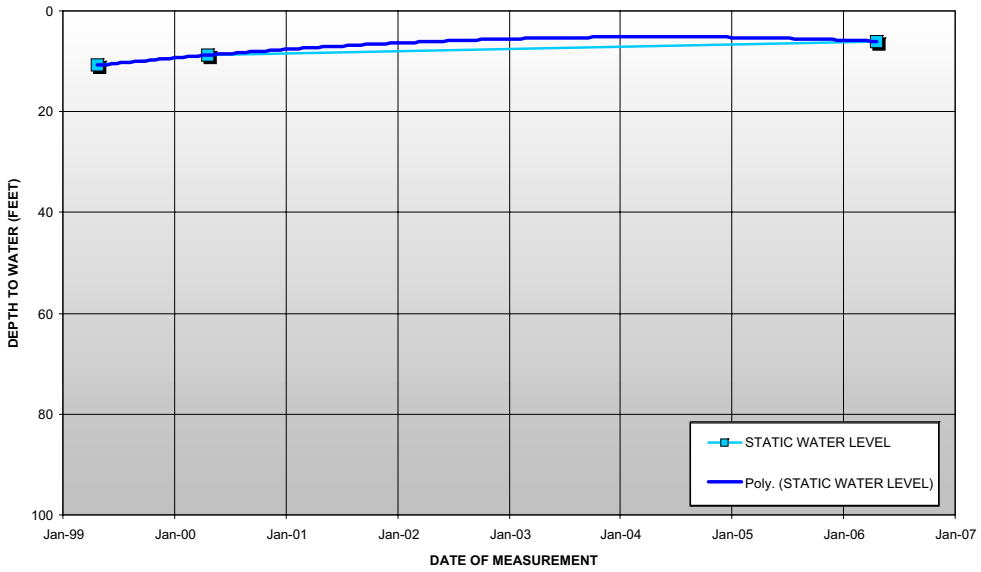


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER NOT AVAILABLE (PARCEL E WELL NO. 2)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F16

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

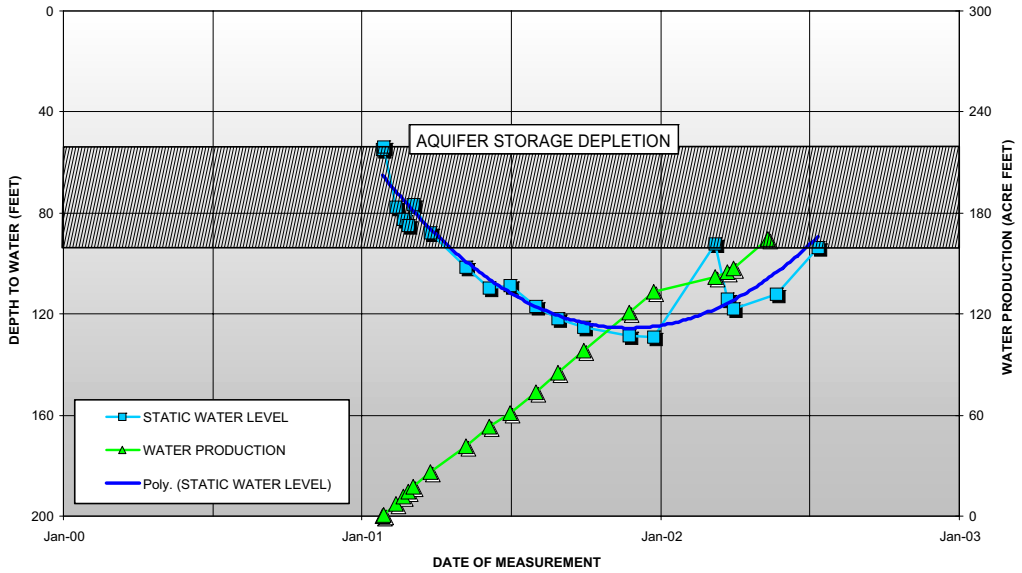


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 29S/13E-21P (Cuesta F&T Well "2")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F15

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

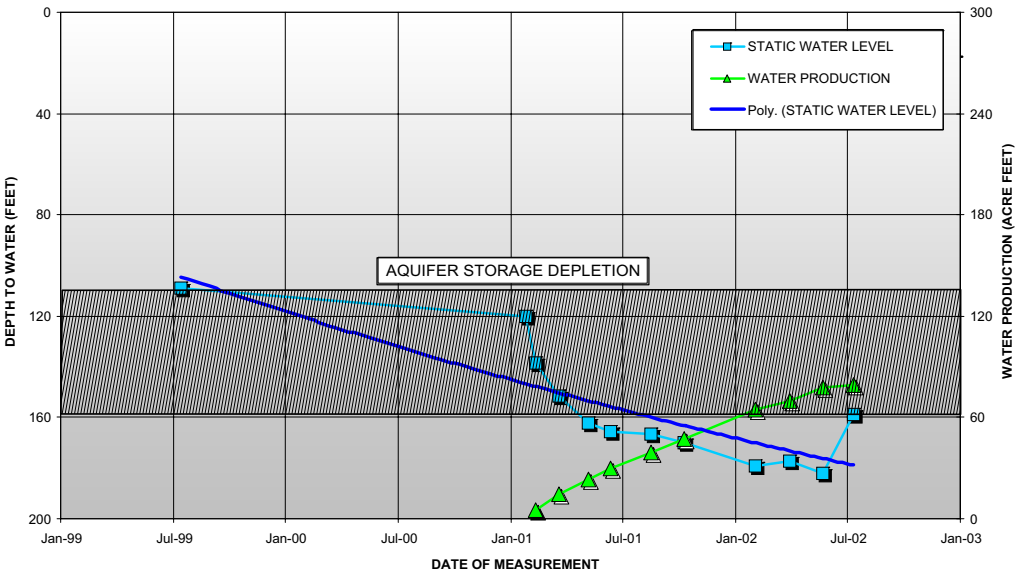


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-31F (Mountain Well No. 2, RHA 2006 NO. 18)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F18

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

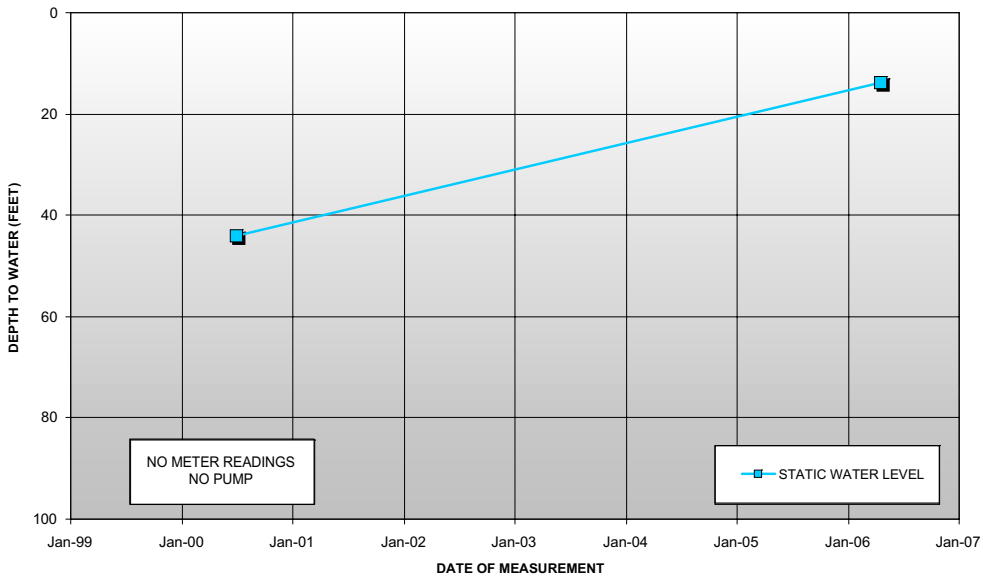


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-06F02 (Mountain Well No. 1, RHA 2006 NO. 17)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F17

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

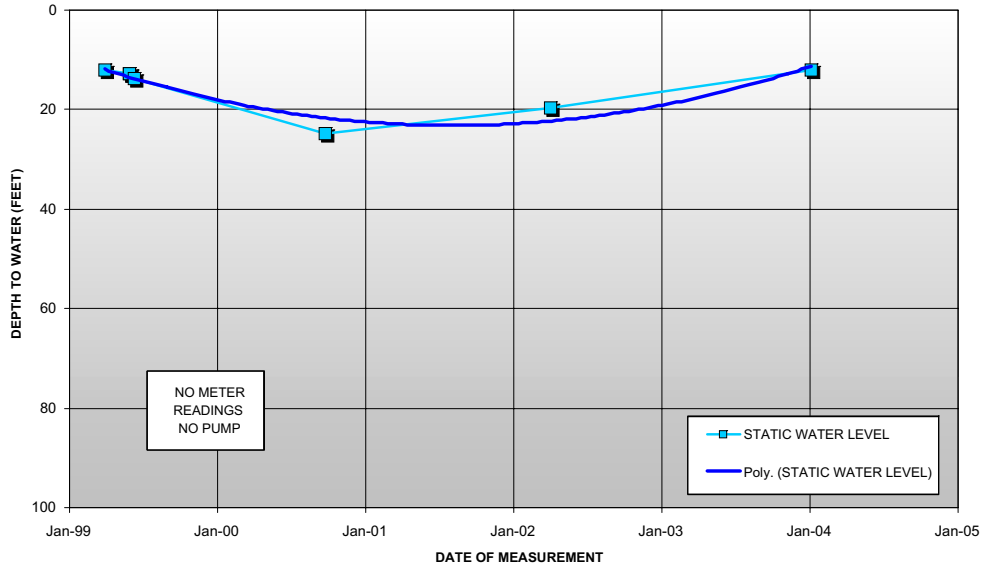


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 29S/13E-08K (China Gardens Well No. 1)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F20

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

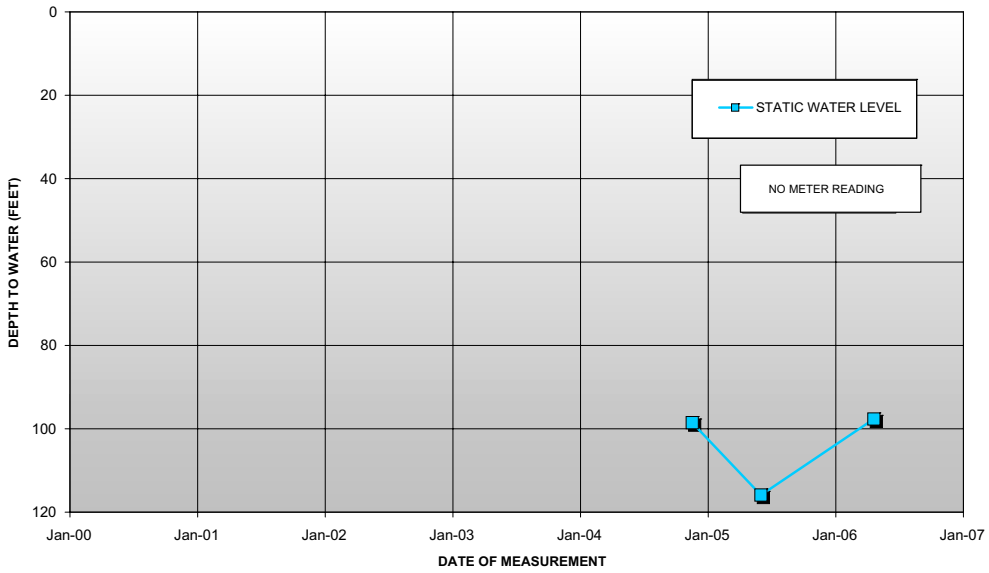


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 30S/13E-03D (Trout Creek Well No. 1)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F19

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

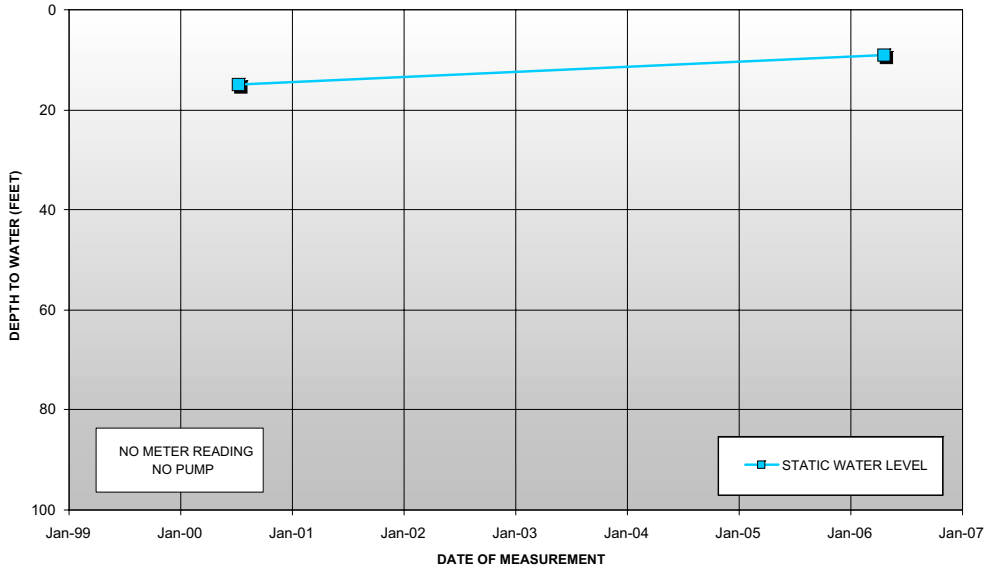


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 29S/13E-35F (Hertel Agricultural)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F22

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

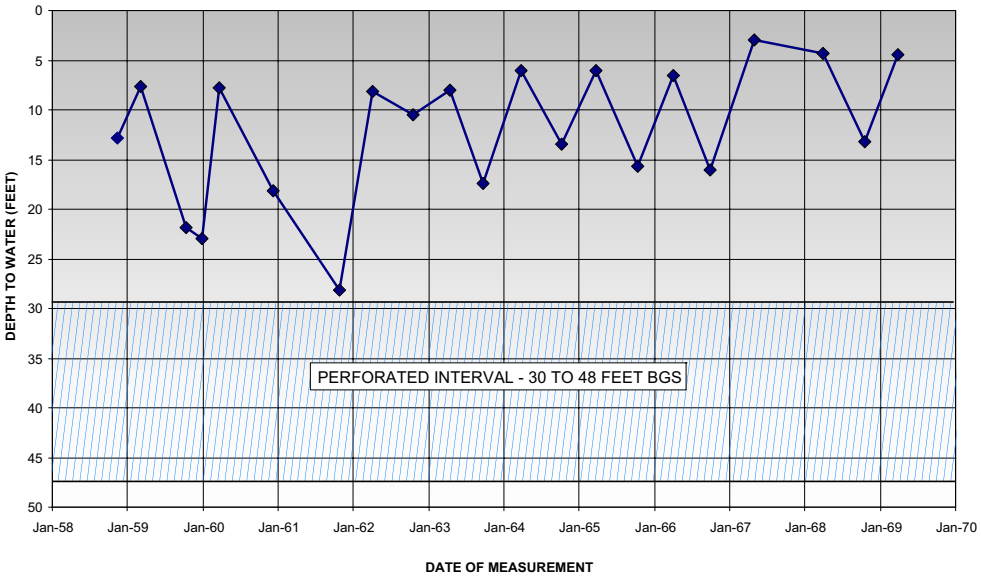


GROUNDWATER HYDROGRAPH
STATE WELL NUMBER 30S/13E-08C (China Gardens Well No. 2)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE F21

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS



COUNTY SERVICE AREA 23 WELL NO. 1 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

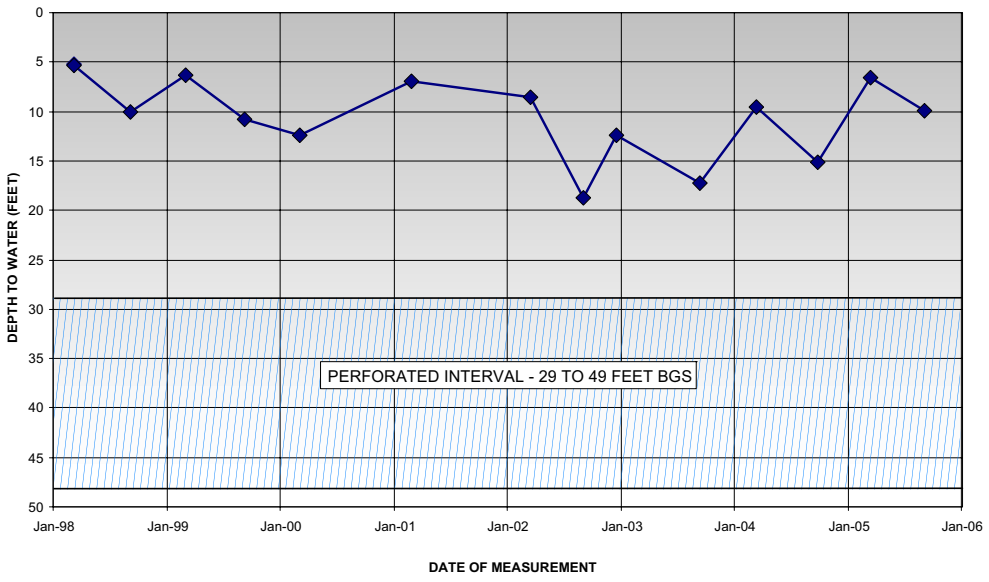
PLATE G1

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

HOPKINS GROUNDWATER CONSULTANTS

APPENDIX G
CSA 23 WELL DATA



COUNTY SERVICE AREA 23 WELL NO. 4 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE G3

June 2006
Project No. 05-012-01

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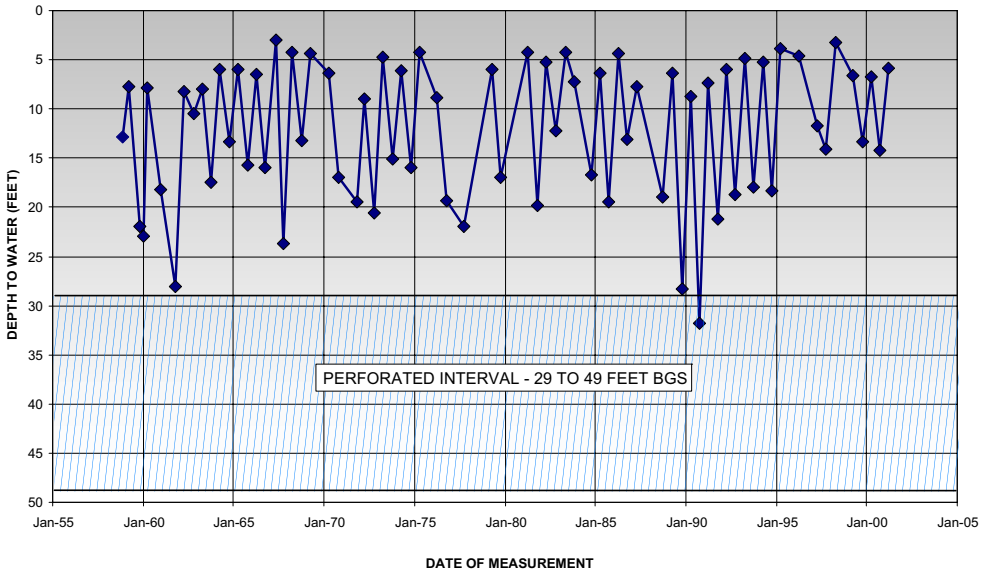

COUNTY SERVICE AREA 23 WELL NO. 2 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE G2

June 2006
Project No. 05-012-01

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Well Log

Garden Farms Community Water District
January 2005

	Gallons			Hours		Well Level		Cubic Feet, Ft^3		
	pumped	backwash	net	Pumped	GPM	Static	Pumping	pumped	backwash	net
Well 1	956,100	16,537	939,563	102	156	6	17	127,812	2,211	125,601
Well 2	69,700		69,700	40	29	8	39	9,318	0	9,318
Totals	1,025,800	16,537	1,009,263	142				137,130	2,211	134,919

Historical	Ft^3				
Month	2001	2002	2003	2004	2005
Well 1	154,639	138,369	120,147	159,479	127,812
Well 2	1,094	668	5,132	2,874	9,318
Well 3			201		
Totals	155,733	139,037	125,480	162,353	137,130

Water Balance[1]		Tank %
net ft^3 Dec	168,857	
net ft^3 Jan	134,919	75
Billed (-)	221,008	
Diff	82,768	

1 previous billing period

Fiscal Year Totals, Ft^3			July - January			
	2001	2002	2003	2004	2005	
Well 1	1,300,026	1,925,960	2,041,223	1,200,000	1,993,265	
Well 2	477,864	64,465	171,059	541,250	84,727	
Well 3			1,179			
Totals	1,777,890	1,990,425	2,213,461	1,741,250	2,077,992	Total af
Acre Feet	40.81	45.69	50.81	39.97	47.70	225.00

Conversion factors
1 gallon = 0.13368055 Ft^3
1 Ft^3 = xxxxx gallons

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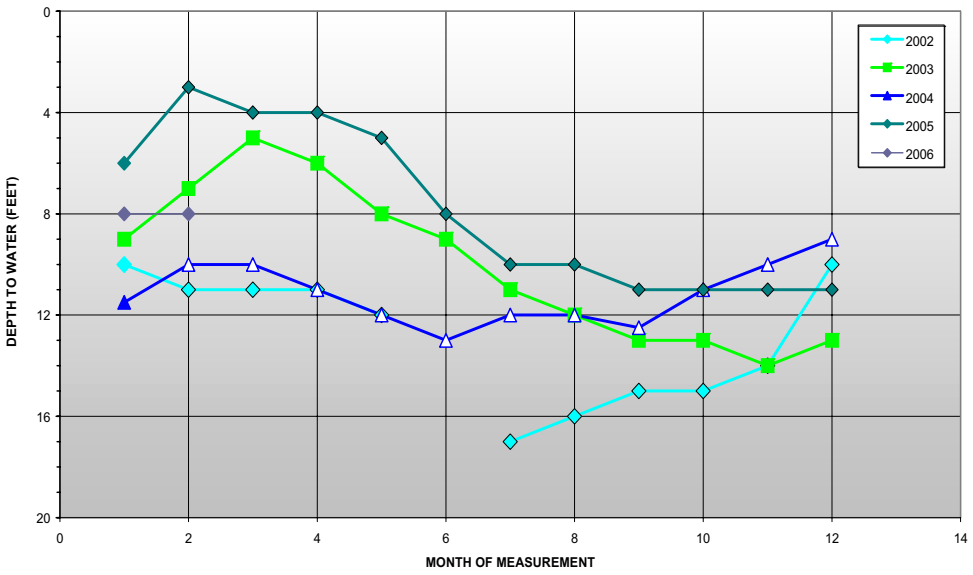
APPENDIX H
GARDEN FARMS WELL DATA

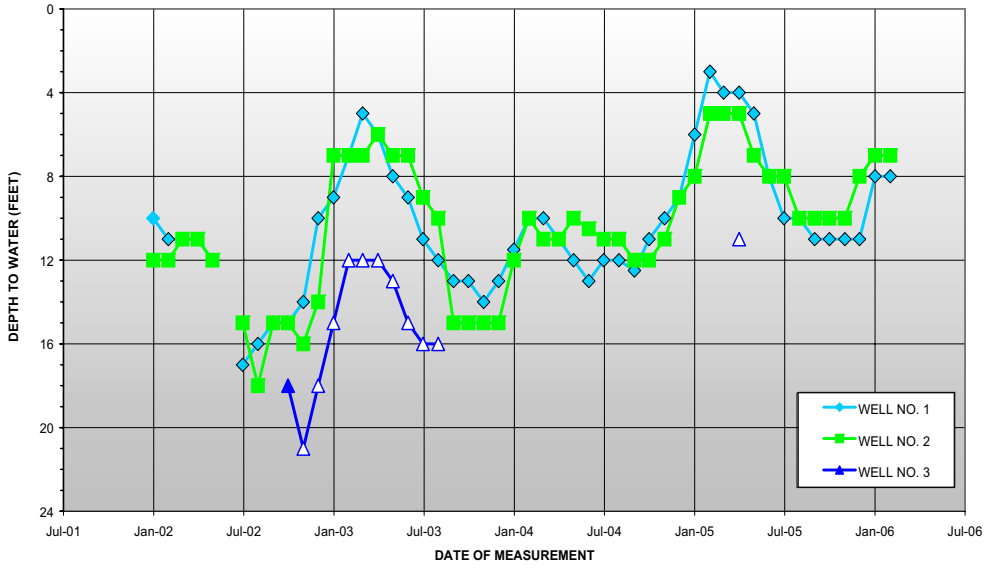


GARDEN FARMS WELL NO. 1 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE H2

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS



GARDEN FARMS WELL NOS. 1, 2, AND 3 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE H1

June 2006
Project No. 05-012-01

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GROUNDWATER
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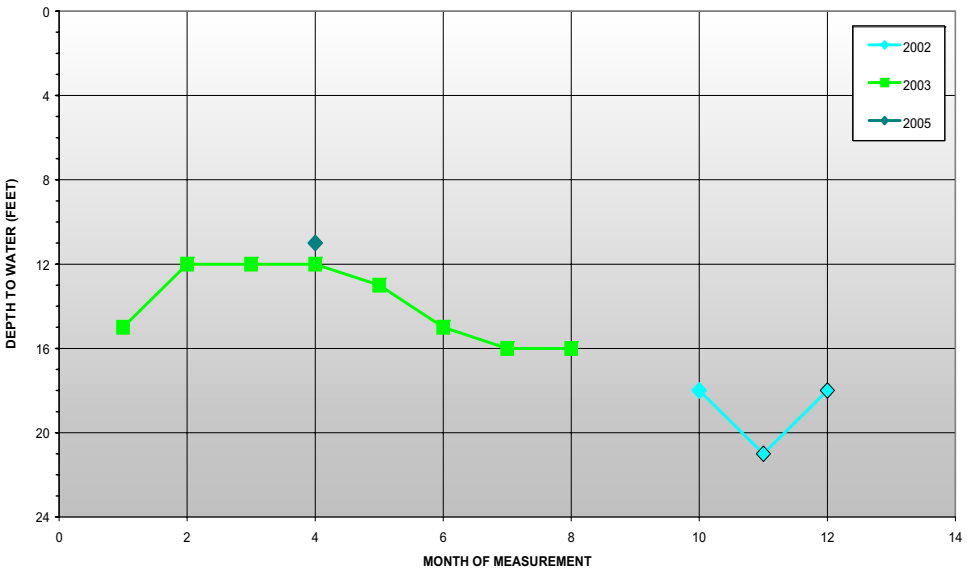
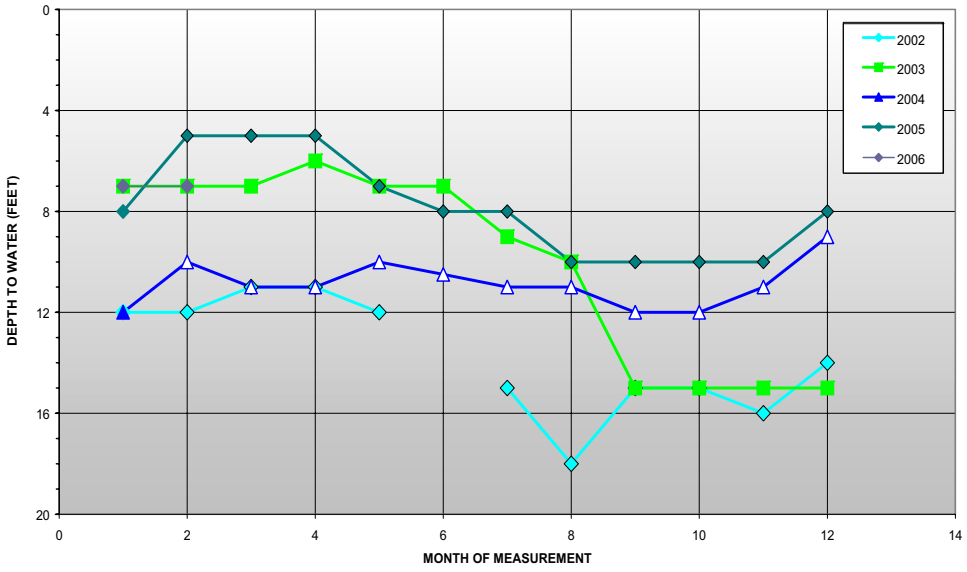


GARDEN FARMS WELL NO. 3 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE H4

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS

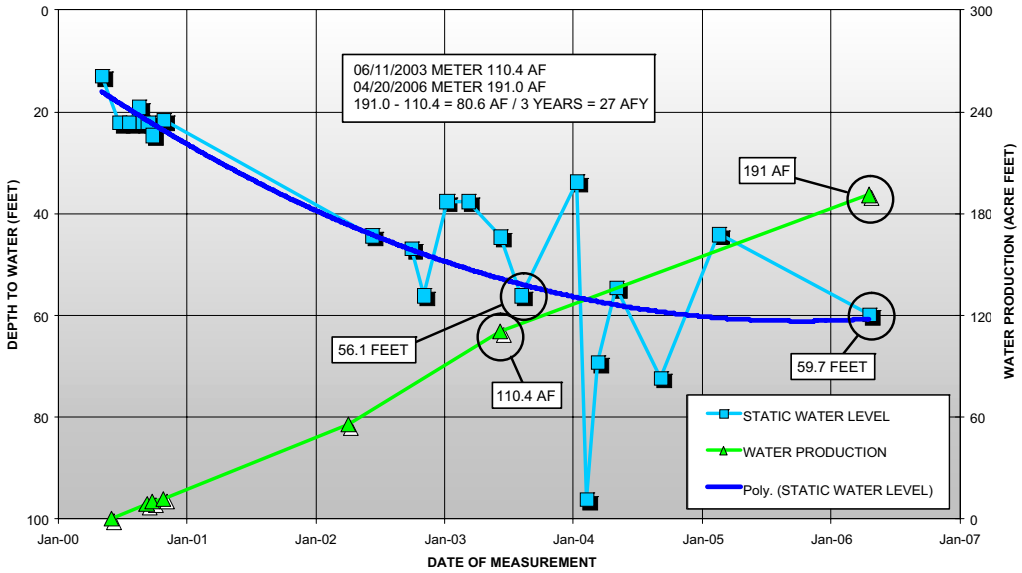


GARDEN FARMS WELL NO. 2 HYDROGRAPH
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE H3

June 2006
Project No. 05-012-01

HOPKINS
GROUNDWATER
CONSULTANTS



GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-35R (Cuesta F&T Well "1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE I1

June 2006
Project No. 05-012-01

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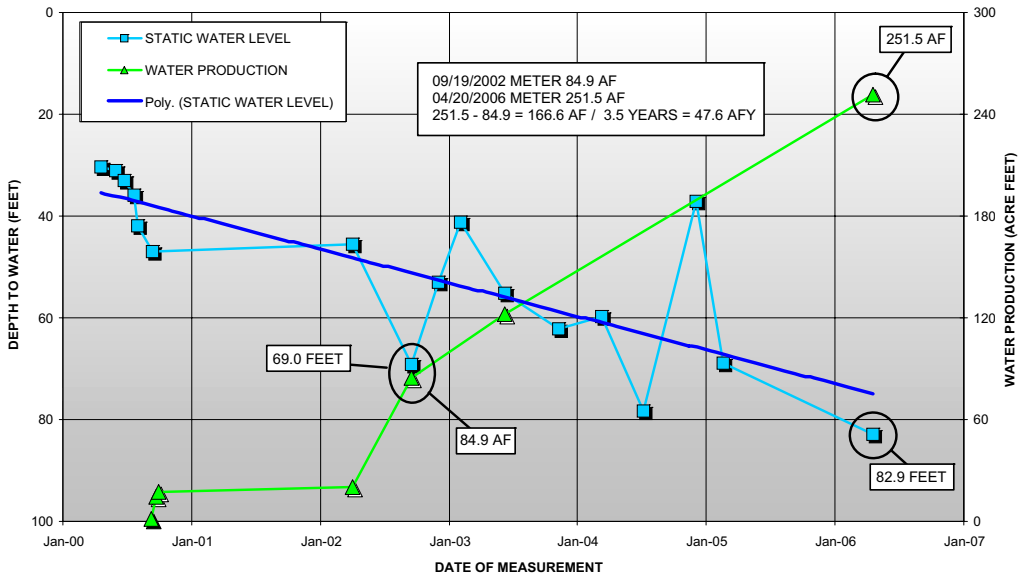
APPENDIX I
ANNUAL WELL YIELD ESTIMATES

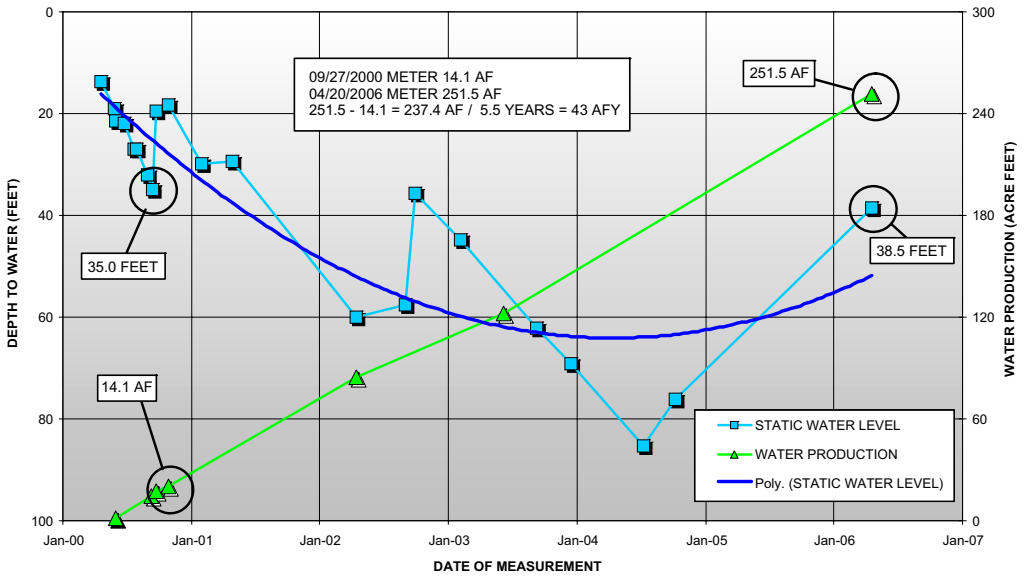


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-02B (Cuesta Well "SR-2A")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE I3

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

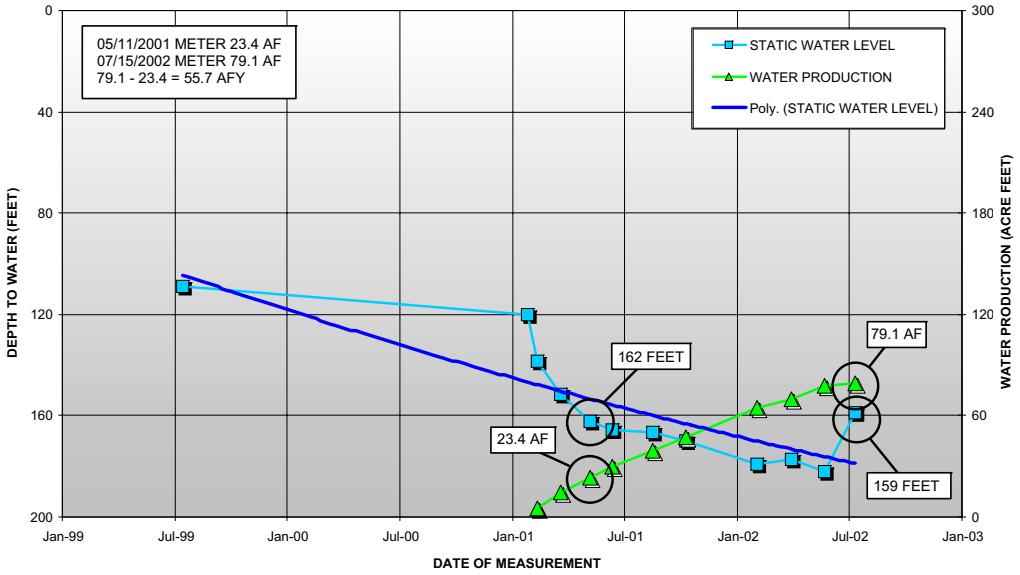


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-01E (Cuesta Well "E")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE I2

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

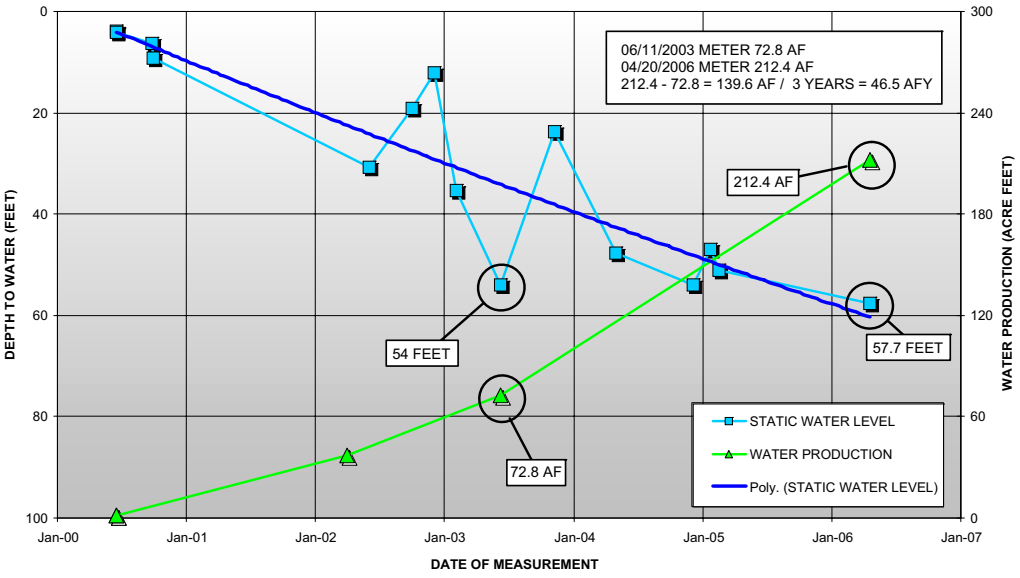


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 30S/13E-06F02 (Mountain Well No. 1, RHA 2006 NO. 17)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE I5

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS

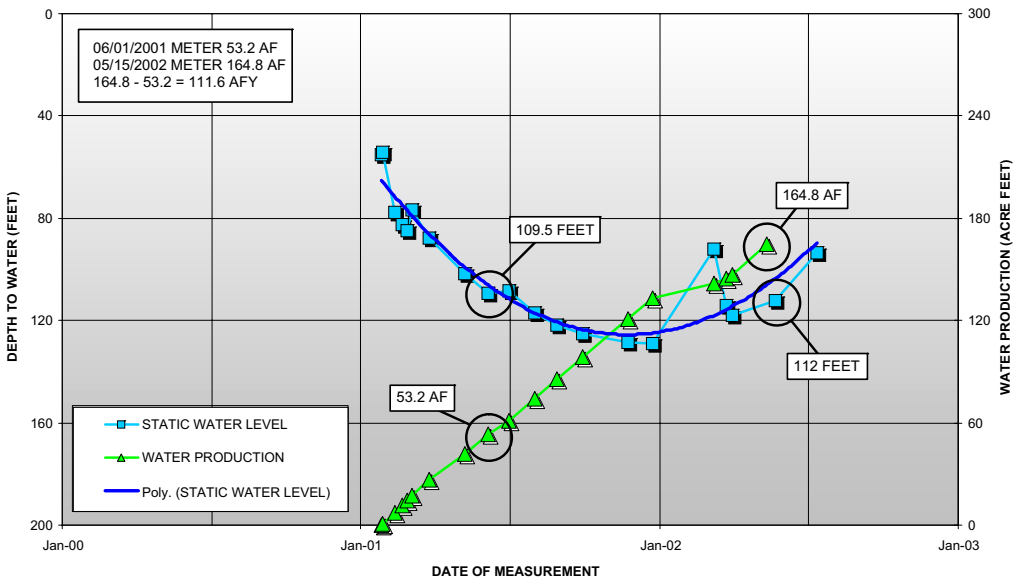


GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-27R (Cuesta Well "H1")
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE I4

June 2006
Project No. 05-012-01

HOPKINS GROUNDWATER CONSULTANTS



GROUNDWATER HYDROGRAPH AND CUMULATIVE GROUNDWATER PRODUCTION
STATE WELL NUMBER 29S/13E-31F (Mountain Well No. 2, RHA 2006 NO. 18)
Santa Margarita Ranch
Water Supply Study
San Luis Obispo County
Santa Margarita, California

PLATE I6

June 2006
Project No. 05-012-01

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