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SUPERIOR COURT OF THE STATE OF CALIFORNIA

IN AND FOR THE COUNTY OF LOS ANGELES

Coordination Proceeding Special Title (Rule 1550 (b))

ANTELOPE VALLEY GROUNDWATER CASES

Included actions:

Los Angeles County Waterworks District No. 40 vs. Diamond Farming Company
Los Angeles Superior Court
Case No. BC 325201

Los Angeles County Waterworks District No. 40 vs. Diamond Farming Company
Kern County Superior Court
Case No. S-1500-CV 254348 NFT

Diamond Farming Company vs. City of Lancaster
Riverside County Superior Court
Lead Case No. RIC 344436 [Consolidated w/Case Nos. 344668 & 353840]

AND RELATED CROSS-ACTIONS.

Judicial Council Coordination No. 4408

Case No.: 1-05-CV-049053

DECLARATION OF STEVEN BACHMAN, Ph.D., IN RESPONSE TO THE DECLARATION OF JOSEPH SCALMANINI RE: REBUTTAL TESTIMONY

PHASE 3 TRIAL

DECLARATION

I, Steven Bachman, PhD, do hereby declare and state as follows:

<u>Response to Mr. Scalmanini's Base Period Discussion</u>

<u>Criteria for Establishing a Base Period</u> – Mr. Scalmanini stated that he is not aware of using the criterion of minimizing the change of storage in selecting a base period (Mr. Scalmanini's Declaration, page 1, lines 11-14). As stated in my direct testimony, Mr. Wildermuth used such a criterion in his work in the San Timoteo basin (Exhibit B-97). My testimony illustrated the problem with choosing a base period such as 1951-2005 during which large changes of storage were taking place – a small error in fixing the location of the groundwater elevation contours affects the calculation of storage change in a large way (Exhibits B-53 through B-60). Thus, a large margin of error was introduced in calculations of the yield of the basin. The logic is clear – by selecting a base period during which there is a smaller change in storage, perhaps the most significant margin of error introduced in the water balance calculation can be minimized.

Another criterion for selecting a base period is data availability and reliability. The purveyors' experts' use of the 1951-2005 base period required extensive extrapolation and interpolation of groundwater elevations in the earlier years, increasing the margin of error (Exhibits B-26 through B-28). Thus, there are serious questions about the reliability of the purveyors' storage change calculation and, thus, the basin yield calculation.

Mr. Scalmanini neglects an important criterion for establishing a base period that is related to storage changes in the basin. The criterion is that the base period should reflect relatively constant management or "cultural practices" in the basin. It has been documented by all parties in the case that there has been a large change in "cultural practices" in the basin over the last 60 years, with agricultural pumping at several times the current rate during the first part of the purveyors' 1951-2005 base period and with urban pumping increasing significantly during the later part of that period. It is these "cultural changes" that have driven the significant storage changes over time. The introduction of State Water in the early 1970s likewise was an additional large change in "cultural practices".

Base Period Representing Mean Water Supply – As discussed by Mr. Scalmanini (Mr. Scalmanini's Declaration, page 1, lines 16-21), climate is certainly a factor in choosing a base period. Climate is represented by the pattern of rainfall and runoff that provides recharge to the Antelope Valley. Gage locations must be chosen so that they properly represent precipitation and thus, recharge patterns in the basin; they must also have reliable and consistent data collection. Rain shadow effects are significant in the Antelope Valley – storms lose their moisture over the Coast Ranges as they move in from the Pacific Ocean. I selected a set of geographically-representative precipitation gage stations to determine climatic effects (Tejon Ranch, Lebec, Fairmont, Palmdale on Exhibit 1). Mr. Scalmanini criticized my choice of gage sites by commenting that one site is outside the adjudication watershed (Tejon Ranch) and one is on the valley floor (Palmdale) where it is claimed by Mr. Durbin that zero recharge is produced. Using these criteria, Mr. Scalmanini must also concede that the purveyors' experts' choice of a gage site is likewise subject to the same criticism. The single precipitation station used by the purveyors' experts (Acton Escondido on Exhibit 1) is likewise outside the watershed. In addition, when the Acton Escondido station had missing data, which was very common during the last 30 years of record, the purveyors' experts attempted a correlation with a gage on the valley floor, the Lancaster Fox Field station (see Exhibit 1) to fill in the missing data (Mr. Wildermuth's direct testimony, Exhibit 6). Thus, the purveyors relied upon a station outside the watershed and filled in missing data from a station on the valley floor where they presume recharge to be zero.

The Acton Escondido station's available data for the past 30 years are problematic. The Western Regional Climate Center, which maintains the database for the precipitation stations used in this case, states on the data header for each site that individual months are not used for annual or monthly statistics if more than 5 days are missing (Exhibit 2). In addition, individual years are not used for annual statistics if any month in the year has more than 5 days missing. Exhibit 3 shows the amount of missing data from the Acton Escondido station; the letter "z" next to the monthly data indicates that 26 or more days are missing for that month. The yellow highlight indicates that from 1979 to 2005, 19 years out of a possible 27 years did not meet the criteria for use of those data in annual statistics. Thus, the majority of that period needed to have data filled in by correlation with the valley-floor, middle-of-the-basin Lancaster Fox Field station. Thus, the weather patterns reflected in the purveyors' cumulative departure plot for the Acton Escondido station (Mr. Wildermuth's Exhibit 6) are those of a valley-floor, interior basin setting.

The use of the Acton Escondido station by the purveyors' experts has a serious flaw for years prior to 1974 – that is the beginning of the record for the Lancaster Fox Field station. Any missing records at Acton Escondido prior to 1974 could not be filled by correlation with the Lancaster Fox Field station. As shown on Exhibit 3, there are insufficient data for using the years 1958 and 1973 at the Acton Escondido station and no ability to fill in the data by correlation with the Lancaster Fox Field station. Thus, use of the Acton Escondido station for the base period 1951-2005 appears to be seriously flawed.

In my testimony, I used four precipitation stations for analysis of my selected base periods. Weather patterns during much of the rainy season come from storms generated in the Gulf of Alaska that move into southern California from the northwest. Thus, it was important to have precipitation data northwest of the Antelope Valley (stations Tejon Ranch and Lebec,

Exhibit 1). Another station was chosen within the Antelope Valley watershed (Fairmont, Exhibit 1) to gage local effects (such as a rain-shadow effect). A final station was chosen within the basin itself (Palmdale, Exhibit 1). Contrary to Mr. Scalmanini's assertion that "precipitation on the Valley floor itself (precipitation at Palmdale)" produces no recharge (Scalmanini Declaration, Page 1, lines 26-28), experts in the trial calculated recharge from precipitation on the valley floor during rain events. This daily calculation of episodic valley-floor recharge caused by storm events confirms that the purveyors' use of annual averages ignored storm intensity and duration – important considerations whether designing flood control facilities or estimating basin recharge.

Exhibits 4 through 7 indicate the individual stations used in my trial testimony on base period analysis (Exhibit B-23). All the cumulative departure charts indicate that there was a net increase in rainfall above average (positive slope on arrowed lines) for both the purveyors' base period of 1951-2005 and my base period of 1985-2005. I acknowledged such in my trial testimony, whereas the purveyors' experts relied on the flawed data from the Acton Escondido station to argue that the 1951-2005 base period plotted as a level line (e.g., Mr. Wildermuth's Exhibit 6). The positive slope in the 1985-2005 base period should result in a net increase in groundwater storage in the basin if the basin is in balance, and my analysis and testimony showed that to be the case.

Using a dry-to-dry base period such as 1976-1992 is not as straight-forward as the wet-to-wet analysis. Whereas a dry-to-dry base period minimizes the amount of water in-transit to the saturated zone, the local effect of the last drought (1987-1991) is significant. Whereas Mr. Scalmanini criticized the 1976-1992 base period as having a net increase in rainfall over average, examination of Exhibits 4 through 7 indicate otherwise. In particular, the Lebec station (Exhibit 5) indicated a net decrease in rainfall over average (a negative slope on arrowed line for 1976-

1992). This local variation in precipitation patterns likely reflects the inconsistent nature of storm rainfall during a drought. It also highlights the expected inherent uncertainty and wide margin of error in using hydrologic data over a large and vast basin such as the Antelope Valley.

Big Rock Creek streamflow – Mr. Scalmanini highlights the plot of Big Rock Creek gaged runoff as not indicating an average condition over the base periods of 1976-1992 and 1985-2005 (Mr. Scalmanini's Declaration, page 2, lines 12-15 and Exhibit Scalmanini 152). As in the precipitation stations, there is a slight increase above average conditions during the period 1985-2005 (Exhibit B-23), which was acknowledged in my testimony. For the period 1976-1992 the increase above average flow for Big Rock Creek (Exhibit B-23) is somewhat more (also as indicated in Exhibits 4, 6, 7 for precipitation), but Big Rock Creek is at odds with the four precipitation stations for either the departure from mean at the beginning of the 1976-1992 period or at the end of the period. The reason for this discrepancy is likely due to the location and size of the Big Rock Creek gaged drainage.

Exhibit 8 shows that the Big Rock Creek gaged drainage is relatively small within the watershed of the adjudication. It represents less than 1% of the watershed (14,530 acres of the overall 1,523,000 acres of watershed). When compared to other areas of the adjudication watershed on the south and west "fringe" of the basin that receive higher rainfall (Southwest, West, and Northwest areas of Exhibit 9), the Big Rock Creek gaged drainage represents less than 4% of the "fringe" area (14, 530 acres of the "fringe" acreage of 379,000 acres). Thus, the Big Rock Creek gage is measuring a very local portion of the basin. Big Rock Creek is also located in the far southeastern portion of the adjudication watershed. It is more susceptible to the rain shadow effect of storm tracks than areas farther to the west in the basin where the storms first reach the valley. Such considerations may be the cause of the obvious discrepancy between weather patterns indicated by the precipitation stations and by Big Rock Creek gaging. Mr.

Scalmanini states that "The best indicator of long-term runoff into the Antelope Valley is the gaged record for Big Rock Creek" (Mr. Scalmanini's Declaration, page 3, lines 18-19). Although recharge from Big Rock Creek is likely important in the southeastern portion of the basin, where groundwater elevations have been stable or rising over the past 25 years, the pumping depression beneath the urban areas, Lancaster and Palmdale, in the middle of the basin likely restricts this recharge from effectively reaching the western half of the basin. The western half of the basin likely relies on recharge along the mountain fronts that border it on two sides.

Response to Mr. Scalmanini's Natural Recharge Discussion

Mr. Scalmanini states that overlapping base periods should not have substantially different amounts of natural recharge (Mr. Scalmanini's Declaration, page 15, lines 12-16). This statement underscores the purveyors' experts' inability and refusal to deal with uncertainty in this basin. The difference in natural recharge that I calculated for the two base periods was about 20,000 acre-feet per year. This number was calculated from a host of inputs with variable margins of error. In my testimony, I demonstrated that a relatively small change in the way groundwater elevations are contoured in a small area of the basin can lead to a difference in storage change of more than 8,000 acre-feet per year (Exhibit B-60). In this context, a variation of 20,000 acre-feet per year in natural yield between base periods is not only logical, it is to be expected.

In conclusion, Mr. Scalmanini's Rebuttal and this Sur Rebuttal assisted in pointing out the problems with the purveyors' choice of using a single flawed precipitation station for establishing a base period, the relative local importance of the Big Rock Creek stream gage station, and the importance of understanding uncertainty in data sources and conclusions. It strengthens my conclusion that multiple precipitation stations are required to be examined in such a large and vast basin area as the Antelope Valley, where relatively close stations can give different results for a base period (e.g., the 1976-1992 base period with both positive and negative slopes on the cumulative departure graph). It also points out the necessity of working within a range of values for basin yield (as I have done), which is required by the margin of error and limitations within the input data. This Declaration also confirms the validity of my approach of using the later base periods that avoids large changes in basin storage, significant changes in "cultural practices", and less reliable data in the 1950s through 1960s timeframe.

Having reviewed Mr. Scalmanini's technical critique of the basis for my opinions, I do not find them to be sufficient to change my opinions expressed at trial. I continue to have the opinion that it is entirely appropriate, even required, to manage the basin within a range of values for perennial yield of 145,000 to 165,000 acre-feet per year. Testimony presented by both purveyors' and overlying parties' experts estimate that average pumping from the basin during the decade ending in 2005 is within the above range of perennial yield.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct. Executed on April 11, 2011 at Santa Barbara, California.

Steven Bachman

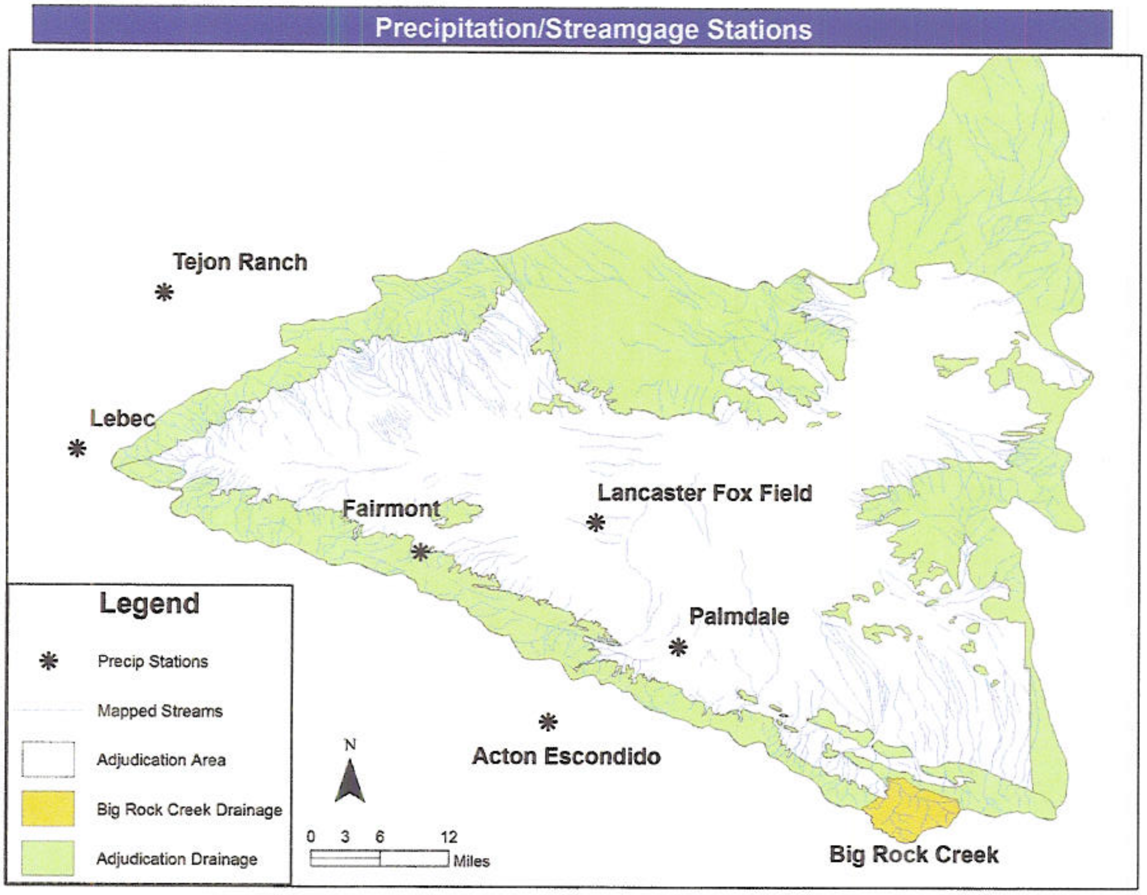

Precipitation/Streamgage Stations
Tejon Ranch
Lebec
Fairmont
Lancaster Fox Field
Palmdale
Acton Escondido
Big Rock Creek
Legend
Precip Stations
Mapped Streams
Adjudication Area
Big Rock Creek Drainage
Adjudication Drainage
N
0 3 6 12
Miles

Exhibit 1

Header for Acton Escondido Precipitation Station (www.wrcc.dri.edu/cgi-bin/)

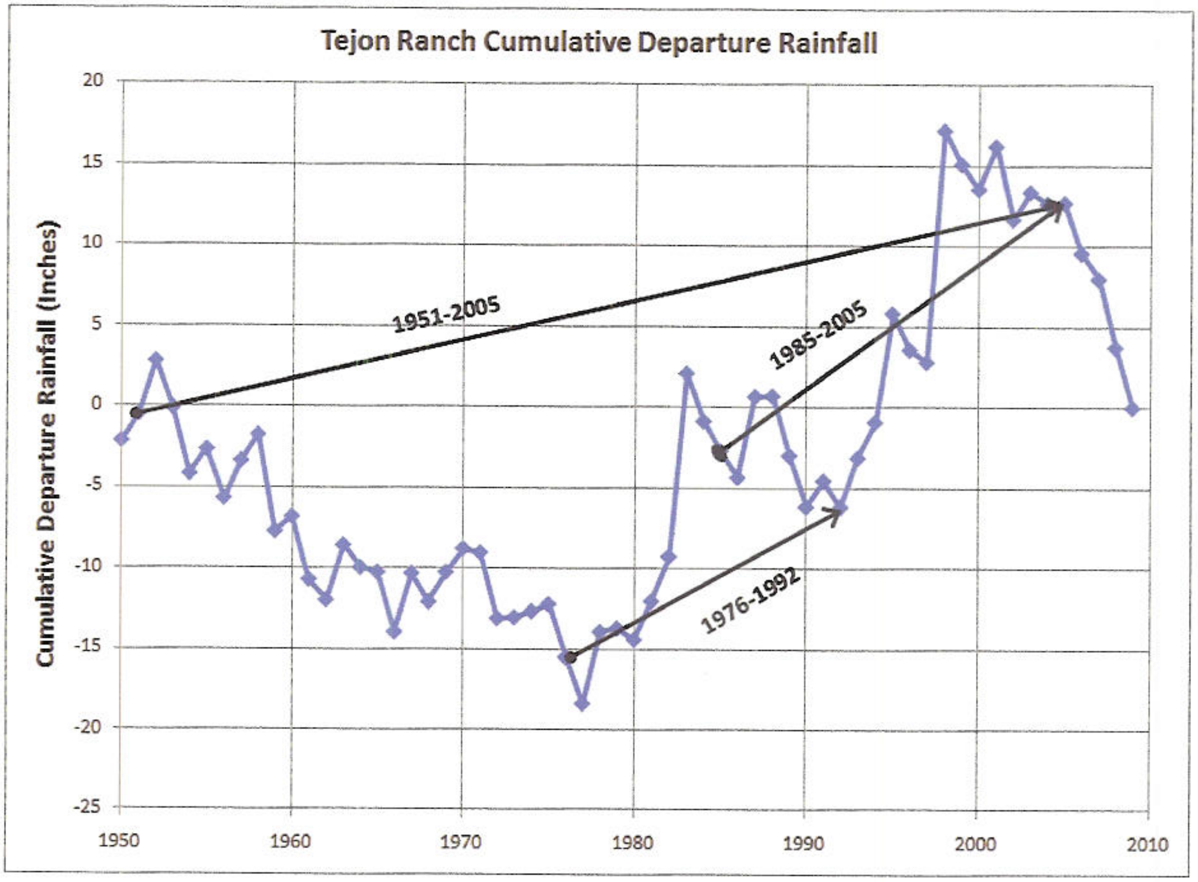
MAXIMUM ALLOWABLE NUMBER OF MISSING DAYS : 5
Individual Months not used for annual or monthly statistics if more than 5 days are missing.
Individual Years not used for annual statistics if any month in that year has more than 5 days missing.

Exhibit 2

a = 1 day missing, b = 2 days missing, c = 3 days, ..etc..,
z = 26 or more days missing, A = Accumulations present

YEAR(S)	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANN
1948	0 z	0 z	0 z	0 z	0 z	0 z	0 a	0	0	0.18	0	1.85	2.03
1949	1.68	0.95	0.87	0	0.38	0	0	0	0.05	0.05	0.75	1.19	5.92
1950	1.25	0.96	0.74	0.88	0.01	0	0.12	0	0.39	0.04	0.13	0.06	4.58
1951	1.61	0.33	0.43	0.55	0.25	0	0.31	0	0	0.66	0.8	4.84	9.78
1952	6.32	0.46	6.42	0.68	0	0	0	0	0.41	0	2.02	2.07	18.38
1953	0.27	0.28	0.23	0.71	0.56	0	0	0	0	0	0.45	0.23	2.73
1954	4.02	1.28	2.16	0.03	0	0	0.01	0	0	0	1.1	0.64	9.24
1955	3.32	0.66	0.07	0.89	1.32	0	0	0	0	0	0.54	0.81	7.61
1956	4.68	0.2	0	2.52	0.32	0	0	0	0	0.17	0	0.1	7.99
1957	4.02	0.88	1.47	0.51	0.81	0.18	0	0	0.04	1.72	0.49	1.67	11.79
1958	1.05	3.51	2.76	3.55	0 n	0	0	0.09	0.17	0.52	0.14	0.06	11.85
1959	1.16	2.73	0	0.31	0	0	0	0	0.5	0	0.04	0.99	5.73
1960	1.55	0.97	0.14	0.41	0	0 c	0	0	0	0.01	2.42	0.14	5.64
1961	0.32	0.05	1.16	0.08	0	0	0	0.87	0	0	1.34	0.9	4.72
1962	1.5	6.27	1.36	0	0.29	0	0	0	0	0.24	0	0	9.66
1963	0.3	1.88	1.27	1.27	0	0.37	0	0.11	1.33	0.5	1.5	0.08	8.61
1964	1.04	0.02	1.56	0.7	0.17	0	0	0	0	0.64	1.06	0.79	5.98
1965	0.26	0.12	0.61	3.18	0	0	0.24	0.64	0.29	0	7.47	3.02	15.83
1966	0.8	1.23	0.2	0	0	0	0	0	0.38	0.04	2.61	2.71	7.97
1967	1.66	0.04	1.45	3.51	0.25	0	0	0.37	0.52	0	4.09	0.81	12.7
1968	0.81	0.5	1.33	0.39	0.1	0	0.03	0.8	0	0.75	0.29	0.91	5.91
1969	7.73	6.75	0.66	0.86	0.32	0.36	0.31	0	0	0	1.55	0.09	18.63
1970	0.6	1.72	2.75	0.15	0	0	0	0	0	0.02	5.04	2.97	13.25
1971	0.26	0.29	0.29	0.5	0.17	0	0	0	0.1	0.13	0.34	5.06	7.14
1972	0	0	0	0.44	0.1	0	0	0.12	0	0.46	1.2	0.89	3.21
1973	1.7 f	3.9	2.15	0	0	0	0	0	0	0	0.94	0.1	7.09
1974	5.34	0.03	1.9	0.12	0.07	0	0	0	0	1.87	0.25	1.53	11.11
1975	0.22	2.01	1.7	1.4	0	0	0	0	0.1	0.3	0.2	0.2	6.13
1976	0	3	0.9	0.8	0.1	0	0.1	0	2.7	0.1	0.4	0.2	8.3
1977	2.3	0.1	1.1	0	2.3	0	0	1.9	0	0	0.1	4.9	12.7
1978	3.6	6.3	5.9	1.4	0	0	0	0.1	1	0.2	1.7	2	22.2
1979	5	2.7	5.9	0	0	0	0	0	0 z	0.3	0.6	0.2	14.7
1980	5.2	7.2	3.2	0 z	0 z	0	0	0 z	0 z	0	0	0.4	16
1981	0 z	1.3	2.8	0.6	0.1	0	0	0	0	0.05	1.7	0.1	6.65
1982	2.9	0.8	4.6	0.25	0.1	0	0	0	0.4	0.3	3.2	1.2	13.75
1983	4	3.3	8.3	2.2	0.1	0	0	2.7	0.5	1.2	0 z	2.2	24.5
1984	0.01	0	0.2	0	0	0 z	0 z	0	0.1	0.06	0.94	5.85	7.16
1985	0.35	0.43	0.54	0	0.14	0	0	0	0.19	0.4	2.11	0.19	4.35
1986	1.92	3.38	3.17	0.51	0	0	0	0.14	0.06	0.15	0.96	0.39	10.68
1987	1.24	0.63	0.93	0.14	0.36	0.1	0	0	0.11	3.04	1.59	1.56	9.7
1988	1.63	1.21	0.6	2.1	0.24	0	0.15	0.09	0	0	0.77	0 z	6.79
1989	0 z	0 z	2.86 x	0 z	0 z	0 z	0	0	0.7	0.2	0 a	0	0.9
1990	0 z	2.3 z	0 z	0 z	0 z	0	0	0	0	0	0.3	0 z	0.3
1991	1.3	0 z	7.1	0	0	0	0 z	0	0	0.5	0.1	0 z	9
1992	2.7	0 z	2.9 c	0.3	0.2	0	0	0 z	0	1.2	0	4.2	11.5
1993	10.2	6.9	1.8	0	0	0.5	0	0	0	0.6	0.8	1.2	22
1994	0.5	2	1.8	0.5	0.3	0	0	0	0	0.4	0.6	0.9	7
1995	8.5 k	0.9	4.8	1.1	0	0.3	0 z	0	0	0	0	0.3	7.4
1996	1.7	4.8	1.6	0.2	0	0	0	0 z	0	0.6	0.91	1.53 d	11.34
1997	2.48	0.4	0	0.2	0	0	0	0	0.55	0	2.05 a	3.43	9.11
1998	2.01	9.72	3.72	1.22	2.24	0.04	0	0	0.48	0.08	0.9	0.71	21.12
1999	0 z	0 z	0.59	1.3	0.08	0.51	0	0	0.35 b	0	0.2	0	3.03
2000	0.59	3.54	1.03	1.37	0.04	0	0	0.25	0 z	0 z	0 z	0 z	6.82
2001	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0
2002	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0
2003	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0 z	0
2004	0.04	3.72	0.43	0.35	0.16	0	0	0	0	4.66	0.2 i	4.96	14.32
2005	4.96	1.49	1.29	0 z	0.2	0	0.16	0.04	0.51	2.74	0 a	0.36	11.75

Exhibit 3



Tejon Ranch Cumulative Departure Rainfall
Cumulative Departure Rainfall (Inches)
20
15
10
5
0
-5
-10
-15
-20
-25
1950
1960
1970
1980
1990
2000
2010
1951-2005
1985-2005
1976-1992

Exhibit 4

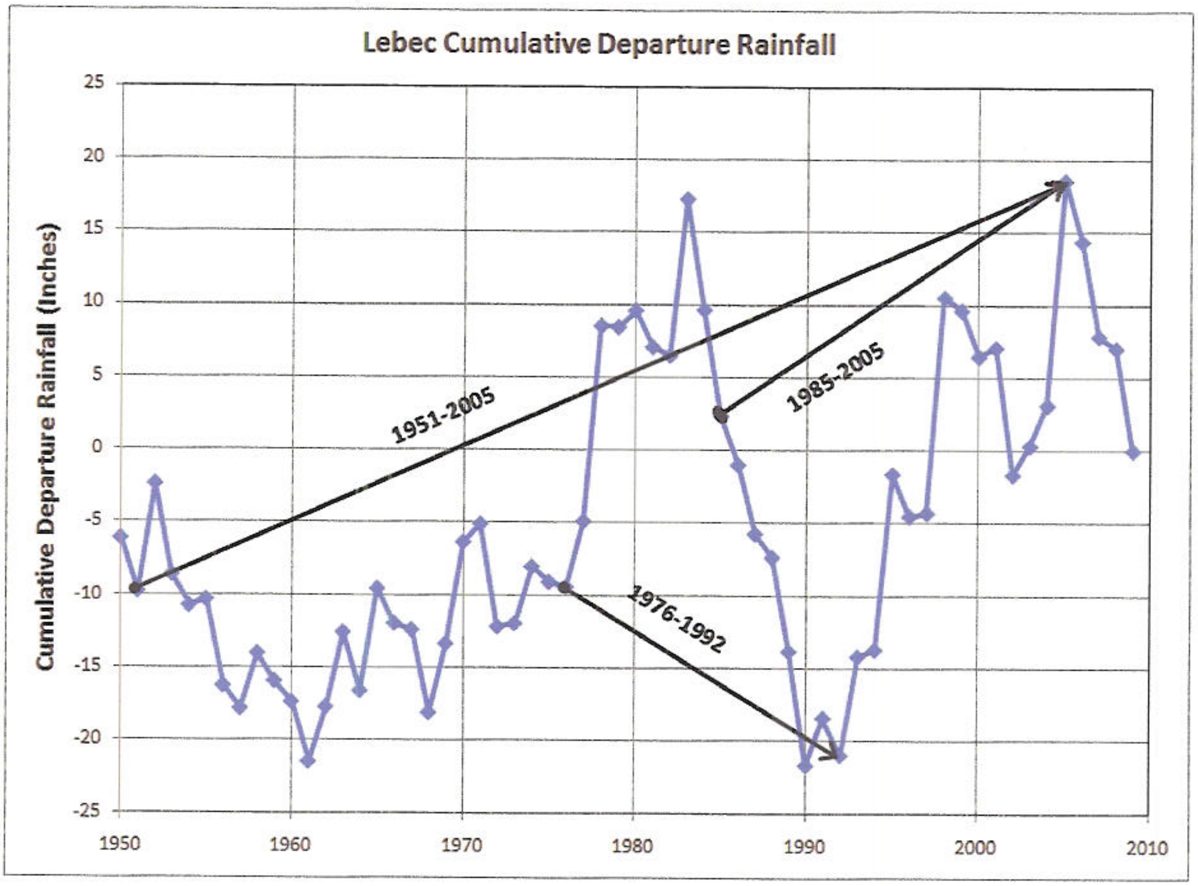

Lebec Cumulative Departure Rainfall
Cumulative Departure Rainfall (Inches)
25
20
15
10
5
0
-5
-10
-15
-20
-25
1950
1960
1970
1980
1990
2000
2010
1951-2005
1985-2005
1976-1992

Exhibit 5

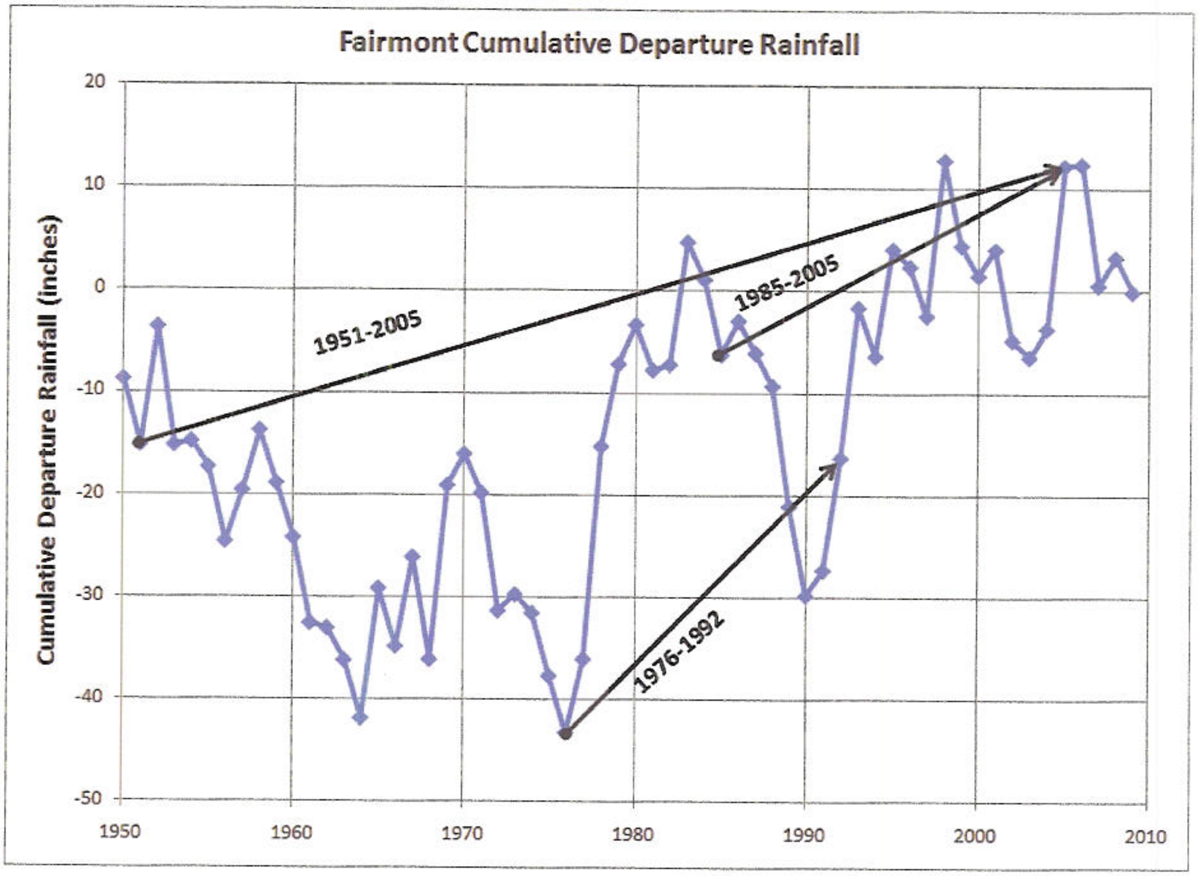

Fairmont Cumulative Departure Rainfall
Cumulative Departure Rainfall (inches)
20
10
0
-10
-20
-30
-40
-50
1950
1960
1970
1980
1990
2000
2010
1951-2005
1985-2005
1976-1992

Exhibit 6

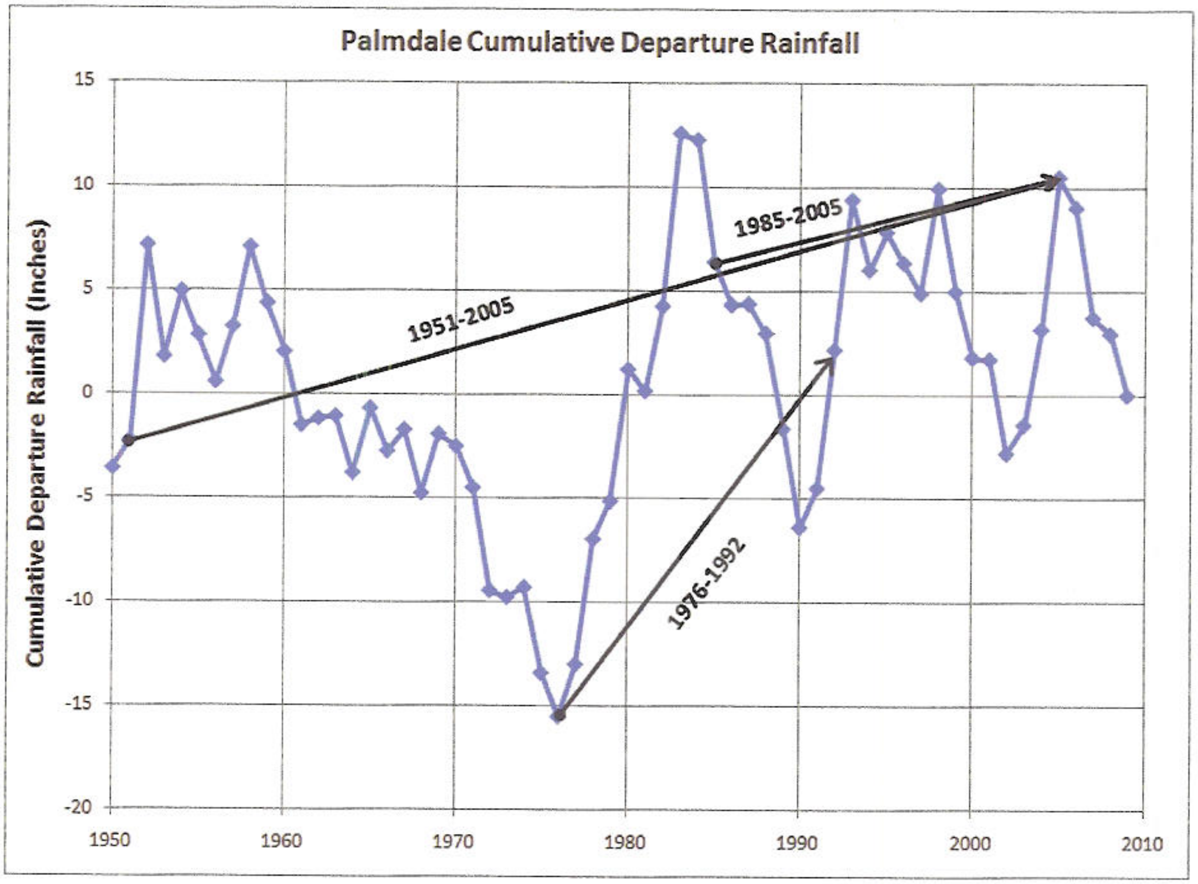

Palmdale Cumulative Departure Rainfall
Cumulative Departure Rainfall (Inches)
15
10
5
0
-5
-10
-15
-20
1950
1960
1970
1980
1990
2000
2010
1951-2005
1985-2005
1976-1992

Exhibit 7

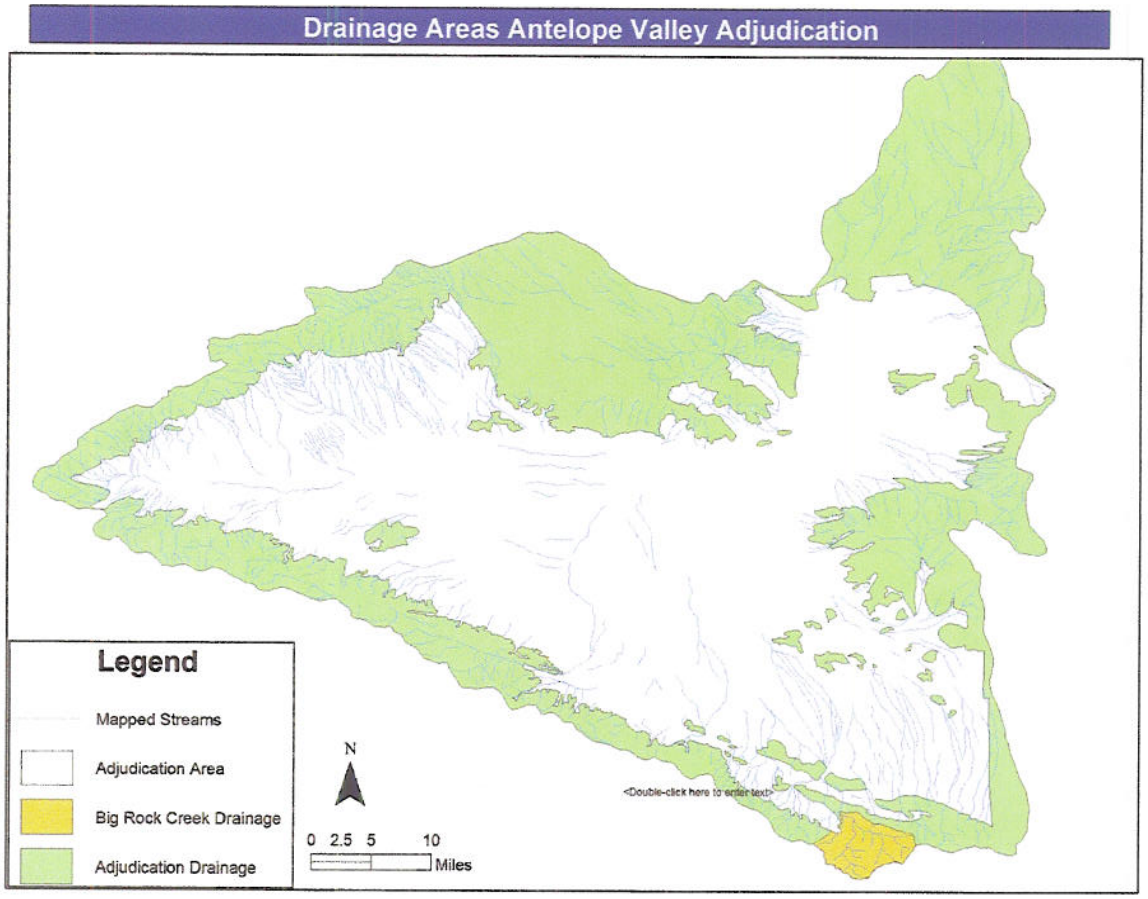

Drainage Areas Antelope Valley Adjudication
Legend
Mapped Streams
Adjudication Area
Big Rock Creek Drainage
Adjudication Drainage
N
0 2.5 5 10
Miles
<Double-click here to enter text>

Exhibit 8

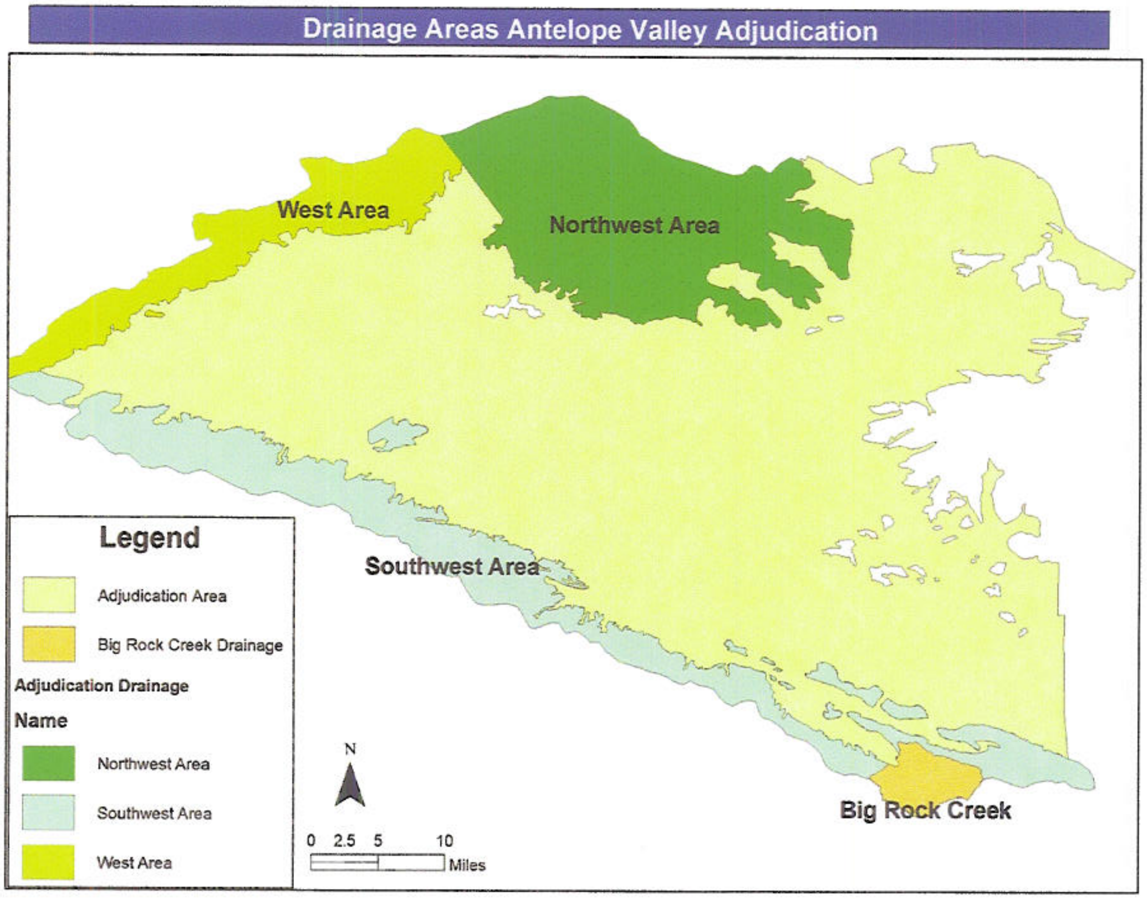

Drainage Areas Antelope Valley Adjudication
West Area
Northwest Area
Southwest Area
Big Rock Creek
Legend
Adjudication Area
Big Rock Creek Drainage
Adjudication Drainage
Name
Northwest Area
Southwest Area
West Area
N
0 2.5 5 10
Miles

Exhibit 9

PROOF OF SERVICE

ANTELOPE VALLEY GROUNDWATER CASES
JUDICIAL COUNCIL PROCEEDING NO. 4408
CASE NO.: 1-05-CV-049053

I am a citizen of the United States and a resident of the county aforesaid; I am over the age of eighteen years and not a party to the within action; my business address is: 5001 E. Commercenter Drive, Suite 300, Bakersfield, California 93309. On April 11, 2011, I served the within **DECLARATION OF STEVEN BACHMAN, Ph.D., IN RESPONSE TO THE DECLARATION OF JOSEPH SCALMANINI RE: REBUTTAL TESTIMONY**

■ (**BY POSTING**) I am "readily familiar" with the Court's Clarification Order. Electronic service and electronic posting completed through www.scefiling.org ; All papers filed in Los Angeles County Superior Court and copy sent to trial judge and Chair of Judicial Council.

Los Angeles County Superior Court
111 North Hill Street
Los Angeles, CA 90012
Attn: **Department 1**
(213) 893-1014

Chair, Judicial Council of California
Administrative Office of the Courts
Attn: Appellate & Trial Court Judicial Services
(Civil Case Coordinator)
Carlotta Tillman
455 Golden Gate Avenue
San Francisco, CA 94102-3688
Fax (415) 865-4315

☐ **(BY MAIL)** I am "readily familiar" with the firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with the U.S. Postal Service on that same day with postage thereon fully prepaid at Bakersfield, California, in the ordinary course of business.

■ (**STATE**) I declare under penalty of perjury under the laws of the State of California that the above is true and correct, and that the foregoing was executed on April 11, 2011, in Bakersfield, California.

LEQUETTA HANSEN