Prepared for

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REVIEW OF WELL TESTING AND SUSTAINABLE YIELD ASSESSMENT

PROPOSED LAETITIA AGRICULTURAL CLUSTER SUBDIVISION SAN LUIS OBISPO, CALIFORNIA

Prepared by

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Project Number WR1387

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Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

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TABLE OF CONTENTS

EXECUTIVE SUMMARY ES-1

1. INTRODUCTION AND BACKGROUND 1
   - 1.1 Proposed Development and Water Demand 1
   - 1.2 Oversight and Review of Well Testing 2

2. HYDROLOGY 3
   - 2.1 Precipitation 3
   - 2.2 Surface Water 4

3. HYDROGEOLOGY AND WELLS AT THE PROJECT SITE 6
   - 3.1 Hydrogeology 6
   - 3.2 Wells and Springs 7

4. TESTING AND ANALYSIS 8
   - 4.1 Pump Testing of the Project Wells 8
   - 4.2 Discussion and Analysis of Hydrographs for Wells 10, 11, 14 & 15 10
   - 4.3 Discussion of Hydrographs for Other Wells at the Project Site 11
   - 4.4 Estimates of Sustainable Pumping Rates 13
     - 4.4.1 Sustainable Yield 13
     - 4.4.2 Calculations of Sustainable Pumping based on the Test Pumping 14
     - 4.4.3 Potential Impact of Well 11 on Los Berros Creek 15
     - 4.4.4 Increased Production from Well 15 16
     - 4.4.5 Recommended Production Rates and Schedule 16
   - 4.5 Source Capacity is Adequate to Achieve Maximum Daily Demand 16
   - 4.6 Estimates of Aquifer Properties 17
     - 4.6.1 Type-Curve Analyses of Detailed Pumping Test Data 18
     - 4.6.2 Cooper-Jacob Analyses of Simplified Pumping Test Data 18
     - 4.6.3 Theis Recovery Analysis following Phase 2 Pumping 19
     - 4.6.4 Transmissivity Estimated from Specific Capacity 19
     - 4.6.5 Summary of Estimates of Aquifer Properties 20
   - 4.7 Fractured Bedrock Aquifers 21

5. CONCLUSIONS AND RECOMMENDATIONS 21

6. REFERENCES 24

TABLES

Table 1. Los Berros Creek Average Monthly Flow Data
Table 2. Summary of Information for Laetitia Wells
Table 3. Pump Testing Rates and Schedule
Table 4. Estimates of Sustainable Yields for Wells 10, 11, 14, 15
Table 5. Estimates of Transmissivity and Hydraulic Conductivity

FIGURES

Figure ES-1: Topographic Map of the Laetitia Site Showing Well Locations
Figure 1: Site Location and Hydrologic Setting
Figure 2: Upper Portion of Los Berros Creek Watershed
Figure 3: Topographic Map of the Laetitia Site Showing Well Locations
Figure 4: Monthly Rainfall during Testing Compared to Average Rainfall includes Correlation between Rainfall at Laetitia and Nipomo
Figure 5: Average Monthly Flow of Los Berros Creek
Figure 6: Regional Geologic Setting
Figure 7: Local Geologic Map and Well Locations
Figure 8: Geologic Cross-Section
Figure 9: Hydrographs for Wells 10 and 11
Figure 10: Hydrographs for Wells 12 and 13
Figure 11: Detailed-Scale Hydrographs for Wells 10 and 11
Figure 12: Detailed-Scale Hydrographs for Wells 14 and 15
Figure 13: Trend Analysis of Phase 3 Data and Projected Water Levels for Well 10
Figure 14: Trend Analysis of Phase 3 Data and Projected Water Levels for Well 14
Figure 15: Trend Analysis of Phase 3 Data and Projected Water Levels for Well 15
Figure 16: Hydrographs for Wells 5, 8 and 9
Figure 17: Hydrographs for Wells 12 and 13
Figure 18: Groundwater Elevation Data for Four Laetitia Irrigation Wells
Figure 19: Proposed Pumping at Well 11 Compared to Average Monthly Flow in Los Berros Creek

APPENDICES

Appendix A: Boring Logs and Well Completion Reports
Appendix B: Aquifer Testing Analyses of Transmissivity

EXECUTIVE SUMMARY

Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

At the request of San Luis Obispo County (the "County") Geosyntec Consultants (Geosyntec) has conducted a third-party review of well testing and an assessment of sustainable yield by Cleath Harris Geologists (CHG) for the proposed Laetitia Agricultural Cluster Subdivision Project in San Luis Obispo County. As described in the Draft Environmental Impact Report (DEIR) (SWCA Morro Group, 2008), the Laetitia Agricultural Cluster Subdivision Project is a proposed development of 102 one-acre residential lots and four buildable open space lots totaling approximately 1,787 acres. Based on analysis by Cleath and Associates[1] (C&A, 2005), the estimated total water demand of the project reported in the DEIR was 143 acre-feet per year (AF/Y), which is equivalent to 89 gallons per minute (gpm). However, with revisions and water conservation measures the estimated project demand was reduced to 46.3 AF/Y (CHG, 2010), which is equivalent to approximately 29 gpm.

Groundwater pumped from four new wells completed in fractured bedrock (Wells 10, 11, 14, and 15) is proposed as the sole water supply for the proposed Agricultural Cluster Subdivision (Figure ES-1). Wells 10 and 11 are screened in the fractured resistant volcanic tuff of the Obispo Formation and Wells 14 and 15 are screened in the siliceous shale of the Monterey Formation. The original project description in the DEIR included use of Wells 12 and 13, but these wells were replaced by Wells 14 and 15 due to concern about potential influence of pumping from Wells 12 and 13 on perennial pools along Los Berros Creek (DEIR, SWCA Morro Group, 2008; Fugro, June 2009; C&A, November 2008; CHG, July 2010). Long-term testing of Wells 10, 11, 14, and 15 was recommended by Fugro (April 2009) and required by the County to provide data to further evaluate feasibility of the long-term groundwater yield from the four wells to meet the water supply demand of the proposed project.

Three phases of cyclic pumping were conducted at the Project Site between 16 October 2009 and 31 December 2010. The third phase of pumping was conducted from late September 2010 through December 2010 at the estimated sustainable yield rate of

[1] Subsequent references to Cleath and Associates are abbreviated C&A. In 2009, the name Cleath and Associates was changed to Cleath Harris Geologists, which is abbreviated as CHG.

87 AF/Y (54 gpm), which was based on the first two phases of testing (CHG, July 2010). The Phase 3 testing established that water levels continued to drop at three of the four wells with pumping at the estimated sustainable yield rates. Thus, equilibrium groundwater conditions were not attained with the Phase 3 production rates and depletion of groundwater storage continued.

Scaling down the production rates to account for time for water levels to return to levels at the beginning of the Phase 3 testing, which is the approach used by CHG (July 2010) for the Phase 1 and 2 data, reduces the estimates of viable long-term production rates for Wells 10, 14, and 15 by 35%, 52%, and 45%, respectively. Scaling of the production rate was not applied to the Phase 3 testing data recorded at Well 11 because prominent recharge influence on water levels at this well occurred that was independent of pumping.

Although the production capacity of Well 11 was substantially higher than the other wells, water level data in this well show rapid recharge likely due to good hydraulic connection between the aquifer and base flow in Los Berros Creek. Since pumping of Well 11 likely reduces base flow in Los Berros Creek, the recommended water production schedule includes curtailment of pumping from Well 11 from August through November each year to help preserve base flow in Los Berros Creek during the dry season, but a slight increase in Well 11 pumping from December through July.

Well 15 is the deepest of the four wells and has the largest available drawdown between the water level attained during Phase 3 pumping and the top of the well screen—approximately 80 feet. Consequently, a production rate from Well 15 that results in continuing gradual drawdown is more sustainable at Well 15 than at the other wells. Accordingly, the recommended long-term production rate for Well 15 includes a 25% increase to the revised calculated sustainable pumping rate that is based on the Phase 3 production and recovery data.

The table below lists the estimates by CHG (July 2010) of sustainable yields from each of the wells and the revised estimates that incorporate analysis of the Phase 3 testing data, adjustment of pumping schedule at Well 11 to lessen impact to the Los Berros Creek riparian corridor, and a 25% increase all year from Well 15 (relative to the revised rate scaled to the Phase 3 recovery). The resulting total production rate is approximately 62 AF/Y or 39 gpm. This is a 28% decrease compared to the sustainable rate estimated by CHG (July 2010) on which the Phase 3 testing pumping rates were based, but 135% of the allocated project demand of 46.3 AF/Y (29 gpm).

The revised estimate of a viable long-term production rate of 62.4 AF/Y, or 39 gpm, is less than the maximum daily demand (MDD) of 46 gpm. However, based on the testing data, the capacity of the four wells is more than adequate to sustain a continuous flow of 46 gpm for a month. Moreover, water in storage tanks can be used to supplement groundwater pumping during periods of short-term high demand.

	Well 10	Well 11	Well 14	Well 15	Total	% of project demand*
	CHG Estimated Sustainable Yield based on Phase 1 & 2 Testing (Table 7 July 2010 & Table 1 Mar 2011)					
AF/Y	10	38	19	20	**87.0**	**188%**
annualized gpm	6.2	23.6	11.8	12.4	53.9	
	Revised Estimated Sustainable Yield & Recommended Pumping based on Phase 3 Testing & Adjustment to Protect Creek Baseflow					
AF/Y	6.5	28.1	9.1	18.8	**62.4**	**135%**
annualized gpm	4.0	*26.1***	5.6	11.7	38.7	
% decrease relative to CHG estimate	35%	26%	52%	6%	28%	

Notes and abbreviaions

***Allocated project demand: 46.3 AF/Y (28.7 gpm)**

** annualized gpm for Well 11 is actually the avg rate for 8 months (no pumping Aug-Nov), but Q for Wells 10, 14, and 15 is avg rate for 12 months

gpm = gallons per minute

AF = acre feet AF/Y = acre feet per year

Q = pumping rate

Estimates of transmissivity of the fractured rock aquifers based on analysis of data recorded during the three phases of pumping tests are substantially lower than previous estimates based on shorter term pumping tests (C&A, October 2005; Fugro, June 2009). This indicates that the long-term capacities of the fractured bedrock aquifers to transmit groundwater are lower than previously estimated and sustainable production potential of the Project Site wells based on the short-term tests were unrealistically high. Initial yields from wells in fractured bedrock aquifers often are not representative of longer-term yields, which are typically lower.

The estimates of viable long-term groundwater production rates reported herein are based on evaluation of water levels recorded in four wells for the period from October 2009 to March 2011, which included several months of pumping. We caution that rainfall during the testing program was 138% of average, and that long-term yields from

water wells producing from bedrock aquifers, which may have linear fracture systems, commonly are substantially less than short-term yields. Nonetheless, long-term groundwater production rates of 21 AF/Y reported by CHG (July 2010) for each of two irrigation wells at the Project Site supports that 62 AF/Y is a viable long-term groundwater production rate from the four project wells combined.

The primary purpose of the well testing program was to evaluate sustainable yield of the proposed project wells. Sustainable yield does not have a "correct" value, but is a subjective concept, and its evaluation is an interdisciplinary issue that depends on time-frame on interest. As also discussed by CHG (July 2010), the concept of sustainable yield has been broadly defined as the amount of water that can be pumped indefinitely without unacceptable environmental, economic, or social consequences (e.g. Alley et al., 1999). The World Commission on Environment and Development (1987) stated that sustainable development must meet the needs of the present without compromising the ability of future generations also to meet their needs. Typically, however, sustainable yield must also allow for sufficient natural discharge of groundwater to preserve streams, springs, wetlands, and riparian corridor ecosystems (e.g. Sophocleous, 1997; 2000). Accordingly, curtailment of pumping from Well 11 from July through November is recommended for a more sustainable water supply with reduced impact on the riparian corridor ecosystem of Los Berros Creek.

1. INTRODUCTION AND BACKGROUND

At the request of San Luis Obispo County (the County) Geosyntec Consultants (Geosyntec) has prepared this report that provides a third-party review of well testing and an assessment of sustainable yield by Cleath Harris Geologists (CHG) for the proposed Laetitia Agricultural Cluster Subdivision Project in San Luis Obispo County.

The Project Site is a proposed new development located between Highway 101 and Upper Los Berros Road, south of the City of Arroyo Grande. Figure 1 is a map showing the Project Site location and setting in context with the Santa Maria Groundwater Basin and hydrologic subareas (HSAs- watersheds) and as delineated by California Department of Water Resources (DWR, 2002). Groundwater pumped from four wells completed in fractured bedrock is proposed as the sole water supply for the project. Figure 2 is a topographic map of the Project Site that shows the water supply well locations for the proposed development.

1.1 Proposed Development and Water Demand

As described in the Draft EIR (DEIR, SWCA Morro Group, 2008), the Laetitia Agricultural Cluster Subdivision Project is a proposed development of 102 one-acre residential lots and four buildable open space lots totaling approximately 1,787 acres. The development would also include approximately 25 acres of internal residential roads, and approximately 113 acres of existing vineyard would be removed to accommodate proposed development and buffer zones. Approximately 140 acres of replacement vineyard would be replanted on-site. Development proposed within the open space lots includes a homeowner's association facility, recreation center, and a community center ("ranch headquarters"). The original project evaluated in the DEIR included an equestrian facility, which no longer is proposed.

The estimated total water demand of the project reported in the Draft Environmental Impact Report (DEIR) for the project (SWCA Morro Group, 2008) was 143 acre-feet per year (AF/Y) based on analysis by Cleath and Associates[2] (C&A, 2005). However, with required water conservation measures such as limitations on area of turf and residential irrigation and removal of the equestrian center, C&A (November 2008)

[2] Subsequent references to Cleath and Associates are abbreviated C&A. In 2009, the name Cleath and Associates was changed to Cleath Harris Geologists, which is abbreviated as CHG.

reported that the project water demand was reduced nearly 50 percent to 73.7 AF/Y, which is equivalent to 45.7 gallons per minute (gpm). With additional limitations on landscape irrigation, the estimated project demand was further reduced to a total of 46.3 AF/Y (CHG, 2010).

1.2 Oversight and Review of Well Testing

The County requested that a third party provide review of existing information, conduct independent testing, and evaluate if the existing wells can provide a sustainable water supply to meet the needs of the proposed development project. The California Water Code outlines two methods for evaluation of well capacity in fractured bedrock[3]. Method 1 requires a report that includes well testing, evaluation of hydrogeology, historical use, and monitoring data from other local wells. Method 2 is either a 72 hour or 10 day test without the more comprehensive report[4].

At a meeting in the County's offices[5] on 7 January 2010, the applicant's consultants (CHG) explained that long-term testing of the wells began in October 2009 and they proposed a well testing program specifically designed for the project and setting, which would be consistent with Method 1 of the California Water Code Methods for Well Capacity Determination in fractured rocks. The County agreed that instead of the third party consultant (Geosyntec) conducting the testing, it was acceptable for CHG to conduct the testing with oversight and review by Geosyntec.

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[3] http://www.cdph.ca.gov/certlic/drinkingwater/Pages/Lawbook.aspx
Section 64554 (g) (h) and (i) are the basis for the guidance. These regulations were part of the California Water Works Standards which became effective in March 2008.

[4] Method 2 specifies that if the water level recovery requirements are met, a production rate equal to 25% of the pumping rate during the 72-hour test will be granted by the Department of Public Health (DPH), or 50% of the pumping rate will be granted by DPH for a 10-day test. The tested well must demonstrate that, within a length of time not exceeding the duration of the pumping time of the pump test (72 hours or 10 days), the water level has recovered to within two feet of the static water level measured at the beginning of the well capacity test or to a minimum of ninety-five percent of the total drawdown measured during the test, whichever is more stringent.

[5] The 7 January 2010 meeting was attended by County Planning Staff, SWCA, Geosyntec, CHG, and the applicant.

At the 7 January 2010 meeting, the parties agreed that CHG would prepare a workplan for Geosyntec to review that presented the proposed testing methodology, and that CHG would provide Geosyntec monitoring data for review during the testing period. However, contractual engagement of Geosyntec as a subconsultant to SWCA for the third party review did not occur until July 2010, and Geosyntec was not provided with a workplan or testing data during the initial two phases of testing. In late July 2010, Geosyntec received the *Laetitia Well Testing and Sustainable Yield Assessment* Report (CHG, July 2010), which documented the first two phases of testing and presented an estimate of sustainable yield from the four project wells of 87 AF/Y.

Based on continuing decline of water levels exhibited in three of the four wells tested during the seven-month period, Geosyntec expressed concern that the average pumping rates from these three wells used during the testing is not sustainable. Accordingly, prior to further evaluation of the testing data and estimates of production capability, Geosyntec requested additional testing during the dry season. In addition, Geosyntec requested all available historical data and water level data in other wells in the vicinity to help assess seasonal variation (Geosyntec, September 2010).

A third phase of test pumping from the four project wells at a rate equivalent to the sustainable yield estimated by CHG (July 2010) started in late September 2010 and continued through December 2010. On 31 March 2011, CHG submitted an addendum presenting the Phase 3 testing data and results.

This report presents a summary of the hydrologic and geologic setting of the site, an overview of wells in the vicinity, a description of the testing program and water level data recorded during testing of the wells, an analysis of the testing data, and review of the *Laetitia Well Testing and Sustainable Yield Assessment* Report by CHG dated July 2010 and the Phase 3 Addendum by CHG dated March 2011.

2. HYDROLOGY

2.1 Precipitation

The DWR (2002) study of Water Resources of the Arroyo Grande-Nipomo Mesa Area[6] included compilation of historical records of precipitation for 36 stations in the San

[6] http://www.dpla.water.ca.gov/sd/water_quality/arroyo_grande/arroyo_grande-nipomo_mesa.html

Luis to Santa Maria vicinity. Mean annual rainfall ranged from 12 to 35 inches with 75 percent occurring between December and March. Based on a contour map of equal mean precipitation for the period of record from 1870 to 1995 (Plate 7, DWR, 2002), the expected mean annual rainfall for the project site is approximately 17 inches.

Beginning in January 2010, rainfall was recorded at three rain gauges installed at the Site. The rain gauges were monitored following storm events, and CHG developed a single continuous rainfall record for the 2009-2010 water year from the on-site data. Based on correlation of the on-site data with a private gauge in east Arroyo Grande Valley the rainfall record was extended back to the beginning of the Phase 1 testing (CHG, July 2010).

Figure 3a shows monthly rainfall during the testing program compared to average monthly rainfall based on rainfall data from 1920 to 2010 at the Nipomo Mehlschau Station. The average Nipomo rainfall data used were increased by a factor of 1.15 to represent average rainfall in the Project Site based on correlation between the Laetitia and Nipomo rainfall data for the period from July 2009 to June 2010, which is shown by Figure 3b. This analysis indicates that the total rainfall in the Laetitia area between July 2009 and March 2011 was 138 percent of average.

2.2 Surface Water

The Project Site is within the upper portion of the Los Berros Canyon Watershed, which is delineated in Figure 4. Los Berros Creek borders the southeast margin of the Site and is a tributary of Arroyo Grande Creek, which flows into the Pacific Ocean near the community of Oceano (Figure 1). Flow in Los Berros Creek is intermittent and influenced by the distribution and depth of alluvial deposits along the creek (C&A, 2004; CHG, July 2010).

The headwaters of Los Berros Creek are located northeast of Temettate Ridge and south of Newsom Ridge. The Los Berros Creek Watershed is 28 square miles in area and has a length of approximately 14 miles. Runoff from Temettate Creek and numerous other small tributaries accumulates prior to emptying into Los Berros Creek. DWR reported annual runoff between 800 and 1100 acre feet for the entire Los Berros Creek watershed for the base period (1984 to 1995) used for a study of Water Resources of the Arroyo Grande-Nipomo Mesa Area (DWR, 2002).

A gauge was established on Los Berros Creek in August 1968 by L. Lopp in cooperation with San Luis Obispo County Flood Control. The gauge monitors runoff from the upper 54 percent of the Los Berros watershed. The United States Geologic

Survey (USGS) maintained a continuous daily record of streamflow at the gauging station from 1968 to 1978[7]. In October 1979, San Luis Obispo County Engineering Department assumed control of the gauge[8].

The gauging station is northeast of Highway 101 at the mouth of the upper canyon near the middle of the southeast margin of the Site, 0.8 miles downstream from Adobe Creek and 3.7 miles north of Nipomo on the upstream side of the bridge where Los Berros Road crosses the creek. The location of the Los Berros Creek gauging station is shown in Figure 3. The road crossing is a box culvert with a 15-foot concrete lip that has become a grade control structure. The channel downstream has been down-cut significantly and consequently the culvert can be a barrier to fish passage (Central Coast Salmon Enhancement, 2005). Downstream of the gauge most of the surface flow in Los Berros Creek seeps into the alluvial deposits of the lower valley.

For this period of the USGS records (1968-1978), the mean flow rate of Los Berros creek was in the range of 1 and 8 cubic feet per second (cfs)[9] during the months of January to May, and 0.16 to 0.68 cfs during the months of June to December. Based on the minimum flow in the USGS record, the resolution of low flow at the Los Berros Gauging station was 0.01 cfs (4.5 gpm). During the period of the USGS record (1968-1978), the only days with zero flow at the Los Berros Gauging Station were during a continuous period without any flow from early October to late December in 1977.

The County Department of Public Works provided available daily flow data for the Los Berros Creek gauging station for the period from 1978 to March 2011. However, no gauging data for Los Berros Creek are available for the period from 2002 to 2005. Some field records with the County indicate that the creek was dry during that period but no data logs have been found to confirm the creek stage or flow during this period.

As reported by C&A (2005), the Bartleson Development Plan (Morro Group, 1996) indicated that discharge of groundwater maintained base flow in Los Berros Creek

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[7] USGS 11141600 LOS BERROS C NR NIPOMO CA
http://ca.water.usgs.gov/waterdata/DiscontinuedSites2006/SurfaceWater.pdf
http://waterdata.usgs.gov/ca/nwis/inventory/?site_no=11141600

[8] San Luis Obispo County Gauge #5
http://www.slocountywater.org/weather/alert/stream/losberros.htm

[9] 1 cfs = 449 gpm

during the dry season prior to approximately 1981 when groundwater pumping was increased from the fractured tuff aquifers of the Obispo Formation. The stream gauging data (Table 1), however, also show zero flow prior to 1981 in the creek during the dry season in 1977, 1979, and 1980. Figure 5 shows the estimated mean monthly flow rate in Los Berros Creek both for the entire period of record, 1968 to 2001, and for the period from 1981 to 2001.

3. HYDROGEOLOGY AND WELLS AT THE PROJECT SITE

3.1 Hydrogeology

The Project Site is underlain by Early Miocene age rocks of the Obispo and Monterey Formations, Pliocene-Pleistocene age rocks of the Paso Robles Formation, and localized shallow unconsolidated alluvial deposits along Los Berros Creek, Adobe Creek, and other drainages. Figure 6 shows a generalized geologic map of the region and Figure 7 is a local geologic map that shows locations of wells within and near the Project Site[10]. Figure 8 is a geologic cross-section through the northern portion of the Project Site that shows the screened interval of the wells. The majority of wells in the vicinity of the Project Site are completed within fractured bedrock aquifers in the Obispo and Monterey Formations.

A study of the water resources of the Arroyo Grande - Nipomo Mesa Region by DWR (2002) reported that the Early Miocene Obispo Formation and the Miocene Monterey Formation are both important sources of water supply in the vicinity. The Obispo Formation consists of resistant mineralized tuff and fine- to coarse-grained crystalline tuff, interbedded with lava flows and fine-grained calcareous sediments. Locally the tuffs are intruded by dikes and sills. Portions of the lava flows, dikes, sills, and the majority of the ashy matrix of the coarse-grained tuff are commonly altered to clay. Groundwater within the Obispo Formation occurs primarily within fractures in the relatively unaltered resistant mineralized tuff.

The Monterey Formation, which is often called Monterey “Shale” actually consists of a range of sedimentary rock types including silicified siltstone, claystone, and sandstone, well-bedded claystone, cherty or porcelaneous shale, and dolomitic shale. Much of the

[10] Addition detail of geologic structure of the project area is shown by the geologic map provided as Figure 2 of the CHG report dated July 2010.

Monterey Formation is fractured and sheared. Groundwater within the Monterey Formation occurs mainly within fractures and parting parallel to bedding.

The Pliocene-Pleistocene Paso Robles Formation is present in the western portion of the project area (Figure 7) and includes unconsolidated to poorly consolidated gravel and clay, sand and clay, silty clay, conglomerate with clasts of Monterey Formation, and some lenses of gravel and sand.

Localized unconsolidated Holocene alluvial sedimentary deposits are present along the lower portion of Los Berros Creek and other drainages in the area. Some shallow wells are completed in the alluvial deposits along creeks.

3.2 Wells and Springs

Seven wells were constructed at the Project Site between 1983 and 1999. Historically, the water supply at the Project Site included separate domestic and irrigation systems. The domestic supply included two wells (FV Wells-2 and -4) that provided water for a winery, a shop, and two single-family residences. The irrigation system included four wells (FV Wells-1 and -3, F&T-1 and -2) and two reservoirs each with storage capacity of 25 acre-feet. Wells F&T-1 and -2 were installed in 1998 to allow vineyard expansion to the west and east (C&A, 2004)[11].

The domestic well (FV Well-2) and the four irrigation wells are all completed in the fractured tuff of the Obispo Formation. Additional wells included a shallow well (Enloe -1) completed in alluvium adjacent to Los Berros Creek and an older windmill-powered well near the maintenance shop (C&A, 2004).

Nearby off-site wells are also completed in the fractured tuff of the Obispo Formation and include the Tremper irrigation well, which is approximately 800 feet southeast of FV Well-1, and three irrigation wells (Bartleson 35Ka, 35Ra, and 35Rb), which are southwest of the Project Site along Highway 101.

Springs occur in some places where the fractured rock aquifers are exposed along slopes. Water from a spring northwest of Well F&T-1 with a reported flow rate of 2 to 5

[11] F&T and F.V Wells are abbreviations for Filipponi-Thompson Drilling, Inc., of Atascadero, California and Floyd.V. Wells, Inc. of Santa Maria, California

gpm was piped to a storage tank that supplied water to the Ranch headquarters (C&A, 2004). Three spring locations are shown in Figure 2.

Table 2 provides a summary of information for the wells including production rates for the irrigation wells and domestic wells based on reports by C&A (2004) and CHG (2010). Based on the reported flow meter records, average annual production from the irrigation wells at Project Property between 1999 and 2003 was 161 AF/Y. The domestic wells are not metered, but water supply to the winery production facility is. C&A (2004) estimated the total water production from the two domestic wells was 6.72 AF/Y in 2003. In addition, a shallow well (only six-feet deep) in the Los Berros Creek channel reportedly provides water to a residence near the southeast corner of the Project Site property (C&A, 2004).

Six new wells that range in total depth from 305 feet to 560 feet were drilled in the northeastern portion of the Project Site property between 2003 and 2006 (C&A October 2005, November 2008). Table 2 includes a summary of information for the new wells and Figures 2 and 7 show the well locations. Available boring logs and driller's well completion reports for the wells at the Project Site are provided in Appendix A.

Groundwater pumped from four of the new wells completed in fractured bedrock (Wells 10, 11, 14, and 15) is proposed as the sole water supply for the proposed Laetitia Agricultural Cluster Subdivision. Wells 10 and 11 are screened in the fractured resistant volcanic tuff of the Obispo Formation and Wells 14 and 15 are screened in the siliceous shale of the Monterey Formation. The DEIR project description included use of Wells 12 and 13, but these wells were replaced by Wells 14 and 15 due to concern about potential influence of pumping from Wells 12 and 13 on perennial pools along Los Berros Creek (DEIR, SWCA Morro Group, 2008; Fugro, June 2009; C&A, November 2008; CHG, July 2010).

Additional longer-term testing of Wells 10, 11, 14, and 15 was recommended by Fugro (April 2009) and required by the County to provide data for further evaluation of the feasibility of the long-term groundwater yield from the four wells to meet the water supply demand of the proposed Laetitia Agricultural Cluster Subdivision project.

4. TESTING AND ANALYSIS

4.1 Pump Testing of the Project Wells

Three phases of cyclic pumping were conducted at the Project Site between 16 October 2009 and 31 December 2010 by CHG. For each phase the pumping alternated between

two pairs of wells: simultaneous pumping at Wells 10 and 11, which are completed in cemented tuffaceous rocks of the Obispo Formation, alternating with simultaneous pumping at Wells 14 and 15, which are completed in the siliceous shales of the Monterey Formation. During the first phase of pumping from 16 October 2009 to 16 January 2010, which CHG termed the dry season, the wells were pumped for 2 to 5 days and then shut off for 4 to 15 days. During the second phase of pumping from 16 January to 10 May 2010, which CHG termed the wet season, the wells were pumped for 3 to 8 days and then shut off for 2 to 9 days.

Following the completion of the first two phases of testing CHG prepared and submitted a report on 23 July 2010. After review of the report Geosyntec prepared a letter dated 10 September 2010 requesting that an additional phase of pumping be conducted during the late summer and early autumn months when the well production capacity typically is lowest because the base flow in the creeks and groundwater elevations generally drop. The third phase of pumping was conducted from 27 September to 31 December 2010. The wells were pumped for 2 to 3 days and then shut off for 4 to 5 days. The Phase 3 pumping was conducted at the sustainable yield rates that were estimated by CHG (July 2010), which was 87 acre feet per year (AF/Y).

During the three phases of pumping, the total volume of groundwater production from the four wells over the fifteen months was 93 acre feet (AF), equivalent to 74.4 AF/Y, which is substantially more than the allocated project demand of 46.3 AF/Y. Table 3 summarizes the three phases of pump testing.

Each well was equipped with a submersible pump and a flow meter. Discharge piping installed in September and October 2009 conveyed the well water to an existing vineyard pipeline near Well 9 and on to a reservoir. From the reservoir, water can be pumped to vineyard blocks or a second reservoir. Figure 3 shows the pipeline routing.

Transducers and data loggers within one-inch PVC sounding tubes in the wells recorded water levels once per hour. Recording of water levels began in Wells 10 and 11 on 29 September 2009; in Wells 12 and 13 on 8 October; and in Wells 14 and 15 on 2 October. The date, time, and meter reading were recorded whenever one of the four wells was turned on or off. Water levels were also recorded with transducers and data loggers in Wells 5, 8, 9, 12 and 13.

4.2 Discussion and Analysis of Hydrographs for Wells 10, 11, 14 & 15

The water level data recorded in the four pumped wells (Wells 10, 11, 14, and 15) were used to prepare time-series charts of groundwater elevation, which are called hydrographs. Figures 9 and 10 present the hydrographs at scales that facilitate including elevations of the ground surface and top and bottom of the screened intervals (also called perforated intervals) in addition to the groundwater elevation for each well.

Figures 11 and 12 present the hydrographs at a more detailed scale. These hydrographs illustrate that water levels in Wells 10, 14, and 15 never stabilized, but exhibited continuing drawdown throughout the course of the three phases of pumping. The detailed hydrographs also illustrate that recovery of water levels was incomplete at Wells 14 and 15 between the pumping phases.

In Well 10, recovery of water level was incomplete after Phase 1 and Phase 2 testing, but a rapid rise in water level occurred after the Phase 3 pumping, which is attributed to period of abundant rainfall (Figure 11). The recovery of water level in Well 10 after Phase 2 pumping is considered more typical.

Full recovery of water levels occurred only at Well 11, which is within a few hundred feet of Los Berros Creek. The hydrograph for Well 11 shows a strong correlation between rainfall and groundwater levels in the vicinity of Well 11. As reported by CHG (July 2010), these data indicate that groundwater levels in the vicinity of Well 11 are influenced by base flow of Los Berros Creek[12]. Conversely, pumping from Well 11 likely influences base flow of Los Berros Creek.

Wells 10, 14, and 15 are much further from Los Berros Creek (thousands of feet away). Also, these wells are more isolated stratigraphically from the creek compared to Well 11 (see Figures 7 and 8). Based on the fact that water levels in three of the four wells (Wells 10, 14, and 15) were still generally dropping during the Phase 3 pumping, the groundwater in the aquifers near these wells did not reach equilibrium levels, and continued pumping at the Phase 3 rates will continue to deplete aquifer storage.

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[12] The water level at Well 11 was actually higher in mid May 2010 after the Phase 2 pumping was terminated compared to mid October 2009 before the Phase 1 pumping began. Beginning in June 2010, a couple of weeks following the termination of the Phase 2 pumping, the water level in Well 11 began dropping.

Figures 13, 14, and 15 provide zoomed-in hydrographs for Wells 10, 14, and 15 during the Phase 3 pumping. On the lower graph in each of these figures, the X-axis is elapsed time since the beginning of Phase 3 pumping at a logarithmic scale. The combined average pumping rates for the four wells during Phase 3 was equivalent to approximately 87 AF/Y (54.7 gpm), which by design is about the same as the sustainable yield from four wells estimated by CHG (July 2010) based on interpretation of the results of the Phase 1 and 2 testing.

Projections of trend lines fitted to the water level data provide estimates of future decreases in water levels and continued depletion of aquifer storage if the Phase 3 pumping rates were continued and equilibrium conditions are not attained in the aquifers. The graphs of water levels shown by Figures 13, 14, and 15 include computer-fitted trend lines projected hundreds of days into the future. The graphs include both a linear trend line (solid line) and a logarithmic trend line (dashed line) fitted to the data. Generally the linear trend lines provide a slightly better fit to the data. Each figure also includes two versions of the graphs: the upper graph uses a linear scale for the X axis (elapsed time), and lower graph uses logarithmic scale to facilitate illustration of recorded data and projection of trends more than 10 years into the future.

Both the linear and logarithmic trends lines provide reasonable fits to the water level data from the Phase 3 pumping, but the two trends are very different in the long-term. If the linear trends continue, in a few years water levels would be significantly below the top of the well screens and production rates from the wells would likely drop off considerably. However, with a logarithmic trend line, the rate of drop in water level decreases with time, and the projected water level remains above the well screen for decades. Moreover, as discussed further below, the water levels may stabilize if the groundwater flow regime attains a new equilibrium condition, but this could take decades or even centuries (e.g. Bredehoeft and Durbin, 2009; Walton 2011).

4.3 Discussion of Hydrographs for Other Wells at the Project Site

Hydrographs are also provided for Wells 5, 8, 9, 12 and 13 (Figures 16 and 17), which were not part of the pumping test program, but were instrumented with transducers and data loggers. Daily rainfall and the test pumping schedule are included on the hydrographs (Figures 16 and 17) to facilitate evaluation of potential influence of both rainfall recharge and the project test pumping on water levels in these wells.

The hydrograph for Well 8 (Figure 16), which is completed in shallow alluvium along Los Berros Creek, shows a rapid 30-foot increase in water level in response to abundant rainfall in December 2010 and January 2011.

Although there are discontinuous water level records and there is uncertainty about pumping limit interpretation, the hydrographs for Wells 5 and 9 (Figure 16), which are completed in the Obispo Tuff, also show increases in water level following periods of abundant rainfall. Water level rise is particularly evident in Well 9 in response to the heavy rainfall in December 2010 and January 2011.

Hydrographs for Wells 12 and 13 (Figure 17), which are deeper and completed within the Monterey, show only a few feet of fluctuation in water level over the entire period of the testing program. Although these wells show an increase in water level in the range of 2 to 4 feet that is clearly related to the heavy rainfall in December 2010 and January 2011, the time frame for replenishment of groundwater flowing within the deeper Monterey Formation aquifers is expected to be much longer, likely years, decades, or more.[13]

As also discussed by CHG (July 2010), water levels recorded in Wells 5, 9, 12, and 13 during the testing program show no significant response to the three phases of pumping from Wells 10, 11, 14, and 15. No water level monitoring data are available from off-site wells such as the Tremper and Fitzgerald Wells to evaluate potential interference between the project wells and off-site wells during the production testing conducted at Wells 10, 11, 14, and 15. Based on available data, pumping from the project wells is not expected to provide significant drawdown interference with other wells due to the additive overlap of the pumping cone of depression. However, production rates from other wells in the area could decrease if pumping from project wells is conducted in excess of sustainable yields of the aquifers, which would result in general lowering of the water levels due to depletion of groundwater storage.

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[13] Analyses of groundwater samples for stable isotopes of oxygen ($^{16}O/^{18}O$) and deuterium/hydrogen ($^{2}H/^{1}H$) would provide insight into the origin and age of groundwater. Isotopes are atoms of the same element that have differing numbers of neutrons. Stable isotopes are those that do not undergo nuclear decay. For example, both hydrogen and oxygen have two stable isotopes (^{1}H and ^{2}H, and ^{16}O and ^{18}O, respectively). Natural hydrologic processes including precipitation segregate these isotopes of hydrogen and oxygen, which makes them ideal tracers of water.

Figure 18 graphically depicts additional water level data available for four other irrigation wells at the project site (Wells F&T-1, F&T-2, FVW-1, and FVW-3, from Table 4 of C&A, January 2004). Although there are only a few data points for each well over periods of several years, the data show a general decline in groundwater elevation at these wells over 30 years.

4.4 Estimates of Sustainable Pumping Rates

4.4.1 Sustainable Yield

The primary purpose of the well testing program was to evaluate sustainable yield of the proposed project wells. Sustainable yield does not have a "correct" value, but is a subjective concept, and its evaluation is an interdisciplinary issue. As also discussed by CHG (July 2010), the concept of sustainable yield has been broadly defined as the amount of water that can be pumped indefinitely without unacceptable environmental, economic, or social consequences (e.g. Alley et al., 1999). According to the World Commission on Environment and Development (1987), sustainable development must meet the needs of the present without compromising the ability of future generations to also meet their needs. Typically, however, sustainable yield must also allow for sufficient natural discharge of groundwater to preserve streams, springs, wetlands, and riparian corridor ecosystems (e.g. Sophocleous, 1997; 2000).

As groundwater in storage is depleted and groundwater elevations continue to drop with ongoing pumping, the "cone of depression" associated with each pumping well (or group of wells) expands and groundwater within an increasing area flows toward the well. The extent of groundwater that ultimately flows to the pumping well is sometimes termed the extent of groundwater "capture" (e.g. Bredehoeft, 1997). The groundwater captured by pumping is derived from decreases in natural discharge and increases in recharge. Natural groundwater discharge commonly supports riparian and wetland ecosystems as well as the base flow of streams and rivers. The groundwater "captured" can also include increased recharge induced by pumping if the boundaries of the groundwater system include a surface water body or adjacent aquifer, but typically the majority of the capture associated with pumping consists of intercepted groundwater that would otherwise discharge or transpire elsewhere. Accordingly, the quantity of sustainable groundwater development usually depends on how much natural groundwater discharge can be captured (e.g. Bredehoeft, 1997; 2002; Ponce, 2007).

With continued pumping, the water level in an aquifer near a well can continue to drop ("drawdown") until it reaches the bottom of the well screen or pump intake, or the

water levels may stabilize if capture expands to equal the pumping rate and a new equilibrium groundwater condition is attained. If a new equilibrium condition is attained the pumping rate theoretically may be sustainable with no further decline in water level (i.e., no additional depletion of groundwater in storage). However, the time to achieve equilibrium pumping conditions can take decades or centuries. And if the groundwater pumping exceeds the potential for capture, new equilibrium conditions are not possible (e.g. Bredehoeft and Durbin, 2009; Walton, 2011; Alley and Leake, 2004).

4.4.2 Calculations of Sustainable Pumping based on the Test Pumping

For the proposed Laetitia project, based on the Phase 1 and 2 pumping and recovery data, CHG calculated an estimated long-term sustainable yield for each of the four wells totaling to 87 AF/Y with allowance for full recovery of water levels during average years to "operational static water levels established during Phase 1" pumping (CHG, Table 7, July 2010). Table 4 lists the annualized average pumping rates for each of the four wells.

The Phase 3 testing established that water levels continued to drop at three of the four wells with pumping at the estimated sustainable yield rates based on evaluation of the Phase 1 and 2 data (CHG, Table 7, July 2010). Thus, equilibrium groundwater conditions were not attained with the Phase 3 production rates and depletion of groundwater storage continued.

The "equilibrium discharge rate" (Q_{eq}) approach used by CHG (July 2010) for the Phase 1 and 2 data was also used to calculate revised estimates of "equilibrium interval" sustainable pumping rates by accounting for the time for groundwater levels to recover to pre-Phase 3 "operational static" elevations and scaling the Phase 3 pumping rates accordingly. The Phase 3 pumping and recovery periods and the "equilibrium interval" pumping rate calculation are shown with the hydrographs in Figures 11 and 12.

The rapid rise in water level in Well 10 after Phase 3 pumping appears related to a period of abundant rainfall near the end of Phase 3 testing. Recovery after Phase 2 pumping is considered more typical. Accordingly, the sketched recovery curve after the Phase 3 pumping was used for the equilibrium pumping calculation instead of the rapid recovery.

Scaling down the production rate to account for time for water levels to return to those at the beginning of the Phase 3 testing reduces the estimates of viable long-term production rates for Wells 10, 14, and 15 by 35%, 52%, and 45%, respectively. Q_{eq} was

not calculated from the Phase 3 testing data recorded at Well 11 because the prominent recharge influence on water levels at this well occurred that was independent of pumping and complicates interpretation of the aquifer response to pumping.

The resulting revised estimate of sustainable yield from the four wells is approximately 65 AF/Y, which equates to an average pumping rate of 42 gpm. Table 4 lists the estimated sustainable pumping rates calculated by CHG using the Phase 1 and 2 data, the actual Phase 3 pumping rates, and the revised estimates of viable long-term pumping rates based on the water levels recorded in the four wells during the Phase 3 pumping and subsequent recovery.

4.4.3 Potential Impact of Well 11 on Los Berros Creek

Although the production capacity of Well 11 was substantially higher than the other wells, the rapid recharge response, close proximity to the creek, and dropping water level beginning in June even without pumping indicates that the production capacity of Well 11 is dependent on base flow in Los Berros Creek and will likely decrease during summer and drought conditions. Moreover, pumping from Well 11 during late summer and autumn would likely substantially reduce base flow in the Los Berros Creek channel. Figure 19a shows the pumping rate proposed by CHG (July 2010) for Well 11 (38.2 AF/Y = 23.7 gpm) compared to average monthly flow rate in Los Berros Creek based on available data for the period from 1981 to 2001. During the months of August through November, the proposed pumping rate from Well 11 exceeds 30 percent of the average flow in Los Berros Creek.

An alternative to help preserve base flows in the creek and decrease impact to the Los Berros Creek riparian corridor would be to not operate Well 11 during the months of August, September, October, and November. However, a higher pumping rate than that used for the Phase 3 testing can likely be sustained at Well 11 the rest of the year (December through July) with insignificant impact to Los Berros Creek. Accordingly, the suggested optimized pumping scheme includes a 10 percent increase to the pumping rate at Well 11 from December through July. Based on average conditions for the period from 1981 to 200, with the proposed 10 percent increase in pumping from Well 11 from December through July, the pumping rate is less than 15 percent of the creek flow. Figure 19b shows the recommended revised pumping schedule for Well 11 compared to average monthly flow rate in Los Berros Creek.

4.4.4 Increased Production from Well 15

Well 15 is the deepest of the four wells and has the largest available drawdown between the water level attained during Phase 3 pumping and the top of screen—approximately 80 feet. Consequently, a production rate from Well 15 that results in continuing gradual drawdown is more sustainable at Well 15 than at the other wells.

Although equilibrium conditions were not attained during the Phase 3 pumping rate, based on evaluation of the water level response to testing at Well 15, the Phase 3 pumping rate can likely be sustained for a few years before the water level would drop below the top of the screen.

Based on review of the pumping test data and well construction details, our estimated long-term viable production rate for Well 15 includes a 25 percent increase to the revised calculated sustainable pumping rate for Well 15 based on the Phase 3 production and recovery. A 25 percent increase in the long-term pumping rate calculated for Well 15 can likely be sustained for many years and can make-up a portion of the decrease in production from Well 11.

4.4.5 Recommended Production Rates and Schedule

Table 4 provides our revised estimates of viable long-term flow rates from the four wells with a net 26 percent reduction of pumping from Well 11 (relative to the Phase 3 rate) to lessen impact to Los Berros Creek (no pumping from August to November), and a 25 percent increase all year from Well 15 (relative to the revised rate scaled to the Phase 3 recovery). The revised resulting total production rate is 62.4 AF/Y or 38.7 gpm. This is a 28 percent decrease compared to the sustainable rate estimated by CHG (July 2010) on which the Phase 3 testing was based, but 135 percent of the allocated project demand of 46.3 AF/Y.

4.5 <u>Source Capacity is Adequate to Achieve Maximum Daily Demand</u>

Community water supply systems are required to have adequate source capacity to meet maximum daily demand (MDD) at all times. In accordance with State guidelines, CHG (July 2010) estimated the MDD for the proposed Laetitia project as 1.5 times the average daily demand (ADD) for the maximum demand month, which based on evapotranspiration requirements would be June. The calculated project water demand in June is 4.06 AF, which equates to 30.6 gpm for continuous flow. And, the MDD

during June would be a factor of 1.5 higher, which is approximately 46 gpm (Appendix A of CHG, July 2010).

The sustainable rate estimated by CHG (July 2010) based on Phase 1 and 2 data and pumped from the four wells during Phase 3 was equivalent to 87 AF/Y, or approximately 54 gpm, which exceeds the maximum MDD value of 46 gpm. However, based on evaluation of the Phase 3 data and including measures to conserve base flow in Los Berros Creek, the revised estimated viable long-term production rate of 62.4 AF/Y, which equates to 38.7 gpm, is less than the MDD of 46 gpm. Nonetheless, based on the testing data, the capacity of the four wells is more than adequate to sustain a continuous flow of 46 gpm for a month. Moreover, water in storage tanks can be used to supplement groundwater pumping during short-term high demands.

4.6 Estimates of Aquifer Properties

Portions of the water level data recorded at Wells 10, 11, 14 and 15 during the testing program were analyzed to estimate transmissivity of the aquifers[14]. Aquifer type-curves used for analyses included the Theis confined solution, Copper-Jacob approximation of the Theis solution, and the Hantush-Jacob Leaky Aquifer solution (e.g. Kruseman and de Ridder, 1992). Subsets of the water level data recorded during the testing were analyzed to estimate aquifer transmissivity using standard graphical aquifer testing analysis methods both by hand and with computer software. Water levels recorded both during pumping and recovery were analyzed. Four general methods were used to estimate transmissivity, each of which are discussed below. The aquifer testing analyses are provided in Appendix B and the estimates of transmissivity and hydraulic conductivity are summarized in Table 5.

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[14] Transmissivity (T) is the capacity of an aquifer to transmit water. The volume of water (e.g. ft^3) that flows through a unit width (ft) of the aquifer during a unit duration of time (e.g. a day) for a unit hydraulic gradient (e.g. 1ft/1ft): ft^3 per ft-day = ft^2/day. Transmissivity equals hydraulic conductivity time aquifer thickness.
As indicated in by Table 5, a 75% well efficiency was assumed for the calculations of transmissivity based on analyses of the water level recorded in the pumping wells. With a 75% well efficiency the drawdown in the aquifer just outside the well would be 25% less, and the calculated transmissivity is thus 25% higher.

4.6.1 Type-Curve Analyses of Detailed Pumping Test Data

Graphical-visual fits to the data were conducted using the aquifer testing analysis software called AQTESOLV™ (Duffield, 2007), which facilitates type-curve analysis with variable pumping rates and concurrent analysis of pumping and recovery data. Based on fitting of the detailed type-curves to the water level data accounting for each pumping cycle, the approximate estimated transmissivities (T) are 8, 110, 50, and 120 ft^2/d and calculated bulk hydraulic conductivity values[15] are 0.06, 0.56, 0.14, and 0.61 ft/d respectively for Wells 10, 11, 14 and 15.

4.6.2 Cooper-Jacob Analyses of Simplified Pumping Test Data

Simplified approximations of the hydrographs were analyzed using the Cooper-Jacob approximation of the Theis confined solution for each of the three phases by neglecting the off-on cycles within each phase and using average pumping rates.

When drawdown associated with the first pumping cycle for each phase of testing was analyzed, the operational pumping rate was used instead of the averaged production rate during the phase of testing. Generally, the transmissivity calculated from the first cycle of pumping was substantially higher than the estimates based on long-term pumping. The initial yield from fractured bedrock commonly is not representative long-term yield.

Based on the Cooper-Jacob analyses of simplified representations of the testing data, approximate representative average values of transmissivities (T) are 35, 105, 40, and 85 ft^2/d and calculated bulk hydraulic conductivity values are 0.25, 0.55, 0.11, and 0.42 ft/d, respectively, for Wells 10, 11, 14, and 15.

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[15]For all the analyses, the bulk hydraulic conductivities were calculated from the estimated transmissivities assuming aquifer thicknesses equal to the well screen lengths. This provides upper limit values for bulk hydraulic conductivity because a thickness of the aquifer greater than the length of the well screen likely contributes flow of groundwater to the wells. Accordingly, the actual bulk K values are likely lower. If a thickness of aquifer greater than the screen length contributes to flow toward the well, the actual bulk hydraulic conductivities would be lower than calculated.

4.6.3 Theis Recovery Analysis following Phase 2 Pumping

Analysis of recovery of water levels after Phase 2 pumping using the Theis Recovery method was conducted for Wells 10, 14, and 15. The approximate respective resulting estimates of transmissivity are 17, 24, and 49 ft^2/d, and calculated bulk hydraulic conductivity values are 0.12, 0.07, and 0.25 ft/d. No correction for well efficiency is made for analysis of recovery data.

4.6.4 Transmissivity Estimated from Specific Capacity

Estimates of transmissivity were also calculated from specific capacity, (Q/S, pumping rate divided by drawdown, e.g. gpm per foot of drawdown) for Wells 10, 11, 14, and 15. Two approaches were used for calculation of drawdown from specific capacity: (1) using the initial static water level before the Phase 1 testing; and (2) using "reset" initial water levels at the beginning of each phase of testing.

Because water levels did not equilibrate, but continued to drop during the pumping tests, using Approach 1 for Wells 10, 14, and 15 results in generally decreasing specific capacities and transmissivities with time. With this method, the specific capacity at Well 10 ranged from 3.6 to 0.6 gpm/ft, and the specific capacities at Wells 14 and 15 ranged from approximately 2 to 0.5 gpm/ft. Transmissivity calculated from the specific capacity values using the following formula (e.g. Heath, 1989):

$$T = (300/0.75)(Q/S),$$

for the following units: T ft^2/d, Q gpm, and S ft

results in transmissivity values ranging from 1400 to 250 ft^2/d for Well 10, and 900 to 200 ft^2/d for Wells 14 and 15. Bulk hydraulic conductivities calculated from the transmissivity values range from 8 to 1.5 ft/d for Well 10, 2.5 to 0.6 ft/d for Well 14, and 4 to 1 ft/d for Well 15.

Using Approach 2, generalized average specific capacities values were also calculated for each of the three phases using the initial and ending water levels during each phase and average pumping rate. For these calculations a "reset" initial water level prior to Phase 2 and Phase 3 pumping was used to calculate drawdown and specific capacity during the Phase 2 and Phase 3 pumping. Accordingly the drawdown is less and the specific capacity values are higher than when calculated using Approach 1, which used the initial water level prior to Phase 1 pumping for all calculations of drawdown.

Transmissivities calculated from specific capacities using Approach 2 range from 5000 to 350 ft^2/d for Well 10, and 900 to 300 ft^2/d for Wells 14 and 15. Bulk hydraulic conductivities calculated from the transmissivity values range from 28 to 2 ft/d for Well 10, 2.5 to 1 ft/d Well 14, and 1 to 4 ft/d for Well 15.

The higher values reflect short-term transmissivity of local fracture systems and the longer term values are better estimates of bulk hydraulic conductivities of the aquifer, but still are substantially higher than estimates based on the other aquifer analysis methods discussed above.

4.6.5 Summary of Estimates of Aquifer Properties

The values for transmissivity and bulk hydraulic conductivity calculated from specific capacity data are considered less reliable than the values based on detailed type-curve analysis, Cooper-Jacob analysis of simplified aquifer response to average pumping, and analysis of recovery after Phase 1 and 2 pumping. The results of the aquifer test analyses excluding the specific capacity methods are listed in Table 5 and summarized below.

Well	Transmissivity (ft^2/d)	Transmissivity (gpd/ft)	Bulk Hydraulic Conductivity (ft/d)
Well 10	8 to 35	60 to 260	0.06 to 0.25
Well 11*	100	750	0.6
Well 14	25 to 50	190 to 375	0.07 to 0.14
Well 15	50 to 120	375 to 900	0.25 to 0.6

* Few estimates of transmissivity and hydraulic conductivity were possible for Well 11 because the aquifer response to pumping was complicated by influence of base flow at Los Berros Creek.

The estimates of transmissivity of the fractured rock aquifers based on the analysis of data recorded during the three phases of pumping tests are substantially lower than previous estimates based on shorter term pumping tests (C&A, October 2005; Fugro, June 2009). This indicates that the long-term capacities of the fractured rock aquifers to transmit groundwater are lower than previously estimated and sustainable production potential of the Project Site wells based on the short-term tests were unrealistically high.

Although the estimates of viable long-term groundwater yields reported herein are based primarily on evaluation of hydrographs and pumping history, the bulk hydraulic conductivities based on analysis of the aquifer testing data are useful for providing a basis for aquifer properties that would be needed if groundwater modeling or other calculations are conducted to further evaluate groundwater production and possible long-term drawdown of groundwater levels in response to proposed pumping (e.g. Bredehoeft, 2002).

4.7 Fractured Bedrock Aquifers

The methods used for estimating transmissivity and hydraulic conductivity of the aquifers tapped by the wells at the Project Site are based on the assumption that the aquifers are homogeneous and isotropic—which means uniform throughout and in all directions. However, the aquifers are in fractured bedrock, so they are not uniform and isotropic. Nonetheless, at a large scale, fractured bedrock aquifers can often be reasonably represented by an equivalent homogenous porous media, although a directional bias (anisotropy) of hydraulic conductivity is common.

Initial yield from wells in fractured bedrock aquifers often is not representative of longer-term yields, which are typically lower. As groundwater is released from storage in fractures, the hydraulic gradient toward the well becomes progressively lower, which causes the well yield to decline. And, a relatively lower hydraulic gradient at the end of the pumping period limits the rate of groundwater flow back into the area of drawdown, so recovery is often substantially slower than drawdown (e.g. Robinson, Noble & Saltbush, 2004; Morrison-Maierle, 2002).

Although the standard analytical techniques for groundwater flow assume uniform radial flow of groundwater toward a pumping well, flow within fracture systems commonly have more linear geometry (e.g. Morrison-Maierle, 2002). For radial flow systems, the rate of drawdown gradually decreases with pumping duration because the volume of aquifer influenced by pumping increases by the distance squared. However, for a system of linear fractures tapped by a well in bedrock, the volume of aquifer influence by pumping can increase linearly with distance, so the rate of drawdown with pumping will be faster than for radial systems.

5. CONCLUSIONS AND RECOMMENDATIONS

Continuing general decline of water levels in Wells 10, 14, and 15 during the three phases of pumping indicates that stable equilibrium groundwater conditions were not attained. Moreover, continued decline in water levels at three of the four wells during

the Phase 3 pumping indicates that the 87 AF/Y sustainable yield estimated by CHG (July 2010) will not result in full recovery to "the Phase 1 operational static water levels," but will cause additional depletion of groundwater storage.

The projections of downward water level trends exhibited during testing and the unknown time to possibly achieve equilibrium pumping conditions underscores that time frame is an important issue with respect to long-term viability of the wells to meet the proposed project demands. Climate change is predicted to result in rainfall occurring in fewer and more intense periods (DWR, 2003), which would likely result in more runoff, perhaps less recharge to groundwater, and possibly long-term decrease in base flow of creeks.

With continued pumping at Phase 3 rates, an expanding cone of depression of groundwater elevation will result in capture of more groundwater and an equilibrium condition accompanied by stable water levels may be attained. However, equilibrium groundwater flow conditions may not occur for decades or longer (e.g. Alley et al., 1999; Bredehoeft, 2002; Bredehoeft and Durbin, 2009). Based on the water level records during Phase 3 pumping, if the linear trend in decreasing groundwater elevations continues at the rates observed during the Phase 3 testing, the water levels in the wells will likely drop below the top of the well screens-- within months in Wells 10 and 14, and within a few years in Well 15.

The long screened intervals (i.e., the large thickness of aquifer screened by the project wells) provide the opportunity to install the pumps hundreds of feet deep and continue pumping when water levels drop well below the top of the screened interval. However, drawdown of water level below the top of the screen typically decreases the production capacity of the wells because as the water level drops, the aquifer saturated thickness (and thus the transmissivity) near the wells will decrease. Nonetheless, the long screened intervals may allow pumping to be sustained with gradually decreasing water levels for many years.

As reported by CHG (July 2010) and discussed above, Well 11 shows rapid recharge likely due to good hydraulic connection between the aquifer and base flow in Los Berros Creek. Because pumping of Well 11 likely reduces base flow in Los Berros Creek, curtailment of pumping from this well is recommended during the late summer and early fall months when creek flows are lowest. The recommended water production schedule includes curtailment of pumping from Well 11 from August through November each year to help preserve base flow in Los Berros Creek.

Well 15 is the deepest of the four wells and has the largest available drawdown between the water level attained during Phase 3 pumping and the top of screen—approximately 80 feet. Consequently, a production rate from Well 15 that results in continuing gradual drawdown is more sustainable at Well 15 than at the other wells. Accordingly, the recommended long-term viable production rate for Well 15 includes a 25 percent increase to the revised calculated sustainable pumping rate for Well 15 based on the Phase 3 production and recovery.

Table 4 summarizes the revisions to the estimated "sustainable" production rates for each of the four wells. Based on our evaluation of the hydrogeologic setting and pumping test data, including the Phase 3 recovery data, the estimated total long-term viable production rate from the four wells is 62.4 AF/Y (38.7 gpm). This is 28 percent less than the sustainable production rate estimated by CHG (July 2010) that was used for Phase 3 testing, but 35 percent more than the allocated project demand of 46.3 AF/Y.

The revised estimated viable long-term production rate of 62.4 AF/Y, which equates to 38.7 gpm, is less than the maximum daily demand (MDD) of 46 gpm. Nonetheless, based on the testing data, the capacity of the wells is more than adequate to sustain a continuous flow of 46 gpm for one month. Moreover, water in storage tanks can be used to supplement groundwater pumping during short-term high demands.

The estimates of viable long-term groundwater production rates reported herein are based on evaluation of water levels recorded in four wells for the period from October 2009 to March 2011, which included several months of pumping. However, we caution that rainfall during the testing program was 138 percent of average, and also that long-term yields of water wells producing from bedrock aquifers, which may have linear fracture systems, commonly are substantially less than short-term yields. Nonetheless, long-term groundwater production rates of 21 AF/Y reported by CHG (July 2010) for each of two irrigation wells[16] at the Project Site supports that 62 AF/Y is a viable long-term groundwater production rate for the four project wells combined.

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[16] CHG, July 2010, page 9 reports that Well 5 produced 540 AF over 26 years, and Well 9 produced 230 AF over 11 years. Each equates to approximately 21 AF/Y. Both of the wells, which are screened in the Obispo Formation fractured bedrock and their locations are shown on Figures 3 and 7.

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TABLES

Table 1
Los Berros Creek Mean Monthly Flow Data

Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	1	2	3	4	5	6	7	8	9	10	11	12
1968								0.15	0.13	0.11	0.09	0.10
1969	29.42	28.69	17.52	4.37	2.07	1.00	0.31	0.28	0.15	0.36	0.47	0.48
1970	0.86	0.98	3.90	0.79	0.27	0.23	0.25	0.13	0.07	0.07	0.11	1.31
1971	2.30	1.18	0.79	0.65	0.50	0.40	0.50	0.28	0.12	0.14	0.10	0.22
1972	0.19	0.24	0.25	0.03	0.05	0.13	0.07	0.06	0.05	0.07	0.28	0.19
1973	6.68	19.16	16.68	2.79	1.15	0.34	0.20	0.08	0.06	0.04	0.06	0.70
1974	10.59	1.55	6.33	7.16	2.09	1.10	0.64	0.35	0.24	0.29	0.51	1.08
1975	0.77	2.59	2.26	1.70	1.00	0.69	0.51	0.41	0.39	0.43	0.43	0.28
1976	0.28	0.45	0.77	0.66	0.43	0.33	0.23	0.13	0.14	0.34	0.36	0.32
1977	0.38	0.39	0.40	0.34	0.40	0.22	0.12	0.08	0.02	0.00	0.00	0.08
1978	8.96	27.98	17.46	6.72	2.75	1.35	0.67	0.41	0.37			0.66
1979	1.10	2.67	4.30				0.08	0.00	0.00	0.00	0.00	0.00
1980	1.81	12.97	8.10	1.44	0.95	1.17	0.29	0.01	0.00	0.00	0.00	0.00
1981	0.06	0.36	8.38	4.06	0.46	0.25	0.07	0.00	0.00	0.00	0.00	0.00
1982	0.00	0.00	1.96	9.87	0.96	0.30	0.04	0.00	0.00	0.00	0.00	1.82
1983	9.38	30.73	36.81	12.17	9.04	4.77	2.99	2.51	1.61	1.69	2.26	4.05
1984	2.70	2.41	1.75	1.14	0.72	0.43	0.38	0.38	0.00	0.00	0.01	0.56
1985	0.82	1.90	1.11	0.85	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1986	0.00		7.23	0.94	0.34	0.05	0.00	0.00	0.00	0.00	0.00	0.00
1987	0.00	0.00	0.37	0.09	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1988	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1989	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1990	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1991	0.00	0.00	11.04	3.86	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1992		5.56	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1993	2.05	6.10	7.62	2.04	0.01	0.00	0.00	0.00	0.00			
1994										0.00	0.00	0.00
1995		1.82			0.72	4.35	0.79	0.00	0.00	0.00	0.00	0.00
1996	0.00	12.19	3.51	0.85	0.01	0.00	0.00	0.00	0.00	0.00		
1997						0.00	0.00	0.00	0.00	0.00	0.01	
1998		73.30	20.82	25.03	12.20	5.44	3.04			0.64	0.48	
1999		1.79	2.40			0.85	0.36	0.13			0.00	0.00
2000	0.00		4.22		0.69	0.09	0.00	0.00	0.00		0.00	
2001		2.57	25.47	2.37		0.01			0.00			
Monthly Means 68-01	**2.94**	**7.99**	**6.93**	**3.36**	**1.45**	**0.92**	**0.58**	**0.42**	**0.39**	**0.47**	**0.52**	**0.82**
Monthly Means 81-01	**1.07**	**8.16**	**7.39**	**3.96**	**1.50**	**0.83**	**0.40**	**0.17**	**0.09**	**0.14**	**0.15**	**0.43**

Notes:
Blank cell insufficient data for calculation of mean monthly value.
Highlighted (yellow) rows include more than one month with greater than 10% of missing data

Table 2
Wells at the Laetitia Vineyard & Winery
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

	Well 1	**Well 2**	**Well 4**	**Well 5**	**Well 7**	**Well 8**	**Well 9**	**Well 10***	**Well 11***	**Well 12**	**Well 13**	**Well 14***	**Well 15***
	F&T #2	F.V. Wells #4	(F.V. Wells #3)	(F.V. Wells #1)	F.V. Wells #2	Enloe #1	(F&T #1)	(2004-3)	(2005-1)	(2004-2)	(2004-1)	2006-1	2006-2
Common Name or Comment	Block "o" Well	Freeway Well	Electric Well	Propane Well	Estate Well	--	Campodonico Well	Proposed Project Supply Well	Proposed Project Supply Well	**	**	Proposed Project Supply Well	Proposed Project Supply Well
Date Drilled (completed)	Nov-98	Unknown	Jul-93	1983	Jul-88	Oct-99	Nov-98	Dec-04	Jul-05	Dec-04	Nov-04	Jun-06	Jul-06
Latitude			35°05.260'	35°05.215'			35°05.678'	35°06.049'	35°05.761'	35°06.094'	35°06.145'	35°06.382'	35°06.542'
Longitude			120°31.636'	120°31.461'			120°30.528'	120°30.434'	120°30.134'	120°29.328'	120°29.278'	120°29.665'	120°29.736'
Use	Irrigation	Domestic	Irrigation	Irrigation	Domestic	Domestic	Irrigation	Proposed Development	Proposed Development			Proposed Development	Proposed Development
Casing Diameter	8-inch PVC	8-inch steel	10-inch PVC	12-inch steel	12-inch PVC	8-inch PVC	8-inch PVC	10-inch PVC	8-inch PVC	8-inch PVC	8-inch PVC	8-inch PVC	8-inch PVC
Ground Surface Elev.			372	365			460	620	410	520	600	710	830
Total Depth of Well (ft bgs)	320	129	500	392	525	65	445	330	305	510	560	530	520
Formation Screened				Obispo Tuff		alluvium	Obispo Tuff	Obispo Tuff	Obispo Tuff	Monterey Shale	Monterey Shale	Monterey Shale	Monterey Shale
Screened Interval (Perforations) (ft bgs)	250-310	N/A	250; 280-340; 360-500	Unknown	185-310; 445-520	25-65	325-425	150-240; 280-330	115-305	190-320; 370-510	220-340; 370-560	170-530	310-510
Pump Setting (ft bgs)	210	120	330	350	300	--	300	260	220	280	320	300	400
Design GPM	260	22	400	500	40	--	260						
Current Production (gpm)	320	Unknown	500	400	Unknown	--	270						
Hours Pumped per Day	6-10 per day up to 4 days, then off for 1-2 weeks	Unknown	24 for 2-3 days to pond, then off for 2-3 days	24 for 1-2 days to pond, then off for 2-3 days	Unknown	--	24 for 2-3 days to pond, then off for 2-3 days						
Distribution	Direct Irrigation	Winery	Pond	Pond	Estate & Winery	--	Pond						

* Proposed Project Well included in Test Pumping Program (also highlighted).
** Proposed Project Well that was Replaced by Well 14 & 15 due to concern about impact on Los Berros Creek
All depths are in feet.
All pumping rates in gallons per minute (gpm).
ft bgs = feet below ground surface

Table 3
Pump Testing Rates and Schedule

Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

				Allocated Project Demand:		**46.3 AF/Y**
						28.7 gpm
	Well 10	**Well 11**	**Well 14**	**Well 15**	**Total**	**% of project demand**
Phase 1. Oct 12 - Dec 16, 2009 ~10 wks (CHG Table 1 July 2010)						
operational Q gpm	50	45	50	35		
total pumped AF	4	3.7	4.6	3.2	15.5	
anualized AF/Y	20.8	19.2	23.9	16.6	**80.6**	**174%**
annualized gpm	12.9	11.9	14.8	10.3	50.0	
Phase 2. Jan 16 to May 10-14 ~ 4 months (CHG Table 4, July 2010)						
operational Q gpm	50	60	60	60		
total pumped AF	11.7	16.1	12.9	13.1	53.8	
annualized AF/Y	35.1	48.3	38.7	39.3	**161.4**	**191%**
annualized gpm	21.8	29.9	24.0	24.4	100.1	
Phase 3. 27 Spt - 30 Dec 2010 ~14 weeks (CHG Table 2, March 2011)						
operational Q gpm	44	55	42	44		
total pumped AF	2.8	10.3	5.2	5.5	23.8	
annualized AF/Y	10.2	38.3	19.4	20.4	**88.3**	**140%**
annualized gpm	6.3	23.7	12.0	12.6	54.7	

Notes and abbreviaions

gpm = gallons per minute
AF = acre feet
AF/Y = acre feet per year
Q = pumping rate

Table 4
Estimates of Sustainable Yields for Wells 10, 11, 14 and 15

Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

Allocated Project Demand: 46.3 AF/Y
28.7 gpm

	Well 10	Well 11	Well 14	Well 15	Total	% of project demand
	1. CHG Est Sus Yield based on Phase 1 & 2 Testing (Table 7 July 2010 & Table 1 Mar 2011)					
AF/Y	10	38	19	20	**87.0**	**188%**
gpm	6.2	23.6	11.8	12.4	53.9	
	2. Phase 3 Testing - production schedule duration of 14 weeks (CHG Table 2 Mar 2011)					
operational Q gpm	44	55	42	44		
Total Pumped AF	2.75	10.30	5.23	5.48	23.8	
annualized AF/Y	10.2	38.3	19.4	20.4	**88.3**	**191%**
annualized gpm	6.3	23.7	12.0	12.6	54.7	
	3.1 Calculated Yield based on Phase 3 Testing					
Pumping Start - Recovery Dates	9/27-2/27	*	9/27-4/27	9/27-3/27		
Pumping Period (weeks)	14	14	14	14		
Recovery Period (weeks)	8	0	16	12		
Total Weeks	22	14	30	26		
calc sus yield from Ph3 Testing AF/Y	6.5	38.3	9.1	11.0	**64.8**	**140%**
gpm`	4.0	23.7	5.6	6.8	40.2	
	3.2 Adjustment to Protect Creek Baseflow					
	No Q from Well 11 Aug - Nov, but 10% increase Dec - Jun					
AF/Y	6.5	28.1	9.1	15	**58.6**	**127%**
gpm	4.0	*26.1***	5.6	9.3	36.3	
	3.3 Optimized Est Sus Yield					
	Well 11 as above and increase Q at Well 15 by 25%					
AF/Y	6.5	28.1	9.1	18.8	**62.4**	**135%**
gpm	4.0	*26.1***	5.6	11.6	38.7	
% of CHG est (1 above)	**65%**	**74%**	**48%**	**94%**	**72%**	
% decrease relative to CHG est (1 above)	35%	26%	52%	6%	28%	

Notes and abbreviaions

* No adjustment for Well 11 recovery due to influence by creek
** For version 4 and 5, operational Q for Well 11 is avg rate for 8 months,
but Q for Wells 10, 14, and 15 is avg rate for 12 months
3.1, 3.1, and 3.3 are revised calculations by Geosyntec of estimated sustainable yield
Verison 3.3, which is highlighted, is the recommended pumping
gpm = gallons per minute
AF = acre feet
AF/Y = acre feet per year
Q = pumping rate

Table 5

Estimates of Transmissivity and Hydraulic Conductivity

Review of Well Testing and Sustainable Yield Assessment

Proposed Laetitia Agricultural Cluster Subdivision, San Luis Obispo, California

Aquifer Properties Based on Detailed Type-Curve Analyses (Hantush-Jacob Leaky Aquifer and Theis Confined Aquifer Solutions)

Well	Transmissivity*		Aquifer Thickness (ft)	Bulk K ft/day	Unit
	ft^2/day	gpd/ft			
Well 10	8.4	63	140	0.06	Resistant tuff
Well 11	107	800	190	0.56	Resistant tuff
Well 14	51	381	360	0.14	Siliceous shale
Well 15	121	905	200	0.61	Siliceous shale

* Transmissivity includes correction (decrease) to drawdown assuming 75% well efficiency

Cooper-Jacob Analyses of Simplified Aquifer Response and Averaged Pumping

	Phase 1					Phase 2					Phase 3					T avg	T** avg	screen	Bulk K
	Q-pmp (gpm)	T_0 (ft^2/d)	Q-prd (gpm)	T_1 (ft^2/d)	T_2 (ft^2/d)	Q-pmp (gpm)	T_0 (ft^2/d)	Q-prd (gpm)	T_1 (ft^2/d)	T_2 (ft^2/d)	Q-pmp (gpm)	T_0 (ft^2/d)	Q-prd (gpm)	T_1 (ft^2/d)	T_2 (ft^2/d)	(ft^2/d)	(ft^2/d)	(ft)	(ft/d)
Well-10	50		12.9	**22**	**30**	50		21.8	**16**	**16**	44	**266***	6.6	**46**		**26**	**35**	140	**0.25**
Well-11	45	**165***	11.9			60	**78**	29.9			55	**138***	24.8			**78**	**104**	190	**0.55**
Well-14	50	**76***	14.8	**16**	**29**	60		24	**18**	**28**	42	**59***	12.6	**40**	**44**	**29**	**39**	360	**0.11**
Well-15	35	**175***	10.3		**55**	60		24.4		**61**	44	**171***	13.2		**71**	**62**	**83**	200	**0.42**

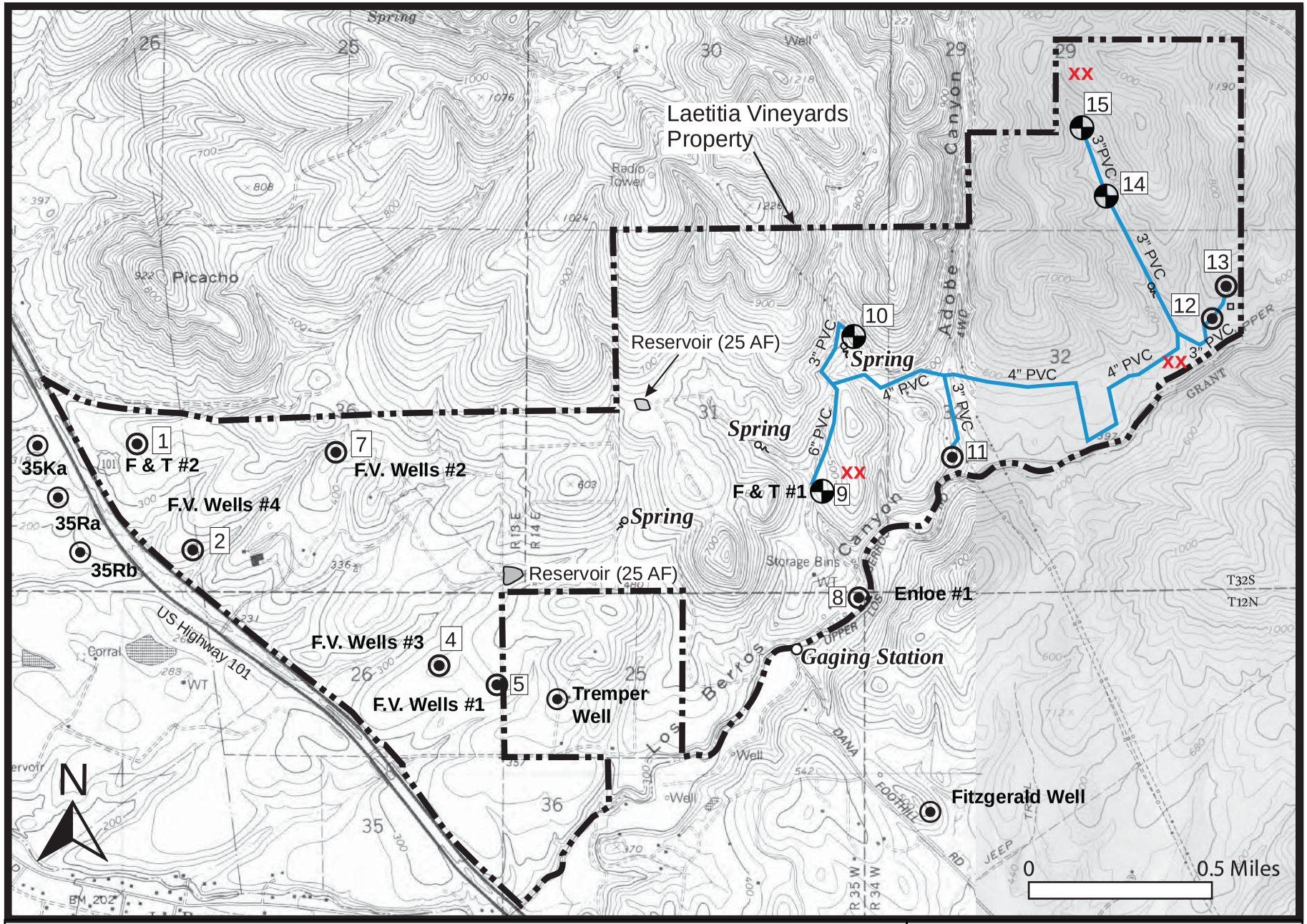
Theis Analysis of Recovery of Water Level Following Phase 1 and 2 Testing

	AF			30 wks	recovery	T	T	b	Bulk K
Well	Ph-1	Ph-2	tot	gpm	Delta S ft	ft2/d	gpd/ft	ft	ft/d
Well 10	4	11.7	15.7	16.9	34	17.4	130	140	0.12
Well 14	4.6	12.9	17.5	18.9	28	23.6	176	360	0.07
Well 15	3.2	13.1	16.3	17.6	12.5	49.2	368	200	0.25

Notes and Abbreviations: T = Transmissivity; Q –pmp = instantaneous pumping rate; Q-prod = production rate; gpd = gallons per day

* Higher transmissivity calculated from early time data likely represents most transmissive fractures near the well (not included in calculation of average transmissivity (Tavg). T**avg includes correction for assumed 75% well efficiency

FIGURES



Base map: U.S.G.S. 7.5 minute topographic, Oceano and Nipomo Quadrangles, CA
Base map scale: 1 inch = 2000 feet
Well locations approximate
Adapted from CHG memo, 4 Jan 2011

Explanation

15 Well Location and number

Well discharge piping

XX Weather recording station

Water Supply Well for Proposed Subdivision

Topographic Map of the Laetitia Site Showing Well Locations
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

May 2011	Figure ES1	Geosyntec consultants

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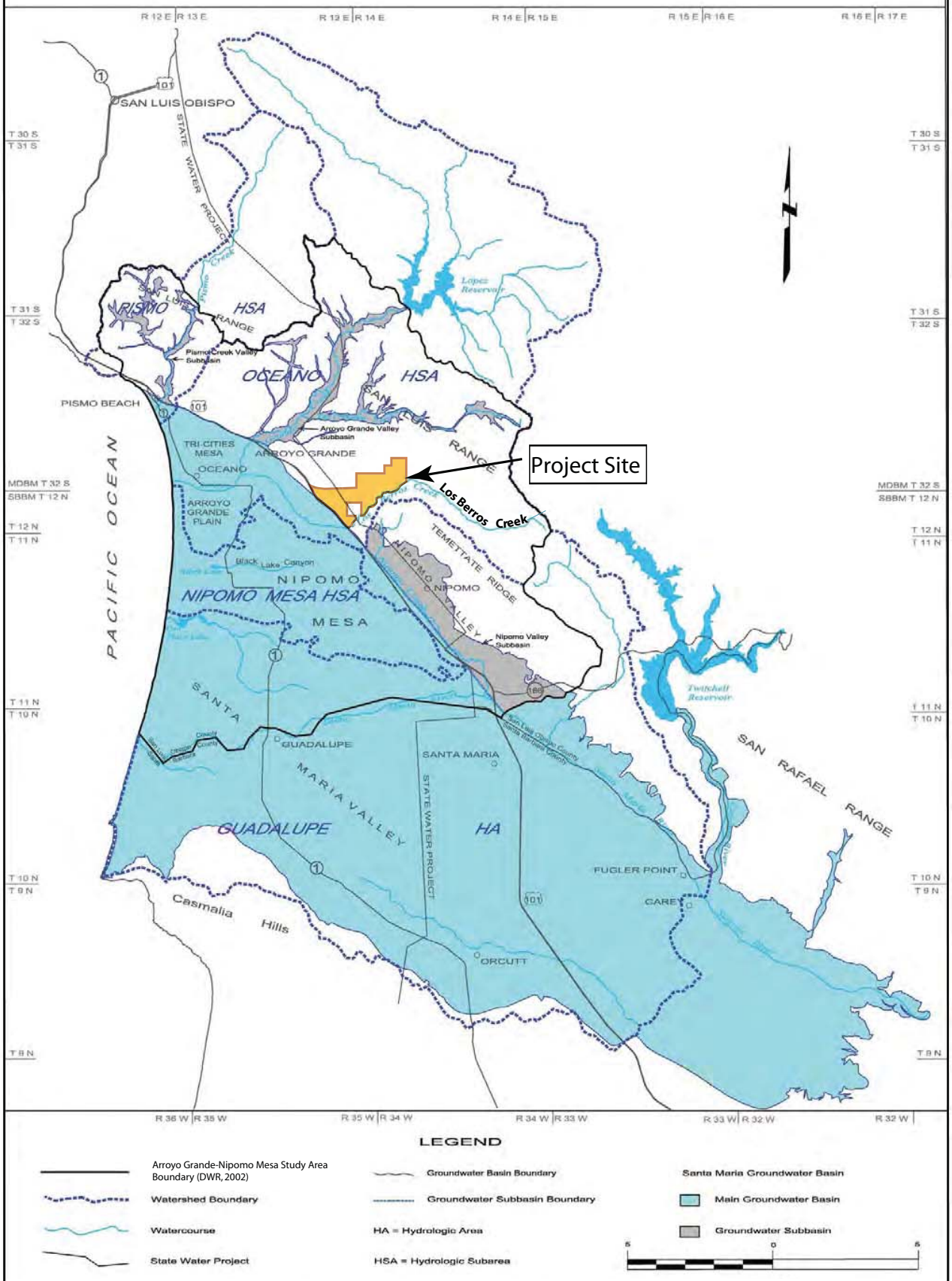

Adapted from Plate 1 of "Water Resources of the Arroyo Grande - Nipomo Mesa Area, (DWR, Southern District, 2002)

Site Location and Hydrologic Setting
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

Geosyntec consultants
Oakland | May 2011

Figure 1

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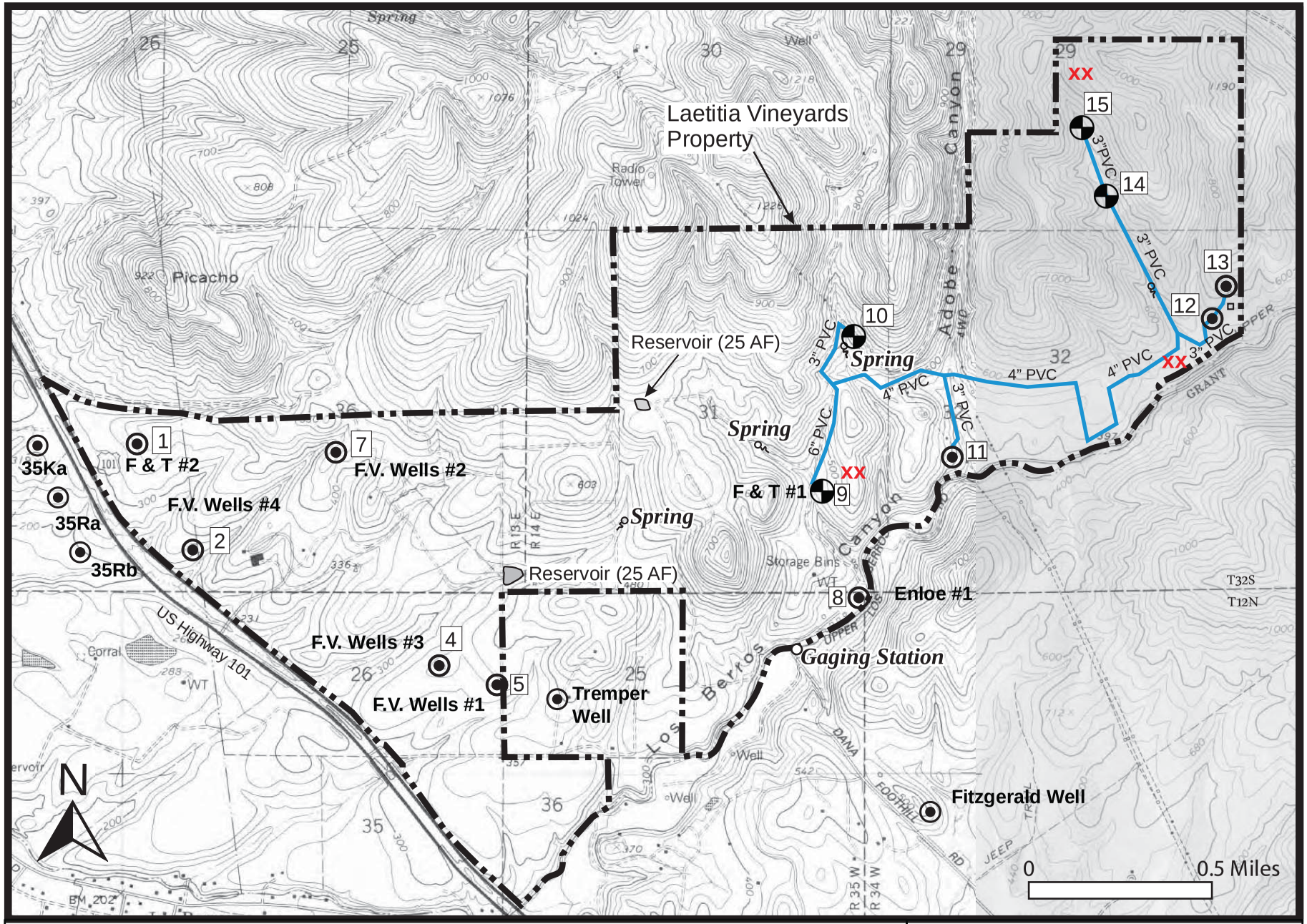

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Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

May 2011	Figure 2	Geosyntec consultants

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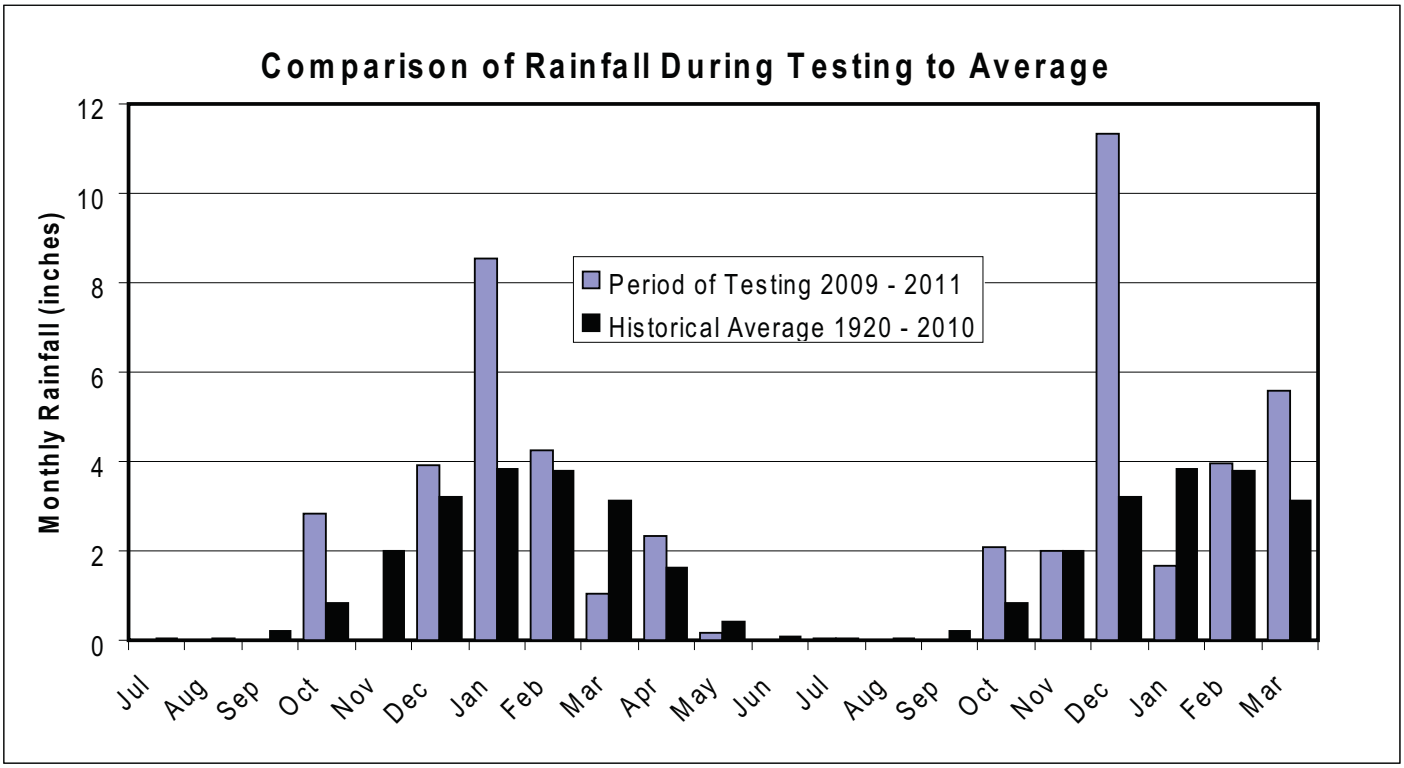
3



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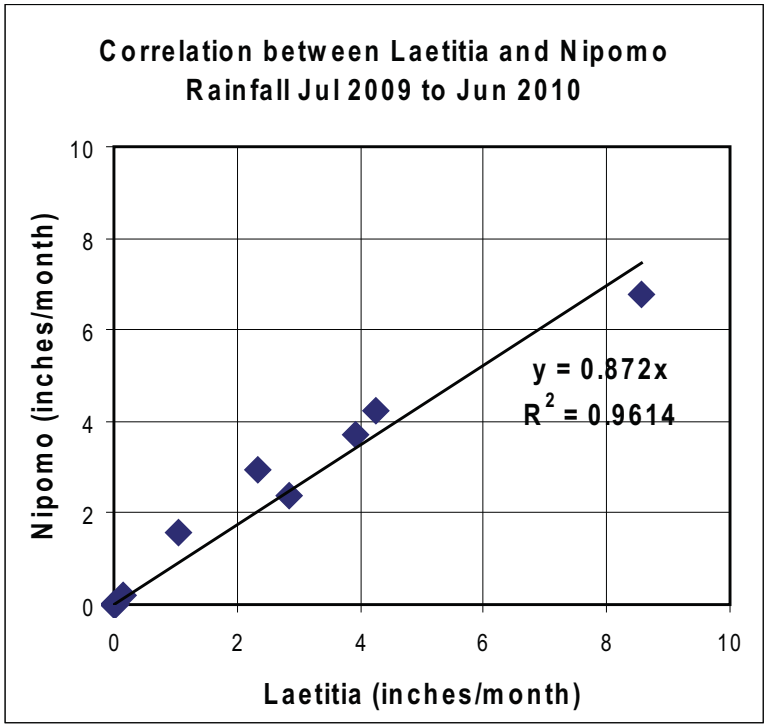

Monthly Rainfall uring Testing ompared to verage Rainfall Review of Well Testing and Sustainable Yield Assessment Proposed Laetitia Agricultural Cluster Subdivision San Luis Obispo, California	Geosyntec consultants		Figure **3**
	Oa land	May 2011	

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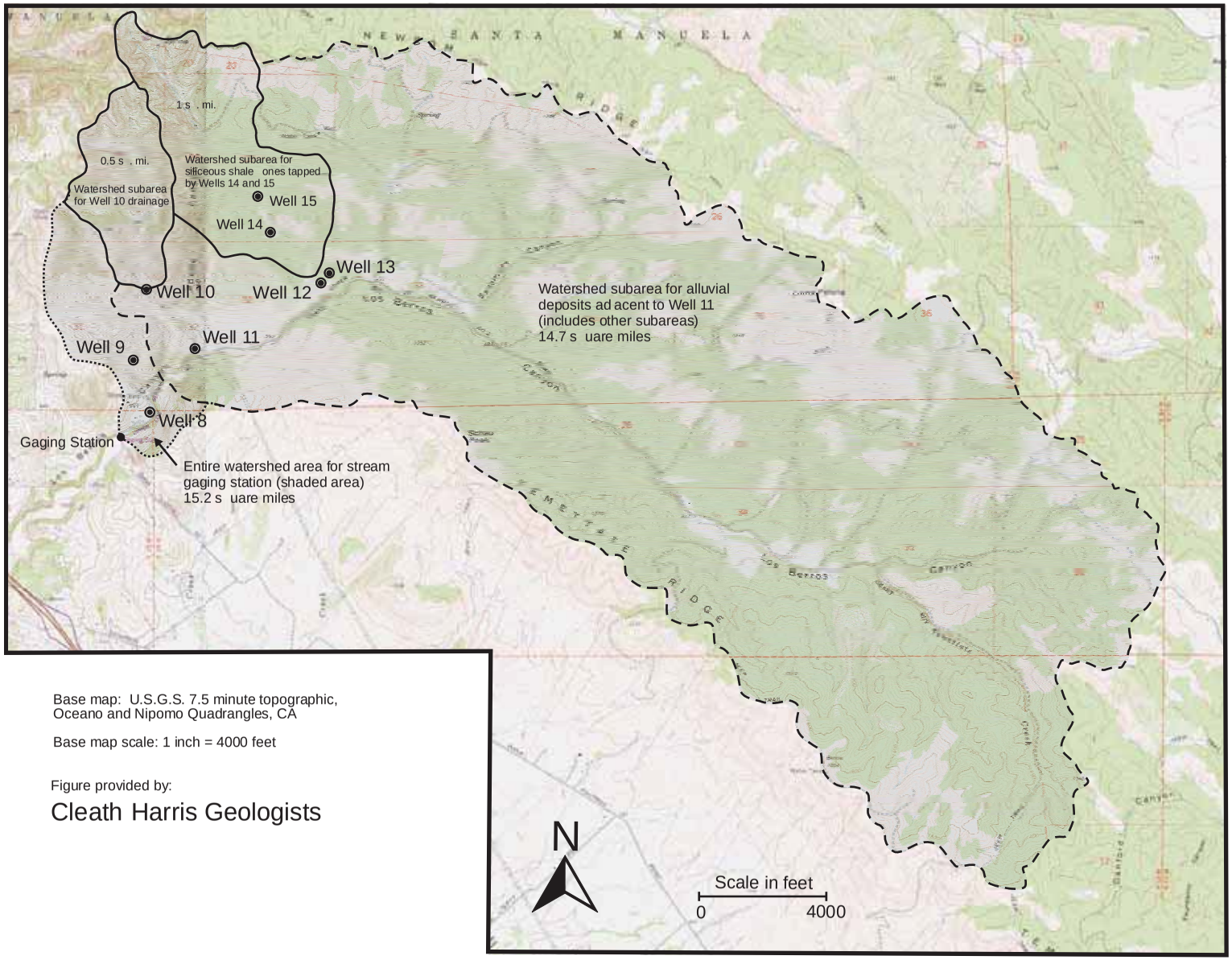

Base map: U.S.G.S. 7.5 minute topographic, Oceano and Nipomo Quadrangles, CA

Base map scale: 1 inch = 4000 feet

Figure provided by:

Cleath Harris Geologists

Los erros anyon Watershed Laetitia gricultural luster
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

May 2011	Figure 4	Geosyntec consultants

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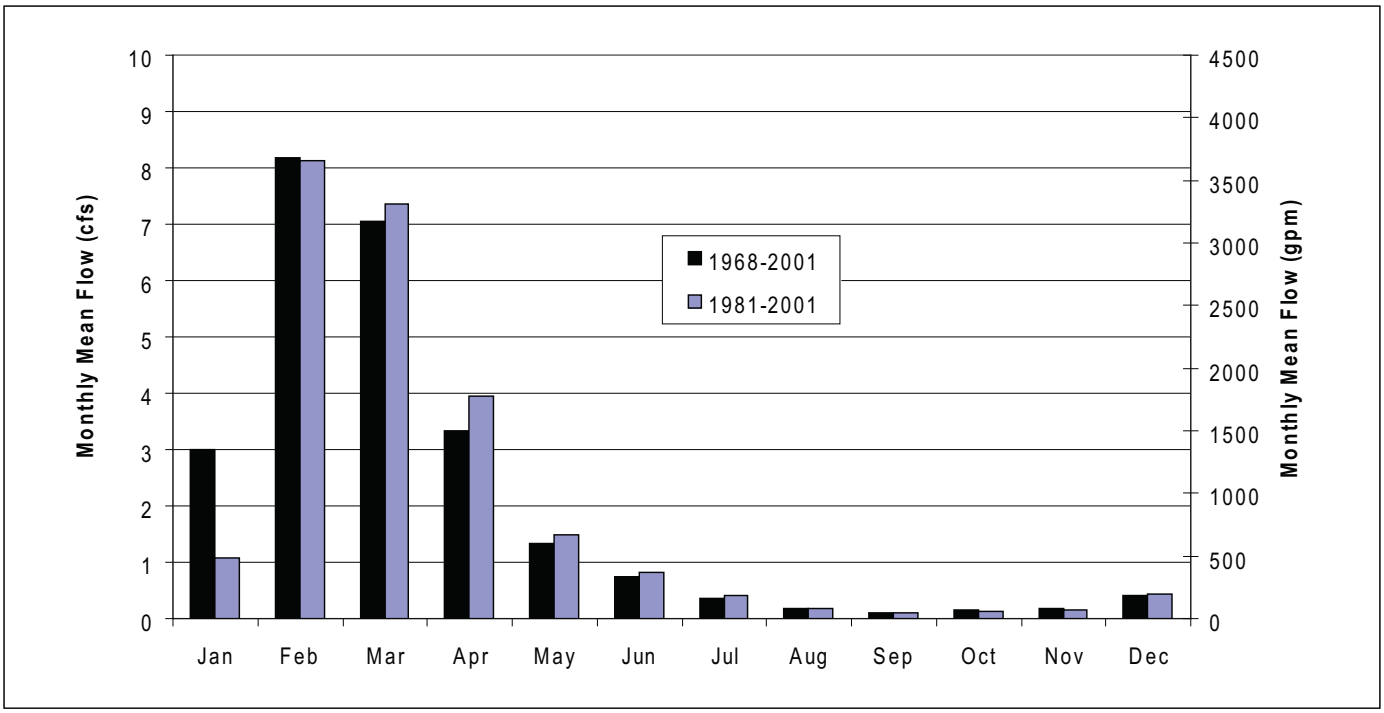

verage Monthly Flow of Los erros ree
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

Geosyntec consultants

Oa land | May 2011

Figure **5**

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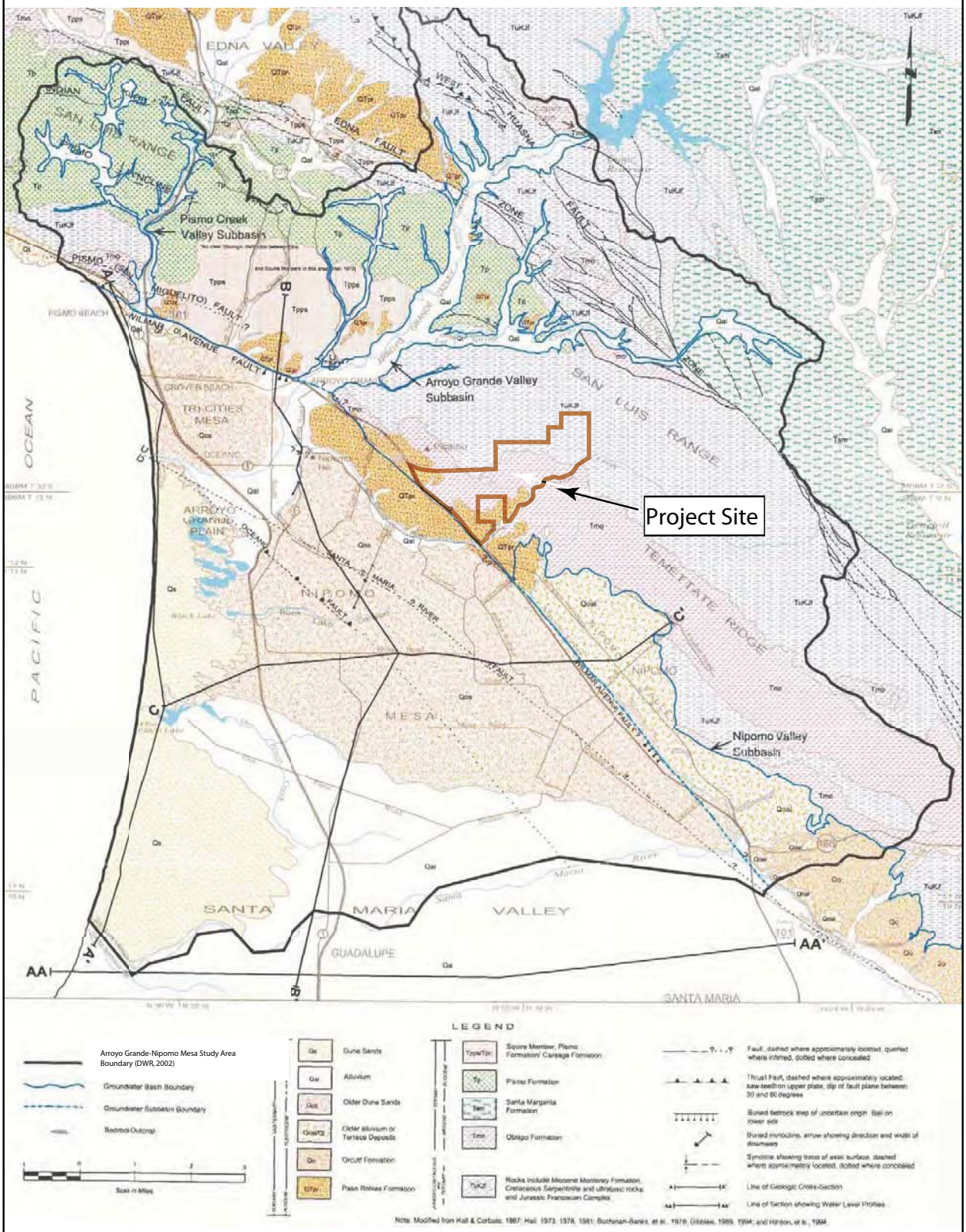

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Regional Geologic Setting
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

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Figure 6

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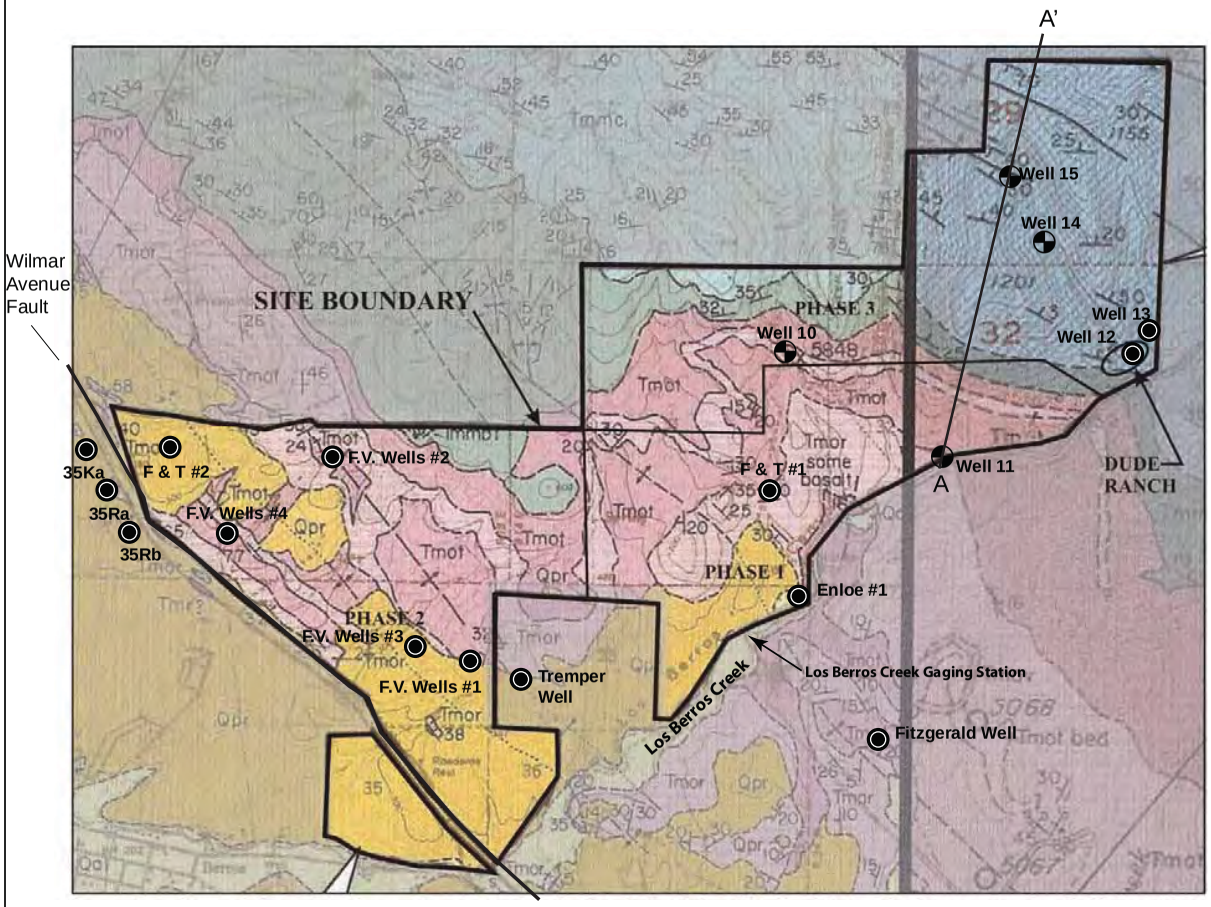

Adapted from DEIR Figure V.A.-1, Geologic Map of the Arroyo Grande Quadrangle, C.A. Hall, 1973 and Geologic Map of the Nipomo Quadrangle, Hall and Corbato, 1967

N

0 2400 ft

Approximate Scale

EXPLANATION

Qal — **Unconsolidated Quaternary Alluvial Deposits**

Qpr — **Paso Robles Formation**
Pliocene-Pleistocene in age
Unconsolidated or poorly consolidated sandsone, siltstone, and claystone

Tmmc, Tmmb — **Monterey Formation**
Miocene in age
Siliceous shale, siltsone, chert, dolomite
Tmmb - Siltstone or chert and dolomitic claystone or silt
Tmmc - Opaline or cherty shale, dolomite

Tmor, Tmot — **Obispo Formation**
Miocene in age
Volcanic tuff and some lava
Tmor - Resistant cemented tuff (water-bearing)
Tmot - Generally soft ashy tuff matrix

A' / A — **Location of Geologic Cross-Section (Figure 4)**

Well 10 — **Water Supply Well for Proposed Subdivision**

F & T #1 — **Other Water Well**

Well Locations Approximate

Local Geologic Map and Well Locations
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

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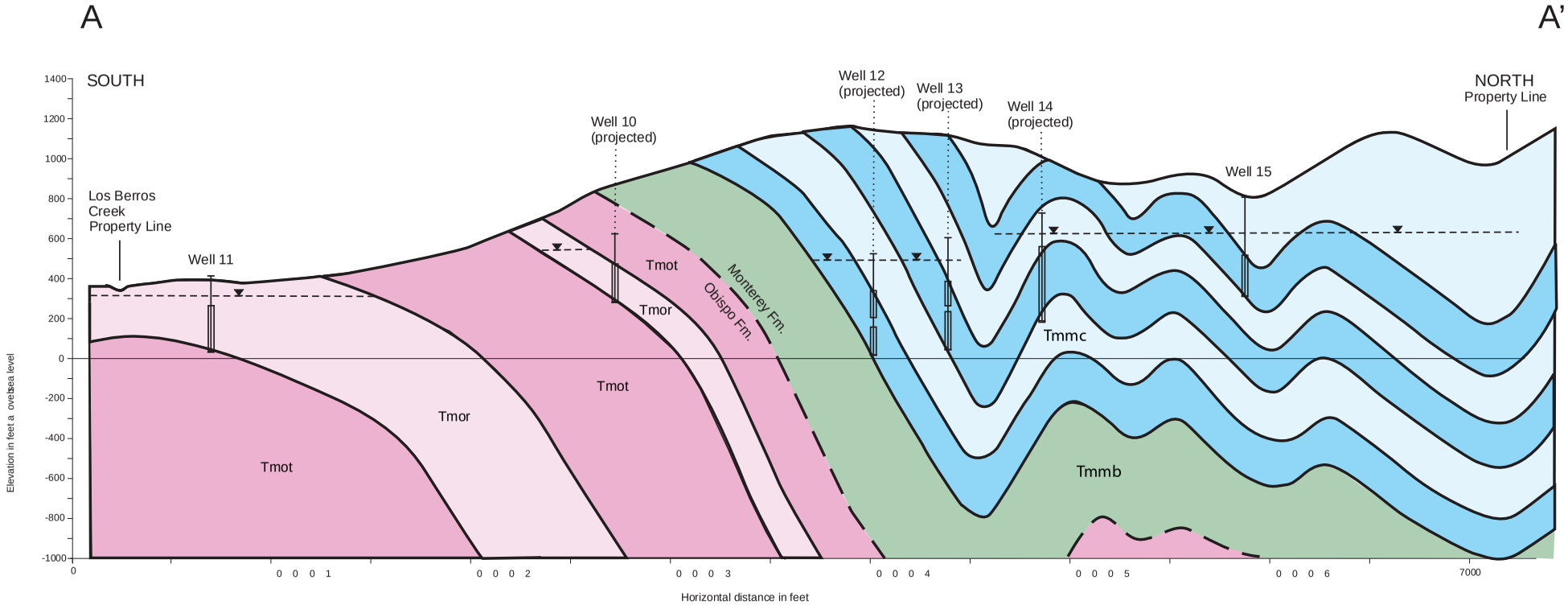
Figure 7



Explanation

Well casing

Well screen

Well level

Note: Water levels measured at the projected well locations do not necessarily represent levels in the aquifer zones along the line of section.

Tmmc	Monterey Formation Opaline or cherty shale and dolomite (dark blue = strata tapped by project well)
Tmmb	Siliceous siltstone, chert, dolomitic claystone or silt Obispo Formation
Tmor	Resistant cemented tuff (water bearing fractures)
Tmot	Generally soft tuff with ashy matrix.

Adapted from Figure 3, CHG, July 2010

Geologic Cross-Section A-A'
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
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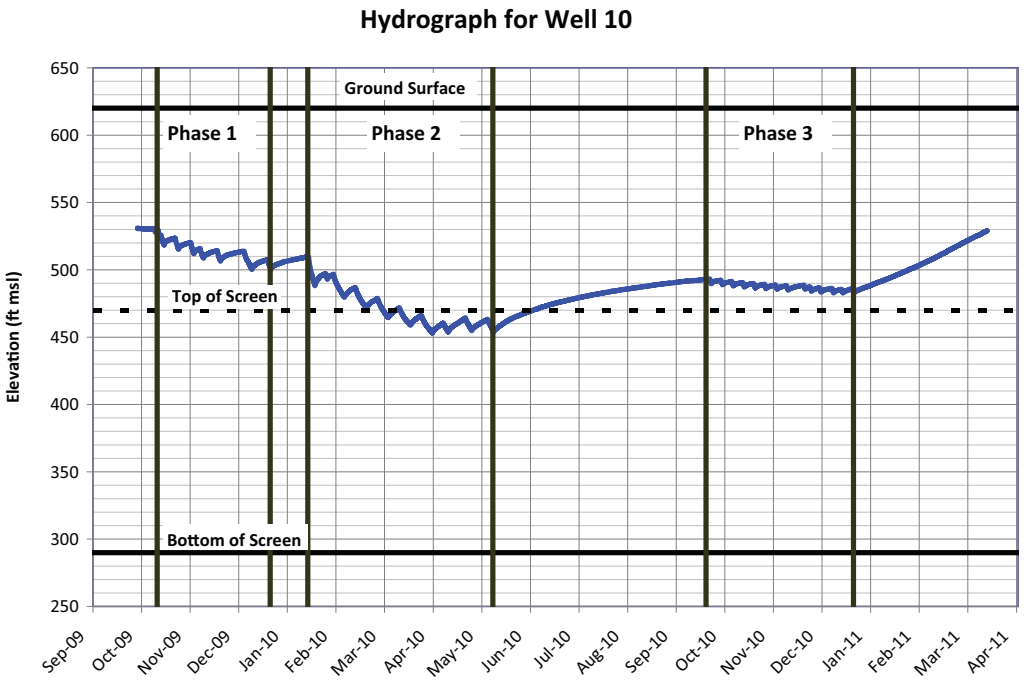
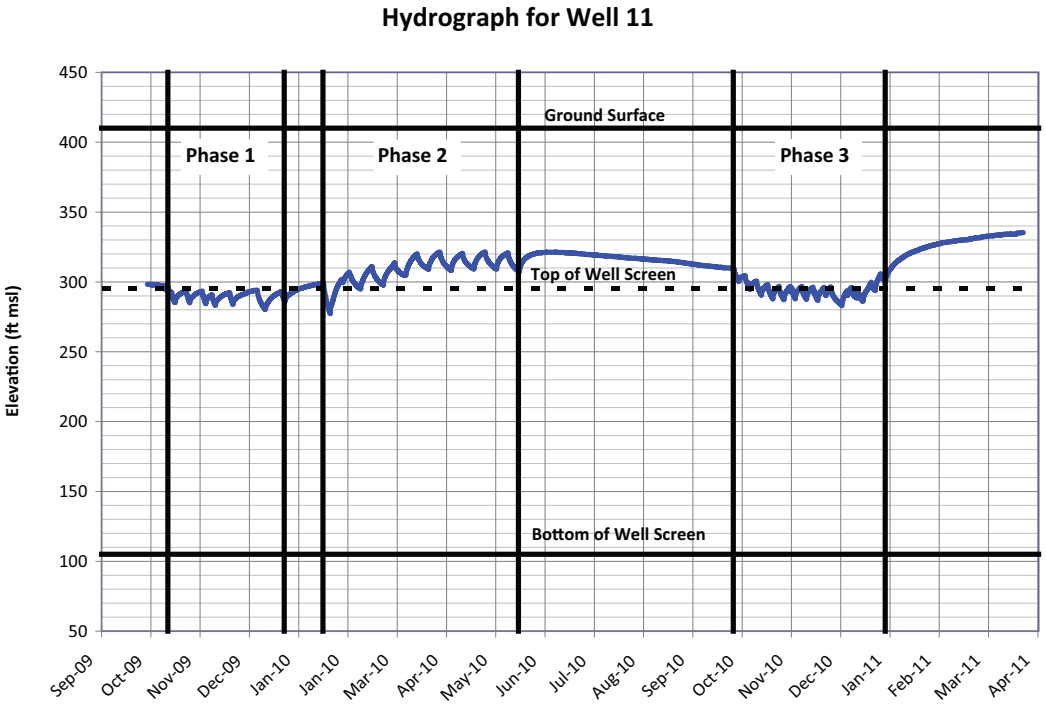
Figure 8

P:\GIS\Laetetia\AI\2011Apr\CrossSectionA.ai





ydrographs for Wells 1 and 11
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
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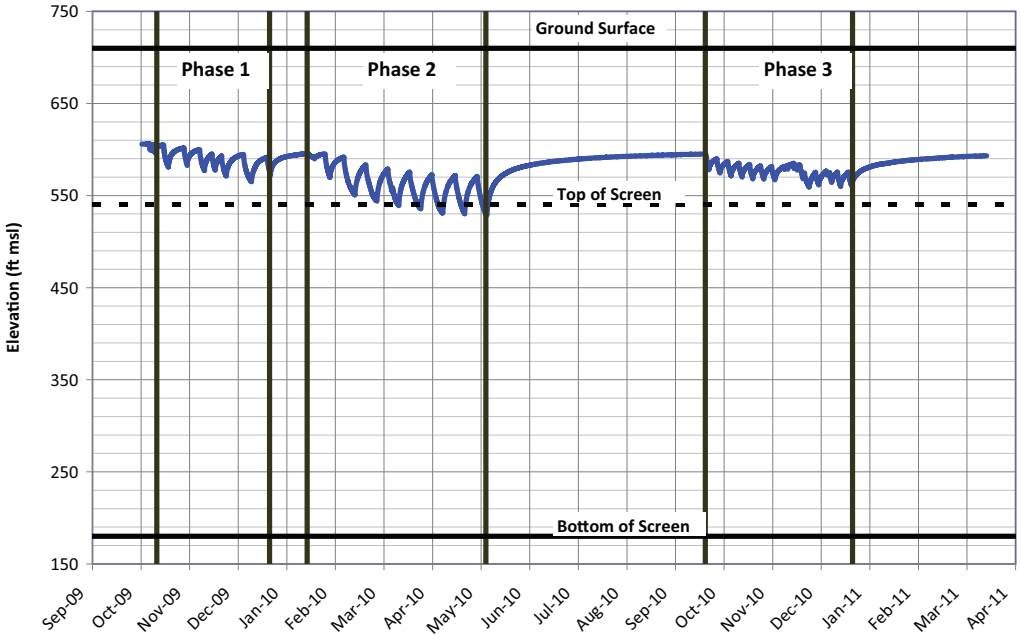
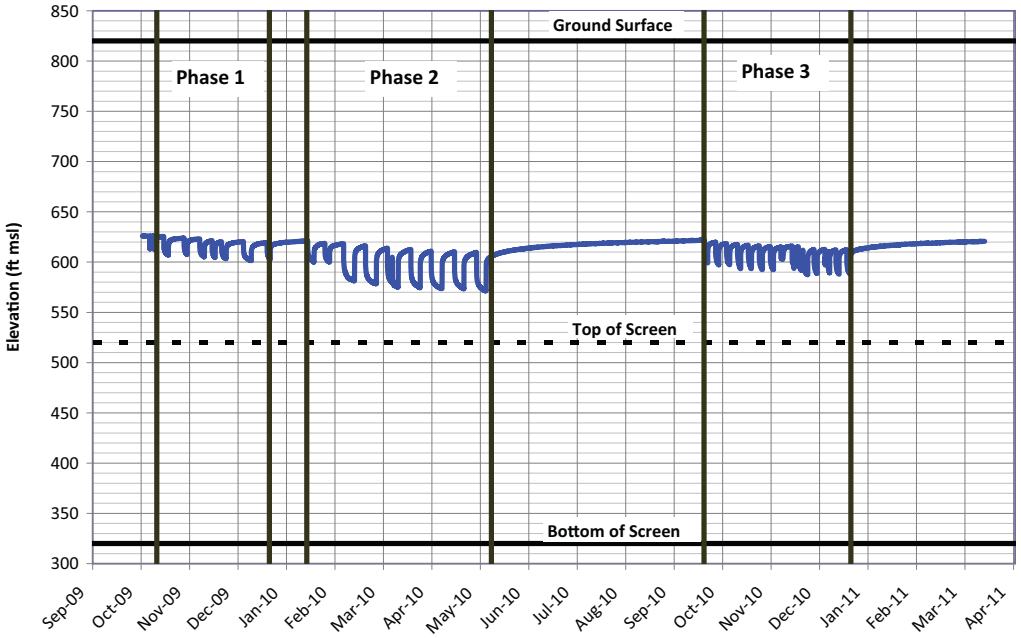
Figure

P:\GIS\Latetia\AI\2011Apr\Hydrographs10 11.ai

Hydrograph for Well 14



Hydrograph for Well 15



ydrographs for Wells 14 and 15
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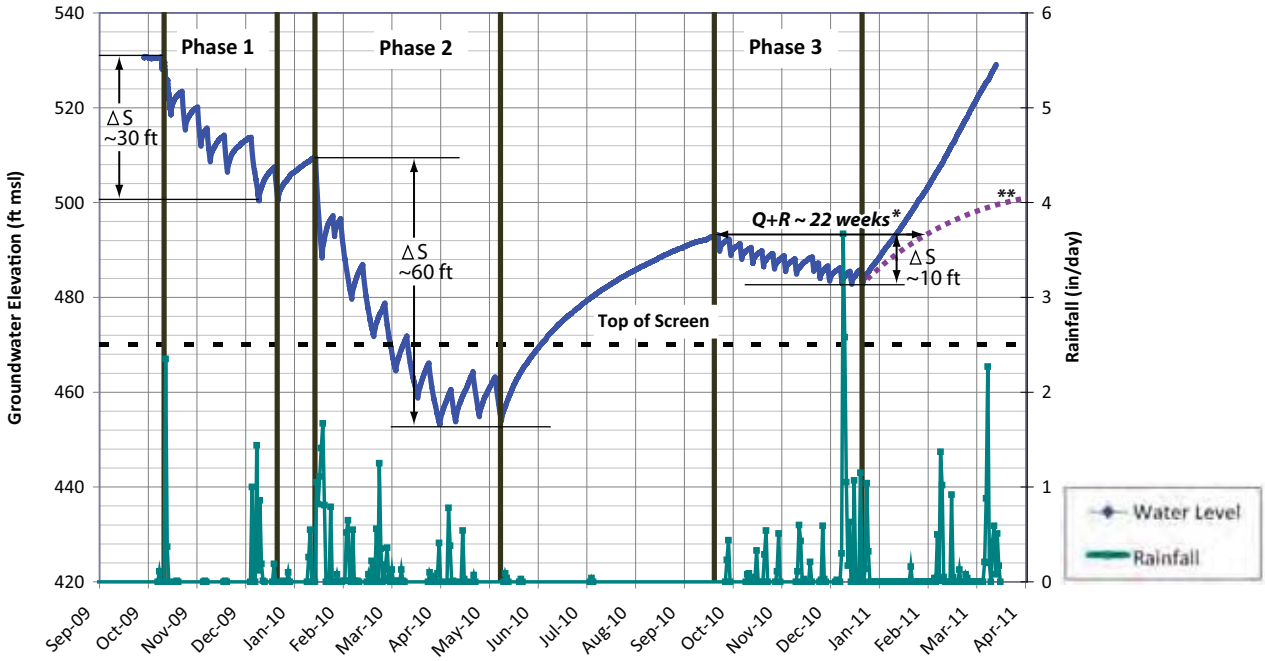
Figure 1

P:\GIS\Latetia\AI\2011Apr\Hydrographs14 15.ai

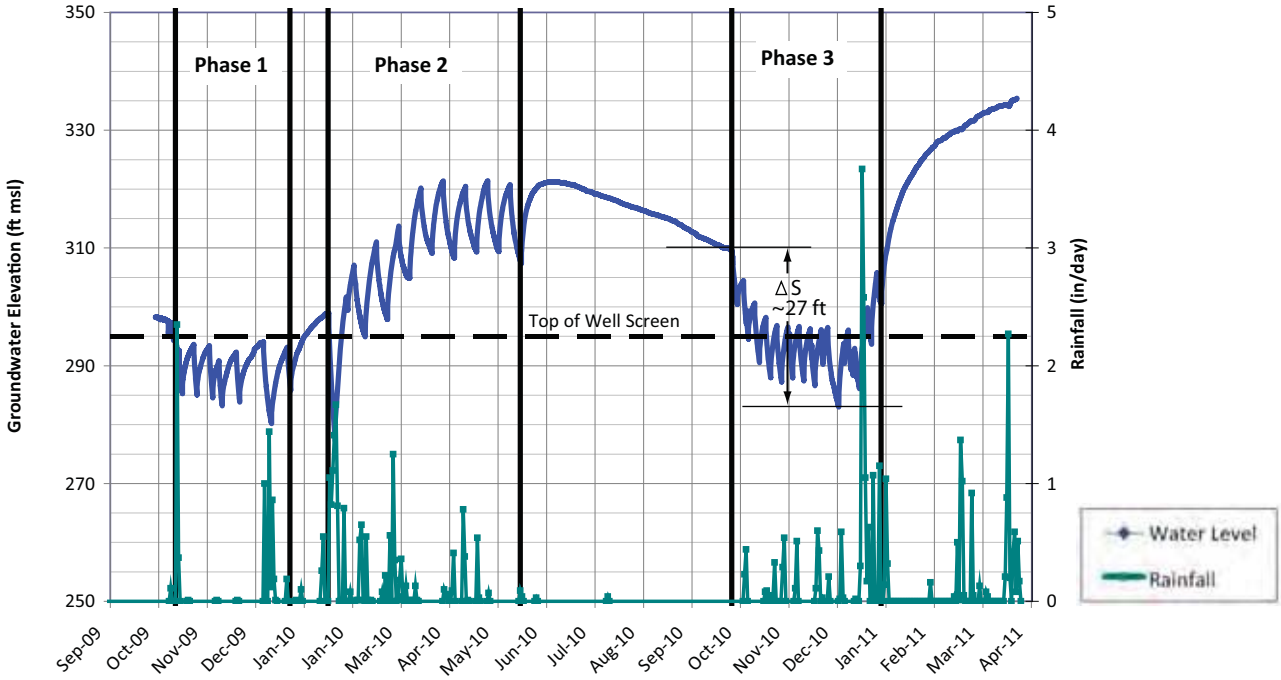
Hydrograph for Well 10



Phase 3 Qe = (2.75 AF 22 w s)(52 w s yr) = 6.5 AF Y = 4.0 gpm

The rapid rise in water level in Well 10 after Phase 3 pumping appears related to period of abundant rainfall. Recovery after Phase 2 pumping is li ely more typical. Accordingly, the s etched recovery curve after the Phase 3 pumping was used for the e uilibrium pumping calculation instead of the rapid recovery.

Hydrograph for Well 11



Qe not calculated for Well 11 because the prominent recharge that occurs at this well is independent of pumping and complicates interpretation of the a uifer response to pumping.

etailed Scale ydrographs for Wells 1 and 11
Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
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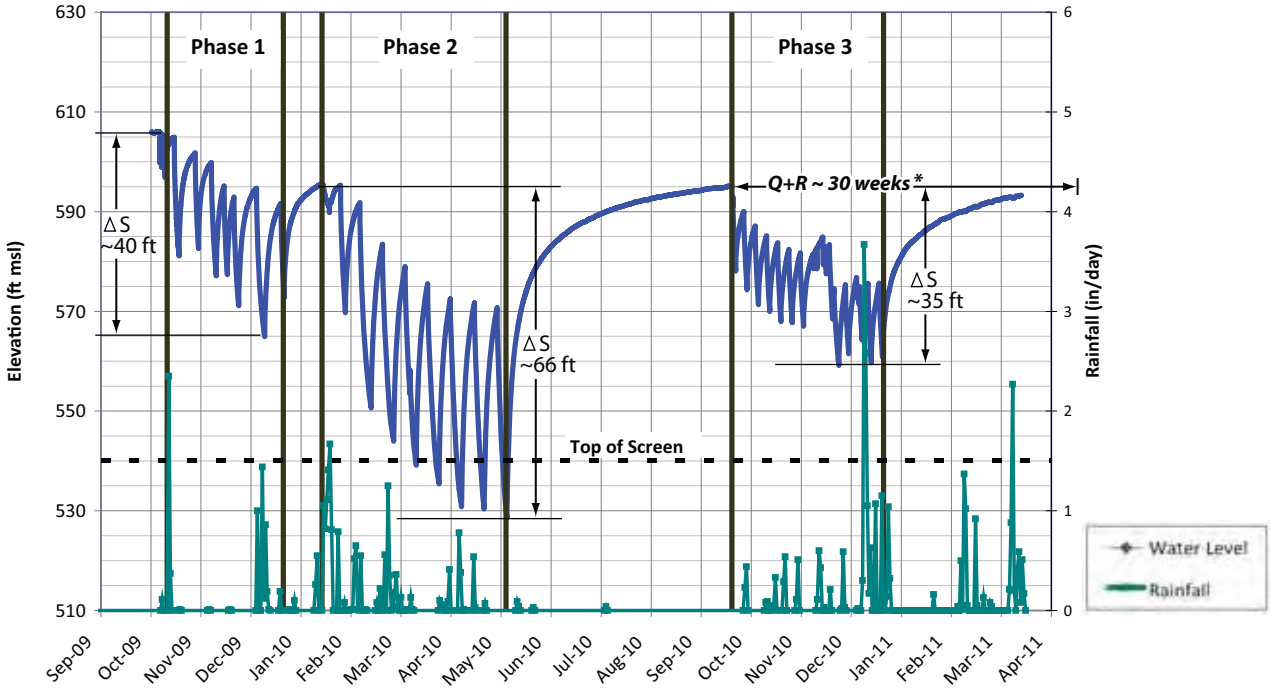
Figure **11**

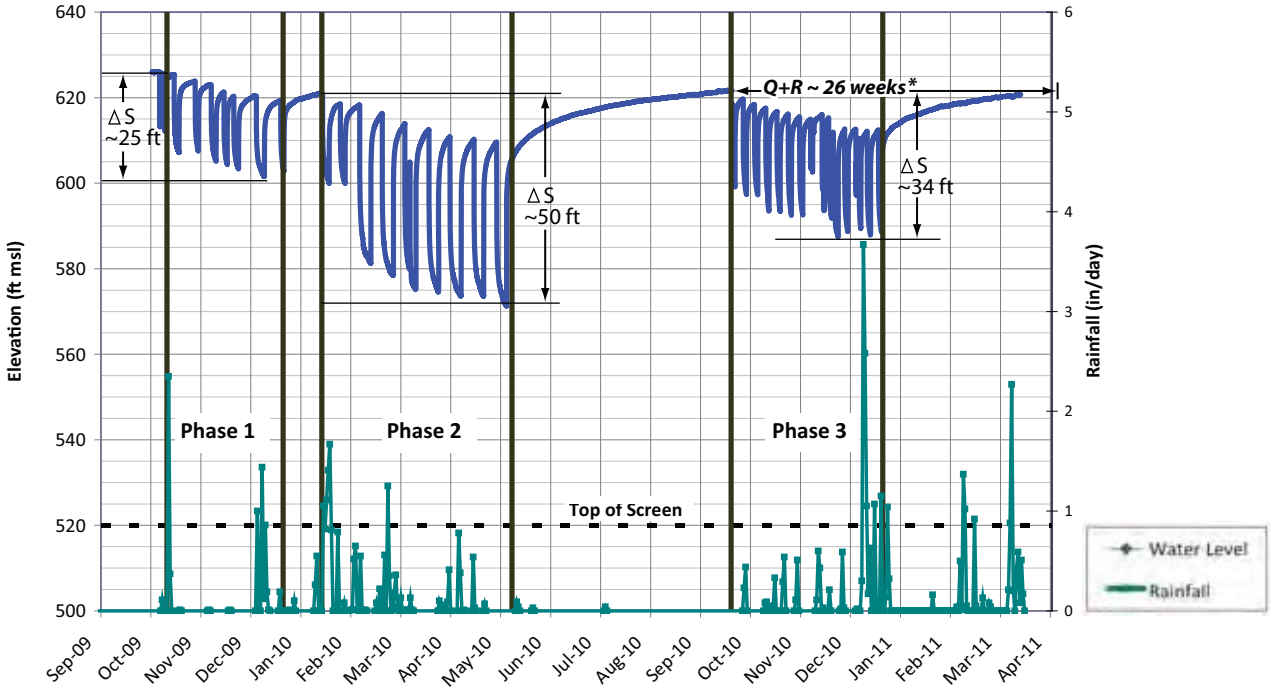
P:\GIS\Latetia\AI\2011Apr\Hydro etail10 11.ai

Hydrograph for Well 14



*** Phase 3 Q_{eq} = (5.23 AF/30 wks)(52 wks/yr) = 9.1 AF/Y = 5.6 gpm**

Hydrograph for Well 15



*** Phase 3 Q_{eq} = (5.48 AF/26 wks)(52 wks/yr) = 11.0 AF/Y = 6.8 gpm**

etailed Scale ydrographs for Wells 14 and 15
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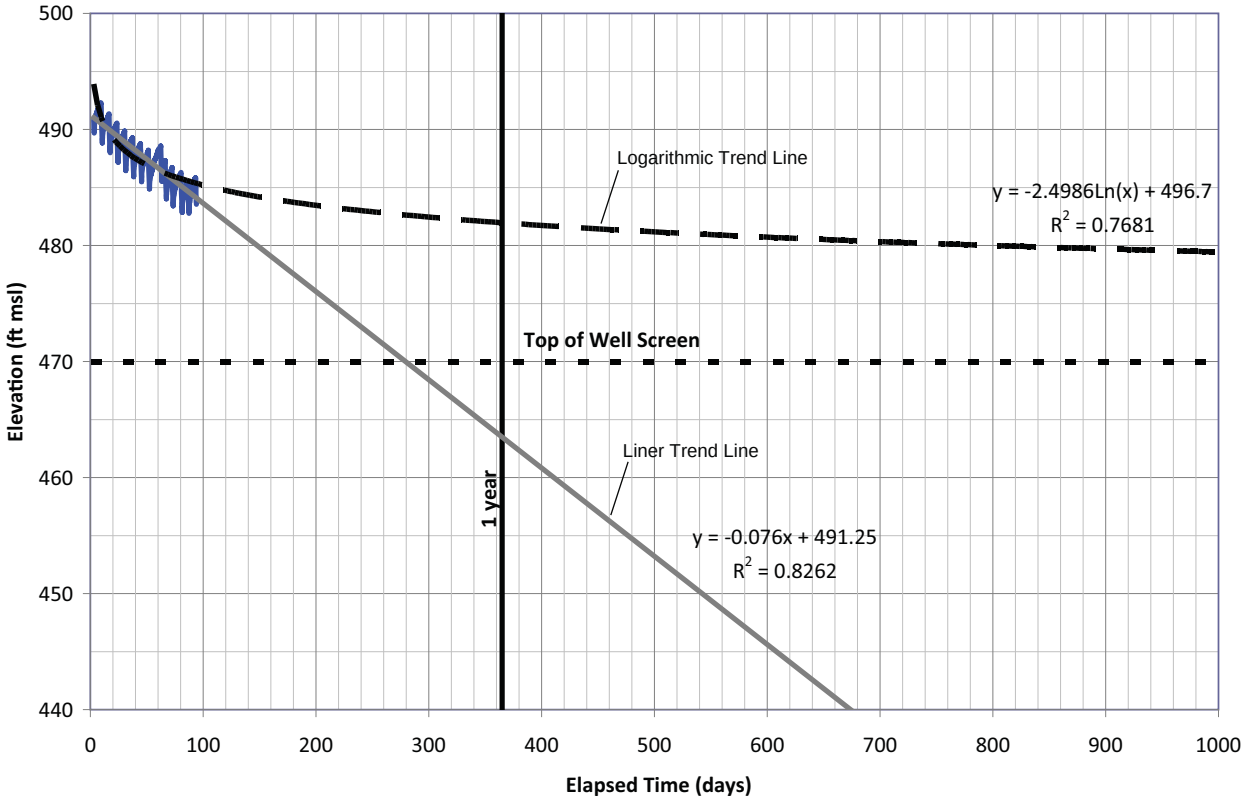
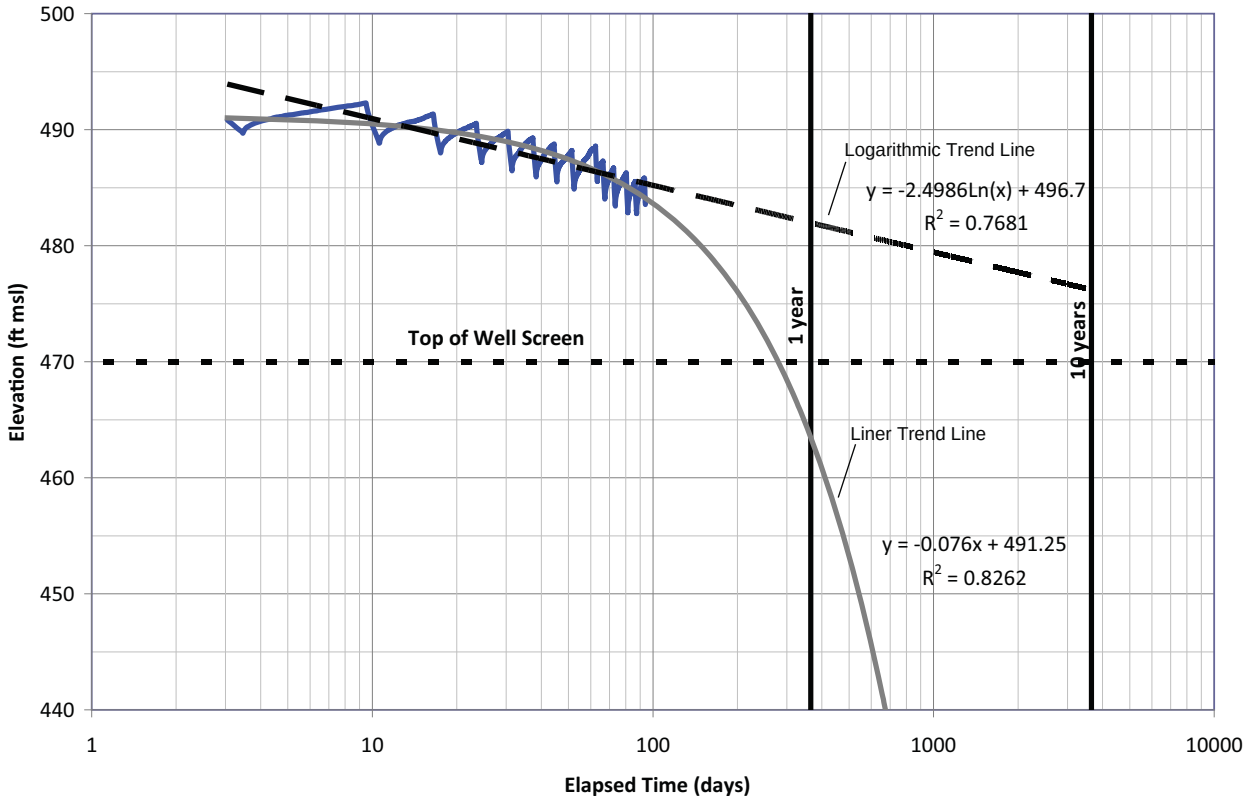
Figure **12**

P:\GIS\Latetia\AI\2011Apr\Hydro etail14 15.ai





Logarithmic Trend Line Liner Trend Line

Note: Lower graph uses logarithmic scale for elapsed time (axis) to facilitate illustration of recorded data and pro ection of trends more than 10 years into the future.

Trend nalysis of Phase 3 ata and Pro ected Water Levels for Well 1

Review of Well Testing and Sustainable Yield Assessment
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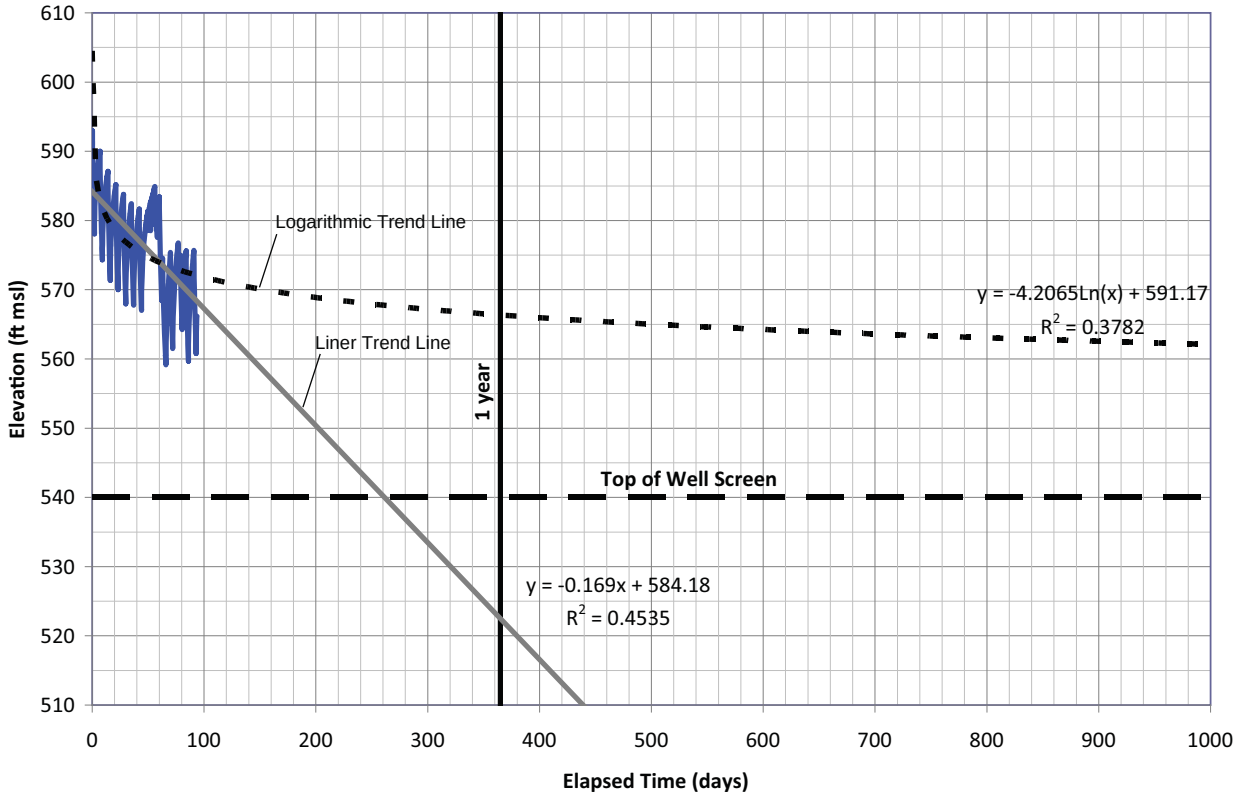
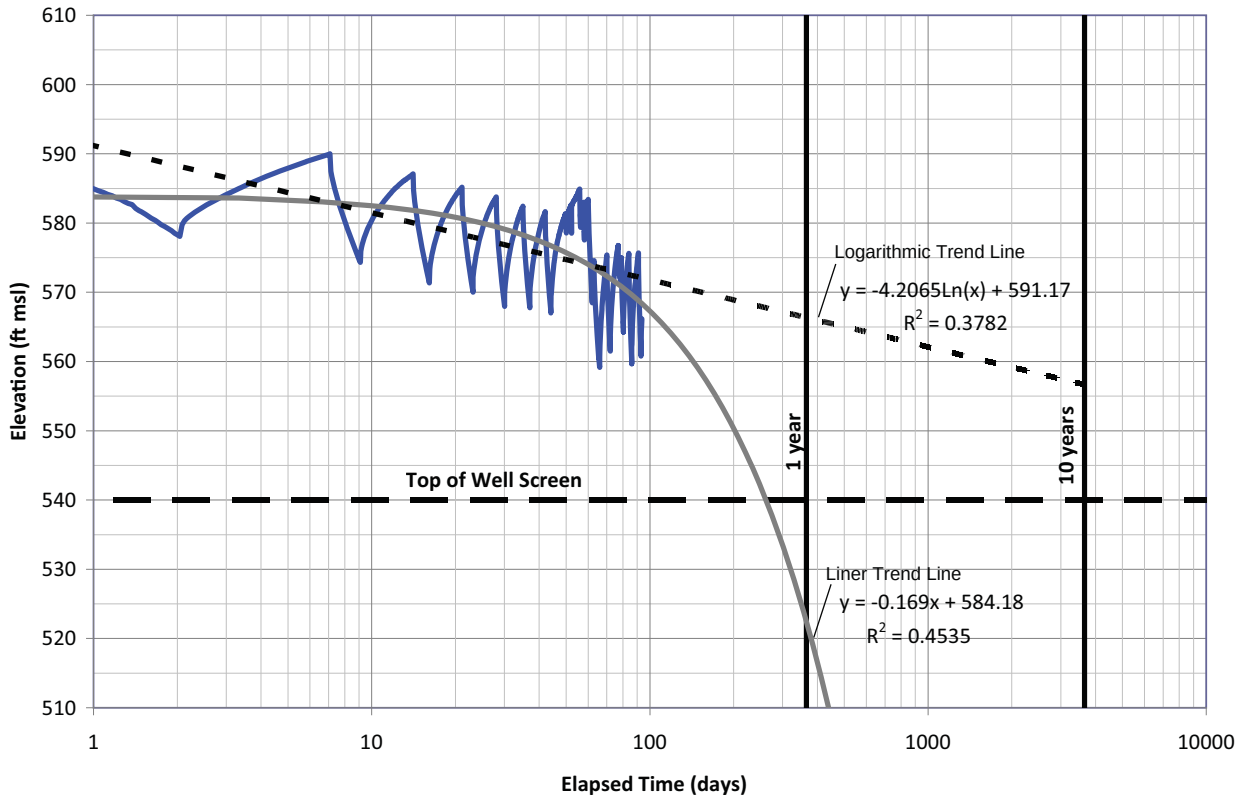
Figure 13

P:\GIS\Latetia\AI\2011Apr\Trend10.ai





Logarithmic Trend Line Liner Trend Line

Note: Lower graph uses logarithmic scale for elapsed time (axis) to facilitate illustration of recorded data and pro ection of trends more than 10 years into the future.

Trend nalysis of Phase 3 ata and Pro ected Water Levels for Well 14

Review of Well Testing and Sustainable Yield Assessment
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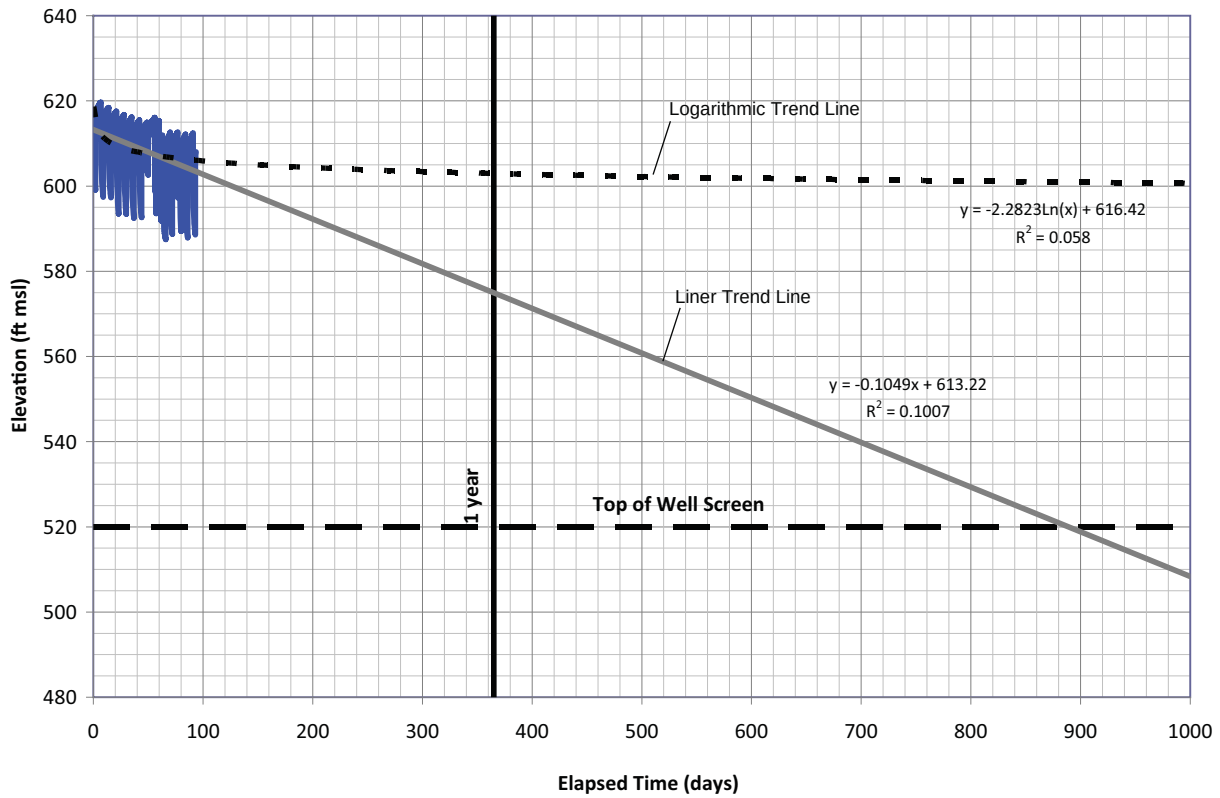
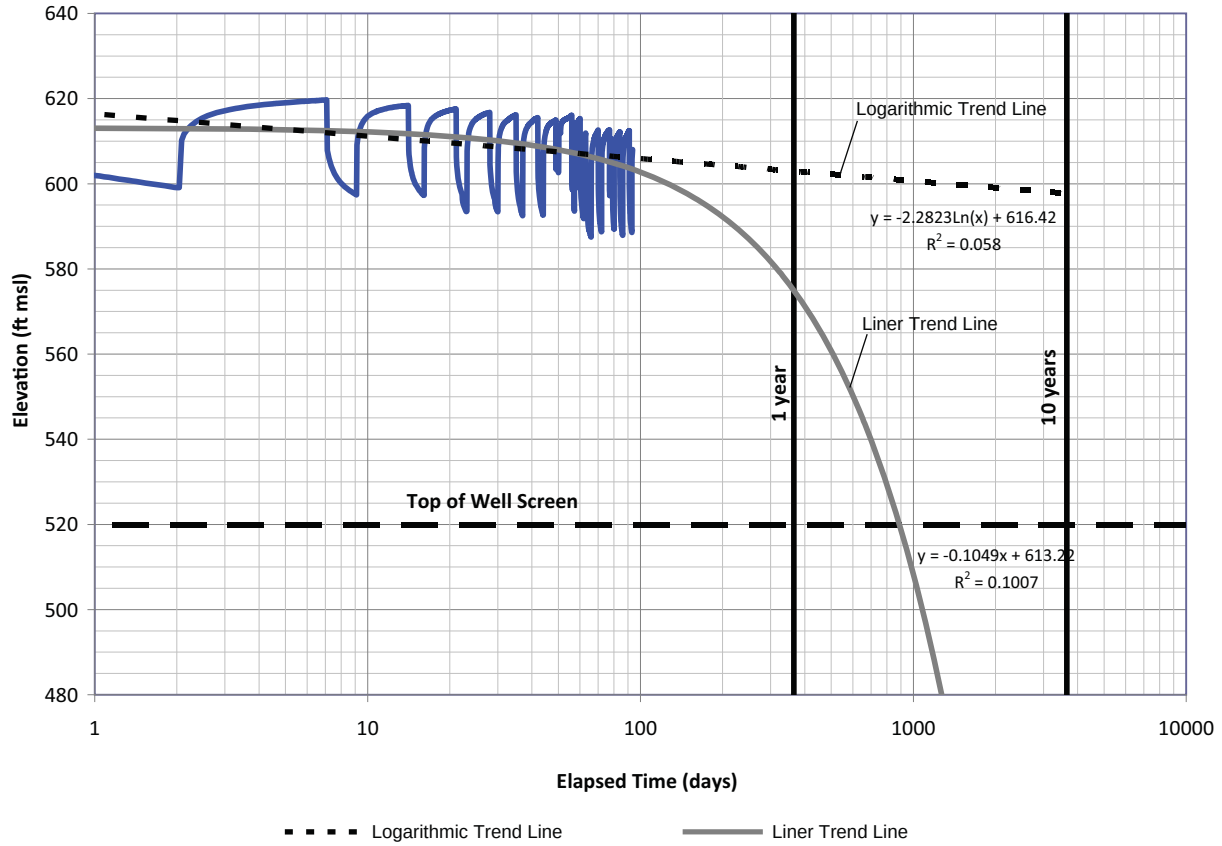
Figure **14**

P:\GIS\Latetia\AI\2011Apr\Trend14.ai





Note: Lower graph uses logarithmic scale for elapsed time (axis) to facilitate illustration of recorded data and pro ection of trends more than 10 years into the future.

Trend nalysis of Phase 3 ata and Pro ected Water Levels for Well 15

Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
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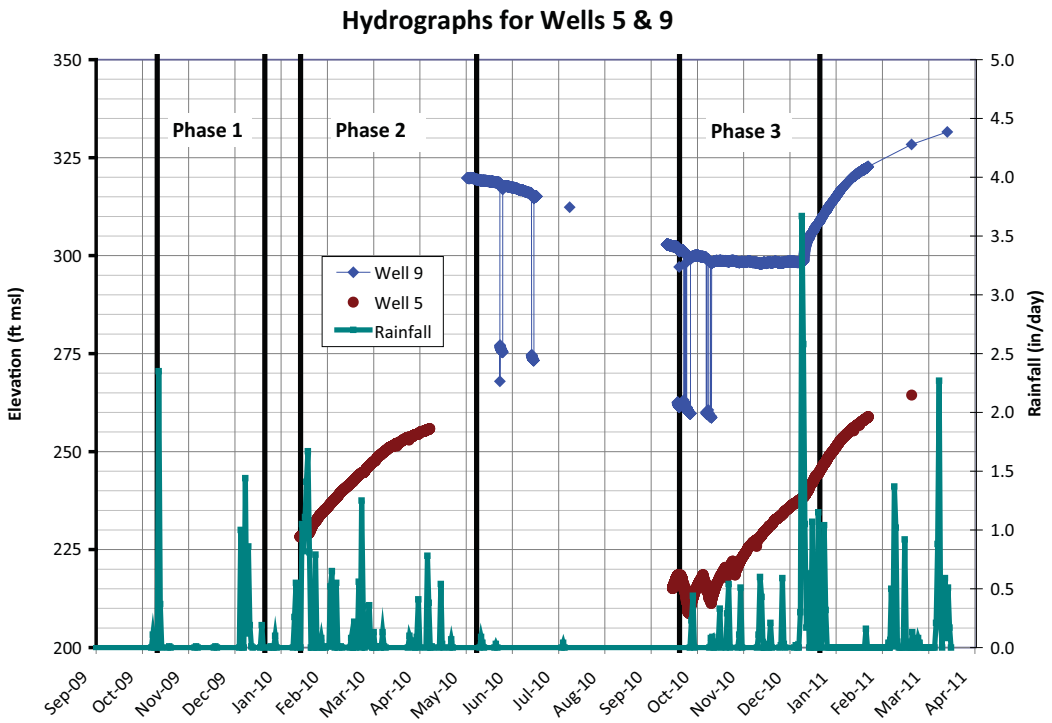
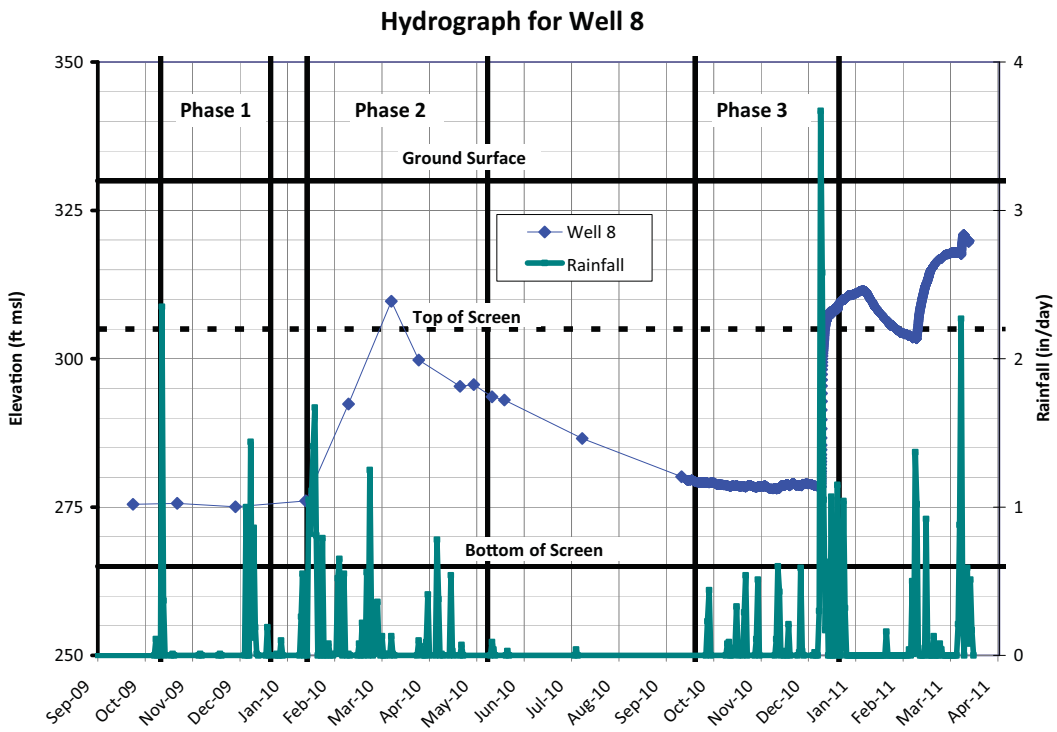
Figure **15**

P:\GIS\Latetia\AI\2011Apr\Trend15.ai

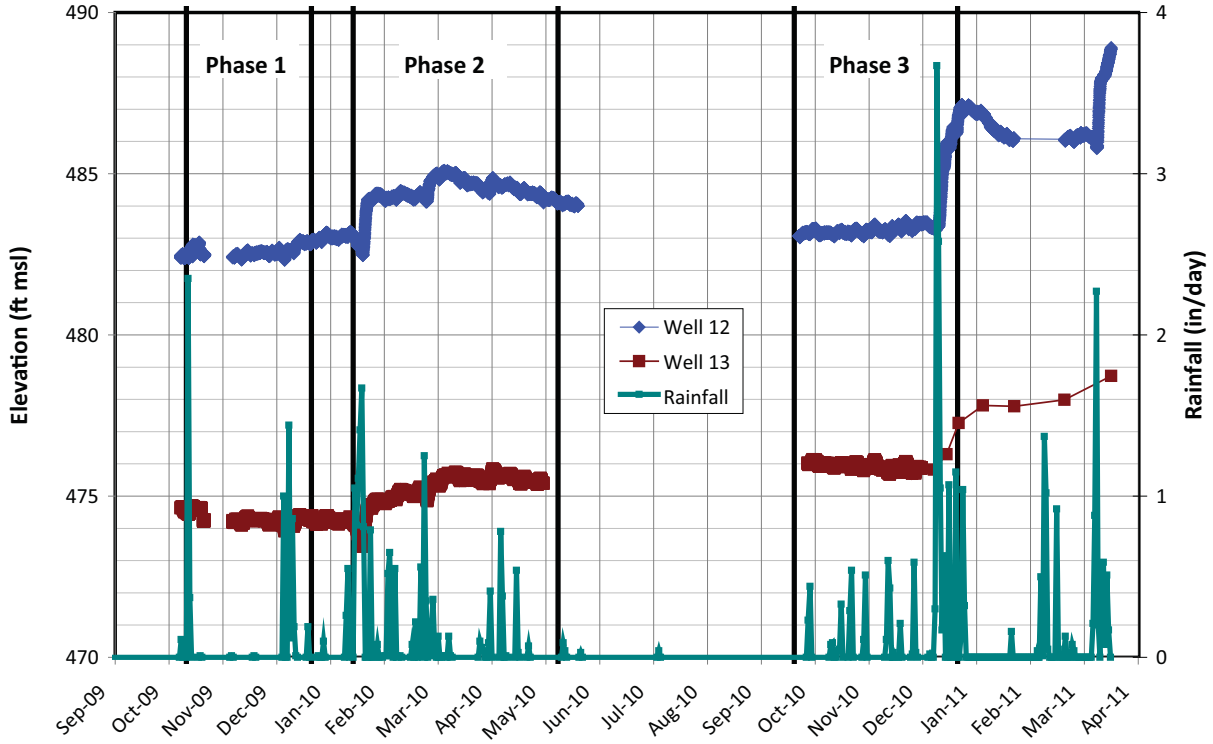




Notes:
Well 5 (F.V. Wells #1) and Well 9 (F&T #1) are irrigation wells completed in the Obispo Tuff.
Well 8 (Enloe #1) is a shallow well adjacent to Los Berros Creek.
See Table 1 for additional Well Information.

Hydrographs for Wells 5, 8, and 9 Review of Well Testing and Sustainable Yield Assessment Proposed Laetitia Agricultural Cluster Subdivision San Luis Obispo, California	Geosyntec consultants Oakland | May 2011	Figure 16

P:\GIS\Latetia\AI\2011Apr\Hydrographs5_8_9.ai

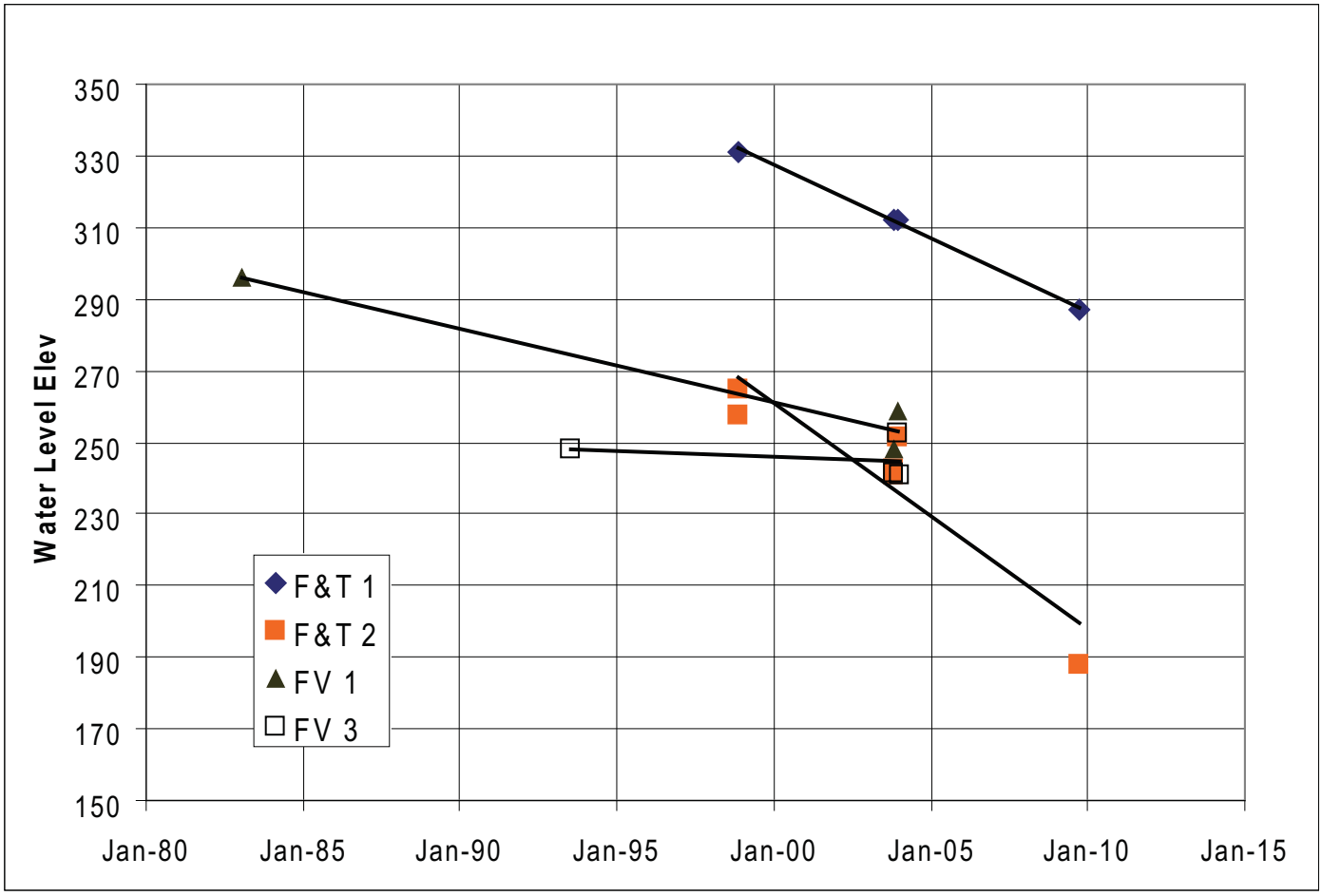


Notes:

Wells 12 and 13 are completed in the Monterey Formation close to Los Berros Creek.

Hydrographs for Wells 1 and 1 Review of Well Testing and Sustainable Yield Assessment Proposed Laetitia Agricultural Cluster Subdivision San Luis Obispo, California	Geosyntec consultants Oakland May 2011	Figure 1

P:\GIS\Latetia\AI\2011Apr\Hydrographs12_1 .ai



Notes:
ata from Table 4 of C A, an 2004

roundwater Elevation ata for Four Laetitia rrigation Wells

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Proposed Laetitia Agricultural Cluster Subdivision
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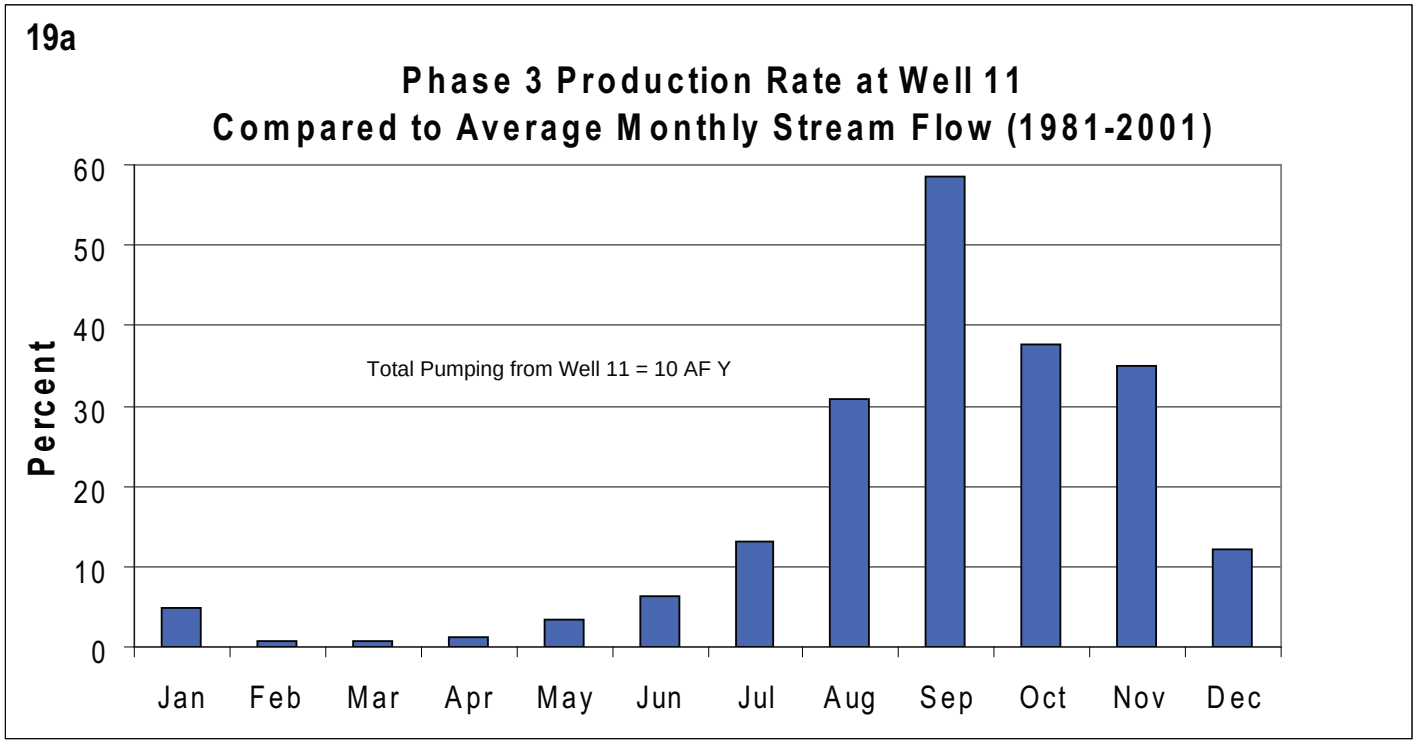
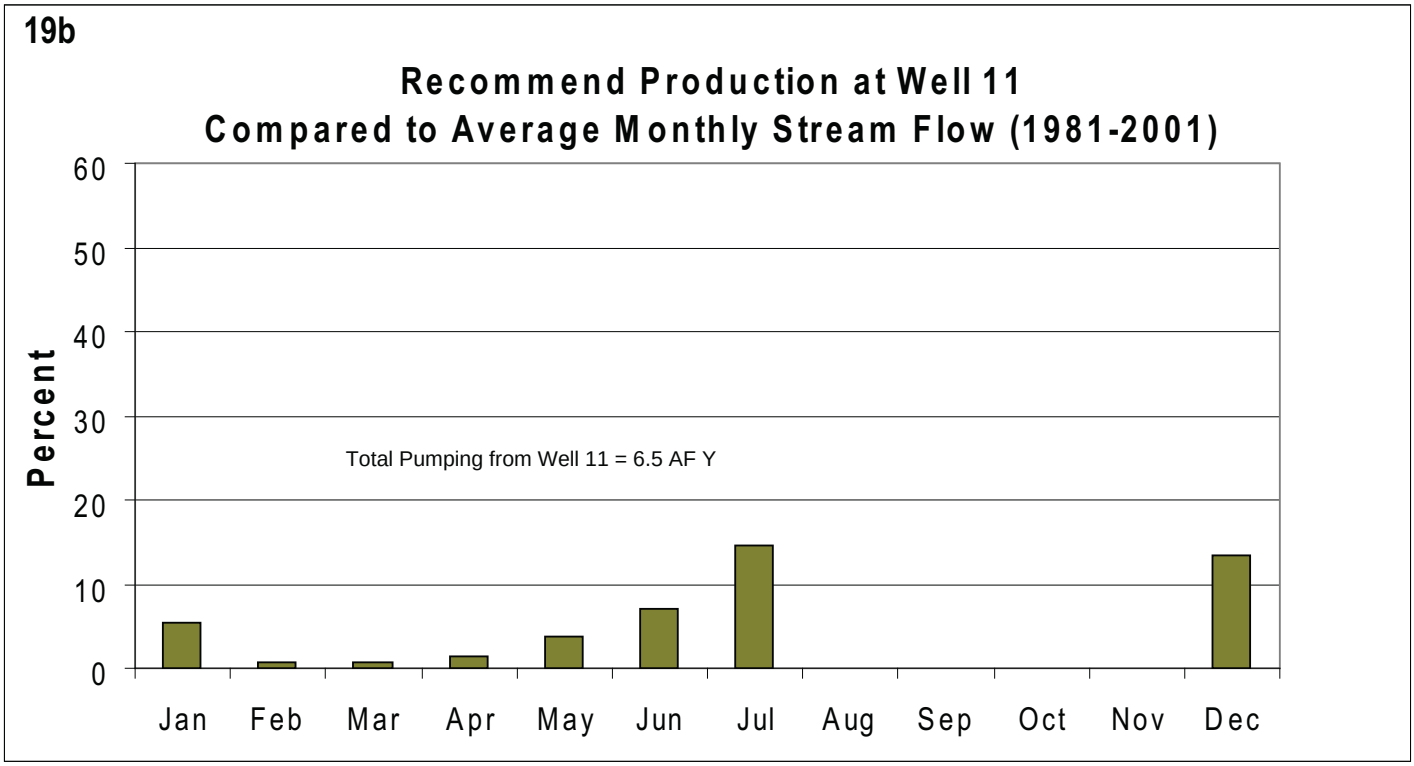
Figure 1

P:\GIS\Latetia\AI\2011Apr\ProposedPump 11.ai





Notes:
Curtailment of pumping from Well 11 from August through November is recommended to help preserve base flow in Los Berros Cree .

Proposed Pumping at Well 11 ompared to verage Monthly Flow in Los erros ree

Review of Well Testing and Sustainable Yield Assessment
Proposed Laetitia Agricultural Cluster Subdivision
San Luis Obispo, California

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Figure 1

P:\GIS\Latetia\AI\2011Apr\ProposedPump 11B.ai

APPENDIX A

Boring Logs and
Well Completion Reports
for Laetitia Wells 10, 11, 14, 15
12, 13, 1, 4, 7, 8, and 9

Mailed 12/15/05 with map

DUPLICATE
Driller's Copy

Page ___ of ___

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 763494

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. Well #3
Date Work Began Dec. 18, 2004 Ended Jan. 15, 2005
Local Permit Agency San Luis Obispo County
Permit No. 2004-593 Permit Date Dec. 6, 2004

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Rotary/air FLUID Water

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	5	Top soil
5	20	Light brown clay
20	40	Light brown clay
40	60	Darker brown clay
60	80	Light grey clay
80	100	Light grey clay/crumbley grey shale
100	120	Grey shale small pieces
120	140	Grey shale small and large
140	200	Grey shale large pieces
200	350	Hard grey rock

Well 2004-3, Laetitia Well 10

from Appendicies to Laetitia Water Studies 6 Oct 2005

TOTAL DEPTH OF BORING 350 (Feet)
TOTAL DEPTH OF COMPLETED WELL 330 (Feet)

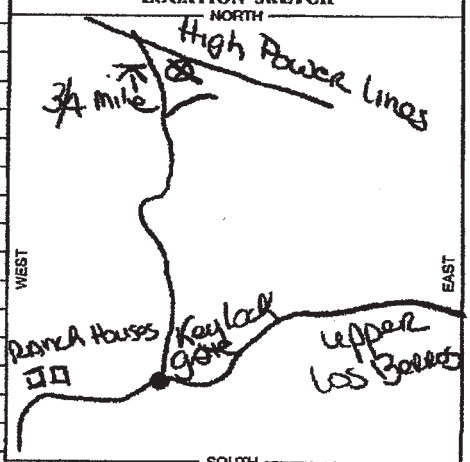
WELL OWNER

Name Dave Hickey Laetitia Winery
Mailing Address 453 Laetitia Vineyard Dr.
Arroyo Grande (CITY) Ca. (STATE) 93420 (ZIP)

WELL LOCATION

Address Upper Los Berros Rd. N14
City Nipomo
County San Luis Obispo County
APN Book 047 Page 301 Parcel 003
Township 32S Range 14E Section 32
Latitude 35° 6.048 (DEG. MIN. SEC.) NORTH Longitude 120° 30.432 (DEG. MIN. SEC.) WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)
WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 71 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 71 (Ft.) & DATE MEASURED Jan. 24, 2005
ESTIMATED YIELD * 200 (GPM) & TEST TYPE pump
TEST LENGTH 72 (Hrs.) TOTAL DRAWDOWN 143 (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	150	17"	X				PVC F480	10	SDR21	
150	240	17"		X			PVC F480	10"	SDR21	.040
240	280	17"	X				PVC F480	10"	SDR21	
280	330	17"		X			PVC F480	10"	SDR 21	.040

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	100	X			
100	340			X	3/4 Pea Gr

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Doug Enloe dba Enloe Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
ADDRESS P.O. Box 1698 Nipomo (CITY) Ca. (STATE) 93444 (ZIP)
Signed Doug Enloe (WELL DRILLER/AUTHORIZED REPRESENTATIVE) Jan 20, 2005 (DATE SIGNED) 318877 (C-57 LICENSE NUMBER)

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well Log
Laetitia Vineyard & Winery

Laetitia Well 10

Well ID: 2004-3
Date: December 18 to December 23, 2004
Location: Upper Los Berros Canyon
Elevation: 620 ft above sea level (from topographic map)
Geologist: D. Burke, Cleath & Associates.
Drilling Company: Enloe Drilling
Drilling Method: Airlift
Total depth: 340 feet

Lithologic Log
Depth to top and bottom in feet

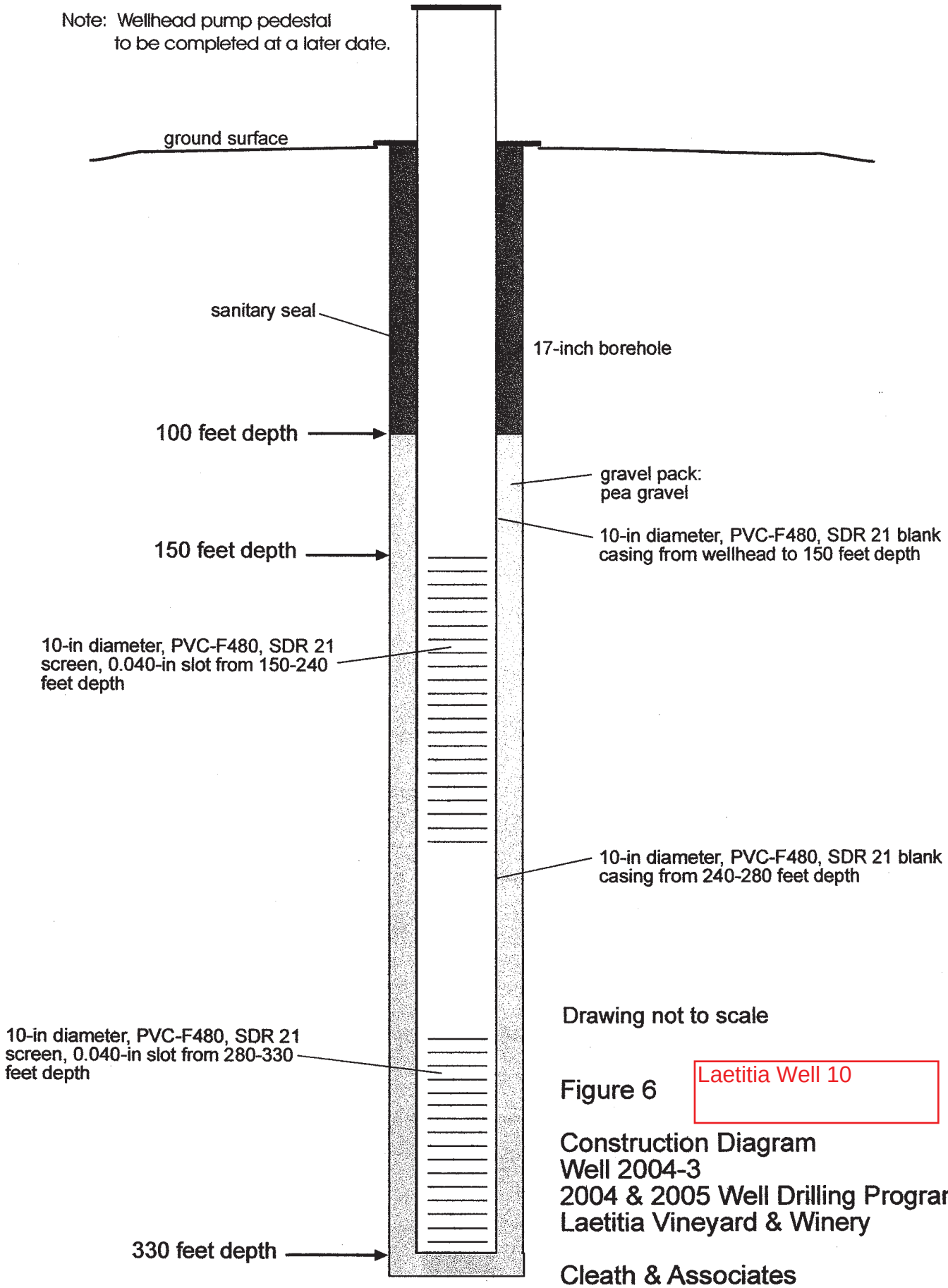
Top	Bottom	Thickness	Description
0	30	30	**Silty, Clayey Sand,** yellowish brown, fine grained sand, lesser medium to coarse grained, fragments of weathered volcanic sandstone.
30	100	70	**Clayey Sand,** light grayish brown, fine grained sand, lesser medium to coarse grained, fragments of gray vitreous welded tuff.
100	120	20	**Sandstone,** medium gray, poorly sorted volcanic sandstone.
120	190	70	**Tuff,** dark gray, welded, vitreous, common pyrite coatings.
190	210	20	**Diabase;** medium to dark gray aphanitic rock, with pyrite and calcite.
210	235	25	**Volcanics,** medium to dark gray aphanitic rock, with lesser amounts of dark yellow aphanitic volcanic rock.
235	295	60	**Diabase,** dark gray aphanitic rock, less resistant, trace quartz.
295	340	45	**Tuff,** dark gray, welded, fractured, with pyrite and calcite filling fractures.

Total Depth: 340

Drill Penetration Rate
Well 2004-3
Laetitia Vineyard and Winery

From	To	Depth	Minutes	Ft/Min
0	5	5	--	--
5	20	15	--	--
20	40	20	15	1.33
40	60	20	15	1.33
60	80	20	20	1.00
80	100	20	40	0.50
100	120	20	25	0.80
120	140	20	65	0.31
140	160	20	85	0.24
160	180	20	90	0.22
180	200	20	162	0.12
200	220	20	142	0.14
220	230	10	40	0.25
230	240	10	175	0.06
240	255	15	150	0.10
255	265	10	45	0.22
265	285	20	40	0.50
285	305	20	190	0.11
305	325	20	175	0.11
325	335	10	60	0.17

Depths in Feet



Drawing not to scale

Figure 6

Laetitia Well 10

Construction Diagram
Well 2004-3
2004 & 2005 Well Drilling Program
Laetitia Vineyard & Winery

Cleath & Associates

weenco

ELECTRIC LOG \ GAMMA \ CALIPER

FILING NO.	COMPANY	ENLOE DRILLING COMPANY
	WELL	LATITICA WINERY NO ~~4~~ 3
	FIELD	NIPOMO
	COUNTY	S.L. OBISPO STATE CALIFORNIA
JOB NO. 39579	LOCATION: SEC ____ TWP ____ RGE ____	OTHER SERV: NONE

Permanent Datum: GROUND LEVEL Elev: ____ K.B. ____
Log Measured From G.L. 0 Ft Above Perm Datum D.F. ____
Drilling Measured From GROUND LEVEL G.L. ____

Date	12-23-2004		
Run No.	ONE		
Depth - Driller	345'		
Depth - Logger	341'		
Btm. Log Inter.	340'		
Top Log Inter.	3'		
Casing-Driller	14" at 20'		
Casing-Logger	13.5 at 20'		
Bit Size	11'		
Type Fluid In Hole	WATER		
Dens. / Visc.	N/A / N/A		
pH / Fluid Loss	N/A / N/A ml		
Source of Sample	WELL		
Rm at Meas.Temp	6.3 at 75 F		
Rmf at Meas.Temp	at 75 F		
Rmc at Meas.Temp	N/A at F		
Source:Rmf Rmc	MEAS		
Rm at BHT	N/A at F		
Time Since Circ.			
Max. Rec. Temp.	N/A F		
Equip / Location	L-10 / BFL		
Recorded By	L. HOCK		
Witnessed By	D. ENLOE		

Fold Here

This Heading and Log Conform To API RP 31

Changes in Mud Type or Additional Samples

Date	Sample No.	Depth-Driller	Type Fluid in Hole	Dens. / Visc.	pH / Fluid Loss	Source of Sample	Rm at Meas. Temp.	Rmf at Meas. Temp.	Rmc at Meas. Temp.	Source: Rmf / Rmc	Rm at BHT	Rmf at BHT	Rmc at BHT
					ml		at F	at F	at F		at F	at F	at F
					ml		at F	at F	at F		at F	at F	at F

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down

Equipment Data

Run No.	Tool Type	PadType	Tool Pos	Other
ONE	ELECTRIC		FREE	

REMARKS:

WELL DRILLED BY: ENLOE DRILLING

DRILLER:

old Here

This Heading and Log Conform To API RP 31

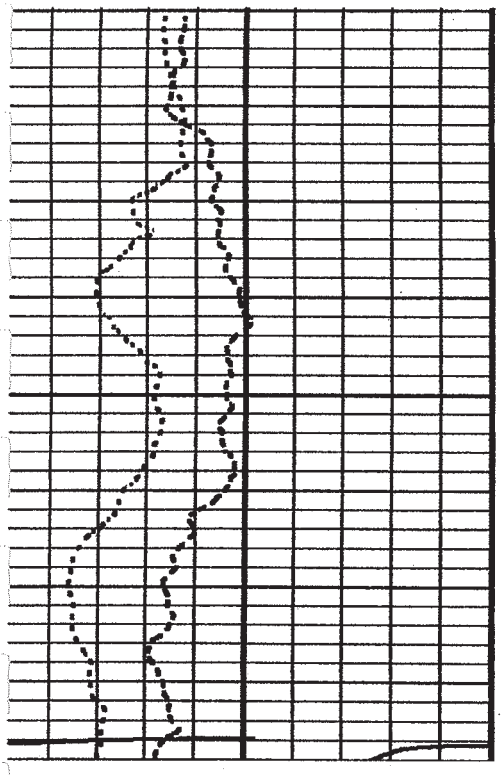
hanges in Mud Type or Additional Samples						Scale Changes			
ate	Sample No.					Type Log	Depth	Scale Up Hole	Scale Down Ho
epth-Driller									
ype Fluid in Hole									
Dens.	Visc.								
ph	Fluid Loss		ml		ml				
Source of Sample						Equipment Data			
Rm at Meas. Temp.		at	F	at	F	Run No.	Tool Type	PadType	Tool Pos	Other
Rmf at Meas. Temp.		at	F	at	F	ONE	ELECTRIC		FREE	
Rmc at Meas. Temp.		at	F	at	F					
Source:Rmf	Rmc									
Rm at BHT		at	F	at	F					
Rmf at BHT		at	F	at	F					
Rmc at BHT		at	F	at	F					

EMARKS:

ELL DRILLED BY:ENLOE DRILLING

RILLER:

SPONTANEOUS POTENTIAL millivolts	DEPTHS	RESISTIVITY ohmmeters2 /meter	ohms
- 5 +		SHORT NORMAL 0 16 Inch 100 0 X10 BACK UP 1000	
0-------API UNITS----------200 GAMMA RAY 10...CALIPER IN INCHES.....20		LONG NORMAL 0 64 Inch 100 0 X10 BACK UP 1000	SINGLE POINT Detail Curve



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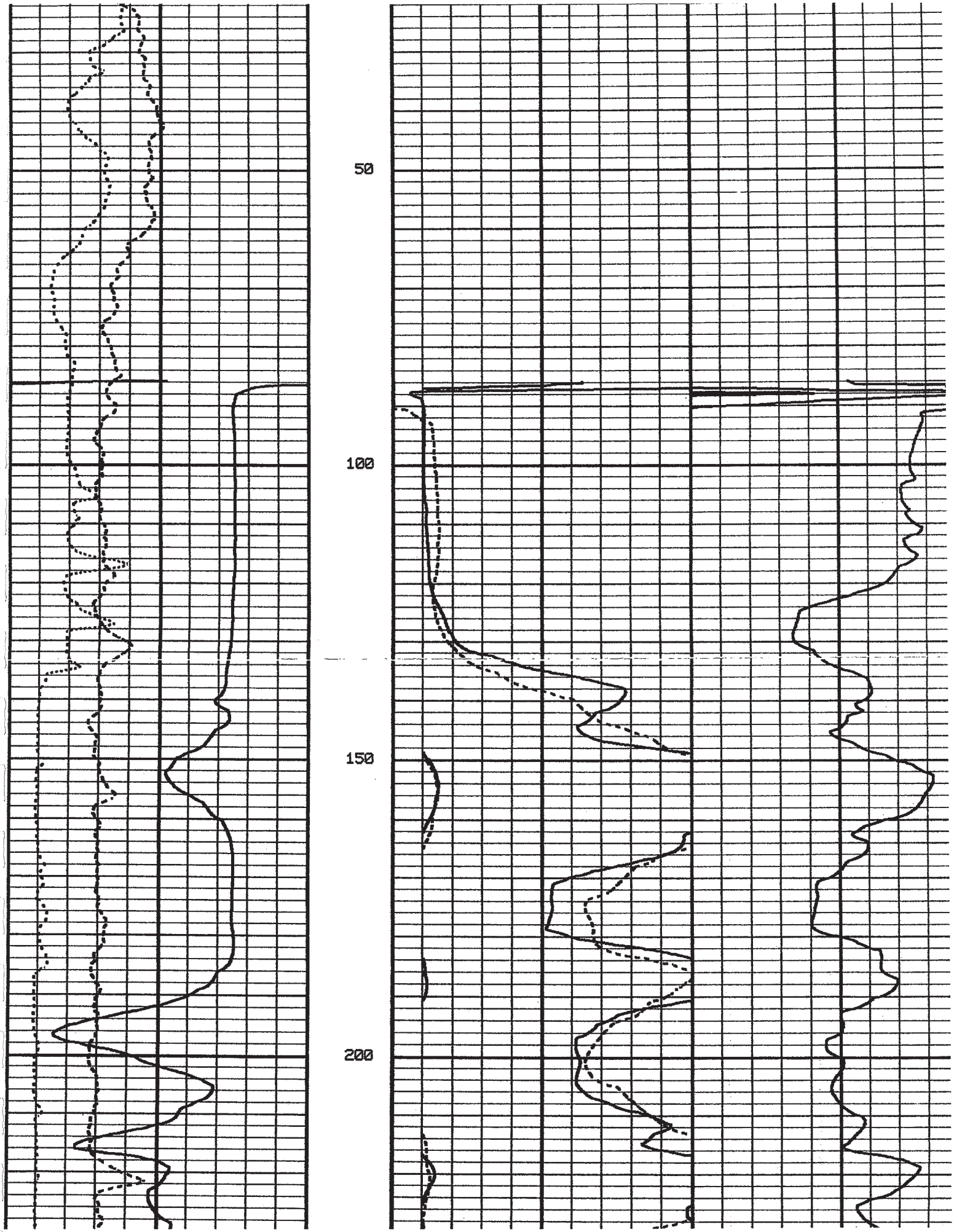
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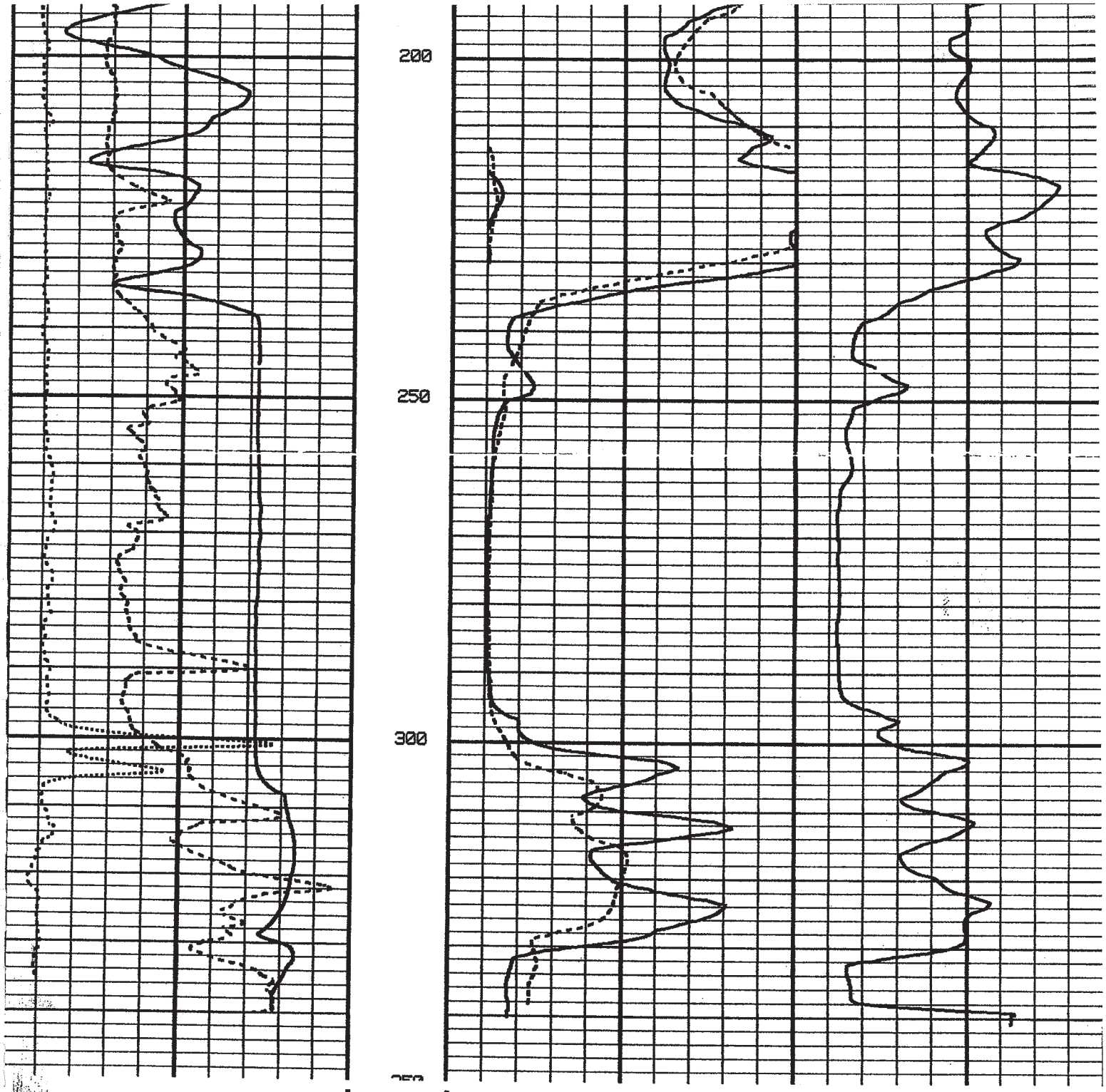

200
250
300
0 API UNITS 200
GAMMA RAY
10 ....CALIPER IN INCHES.....20
- 5 +
0 X10 BACK UP 1000
0 64 Inch 100
LONG NORMAL
0 X10 BACK UP 1000
0 16 Inch 100
SHORT NORMAL
Detail Curve
SINGLE POINT
millivolts
SPONTANEOUS POTENTIAL
DEPTHS
ohmmeters2/meter
RESISTIVITY
ohms
RESISTANCE

Pumping Test (72 hour), Laetitia Well 2004-3, February 1, 2005

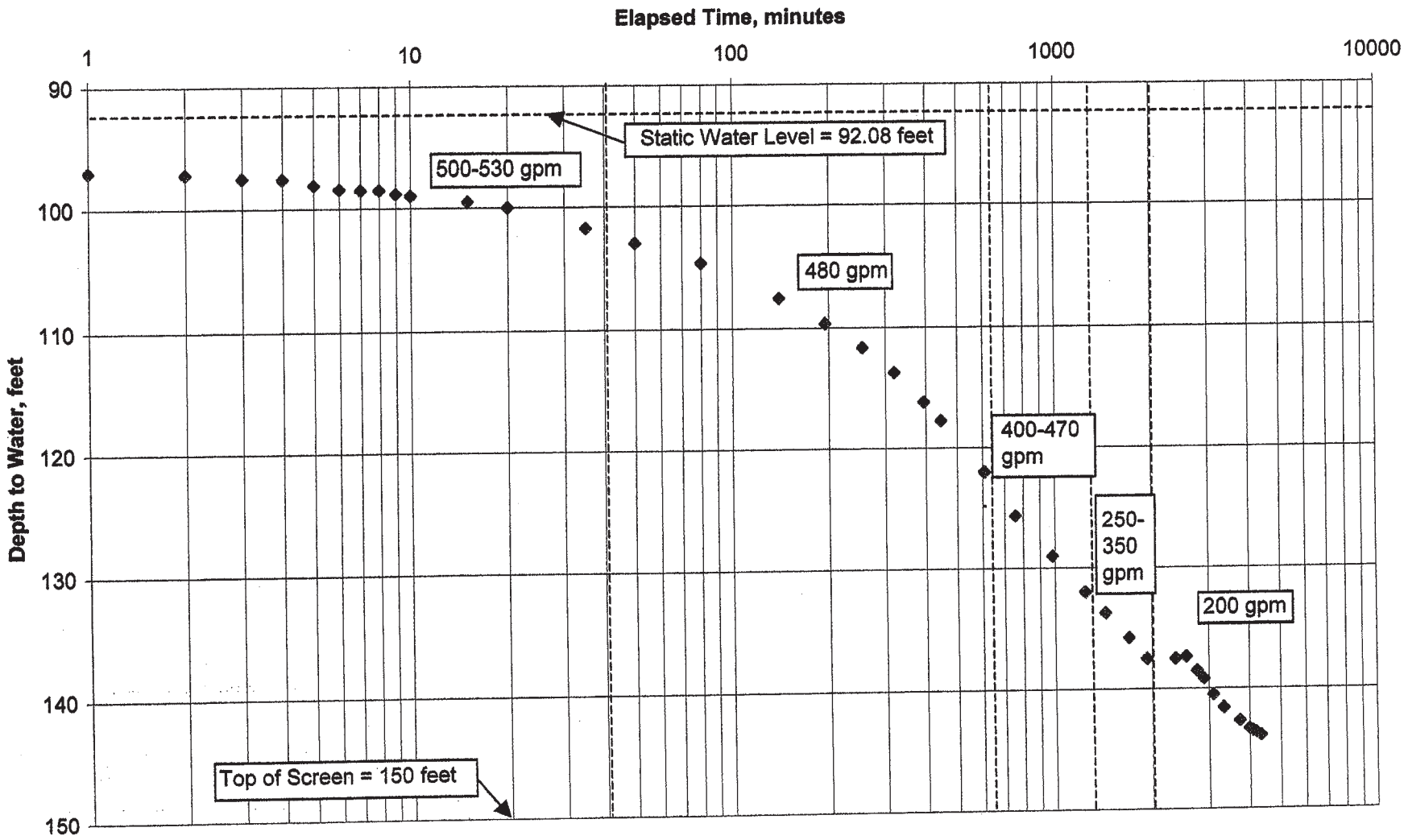
Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute
2/1/2005	12:40	0	92.08	0	Start
	12:41	1	97.00	4.92	
	12:42	2	97.17	5.09	500
	12:43	3	97.50	5.42	
	12:44	4	97.58	5.50	
	12:45	5	98.08	6.00	
	12:46	6	98.42	6.34	
	12:47	7	98.50	6.42	
	12:48	8	98.50	6.42	
	12:49	9	98.83	6.75	
	12:50	10	99.00	6.92	
	12:55	15	99.50	7.42	530
	13:00	20	100.00	7.92	
	13:15	35	101.75	9.67	550
	13:30	50	103.00	10.92	
	14:00	80	104.67	12.59	
	15:00	140	107.60	15.52	
	15:55	195	109.67	17.59	476
	16:55	255	111.67	19.59	498
	18:00	320	113.75	21.67	479
	19:15	395	116.17	24.09	477
	20:06	446	117.75	25.67	478
	22:47	607	122.00	29.92	480
2/2/2005	1:17	757	125.67	33.59	
	5:04	984	129.00	36.92	425
	9:22	1242	132.00	39.92	
	12:41	1441	133.75	41.67	
	17:01	1701	135.75	43.67	
	20:54	1934	137.50	45.42	
2/3/2005	4:10	2370	137.50	45.42	
	7:23	2563	137.33	45.25	
	10:46	2766	138.50	46.42	
	13:00	2900	139.17	47.09	
	16:18	3098	140.50	48.42	
	20:13	3333	141.58	49.50	
2/4/2005	2:53	3733	142.67	50.59	
	7:17	3997	143.33	51.25	
	9:04	4104	143.50	51.42	
	10:44	4204	143.67	51.59	
	13:06	4346	143.92	51.84	
	STOP				

Recovery Test, Laetitia 2004-3, Feb 4-6 2004

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recovery Time Ratio
Mo./Day/Yr	hr:min	minutes	feet	feet	t/t(0)
Recovery					
2/4/2005	13:07	1	143.92	51.84	4347
	13:08	2	143.00	50.92	2174
	13:09	3	142.67	50.59	1450
	13:10	4	142.50	50.42	1088
	13:11	5	142.50	50.42	870
	13:12	6	142.33	50.25	725
	13:13	7	142.33	50.25	622
	13:14	8	142.33	50.25	544
	13:15	9	142.33	50.25	484
	13:20	14	142.17	50.09	311
	13:25	19	142.17	50.09	230
	13:30	24	142.17	50.09	182
	13:45	39	142.00	49.92	112
	14:00	54	141.83	49.75	81
	14:30	84	141.50	49.42	53
	15:00	114	141.00	48.92	39
	16:00	174	140.50	48.42	26
	17:00	234	140.00	47.92	20
	20:30	444	139.17	47.09	11
	8:00	1134	136.00	43.92	5
2/5/2005	13:29	1463	134.08	42	4
	20:30	1884	133.08	41	3
2/6/2005	10:30	2724	130.58	38.5	3
	20:30	3324	129.00	36.92	2
2/7/2005	10:00	4134	126.67	34.59	2
2/8/2005	11:00	5634	123.5	31.42	2
2/9/2005	17:00	7434	123	30.92	2
2/13/2005	11:00	12834	114.41	22.33	1

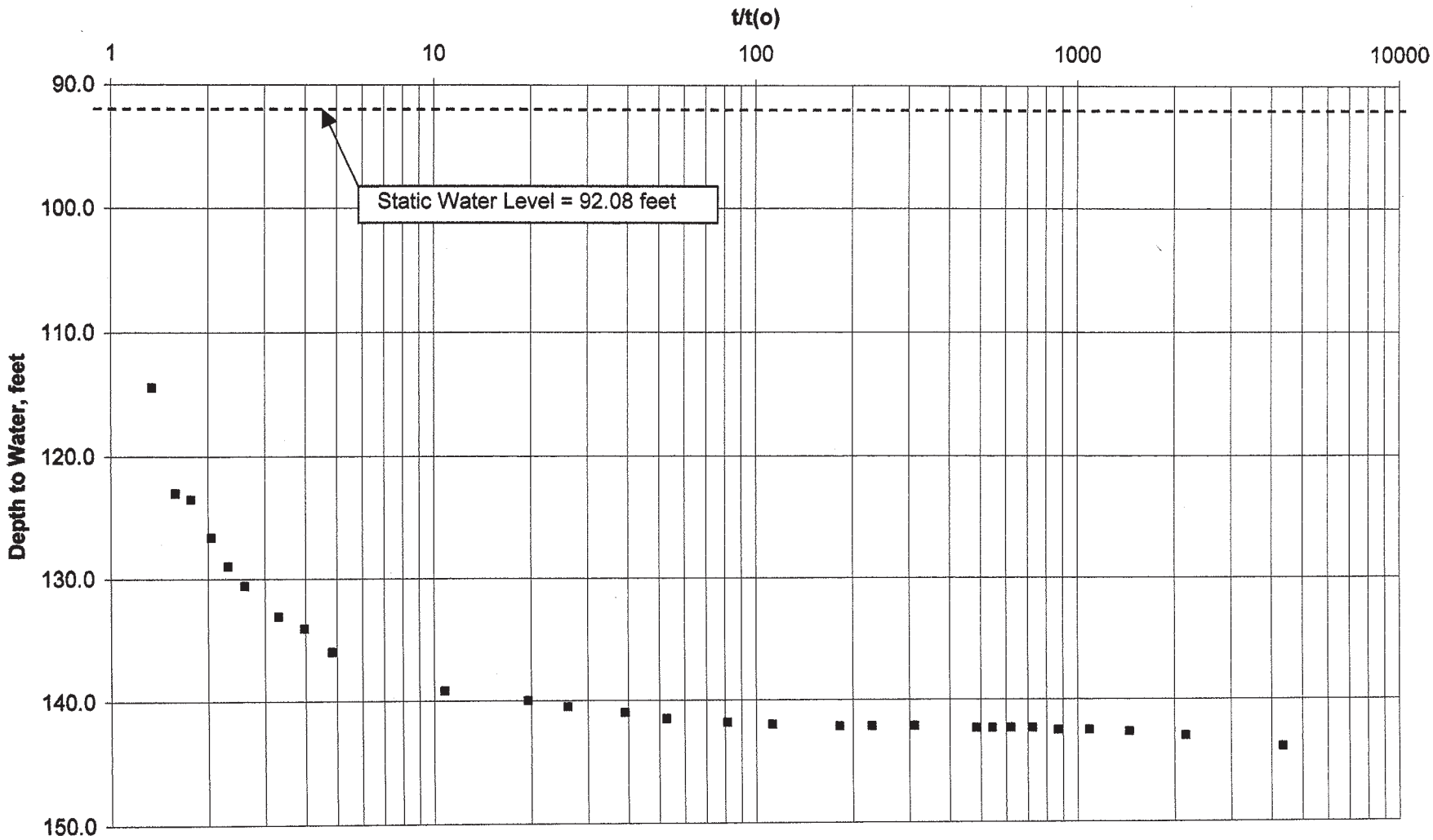
Pumping Test (72 hour) - Laetitia Well #2004-3
February 1 to February 4, 2005

Depth to Static Water Level: 92.08 feet **Ave Pumping Rate: 300 gpm**



Recovery Test - Laetitia Well 2004-3
February 4, 2005

Depth to Static Water Level: 92.08 feet **Average Pumping Rate: 300 gpm**



ORIGINAL
File with DWR

Page ___ of ___

Owner's Well No. #4-2005

Date Work Began June27,2005, Ended July15,2005

Local Permit Agency San Luis Obispo Environmental

Permit No. 2004-594 Permit Date Dec.6, 2005

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 1085590

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Mud Rotary FLUID Bentinite

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	5	Top soil
5	20	Clay
20	60	Loose shale-Lt. Brown
60	70	Grey shale
70	80	Grey and brown shale
80	100	Lt. tan shale
100	150	Lt. blue rock (solid)
150	180	Lt. brown rock (solid)
180	210	Lt. blue sandstone
210	230	Dk. Blue Sandstone
230	260	Dk Grey Rock
260	280	Soft dark grey rock
280	310	Large pieces of dark brown rock

2005-1, Laetitia Well 11

from Appendicies to Laetitia Water Studies 6 Oct 2005

TOTAL DEPTH OF BORING 310 (Feet)

TOTAL DEPTH OF COMPLETED WELL 308 (Feet)

WELL OWNER

Name Dave Hickey Laetitia Winery

Mailing Address 453 Laetitia Vineyard Dr.

Arroyo Grande (CITY) Ca. (STATE) 93420 (ZIP)

WELL LOCATION

Address 787 Upper Los Berros Rd.

City Nipomo

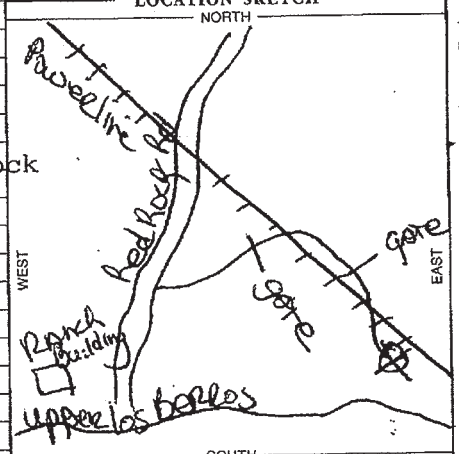
County San Luis Obispo County

APN Book 048 Page 121 Parcel 006

Township 32S Range 14E Section 32

Lat 35° 05. 938 (DEG. MIN. SEC.) N Long 120° 30. 390 (DEG. MIN. SEC.) W

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)

___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial

MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 89 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 89 (Ft.) & DATE MEASURED July26,2005

ESTIMATED YIELD * 200+ (GPM) & TEST TYPE Pump

TEST LENGTH 76 (Hrs.) TOTAL DRAWDOWN 35 (Ft.)

** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	115	12	X				PVCf480	8	SDR 21	
115	305	12		X			PVCf480	8	SDR 21	.040

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			
50	305			X	~~Laps#3~~

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Doug Enloe dba Enloe Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 1698 Nipomo (CITY) Ca. (STATE) 93444 (ZIP)

Signed Doug Enloe (C-57 LICENSED WATER WELL CONTRACTOR) Sept.21,2005 (DATE SIGNED) 318877 (C-57 LICENSE NUMBER)

DWR 188 REV. 05-03 IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM OSP 03 7883

Well Log
Laetitia Vineyard & Winery

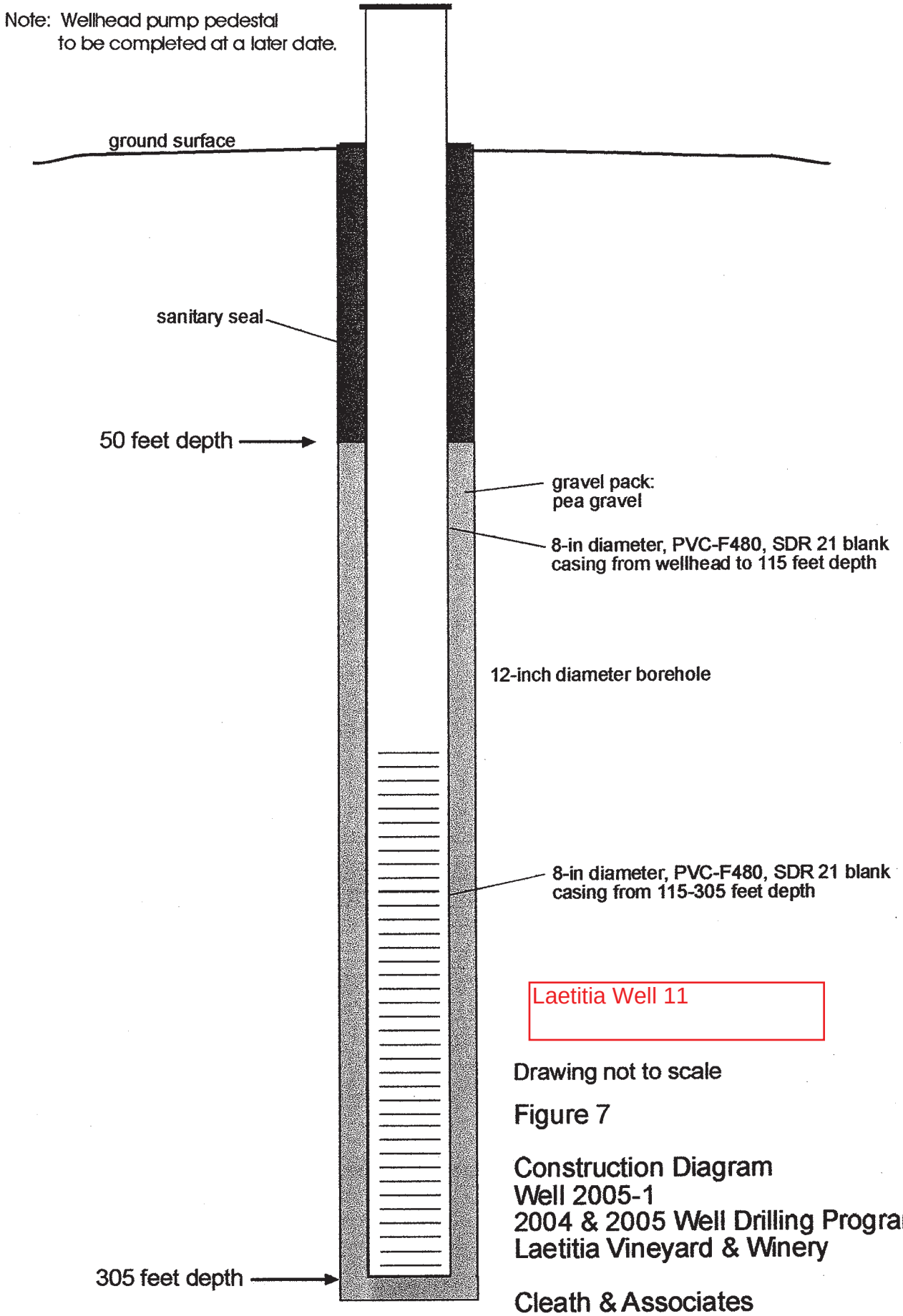
Laetitia Well 11

Well ID: 2005-1
Date: June 27 to July 12, 2005
Location: Upper Los Berros Canyon
Elevation: 410 ft above sea level (from topographic map)
Geologist: N. Kelley, Cleath & Associates.
Drilling Company: Enloe Drilling
Drilling Method: Airlift
Total depth: 310 feet

Lithologic Log
Depth to top and bottom in feet

Top	Bottom	Thickness	Description
0	20	20	**Volcanics,** dark reddish brown to dark gray, weathered and oxidized.
20	60	40	**Rhyolitic Volcanics**, white to gray, trace oxidation.
60	100	40	**Tuffaceous Mudstone**, dark gray, with up to 50 percent reddish to white oxidized volcanics.
100	120	20	**Tuff and Tuffaceous Siltstone,** gray to yellowish brown, cuttings finely ground.
120	190	70	**Rhyolite Tuff;** yellowish brown and gray.
190	220	40	**Clayey Tuff,** light gray.
220	310	90	**Rhyolite Tuff and Tuffaceous Siltstone,** light to dark gray with reddish yellow volcanic fragments, larger clasts from 280-290 feet. Becoming very hard at 310 feet (drilled one foot in one hour).

Total Depth: 310



Drawing not to scale

Figure 7

Construction Diagram
Well 2005-1
2004 & 2005 Well Drilling Program
Laetitia Vineyard & Winery

Cleath & Associates

Laetitia Well 11

welenco

ELECTRIC LOG

ILING NO.	COMPANY Enloe Drilling
	WELL Laettica Vineyards 2005-1
	FIELD Arroyo Grande
	COUNTY San Luis Obispo STATE California
	LOCATION: Upper Los Barros Cyn.
OB NO. 4573	SEC ____ TWP ____ RGE ____
	OTHER SERV: NONE

Permanent Datum: GROUND LEVEL Elev: N/A K.B. ____
Log Measured From G.L. 0 Ft Above Perm Datum D.F. ____
Drilling Measured From GROUND LEVEL G.L. ____

Date	07-13-2005		
Run No.	ONE		
Depth - Driller	310'		
Depth - Logger	309'		
Btm. Log Inter.	308'		
Top Log Inter.	110'		
Casing-Driller	12" at 73'		
Casing-Logger	12" at 73'		
Bit Size	11"		
Type Fluid In Hole	WATER		
Dens. | Visc.	N/A | N/A		
pH Fluid Loss	N/A | N/A ml		
Source of Sample	AIR LIFT		
Rm at Meas.Temp	7.1 at 75 F		
Rmf at Meas.Temp	7.1 at 75 F		
Rmc at Meas.Temp	N/A at F		
Source:Rmf Rmc	MEAS		
Rm at BHT	N/A at F		
Time Since Circ.			
Max. Rec. Temp.	N/A F		
Equip | Location	L11 | BFL		
Recorded By	BOBINSKI		

Fold Here

This Heading and Log Conform To API RP 31

Scale Changes

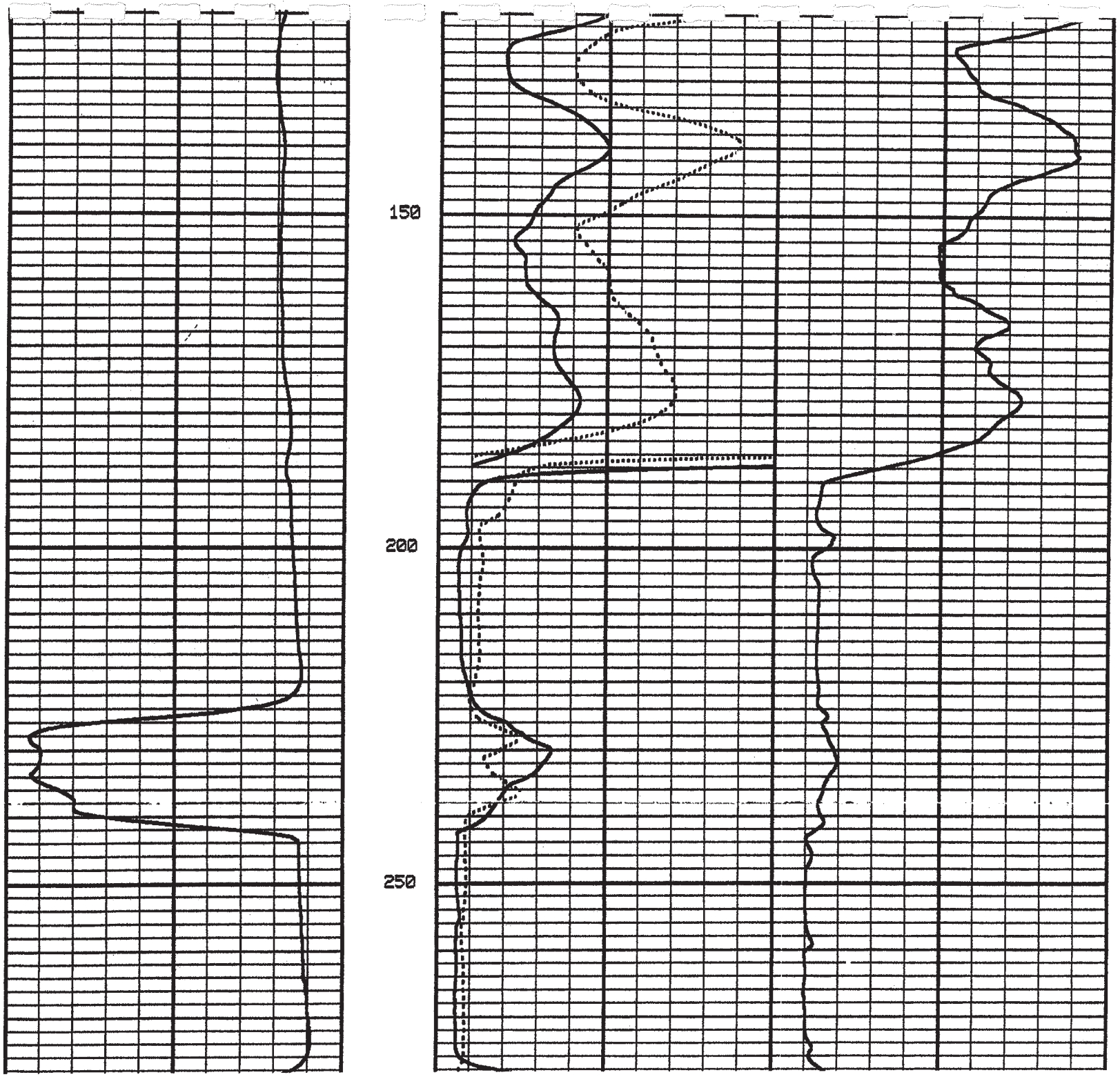
Type Log	Depth	Scale Up Hole	Scale Down Hole

Equipment Data

Run No.	Tool Type	PadType	Tool Pos	Other
ONE	ELECTRIC		FREE	

Changes in Mud Type or Additional Samples

Date	Sample No.		
Depth-Driller			
Type Fluid in Hole			
Dens. | Visc.			
ph | Fluid Loss		ml	ml
Source of Sample			
Rm at Meas. Temp.		at F	at F
Rmf at Meas. Temp.		at F	at F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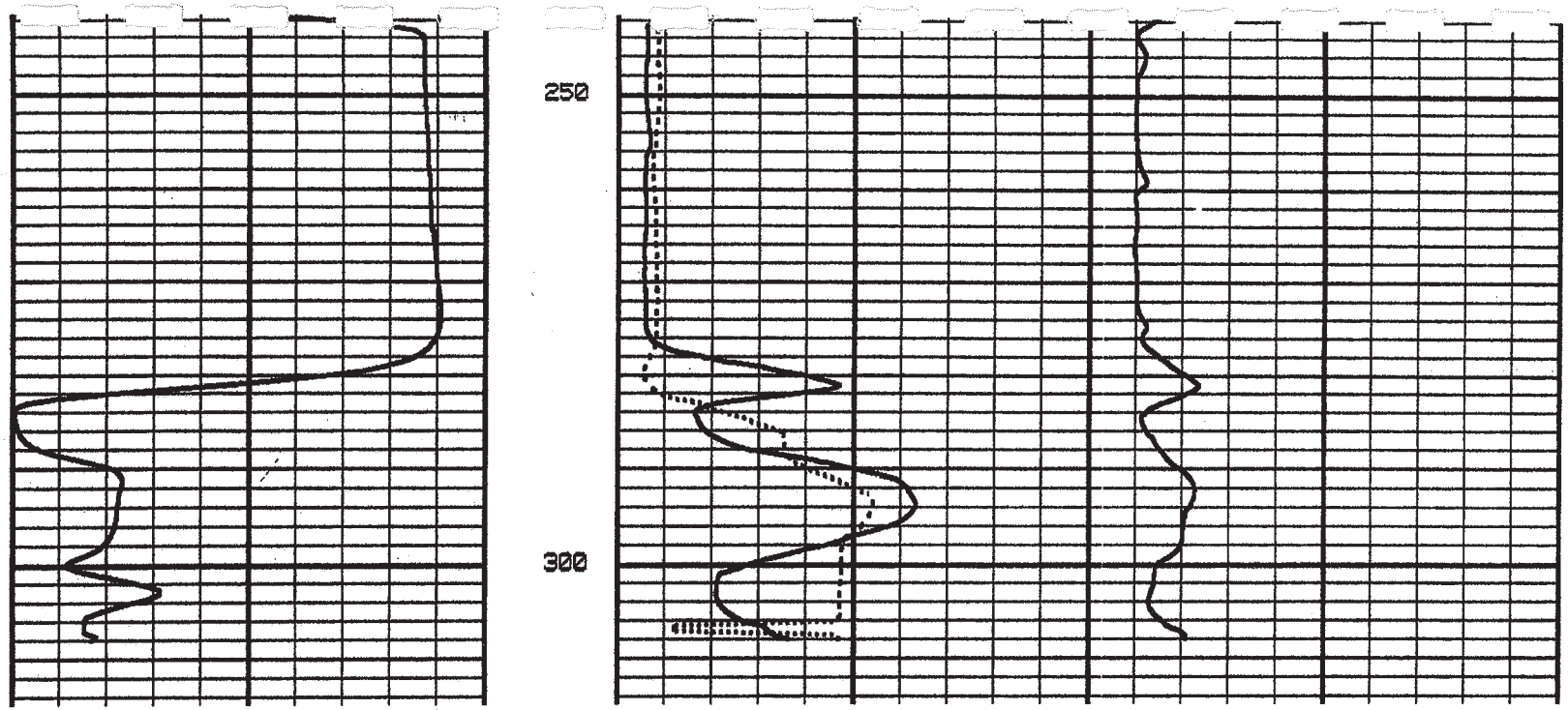
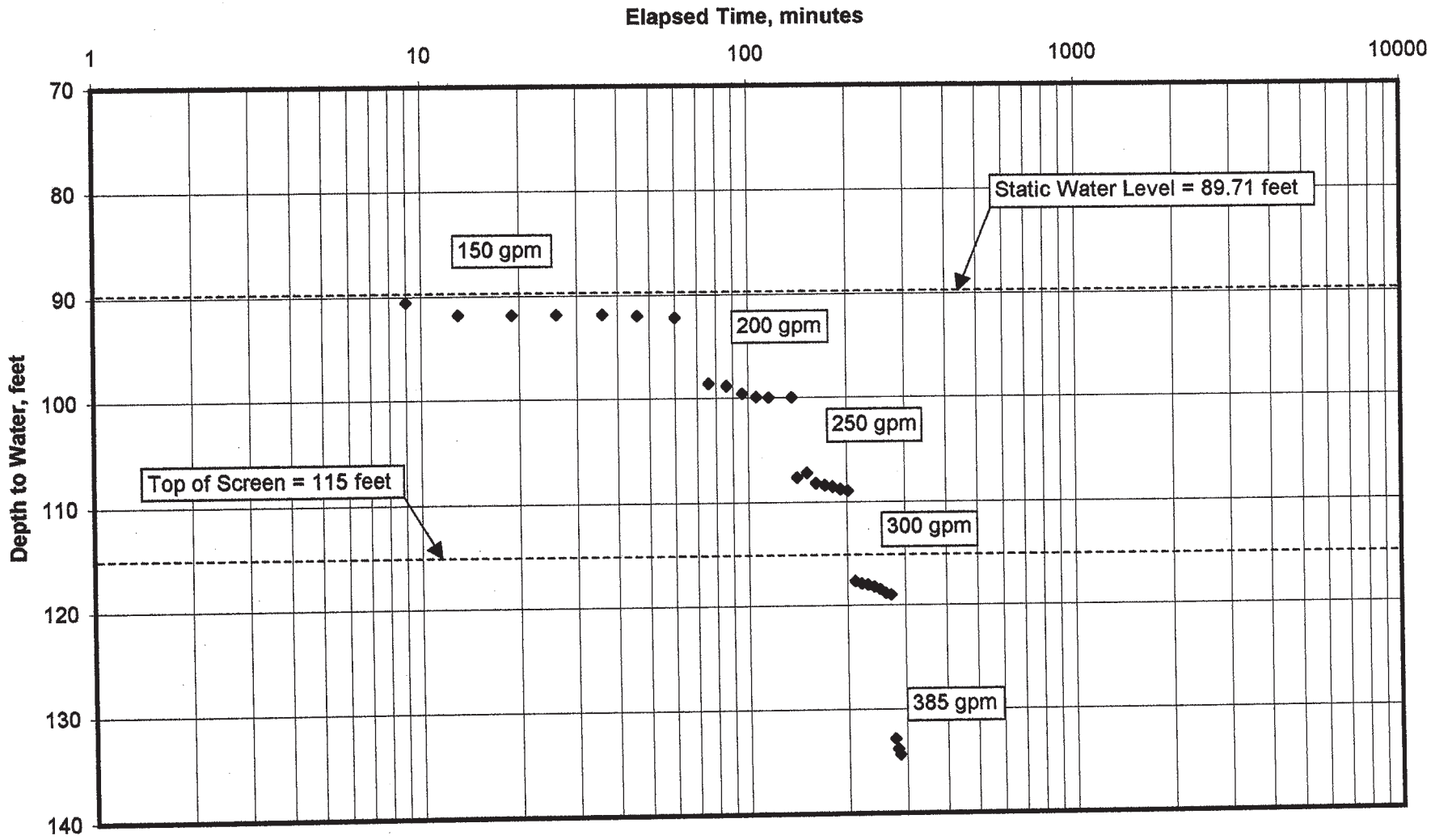


- ⟷ + 40mV		0 X10 BACK UP 1000 0 LONG NORMAL 100 64 INCH	Detail Curve SINGLE POINT
		0 X10 BACK UP 1000 0 SHORT NORMAL 100 16 INCH	
SPONTANEOUS POTENTIAL millivolts	DEPTHS	Ohmmeters2/ meter RESISTIVITY	Ohms RESISTANCE

Step Test, Laetitia Well 2005-1, July 21, 2005

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute
	11:04	0	89.71	0	Start
	11:13	9	90.50	0.79	150
	11:17	13	91.75	2.04	150
	11:23	19	91.83	2.12	150
	11:30	26	91.83	2.12	150
	11:40	36	91.83	2.12	150
	11:50	46	91.96	2.25	150
	12:04	60	92.17	2.46	150
	12:20	76	98.58	8.87	200
	12:30	86	98.83	9.12	200
	12:40	96	99.58	9.87	200
	12:50	106	99.92	10.21	200
	13:00	116	99.96	10.25	200
	13:20	136	99.96	10.25	200
	13:25	141	107.63	17.92	250
	13:35	151	107.16	17.45	250
	13:45	161	108.16	18.45	250
	13:55	171	108.33	18.62	250
	14:05	181	108.50	18.79	250
	14:15	191	108.75	19.04	250
	14:25	201	108.92	19.21	250
	14:35	211	117.58	27.87	300
	14:45	221	117.83	28.12	300
	14:55	231	117.92	28.21	300
	15:05	241	118.16	28.45	300
	15:15	251	118.41	28.70	300
	15:25	261	118.79	29.08	300
	15:35	271	118.92	29.21	300
	15:40	276	132.83	43.12	385
	15:45	281	133.83	44.12	385
	15:50	286	134.41	44.12	385
	STOP				pump off

Step Test - Laetitia Well #2005-1
July 21, 2005
Depth to Static Water Level: 89.71 feet



Pumping Test, Laetitia Well 2005-1, July 26 to 29, 2005

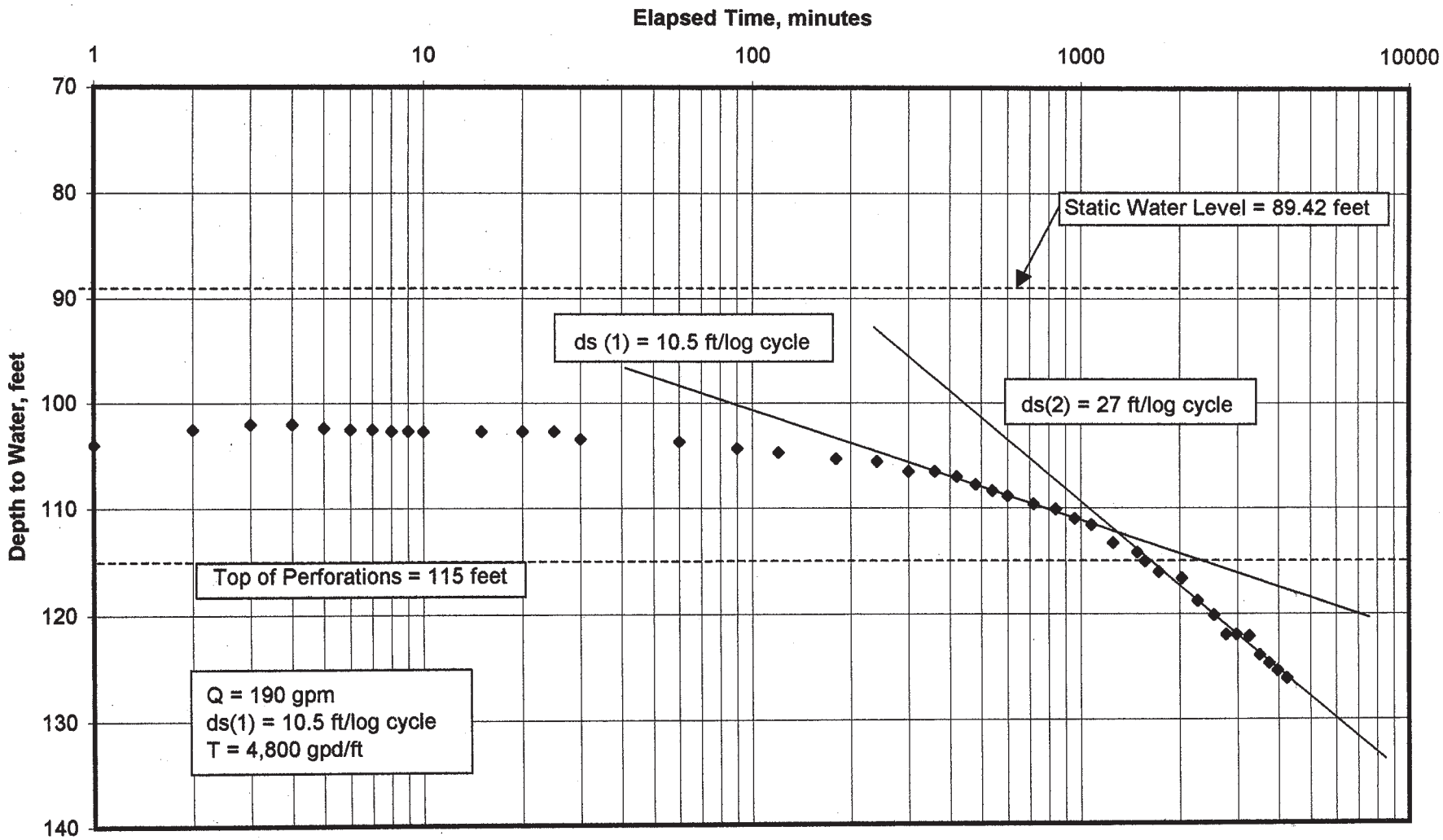
Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute
7/26/2005	12:00	0	89.42	0	Start
	12:01	1	104.00	14.58	200
	12:02	2	102.50	13.08	
	12:03	3	102.00	12.58	
	12:04	4	102.00	12.58	
	12:05	5	102.33	12.91	240
	12:06	6	102.50	13.08	
	12:07	7	102.50	13.08	
	12:08	8	102.63	13.21	
	12:09	9	102.63	13.21	
	12:10	10	102.67	13.25	200
	12:15	15	102.71	13.29	
	12:20	20	102.67	13.25	200
	12:25	25	102.67	13.25	
	12:30	30	103.42	14.00	210
	13:00	60	103.67	14.25	180
	13:30	90	104.33	14.91	193
	14:00	120	104.71	15.29	197
	15:00	180	105.33	15.91	197
	16:00	240	105.58	16.16	197
	17:00	300	106.50	17.08	193
	18:00	360	106.50	17.08	195
	19:00	420	107.00	17.58	
	20:00	480	107.75	18.33	193
	21:00	540	108.33	18.91	193
	22:00	600	108.83	19.41	198
7/27/2005	0:00	720	109.58	20.16	191
	2:00	840	110.08	20.66	188
	4:00	960	111.00	21.58	191
	6:00	1080	111.58	22.16	188
	8:53	1253	113.25	23.83	190
	12:48	1488	114.17	24.75	
	14:12	1572	115.00	25.58	
	16:45	1725	116.00	26.58	194
	21:50	2030	116.58	27.16	187
7/28/2005	1:48	2268	118.75	29.33	
	6:25	2545	120.08	30.66	
	10:12	2772	121.92	32.50	
	13:35	2975	121.92	32.50	
	18:14	3254	122.08	32.66	
	22:21	3501	123.83	34.41	191
7/29/2005	2:21	3741	124.67	35.25	188
	6:13	3973	125.33	35.91	187
	10:38	4238	126.08	36.66	185
	11:45	4305	126.25	36.83	185
	12:00				average flow 190 gpm

Recovery Test, Laetitia Well 2005-1, July 25, 2005

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recovery Time Ratio
Mo./Day/Yr	hr:min	minutes	feet	feet	t/t(0)
Recovery					
7/29/2005	12:00	0	126.25	36.83	
	12:01	1	113.33	23.91	4306
	12:02	2	112.75	23.33	2154
	12:03	3	112.63	23.21	1436
	12:04	4	112.50	23.08	1077
	12:05	5	112.33	22.91	862
	12:10	10	112.17	22.75	432
	12:20	20	112.17	22.75	216
	12:32	32	111.50	22.08	136
	14:28	148	110.33	20.91	30
7/30/2005	9:00	1260	103.50	14.08	4
	STOP				

Pumping Test - Laetitia Well #2005-1
July 22 to 25, 2005

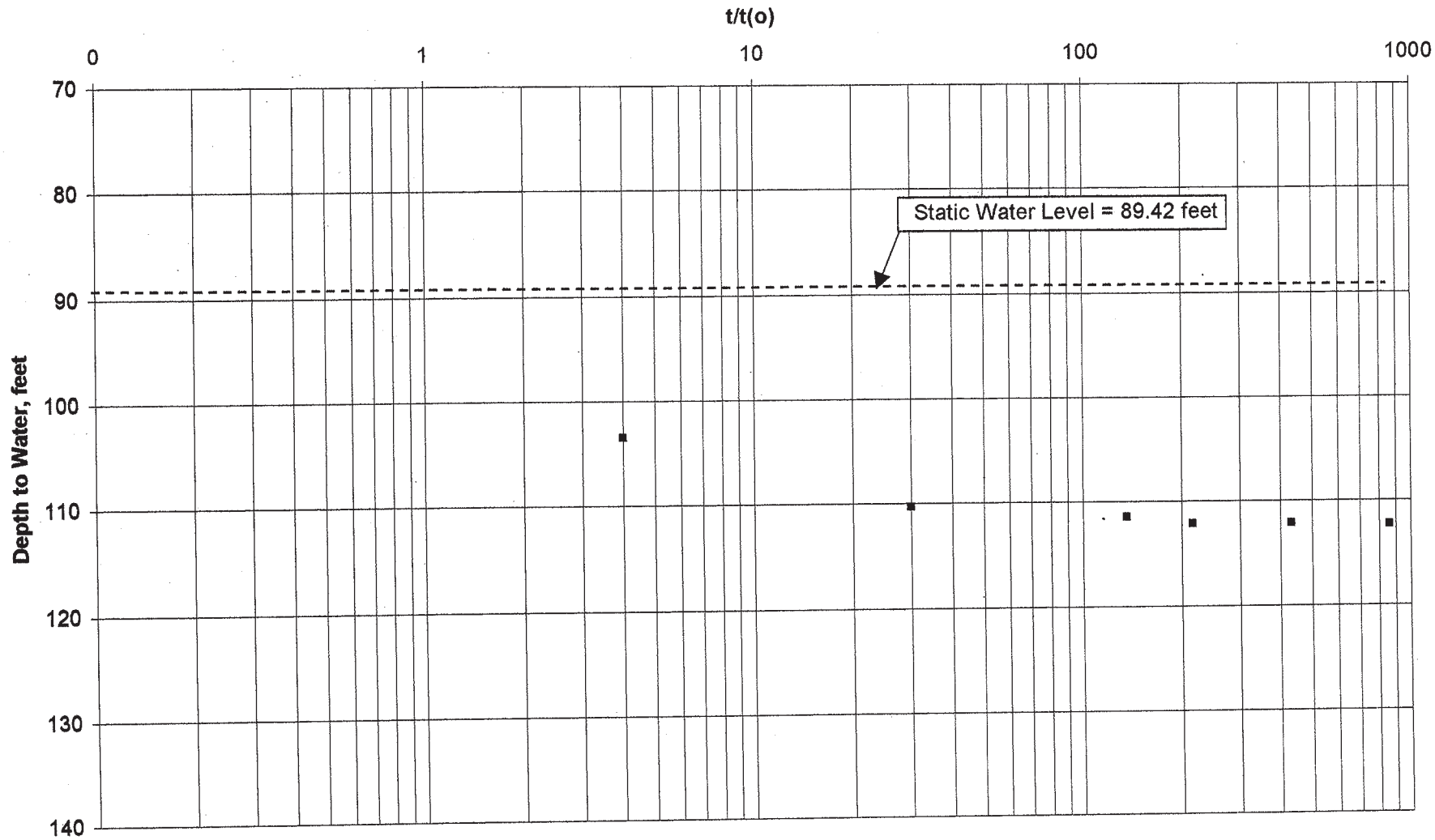
Depth to Static Water Level: 89.42 feet **Average Pumping Rate: 190 gpm**



Recovery Test - Laetitia Well 2005-1
July 25, 2005

Depth to Static Water Level: 89.42 feet

Average Pumping Rate: 200 gpm



DUPLICATE
Driller's Copy

#14

Page ___ of ___

Owner's Well No. Well#1-2006

Date Work Began May18, 2006 Ended June10, 2006

Local Permit Agency San Luis Obispo Environmental Health

Permit No. 2006-128 Permit Date May17, 2006

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 1097648

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Mud Rotary FLUID Bentinite

DEPTH BELOW SURFACE FT.	to FT.	DESCRIPTION (Describe material, grain size, color, etc.)
0	20	Loose Gravel
20	40	Shale gravel
40	100	Brown shale
100	190	Light tan shale
190	600	Mostly black shale

WELL OWNER

Name Diva Rickey/Laetitia Winery

Mailing Address 453 Laetitia Vineyard Dr.

City Arroyo Grande CA 93420 (State, Zip)

WELL LOCATION

Address Upper Los Berros Rd.

City Nipomo

County San Luis Obispo County

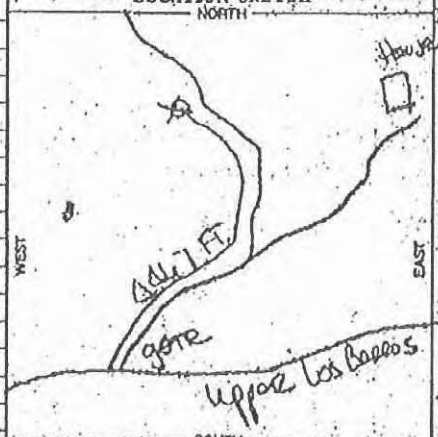
APN Book 047 Page 051 Parcel 005

Township 03S Range 14E Section 29

Lat. 35° 06 348 N Long 120° 29 643 W

LOCATION SKETCH

NORTH



SOUTH

Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
___ MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedure and Materials Under "GEOLOGIC LOG")

USES (✓)
WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial
___ MONITORING
___ TEST WELL
___ CATHODIC PROTECTION
___ HEAT EXCHANGE
___ DIRECT PUSH
___ INJECTION
___ VAPOR EXTRACTION
___ SPARGING
___ REMEDIATION
___ OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 107 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 107 (Ft.) & DATE MEASURED 6/13/06

ESTIMATED YIELD* 235 (GPM) & TEST TYPE Pump

TEST LENGTH 75 (Hrs.) TOTAL DRAWDOWN 213 (Ft.)

* May not be representative of a well's long-term yield.

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL 530 (Feet)

CASING (S)

DEPTH FROM SURFACE FT.	to FT.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	170	11"	X				PVC F480	8"	SDR 21	
170	530	11"		X			PVC F480	8"	SDR 21	.040

ANNULAR MATERIAL

DEPTH FROM SURFACE FT.	to FT.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			
50	600			X	Tapl5#3

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Doug Fulge dba Fulge Well Drilling (PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 1698 CITY Nipomo STATE Ca. ZIP 93444

Signed Doug Fulge (C-57 LICENSED WATER WELL CONTRACTOR) DATE SIGNED Aug.18,2006 C-57 LICENSE NUMBER 318877

DWR 188 REV. (6/0)

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

CONFIDENTIAL
NOT FOR PUBLIC USE
WATER CODE

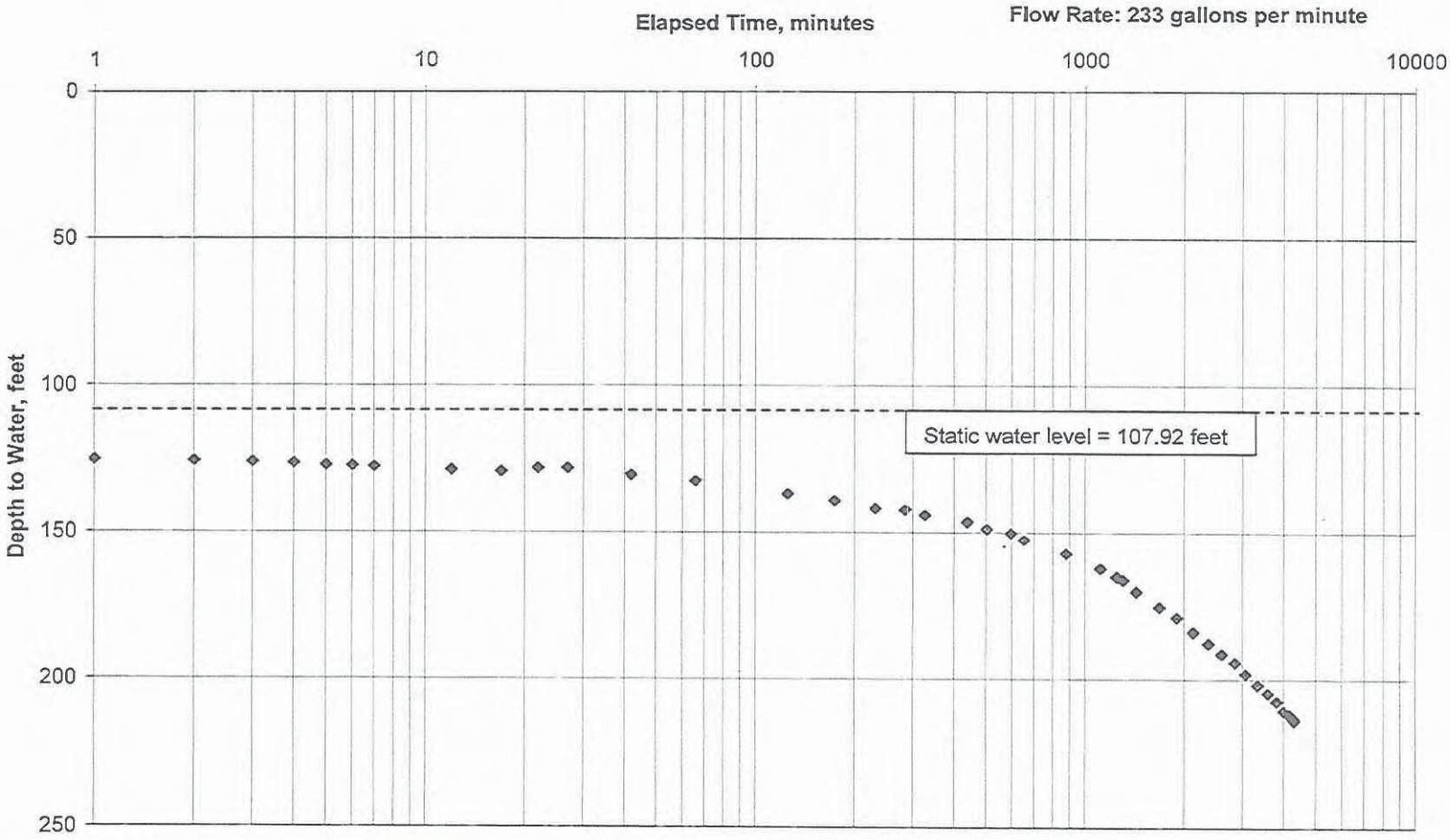
Laetitia Well 14

from Attachment to CHG 4 Nov 2008 ltr regarding alternative wells

Constant Discharge Test, Laetitia Well 14, June 13-16, 2006

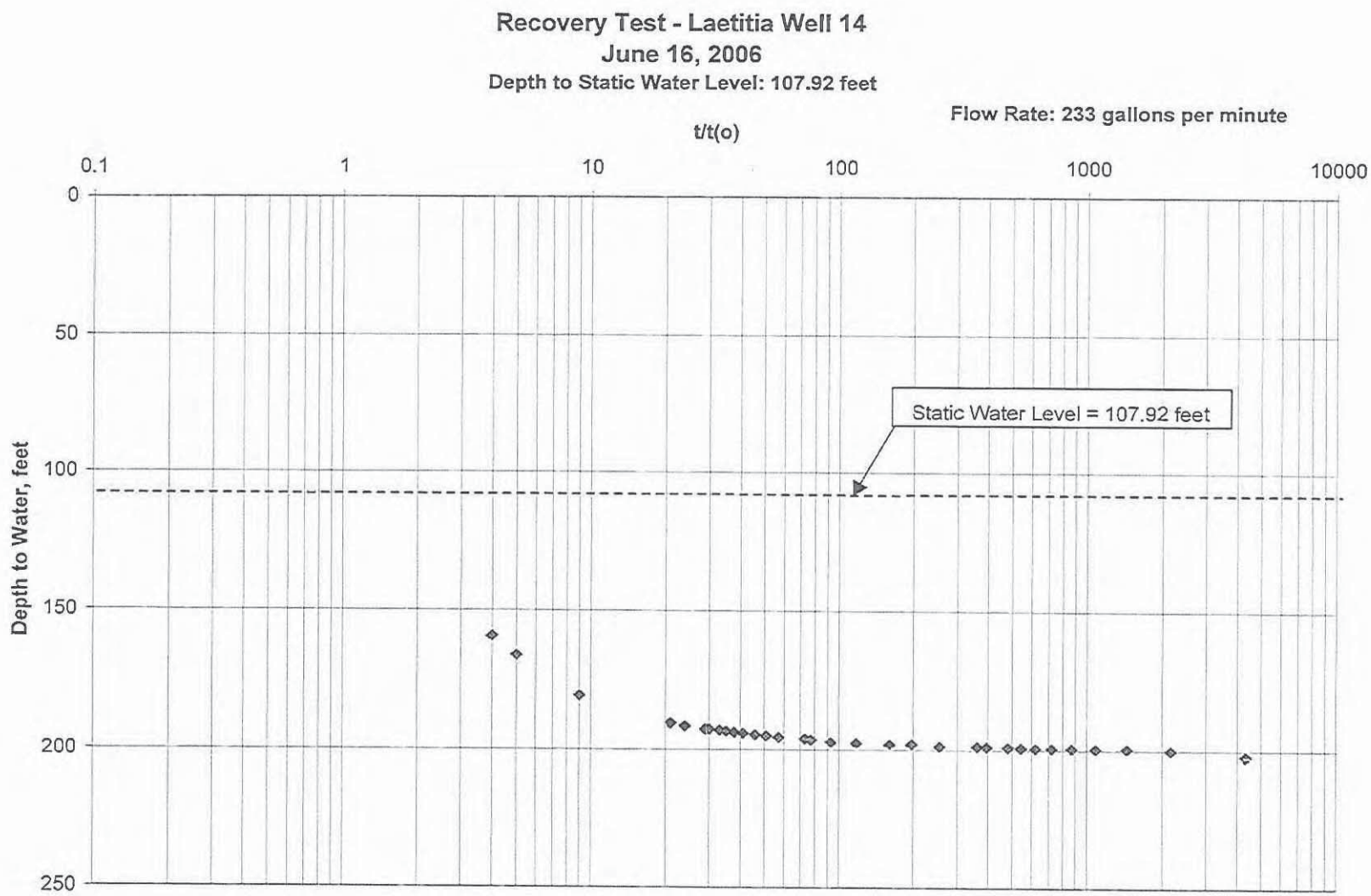
Day	Time	Elapsed Time	Depth to Water	Drawdown	Meter	Recorded Pumping Rate
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons x 100	gallons per minute
6/13/2006	13:23	0	107.92	0	195073	Start
	13:24	1	125.25	17.33		
	13:25	2	125.67	17.75		
	13:26	3	126	18.08		
	13:27	4	126.25	18.33		
	13:28	5	127	19.08	195091	360
	13:29	6	127.25	19.33		
	13:30	7	127.5	19.58	195096	250
	13:35	12	128.25	20.33	195108	240
	13:40	17	128.75	20.83	195122	280
	13:45	22	127.75	19.83	195134	240
	13:50	27	127.67	19.75	195143	180
	14:05	42	130	22.08	195178	233
	14:29	66	132.25	24.33	195235	238
	15:29	126	136.67	28.75	195382	245
	16:18	175	138.83	30.91	195498	237
	17:15	232	141.6	33.68	195635	240
	18:08	285	142.17	34.25	195762	240
	18:51	328	143.83	35.91	195865	240
	20:43	440	146.17	38.25	196131	238
	21:45	502	148.83	40.91	196278	237
	23:18	595	150.17	42.25	196497	235
6/14/2006	0:17	654	152.6	44.68	196635	234
	4:00	877	157.33	49.41	197174	242
	8:00	1117	162.08	54.16	197713	225
	10:18	1255	165	57.08	198033	232
	11:13	1310	166.08	58.16	198160	231
	13:21	1438	169.83	61.91	198464	238
	17:34	1691	175.17	67.25	199066	238
	21:00	1897	179.17	71.25	199537	229
6/15/2006	1:00	2137	183.67	75.75	200108	238
	5:00	2377	187.5	79.58	200661	230
	8:52	2609	191	83.08	201190	228
	12:48	2845	194.17	86.25	201729	228
	16:25	3062	198	90.08	202238	235
	21:00	3337	201.83	93.91	202882	234
6/16/2006	1:05	3582	204.67	96.75	203450	232
	5:00	3817	207.33	99.41	203993	231
	8:05	4002	210.42	102.50	204416	229
	10:57	4174	211.5	103.58	204820	235
	13:12	4309	213	105.08	205132	231
	13:23	4320	213.5	105.58		
					average flow	233

Constant Discharge Test - Laetitia Well 14
June 13-16, 2006



Recovery Test, Laetitia Well 14, June 16, 2006

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recovery Time Ratio
Mo./Day/Yr	hr:min	minutes	feet	feet	t/t(0)
Recovery					
6/16/2006	13:23	0	213.50	105.58	
	13:24	1	202.00	94.08	4321
	13:25	2	200.00	92.08	2161
	13:26	3	199.42	91.5	1441
	13:27	4	199.50	91.58	1081
	13:28	5	199.33	91.41	865
	13:29	6	199.33	91.41	721
	13:30	7	199.33	91.41	618
	13:31	8	199.17	91.25	541
	13:32	9	199.00	91.08	481
	13:34	11	198.83	90.91	394
	13:35	12	198.58	90.66	361
	13:40	17	198.50	90.58	255
	13:45	22	197.67	89.75	197
	13:50	27	197.67	89.75	161
	14:00	37	197.08	89.16	118
	14:10	47	196.92	89	93
	14:20	57	196.33	88.41	77
	14:23	60	195.92	88	73
	14:40	77	195.33	87.41	57
	14:50	87	194.92	87	51
	15:00	97	194.42	86.5	46
	15:10	107	194.00	86.08	41
	15:20	117	193.67	85.75	38
	15:30	127	193.33	85.41	35
	15:40	137	192.92	85	33
	15:50	147	192.50	84.58	30
	16:00	157	192.17	84.25	29
	16:30	187	191.17	83.25	24
	17:00	217	190.00	82.08	21
	22:04	521	180.50	72.58	9
	8:32	1149	166.00	58.08	5
	14:10	1487	159.00	51.08	4
	STOP				


Recovery Test - Laetitia Well 14
June 16, 2006
Depth to Static Water Level: 107.92 feet
Flow Rate: 233 gallons per minute
t/t(o)
0.1
1
10
100
1000
10000
0
50
100
150
200
250
Depth to Water, feet
Static Water Level = 107.92 feet

DUPLICATE
Driller's Copy

#15

Page ___ of ___

Owner's Well No. Well#2 2006

Date Work Began June14, 2006 Ended July8, 2006

Local Permit Agency San Luis Obispo Environmental Health

Permit No. 2006-148 Permit Date June14, 2006

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 1097649

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Mud Rotary FLUID Bentinite

DEPTH FROM SURFACE ft to ft	DESCRIPTION (Describe material, grain size, color, etc.)
0 - 40	Loose shale gravel
40 - 140	Tan shale
140	Lost circualtion/air drilling
140 - 200	Tan shale
200 - 220	Tan and black shale
220 - 600	Mostly black shale

NOT FOR PUBLIC RELEASE
CONFIDENTIAL
WATER CODE

Laetitia Well 15

from Attachment to CHG 4 Nov 2008 ltr regarding alternative wells

TOTAL DEPTH OF BORING 600 (Feet)

TOTAL DEPTH OF COMPLETED WELL 520 (Feet)

WELL OWNER

Name Dave Hickey/Laetitia Winary

Mailing Address 455 Laetitia Vineyard Dr.

City Arroyo Grande State Ca. Zip 93420

WELL LOCATION

Address Upper Los Berros Rd.

City Nipomo

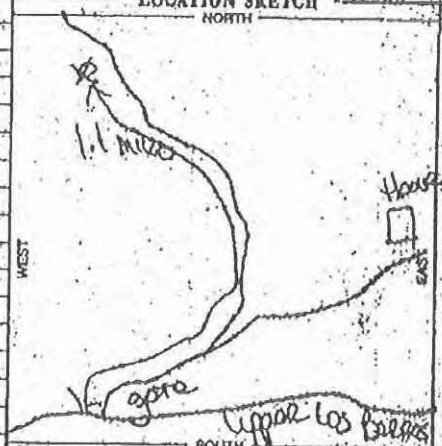
County San Luis Obispo County

APN Book 047 Page 051 Parcel 005

Township 32S Range 14E Section 29

Lat ___ ° ___ ' ___ " N Long ___ ° ___ ' ___ " W (DEG. MIN. SEC.)

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)
X NEW WELL
___ MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Proc. Alloc. and Methods Under "GEOLOGIC LOG")

USES (✓)
WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial
___ MONITORING
___ TEST WELL
___ CATHODIC PROTECTION
___ HEAT EXCHANGE
___ AREA FLUSH
___ INJECTION
___ VAPOR EXTRACTION
___ BIOVENTING
___ REMEDIATION
___ OTHER (SPECIFY)

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 203 (Ft.) BELOW SURFACE

DEPTH OF STATIC WATER LEVEL 203 (Ft.) & DATE MEASURED 7/27/06

ESTIMATED YIELD 150 (GPM) & TEST TYPE Pump

TEST LENGTH 75 (Hrs.) TOTAL DRAWDOWN 304 (Ft.)

* May not be representative of a well's long-term yield.

CASING (S)

DEPTH FROM SURFACE ft to ft	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CONDUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 - 310	11"	X				PVC F480	8"	SDR 21	
310 - 510	11"		X			PVC F480	8"	SDR 21	.040
510 - 520	11"	X				PVC F480	8"	SDR 21	

ANNULAR MATERIAL

DEPTH FROM SURFACE ft to ft	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 - 50	X			
50 - 600			X	Lapilli#3

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Doug Enloe dba Enloe Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 1698 City Nipomo State Ca. Zip 93444

Signed Doug Enloe
C-57 LICENSED WATER WELL CONTRACTOR

Aug 22, 2006
DATE SIGNED

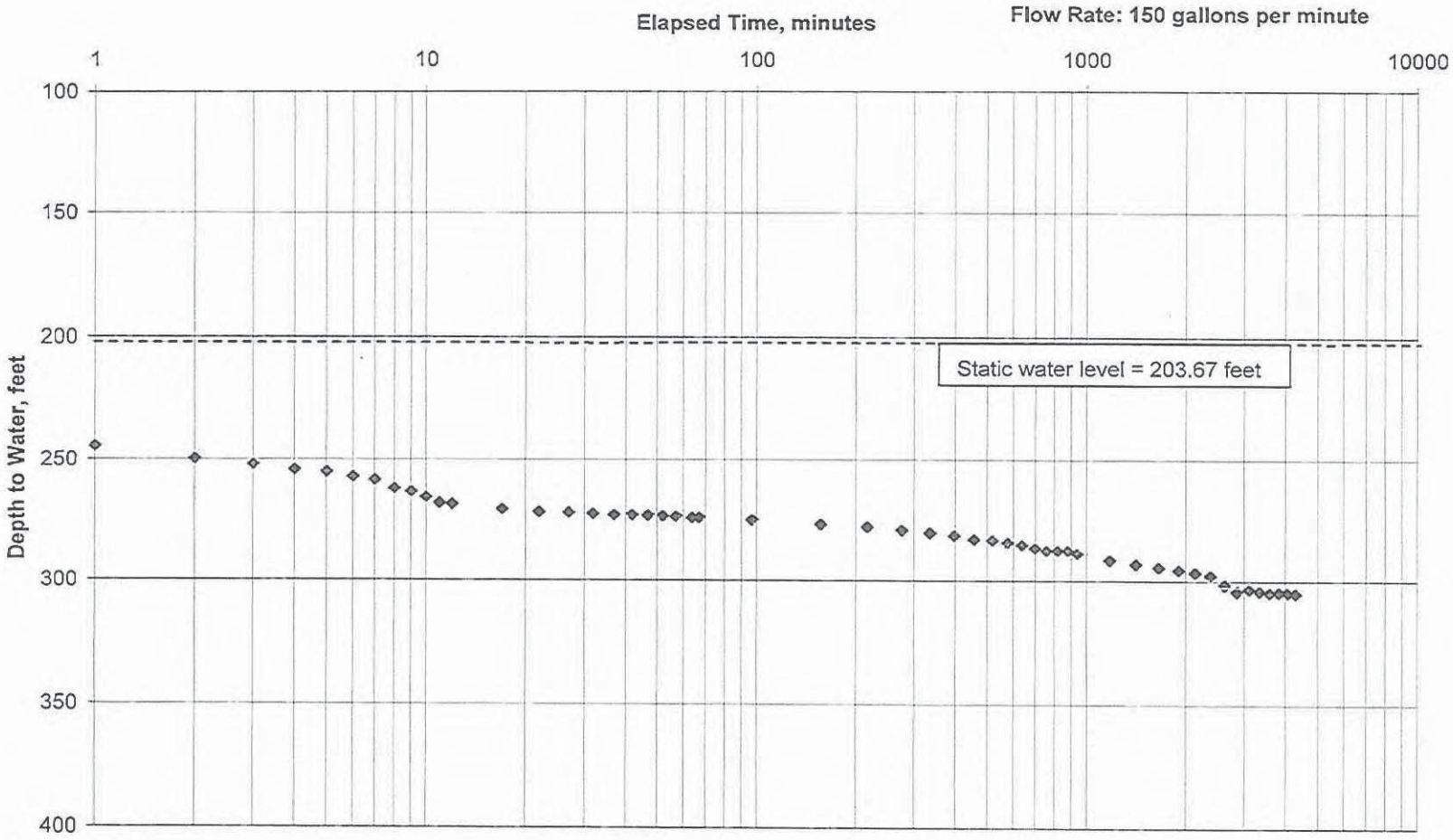
C-57 LICENSE NUMBER 310877

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Constant Discharge Test, Well 15, July 27-30, 2006

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recorded Pumping Rate
Mo./Day/Yr	hr:min	minutes	feet	feet	gallons per minute
7/27/2006	16:23	0	203.67	0	Start
	16:24	1	244.33	40.66	150
	16:25	2	249.75	46.08	
	16:26	3	252	48.33	
	16:27	4	254.25	50.58	
	16:28	5	255.08	51.41	
	16:29	6	256.83	53.16	
	16:30	7	258.17	54.50	
	16:31	8	261.75	58.08	
	16:32	9	263	59.33	
	16:33	10	265.33	61.66	
	16:34	11	267.5	63.83	
	16:35	12	268	64.33	
	16:40	17	270	66.33	
	16:45	22	271.08	67.41	
	16:50	27	271.42	67.75	
	16:55	32	272	68.33	
	17:00	37	272.42	68.75	
	17:05	42	272.42	68.75	
	17:10	47	272.58	68.91	
	17:15	52	272.75	69.08	
	17:20	57	273.08	69.41	
	17:27	64	273.42	69.75	
	17:30	67	273.5	69.83	
	18:00	97	274.58	70.91	
	19:00	157	276.33	72.66	
	20:00	217	277.33	73.66	
	21:00	277	278.67	75.00	
	22:00	337	279.67	76.00	
	23:00	397	281.17	77.50	
7/28/2006	0:00	457	282.17	78.50	
	1:00	517	283	79.33	
	2:00	577	284	80.33	
	3:00	637	285	81.33	
	4:00	697	286.17	82.50	
	5:00	757	287.33	83.66	
	6:00	817	287.33	83.66	
	7:00	877	287.33	83.66	
	8:00	937	288.67	85.00	
	12:00	1177	290.92	87.25	
	16:00	1417	292.67	89.00	
	20:00	1657	294	90.33	
7/29/2006	0:00	1897	295.33	91.66	
	4:00	2137	296	92.33	
	8:00	2377	297.33	93.66	
	12:00	2617	301.33	97.66	
	16:00	2857	304	100.33	
	20:00	3097	303.33	99.66	
7/30/2006	0:00	3337	304.17	100.50	
	4:00	3577	304.67	101.00	
	8:00	3817	304.5	100.83	
	12:00	4057	304.58	100.91	
	16:00	4297	304.83	101.16	150
	16:15	4320			stop pump

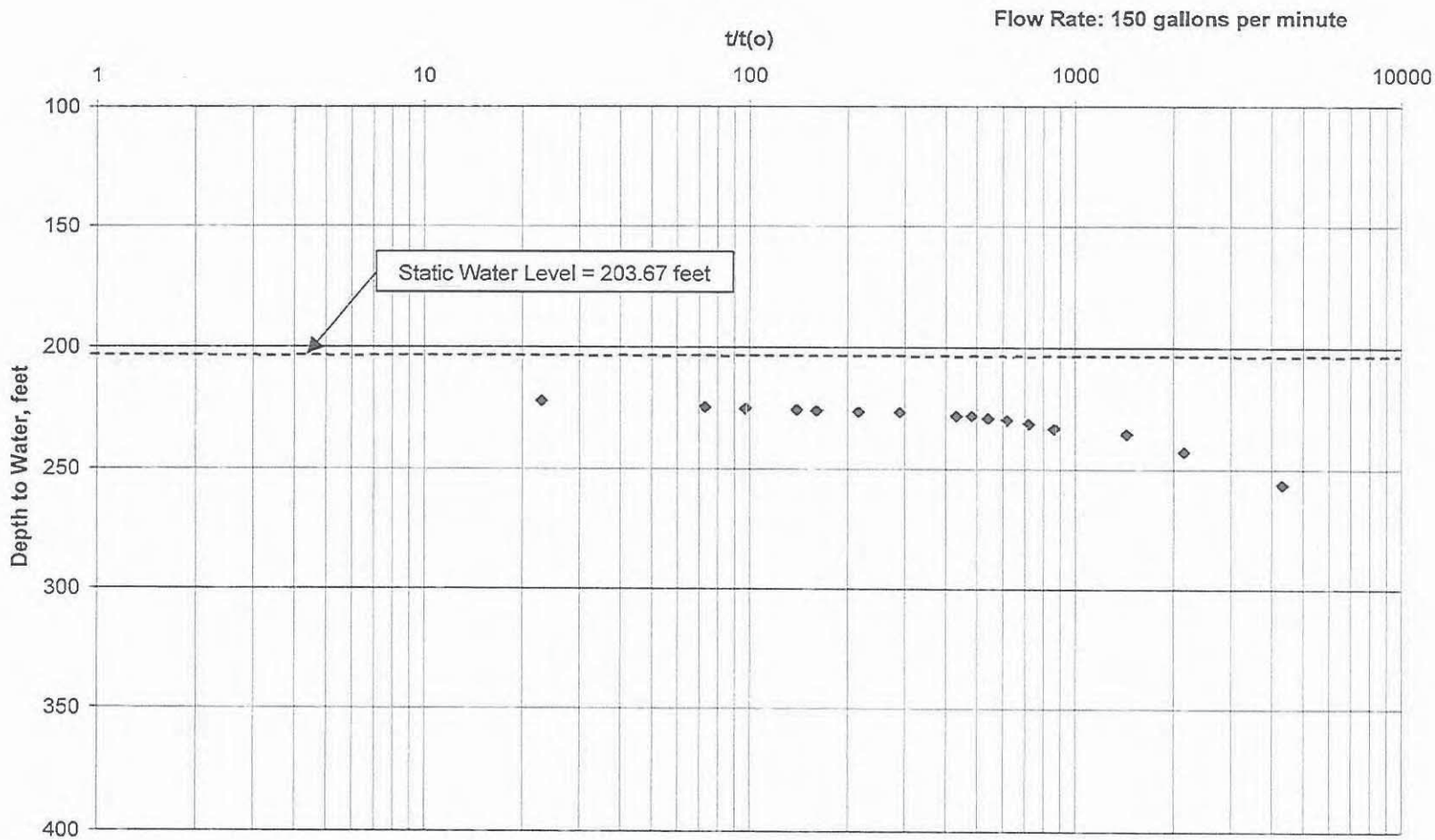
Constant Discharge Test - Laetitia Well 15
July 27-30, 2006



Recovery Test, Laetitia Well 15, July 30, 2006

Day	Time	Elapsed Time	Depth to Water	Drawdown	Recovery Time Ratio
Mo./Day/Yr	hr:min	minutes	feet	feet	t/t(0)
Recovery					
7/30/2006	16:15	0	304.90	101.23	
	16:16	1	256.00	52.33	4321
	16:17	2	242.50	38.83	2161
	16:18	3	235.00	31.33	1441
	16:20	5	232.83	29.16	865
	16:21	6	230.67	27	721
	16:22	7	229.33	25.66	618
	16:23	8	228.50	24.83	541
	16:24	9	227.75	24.08	481
	16:25	10	227.50	23.83	433
	16:30	15	226.33	22.66	289
	16:35	20	225.83	22.16	217
	16:42	27	225.42	21.75	161
	16:46	31	225.08	21.41	140
	17:00	45	224.50	20.83	97
	17:15	60	224.00	20.33	73
	19:32	197	221.33	17.66	23
	STOP				

Recovery Test - Laetitia Well 15
July 30, 2006



Mailed 2/15/05 with map

DUPLICATE
Driller's Copy

Page ___ of ___

Owner's Well No. Well #2

Date Work Began Nov. 18, 2004. Ended Dec. 11, 2004

Local Permit Agency San Luis Obispo County

Permit No. 2004-551 Permit Date Nov. 09, 2004

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 763493

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DRILLING METHOD Rotary/Air FLUID Water

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	10	Shale
10	30	Shale with sand
30	100	Mudstone with fine sand
100	190	Mudstone
190	220	Mudstone and shale
220	320	Mudstone and gray porcelanite
320	370	Mudstone
370	520	Mudstone with chert
520	576	Silstone

2004-2, Laetitia Well 12

from Appendix A of C&A Oct 2005

TOTAL DEPTH OF BORING 580 (Feet)
TOTAL DEPTH OF COMPLETED WELL 510 (Feet)

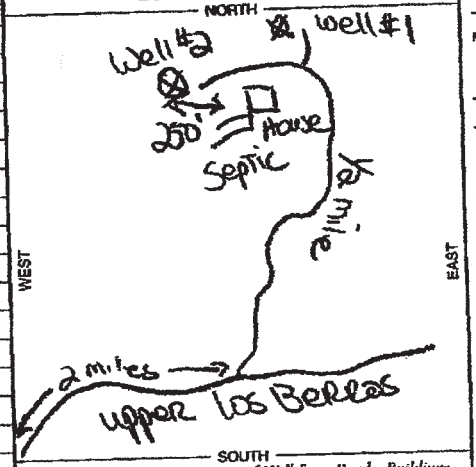
WELL OWNER

Name Dave Hickey Laetitia Winery
Mailing Address 453 Laetitia Vineyard Dr.
Arroyo Grande, Ca. 93420
CITY STATE ZIP

WELL LOCATION

Address 787 Upper Los Berros Rd.
City Nipomo
County San Luis Obispo County
APN Book 048 Page 121 Parcel 006
Township 32S Range 14E Section 32
Latitude 35° 06. 090 NORTH (DEG. MIN. SEC.) Longitude 120° 29. 328 WEST (DEG. MIN. SEC.)

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (*Describe Procedures and Materials Under "GEOLOGIC LOG"*)

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 38'1" (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 38'1" (Ft.) & DATE MEASURED Dec. 26, 2004
ESTIMATED YIELD * 250 (GPM) & TEST TYPE Pump
TEST LENGTH 72 (Hrs.) TOTAL DRAWDOWN 130'1" (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	190	15	X				PVC F480	8	SDR21	
190	320	12		X			PVC F480	8	SDR21	.040
320	370	12	X				PVC F480	8	SDR21	
370	510	12		X			PVC F480	8	SDR21	.040

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	60	X			
60	510			X	Pea Gravel

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Doug Enloe dba Enloe Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 1698 Nipomo Ca. 93444
CITY STATE ZIP

Signed Doug Enloe
WELL DRILLER/AUTHORIZED REPRESENTATIVE

Jan. 20, 2005 DATE SIGNED
318877 C-57 LICENSE NUMBER

DWR 188 REV. 11-96

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well Log
Laetitia Vineyard & Winery

Laetitia Well 12

Well ID: 2004-2
Date: November 17 to December 6, 2004
Location: Upper Los Berros Canyon
Elevation: 520 ft above sea level (from topographic map)
Geologist: N. Kelley, Cleath & Associates.
Drilling Company: Enloe Drilling
Drilling Method: Airlift to 340 feet, mud rotary 340 to 580 feet
Total depth: 580 feet

Lithologic Log
Depth to top and bottom in feet

Top	Bottom	Thickness	Description
0	10	10	**Shale,** tan to dark brown, trace chert.
10	30	20	**Shale with Silty Sand,** tan shale, angular to subangular fine silty sand.
30	100	70	**Mudstone,** predominantly dark brown to black mudstone, lesser tan shale, trace fine sand and silt, trace chert.
100	190	90	**Mudstone,** dark brown to black mudstone, with reddish brown vitreous chert to ½".
190	220	30	**Shale and Mudstone,** light grayish brown to tan shale and dark brown mudstone, lesser gray porcelanite and reddish brown banded cherts.
220	320	100	**Mudstone,** predominantly dark brown mudstone, lesser tan shale, trace translucent gray porcelanite, trace reddish brown vitreous chert to 1".
320	370	50	**Mudstone,** predominantly dark brown mudstone, trace reddish brown vitreous chert to ½".
370	520	150	**Mudstone with Chert,** predominantly dark mudstone, lesser fragments of reddish brown vitreous chert to ½".
520	580	60	**Siltstone,** dark grayish brown siltstone and mudstone with lesser tan shale, trace chert fragments.

Total Depth 580

Drill Penetration Rate
Well 2004-2
Laetitia Vineyard and Winery

From	To	Depth	Minutes	Ft/Min
0	20	20	--	--
20	40	20	40	0.50
40	60	20	20	1.00
60	80	20	--	--
80	100	20	--	--
100	120	20	49	0.41
120	140	20	44	0.45
140	160	20	40	0.50
160	180	20	62	0.32
180	200	20	125	0.16
200	220	20	--	--
220	240	20	60	0.33
240	260	20	38	0.53
260	280	20	82	0.24
280	300	20	27	0.74
300	320	20	57	0.35
320	340	20	85	0.24
340	360	20	130	0.15
360	380	20	120	0.17
380	400	20	175	0.11
400	420	20	55	0.36
420	440	20	55	0.36
440	460	20	90	0.22
460	480	20	65	0.31
480	500	20	140	0.14
500	530	30	255	0.12
530	564	34	530	0.06

Depths in Feet

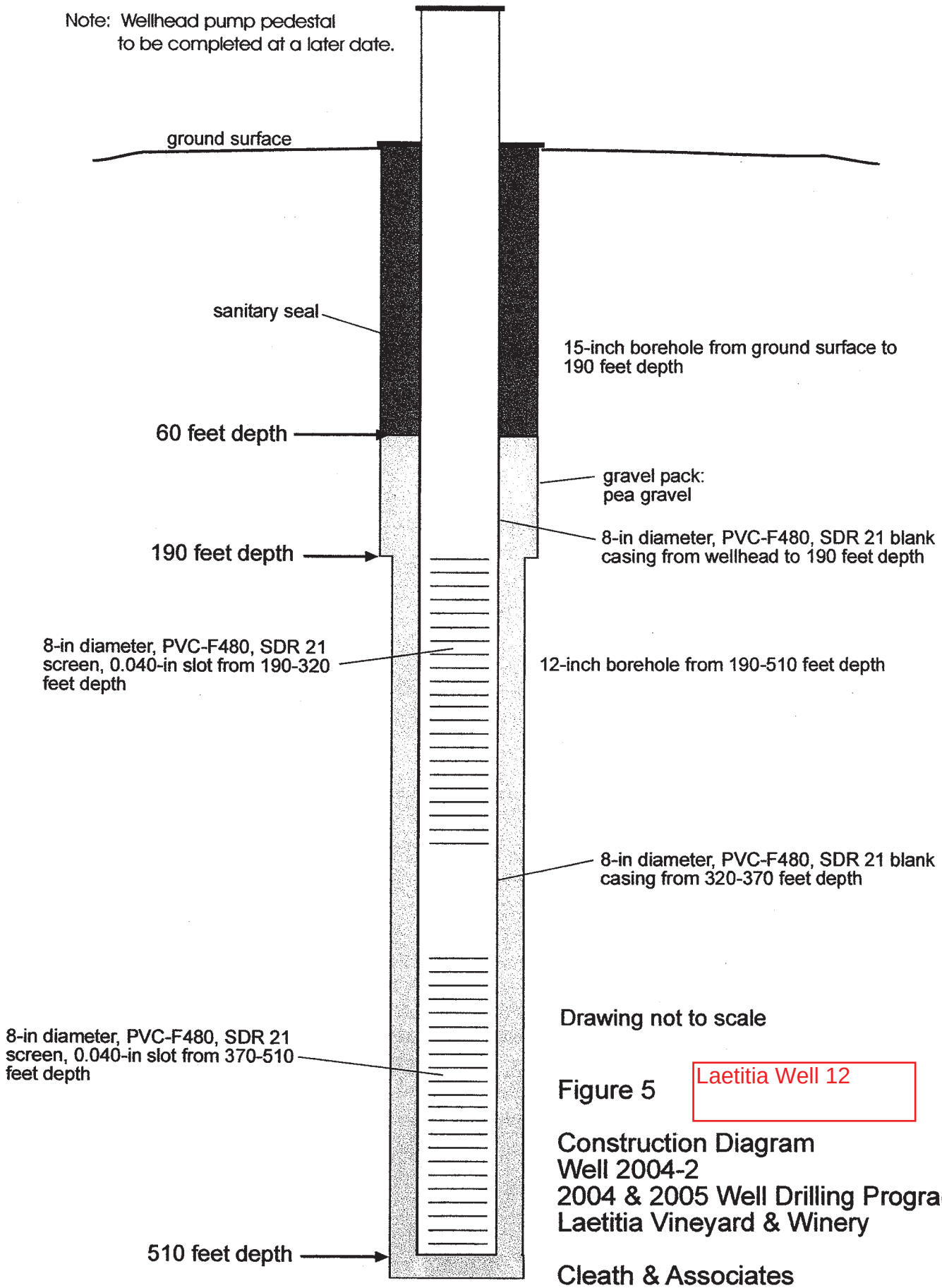


Figure 5

Laetitia Well 12

Construction Diagram
Well 2004-2
2004 & 2005 Well Drilling Program
Laetitia Vineyard & Winery

Cleath & Associates

welenco

GAMMA / ELECTRIC LOG / CALIPER

FILING NO.

COMPANY Enloe Well Drilling
WELL Laetitie Vinery #2
FIELD
COUNTY San Luis Obispo STATE California

LOCATION:
SEC TWP RGE

OTHER SERV:
NONE

JOB NO.
39506

Permanent Datum: GROUND LEVEL Elev: N/A
Log Measured From G.L. 0 Ft Above Perm Datum
Drilling Measured From GROUND LEVEL

K.B.
D.F.
G.L.

Date	12-06-2004	
Run No.	ONE	
Depth - Driller	576'	
Depth - Logger	576'	
Btm. Log Inter.	576'	
Top Log Inter.	0'	
Casing-Driller	13.5 at 8'	
Casing-Logger	13.5 at	
Bit Size	12"	
Type Fluid In Hole	BENTONITE	
Dens. / Visc.	N/A / N/A	
pH / Fluid Loss	N/A / N/A ml	
Source of Sample	CIRC.	
Rm at Meas.Temp	5.5 at 75 F	
Rmf at Meas.Temp	5.2 at 75 F	
Rmc at Meas.Temp	N/A at F	
Source:Rmf Rmc	MEAS	
Rm at BHT	N/A at F	
Time Since Circ.	2 HRS	
Max. Rec. Temp.	N/A F	
Equip / Location	L16 / BFL	
Rec. added By	RODINSKY	

This Heading and Log Conform To API RP 31

Fold Here

Changes in Mud Type or Additional Samples

Date	Sample No.	Depth-Driller	Type Fluid in Hole	Dens.	Visc.	pH	Fluid Loss	Source of Sample	Rm at Meas. Temp.	Rmf at Meas. Temp.	Rmc at Meas. Temp.	Source:Rmf Rmc	Rm at BHT	Rmf at BHT	Rmc at BHT
							ml		at F	at F	at F		at F	at F	at F

Scale Changes

Type Log	Depth	Scale Up Hole	Scale Down Hole

Equipment Data

Run No.	Tool Type	PadType	Tool Pos	Other
ONE	ELECTRIC		FREE	

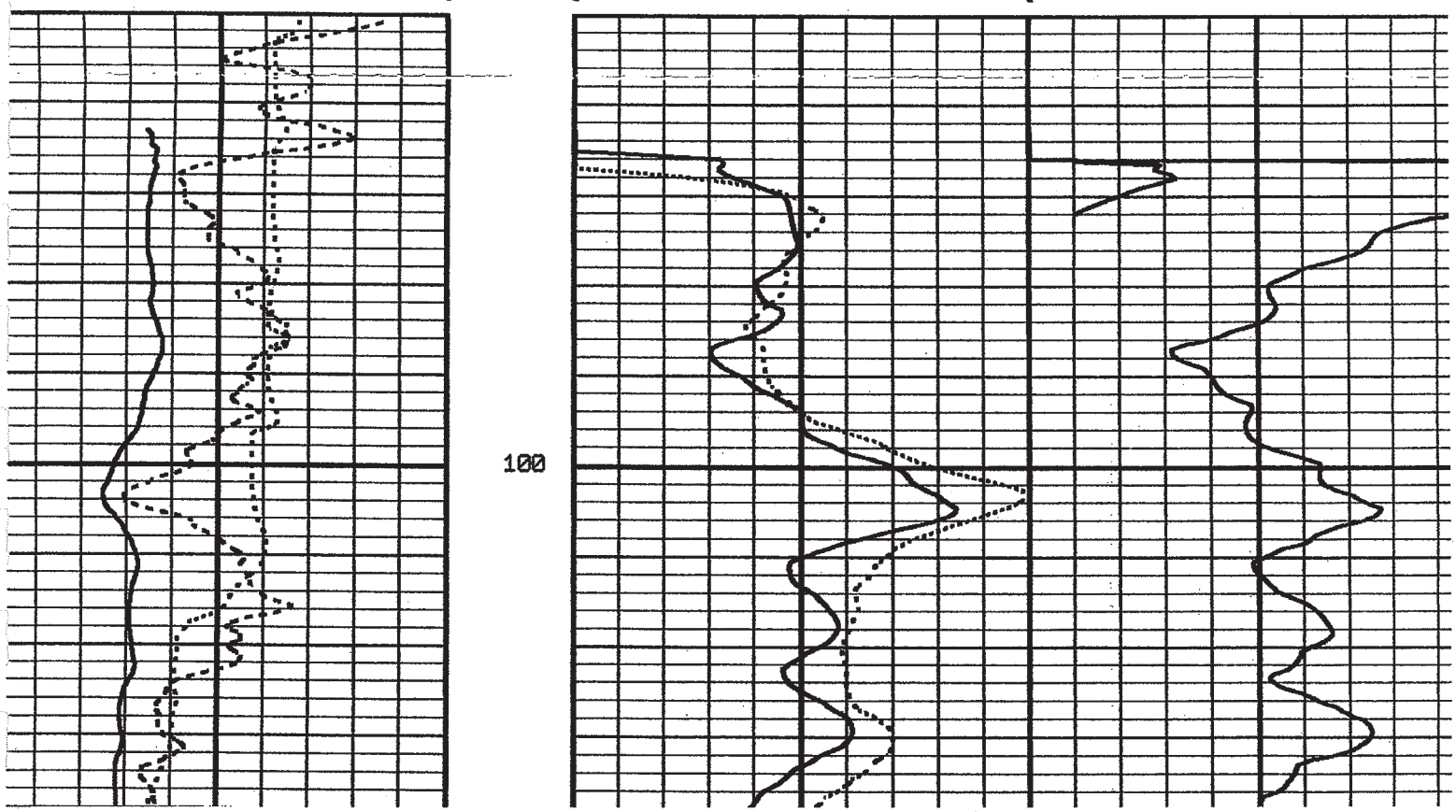
REMARKS WELL DRILLED BY ENLOE WELL DRILLING

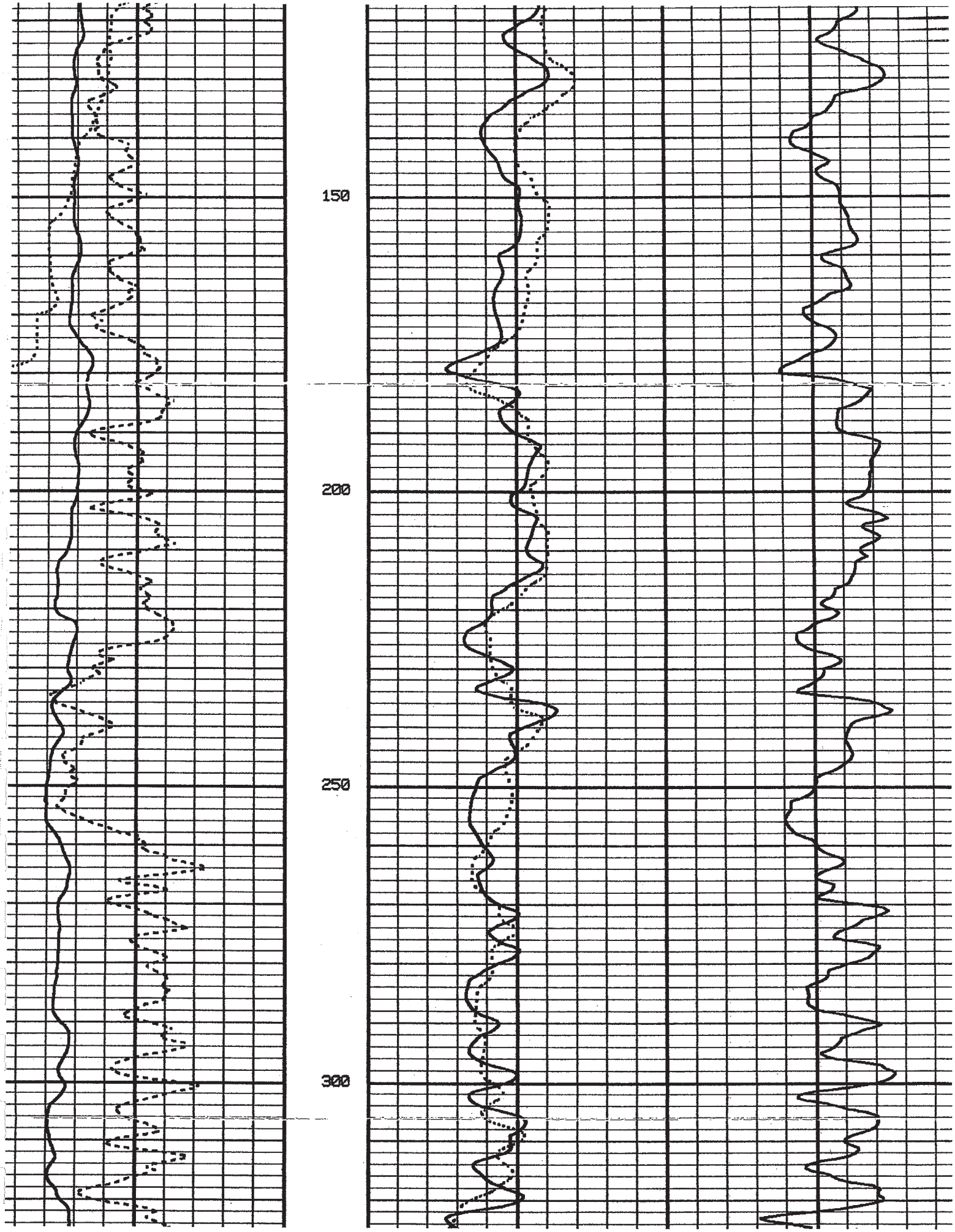
SPONTANEOUS POTENTIAL millivolts	DEPTHS	RESISTIVITY ohmmeters2 /meter	RESISTANCE ohms

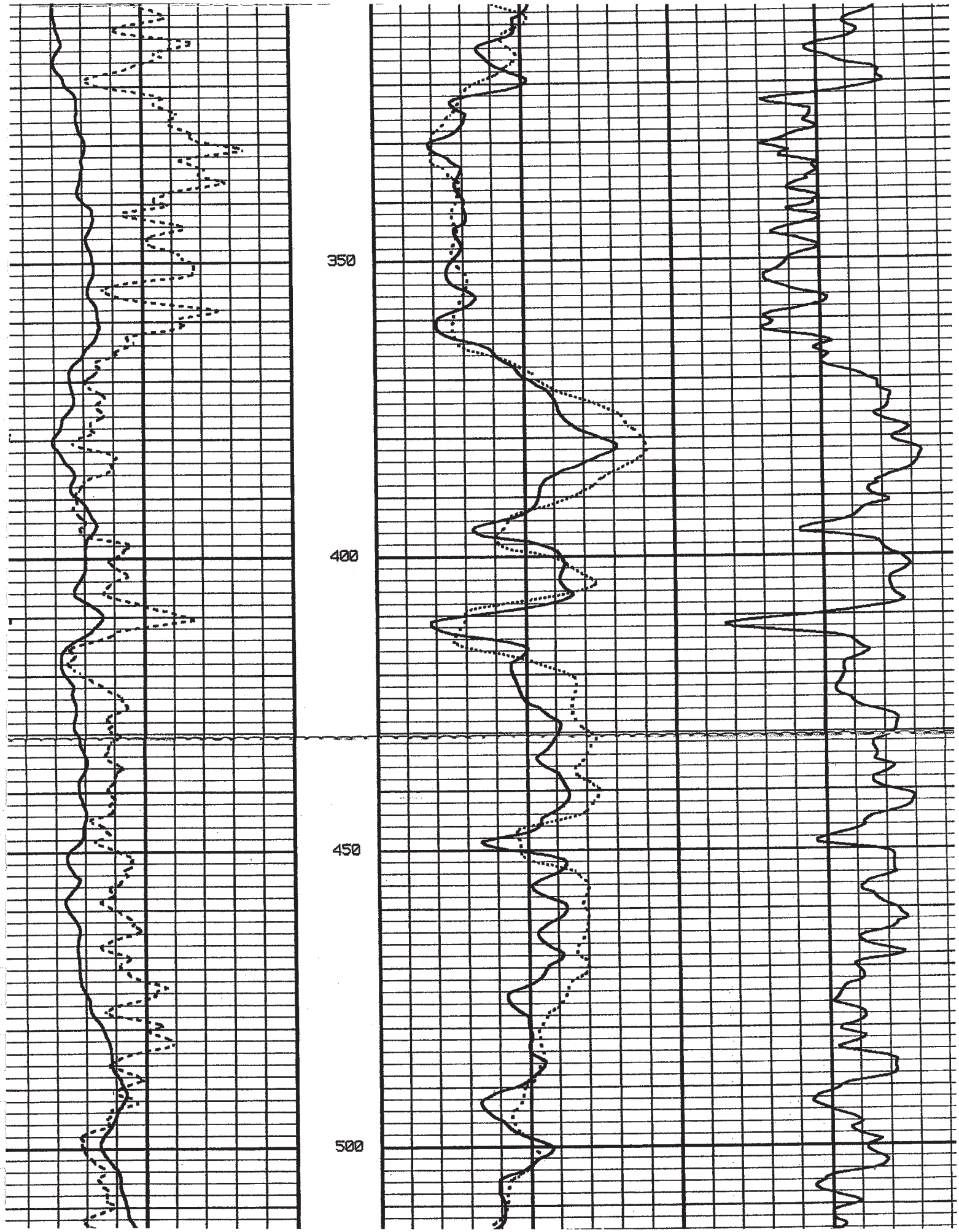
hanges in Mud Type or Additional Samples						Scale Changes			
ate	Sample No.					Type Log	Depth	Scale Up Hole	Scale Down Hol
epth-Driller									
ype Fluid in Hole									
Dens.	Visc.								
ph	Fluid Loss		ml		ml				
Source of Sample						Equipment Data			
Rm at Meas. Temp.		at	F	at	F	Run No.	Tool Type	PadType	Tool Pos	Other
Rmf at Meas. Temp.		at	F	at	F	ONE	ELECTRIC		FREE	
Rmc at Meas. Temp.		at	F	at	F					
Source:Rmf	Rmc									
Rm at BHT		at	F	at	F					
Rmf at BHT		at	F	at	F					
Rmc at BHT		at	F	at	F					

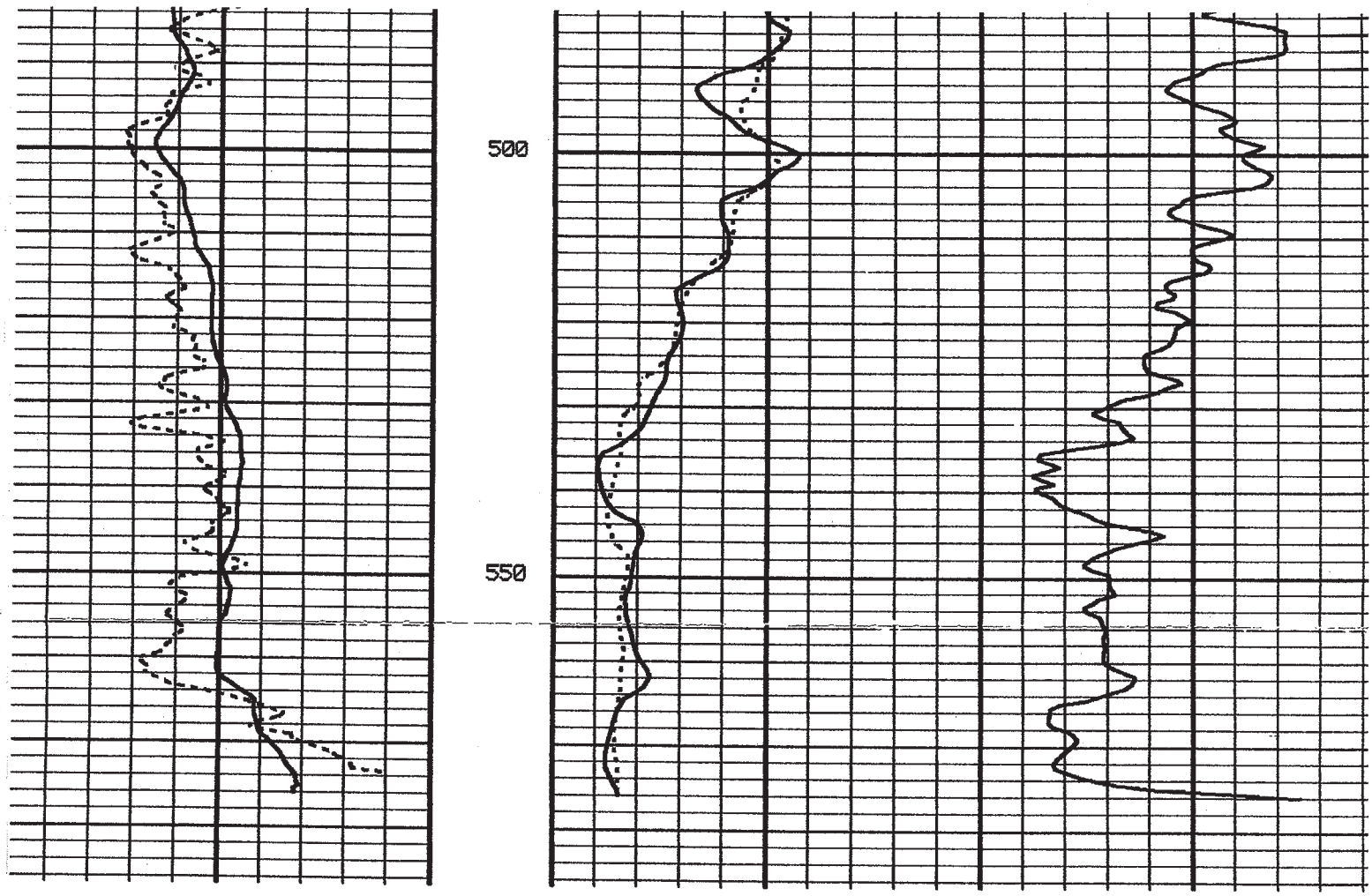
REMARKS WELL DRILLED BY ENLOE WELL DRILLING

SPONTANEOUS POTENTIAL millivolts	DEPTHS	RESISTIVITY ohmmeters2 /meter	RESISTANCE ohms
- |↔| + 10 Mv		SHORT NORMAL 0 16 Inch 200	
		0 X10 BACK UP 2000	
GAMMA RAY 0 ---------- API --------- 150		LONG NORMAL 0 64 Inch 200	SINGLE POINT Detail Curve
CALIPER 4 ..... Inches 14		0 X10 BACK UP 2000	X10 BACK UP




150
200
250
300


350
400
450
500



4 .....Inches .....14 CALIPER LOG 0 ---------- API ---------- 150 GAMMA RAY - ↔ + 10mV		0 X10 BACK UP 2000 ..... 0 LONG NORMAL 200 64 INCH 0 X10 BACK UP 2000 0 SHORT NORMAL 200 16 INCH	X10 BACK UP Detail Curve SINGLE POINT
SPONTANEOUS POTENTIAL milivolts	DEPTHS	Ohmmeters2/ meter RESISTIVITY	Ohms RESISTANCE

Mailed 2/15/05 w/ Map

DUPLICATE
Driller's Copy

Page ____ of ____
Owner's Well No. 1
Date Work Began _____ Ended _____
Local Permit Agency San Luis Obispo County
Permit No. 2004-520 Permit Date Oct.24,2004

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet
No. 763488

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL X HORIZONTAL ___ ANGLE ___ (SPECIFY)
DRILLING METHOD Air FLUID Water

DEPTH FROM SURFACE FT.	to FT.	DESCRIPTION *Describe material, grain size, color, etc.*
0	90	Brown shale, Sandy clay
90	120	Darker shale mix
120	180	Black Shale
180	580	Blakk shale & gravel

2004-1, Laetitia Well 13

from Appendix A of C&A Oct 2005

TOTAL DEPTH OF BORING 580 (Feet)
TOTAL DEPTH OF COMPLETED WELL 560 (Feet)

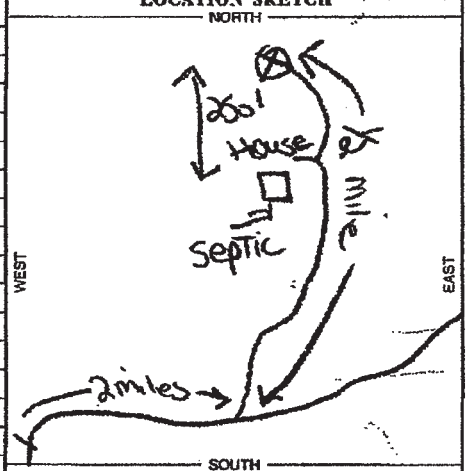
WELL OWNER

Name Dave Hickey Laetitia Winery
Mailing Address 453 Laetitia Vineyard Dr.
Arroyo Grande Ca. 93420
CITY STATE ZIP

WELL LOCATION

Address 787 Upper Los Berros Rd.
City Nipomo
County San Luis Obispo County
APN Book 048 Page 121 Parcel 006
Township 32S Range 14E Section 32
Latitude 35° 06. 142 NORTH (DEG. MIN. SEC.) Longitude 120° 29. 275 WEST (DEG. MIN. SEC.)

LOCATION SKETCH



Illustrate or Describe Distance of Well from Roads, Buildings, Fences, Rivers, etc. and attach a map. Use additional paper if necessary. ***PLEASE BE ACCURATE & COMPLETE.***

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USES (✓)

WATER SUPPLY
X Domestic ___ Public
___ Irrigation ___ Industrial
MONITORING ___
TEST WELL ___
CATHODIC PROTECTION ___
HEAT EXCHANGE ___
DIRECT PUSH ___
INJECTION ___
VAPOR EXTRACTION ___
SPARGING ___
REMEDIATION ___
OTHER (SPECIFY) ___

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH TO FIRST WATER 121 (Ft.) BELOW SURFACE
DEPTH OF STATIC WATER LEVEL 121 (Ft.) & DATE MEASURED Dec.19,2004
ESTIMATED YIELD * 180 (GPM) & TEST TYPE pump
TEST LENGTH 44 (Hrs.) TOTAL DRAWDOWN 224 (Ft.)
** May not be representative of a well's long-term yield.*

CASING (S)

DEPTH FROM SURFACE FT.	to FT.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	220	12"	X				PVC F480	8"	SDR21	
220	340	12"		X			PVC F480	8"	SDR21	.040
340	370	12"	X				PVC F480	8"	SDR21	
370	560	12"		X			PVC F480	8"	SDR21	.040

ANNULAR MATERIAL

DEPTH FROM SURFACE FT.	to FT.	TYPE CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			
50	580			X	Pea Grave

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other _____

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Doug Enloe dba Enloe Well Drilling
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

P.O. Box 1698 Nipomo Ca. 93444
ADDRESS CITY STATE ZIP

Signed Doug Enloe
WELL DRILLER/AUTHORIZED REPRESENTATIVE

Nov.26,2004 318877
DATE SIGNED C-57 LICENSE NUMBER

DWR 188 REV. 11-97

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

Well Log
Laetitia Vineyard & Winery

Laetitia Well 13

Well ID: 2004-1
Date: November 1 to 10, 2004
Location: Upper Los Berros Canyon
Elevation: 600 ft above sea level (from topographic map)
Geologist: D. Burke, Cleath & Associates.
Drilling Company: Enloe Drilling
Drilling Method: air lift
Total depth: 560 feet

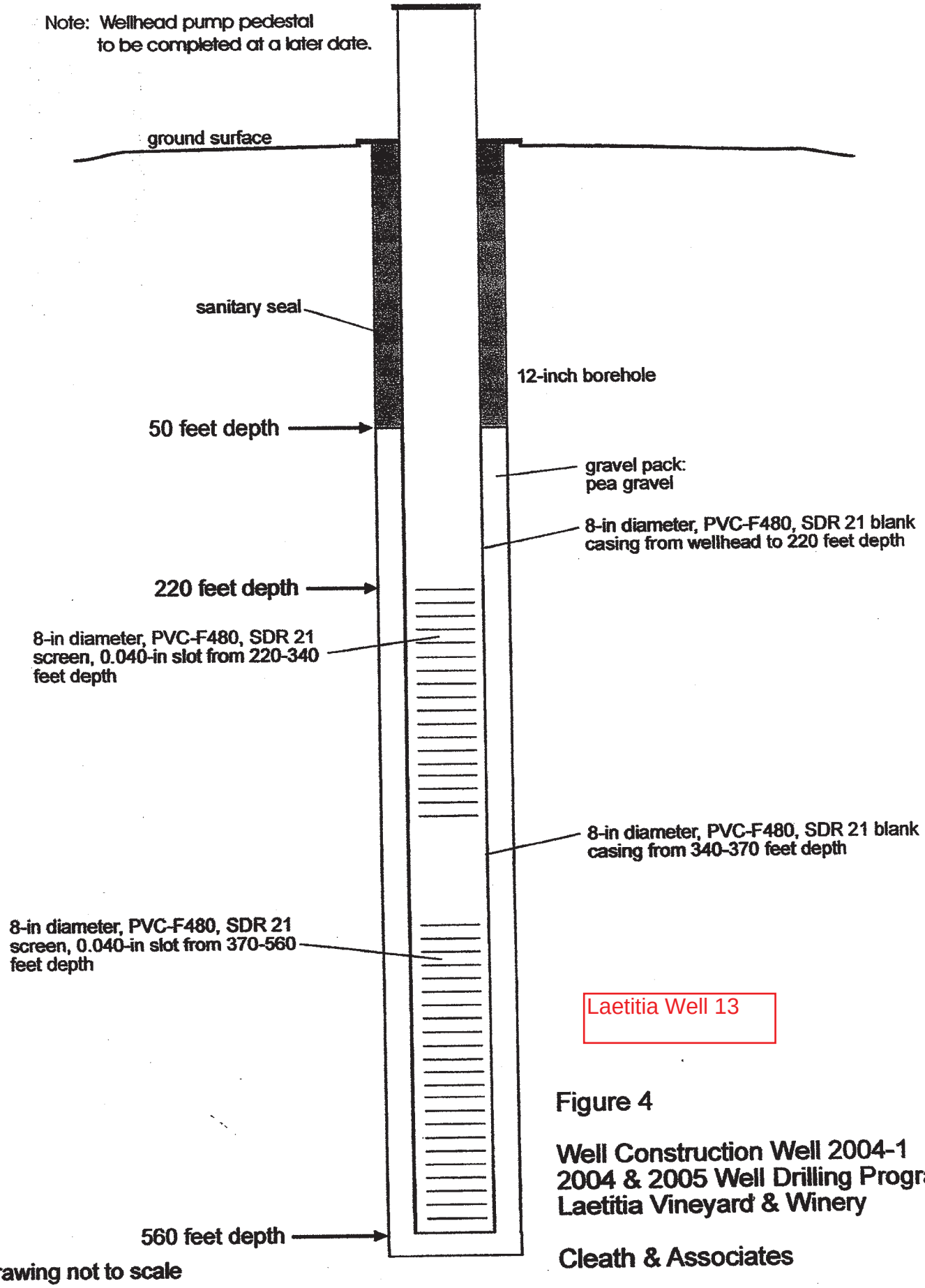
Lithologic Log
Depth to top and bottom in feet

Top	Bottom	Thickness	Description
0	5	5	**Sandy Clay,** topsoil.
5	10	5	**Mudstone**, dark brownish gray mudstone, lesser light grayish brown porcelanite, trace light brown chert.
10	20	10	**Clay**, soft grayish brown clay with porcelanite and mudstone, trace chert.
20	80	60	**Porcelanite with Chert,** light gray porcelanite, lesser chert trace clay.
80	200	120	**Mudstone**, lesser light grayish brown porcelanite, trace chert.
200	225	25	**Porcelanite and Mudstone,** equal parts brownish gray porcelanite and dark brown mudstone, trace chert.
225	240	15	**Porcelanite,** grayish porcelanite, lesser grayish brown mudstone.
240	280	40	**Mudstone,** predominantly dark mudstone, lesser light grayish brown porcelanite, trace large chert fragments to 2".
280	295	15	**Mudstone, Porcelanite and Chert,** nearly equal parts dark mudstone, grayish porcelanite and red to brown chert, trace large chert clast to 2".
295	330	35	**Mudstone**, predominantly dark mudstone, lesser fine brown sandstone and pale chert.
330	340	10	**Chert,** grayish brown banded chert and lesser dark mudstone.
340	410	70	**Mudstone**, predominantly dark mudstone, lesser large glassy chert.
410	460	50	**Mudstone and Chert,** dark brownish mudstone and large glassy chert fragments, trace rounded porcelanite pebbles.

Well 2004-1 (continued)

Top	Bottom	Thickness	Description
460	480	20	**Mudstone,** dark grayish brown mudstone, minor amounts of porcelanite, trace chert fragments to 2".
480	530	50	**Mudstone and Chert,** dark grayish brown mudstone and large glassy chert fragments, trace rounded porcelanite pebbles.
530	560	30	**Chert and Mudstone**, large fragments of glassy reddish brown chert, lesser dark brown mudstone.

Total Depth: 560



Laetitia Well 13

Figure 4

Well Construction Well 2004-1
2004 & 2005 Well Drilling Program
Laetitia Vineyard & Winery

Cleath & Associates

DUPLICATE
Driller's Copy

Page 1 of 1

Owner's Well No. #3

Date Work Began 11/09/98, Ended 11/13/98

Local Permit Agency San Luis Obispo

Permit No. 98-312 Permit Date 12/02/98

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 511275

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	3	TOP SOIL
3	8	BROWN CLAY
8	15	CLAY & GRAVEL MIX
15	18	BROWN CLAY
18	30	FINE BROWN SAND
30	35	BROWN CLAY & SHALE GRAVEL
35	47	BROWN CLAY
47	57	GREEN SHALE
57	64	SOFT GREY SHALE
64	110	BROWN SHALE
110	212	SOFT GREY SHALE
212	226	BROWN SHALE
226	233	GREY SHALE
233	256	BRWN SHALE
256	307	GREY SHALE
307	360	SOFT GREEN/BROWN SHALE
360	397	GREENISH SHALE
397	450	BLUE SHALE
450	470	BROWN SHALE

AIR LIFT TEST IS ONLY APPROXIMATE.
A TEST PUMP IS RECOMMENDED FOR AN
ACCURATE ACCOUNT.

F&T #2, Laetitia Well 1

TOTAL DEPTH OF BORING 470 (Feet)
TOTAL DEPTH OF COMPLETED WELL 320 (Feet) MT

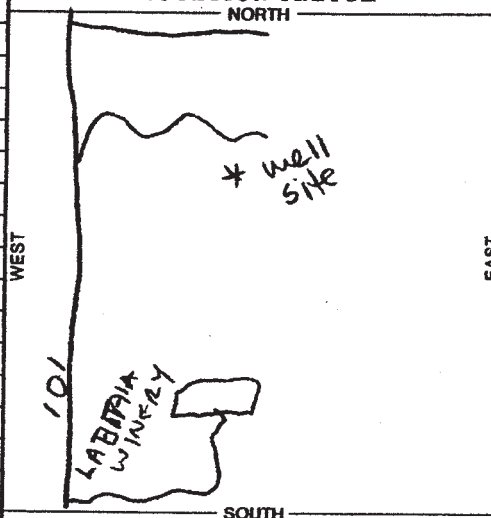
WELL OWNER

Name Bilo Zarif
Mailing Address 453 Deutz Drive
Arroyo Grande CA 93420
CITY STATE ZIP

WELL LOCATION

Address Laetitia Vineyards
City Arroyo Grande
County San Luis Obispo
APN Book 047 Page 030 Parcel 005
or Township 32S Range 13E Section 35
or Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY (Describe Procedures and Materials Under "GEOLOGIC LOG")

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
X Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Rotary FLUID Bentonite

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL 90 (Ft.) & DATE MEASURED 11/13/98
ESTIMATED YIELD* 300 (GPM) & TEST TYPE Air Lift
TEST LENGTH 1 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	250	14	Blank				PVC	8	SDR 21	
250	310	14		Screen			PVC	8	SDR 21	.040
310	320	14	Blank				PVC	8	SDR 21	

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	52	X			
52	320				Monterey Sand

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
___ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Filipponi & Thompson Drilling, Inc.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS P.O. Box 835 Atascadero CA 93423
CITY STATE ZIP

Signed [signature] 12/20/98 432680
WELL DRILLER/AUTHORIZED REPRESENTATIVE DATE SIGNED C-57 LICENSE NUMBER

DUPLICATE
Driller's Copy

FV WELL #3

Page ____ of ____

Owner's Well No. #93-01

Date Work Began 07-01-93, Ended 07-15-93

Local Permit Agency SLO COUNTY ENVIRONMENTAL HEALTH

Permit No. #93-086 Permit Date 06-02-93

STATE OF CALIFORNIA

WELL COMPLETION REPORT

Refer to Instruction Pamphlet

No. 402070

DWR USE ONLY — DO NOT FILL IN

STATE WELL NO./STATION NO.

LATITUDE LONGITUDE

APN/TRS/OTHER

GEOLOGIC LOG

ORIENTATION (✓) X VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)

DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft. to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
	(SEE ATTACHED LOG)

FV Wells # 3, Laetitia Well 4

from Appendix A of C&A Jan 2004

TOTAL DEPTH OF BORING 531 (Feet)

TOTAL DEPTH OF COMPLETED WELL 505 (Feet)

WELL OWNER

Name BICCHO VINEYARDS c/o HAMPTON FARMING

Mailing Address 2515 S. PROFESSIONAL PARKWAY

SANTA MARIA (CITY) CA (STATE) 93455 (ZIP)

WELL LOCATION

Address HWY 101 & THOMPSON RD

City ARROYO GRANDE

County SAN LUIS OBISPO

APN Book ___ Page ___ Parcel 47-311-07

or Township 12 N Range 35W Section 36

or Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH

NORTH

(SEE ATTACHED MAP)

WEST EAST

SOUTH

Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL

MODIFICATION/REPAIR

___ Deepen

___ Other (Specify)

___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USE(S) (✓)

___ MONITORING

WATER SUPPLY

___ Domestic

___ Public

X Irrigation

___ Industrial

___ "TEST WELL"

___ CATHODIC PROTECTION

___ OTHER (Specify)

DRILLING METHOD DIRECT ROTARY FLUID FOAM/MUD

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED ___

ESTIMATED YIELD* ___ (GPM) & TEST TYPE ___

TEST LENGTH ___ (Hrs.) TOTAL DRAWDOWN ___ (Ft.)

** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft. to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL/GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0 : 505	17½	X				PVC	10	.511W	
150 : 180	17½		X			PVC	10	.511W	.040"x2"
200 : 250	17½		X			PVC	10	.511W	" "
280 : 340	17½		X			PVC	10	.511W	" "
360 : 500	17½		X			PVC	10	.511W	" "

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft. to Ft.	TYPE: CEMENT (✓)	BENTONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0 : 50	X			
50 : 505			X	(LONE S
				LAPIS#
				GRAVEL

ATTACHMENTS (✓)

X Geologic Log

___ Well Construction Diagram

X Geophysical Log(s)

___ Soil/Water Chemical Analyses

___ Other ___

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief

NAME FLOYD V. WELLS, INC./CHARLES C. WELLS
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)

ADDRESS 1337 W. BETTERAVIA ROAD (CITY) SANTA MARIA (STATE) CA (ZIP) 93455

Signed Charles C. Wells CHARLES C. WELLS 07/26/93 2295

FLOYD V. WELLS, INC.
DEPEND ON WELLS FOR WATER

WATER WELL DRILLING LOG

PUMP SALES & SERVICE
WATER WELL DRILLING CONTRACTOR
1337 W. BETTERAVIA RD.
SANTA MARIA, CA 93455
805/925-8626 FAX 805/928-7826
CA LIC.#C57-229570

Owner: PICCHO VINEYARDS c/o HAMPTON FARMING Company:

Well No.: #93-01 Rig: #7

Location of Well: PICCHO VINEYARDS, APPROX 1 MILE NORTH OF LOS BERROS/THOMPSON RD INTERSECTION ON HWY 101 IN VINEYARD & APPROX 1.1 MILE WEST OF HWY 101

APN 47-311-07 T-12N, R-35W, SECTION 36

SAN LUIS OBISPO COUNTY PERMIT #93-086

~~Surface Pipe~~ or Seal: TOP CEMENTED IN 17½"BOREHOLE Size: - Depth: 50' Gauge: -

Well Bore Diameter: 17½" Depth of Casing Set: 505'

Casing Size: 10" SDR21/F-480 Gauge: .511 W Type: PVC

Perforations: Size: .040" X 2" Type: HORIZ.SLOT WELL SCREEN Number: 8 ROWS/FULL FLO

Perforation Location from Ground Level: 150'

From:	To:	
0'	150'	BLANK
150'	180'	SCREEN
180'	200'	BLANK
~~200'~~	~~250'~~	~~SCREEN~~
250'	280'	BLANK
280'	340'	SCREEN
~~340'~~	~~360'~~	~~BLANK~~
360'	500	SCREEN
500'	505'	BLANK

Gravel Pack: Type: LONE STAR Size LAPIS #3 Quantity: ~~29 TONS~~

Bits: No. Used: 3 Size: 1-9 7/8",1-14 3/4" & 1-17½"

Drilling Method: Air: Foam: X Mud: X

Material Used: Gel.: 160-50#QUIK GEL P-95: 10-GALLONS VERSA FOAM Foam:

Well Started: JULY 1, 1993 Well Completed: JULY 15, 1993 Driller: CLARENCE BEVIER

TEST PUMPING INFORMATION:

Production Test:

Standing Water Level: Pumping Level:

G.P.M.: Pumping Level

REMARKS:

FLOYD V. WELLS, INC.
DEPEND ON WELLS FOR WATER

PUMP SALES & SERVICE
CA LIC. #C57-229570
WATER WELL DRILLING CONTRACTOR

FORMATION LOG

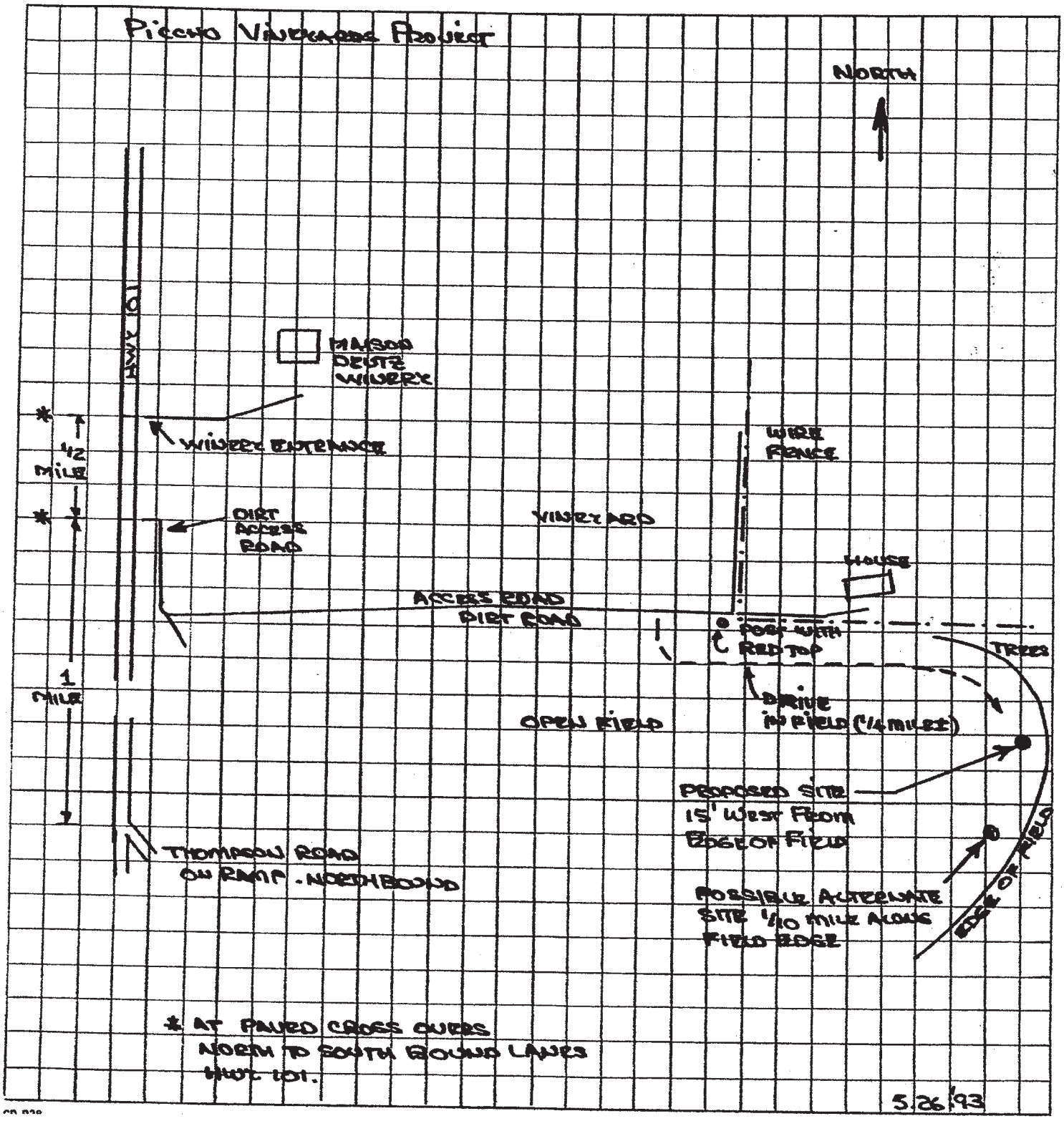
JOB NAME: PICCHO VINEYARDS
JOB DATE: JULY 8, 1993

FROM - TO	FORMATION RECORD
0'- 1'	ADOBE
1'- 95'	REDROCK
95'-155'	GREY ROCK
155'-181'	GREY-BROWN MONTEREY SHALE
181'-240'	GREY SANDSTONE SHALE
240'-281'	GREY-BROWN ROCK
281'-301'	LOOSE GREY SHALE
301'-541'	MONTEREY SHALE W/GREY MUDSTONE 301'-321'
	HARD & SOFT FORMATIONS THROUGHOUT TO 541'

WELL PERMIT PLOT PLAN

SAN LUIS OBISPO COUNTY HEALTH DEPARTMENT
2191 Johnson Avenue
San Luis Obispo, California 93401
Telephone: 805/543-1200

INDICATE BELOW THE **EXACT LOCATION** OF WELL WITH RESPECT TO THE FOLLOWING ITEMS: PROPERTY LINES, WATER BODIES OR WATER COURSES, DRAINAGE PATTERN, ROADS, EXISTING WELLS, SEWERS AND PRIVATE SEWAGE DISPOSAL SYSTEMS. **INCLUDE DIMENSIONS.**



FV Well #2

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

WATER WELL DRILLERS REPORT

DUPLICATE
Driller's Copy

Do not fill in
No. 276926

Notice of Intent No. _____
Local Permit No. or Date San Luis Obispo County Permit #88-204

State Well No. _____
Other Well No. _____

(1) OWNER: Name Piccho Vineyards C/O Hampton Farming
Address 3201 Skyway, Suite 103
City Santa Maria, CA ZIP 93455

(2) LOCATION OF WELL (See instructions):
County San Luis Obispo Owner's Well Number 3
Well address if different from above APN 47-310-310
Township 12N Range 35W Section 26
Distance from cities, roads, railroads, fences, etc. Off U.S. Highway 101, North of Los Berros Road, Maison Deutz Winery, 453 Deutz Drive, Arroyo Grande, 4/10 Mile North of 101

(SEE ATTACHED MAP)

WELL LOCATION SKETCH

(3) TYPE OF WORK:
New Well [X] Deepening [ ]
Reconstruction [ ]
Reconditioning [ ]
Horizontal Well [ ]
Destruction [ ] (Describe destruction materials and procedures in Item 12)

(4) PROPOSED USE:
Domestic [X]
Irrigation [X]
Industrial [ ]
Test Well [ ]
Municipal [ ]
Other [ ]
(Describe)

(5) EQUIPMENT:
Rotary [X] Reverse [ ]
Cable [ ] Air [ ]
Other [ ] Bucket [ ]

(6) GRAVEL PACK: Sisquoc
Yes [X] No [ ] Size 1/4X1/8
Diameter of bore 22"
Packed from 50 to 525 ft.

(7) CASING INSTALLED:
Steel [ ] Plastic [X] Concrete [ ]

(8) PERFORATIONS: .040X2 Screen
Type of perforation or size of screen

From ft.	To ft.	Dia. in.	Gage or Wall	From ft.	To ft.	Slot size
0	525	12	.006	185	310	.040 Horiz Slot Full Flow Well Screen
				445	520	.040 Horiz Slot Full Flow Well Screen

(9) WELL SEAL:
Was surface sanitary seal provided? Yes [X] No [ ] If yes, to depth _____ ft.
Were strata sealed against pollution? Yes [X] No [ ] Interval * ft.
Method of sealing Top 50' Cement Sealed In 22" Borehole

(10) WATER LEVELS:
Depth of first water, if known _____ ft.
Standing level after well completion _____ ft.

(11) WELL TESTS:
Was well test made? Yes [ ] No [ ] If yes, by whom? _____
Type of test Pump [ ] Bailer [ ] Air lift [ ]
Depth to water at start of test _____ ft. At end of test _____ ft.
Discharge _____ gal/min after _____ hours Water temperature _____
Chemical analysis made? Yes [ ] No [XXX] If yes, by whom? _____
Was electric log made Yes [XX] No [ ] If yes, attach copy to this report

(12) WELL LOG: Total depth 550 ft. Completed depth 525 ft.

from ft.	to ft.	Formation (Describe by color, character, size or material)
		(SEE ATTACHED LOG)
		* Hole Plug Seal Placed At 310' To 314' & 441' To 445'

FV Wells #2, Laetitia Well 7, "Estate Well"

from Appendix A of C&A Jan 2004

Work started June 16, 19 88 Completed July 1, 19 88

WELL DRILLER'S STATEMENT:
This well was drilled under my jurisdiction and this report is true to the best of my knowledge and belief.
Signed Charles C. Wells (Well Driller)
NAME FOR FLOYD V. WELLS, INC. (Person, firm, or corporation) (Typed or printed)
Address P.O. Box 1007
City Santa Maria, CA ZIP 93455
License No. C57-229570 Date of this report July 6, 1988

ONLY FOR PUBLIC USE
NOT FOR PUBLIC USE
WATER CODE SEC. 13752

IF ADDITIONAL SPACE IS NEEDED, USE NEXT CONSECUTIVELY NUMBERED FORM

DWR 188 (REV. 10-86) 86 96355

FLOYD V. WELLS, INC.
"Depend on Wells for Water"
1337 WEST BETTERAVIA ROAD
SANTA MARIA, CALIFORNIA 93455
(805) 925-8626
CALIFORNIA LICENSE NO. C57-229570

WATER WELL DRILLING LOG

Owner: Piccho Vineyards — Company: C/O Hampton Farming

Well No.: 3 — Rig: No. 8

Location of Well: 4/10 of a mile North of Highway 101
453 Deutz Road
APN 47-310-10
T-12N, R-35W, Section 26

Surface Pipe or Seal: Cemented Casing in Borehole — Size: 22" — Depth: 50' — Gauge:

Well Bore Diameter: 22" — Depth of Casing Set: 525'

Casing Size: 12-3/4" O.D. — Gauge: .606 — Type: Class 200 PVC

Perforations: Size: 2"X.040 — Type: Horizontal Screen — Number: Full Flow

Perforation Location from Ground Level: 185'

From:	To:	
0'	185'	Blank
185'	310'	Screen
310'	445'	Blank
445'	520'	Screen
520'	525'	Blank

With Cap On Bottom

Gravel Pack: Type: Sisquoc — Size: 1/4X1/8 — Quantity: 39 Tons

Bits: No. Used: 2 — Size: 17½", 22"

Drilling Method: Air: — Foam: — Mud: X

Material Used: Gel.: 145-50# Sack Quick Gel — Foam: 25# Drispac — Other: 20 Bags Hole Plug

Well Started: June 16, 1988 — Well Completed: July 1, 1988 — Driller: Mark

Hole Plug Seal Placed 310' To 314' And 441' To 445'

TEST PUMPING INFORMATION:

Production Test:

Standing Water Level: — Pumping Level:

G.P.M.: — Pumping Level

REMARKS:

FLOYD V. WELLS, INC.
"Depend on Wells for Water"
1337 WEST BETTERAVIA ROAD
SANTA MARIA, CALIFORNIA 93455
(805) 925-8626
CALIFORNIA LICENSE NO. C57-229570

FORMATION LOG

Piccho Vineyads Well No. 3

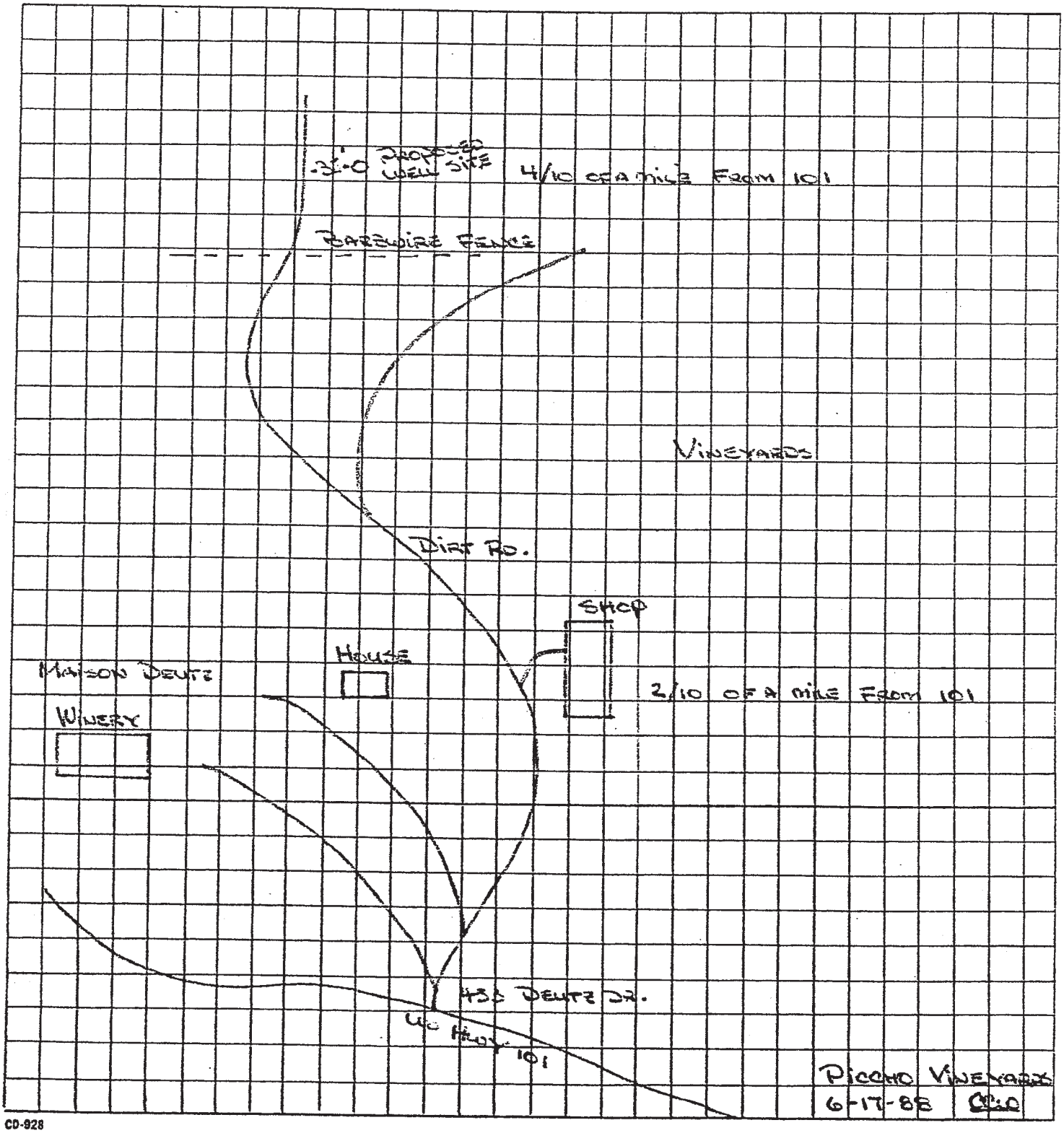
FROM	TO	DESCRIPTION
0'	45'	Tan And Brown Shale
45'	64'	Blue Clay
64'	89'	Blue Clay And Shale
89'	135'	Blue Clay, Shale And Fine Sand
135'	208'	Shale, Blue Clay And Coarse To Fine Sand
208'	330'	Volcanic, Gray Shale, Fine Sand
330'	493'	Gray Shale, Some Clay, Fine Sand
492'	528'	Volcanic, Shale With Sticky Clay, Fine Sand
528'	550	Sticky Clay

WELL PERMIT PLOT PLAN

SAN LUIS OBISPO COUNTY HEALTH DEPARTMENT
2191 Johnson Avenue
San Luis Obispo, California 93401
Telephone: 805/543-1200

SCALE: ~~1/4" = 25'~~

INDICATE BELOW THE **EXACT LOCATION** OF WELL WITH RESPECT TO THE FOLLOWING ITEMS: PROPERTY LINES, WATER BODIES OR WATER COURSES, DRAINAGE PATTERN, ROADS, EXISTING WELLS, SEWERS AND PRIVATE SEWAGE DISPOSAL SYSTEMS. **INCLUDE DIMENSIONS.**



CD-928

Campodonico Ranch Domestic Well
Los Berros Creek Road

Enloe #1, Laetitia Well 8

from Appendix A, C&A Jan 2004

Date: October 27, 1999
Location: Los Berros Creek Rd. at Ranch Headquarters
Geologists: S. Harris, Cleath & Assoc.
Drilling Company/Method: Enloe Well Drilling / Mud Rotary
Total depth: 65 feet

Lithologic Log

Depth (ft)	Description
10	**Sand and Gravel**; brown, fine to coarse grained sand, fine angular to subangular gravel.
20	**Sandy Gravel**; light reddish brown, fine to coarse grained sand, gravel to 3/4-inch, mostly angular to subangular shale and chert clasts.
30	**Sandy Gravel**; trace silt, light reddish brown, fine to coarse grained sand, gravel to 1-inch, mostly angular to subrounded shale clasts to ½-inch.
40	**Sandy Gravel**; as above, gravel increasing to 1½-inch, silt inferred as thin stringers.
50	**Gravel**; with sand, tan and gray shale, red cherts, angular to subangular clasts mostly 1 to 2-inch.
60	**Gravel**; with sand, as above.
65	Blue clay.

Well Construction

Casing type: 8-inch diameter PVC, Class 200 water well casing
Perforations: 0.040-inch slots, high density spacing
Gravel Pack: pea gravel
Borehole diameter: 15-inch

Depth (ft)	Description
0 - 25	Blank casing
25 - 65	Perforated casing with end cap
(Annular space)	
0 - 23	Sanitary seal
23 - 65	Gravel pack

Total well depth 65 feet

DUPLICATE
Driller's Copy
Page 1 of 1

STATE OF CALIFORNIA
WELL COMPLETION REPORT
Refer to Instruction Pamphlet

No. 511274

DWR USE ONLY — DO NOT FILL IN
STATE WELL NO./STATION NO.
LATITUDE LONGITUDE
APN/TRS/OTHER

Owner's Well No. #1
Date Work Began 10/23/98, Ended 11/3/98
Local Permit Agency San Luis Obispo
Permit No. 98-256 Permit Date 10/15/98

GEOLOGIC LOG

ORIENTATION (✓) ___ VERTICAL ___ HORIZONTAL ___ ANGLE ___ (SPECIFY)
DEPTH TO FIRST WATER ___ (Ft.) BELOW SURFACE

DEPTH FROM SURFACE Ft.	to Ft.	DESCRIPTION *Describe material, grain size, color, etc.*
0	1	TOP SOIL
1	3	FRACTURED ROCK
3	42	BROWN SHALE
42	43	DARD GREY SHALE
43	94	BROWN SHALE
94	435	GREY SHALE
435	480	BROWN SHALE

F&T #1, Laetitia Well 9

from Appendix A of C&A Jan 2004

TOTAL DEPTH OF BORING 480 (Feet)
TOTAL DEPTH OF COMPLETED WELL 445 (Feet) GF

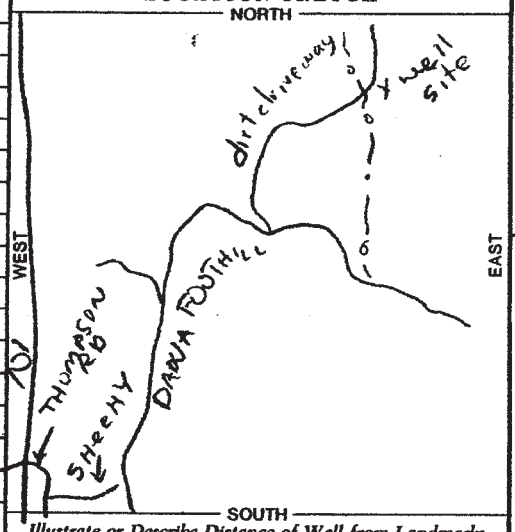
WELL OWNER

Name Bilo Zarif
Mailing Address 453 Deutz Drive
Arroyo Grande CA 93420
CITY STATE ZIP

WELL LOCATION

Address Laetitia Vineyard
City Arroyo Grande
County San Luis Obispo
APN Book 047 Page 030 Parcel 003
or Township 12N Range 13E Section 30
or Latitude ___ DEG. ___ MIN. ___ SEC. NORTH Longitude ___ DEG. ___ MIN. ___ SEC. WEST

LOCATION SKETCH



Illustrate or Describe Distance of Well from Landmarks such as Roads, Buildings, Fences, Rivers, etc. PLEASE BE ACCURATE & COMPLETE.

ACTIVITY (✓)

X NEW WELL
MODIFICATION/REPAIR
___ Deepen
___ Other (Specify)
___ DESTROY *(Describe Procedures and Materials Under "GEOLOGIC LOG")*

PLANNED USE(S) (✓)

___ MONITORING
WATER SUPPLY
___ Domestic
___ Public
X Irrigation
___ Industrial
___ "TEST WELL"
___ CATHODIC PROTECTION
___ OTHER (Specify)

DRILLING METHOD Rotary FLUID Air

WATER LEVEL & YIELD OF COMPLETED WELL

DEPTH OF STATIC WATER LEVEL ___ (Ft.) & DATE MEASURED 11/3/98
ESTIMATED YIELD* 500 (GPM) & TEST TYPE ___
TEST LENGTH 3 (Hrs.) TOTAL DRAWDOWN ___ (Ft.)
** May not be representative of a well's long-term yield.*

CASING(S)

DEPTH FROM SURFACE Ft.	to Ft.	BORE-HOLE DIA. (Inches)	TYPE (✓) BLANK	SCREEN	CON-DUCTOR	FILL PIPE	MATERIAL / GRADE	INTERNAL DIAMETER (Inches)	GAUGE OR WALL THICKNESS	SLOT SIZE IF ANY (Inches)
0	325	13	Blank				PVC	8	SDR 21	
325	425	13		Screen			PVC	8	SDR 21	.040

ANNULAR MATERIAL

DEPTH FROM SURFACE Ft.	to Ft.	TYPE CE-MENT (✓)	BEN-TONITE (✓)	FILL (✓)	FILTER PACK (TYPE/SIZE)
0	50	X			
50	425				Monterey Sand

ATTACHMENTS (✓)

___ Geologic Log
___ Well Construction Diagram
✓ Geophysical Log(s)
___ Soil/Water Chemical Analyses
___ Other ___

ATTACH ADDITIONAL INFORMATION, IF IT EXISTS.

CERTIFICATION STATEMENT

I, the undersigned, certify that this report is complete and accurate to the best of my knowledge and belief.

NAME Filipponi & Thompson Drilling, Inc.
(PERSON, FIRM, OR CORPORATION) (TYPED OR PRINTED)
P.O. Box 845 Atascadero CA 93423
ADDRESS CITY STATE ZIP

Signed ___ (WELL DRILLER/AUTHORIZED REPRESENTATIVE) DATE SIGNED 12/23-98 C-57 LICENSE NUMBER 432680

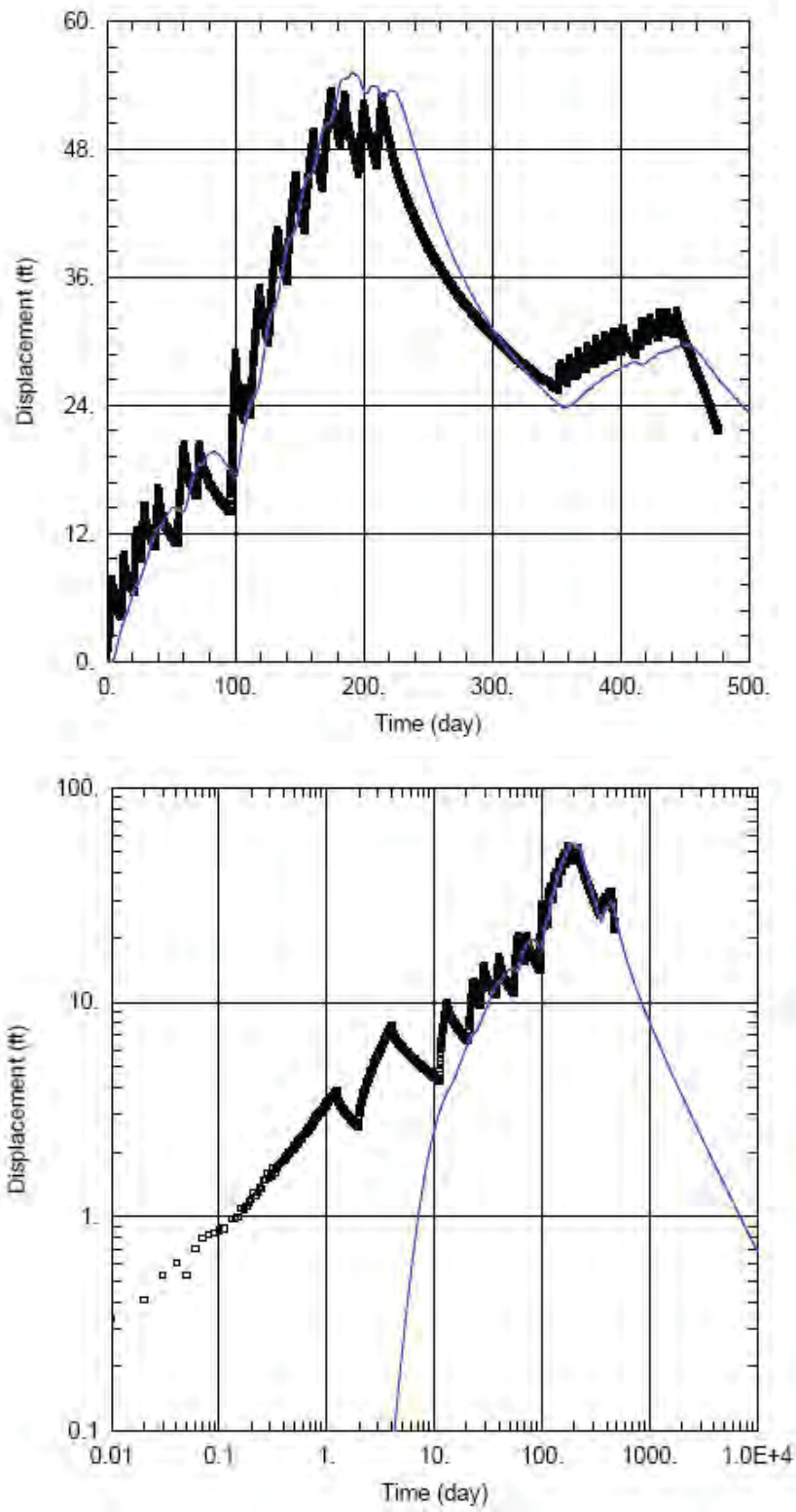
APPENDIX B
Aquifer Testing Analyses of Transmissivity

Aquifer Properties Based on Detailed Type-Curve Analyses
(Hantush-Jacob Leaky Aquifer and Theis Confined Aquifer Solutions)

Cooper-Jacob Analyses of Simplified Aquifer Response and Averaged Pumping

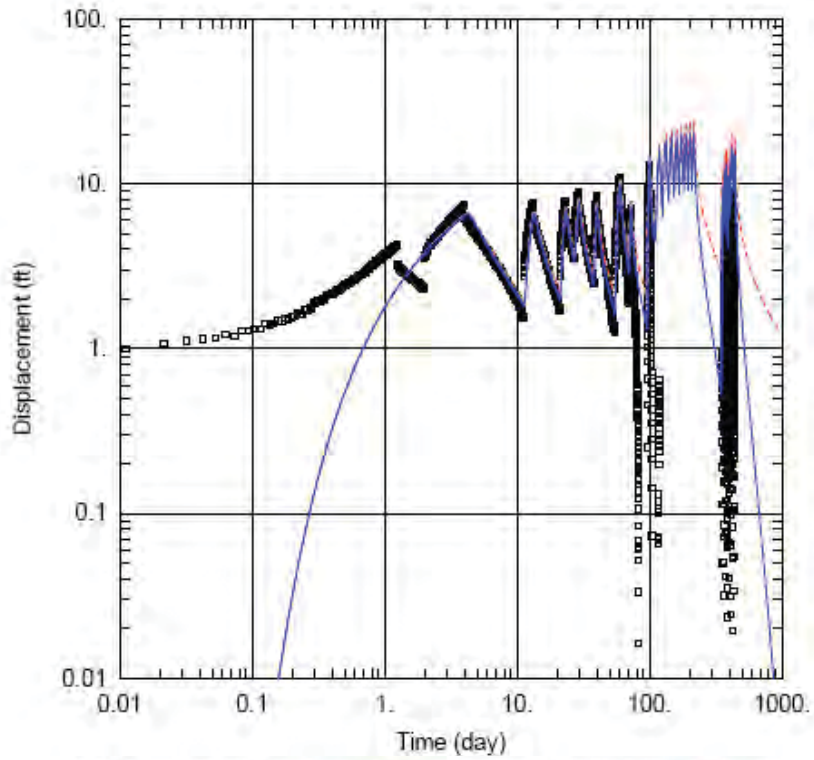
Theis Analysis of Recovery of Water Level Following Phase 1 and 2 Testing

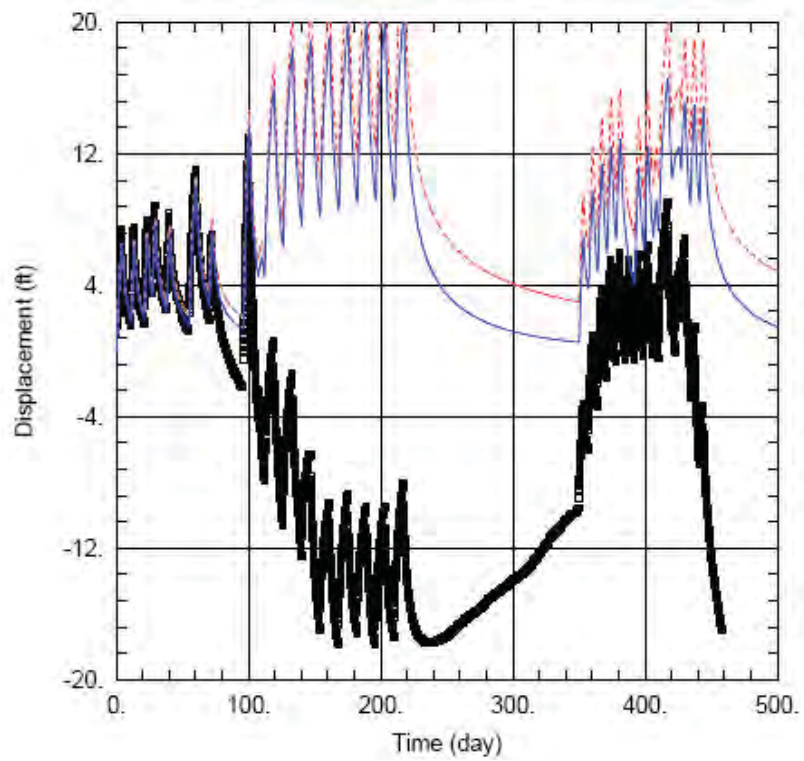
Transmissivity Calculated from Specific Capacity



Well 10 Type Curve Analysis with Variable Pumping Rate. T = 9.3 ft^2/day

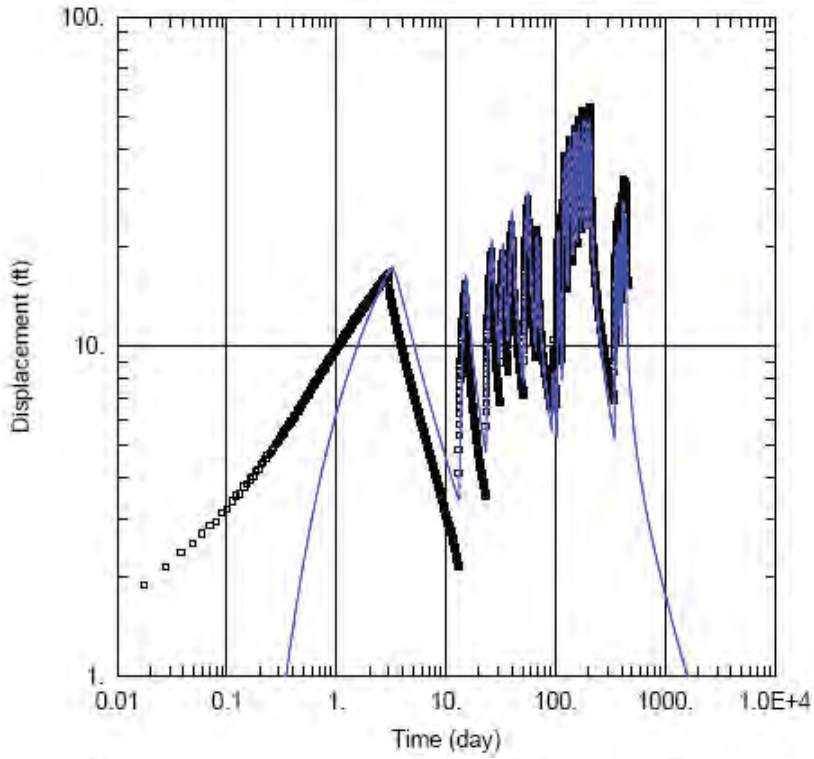
Type-Curves for Hantush-Jacob Leaky Aquifer and Theis Confined Aquifer Solution (which are essentially identical in this case due to very low leakage) fitted to water level data recorded during Phase1, Phase 2 and Phase 3 Testing using AQTESOLV, which allows the type-curve to account for the variable pumping rates. Upper graph has linear scale for drawdown (displacement) of water level and elapsed time. Lower graph has logarithmic scales for both axes. Drawdown data are corrected (reduced) assuming 70% well efficiency. Fit of type-curve to first few cycles of pumping is poor, but this has little influence on the estimated transmissivity.

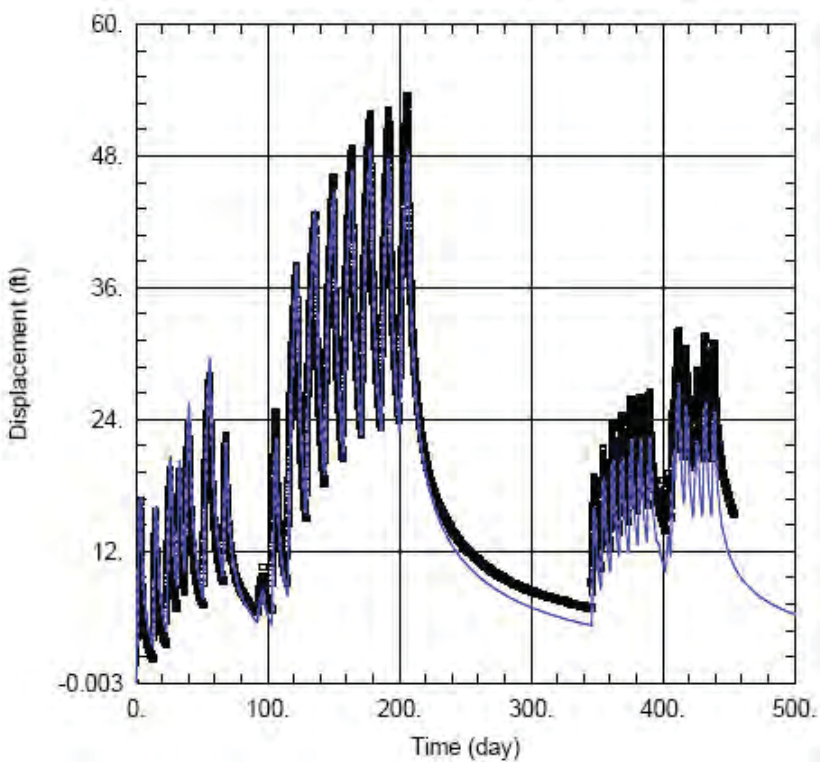




Well 11 Type Curve Analysis with Variable Pumping Rate. T = 115 ft^2/day

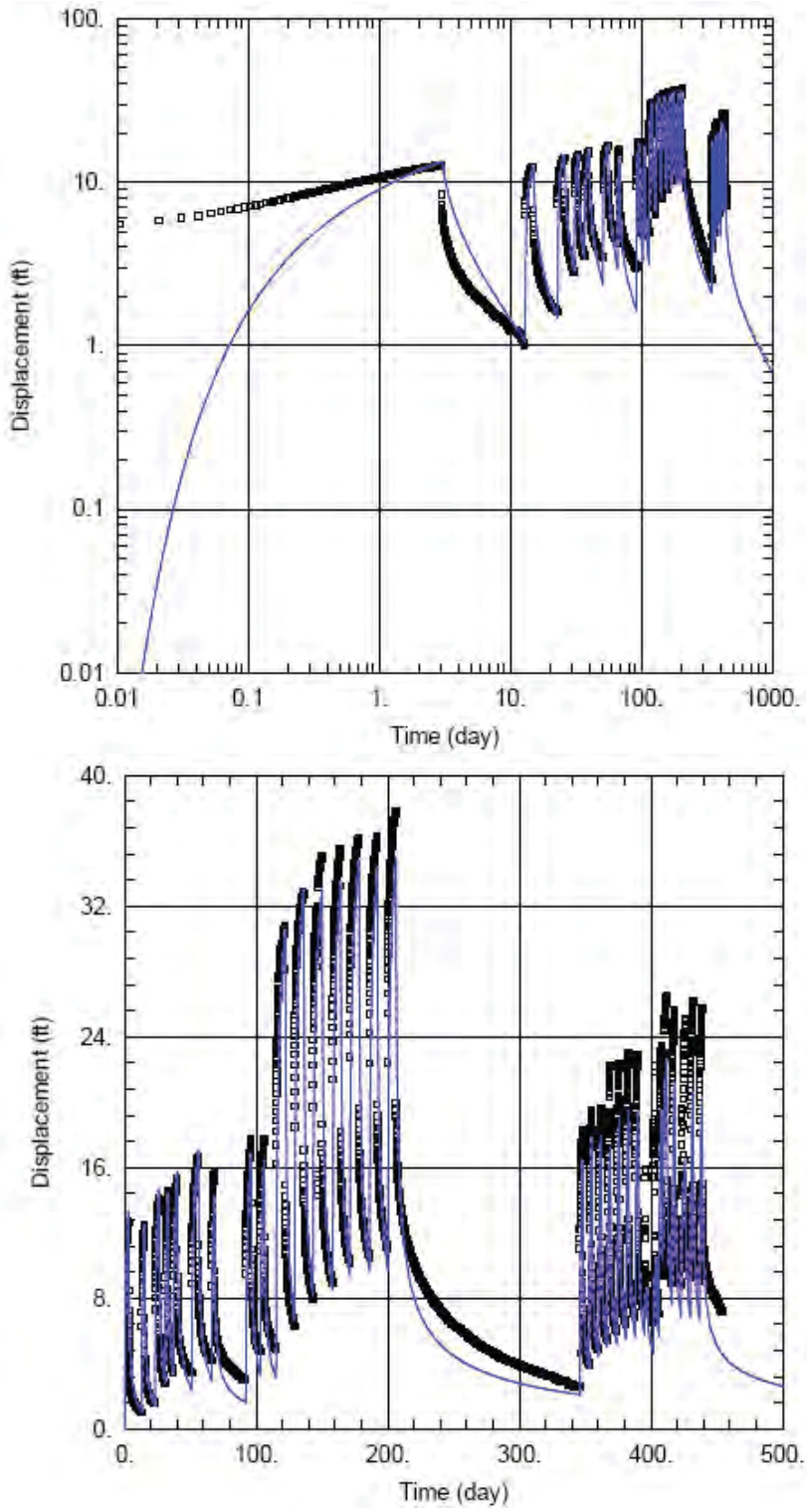
Type-Curves for Hantush-Jacob Leaky Aquifer and Theis Confined Aquifer Solution fitted to water level data recorded during Phase1, Phase 2 and Phase 3 Testing using AQTESOLV, which allows the type-curve to account for the variable pumping rates. Upper graph has linear scale for drawdown (displacement) of water level and elapsed time. Lower graph has logarithmic scales for both axes. Drawdown data are corrected (reduced) assuming 70% well efficiency. Fit of type-curve to first few cycles of pumping is good, but fit to later data is poor due to pronounced increase in water level in Well 11 during pumping as a consequence of recharge from Los Berros Creek.





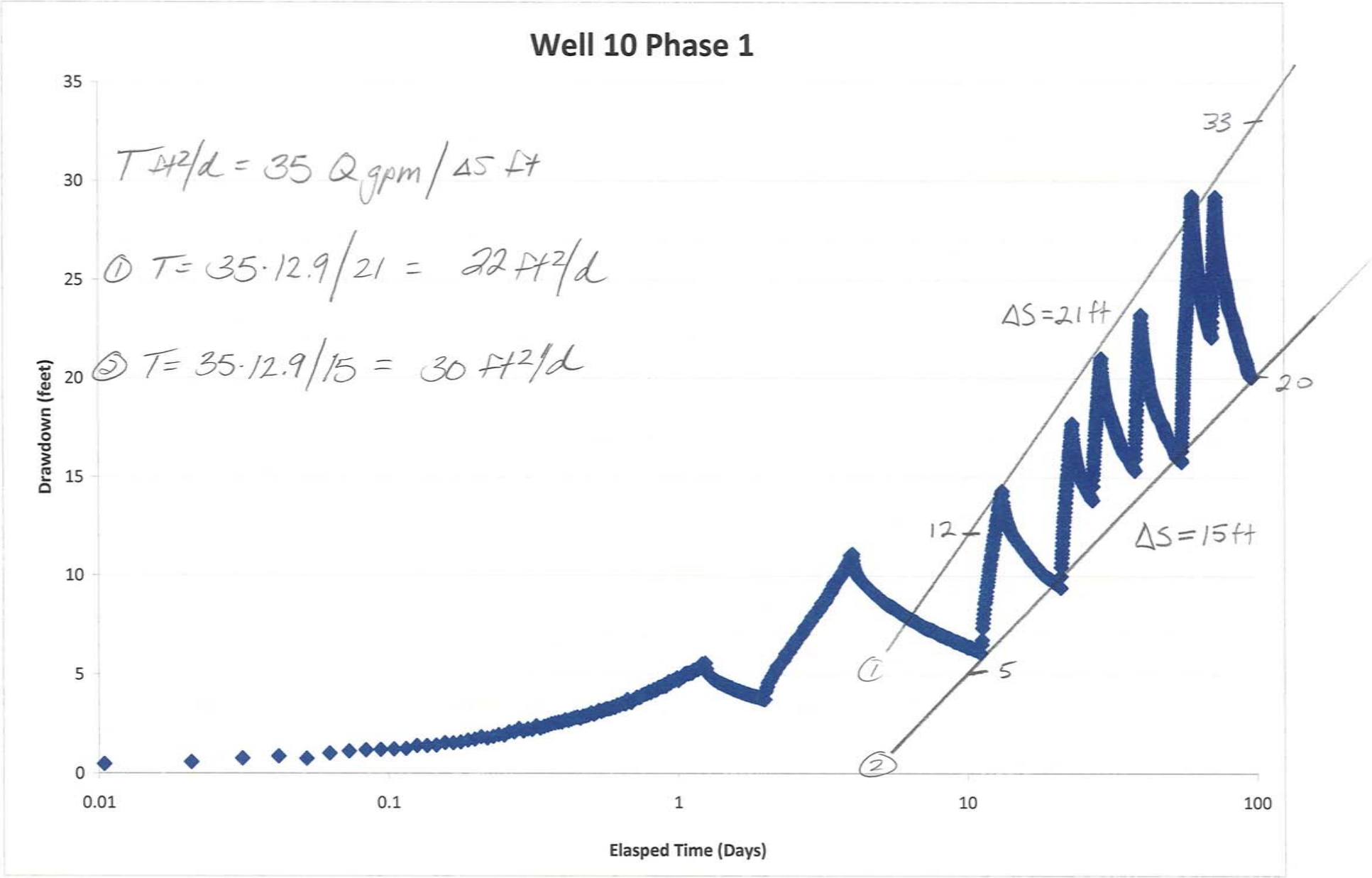
Well 14 Type Curve Analysis with Variable Pumping Rate. T = 55 ft^2/day

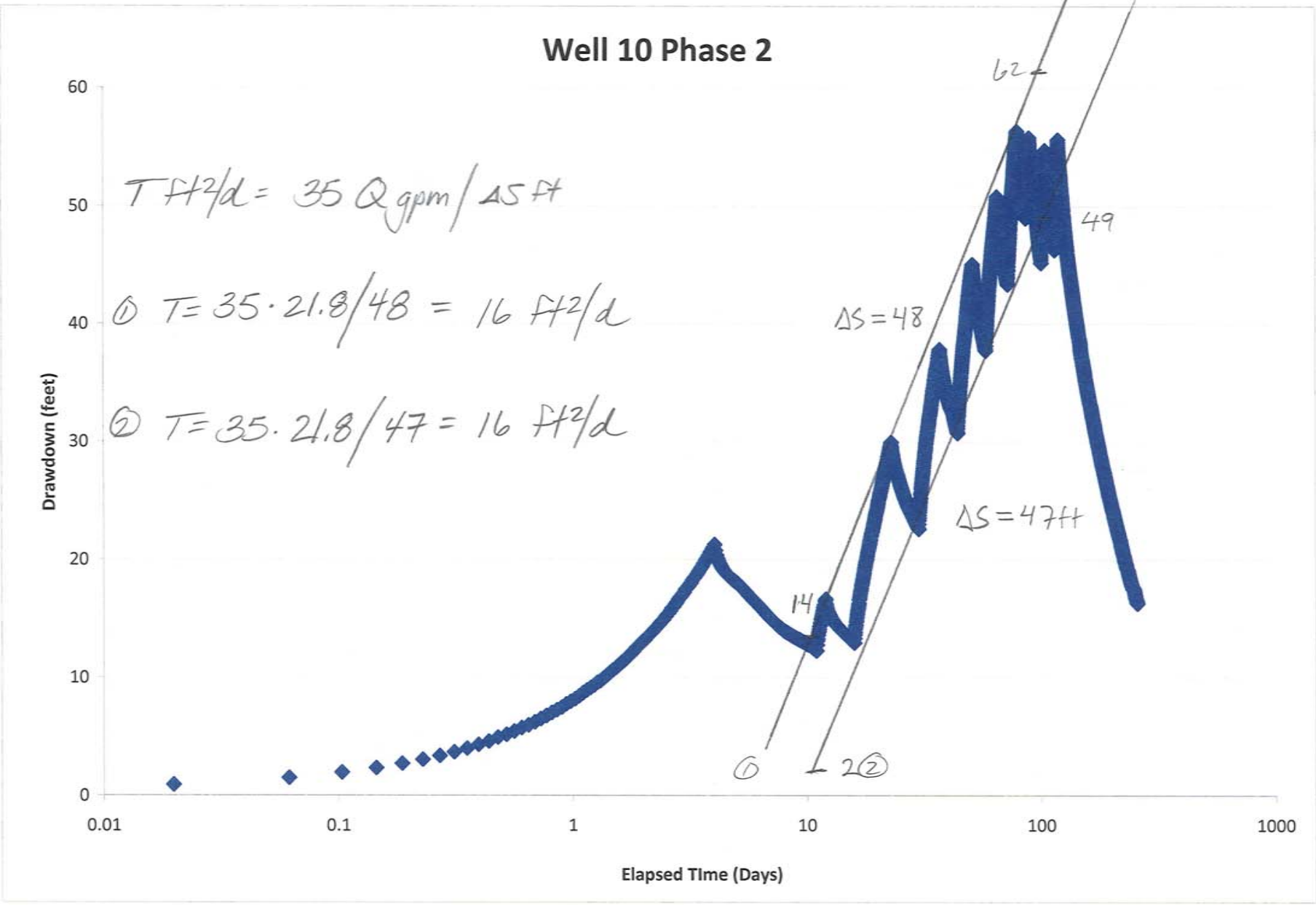
Type-Curves for Hantush-Jacob Leaky Aquifer and Theis Confined Aquifer Solution (which are essentially identical in this case due to very low leakage) fitted to water level data recorded during Phase1, Phase 2 and Phase 3 Testing using AQTESOLV, which allows the type-curve to account for the variable pumping rates. Upper graph has linear scale for drawdown (displacement) of water level and elapsed time. Lower graph has logarithmic scales for both axes. Drawdown data are corrected (reduced) assuming 70% well efficiency. Fit of type-curve to first couple cycles of pumping is poor, but this has little influence on the estimated transmissivity.

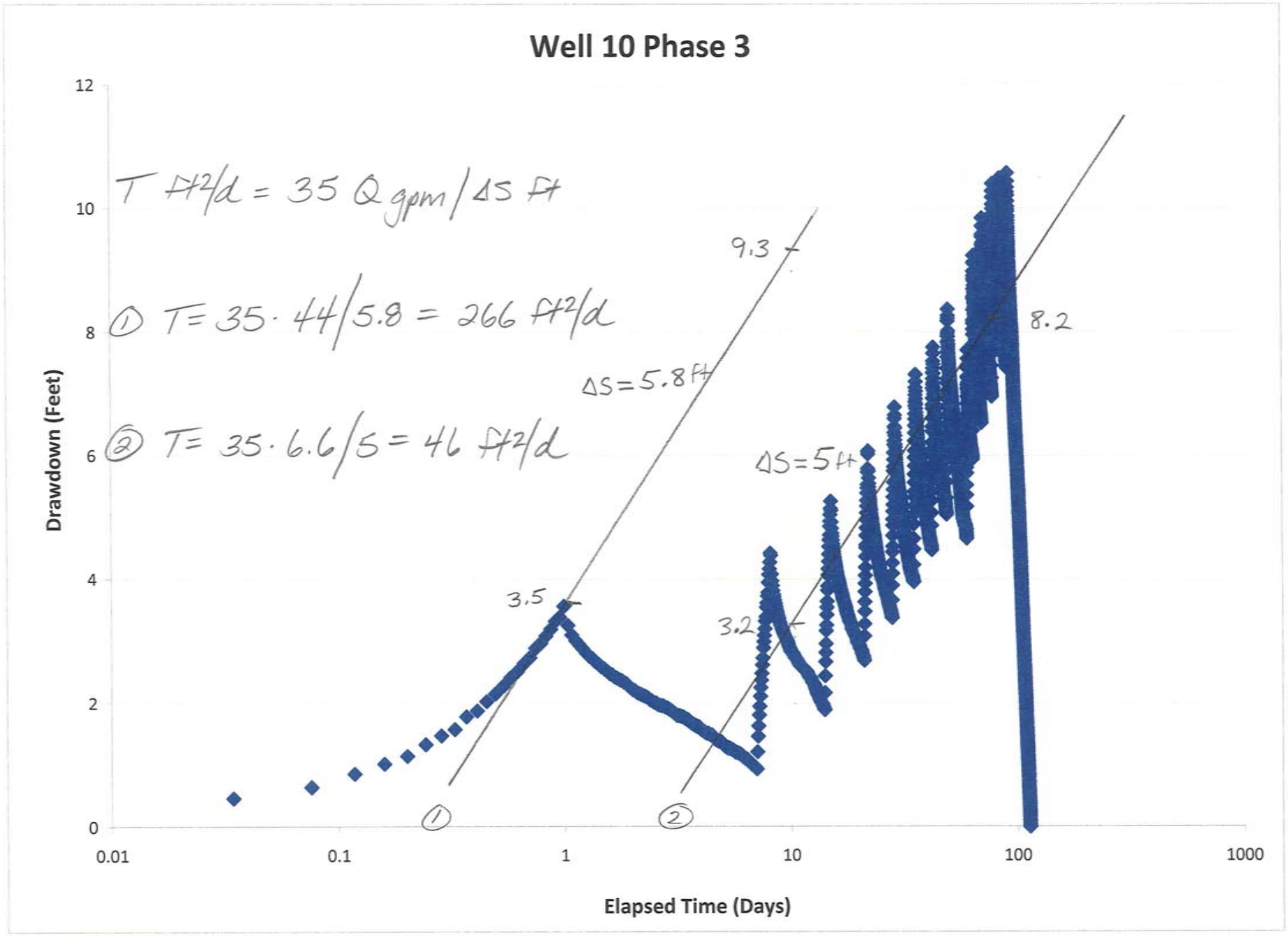


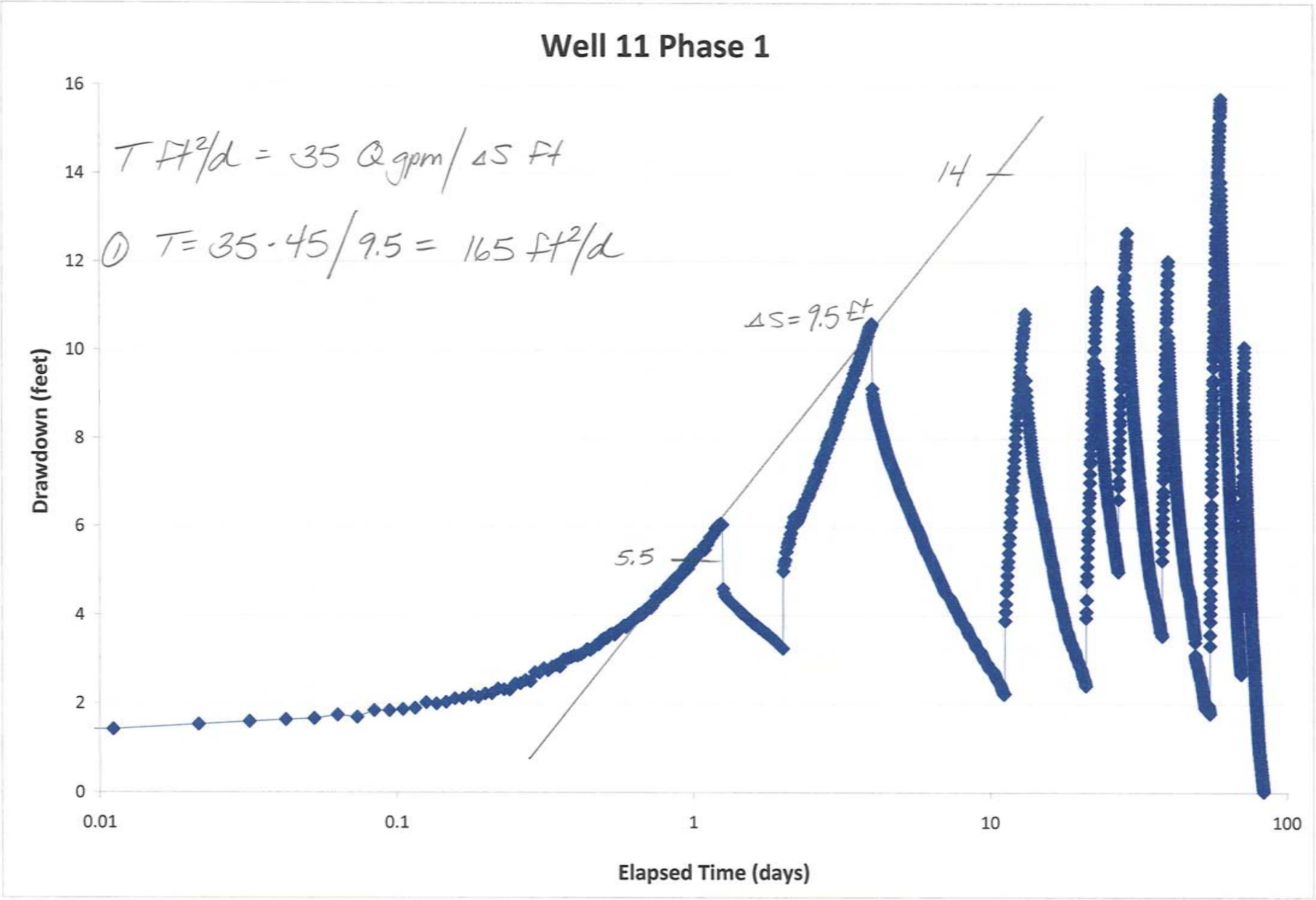
Well 15 Type Curve Analysis with Variable Pumping Rate. T = 131 ft^2/day

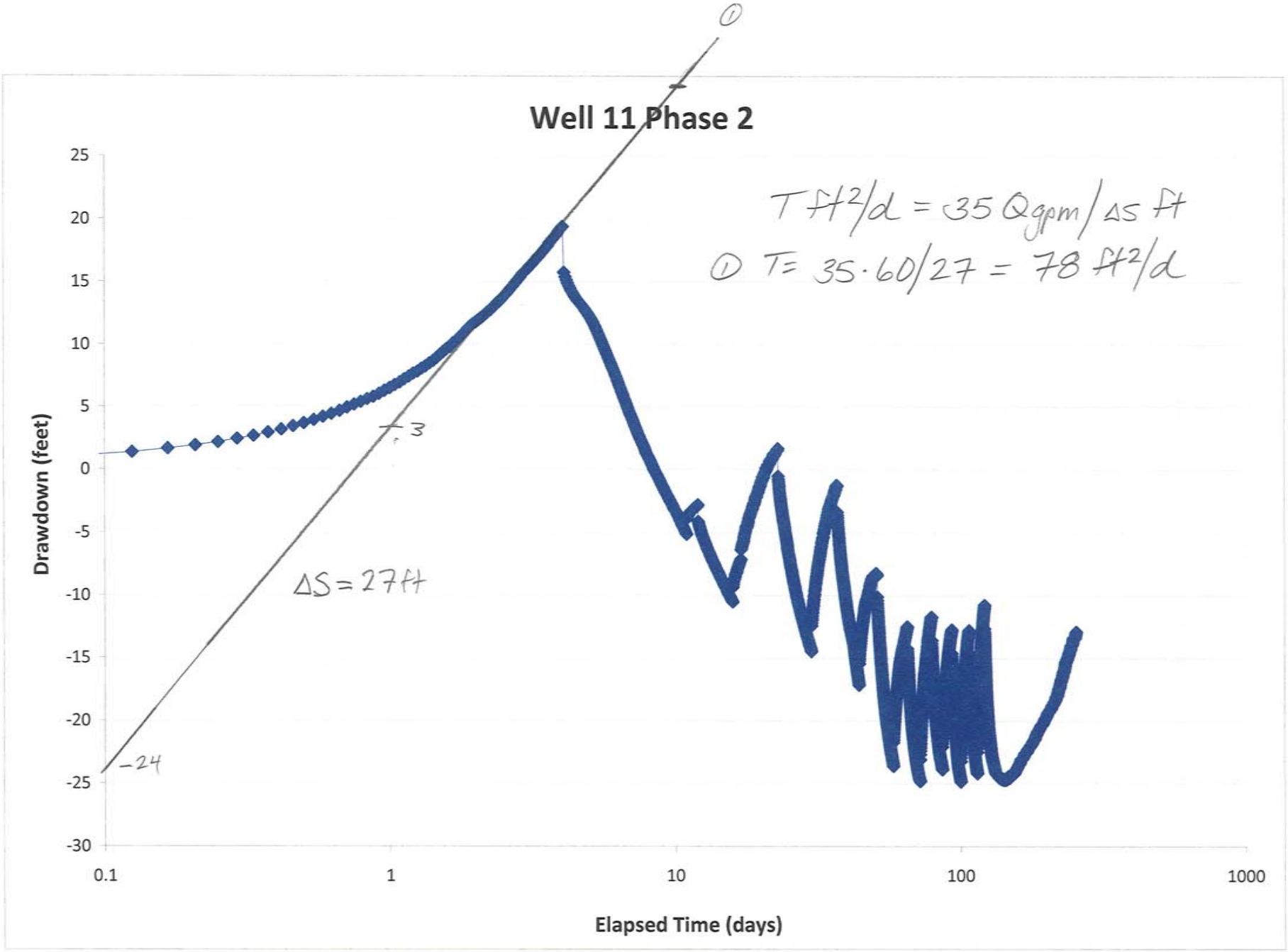
Type-Curves for Hantush-Jacob Leaky Aquifer and Theis Confined Aquifer Solution (which are essentially identical in this case due to very low leakage) fitted to water level data recorded during Phase1, Phase 2 and Phase 3 Testing using AQTESOLV, which allows the type-curve to account for the variable pumping rates. Upper graph has linear scale for drawdown (displacement) of water level and elapsed time. Lower graph has logarithmic scales for both axes. Drawdown data are corrected (reduced) assuming 70% well efficiency. Fit of type-curve to beginning of the first cycle of pumping is poor, but this has little influence on the estimated transmissivity.

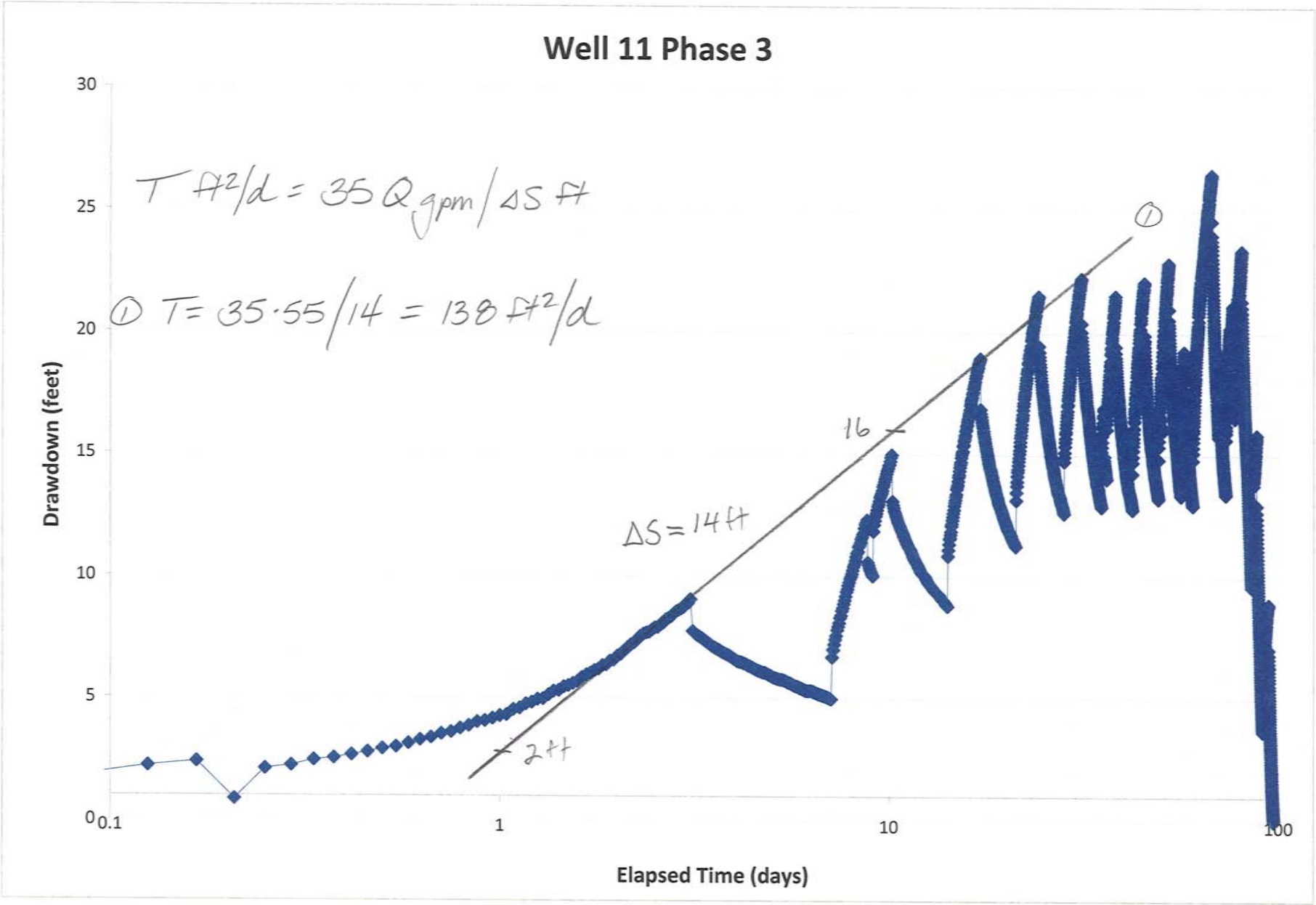

Well 10 Phase 1
Drawdown (feet)
Elasped Time (Days)
35
30
25
20
15
10
5
0
0.01
0.1
1
10
100
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·12.9/21 = 22 ft²/d
② T = 35·12.9/15 = 30 ft²/d
33
ΔS = 21 ft
20
12
ΔS = 15 ft
5
①
②

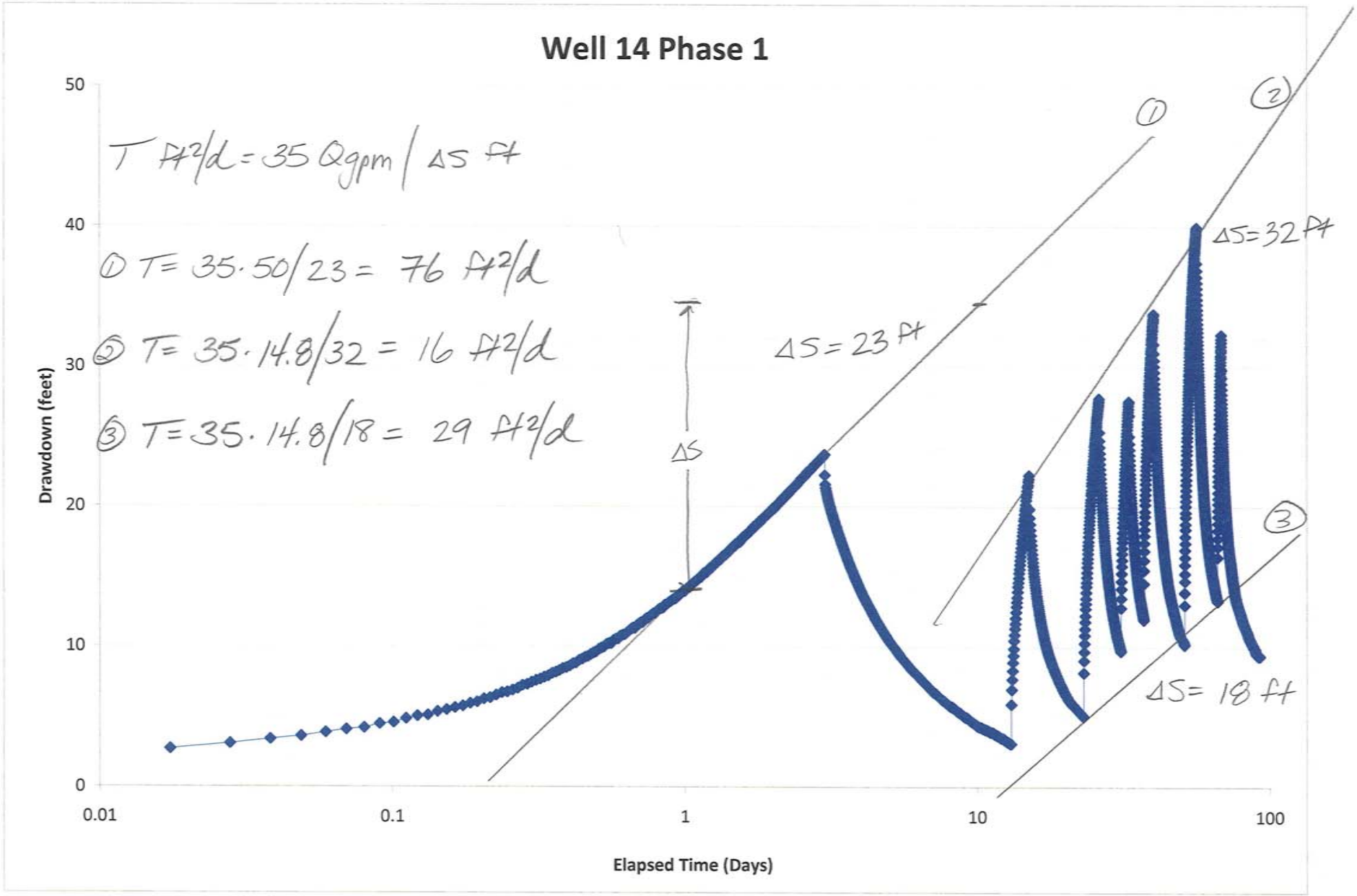

Well 10 Phase 2
Drawdown (feet)
Elapsed Time (Days)
0
10
20
30
40
50
60
0.01
0.1
1
10
100
1000
T ft²/d = 35 Q gpm / ΔS ft
① T = 35 · 21.8 / 48 = 16 ft²/d
② T = 35 · 21.8 / 47 = 16 ft²/d
62
49
ΔS = 48
ΔS = 47ft
14
①
2②

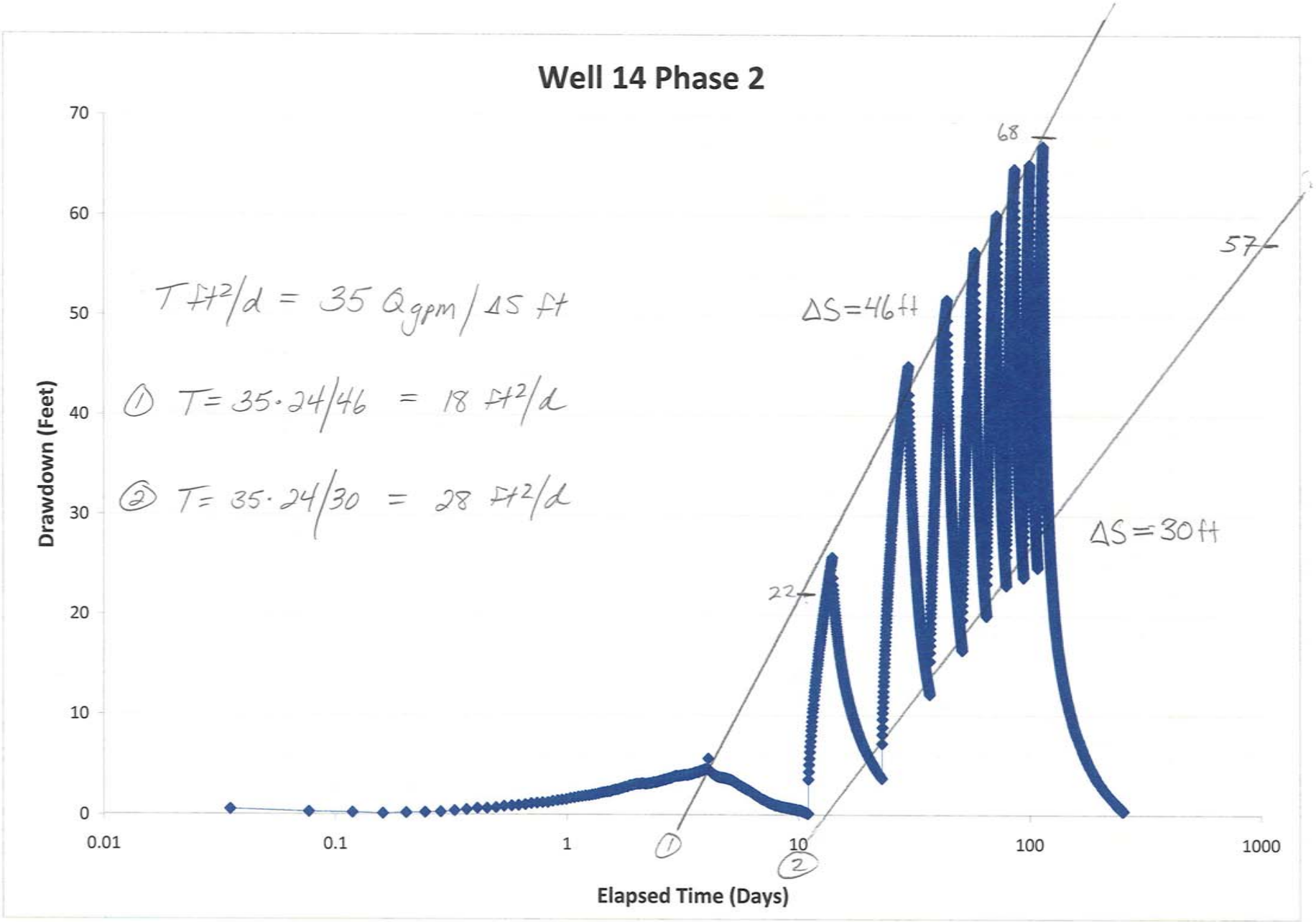

Well 10 Phase 3
Drawdown (Feet)
Elapsed Time (Days)
0
2
4
6
8
10
12
0.01
0.1
1
10
100
1000
T ft²/d = 35 Q gpm / ΔS ft
① T = 35 · 44 / 5.8 = 266 ft²/d
② T = 35 · 6.6 / 5 = 46 ft²/d
9.3
8.2
ΔS = 5.8 ft
ΔS = 5 ft
3.5
3.2
①
②

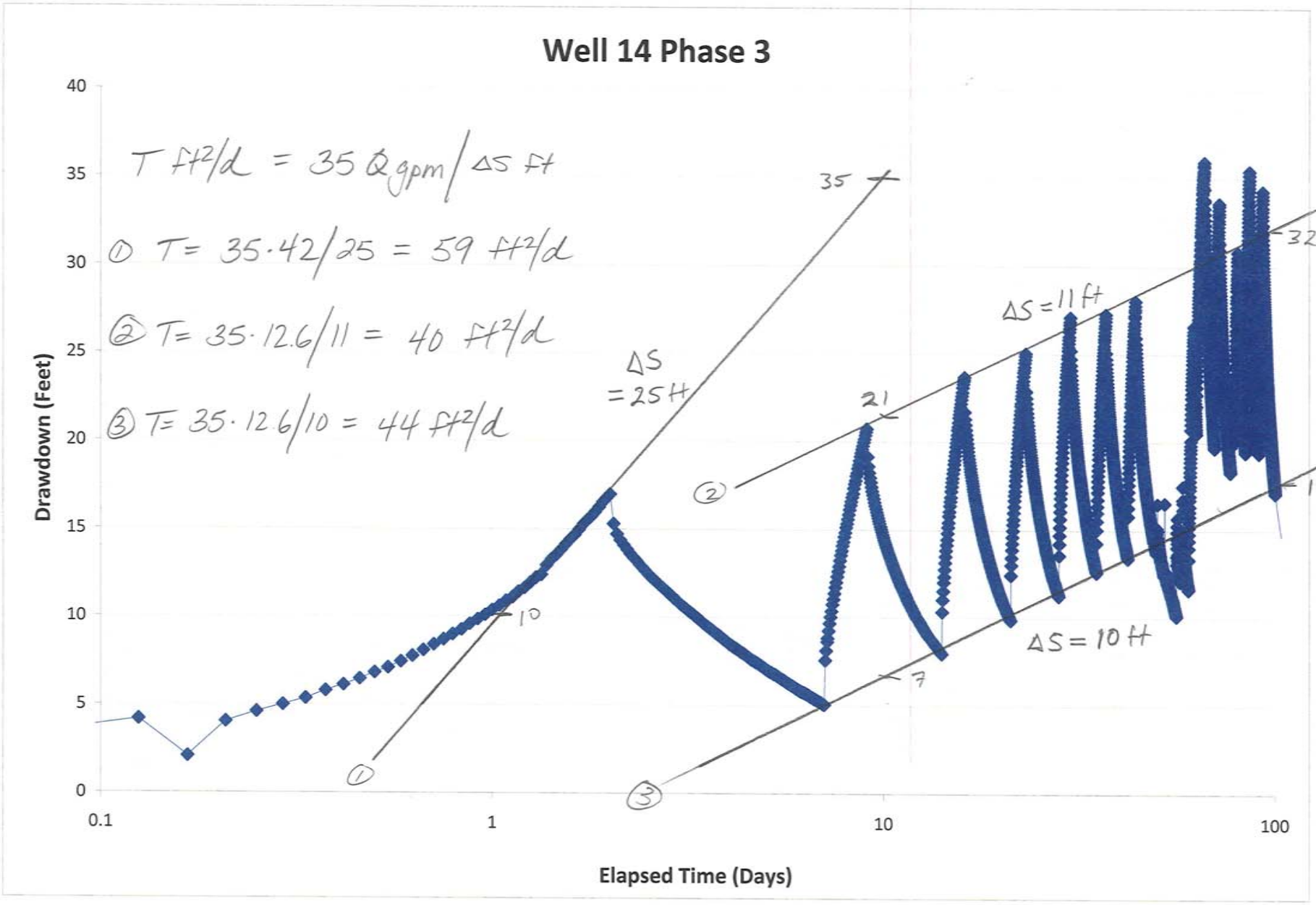

Well 11 Phase 1
T ft²/d = 35 Q gpm / ΔS ft
① T = 35 · 45 / 9.5 = 165 ft²/d
14
ΔS = 9.5 ft
5.5
Drawdown (feet)
Elapsed Time (days)
0
2
4
6
8
10
12
14
16
0.01
0.1
1
10
100

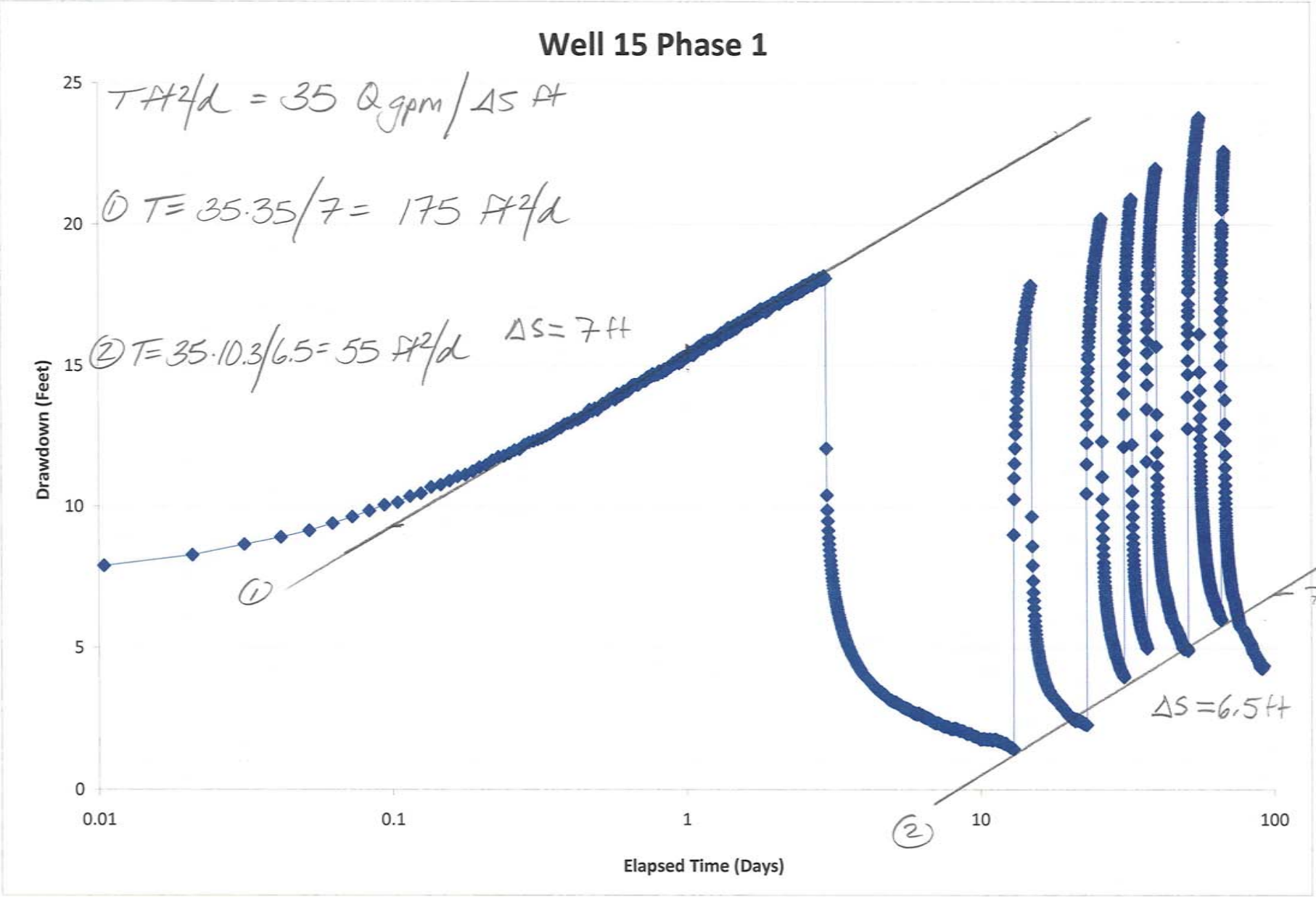

Well 11 Phase 2
Drawdown (feet)
Elapsed Time (days)
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
0.1
1
10
100
1000
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·60/27 = 78 ft²/d
ΔS = 27 ft
-3
-24
①

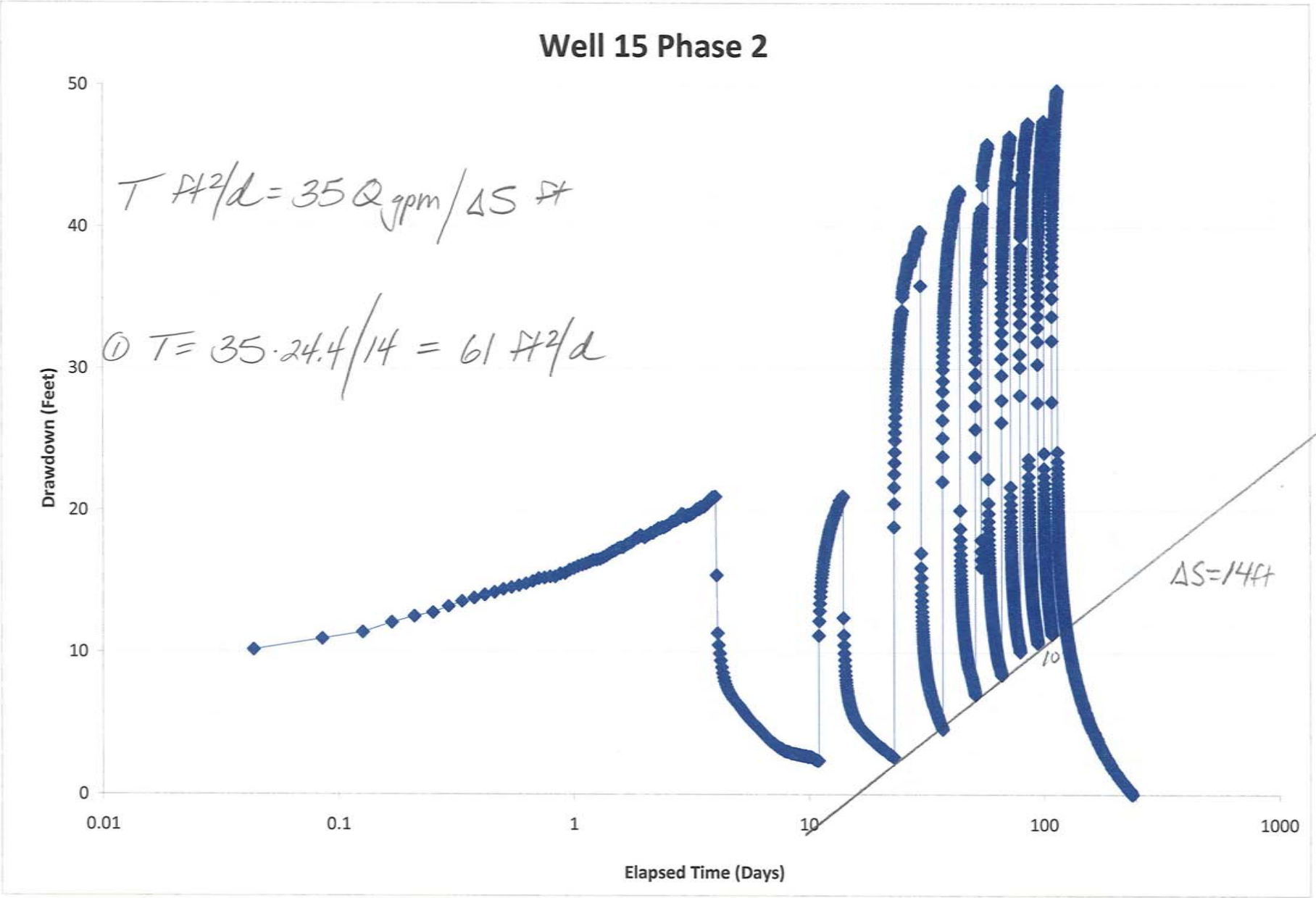

Well 11 Phase 3
Drawdown (feet)
Elapsed Time (days)
30
25
20
15
10
5
0
0.1
1
10
100
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·55/14 = 138 ft²/d
ΔS = 14 ft
16
2 ft
①

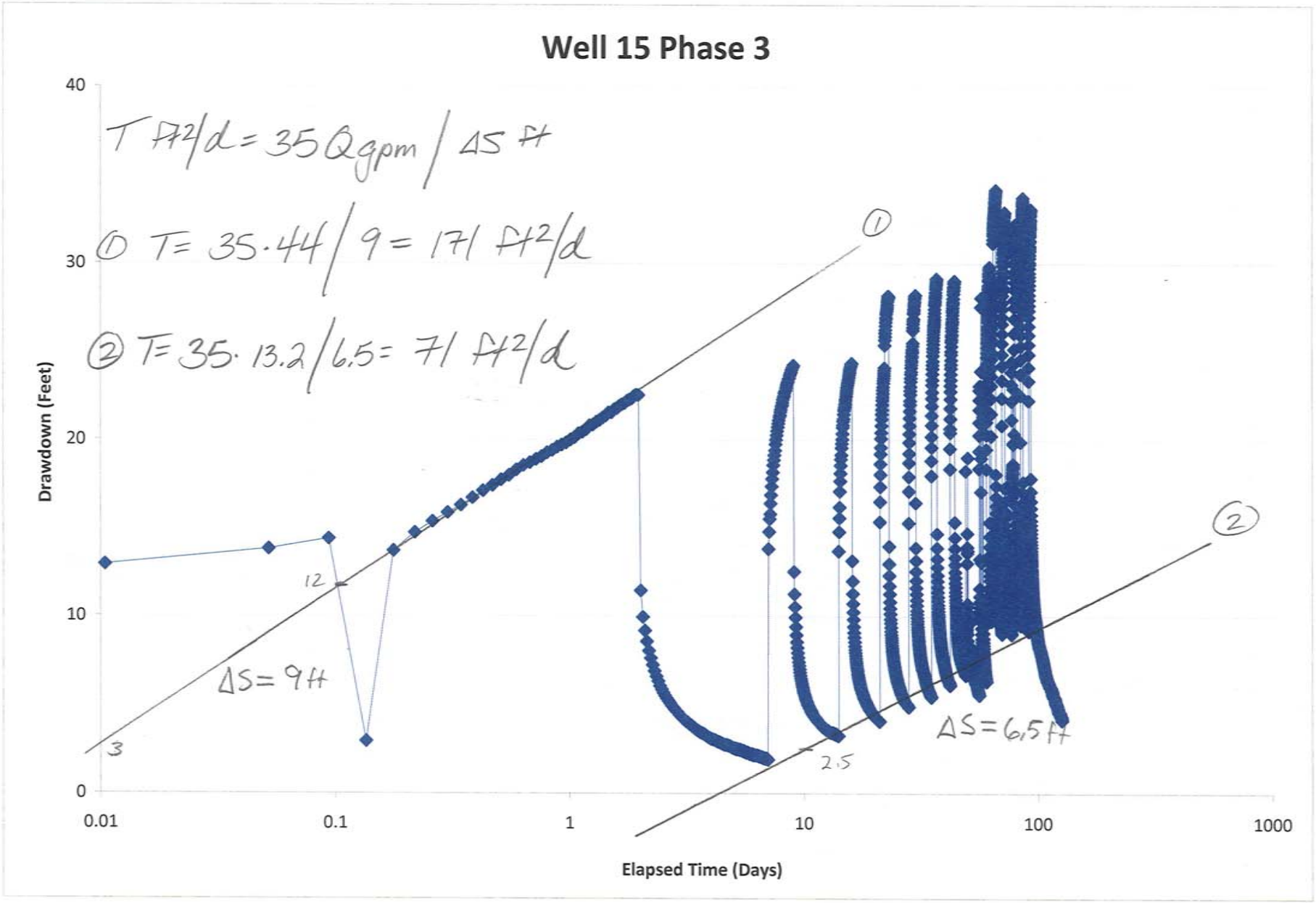

Well 14 Phase 1
Drawdown (feet)
Elapsed Time (Days)
50
40
30
20
10
0
0.01
0.1
1
10
100
T ft²/d = 35 Qgpm / ΔS ft
① T = 35·50/23 = 76 ft²/d
② T = 35·14.8/32 = 16 ft²/d
③ T = 35·14.8/18 = 29 ft²/d
ΔS
ΔS = 23 ft
ΔS = 32 ft
ΔS = 18 ft
①
②
③


Well 14 Phase 2
Drawdown (Feet)
Elapsed Time (Days)
70
60
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·24/46 = 18 ft²/d
② T = 35·24/30 = 28 ft²/d
ΔS=46ft
ΔS=30ft
68
57
22
①
②


Well 14 Phase 3
Drawdown (Feet)
Elapsed Time (Days)
40
35
30
25
20
15
10
5
0
0.1
1
10
100
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·42/25 = 59 ft²/d
② T = 35·12.6/11 = 40 ft²/d
③ T = 35·12.6/10 = 44 ft²/d
ΔS = 25 ft
ΔS = 11 ft
ΔS = 10 ft
35
32
21
17
10
7
①
②
③


Well 15 Phase 1
T ft²/d = 35 Q gpm / Δs ft
① T = 35·35/7 = 175 ft²/d
② T = 35·10.3/6.5 = 55 ft²/d
Δs = 7 ft
Δs = 6.5 ft
7
①
②
Drawdown (Feet)
Elapsed Time (Days)
25
20
15
10
5
0
0.01
0.1
1
10
100


Well 15 Phase 2
Drawdown (Feet)
Elapsed Time (Days)
50
40
30
20
10
0
0.01
0.1
1
10
100
1000
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·24.4/14 = 61 ft²/d
ΔS=14ft
①
10


Well 15 Phase 3
Drawdown (Feet)
Elapsed Time (Days)
40
30
20
10
0
0.01
0.1
1
10
100
1000
T ft²/d = 35 Q gpm / ΔS ft
① T = 35·44 / 9 = 171 ft²/d
② T = 35·13.2 / 6.5 = 71 ft²/d
①
②
12
3
ΔS = 9 ft
2.5
ΔS = 6.5 ft

Groundwater Level Recovery at Well 10
Laetitia Vineyard & Winery

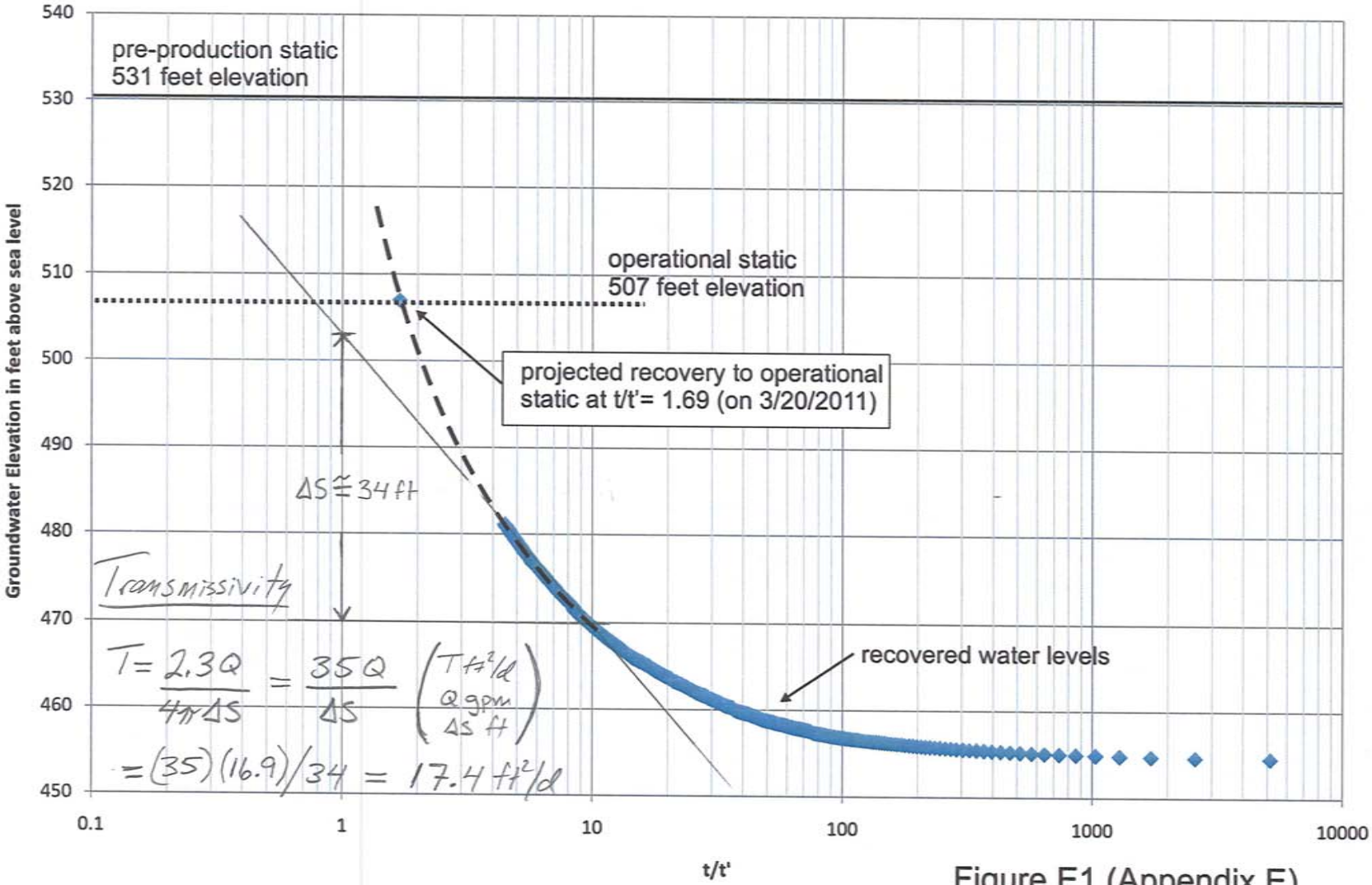


Figure E1 (Appendix E)
Well 10 Recovery
Laetitia Agricultural Cluster

Cleath-Harris Geologists

Groundwater Level Recovery at Well 14
Laetitia Vineyard & Winery

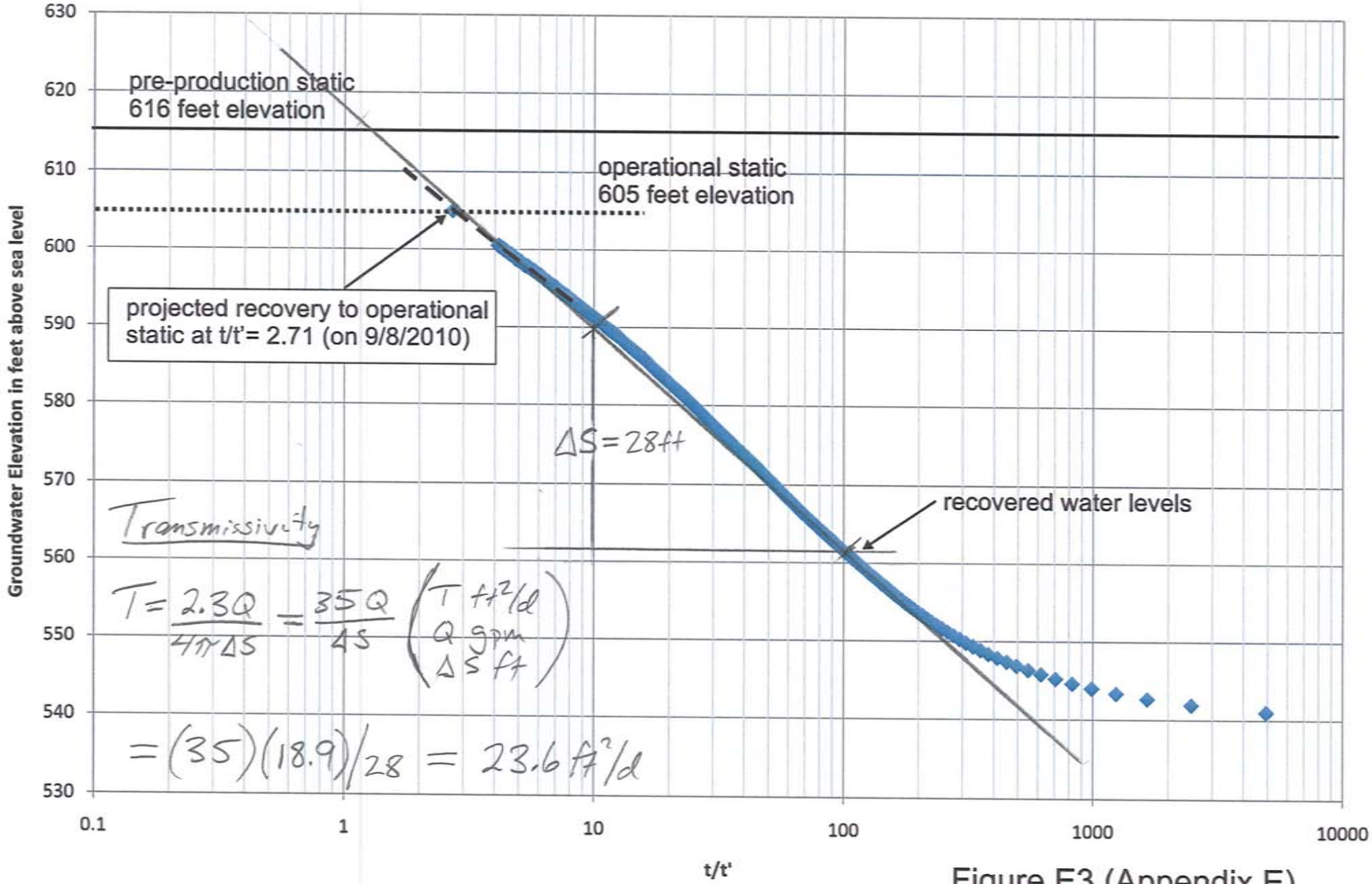


Figure E3 (Appendix E)
Well 14 Recovery
Laetitia Agricultural Cluster

Cleath-Harris Geologists

Groundwater Level Recovery at Well 15
Laetitia Vineyard & Winery

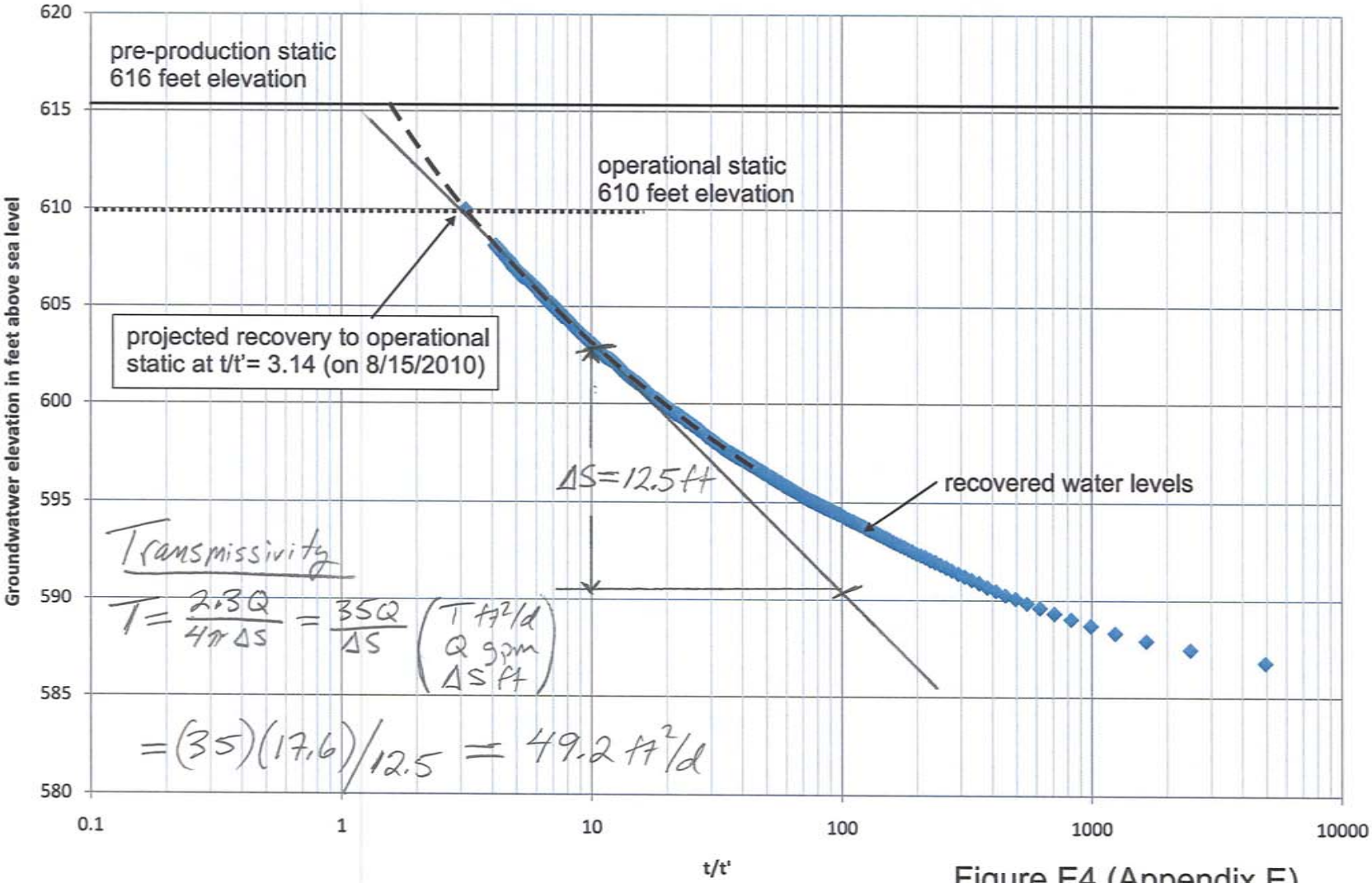


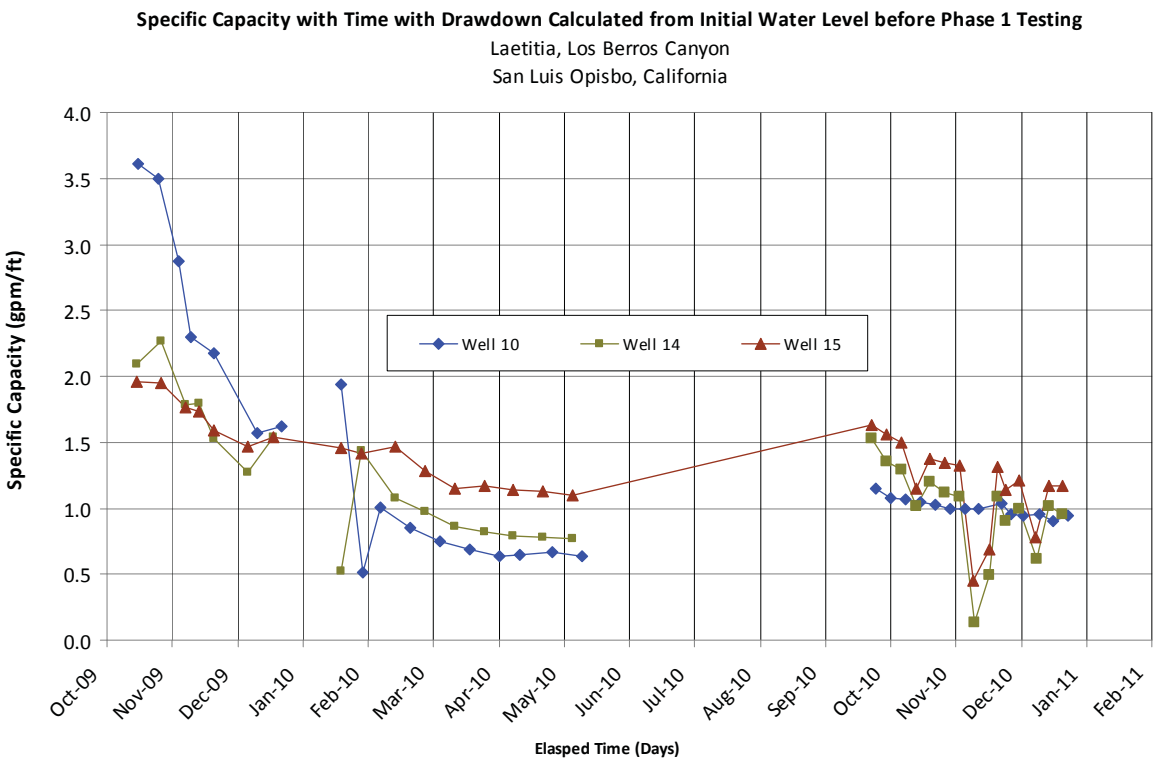
Figure E4 (Appendix E)
Well 15 Recovery
Laetitia Agricultural Cluster

Cleath-Harris Geologists

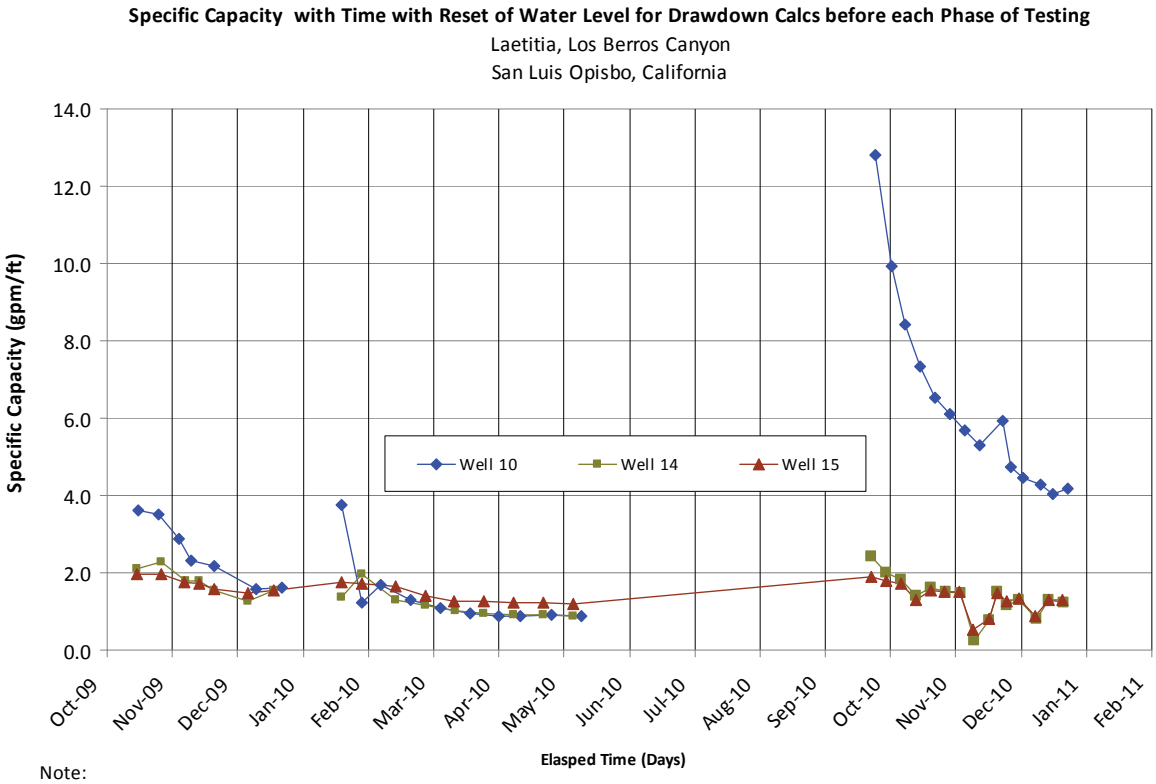
Calculations of Specific Capacity and Transmissivity from Pumping Test Data

				Relative to water level before Phase 1				Relative to water level before each Phase			
Well	Elapsed Time (Days)	Date	Flowrate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)	T ft2/d (300Q/S) (1/0.75)	Bulk K (ft/d)	Drawdown (ft)	Specific Capacity (gpm/ft)	T ft2/d (300Q/S) (1/0.75)	Bulk K (ft/d)
Well 10	Phase 1	10/12/2009									
	4	10/16/09	40	11.10	3.6	1442.7	8.0	11.10	3.6	1442.7	8.0
	13	10/25/09	50	14.31	3.5	1400.7	7.8	14.31	3.5	1400.7	7.8
	23	11/04/09	51	17.72	2.9	1149.2	6.4	17.72	2.9	1149.2	6.4
	29	11/10/09	48	21.02	2.3	919.9	5.1	21.02	2.3	919.9	5.1
	40	11/20/09	51	23.22	2.2	871.5	4.8	23.22	2.2	871.5	4.8
	60	12/11/09	46	29.23	1.6	626.9	3.5	29.23	1.6	626.9	3.5
	72	12/23/09	47	29.20	1.6	648.7	3.6	29.20	1.6	648.7	3.6
	Phase 2	01/16/10									
	4	01/20/10	80	41.32	1.9	776.5	4.3	21.27	3.8	1508.4	8.4
	14	01/30/10	17	34.02	0.5	204.1	1.1	13.97	1.2	497.0	2.8
	23	02/08/10	50	50.00	1.0	403.2	2.2	29.95	1.7	673.1	3.7
	37	02/22/10	49	57.88	0.9	340.6	1.9	37.83	1.3	521.2	2.9
	51	03/08/10	49	65.11	0.7	299.7	1.7	45.06	1.1	433.0	2.4
	65	03/22/10	48	70.62	0.7	273.2	1.5	50.57	1.0	381.6	2.1
	79	04/05/10	49	76.40	0.6	254.1	1.4	56.35	0.9	344.5	1.9
	89	04/15/10	49	75.83	0.6	256.6	1.4	55.78	0.9	348.9	1.9
	104	04/30/10	50	74.75	0.7	267.6	1.5	54.70	0.9	365.7	2.0
	118	05/14/10	48	75.66	0.6	254.8	1.4	55.61	0.9	346.6	1.9
	Phase 3	09/27/10									
	4	10/01/10	46	39.91	1.1	457.6	2.5	3.57	12.8	5120.3	28.4
	11	10/08/10	44	40.76	1.1	431.0	2.4	4.42	9.9	3973.1	22.1
	18	10/15/10	44	41.60	1.1	426.3	2.4	5.26	8.4	3369.3	18.7
	25	10/22/10	45	42.42	1.1	420.2	2.3	6.08	7.3	2933.1	16.3
	32	10/29/10	44	43.13	1.0	410.0	2.3	6.79	6.5	2605.7	14.5
	39	11/04/10	43	43.38	1.0	396.0	2.2	7.04	6.1	2440.6	13.6
	46	11/12/10	44	44.09	1.0	399.4	2.2	7.75	5.7	2271.3	12.6
	53	11/18/10	44	44.71	1.0	395.9	2.2	8.37	5.3	2114.6	11.7
	64	11/29/10	46	44.05	1.0	413.8	2.3	7.71	5.9	2365.2	13.1
	68	12/03/10	43	45.47	0.9	380.0	2.1	9.13	4.7	1892.2	10.5
	74	12/10/10	44	46.18	0.9	378.5	2.1	9.84	4.4	1776.4	9.9
	82	12/17/10	45	46.74	1.0	381.3	2.1	10.40	4.3	1714.1	9.5
	88	12/24/10	42	46.82	0.9	359.8	2.0	10.48	4.0	1607.0	8.9
	95	12/30/10	44	46.91	0.9	375.5	2.1	10.57	4.2	1666.6	9.3
Well 11	Phase 1	10/12/2009									
	4	10/16/09	37	10.59	3.5	1382.4	7.3	10.59	3.5	1382.4	7.3
	13	10/25/09	45	10.83	4.2	1660.7	8.7	10.83	4.2	1660.7	8.7
	23	11/04/09	45	11.34	4.0	1587.4	8.4	11.34	4.0	1587.4	8.4
	29	11/10/09	45	12.67	3.5	1418.2	7.5	12.67	3.5	1418.2	7.5
	40	11/20/09	44	12.03	3.7	1471.2	7.7	12.03	3.7	1471.2	7.7
	60	12/11/09	43	15.70	2.7	1097.4	5.8	15.70	2.7	1097.4	5.8
	72	12/23/09	43	10.08	4.3	1712.6	9.0	10.08	4.3	1712.6	9.0
	Phase 2	01/16/10									
	8	01/24/10	71	18.65	3.8			32.28			
	18	02/03/10	14	-8.72	-1.6			4.91			
	27	02/12/10	57	-1.50	-37.9			12.13			
	41	02/26/10	61	-2.00	-30.6			11.63			
	55	03/12/10	59	-9.12	-6.5			4.51			
	69	03/26/10	58	-14.99	-3.9			-1.36			
	83	04/09/10	60	-12.46	-4.8			1.17			
	97	04/23/10	59	-13.45	-4.4			0.18			
	111	05/07/10	59	-13.55	-4.3			0.08			
	125	05/21/10	60	-11.50	-5.2			2.13			
	Phase 3	09/27/10									
	7	10/04/10	43	-4.56	-9.4			-3.84			
	14	10/11/10	49	1.36	36.0			2.09			
	21	10/18/10	55	5.34	10.2			6.06			
	28	10/25/10	55	7.89	7.0			8.61			
	35	11/01/10	54	8.62	6.3			9.35			
	42	11/07/10	4	7.91	0.5			8.63			
	49	11/15/10	53	8.41	6.3			9.13			
	56	11/21/10	54	9.24	5.8			9.96			
	62	11/28/10	30	3.74	7.9			4.47			
	71	12/07/10	53	10.01	5.3			10.73			
	80	12/15/10	28	7.49	3.8			8.21			
	84	12/19/10	51	9.75	5.2			10.48			
	91	12/27/10	55	1.44	38.4			2.16			
	98	01/02/11	54	-4.71	-11.5			-3.98			

				Relative to water level before Phase 1				Relative to water level before each Phase			
Well	Elapsed Time (Days)	Date	Flowrate (gpm)	Drawdown (ft)	Specific Capacity (gpm/ft)	T ft2/d (300Q/S)(1/0.75)	Bulk K (ft/d)	Drawdown (ft)	Specific Capacity (gpm/ft)	T ft2/d (300Q/S)(1/0.75)	Bulk K (ft/d)
Well 14	Phase 1	10/12/2009									
	3	10/14/09	49.7	23.7	2.1	837.3	2.3	23.72	2.1	837.3	2.3
	15	10/26/09	50.4	22.3	2.3	906.4	2.5	22.25	2.3	906.4	2.5
	26	11/07/09	49.4	27.7	1.8	712.3	2.0	27.74	1.8	712.3	2.0
	33	11/13/09	49.6	27.5	1.8	719.8	2.0	27.54	1.8	719.8	2.0
	40	11/20/09	51.6	33.8	1.5	611.5	1.7	33.77	1.5	611.5	1.7
	56	12/07/09	50.7	39.9	1.3	507.4	1.4	39.95	1.3	507.4	1.4
	68	12/19/09	49.8	32.3	1.5	616.9	1.7	32.28	1.5	616.9	1.7
	Phase 2	01/16/10									
	4	01/20/10	7.8	15.0	0.5	207.5	0.6	5.67	1.4	550.4	1.5
	14	01/30/10	50.3	35.2	1.4	572.6	1.6	25.79	2.0	780.5	2.2
	30	02/15/10	58.3	54.3	1.1	429.4	1.2	44.92	1.3	518.9	1.4
	44	03/01/10	59.2	60.9	1.0	388.6	1.1	51.58	1.1	459.2	1.3
	58	03/15/10	56.9	65.8	0.9	346.3	1.0	56.40	1.0	403.8	1.1
	72	03/29/10	57.2	69.5	0.8	329.4	0.9	60.11	1.0	380.8	1.1
	86	04/12/10	58.3	74.1	0.8	314.6	0.9	64.73	0.9	360.1	1.0
	100	04/26/10	58.4	74.5	0.8	313.6	0.9	65.15	0.9	358.7	1.0
	114	05/10/10	58.5	76.3	0.8	306.4	0.9	66.97	0.9	349.3	1.0
	Phase 3	09/27/10									
	2	09/28/10	40.6	26.6	1.5	610.9	1.7	16.75	2.4	969.8	2.7
	9	10/06/10	41.5	30.6	1.4	543.0	1.5	20.72	2.0	801.0	2.2
	16	10/13/10	43.5	33.5	1.3	518.4	1.4	23.69	1.8	733.8	2.0
	23	10/20/10	35.5	34.9	1.0	406.7	1.1	25.04	1.4	566.5	1.6
	30	10/26/10	44.2	36.9	1.2	478.7	1.3	27.10	1.6	652.6	1.8
	37	11/02/10	41.6	37.1	1.1	448.0	1.2	27.28	1.5	609.7	1.7
	44	11/09/10	41.2	37.9	1.1	435.5	1.2	28.02	1.5	588.5	1.6
	51	11/16/10	3.2	23.1	0.1	55.3	0.2	13.30	0.2	96.2	0.3
	58	11/24/10	13.5	27.3	0.5	198.1	0.6	17.49	0.8	309.6	0.9
	62	11/27/10	39.7	36.4	1.1	435.7	1.2	26.58	1.5	597.0	1.7
	66	12/01/10	41.5	45.7	0.9	363.1	1.0	35.90	1.2	462.6	1.3
	72	12/07/10	43.2	43.4	1.0	397.9	1.1	33.56	1.3	514.6	1.4
	80	12/16/10	25.0	40.6	0.6	246.2	0.7	30.80	0.8	324.9	0.9
	86	12/21/10	45.9	45.0	1.0	408.0	1.1	35.16	1.3	522.3	1.5
	93	12/28/10	42.1	44.1	1.0	382.1	2.1	34.25	1.2	491.9	1.4
Well 15	Phase 1	10/12/2009									
	3	10/14/09	35.4	18.1	2.0	782.6	3.9	18.08	2.0	782.6	3.9
	15	10/26/09	34.7	17.8	1.9	779.2	3.9	17.82	1.9	779.2	3.9
	26	11/06/09	35.7	20.2	1.8	706.3	3.5	20.22	1.8	706.3	3.5
	33	11/13/09	36.1	20.9	1.7	691.5	3.5	20.91	1.7	691.5	3.5
	40	11/20/09	35.0	21.9	1.6	637.8	3.2	21.94	1.6	637.8	3.2
	56	12/06/09	34.8	23.8	1.5	584.8	2.9	23.79	1.5	584.8	2.9
	68	12/19/09	34.7	22.6	1.5	613.5	3.1	22.59	1.5	613.5	3.1
	Phase 2	01/16/10									
	4	01/20/10	37.0	25.3	1.5	584.3	2.9	20.97	1.8	706.3	3.5
	14	01/30/10	36.0	25.3	1.4	568.1	2.8	20.95	1.7	686.8	3.4
	30	02/15/10	59.1	40.2	1.5	587.7	2.9	35.86	1.6	659.5	3.3
	44	02/28/10	59.7	46.7	1.3	511.7	2.6	42.31	1.4	564.6	2.8
	58	03/14/10	57.5	49.9	1.2	460.3	2.3	45.56	1.3	504.5	2.5
	72	03/29/10	58.8	50.5	1.2	465.8	2.3	46.15	1.3	510.0	2.6
	86	04/11/10	58.9	51.7	1.1	455.9	2.3	47.30	1.2	498.1	2.5
	100	04/25/10	58.5	51.7	1.1	452.8	2.3	47.27	1.2	494.8	2.5
	114	05/10/10	59.4	54.0	1.1	440.1	2.2	49.64	1.2	478.9	2.4
	Phase 3	09/27/10									
	2	09/28/10	42.7	26.2	1.6	651.6	3.3	22.53	1.9	758.0	3.8
	9	10/05/10	43.5	27.9	1.6	623.0	3.1	24.23	1.8	717.6	3.6
	16	10/12/10	42.0	28.0	1.5	600.2	3.0	24.34	1.7	690.9	3.5
	23	10/19/10	36.4	31.8	1.1	458.4	2.3	28.09	1.3	518.5	2.6
	30	10/26/10	43.7	31.9	1.4	548.4	2.7	28.22	1.5	619.9	3.1
	37	11/02/10	44.0	32.8	1.3	535.6	2.7	29.16	1.5	603.2	3.0
	44	11/09/10	43.4	32.7	1.3	530.9	2.7	29.03	1.5	598.2	3.0
	50	11/15/10	10.3	22.7	0.5	180.6	0.9	19.02	0.5	215.5	1.1
	58	11/24/10	17.9	26.2	0.7	273.5	1.4	22.53	0.8	318.1	1.6
	62	11/27/10	44.1	33.5	1.3	526.0	2.6	29.83	1.5	590.9	3.0
	66	12/01/10	43.3	37.9	1.1	457.4	2.3	34.18	1.3	506.6	2.5
	72	12/07/10	44.1	36.5	1.2	482.8	2.4	32.87	1.3	536.8	2.7
	80	12/15/10	28.1	35.9	0.8	313.4	1.6	32.24	0.9	349.1	1.7
	86	12/21/10	43.6	37.4	1.2	466.0	2.3	33.72	1.3	516.9	2.6
	93	12/28/10	42.81	36.8	1.2	465.8	2.3	33.08	1.3	517.7	2.6



Note:
Well 11 is not included because recharge
exceeded drawdown over the course of testing



Note:
Well 11 is not included because recharge
exceeded drawdown over the course of testing