From:	Bennett, Jim
To:	Gungle, Ashley
Cc:	Hingtgen, Robert J
Subject:	Soitec - Scoping for Groundwater Investigation, Pine Valley Mutual Water Company
Date:	Monday, September 30, 2013 3:58:00 PM
Attachments:	Pine South1.xls Pine North1.xls PV Water Demand.xls POD_08-016_Landscape_Design_Manual.pdf Grapes Water Uses.xls Subchapter 2 - boutique winery ordinance.docx Pine Valley Well No.5 Production, Water Level Information.xlsx PDS2004-3200-20857-PDS-PLN-Groundwater Report1.pdf Pine Valley North - Private Well Historical Water Levels.xlsx PVMWC Groundwater Scoping.pdf Well No. 5 Hydrograph.xls

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Ashley,

I have scoped the groundwater investigation for Soitec's proposal to utilize up 16 acre-feet of groundwater from PVMWC Well No.5. The following attachments are to aid DUDEK in the investigation:

1. Pine South Water Balance Calculations
2. Pine North Water Balance Calculations
3. PV Water Demand – for Pine South and Pine North
4. Landscape Design Manual excerpt of ETo calculated for Pine Valley
5. Grapes Backup Calculations
6. Excerpt from the County Boutique Winery Ordinance that provides additional insight into water demand for grapes.
7. PVMWC Well No.5, info used to develop specific capacity rough estimate.
8. TPM 20857 Well Test Report
9. Pine North – Private Wells Water Historic Water Levels
10. **Groundwater Scoping Letter for this project**
11. Well No. 5 Hydrograph highlighting spring water level recoveries.

One other issue that I didn't mention in the scoping letter is the issue of nitrate and Well No. 5. Please be sure to document the nitrate problem this well reportedly has had (according to conversation I had with PVMWC) and the time that the well has been not pumping. This can be added to the existing conditions section.

Please forward this information to DUDEK.

Thank you,

Jim Bennett, P.G. #7707, CHG#854
Groundwater Geologist

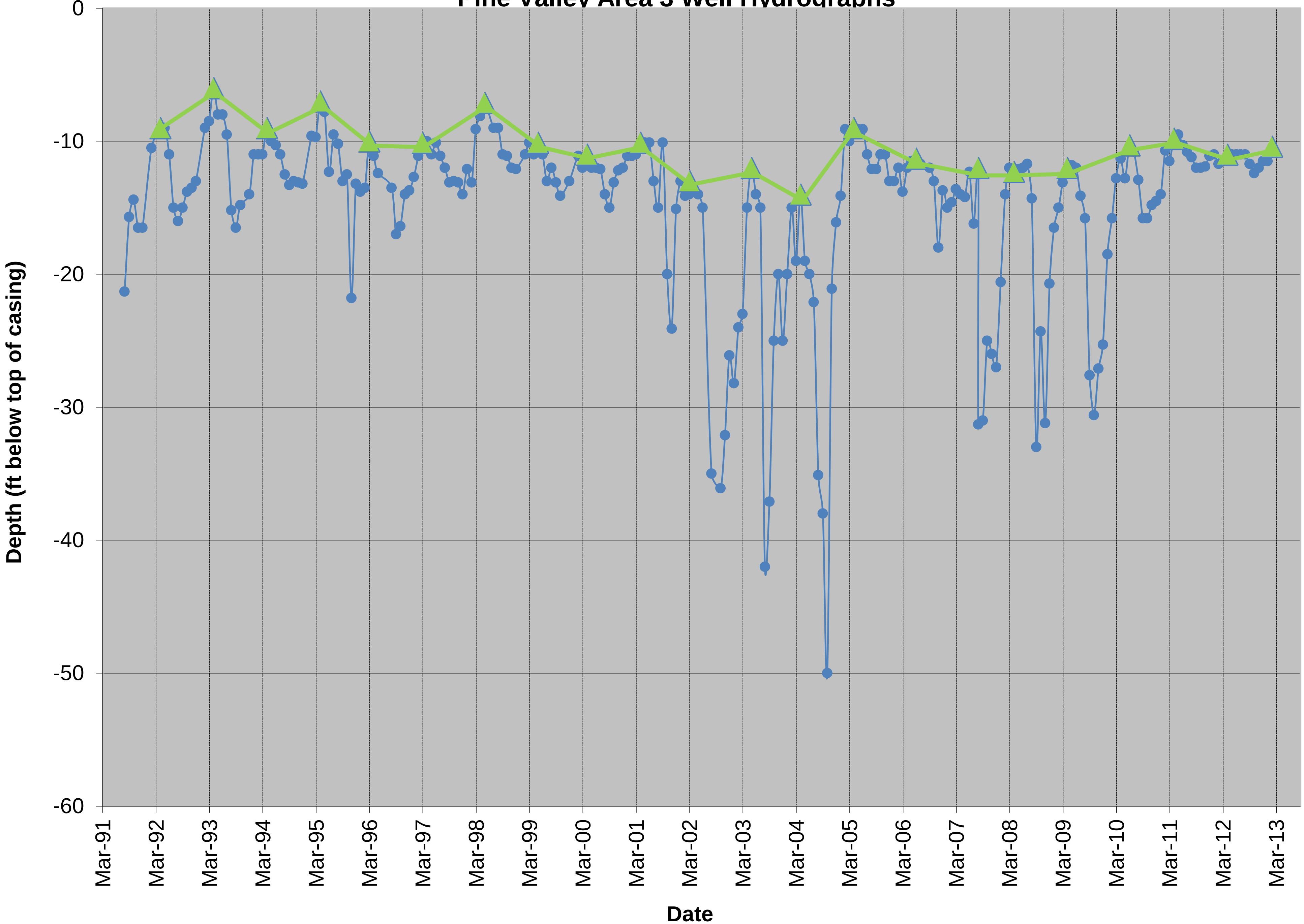
County of San Diego
Planning & Development Services
5510 Overland Avenue, Suite 110, San Diego, CA 92123

Phone: 858-694-3820 Fax: 858-694-3373

PVMWC Well No. 5

Figure 2-53: Pine Valley Community Planning Group

Pine Valley Area 3 Well Hydrographs



Various crops produced in the County of San Diego have differing water needs. Crop coefficients are used by growers and scientists to estimate and manage irrigation methods for specific crops. Information about efficient crop watering, timing, and methods has not been calculated to develop a crop coefficient or standard for wine grape crops in the San Diego region. However, the County of San Diego estimates that water use for irrigation could be as high as 2.1-2.9 AF per acre per year (684,300-945,000 gallons). The actual amount of water used varies throughout the year. For example, most irrigation would occur during the growing season (mid-April to October), and it is expected that the vines would not be watered from November through February.

According to the Farm and Home Advisors Office, grape growers use less water than the above numbers indicate. In a comparison between grapes and avocados, avocados (a water-intensive crop) can require up to 3-4 AF per year per acre (977,500-1,303,400 gallons) for optimum production. On the opposite end of the spectrum, grapes (not a water-intensive crop), require about 1.5 AF per year per acre (488,800 gallons) (Bender pers. com. 2009).

Existing winery operators were also consulted about their water use. Irrigation for crops is actually less than one AF per year per acre (50,000 to 300,000 gallons). The range of water use at existing wineries is explained by the variation in elevation, rainfall, and soil conditions. Further, studies have shown that vines growing under water “stress” or deficit conditions can often produce fruit with superior winemaking characteristics. A waterdeficit condition causes the production of a chemical which signals the plant to switch from foliage making to survival mode, or fruit growth (Goode 2006). This is an important characteristic in a region with increased scarcity of and competition for water resources. In addition to crop irrigation, water is used for wine production, cleaning, and visitor services (i.e., restrooms).

The peak months of water use in wine processing are the harvest season (August through September). During this time, water use in wine production is estimated at six gallons of water for every gallon of wine produced (County of Napa pers. com. 2009). Local water use for wine production could be as high as 10 gallons of water for each gallon of wine produced (McGeary pers. com 2009).

County of San Diego, Planning & Development Services
Project Planning Division

Memorandum

TO:	Ashley Gungle, Project Manager
FROM:	Jim Bennett, Groundwater Geologist
SUBJECT:	Groundwater Scoping, Pine Valley Groundwater Investigation; Rugged Solar Project, Project Number PDS2013-3300-12-007
DATE:	September 30, 2013

GROUNDWATER INVESTIGATION – PINE VALLEY MUTUAL WATER COMPANY

Project Specific Information: The following draft project description was provided by the applicant's hydrogeologist on September 27, 2013:

Rough Acres Water Company, Inc. (Rough Acres) proposes purchasing up to 16 acre feet of water from the Pine Valley Mutual Water Company (PVMWC) for use during the construction phase of the Rugged Solar Farm Project (Project). The PVMWC owns and operates 10 water supply wells that serve approximately 675 residences and 20 commercial entities in and around Pine Valley, California. Wells No 1 and No 10 are the primary production wells, supplying approximately 77% of the total water produced by the PVMWC well field. The other wells in the well field are rotated into service on an as needed basis.

The PVMWC has agreed to dedicate well No 5 to the Project for the 60 day peak construction period. Based on the past performance of this well and the anticipated total demand on the well field, the PVMWC anticipates being able to supply up to 16 acre feet from this well over the 60 day period. Wells No 1 and 10 will continue to supply the bulk of the water to the PVMWC customer base and the remaining wells will continue to be used as needed to meet any additional demand during the 60 days that well No 5 will be dedicated to the project.

General Information: The project is proposing to use groundwater. Based on the potential impacts the project may have on groundwater resources, a groundwater investigation is required to evaluate the significance of potential impacts. The groundwater investigation report must be completed using the County's approved Guidelines for Determining Significance and Report Format and Content Requirements which can be found on the World Wide Web at http://www.sdcounty.ca.gov/PDS/docs/GRWTR-Guidelines.pdf (Guidelines) http://www.sdcounty.ca.gov/PDS/docs/GRWTR-Report-Format.pdf (Report Formats).

The project is not subject to the Groundwater Ordinance. The Groundwater Ordinance exempts projects in which water is to be obtained from a Water Service Agency.

Groundwater Investigation Requirements: A Draft Update Pine Valley Cumulative Groundwater Study, prepared by DUDEK, dated July 23, 2013 with a proposal to pump 38 acre-feet of groundwater from the PVWMC was provided for review by the County. County comments provided to DUDEK on August 20, 2013 indicated the report does not adequately evaluate potential impacts to groundwater resources in Pine Valley to meet County requirements. It was further stated that any pumping of groundwater above historic annual average groundwater pumping by PVMWC (defined as 270 acre-feet per year based on the past 12 years of pumping) would require additional groundwater investigation to evaluate these additional impacts to the PVMWC well portfolio and other groundwater dependent well users in this basin. On September 25, 2013, the applicant indicated in a meeting with the County that they would like to propose pumping groundwater at rates above historic annual average groundwater pumping. Therefore, this groundwater investigation is being scoped following County Report Formats as follows:

1.0 INTRODUCTION

Discuss the Purpose of the Report (Section 1.1), Project Location and Description (Section 1.2), and Applicable Groundwater Regulations (Section 1.3). Under purpose, please indicate that this groundwater investigation is being provided to evaluate the one time use of up to 16 acre-feet of groundwater from the PVMWC and the results should not be relied upon for use for any other groundwater proposal subject to County review in Pine Valley. The project description must document the maximum anticipated production for the project and which wells are anticipated to be utilized. All environmental review will then be based on maximum anticipated production and the wells identified. Under applicable groundwater regulations, please include the County Guidelines for Determining Significance – Groundwater Resources and the Biological Guildelines and list the 50% Reduction of Groundwater in Storage, Well Interference, and Groundwater Dependent Habitat guidelines. For the Groundwater Dependent Habitat guidelines, the threshold shall be modified to take into account the unique situation that this well has and will continue to be used by the PVMWC. Therefore, the threshold shall be if pumping by this project exceeds historical baseline conditions at Well No. 5 (or any other wells proposed for use), this would be considered a potentially significant impact. Further state the project is not subject to the Groundwater Ordinance due to water being provided by a Water Service Agency as defined within the Ordinance. Based on the location of private offsite wells to be included in the well interference analysis, it is possible that the fractured rock and/or alluvial well interference guideline could be applicable.

2.0 BACKGROUND AND EXISTING CONDITIONS

Since a groundwater investigation was just completed for Pine Valley in 2010, the typical sections required within the Report Formats are not required. Your July 23, 2013 letter report provides all the necessary information to be included in this section of the report. Please format the information contained within your July 23, 2013 letter report as follows:

Summarize the findings of the Pine Valley Cumulative Groundwater Study under Previous Work (Section 2.1). This discussion can be imported from your July 23, 2013 letter report under the Section titled Previous Work including historical groundwater levels, and long-term groundwater availability analysis. Include the County study as an attachment to this investigation. Under Existing Conditions (Section 2.2) include Groundwater Production Volumes (Section 2.2.1) of the PVMWC well from 1999 to the present, Groundwater Levels (Section 2.2.2). Please include figures from your letter report including production volumes and water levels of select wells including well 5. Also, provide a table that summarizes the current water level of each well, the historic high (shallow) groundwater level, and the historic low groundwater level. Please use this table in the discussion to describe where Pine Valley is in terms of historical high and low groundwater levels.

3.0 WATER QUANTITY IMPACT ANALYSIS

50% Reduction of Groundwater in Storage (Section 3.1 (include subsections 3.1.1. through 3.1.5. as specified in the Report Formats). This includes Pine North and Pine South basins. The County has already conducted a 34 year water balance analyses of both basins that covered the period of 1971 to 2005. Spreadsheets from both basins will be provided to you with analysis already performed. Additionally, an updated water demand spreadsheet will be provided with updated demands from each basin since the 2010 study. It should be noted in the analysis that the PVMWC is intending to provide all water from Well No. 5 within the Pine North basin, but Pine South basin is also being analyzed in case the water company at the time it delivers the water for water management reasons needs to extract from wells in Pine South. The impacts analysis shall include the following three scenarios:

1. Existing Conditions Groundwater Demand (this will include discretionary projects in process and recently approved).
2. Existing Conditions plus this project. Since the project intends on pumping groundwater as a one-time event, to evaluate a worst-case scenario, 16 acre-feet of groundwater production was added to the month with the lowest volume of groundwater in storage in the 34 year period analyzed. For Pine South, this was January 1991. For Pine North, this was November 2002.
3. Current General Plan Buildout

Long-Term Groundwater Availability (Section 3.1.2.4): In addition to the water balance analysis that is to be provided in this section, provide a separate analysis of groundwater drawdown and recovery from 1991 to the present in Well No. 5. A figure will be provided to you of the well hydrograph for Well No. 5 with the spring water levels for each year highlighted. As you will note, the well recovers each year to within 6 to 14 feet of the measuring point within the well. Please include in the analysis the amount of groundwater that was pumped from Well No. 5 on a year-by year basis, precipitation that occurred, the amount of drawdown that occurred, and the recovery during the winter and spring months. Please describe the setting of the well adjacent to Pine Creek and Pine Creek’s influence on recovery within this well. Then discuss the existing condition within Well No. 5 and what anticipated groundwater conditions would look like in the Spring of 2015 after allowing for pumping 16 acre-feet of groundwater from this well in the year 2014. Include a range of recovery water levels based on a wet, average, or dry winter.

Direct Impacts Analysis, Well No. 5 (Section 3.2). Due to the unique opportunity of having quite a bit of historical data on Well No. 5 and wells in the surrounding area, aquifer testing will not be required. The Well Testing section of the Report Formats has been modified. This will include looking at the production capacity of Well No. 5 (Section 3.2.1) and evaluating well interference (Section 3.2.2) on any nearby private well users.

Well No. 5 Production Capacity (Section 3.2.1.): Please evaluate what the production capacity of Well No. 5 is by looking at historical pumping data, static water levels, and pumping water level data. The highest month of well production by PVMWC for Well No. 5 was June 2004 where they produced 1,210,608 gallons of water from the well. The static water level was measured at 22.1 feet bgs and the pumping water level was 99 feet bgs. Therefore, by utilizing these numbers you can extrapolate a rough estimate of specific capacity of the well at 0.364 gallons per minute/foot of drawdown during this month of pumping. The current water level in Well No. 5 during the summer of 2013 is somewhere around 11 feet bgs. Therefore, there is a maximum drawdown possible of about 114 feet before hitting the pump intake at 125 feet bgs. To calculate the maximum yield you multiply the amount of maximum drawdown that could occur times the specific capacity. In this case, this would result in the following: Maximum Yield = 114 feet x 0.3644 = 41.5 gallons per minute. This would allow for a maximum pumping rate of 41.5 gallons per minute which could produce a maximum of 5.5 acre-feet per month. The project needs 16 acre-feet of groundwater in which Well No. 5 would take at least 3 months to produce this amount of water while being pumped at maximum capacity throughout this period. Since this represents a maximum rate of production which is anticipated to go to the pump intake, it may not be possible to sustain this rate for a 3 month period. If you want to provide further analysis using historical pumping data, static water levels, and pumping water level data, please consult with the County before proceeding. The limitations of this analysis should be pointed out including the static water levels may not truly be static (this may have been a recovery water level).

Well No. 5 Well Interference Analysis (Section 3.2.2): Please evaluate well interference from Well No. 5 on all nearby private wells and groundwater dependent habitat. Please coordinate with County staff on appropriate guideline (fractured rock vs. alluvial). Under methodology (Section 3.2.3.), please include total drawdown within Well No. 5 that is anticipated to occur, the estimated specific capacity, the estimated transmissivity by utilizing the specific capacity data to obtain an estimate, and potential offsite well interference utilizing this information. Include a figure with all PVWMC wells and any offsite private wells. The well interference calculations shall focus on the closest offsite private well user. According to County records (which need to be further verified during the investigation), the closest private well user is located 620 feet north of Well No. 5. The County has historical water level information from this well in its database and a well test report that was completed for the Kenyon TPM 20857. Both will be provided to you. The offsite well interference calculation should consider pumping at the maximum production rate of Well No. 5 (no more than 5.5 acre-feet per month). After calculations have been completed, please provide additional discussion based on historical water level information that Pine Creek is a recharge boundary from wells across the creek. Please compare water levels from Well No. 5 and other PVMWC wells to the wells across the creek at the Kenyon TPM and another well about 2,200 feet north of Well No. 5 the County has monitored since 1982. Lastly, under methodology, please provide procedures and analysis of impacts to groundwater dependent habitat. It is suggested that development of historical drawdown underneath the groundwater dependent habitat adjacent to Well No. 5 be compared to theoretical drawdown that would occur as a result of pumping. The CEQA threshold for impacts to biological habitat would be if you exceed historical baseline conditions of pumping. Under Sections 3.2.4, 3.2.5, and 3.2.6, include Significance of Impacts Prior to Mitigation, Mitigation Measures and Design Considerations, and Conclusions. For production capacity, this is not a CEQA issue and therefore discussion should be limited to Design Considerations and Conclusions. If analysis shows that pumping 16 acre-feet in two months is not realistic from Well No.5, the design considerations and conclusions should include recommendations and conclusion of an alternative plan to alter the project description in order to meet project objectives.

Lastly, include Summary of Project Impacts and Mitigation (Section 4.0), References (Section 5.0), and List of Preparers and Persons and Organizations Contacted (Section 6.0).

The Memorandum of Understanding must be executed by the applicant and consultant and subsequently submitted with the first iteration review.

Water Efficient Landscape Design Manual

County of San Diego

Department of Planning and Land Use

DPLU (02/10)

APPROVAL

I hereby certify that this **Water Efficient Landscape Design Manual** has been considered and approved by the Director of Planning and Land Use on this 16th day of February, 2010, to be used in conjunction with the County's Water Conservation in Landscaping Ordinance, County Code, Title 8, Division 6, Chapter 7.

ERIC GIBSON
Director of Planning and Land Use

APPENDIX A
REFERENCE EVAPOTRANSPIRATION (ETO) DATA

Reference Evapotranspiration (ETo) Table

County Classification		CIMIS Station/ Location	Annual ETo	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Coastal	Torrey Pines	46.4	1.8	2.2	3.4	4.5	5.3	5.7	5.9	5.6	4.5	3.4	2.4	1.8
		Oceanside	48.7	2.1	2.4	3.7	4.8	5.4	5.7	6.0	6.0	4.6	3.6	2.4	2.0
		Chula Vista*	44.2	2.2	2.7	3.4	3.8	4.9	4.7	5.5	4.9	4.5	3.4	2.4	2.0
	Coastal Corridor	San Diego	46.5	2.1	2.4	3.4	4.6	5.1	5.3	5.7	5.6	4.3	3.6	2.4	2.0
		Miramar	46.4	1.8	2.2	3.4	4.5	5.3	5.7	5.9	5.6	4.5	3.4	2.4	1.8
	Inland	Otay Lake	50.5	1.3	1.9	3.3	4.7	5.9	7.0	7.8	6.8	5.2	3.5	2.0	1.2
		Santee*	51.1	2.1	2.7	3.7	4.5	5.5	6.1	6.6	6.2	5.4	3.8	2.6	2.0
		Ramona	51.6	2.1	2.1	3.4	4.6	5.2	6.3	6.7	6.8	5.3	4.1	2.8	2.1
	Mountain	Escondido	57.0	2.5	2.7	3.9	5.3	6.1	6.9	7.3	7.0	5.5	4.2	3.0	2.5
		Pine Valley*	54.8	1.5	2.4	3.8	5.1	6.0	7.0	7.8	7.3	6.0	4.0	2.2	1.7
		Warner Springs*	56.0	1.6	2.7	3.7	4.7	5.7	7.6	8.3	7.7	6.3	4.0	2.5	1.3
	Desert	Borrego Springs	75.4	2.7	3.5	5.9	7.7	9.7	10.1	9.3	8.3	6.9	5.5	3.4	2.2

APPENDIX A
REFERENCE EVAPOTRANSPIRATION (ETO) DATA

With the exception of those locations identified with an asterisk (*), the values in the ETo table are based on the monthly average ETo data available on the California Irrigation Management Information System (CIMIS) website (http://www.cimis.water.ca.gov) as of January 6, 2010. Locations identified with an asterisk (*) are included in the State's Model Efficient Landscape Ordinance ETo Table (Appendix A) but do not have data available on the CIMIS site. For these locations, the ETo table uses the data contained in the State's ETo table.

Monthly average ETo is a long-term average of monthly ETo. The time period over which the data is averaged varies from station to station depending on how long the station has been active. The minimum time requirement was five years. Stations with less than five years of data at the time of calculation (year 2000) were assigned regional averages.

County Classification Alternative

The following classifications have been assigned by the County to the various California Irrigation Management Information System (CIMIS) zones. (See the Reference Evapotranspiration (ETo) Table above and the CIMIS Zones map below). The average annual ETo for each classification is based on the average annual ETo of the CIMIS stations within the classification. For sites within geographical areas not included in the Reference Evapotranspiration (ETo) Table above, the average annual ETo from the table below may be used. This table has also been used to calculate the Maximum Applied Water Allowance for the Application for Residential Outdoor Water Use Compliance. (See Appendix B).

Classification	Average Annual ETo (inches per year)
Coastal	46.4
Coastal Corridor	46.4
Inland	51.1
Mountain	55.9
Desert	75.4

Well 5 Groundwater Production					
	1999	2000	2001	2002	2003	2004
Jan	192610	227916	286634	329225	312589	338769
Feb	257798	344581	247064	336690	226494	566356
Mar	436436	341597	441896	306156	0	596829
Apr	342726	333518	216868	436832	92004	809299
May	501212	538994	936249	566505	357469	729046
Jun	405797	651897	320862	954874	813749	1210608
Jul	605184	550304	864965	828672	993045	883538
Aug	797241	544073	760118	993591	523076	760604
Sep	423233	114863	519636	248695	221857	694698
Oct	241604	341694	461322	192580	512829	349099
Nov	448389	112477	113838	178847	164859	0
Dec	170896	207286	525537	282146	138156	8004
Total (acre-feet)	**14.8**	**13.2**	**17.5**	**17.4**	**13.4**	**21.3**

Well No. 5 Rough Estimate of Specific Capacity

1999	2000	2001	2002	2003	2004
			0.094	0.094	0.102
			0.095	0.070	0.173
			0.086	0.000	0.182
			0.120		0.250
			0.158	0.102	0.228
		0.085		0.233	0.364
		0.267	0.291	0.354	0.273
		0.205		0.195	0.244
		0.160	0.118	0.073	0.350
		0.134	0.097	0.175	
		0.033	0.099	0.064	
		0.154	0.091	0.047	

Maximum Yield:		0.364413	Specific Capacity
		114	Maximum Drawdown
		41.5	gallons per minute
		1794659	5.5 acre-feet per month
June 2004 One Month Pumping			
Drawdown	76.9		
GPM	28.02333		
Specific Capacity:	0.364413 gpm/foot		
Current Water Level:		11	
Pump Intake		125	
Maximum Drawdown Possible		114	

Well 5 Static Water Levels						
	1999	2000	2001	2002	2003	2004
Jan	-11	-11.1	-11.1	-14.1	-24	-15
Feb	-10.1	-12	-11	-14	-23	-19
Mar	-11	-11	-10.1	-13	-15	-14
Apr	-10.1	-12	-10.1	-14	-12	-19
May	-11	-12	-10.1	-15	-14	-20
Jun	-13	-12.1	-13		-15	-22.1
Jul	-12	-14	-15	-35	-42	-35.1
Aug	-13.1	-15	-10.1		-37.1	-38
Sep	-14.1	-13.1	-20	-36.1	-25	-50
Oct		-12.2	-24.1	-32.1	-20	-21.1
Nov	-13	-12	-15.1	-26.1	-25	-16.1
Dec		-11.1	-13	-28.2	-20	-14.1

Well 5 Pumping Water Levels						
	1999	2000	2001	2002	2003	2004
Jan				-95	-101.03	-92
Feb				-96.07	-98.06	-95
Mar				-95		-90
Apr				-98		-94.06
May				-98.04	-95	-94.06
Jun			-100		-96	-99
Jul			-90	-101.03	-107	-110
Aug			-96		-99.04	-110.05
Sep			-95	-85	-95	-96
Oct			-104	-78.1	-88	
Nov			-95.03	-68	-85	
Dec			-92.02	-100.1	-88	

-74.95

Well ID	X	Y	
PIN-21	-116.530016666667	32.8388833333333	
PIN-22	-116.528208333333	32.8384083333333	
PIN-04	-116.52763400000	32.84291100000	

Well ID	Date	W_Level	Well_Pumping?
PIN-21	22-Oct-09	-25.19	No
PIN-21	14-Jan-10	-25.6	No
PIN-21	27-Jan-10	-23.6	No
PIN-21	18-Mar-10	-20.7	No

Well ID	Date	W_Level	Well_Pumping?
PIN-22	22-Oct-09	-14.72	No
PIN-22	14-Jan-10	-10	No
PIN-22	27-Jan-10	-5.6	No
PIN-22	18-Mar-10	-5.8	No

Well ID	Date	W_Level	Well_Pumping?
PIN-04	09-Apr-82	-8.5	
PIN-04	30-Jun-82	-12.1	
PIN-04	14-Sep-82	-12.9	
PIN-04	15-Dec-82	-13.4	
PIN-04	20-May-83	-13.7	
PIN-04	13-Aug-83	-14.4	
PIN-04	12-Apr-84	-15	
PIN-04	12-May-84	-15.5	
PIN-04	28-Aug-84	-15.6	
PIN-04	05-May-85	-15.3	
PIN-04	04-Jun-86	-15.1	
PIN-04	22-Dec-86	-18	
PIN-04	16-Jul-86	-17	
PIN-04	23-Dec-87	-18.7	
PIN-04	11-Apr-88	-15.8	
PIN-04	21-Jun-88	-16.2	
PIN-04	28-Aug-90	-29.1	
PIN-04	05-Aug-91	-15.65	
PIN-04	30-Oct-91	-16.6	
PIN-04	12-Dec-91	-17.3	
PIN-04	15-Apr-92	-14.4	
PIN-04	28-Jun-93	-13.85	
PIN-04	20-Oct-93	-16	
PIN-04	28-Oct-93	-16	
PIN-04	11-Mar-94	-14.2	
PIN-04	31-Aug-94	-16.5	
PIN-04	30-Dec-94	-18.4	
PIN-04	26-Apr-95	-13	
PIN-04	20-Sep-95	-15.5	
PIN-04	01-Dec-95	-16.4	
PIN-04	26-Apr-96	-14	
PIN-04	21-Aug-96	-17	

PIN-04	15-Jan-97	-19.4	
PIN-04	01-May-97	-15.6	
PIN-04	28-Aug-97	-18.4	
PIN-04	25-Nov-97	-20	
PIN-04	29-Dec-98	-13.91	
PIN-04	30-Dec-99	-18.7	
PIN-04	20-Apr-00	-15.9	
PIN-04	24-Aug-00	-19.1	
PIN-04	18-Jan-01	-21.6	
PIN-04	01-Oct-01	-20.3	
PIN-04	06-Feb-02	-23.3	
PIN-04	03-Jul-02	-27.8	
PIN-04	13-Nov-02	-31.4	
PIN-04	27-Feb-03	-32.4	
PIN-04	21-May-03	-16.3	
PIN-04	18-Aug-03	-17.9	
PIN-04	25-Nov-03	-20	
PIN-04	03-Mar-04	-16.5	
PIN-04	28-Jul-04	-21.1	
PIN-04	12-Nov-04	-17.7	
PIN-04	14-Jan-05	-13.1	
PIN-04	03-Jun-05	-13.2	
PIN-04	12-Jan-06	-16.5	
PIN-04	16-Jun-06	-14.8	
PIN-04	04-May-01		
PIN-04	25-Aug-05		
PIN-04	19-Dec-06	-20.34	
PIN-04	29-May-07		
PIN-04	13-Jun-07	-21.11	
PIN-04	23-Aug-07	-22.3	
PIN-04	31-Dec-07	-21.9	
PIN-04	04-Apr-08	-14.5	No
PIN-04	28-Jul-08	-16.1	No
PIN-04	07-Jan-09	-18.6	No
PIN-04	14-Apr-09	-14.5	No
PIN-04	21-Jul-09	-19.3	No
PIN-04	15-Oct-09	-19.2	No
PIN-04	14-Jan-10	-20.8	No
PIN-04	27-Jan-10	-14.7	No
PIN-04	18-Mar-10	-13.4	No

Table 5
Pine South Basin
Groundwater in Storage Calculations

Size (Acres)	3615
Modeled Maximum GW in Storage (AF)	2138
Modeled Average GW Recharge (AFY)	963

Scenario	Estimated GW Demand (AFY)	Estimated Average GW in Storage	Estimated Minimum GW in Storage
Existing Conditions (Includes Discretionary Permits)	323	86%	55%
*Existing Conditions (Includes Discretionary Permits) Plus Project	323	86%	54%
General Plan Buildout	428	77%	31%

Note: Future predicted change in the amount of groundwater in storage for scenarios is based upon historical precipitation from July 1971 to June 2005. Scenarios with estimated groundwater in storage at or below 50% at any time are considered to have a potentially significant impact to groundwater resources.

AF - Acre-Feet
AFY- Acre-Feet Per Year
GW - Groundwater

*Applied 15 acre-feet of water use in January 1991 which represented the lowest point of groundwater in storage in the 34-year period analyzed.

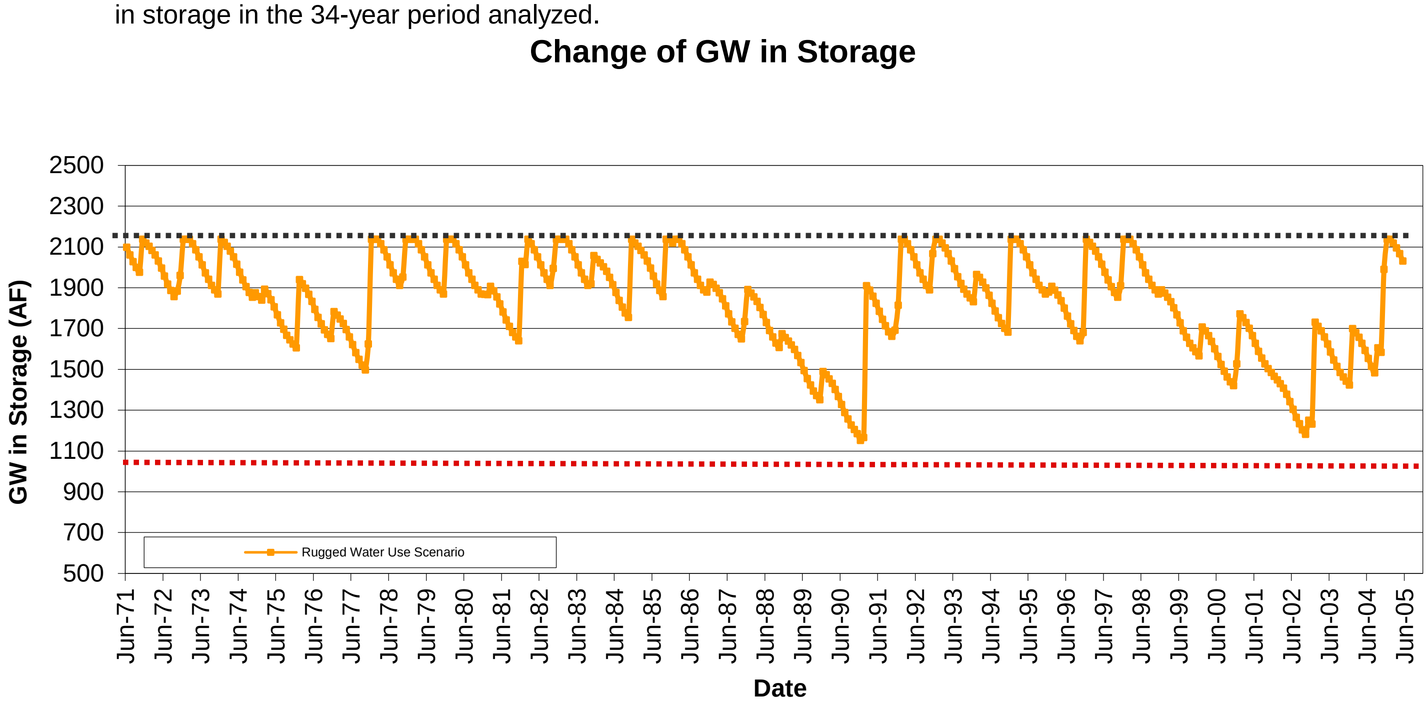


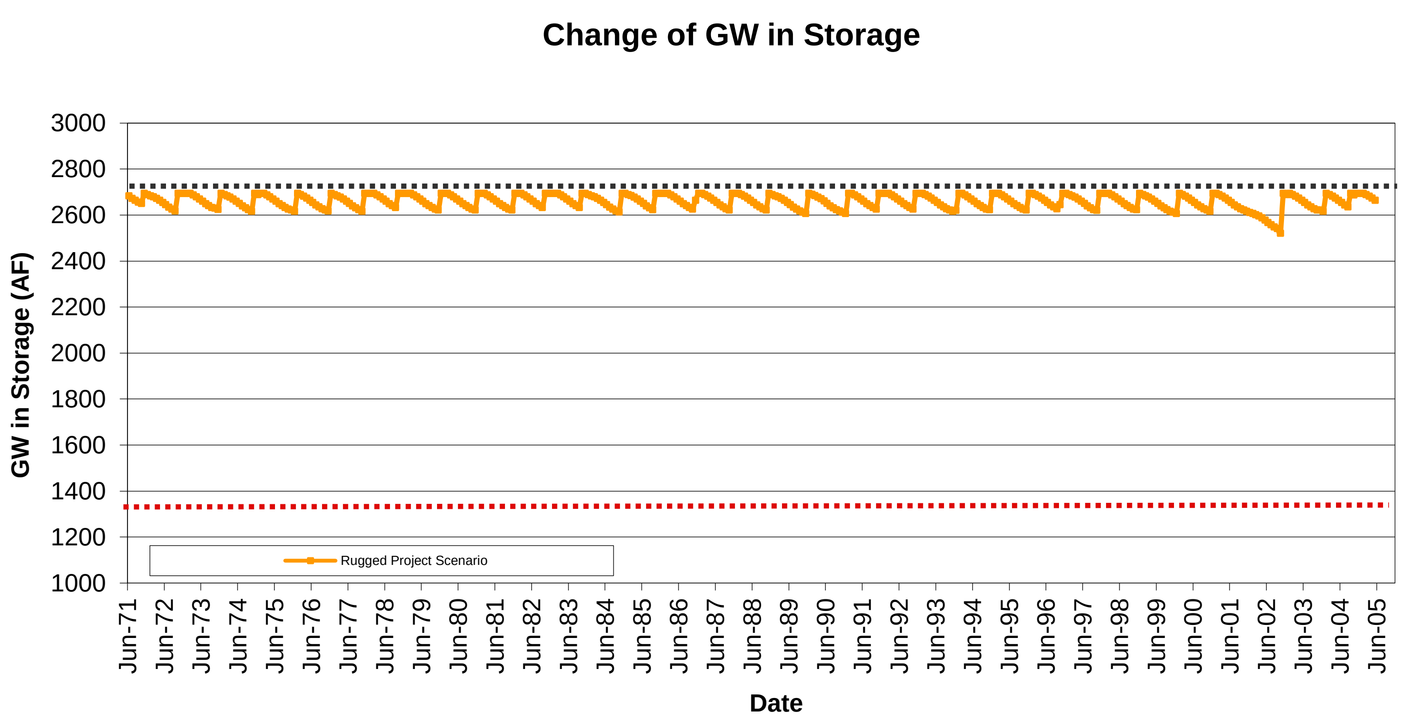
Table 6
Pine North Basin
Groundwater in Storage Calculations

Size (Acres)	15189
Modeled Maximum GW in Storage (AF)	2694
Modeled Average GW Recharge (AFY)	4462

Scenario	Estimated GW Demand (AFY)	Estimated Average GW in Storage	Estimated Minimum GW in Storage
Existing Conditions (Includes Discretionary Permits)	87	99%	94%
*Existing Conditions (Includes Discretionary Permits) Plus Project	87	99%	94%
General Plan Buildout	99	99%	93%

Note: Future predicted change in the amount of groundwater in storage for scenarios is based upon historical precipitation from July 1971 to June 2005. Scenarios with estimated groundwater in storage at or below 50% at any time are considered to have a potentially significant impact to groundwater resources.

AF - Acre-Feet
AFY- Acre-Feet Per Year
GW - Groundwater



Peterson Environmental Services

Providing Services In
Environmental Processing
and Hydrogeology

Addendum to
Well Testing Report
Prepared for the County of San Diego
Kenyon TPM 20857
February 9, 2009

By John Peterson
August 26, 2010

The well test report was previously prepared to document well testing, including a production test of 24 hours and water quality testing for an existing well located on a proposed tentative parcel map in Pine Valley California. Since the completion and approval of the report (February 9, 2009) the project has modified to add additional acreage as well as to add one additional lot. This addendum documents changes to the report due to the addition of this lot.

The project description is modified to reflect recent changes in the project. These changes are required in the following sections of the report:

1) Project description in the Executive Summary, page 3
2) Project description in the project description, page 4
3) Project description in the Pump Test Plan, Appendix A

The project description is changed to **"The project consists of a total of 21.01 acres of which four lots are proposed. The lots range in size from 2.68 to 8.63 acres with an average parcel size of 1 dwelling unit per 5.25 acres.**

Also Figure 2 has been changed to reflect this revision to the project.

With the addition of one lot, the potential impacts to riparian habitat as discussed on pages 10, 11, and 12 of the report are no longer valid. The following presents a revised analysis of potential impacts to riparian habitat:

The equation below was used to calculate predicted drawdown following 5 years of continual pumping (considering demand from 3 additional residential parcels) on groundwater within the riparian habitat:

$$s = \frac{264\,Q}{T} \times \log \frac{0.3\,Tt}{r^2 S}$$

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Where:

s=	**1.8**	predicted drawdown at edge of riparian habitat (feet)
Q=	0.93	Average pumping rate (gpm)
T	177.6	Transmissivity, (gallons per day/ft)
T	1825	time (days)
R	300	distance from pumping well (feet)
s=	0.05	storativity (dimensionless)

Reference: Cooper, H.H., Jr. and C.E. Jacobs. 1946. A Generalized Graphical Method for Evaluating Formation Constraints and Summarizing Well Field History. Transactions, American Geophysical Union 27:526-34.

Drawdown at the edge of the riparian habitat is estimated to be approximately 1.8 feet after five years of continual pumping. A conservative assumption in the equation is that no groundwater recharge occurs during that 5-year period. Based on historical groundwater levels recorded along Pine Creek from the early 1980s to the present, some groundwater recharge appears to occur in all but the driest years. Therefore, drawdown as predicted in the equation does not take into consideration recharge and may be an overestimation of potential impacts. The amount of drawdown as predicted to occur as calculated is below the 3-foot threshold contained within the County Guidelines for Determining Significance – Biological Resources. Therefore, groundwater impacts to groundwater dependent habitat as a result of the project are considered to be less than significant.

Submitted by:

John Peterson

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California Certified Hydrogeologist #90
California Professional Geologist #3713

Well Testing Report
Prepared for the County of San Diego
Kenyon TPM 20857

By John Peterson
California Registered Geologist #3713
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February 9, 2009

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Table of Contents

List of Terms, Acronyms and Abbreviations

Ac-ft	acre-feet (325,900 gallons)
ac-ft/yr/du	acre-feet per year per dwelling unit
CEQA	California Environmental Quality Act
DPLU	Department of Planning and Land Use, County of San Diego
Ft	feet
GIS	Geographic Information System
gpm	gallons per minute
Guidelines	County of San Diego, Guidelines for Determining Significance and Report Format and Content Requirements Groundwater
id	internal diameter
hp	horsepower
MCL	Maximum contaminant level
mg/l	milligrams per liter
NEPA	National Environmental Policy Act
pCi/L	pico curies per liter
TDS	Total dissolved solids (mg/l)
TOC	Top of casing (measuring point)
TPM	Tentative Parcel Map

Executive Summary

This investigation has been completed to provide the San Diego County Department of Planning and Land Use information regarding available groundwater resources for the proposed Kenyon TPM 20857. Both groundwater quantity and groundwater quality has been investigated to determine if any potential impacts to the groundwater system would result from the proposed project. The project is located just north of the community of Pine Valley California (Figure 1 and 2 and Attachment 1 located in Pump Test Plan Appendix A) and includes a planned residential subdivision of 3 single family lots on 15.88 gross acres. This results in an average overall density of 1 dwelling unit per 5.3 acres. The project will be using groundwater since no imported water is available in this area of the County and the project is located outside the district boundaries of the Pine Valley Mutual Water Company.

To accomplish this objective a 24-hour constant rate discharge test was completed on one well and water samples were collected at the end of the test for nitrate, TDS, coliform bacteria, and uranium and gross alpha. The test was completed according to the approved pump test plan dated December 17, 2008 and also the additional email direction provided by Mr. Bennett on December 29, 2008 (Appendix B). This included increasing the production rate to 6 gpm and the request to monitor the existing domestic well in the eastern portion of the project. The higher production rate was to reflect that the project would add an additional two homes sites to the area. Thus the production of 6 gpm reflects the design production yield of two additional homes proposed for the project. The completed test complied with these specific requests from Mr. Bennett.

Chapter 1

1.0 Introduction

1.1 Purpose of the Report

The purpose of this report is to: 1) document groundwater resource yield potential on the project site to determine if these resources are capable of meeting the projected water demand of the project, 2) identify any adverse potential groundwater resource impacts resulting from the proposed project, 3) evaluate groundwater quality to ensure that the groundwater resources meets all health standards, and/or mitigate significant impacts consistent with federal, state and local rules and regulations including the California Environmental Quality Act (CEQA) and the San Diego County Groundwater Ordinance #9826.

1.2 Project Location and Description

Project Location

The project is located in the unincorporated community of Pine Valley California in the central portion of San Diego County (Figures 1 and 2). The project is located just north of community of Pine Valley and is located off of Pine Creek Road.

Project Description

The project is a proposed residential subdivision of 3 single family lots on 15.88 acres (Attachment A in Pump Test Plan). This results in an average overall density of 1 dwelling unit per 5.3 acres. The project will be using groundwater since no imported water is available in this area of the County and as a result the project falls under the requirements of the San Diego County Groundwater Ordinance. The project is estimated to use 1.5 ac-ft per year based on the usage of .5 ac-ft per year per residential unit as defined within the County Groundwater Ordinance #9826.

Well sampling and a constant rate discharge test were completed in compliance with the approved *Pump Test Plan, Kenyon TPM 21107, December 5, 2008* (Appendix A). The pump test plan was reviewed and approved by Mr. Jim Bennett, County Groundwater Geologist prior to initiation of the work. As also given (email Bennett to Peterson, Appendix B) the production rate for the test was increased to 6 gpm and the nearby onsite domestic well was monitored during the test.

1.3 Applicable Groundwater Regulations

Federal Regulations and Standards

The proposed action does not include lands under Federal jurisdiction and as such the regulations contained within the NEPA do not apply.

State Regulations and Standards
Since the proposed action includes a discretionary permit application the project falls under the requirements of the California Environmental Quality Act (CEQA). Specifically Appendix G, Title 14, Chapter 3, §15000-15387 gives two questions: 1) will the project "***violate any water quality standards or waste discharge requirements***?" and 2) will the project "***substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g. the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted***)".

Specific direction has been provided by the County of San Diego within the Guidelines to address these issues from the CEQA Guidelines. This report has been completed following those directions.

County Regulations and Standards
Within the County of San Diego groundwater regulations are contained within the San Diego County Groundwater Ordinance #9826. Since the proposed project will be using groundwater, the action falls under the regulations contained within the Ordinance with specific reference to Section 67.722 B (2) where the following finding must be made for the project:

> "***That groundwater resources are adequate to meet the groundwater demands of the project***". (County of San Diego, 2007)

As identified within the Guidelines (Section 4.1 pages 22 to 24) the threshold for determining significance is:

> "***For proposed projects in fractured rock basins, a soil moisture balance, or equivalent analysis, conducted using a minimum of 30 years or precipitation data, including drought periods, concludes that at any time groundwater in storage is reduced to a level of 50% or less as a result of groundwater extraction.***"

Also the Ordinance identifies specific minimum parcel sizes for residential density (Section 67.722 A). These density requirements as identified within the County Groundwater Limitations Map list the project as having greater than 21 inches of average annual rainfall. This rainfall value results in a minimum parcel size of 4 acres (County Groundwater Ordinance Section 67.722 A 1). The proposed project has an average parcel size of 1 dwelling unit per 5.3 acres with a minimum parcel size of 2.68 gross acres. Section 67.722 A. 2 allows for lot area averaging to decrease the minimum parcel size dependent on three findings. These include:

a. That the overall average density of the project does not exceed the minimum parcel size of 4 acres. The design of the project complies with this requirement.
b. No proposed lot is less than 67% of the required minimum lot size. With the minimum parcel size of 4 acres this would require that all lots are no smaller

than 2.68 acres (4 acres x .67 = 2.68 acres). The project complies with this requirement.

c. The Director has reviewed and approved the lot density and water resource distribution and project shall not be allowed which place smaller lots in dry areas of the subdivision. This finding has been made by the Director.

The Ordinance also identifies specific requirements (Section 67.722 C) for residential well tests. As required by the Ordinance one well was pump tested on the project for water quality and well yield parameters. The selection of the well site for this yield test was approved by Mr. Jim Bennett, San Diego County Groundwater Geologist prior to testing. The well was pump tested in compliance with the Guidelines for Performing Residential Well Tests. Also as required by the Guidelines a projection of well drawdown to 5 years of continuous production has been completed for this investigation.

Chapter 2

2.1 Well Testing

2.1.1 Guidelines for the Determination of Significance

The project is proposing individual residential wells. As a result according to the Guidelines (page 18) the following thresholds apply:

1. ***Proposed projects requiring groundwater resources for uses associated with single-family residences require well production during the well test to be no less than 3 gpm for each well tested. Proposed projects that cannot meet this requirement will be considered to have a significant impact.***
2. ***Where analysis of a residential well test indicates that greater than 0.5 feet of residual drawdown is projected, the project will be considered to have a significant impact.***
3. ***The analysis of the residential well test must indicate that the amount of drawdown predicted to occur in the well after five years of continual pumping at the rate of projected water demand (a) will not interfere with the continued production of sufficient water to meet the needs of the anticipated residential use(s) and (b) must be less than the saturated depth of water above the pump intake or 100 feet, whichever is less. (The pump intake is assumed to be 50-feet above the bottom of the well). Proposed projects that cannot meet this guideline will be considered to have a significant impact.***

2.2.2 Methodology

As identified by the Mr. Jim Bennett one well, located on the southwestern edge of the project on Lot #3 was selected to be tested for groundwater yield. The well was tested according to the directions provided within the Guidelines and subsequent directions provided by Mr. Bennett (Appendix B).

2.2.2.1 Well Test Description

The well was pump tested for 24 hour period at an average discharge rate of 6.8 gpm. Over the course of the test 9,835 gallons were produced. Recovery was monitored via an installed data logger for 5,739 minutes or for almost 3 days. The test and result are summarized below.

2.2.2.2 Testing Summary

The well was constructed in the southwestern edge of the proposed project on Lot #3 (see Figure 2) at an elevation of approximately 3,662 feet. The well was completed by Franks Well Drilling which is located in Quatay California in early December 2008 (see California Well Log within the pump test plan, Appendix A). The well was drilled to 480 feet with a 20 foot annular seal and with a 4.5 inch PVC casing to total depth. The well log reports soil and sand/gravel to 60 feet, loose white granite to 160 feet and white granite from 160 to total depth of 480 feet. The drillers log does not state a static water level but gives an estimated well yield of 12+ gpm.

The well was set up on Tuesday January 6, 2009 using a test submersible pump (with foot valve to prevent backflow) installed to an approximate depth of 440 feet. A 1 inch PVC sounding tube (set to 400 feet) was placed in the well to allow for the installation of a Global Water Data Logger to collect water level measurements during the test. A ¾ inch water flow meter was calibrated to ensure accurate water production data and a gate value was installed to regulate flow rate during the test. At the time of installation the meter had a total cumulative flow value of 1707.7 cubic feet. Prior to any production, groundwater depth, as measured from the top of the PVC sounding tube, was 25.9 feet (measured by electrical water level indicator). The sounding tube was set 3.0 feet above ground surface, and all measured water levels during the test were measured from the top of the sounding tube. Following installation of the equipment the well was turned on to check the installation and to calibrate the flow rate to 6.5 gpm. Also chlorine was added to the well at this time to disinfect the well prior to the test. A total of 287 gallons of water was produced to complete this task (a portion of which was recirculated back down the well to allow for full disinfection of the well). This resulted in a meter reading at the beginning of the constant discharge test of 1707.7 cubic feet.

Also the nearby onsite domestic well was measured for static water level (on Tuesday January 6, 2009). A measurement of 7.7 feet below TOC was observed. At the same time the power was turned off for the well to ensure that the well was off-line during the production testing that was scheduled to begin the next day.

The constant rate discharge test began at 9:22 am on Wednesday January 7, 2009. Prior to initiation of the test static water level was monitored with the same equipment and was recorded at 25.9 feet below top of sounding tube. As a result the well was determined to have fully recovered from the calibration testing which was completed two days earlier. The test began at a yield of approximately 6.8 gpm. Water production was also checked periodically using a stop watch and calibrated 5 gallon bucket. The water was directed through garden hoses to the east (down gradient) from the site. Approximately 300 feet of hose was used and the discharge water was directed onto lower river terrace and flowed away (south) from the well.

Production rate was adjusted two different times during the test. The first was at about 180 minutes into the test when the discharge rate was increased by about .2 to .3 gpm and the second increase was completed at 16:40 (at a production time of 450 minutes) when the rate was increased up by about .2 to .3 gpm. The second adjustment appears to show up on the production curve at about 450 minutes of production (Figure 3). During the pumping interval maximum production was approximately 6.9 gpm and averaged about 6.8 gpm. The pumping phase of the test was completed at 9:22 am on Thursday January 8, 2009 for a pumping period of 1440 minutes. At the end of the test a total of 9,835 gallons of water (final meter reading of 3,022.5 cubic feet) had been produced for an average discharge rate of 6.8 gpm over the length of the test. This quantity of water equals 12.6 borehole volumes of water (please note that for this calculation borehole diameter was estimated at 6.5 inches, as given in the well log). For the length of the test the well had a maximum drawdown of 112.4 feet (Figure 3 and Table 4). Thus the specific capacity of the well (gpm/ft of drawdown) was .06 gpm/ft.

As requested by Mr. Bennett the onsite domestic well was monitored immediately prior to the test and periodically during the test. Prior to the test (morning of Wednesday January 7, 2009) the well was measured at 10.8 feet below TOC, or with a drawdown of 3.1 feet from the baseline level measured the previous day. Over the course of the 24-hour production test the well was seen to be recovering (water levels rising) over the course of the production test. At the end of the test the water level was measured at 9.1 feet below TOC or a total recovery of 1.7 feet during the test. The electrical meter was then checked on the morning of the test and it was confirmed that the well had in fact been off and not in production. Following consultation with Mr. Bennett I checked with Mr. Flip Boerman, Manager of the Pine Valley Mutual Water Company. At our meeting he stated that the Water District had been producing two of their wells (Well #5 and #7) for a total of 24 hours beginning the morning of Tuesday January 6, 2009. He reported that the both of the wells were producing at 70 gpm for a combined total of 140 gpm. Thus for the 24 hour period a total of 201,600 gallons of water was produced from the combined two wells. Since both of these wells are located just to the south of the onsite domestic well it is probable that the drawdown and resulting recovery in the well was a result of this production from these two District wells. Thus all measurements taken from the onsite domestic well is not reflective of the pumping test for the Kenyon project rather responding to the District production from these two wells.

Recovery was monitored for almost 3 days to about 9 am on Sunday January, 2009. Recovery measurements were extended to 3 days with the use of the data logger. Groundwater recovery was very quick with full recovery seen at about a T/T' time of 25 (or about 60 minutes of recovery, at which time residual drawdown was at .8 feet).

2.2.2.3 Well Test Analysis

Total drawdown during the test was **112.4 feet.**
Specific Capacity (given as gpm/foot of drawdown) was **.06** (6.8 gpm/112.4 ft of drawdown).
Residual drawdown as projected on the t/t' curve was **0 feet.**
Transmissivity is calculated using the Cooper-Jacobs approximation to the Theis equation which states:

$$T = \frac{2.3 \times Q}{4 \times \Pi \times \Delta s}$$

Where
T = Transmissivity (feet^2/day)
Q = average pumping rate in feet^3/day
$\Pi = 3.14$
Δs = the change is drawdown over 1 log cycle of time (or recovery as shown on the t/t' plot

Using this equation the value for Transmissivity becomes (**pumping**):

$$T = \frac{2.3 \times 1309}{4 \times 3.14 \times 10}$$

T = **24.0 ft^2/day pumping phase**

Transmissivity for recovery was not calculated given that recovery was very rapid with full recovery being record at 60 minutes. This is likely due to the large aquifer in the area. Thus no transmissivity for the recovery phase is given.

No estimates of storativity can be given since a monitoring well was not available for the test.

Calculated predicted drawdown after 5 years of production can be estimated by projecting drawdown out to 5 years or 2,600,000 minutes. As shown on Figure 5 the projected drawdown, at a continuous yield of 6.8 gpm would be 126 feet. (Please note that this production reflects two future home sites and not just one). However this value must be corrected to reflect the continuous yield of 6.8 gpm from the completed pump test. (.62 gpm equals the annual demand of two residential homes at an annual demand of.5 ac-ft/yr/home which is used within these calculations.) This correction is given by:

$$\frac{6.8 \text{ gpm}}{126 \text{ feet}} = \frac{0.62 \text{ gpm}}{x \text{ (predicted drawdown at 5 years)}}$$

Thus predicted drawdown at 5 years equals **11.5 feet**. This value is less than the threshold as identified in the County Guidelines of 100 feet or less for projected drawdown following 5 years of production.

No offsite or onsite well interference problems are anticipated due to the following factors:

1) Predicted drawdown following 5-years of continuous production is estimated at 11.5 feet within the pumping well. This also assumes no groundwater recharge over the 5-yr period.
1) A wetland habitat does exist on the eastern edge of the property along Pine Valley Creek as it flows toward the south. An estimate of groundwater drawdown induced by project's production (figured from two additional residential lots) can be determined using the Cooper-Jacob approximation of the Theis nonequilibrium flow equation (Freeze and Cherry, 1979).

This equation is given as:

$$s = \frac{264Q}{\Pi T} \log \frac{0.3Tt}{r^2 S}$$

Where:

s = groundwater drawdown (feet)
Q = pumping rate (gallons per minute)
T= transmissivity (gallons /day*foot)
t = time since pumping began (days)
r= distance from pumping well (feet)
S = groundwater storage coefficient (dimensionless)

This equation permits the calculation of drawdown at a given distance from a pumping well at a given time. The equation assumes that the transmissivity of the aquifer remains constant in all directions and that the boundaries of the aquifer are beyond the influence of pumping from the pumping well.

For the projection of groundwater level declines induced by two additional residential wells the following values were used:

s = calculated drawdown from two additional residential wells due. This is the unknown within the equation.
Q = .62 gpm which is based on the continuous demand of two residential homes at .31 gpm each (.5 ac-ft/yr for each residence).
T = 177.6 gallons per day/ft transmissivity of the fractured rock aquifer based on the pump test. As given above transmissivity was calculated at 24.0 ft^2/day. When converting units this equals 177.6 gallons per day/ft.
t = 1,825 days of production for 5 years.
r = 600 feet, distance between the residential well and Pine Valley Creek.
S = 5% (.05) assumed specific yield for the sands and gravels encountered in the drilling of the well.

Based on these values the estimated drawdown of the two new residential wells associated with this project to the riparian wetland would be .2 feet. Also these calculations assume no groundwater recharge within the watershed during the 5 years of projected production from the project wells.

2.2.3 Significance of Impacts Prior to Mitigation

Low Well Yield: The tested well met all thresholds of significance. The well was pumped for a 24-hour period at a yield of greater than 3 gpm. The well recovered so that projected residual drawdown was less than .5 feet. Also projected drawdown following 5 years of continuous projection at .62 gpm met identified thresholds of significance. As such the data support the conclusion for the finding of "***less than significant***" for low well yield.

Impacts to Riparian Habitat: Groundwater withdrawal can lower groundwater levels within the riparian habitat along Pine Valley Creek, which is located on the eastern edge of the project. The County Guidelines has identified a threshold of 3 feet decline as being significant to riparian habitats. The projected impact resulting from 2 additional wells with 5 years of continuous production and no groundwater recharge during the period is .2 feet. This value is well within the Guideline threshold of 3 feet. As such the data support the conclusion for the finding of ***"less than significant"*** for potential impacts to riparian habitat.

2.2.4 Mitigation Measures and Design Considerations

Since the well testing showed that low well yield is "***less than significant***" no mitigation measures or design considerations are proposed or required.

2.2.5 Conclusions

The well tested met all threshold criteria. The testing showed that the significance level was "***less than significant***" and no mitigation measures or design considerations are proposed.

Chapter 3

3.0 Water Quality Analysis

3.1 Guidelines for Determination of Significance

According to the Guidelines the following threshold of significance must be met for water quality:

> ***Groundwater resources for proposed projects requiring a potable water source must not exceed the Primary State of Federal Maximum Contaminant Levels (MCLs) for applicable contaminants. Proposed projects that cannot demonstrate compliance with applicable MCLs will be considered to have a significant impact. In general, projects will be required to sample water supply wells for nitrate, bacteria (fecal and total coliform) and radionuclide activity.***

3.2 Methodology

At the end of the projection test (completed on January 8, 2009) samples were collected for: nitrate, total dissolved solids (TDS) and total and fecal coliform and gross alpha and uranium. The initial water sample reported positive for total coliform and negative for E Coli. As a result two additional series of samples were collected following additional chlorination of the well. These samples were collected on January 14 and 27 2009. The last sample collected on January 27 was reported negative for both total and E Coli bacteria. These results are given in Appendix C.

3.2.1 Sampling Procedures

Sample Handling and Transportation: All sample containers used for the samples were provided from the Environmatrix Analytical Lab. This lab is a certified by the California Department of Health Services. Sample containers for gross alpha, uranium, nitrate, and TDS were clean and unpreserved plastic bottles. Sample containers for total and fecal coliform were collected in preserved bottles as provided by the Lab. All samples were collected by me, placed immediately in an ice cooler at 4^0C and transported directly to the lab within the time limits established. Please note that gross alpha and uranium testing was performed at BSK Analytical Laboratories located in Fresno California, as a subcontractor to EnvironMatrix Analytical Labs. Chain of custody was directly from me to the lab personnel for all samples.

Analytical Methods: Analytical processes employed for the testing are given in Table 1:

Table 1: Analytical Methods

Analyte	Method	MCL
Nitrate (reported as N)	SM 4500 NO3 E	10 mg/l
Total Dissolved Solids	SM 2540 C	500 mg/l recommended
Gross Alpha	EPA 00-02	15 pCi/L
Uranium	EPA 200.8	20 pCi/l
Total and E Coli	SM 9223	absent

3.2.2 Groundwater Sampling Analysis:

Initial water samples were collected on January 8, 2009 following the 24 hour production test. (Subsequent samples of coliform bacteria were also collected on Jan 14 and 27, 2009). During the 24-hour production test a total of 12.6 well bore volumes of water were produced (9,835 gallons).

The results for radionuclides are given in Table 2.

Table 2: Radionuclides

Well #	Gross Alpha[1]	Uranium[2]
Lot #3	5.6 +/- 0.42	3.4 (no sigma reported)

[1] Given in piCi/L and a MCL of 15
[2] Given in piCi/L and a MCL of 20

Table 3: Water Quality Results

Element	Result
Nitrate[1]	.24
TDS[2]	313
Total Coliform[3]	Present
E. Coli[3]	Absent

[1] Given in mg/l and a MCL of 10
[2] Given in mg/l and a recommended MCL of < 500
[3] Must be absent

All samples were analyzed within laboratory holding time for each constituent.

Due to the positive result for total coliform bacteria the well was chlorinated a second and then third time. The third sample tested negative (absent) for both total and E coli bacteria.

3.3 Significance of Impacts Prior to Mitigation

Samples collected for gross alpha and uranium are within MCL. Samples collected for nitrate and TDS were well less than MCL and the sample for coliform was recorded as "absent" for both fecal and total coliform bacteria (within the third round of testing). In summary all water quality samples met identified thresholds.

3.4 Mitigation Measures and Design Considerations

Since all water quality samples were within thresholds no mitigation measures or design considerations are proposed.

3.5 Conclusions

All water quality thresholds have been met and no mitigation measures or design considerations are required. The data supports the finding that impacts to groundwater quality are "***less than significant***".

Chapter 4: Conclusions

Summary of Project Impacts and Mitigation
No significant environmental impacts to groundwater resources were identified within this investigation. Specific results include:

Low Well Yield:
One well was pump tested for a 24 hour interval at a yield of greater than 6 gpm. Recovery within the well indicated full recovery as projected on the t/t' plot. (Figure 4). Also the projected drawdown following 5 years of production, estimated at 11.5 feet is less than the identified threshold. Thus the well met all thresholds identified by the Guidelines. As such it has been found that the project as proposed met the thresholds set for low well yield and the finding of "***less than significant***" can be support.

Impacts to Riparian Habitats:
The well is located about 600 feet to the west from Pine Valley Creek in which riparian habitats are located. Projecting groundwater level declines from two new domestic wells it is estimated that drawdown induced from the extraction would be on the order of .2 feet, or well within the identified threshold of 3 feet. As such it has been found that the project as proposed met the thresholds set for impacts to riparian habitats and that the finding of ***"less than significant"*** can be support.

Groundwater Quality:
The initial water quality samples were collected on January 8, following the 24 hour production test. The test results showed that all measured levels met the MCL for the respective elements (with the exception of total coliform). As a result two additional samples were collected on January 14 and 27 for coliform bacteria. The third sample was negative for both total and E Coli bacteria.

As a result the well met all MCL levels for the identified elements. Due to this the finding "***less than significant***" can be made for the project in relationship to potable water quality.

Within this review no threshold was determined to be above any identified threshold and as a result no mitigation or design considerations are proposed. The project as proposed meets all thresholds as identified with the County Guidelines.

Respectfully Submitted

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Chapter 5: REFERENCES

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Table 4: Raw Water Level Data "Production" From Global Water 500 ft Data Logger

Date	Time	Feet	Volts	Date	Time	Feet	Volts
1/7/2009	09:21:32	372.1	17.15	1/7/2009	09:53:27	312.5	17.11
1/7/2009	09:22:02	371.9	17.15	1/7/2009	09:55:27	311	17.11
1/7/2009	09:22:32	371.7	17.16	1/7/2009	09:56:20	310.5	17.11
1/7/2009	09:23:02	370.6	17.15	1/7/2009	10:01:20	307	17.11
1/7/2009	09:23:32	367.6	17.15	1/7/2009	10:06:20	304.5	17.1
1/7/2009	09:24:02	367.4	17.15	1/7/2009	10:11:20	302.5	17.1
1/7/2009	09:24:32	364.3	17.14	1/7/2009	10:16:20	301.4	17.09
1/7/2009	09:25:02	361.6	17.14	1/7/2009	10:21:20	299.9	17.09
1/7/2009	09:25:32	356.6	17.14	1/7/2009	10:26:20	298.7	17.09
1/7/2009	09:26:02	353.1	17.15	1/7/2009	10:31:20	297.6	17.09
1/7/2009	09:26:32	350.6	17.14	1/7/2009	10:36:20	295.4	17.08
1/7/2009	09:27:02	348.6	17.14	1/7/2009	10:41:20	294.6	17.08
1/7/2009	09:27:32	347	17.14	1/7/2009	10:46:20	292.4	17.08
1/7/2009	09:28:02	345.1	17.14	1/7/2009	10:51:20	291.4	17.07
1/7/2009	09:28:32	343.5	17.14	1/7/2009	10:56:20	290.6	17.07
1/7/2009	09:29:02	341.5	17.14	1/7/2009	11:01:20	290.1	17.07
1/7/2009	09:29:32	341.5	17.14	1/7/2009	11:06:20	288.7	17.06
1/7/2009	09:30:02	339.1	17.14	1/7/2009	11:11:20	288.4	17.06
1/7/2009	09:30:32	338.3	17.13	1/7/2009	11:16:20	288.1	17.06
1/7/2009	09:31:02	337.3	17.14	1/7/2009	11:21:20	288.1	17.05
1/7/2009	09:31:32	335.8	17.13	1/7/2009	11:26:20	287.2	17.05
1/7/2009	09:32:02	335.8	17.14	1/7/2009	11:31:20	287.4	17.05
1/7/2009	09:32:32	334.8	17.13	1/7/2009	11:36:20	286.9	17.04
1/7/2009	09:33:02	333.7	17.14	1/7/2009	11:41:20	285.3	17.04
1/7/2009	09:33:32	333.2	17.13	1/7/2009	11:46:20	285.4	17.04
1/7/2009	09:34:02	332.5	17.13	1/7/2009	11:51:20	284.4	17.04
1/7/2009	09:34:32	331	17.13	1/7/2009	11:56:20	284.8	17.03
1/7/2009	09:35:02	330.8	17.13	1/7/2009	12:01:20	283.6	17.03
1/7/2009	09:35:32	330.5	17.12	1/7/2009	12:06:20	282.8	17.03
1/7/2009	09:36:02	329.3	17.12	1/7/2009	12:11:20	282.1	17.03
1/7/2009	09:36:32	329	17.12	1/7/2009	12:16:20	281.8	17.02
1/7/2009	09:37:02	327.3	17.12	1/7/2009	12:21:20	281.8	17.02
1/7/2009	09:37:27	327.7	17.12	1/7/2009	12:26:20	280.9	17.01
1/7/2009	09:39:27	324.2	17.12	1/7/2009	12:29:03	282.3	17.01
1/7/2009	09:41:27	322.5	17.12	1/7/2009	12:44:03	276.6	17.01
1/7/2009	09:43:27	320.7	17.12	1/7/2009	12:59:03	276.6	17
1/7/2009	09:45:27	319	17.12	1/7/2009	13:14:03	276.1	16.99
1/7/2009	09:47:27	317.7	17.12	1/7/2009	13:29:03	275.1	16.98
1/7/2009	09:49:27	315.4	17.11	1/7/2009	13:44:03	275.4	16.98
1/7/2009	09:51:27	313.5	17.11				

Table 4: Raw Water Level Data "Production"
Page 2

Date	Time	Feet	Volts
1/7/2009	13:59:03	276.1	16.97
1/7/2009	14:14:03	275.9	16.96
1/7/2009	14:29:03	276.3	16.95
1/7/2009	14:44:03	276.4	16.95
1/7/2009	14:59:03	277.1	16.94
1/7/2009	15:14:03	277.3	16.93
1/7/2009	15:29:03	277.1	16.92
1/7/2009	15:44:03	276.1	16.91
1/7/2009	15:59:03	276.3	16.9
1/7/2009	16:14:03	276.1	16.9
1/7/2009	16:29:03	275.9	16.88
1/7/2009	16:44:03	276.6	16.87
1/7/2009	16:59:03	275.6	16.85
1/7/2009	17:14:03	267.8	16.84
1/7/2009	17:29:03	264.6	16.82
1/7/2009	17:44:03	263.5	16.81
1/7/2009	17:59:03	263.6	16.8
1/7/2009	18:14:03	262.8	16.79
1/7/2009	18:29:03	263	16.77
1/7/2009	18:44:03	262.6	16.76
1/7/2009	18:59:03	263.3	16.74
1/7/2009	19:14:03	264.1	16.73
1/7/2009	19:29:03	264.3	16.72
1/7/2009	19:44:03	264	16.71
1/7/2009	19:59:03	263.8	16.69
1/7/2009	20:14:03	263.8	16.69
1/7/2009	20:29:03	263	16.67
1/7/2009	20:44:03	263.3	16.66
1/7/2009	20:59:03	262.8	16.65
1/7/2009	21:14:03	263.1	16.64
1/7/2009	21:29:03	262.5	16.63
1/7/2009	21:44:03	262.6	16.62
1/7/2009	21:59:03	262.6	16.61
1/7/2009	22:14:03	262.8	16.6
1/7/2009	22:29:03	262.3	16.58
1/7/2009	22:44:03	263	16.57
1/7/2009	22:59:03	262.3	16.56
1/7/2009	23:14:03	262.5	16.55
1/7/2009	23:29:03	263.3	16.54

Date	Time	Feet	Volts
1/7/2009	23:44:03	262.5	16.53
1/7/2009	23:59:03	262.6	16.52
1/8/2009	00:14:03	262.6	16.5
1/8/2009	00:29:03	261.8	16.49
1/8/2009	00:44:03	262.3	16.48
1/8/2009	00:59:03	262.1	16.47
1/8/2009	01:14:03	262.1	16.45
1/8/2009	01:29:03	262.6	16.44
1/8/2009	01:44:03	262.6	16.43
1/8/2009	01:59:03	262	16.42
1/8/2009	02:14:03	262.1	16.41
1/8/2009	02:29:03	262	16.39
1/8/2009	02:44:03	262.1	16.39
1/8/2009	02:59:03	262.3	16.37
1/8/2009	03:14:03	262	16.36
1/8/2009	03:29:03	262.3	16.35
1/8/2009	03:44:03	262	16.34
1/8/2009	03:59:03	262	16.33
1/8/2009	04:14:03	261.8	16.32
1/8/2009	04:29:03	261.8	16.31
1/8/2009	04:44:03	261	16.3
1/8/2009	04:59:03	261	16.29
1/8/2009	05:14:03	262	16.27
1/8/2009	05:29:03	260.8	16.27
1/8/2009	05:44:03	261.3	16.26
1/8/2009	05:59:03	261.3	16.25
1/8/2009	06:14:03	260.6	16.24
1/8/2009	06:29:03	261	16.23
1/8/2009	06:44:03	261.3	16.22
1/8/2009	06:59:03	261	16.21
1/8/2009	07:14:03	262	16.2
1/8/2009	07:29:03	261.3	16.2
1/8/2009	07:44:03	261	16.19
1/8/2009	07:59:03	259.8	16.21
1/8/2009	08:14:03	261	16.23
1/8/2009	08:29:03	261.6	16.24
1/8/2009	08:44:03	259.5	16.24
1/8/2009	08:59:03	260.6	16.24
1/8/2009	09:14:03	261	16.24

Table 5: Raw Water Level Data "Recovery"
Page 1

Date	Time Minutes	Recovery Minutes	Depth of Water	Residual Drawdown	Date	Time Minutes	Recovery Minutes	Depth of Water	Residual Drawdown
1/8/2009	09:23:40		262.1	109.8	1/8/2009	09:41:10	17.5	358.9	13
1/8/2009	09:24:10	0.5	267.5	104.4	1/8/2009	09:41:40	18	359.6	12.3
1/8/2009	09:24:40	1	272.8	99.1	1/8/2009	09:42:10	18.5	360.4	11.5
1/8/2009	09:25:10	1.5	277.9	94	1/8/2009	09:42:40	19	361.1	10.8
1/8/2009	09:25:40	2	282.8	89.1	1/8/2009	09:43:10	19.5	361.8	10.1
1/8/2009	09:26:10	2.5	287.7	84.2	1/8/2009	09:43:22	19.8	361.9	10
1/8/2009	09:26:40	3	292.4	79.5	1/8/2009	09:45:22	21.8	364.1	7.8
1/8/2009	09:27:10	3.5	296.7	75.2	1/8/2009	09:47:22	23.8	365.6	6.3
1/8/2009	09:27:40	4	301.1	70.8	1/8/2009	09:49:22	25.8	367.1	4.8
1/8/2009	09:28:10	4.5	305.2	66.7	1/8/2009	09:51:22	27.8	367.9	4
1/8/2009	09:28:40	5	309.2	62.7	1/8/2009	09:52:36	29	368.4	3.5
1/8/2009	09:29:10	5.5	313.2	58.7	1/8/2009	10:02:36	39	370.4	1.5
1/8/2009	09:29:40	6	316.9	55	1/8/2009	10:12:36	49	371.1	0.8
1/8/2009	09:30:10	6.5	320.5	51.4	1/8/2009	10:22:36	59	371.2	0.7
1/8/2009	09:30:40	7	323.8	48.1	1/8/2009	10:32:36	69	371.4	0.5
1/8/2009	09:31:10	7.5	327	44.9	1/8/2009	10:42:36	79	371.6	0.3
1/8/2009	09:31:40	8	330	41.9	1/8/2009	10:52:36	89	371.6	0.3
1/8/2009	09:32:10	8.5	332.8	39.1	1/8/2009	11:02:36	99	371.6	0.3
1/8/2009	09:32:40	9	335.3	36.6	1/8/2009	11:12:36	109	371.7	0.2
1/8/2009	09:33:10	9.5	337.6	34.3	1/8/2009	11:22:36	119	371.6	0.3
1/8/2009	09:33:40	10	340	31.9	1/8/2009	11:32:36	129	371.6	0.3
1/8/2009	09:34:10	10.5	342	29.9	1/8/2009	11:42:36	139	371.6	0.3
1/8/2009	09:34:40	11	344	27.9	1/8/2009	11:52:36	149	371.6	0.3
1/8/2009	09:35:10	11.5	345.5	26.4	1/8/2009	12:02:36	159	371.4	0.5
1/8/2009	09:35:40	12	347.1	24.8	1/8/2009	12:12:36	169	371.6	0.3
1/8/2009	09:36:10	12.5	348.6	23.3	1/8/2009	12:22:36	179	371.6	0.3
1/8/2009	09:36:40	13	350.1	21.8	1/8/2009	12:32:36	189	371.6	0.3
1/8/2009	09:37:10	13.5	351.3	20.6	1/8/2009	12:42:36	199	371.6	0.3
1/8/2009	09:37:40	14	352.4	19.5	1/8/2009	12:52:36	209	371.6	0.3
1/8/2009	09:38:10	14.5	353.4	18.5	1/8/2009	13:02:36	219	371.4	0.5
1/8/2009	09:38:40	15	354.6	17.3	1/8/2009	13:12:36	229	371.7	0.2
1/8/2009	09:39:10	15.5	355.6	16.3	1/8/2009	13:22:36	239	371.6	0.3
1/8/2009	09:39:40	16	356.6	15.3	1/8/2009	13:32:36	249	371.7	0.2
1/8/2009	09:40:10	16.5	357.4	14.5	1/8/2009	13:42:36	259	371.6	0.3
1/8/2009	09:40:40	17	358.1	13.8	1/8/2009	13:52:36	269	371.7	0.2

Table 5: Raw Water Level Data "Recovery"
Page 2

Date	Time Minutes	Recovery Minutes	Depth of Water	Residual Drawdown	Date	Time Minutes	Recovery Minutes	Depth of Water	Residual Drawdown
1/8/2009	14:02:36	279	371.6	0.3	1/8/2009	19:52:36	629	373.1	-1.2
1/8/2009	14:12:36	289	371.6	0.3	1/8/2009	20:02:36	639	373.2	-1.3
1/8/2009	14:22:36	299	371.6	0.3	1/8/2009	20:12:36	649	373.1	-1.2
1/8/2009	14:32:36	309	371.6	0.3	1/8/2009	20:22:36	659	372.9	-1
1/8/2009	14:42:36	319	371.6	0.3	1/8/2009	20:32:36	669	373.1	-1.2
1/8/2009	14:52:36	329	371.7	0.2	1/8/2009	20:42:36	679	374.2	-2.3
1/8/2009	15:02:36	339	371.6	0.3	1/8/2009	20:52:36	689	373.9	-2
1/8/2009	15:12:36	349	371.7	0.2	1/8/2009	21:02:36	699	373.9	-2
1/8/2009	15:22:36	359	371.6	0.3	1/8/2009	21:12:36	709	373.7	-1.8
1/8/2009	15:32:36	369	371.6	0.3	1/8/2009	21:22:36	719	373.7	-1.8
1/8/2009	15:42:36	379	371.6	0.3	1/8/2009	21:32:36	729	373.6	-1.7
1/8/2009	15:52:36	389	371.6	0.3	1/8/2009	21:42:36	739	373.7	-1.8
1/8/2009	16:02:36	399	371.4	0.5	1/8/2009	21:52:36	749	373.7	-1.8
1/8/2009	16:12:36	409	371.4	0.5	1/8/2009	22:02:36	759	373.7	-1.8
1/8/2009	16:22:36	419	371.6	0.3	1/8/2009	22:12:36	769	373.7	-1.8
1/8/2009	16:32:36	429	371.7	0.2	1/8/2009	22:22:36	779	373.7	-1.8
1/8/2009	16:42:36	439	371.7	0.2	1/8/2009	22:32:36	789	373.7	-1.8
1/8/2009	16:52:36	449	371.7	0.2	1/8/2009	22:42:36	799	373.7	-1.8
1/8/2009	17:02:36	459	372.1	-0.2	1/8/2009	22:52:36	809	373.7	-1.8
1/8/2009	17:12:36	469	372.1	-0.2	1/8/2009	23:02:36	819	373.6	-1.7
1/8/2009	17:22:36	479	372.1	-0.2	1/8/2009	23:12:36	829	373.9	-2
1/8/2009	17:32:36	489	372.2	-0.3	1/8/2009	23:22:36	839	373.6	-1.7
1/8/2009	17:42:36	499	372.2	-0.3	1/8/2009	23:32:36	849	373.6	-1.7
1/8/2009	17:52:36	509	372.4	-0.5	1/8/2009	23:42:36	859	373.7	-1.8
1/8/2009	18:02:36	519	372.6	-0.7	1/8/2009	23:52:36	869	373.6	-1.7
1/8/2009	18:12:36	529	372.6	-0.7	1/9/2009	00:02:36	879	373.6	-1.7
1/8/2009	18:22:36	539	372.6	-0.7	1/9/2009	00:12:36	889	373.6	-1.7
1/8/2009	18:32:36	549	372.7	-0.8	1/9/2009	00:22:36	899	373.6	-1.7
1/8/2009	18:42:36	559	372.6	-0.7	1/9/2009	00:32:36	909	373.4	-1.5
1/8/2009	18:52:36	569	372.7	-0.8	1/9/2009	00:42:36	919	373.4	-1.5
1/8/2009	19:02:36	579	372.9	-1	1/9/2009	00:52:36	929	373.6	-1.7
1/8/2009	19:12:36	589	372.7	-0.8	1/9/2009	01:02:36	939	373.4	-1.5
1/8/2009	19:22:36	599	372.9	-1	1/9/2009	01:12:36	949	373.4	-1.5
1/8/2009	19:32:36	609	372.7	-0.8	1/9/2009	01:22:36	959	373.4	-1.5
1/8/2009	19:42:36	619	373.1	-1.2	1/9/2009	01:32:36	969	373.6	-1.7

Table 5: Raw Water Level Data "Recovery"
Page 3

Date	Time Minutes	Recovery Minutes	Depth of Water	Residual Drawdown	Date	Time Minutes	Recovery Minutes	Depth of Water	Residual Drawdown
1/9/2009	01:42:36	979	373.4	-1.5	1/9/2009	07:32:36	1329	373.7	-1.8
1/9/2009	01:52:36	989	373.6	-1.7	1/9/2009	07:42:36	1339	373.6	-1.7
1/9/2009	02:02:36	999	373.6	-1.7	1/9/2009	07:52:36	1349	373.6	-1.7
1/9/2009	02:12:36	1009	373.6	-1.7	1/9/2009	08:02:36	1359	373.4	-1.5
1/9/2009	02:22:36	1019	373.4	-1.5	1/9/2009	08:12:36	1369	373.2	-1.3
1/9/2009	02:32:36	1029	373.6	-1.7	1/9/2009	08:22:36	1379	372.9	-1
1/9/2009	02:42:36	1039	373.6	-1.7	1/9/2009	08:32:36	1389	372.7	-0.8
1/9/2009	02:52:36	1049	373.6	-1.7	1/9/2009	08:42:36	1399	372.6	-0.7
1/9/2009	03:02:36	1059	373.6	-1.7	1/9/2009	08:52:36	1409	372.4	-0.5
1/9/2009	03:12:36	1069	373.6	-1.7	1/9/2009	09:02:36	1419	372.4	-0.5
1/9/2009	03:22:36	1079	373.6	-1.7	1/9/2009	09:12:36	1429	372.2	-0.3
1/9/2009	03:32:36	1089	373.6	-1.7	1/9/2009	09:22:36	1439	372.2	-0.3
1/9/2009	03:42:36	1099	373.7	-1.8	1/9/2009	09:32:36	1449	372.1	-0.2
1/9/2009	03:52:36	1109	373.7	-1.8	1/9/2009	09:42:36	1459	372.1	-0.2
1/9/2009	04:02:36	1119	373.6	-1.7	1/9/2009	09:52:36	1469	372.1	-0.2
1/9/2009	04:12:36	1129	373.6	-1.7	1/9/2009	10:02:36	1479	372.1	-0.2
1/9/2009	04:22:36	1139	373.6	-1.7					
1/9/2009	04:32:36	1149	373.6	-1.7					
1/9/2009	04:42:36	1159	373.7	-1.8					
1/9/2009	04:52:36	1169	373.6	-1.7					
1/9/2009	05:02:36	1179	373.6	-1.7					
1/9/2009	05:12:36	1189	373.6	-1.7					
1/9/2009	05:22:36	1199	373.6	-1.7					
1/9/2009	05:32:36	1209	373.7	-1.8					
1/9/2009	05:42:36	1219	373.6	-1.7					
1/9/2009	05:52:36	1229	373.6	-1.7					
1/9/2009	06:02:36	1239	373.6	-1.7					
1/9/2009	06:12:36	1249	373.6	-1.7					
1/9/2009	06:22:36	1259	373.6	-1.7					
1/9/2009	06:32:36	1269	373.7	-1.8					
1/9/2009	06:42:36	1279	373.6	-1.7					
1/9/2009	06:52:36	1289	373.6	-1.7					
1/9/2009	07:02:36	1299	373.6	-1.7					
1/9/2009	07:12:36	1309	373.6	-1.7					
1/9/2009	07:22:36	1319	373.6	-1.7					

Figure 3
Kenyon TPM 20857
Production

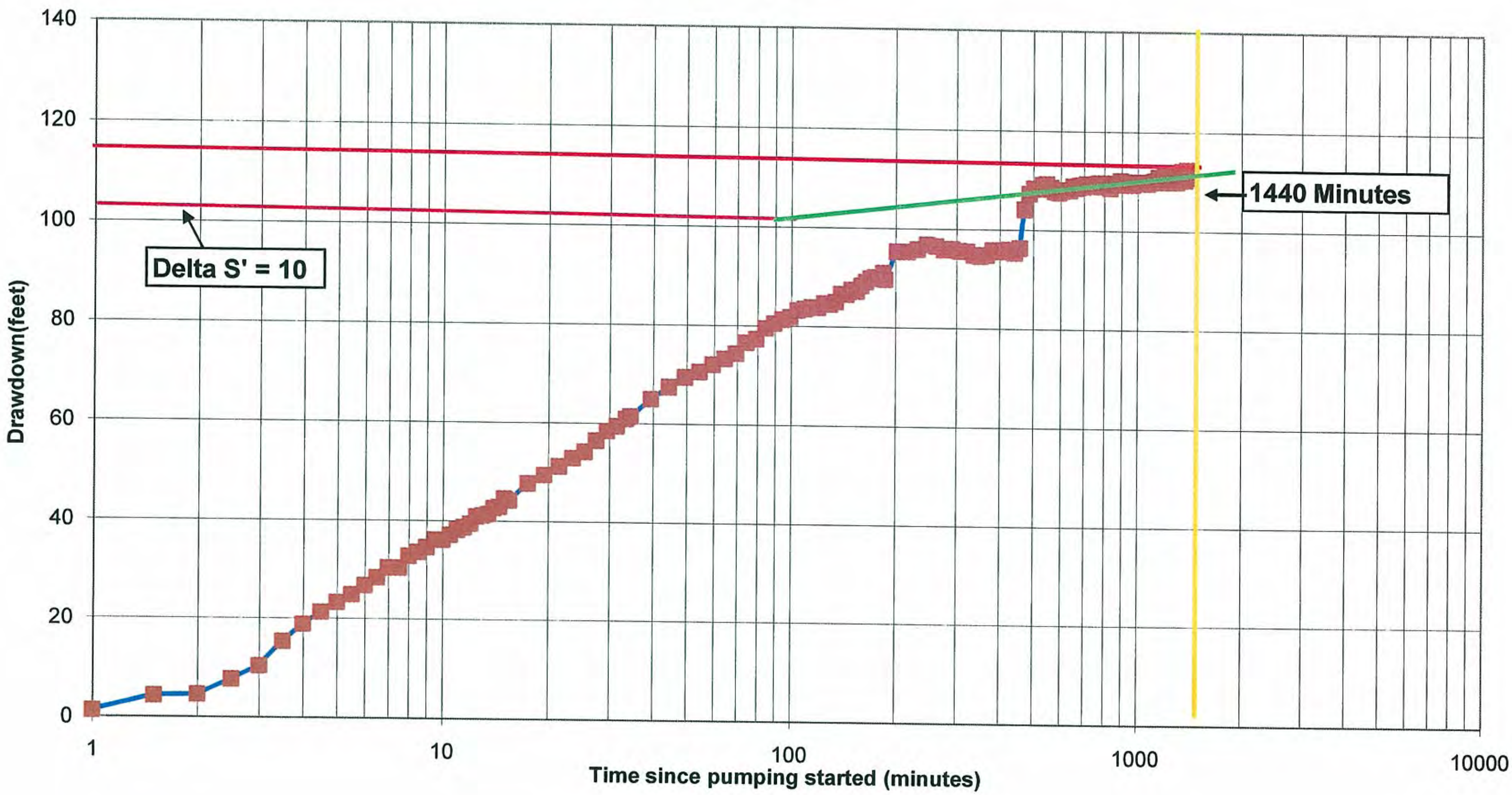


Figure 4
Kenyon TPM 20857
Recovery Graph

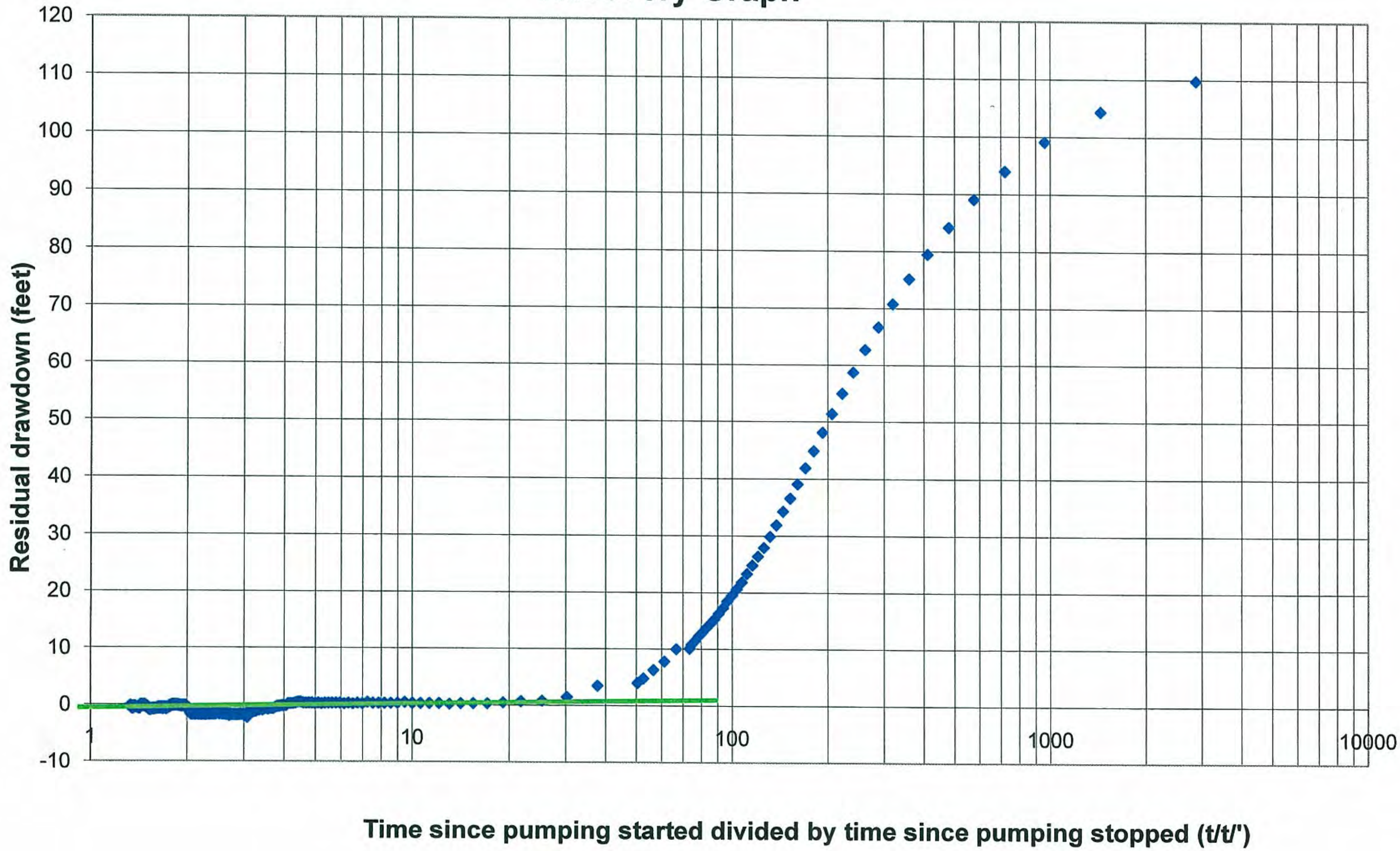
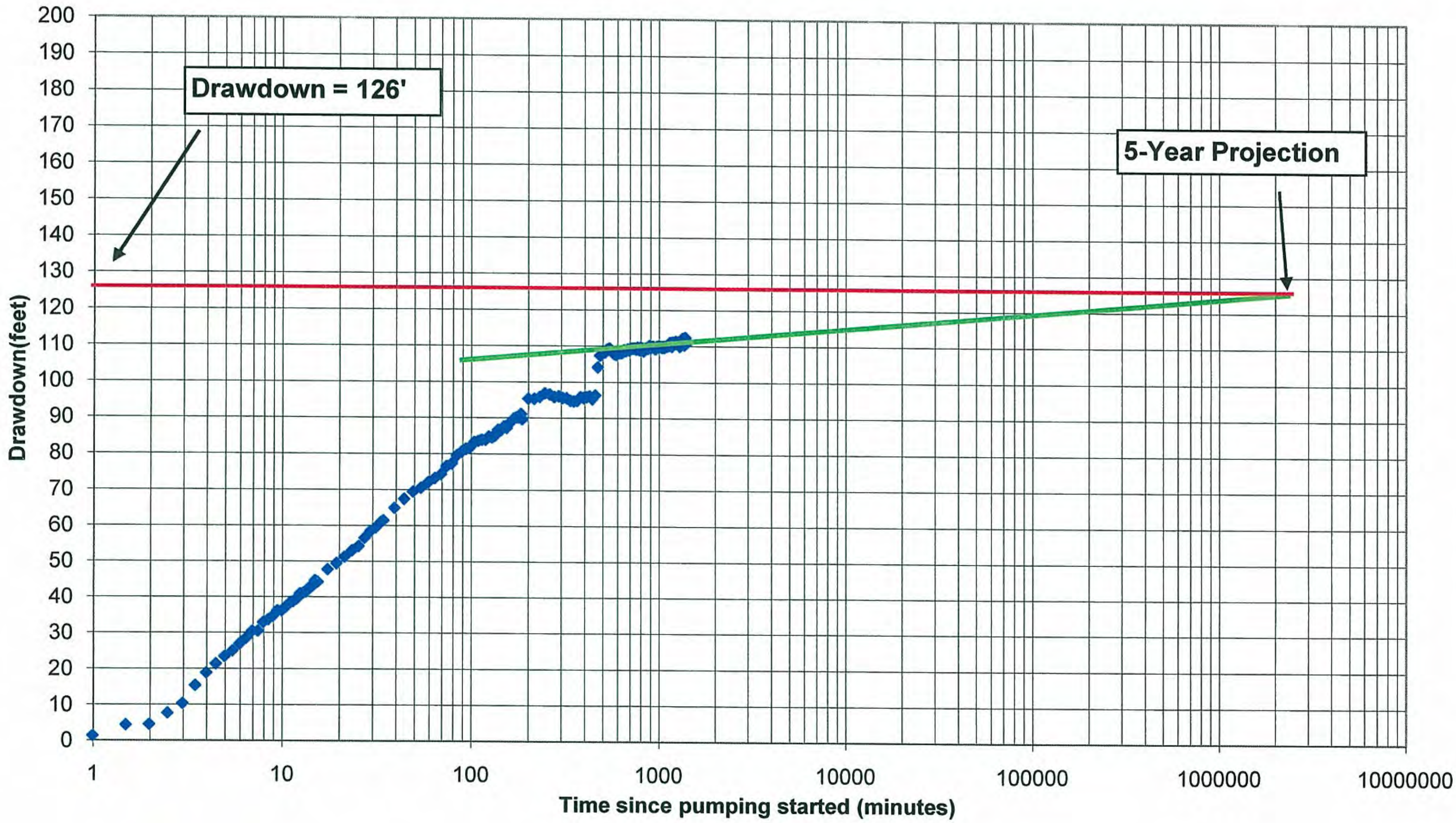


Figure 5
Kenyon TPM 20857
5-Year Projection



	CIMIS ETo (in inches)												
CIMIS ZONE	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**	**Total**
16	1.55	2.52	4.03	5.7	7.75	8.7	9.3	8.37	6.3	4.34	2.4	1.55	62.51
Pine Valley	1.5	2.4	3.8	5.1	6	7	7.8	7.3	6	4	2.2	1.7	54.80

*Grapes Crop Coefficient	0	0	0.06	0.06	0.8	0.8	0.8	0.8	0.08	0.08	0	0

*Crop Coefficient obtained from "A Guide to Irrigation Water Needs for Landscape Plantings in California, University of California"

Grape Water Usage	**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUNE**	**JULY**	**AUG**	**SEPT**	**OCT**	**NOV**	**DEC**	**Total applied water (inches)**
CIMIS Zone 16	0.0	0.0	0.2	0.3	6.2	7.0	7.4	6.7	0.5	0.3	0.0	0.0	28.7
Pine Valley	0.0	0.0	0.2	0.3	4.8	5.6	6.2	5.8	0.5	0.3	0.0	0.0	23.8