

Appendix H5

Addendum to September 1, 2011
Cadiz Groundwater Modeling and
Impact Analysis



Technical Memorandum



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From:	Dennis E. Williams, Ph.D. President GEOSCIENCE Support Services, Inc.
Date:	November 14, 2011
Subject:	Addendum to September 1, 2011 Cadiz Groundwater Modeling and Impact Analysis (Geoscience)

This Technical Memorandum provides a supplemental assessment of historical geohydrologic conditions at the Cadiz Agricultural Wellfield and additional information with regards to the selected groundwater extraction scenarios and wellfield configuration.

1.0 Discussion of Change in Water Levels in Cadiz Agricultural Wellfield Area

The Cadiz Agricultural Wellfield extracts groundwater from aquifers that are for the most part semi-confined or leaky. A semi-confined aquifer is an aquifer that has lower permeability sedimentary units above the main aquifer system as well as in the main aquifer system. The result is that when the wellfield is operated, an immediate drop in the water level occurs in association with the recharge to the well field. This cone of depression expands in a logarithmic form from each of the wells, overlapping when interference occurs. The cone of depression continues to expand outward away from the wellfield until the recharge is sufficient to meet the wellfield demands. During this time, the cone of depression behaves like a confined aquifer system until the vertical hydraulic gradient is established to allow leakage from the upper saturated materials through the aquitards to the main aquifer system. As such, there is a time lag associated with the pumping of a semi-confined system such as the Cadiz Agricultural Wellfield before stabilization occurs. The time lag may occur over decades as in the Cadiz Agricultural Wellfield case. This phenomenon is very similar to the phenomenon of delayed yield in unconfined aquifers. That is, in the early stages of operations, the aquifer system behaves as a confined system until the delayed yield of the vertical gravity drainage “catches up” and allows stabilization of

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ground water levels. The fact that this is a semi-confined system is supported by: (1) static (non-pumping) water levels rising above the top of the well screens; (2) aquifer parameters calculated from pumping test data; and (3) the stratigraphy of the aquifer as assessed from the lithologic logs of the wells.

Therefore, the stresses caused by Cadiz agricultural pumping have not created sufficient recharge (from vertical leakage or other induced recharge) to sufficiently stabilize water levels.

2.0 Selection of 50,000 acre-ft/yr for Proposed Conservation Pumping

The Project intends to conserve groundwater from evaporation to dry lakes by retrieving groundwater presently down gradient from the well-field in addition to capturing natural recharge. Previous analysis (GEOSCIENCE Technical Memorandum dated September 20, 2011) has shown that pumping in excess of the natural recharge is necessary to reduce the evaporative losses to the dry lakes. Project pumping of 50,000 acre-ft/yr and 75,000 acre-ft/yr was used for determining the volumes of conservation using the ground water model. The analysis showed that conservation of evaporative losses increases with increased Project pumping by retrieving water that was moving down-gradient towards the dry lakes. That is to say Project pumping of 50,000 acre-ft/yr will result in increased conservation of evaporative losses above the natural recharge (32,000 acre-ft/yr) and Project pumping of 75,000 acre-ft/yr will further increase conservation by reducing outflows to the dry lakes. However, due to Project uncertainties with natural recharge, a pumping rate of 50,000 acre-ft/yr was selected for the Project to balance the objective of retrieving water before it can evaporate with the intent to minimize impacts. Pumping of less than the proposed 50,000 acre-ft/yr will result in an increase of loss to the dry lakes relative to Project pumping of 50,000 acre-ft/yr.

The aquifer storage created from the 50-year period of operation will allow natural recharge to fill the area of vacated storage resulting in continued minimal losses to the dry lakes during the early part of the recovery phase. Losses to evaporation will increase as ground water levels rise to pre-project conditions.

3.0 Discussion of Wellfield Configuration

Two wellfield configurations were used to address the potential range in recharge rates and thus transmissivity variations of the aquifer. The wellfield construction will be "Phased". That is, a group of wells will be constructed initially in the Fenner Gap area. Long-term pumping tests on these wells will be used to validate regional aquifer characteristics. Based on these data, the model will be recalibrated

and subsequent well locations will be based on the optimum locations from the regional aquifer tests. The wellfield installation is adaptable to the findings from the field data.

4.0 Additional Model Runs and Relationship to Wellfield Configuration

Two wellfield configurations were used in the September 1, 2011 Cadiz Groundwater Modeling and Impact Analysis to address the potential range in recharge rates and thus transmissivity variations of the aquifer. Wellfield configuration A focuses pumping in the Fenner Gap, including the use of high capacity wells in the carbonate aquifer, in the case of 32,000 acre-ft/yr of recharge. If, while installing the production wells, it is determined that the aquifer is not as transmissive as estimated from the 32,000 acre-ft/yr recharge, the lateral distance between each pumping well will be increased as shown in configuration B. So, the installation of the wellfield is adaptive to findings in the field.

Three additional groundwater flow model runs were made including (See Attached Tables):

- Natural Recharge of 32,000 acre-ft/yr with Wellfield configuration B,
- Natural Recharge of 16,000 acre-ft/yr with Wellfield configuration A, and
- Natural Recharge of 5,000 acre-ft/yr with Wellfield configuration A.

The following table summarizes the predicted drawdown at the end of 50 years (i.e., end of Project pumping) under each wellfield configuration and natural recharge conditions.

Natural Recharge	Wellfield Configuration A		Wellfield Configuration B	
	Drawdown at Wellfield [ft]	Drawdown at Bristol Dry Lake [ft]	Drawdown at Wellfield [ft]	Drawdown at Bristol Dry Lake [ft]
32,000 acre-ft/yr	70 – 80	10 – 30	60 – 70	10 - 40
16,000 acre-ft/yr	170 – 180	10 – 50	120 – 130	10 – 60
5,000 acre-ft/yr	380 – 390	0 – 70	260 - 270	0 – 80

As shown, under natural recharge of 5,000 acre-ft/yr conditions, an additional 120 ft of drawdown would occur with wellfield configuration A as compared to wellfield configuration B. As can be seen in the above table, when assumed recharge rates are low, drawdowns are increased for the centralized wellfield configuration A. The increased drawdowns occur in these low recharge scenarios as in order to calibrate, the transmissive characteristics of the aquifer were also made very low. What this is saying is that for low recharge rates the wellfield needs to be “spread out” and not centralized as in Wellfield Configuration A. As a result, the wellfield construction will be “Phased” as described above in section 3.0. That is, a group of wells will be constructed initially and long-term pumping tests run on these wells to validate regional aquifer characteristics. Based on these data, the model will be recalibrated and subsequent well locations based on the optimum locations from regional aquifer tests. This illustrates the importance of installation of a wellfield that is adaptable to the findings from the field data.

5.0 Explanation of Depth to Groundwater and Additional Table

In the Cadiz Groundwater Modeling and Impact Analysis, existing depth to water was based on the model-generated depth to water at five selected locations (see Figure 71 of the report) at the end of transient model calibration (i.e., December 2009). These locations were selected for the purpose of evaluation of groundwater water impacts and are not actual wells. In general, the water levels at these locations are consistent with the groundwater level contours shown in Figure 2 of the report and our interpretation of depth to water control point data by Moyle (1967) and Shafer (1964) (see Figure 2 of GEOSCIENCE, 2000¹). For example, the model-calculated depth to water of 33 ft and 18 ft and the edge and center of Bristol Dry Lake, respectively, is consistent with our interpreted depths of 39 ft and 16 ft.

The table shown in page 52 of the report is revised to the following:

Location	Model-Calculated Depth to Groundwater (December 2009) [ft]	Time	Depth to Groundwater [ft]		
			Project Scenario	Sensitivity Scenario 1	Sensitivity Scenario 2
Center of Wellfield	354	End of 50 Years	435	486	627
		End of 100 Years	351	371	412

¹ Cadiz Groundwater Storage and Dry-Year Supply Program Dry Lake Evapotranspiration Estimates. Prepared for the Metropolitan Water District of Southern California. June 19, 2000.

Existing Cadiz Wells	156	End of 50 Years	197	241	315
		End of 100 Years	154	181	219
Edge of Bristol Dry Lake	33	End of 50 Years	68	95	118
		End of 100 Years	42	74	108
Center of Bristol Dry	18	End of 50 Years	50	63	54
		End of 100 Years	33	62	79
Edge of Cadiz Dry Lake	7	End of 50 Years	21	59	72
		End of 100 Years	10	17	68

The depth to water of 18 feet shown in the table above represents only one model cell (an area of 500 ft by 500 ft) in the Bristol Dry Lake. The model-calculated average evaporation during the period from 1986 to 2009 was 30,300 acre-ft/yr, 15,000 acre-ft/yr and 4,800 acre-ft/yr for natural recharge of 32,000 acre-ft/yr, 16,000 acre-ft/yr and 5,000 acre-ft/yr, respectively.



Table 1

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 32,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
1	1986	32,422	32,384	2,970	-2,932	-2,932
2	1987	32,422	32,244	3,366	-3,188	-6,120
3	1988	32,422	32,041	4,059	-3,678	-9,798
4	1989	32,422	31,793	5,940	-5,311	-15,109
5	1990	32,422	31,472	6,689	-5,738	-20,847
6	Jan-91	2,700	2,608	48	45	-20,802
7	Feb-91	2,700	2,606	109	-14	-20,817
8	Mar-91	2,700	2,604	120	-23	-20,840
9	Apr-91	2,700	2,602	321	-222	-21,062
10	May-91	2,700	2,600	484	-383	-21,446
11	Jun-91	2,700	2,598	625	-522	-21,968
12	Jul-91	2,700	2,596	653	-549	-22,517
13	Aug-91	2,700	2,594	457	-351	-22,867
14	Sep-91	2,700	2,592	279	-171	-23,038
15	Oct-91	2,700	2,591	203	-93	-23,132
16	Nov-91	2,700	2,589	151	-40	-23,172
17	Dec-91	2,700	2,588	136	-23	-23,195
18	Jan-92	2,700	2,586	13	101	-23,094
19	Feb-92	2,700	2,585	143	-27	-23,121
20	Mar-92	2,700	2,583	287	-170	-23,291
21	Apr-92	2,700	2,582	479	-360	-23,651
22	May-92	2,700	2,580	592	-472	-24,123
23	Jun-92	2,700	2,579	594	-472	-24,595
24	Jul-92	2,700	2,577	797	-674	-25,269
25	Aug-92	2,700	2,576	395	-271	-25,540
26	Sep-92	2,700	2,575	285	-160	-25,700
27	Oct-92	2,700	2,574	56	71	-25,629
28	Nov-92	2,700	2,573	46	82	-25,548
29	Dec-92	2,700	2,571	77	52	-25,496
30	Jan-93	2,700	2,570	127	3	-25,492
31	Feb-93	2,700	2,569	157	-25	-25,518
32	Mar-93	2,700	2,568	228	-96	-25,613
33	Apr-93	2,700	2,567	319	-185	-25,798
34	May-93	2,700	2,565	622	-487	-26,285
35	Jun-93	2,700	2,565	747	-611	-26,896
36	Jul-93	2,700	2,564	781	-644	-27,541
37	Aug-93	2,700	2,562	479	-341	-27,882
38	Sep-93	2,700	2,562	349	-210	-28,092
39	Oct-93	2,700	2,561	295	-155	-28,247
40	Nov-93	2,700	2,559	125	16	-28,231
41	Dec-93	2,700	2,559	46	95	-28,136
42	Jan-94	2,700	2,557	88	55	-28,081
43	Feb-94	2,700	2,556	155	-11	-28,092
44	Mar-94	2,700	2,555	331	-186	-28,278
45	Apr-94	2,700	2,554	619	-473	-28,751

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Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
46	May-94	2,700	2,553	796	-648	-29,399
47	Jun-94	2,700	2,552	895	-747	-30,146
48	Jul-94	2,700	2,551	858	-708	-30,854
49	Aug-94	2,700	2,549	475	-323	-31,177
50	Sep-94	2,700	2,548	235	-83	-31,260
51	Oct-94	2,700	2,547	83	70	-31,191
52	Nov-94	2,700	2,546	47	108	-31,082
53	Dec-94	2,700	2,545	154	2	-31,081
54	Jan-95	2,700	2,543	35	122	-30,959
55	Feb-95	2,700	2,542	249	-91	-31,050
56	Mar-95	2,700	2,541	382	-223	-31,272
57	Apr-95	2,700	2,540	577	-416	-31,689
58	May-95	2,700	2,539	960	-798	-32,487
59	Jun-95	2,700	2,538	1,233	-1,071	-33,558
60	Jul-95	2,700	2,537	605	-441	-33,999
61	Aug-95	2,700	2,536	624	-459	-34,459
62	Sep-95	2,700	2,535	589	-423	-34,882
63	Oct-95	2,700	2,533	417	-249	-35,131
64	Nov-95	2,700	2,532	171	-3	-35,134
65	Dec-95	2,700	2,531	128	42	-35,092
66	Jan-96	2,700	2,530	156	15	-35,078
67	Feb-96	2,700	2,528	275	-103	-35,181
68	Mar-96	2,700	2,527	612	-439	-35,619
69	Apr-96	2,700	2,526	770	-596	-36,215
70	May-96	2,700	2,524	919	-742	-36,957
71	Jun-96	2,700	2,523	951	-774	-37,731
72	Jul-96	2,700	2,522	855	-676	-38,407
73	Aug-96	2,700	2,520	418	-238	-38,645
74	Sep-96	2,700	2,519	428	-246	-38,891
75	Oct-96	2,700	2,517	217	-34	-38,925
76	Nov-96	2,700	2,516	57	128	-38,797
77	Dec-96	2,700	2,514	62	124	-38,673
78	Jan-97	2,700	2,513	114	74	-38,599
79	Feb-97	2,700	2,512	194	-6	-38,605
80	Mar-97	2,700	2,510	433	-242	-38,848
81	Apr-97	2,700	2,509	659	-467	-39,315
82	May-97	2,700	2,508	814	-621	-39,936
83	Jun-97	2,700	2,506	969	-775	-40,711
84	Jul-97	2,700	2,506	862	-668	-41,378
85	Aug-97	2,700	2,504	593	-397	-41,775
86	Sep-97	2,700	2,503	387	-190	-41,965
87	Oct-97	2,700	2,502	262	-63	-42,028
88	Nov-97	2,700	2,501	76	123	-41,905
89	Dec-97	2,700	2,500	100	100	-41,804
90	Jan-98	2,700	2,498	120	82	-41,722

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Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
91	Feb-98	2,700	2,497	88	115	-41,607
92	Mar-98	2,700	2,497	257	-54	-41,661
93	Apr-98	2,700	2,495	442	-237	-41,898
94	May-98	2,700	2,494	758	-552	-42,450
95	Jun-98	2,700	2,494	810	-603	-43,053
96	Jul-98	2,700	2,493	909	-701	-43,754
97	Aug-98	2,700	2,492	776	-568	-44,322
98	Sep-98	2,700	2,491	393	-183	-44,506
99	Oct-98	2,700	2,490	290	-79	-44,585
100	Nov-98	2,700	2,489	114	97	-44,488
101	Dec-98	2,700	2,489	130	82	-44,406
102	Jan-99	2,700	2,488	95	117	-44,288
103	Feb-99	2,700	2,487	145	69	-44,220
104	Mar-99	2,883	2,486	461	-64	-44,284
105	Apr-99	2,801	2,485	779	-462	-44,747
106	May-99	2,745	2,484	954	-693	-45,440
107	Jun-99	2,852	2,483	1,151	-783	-46,223
108	Jul-99	2,948	2,483	1,228	-763	-46,985
109	Aug-99	2,918	2,482	1,046	-609	-47,595
110	Sep-99	2,817	2,480	696	-360	-47,954
111	Oct-99	2,700	2,480	344	-123	-48,078
112	Nov-99	2,700	2,479	179	43	-48,035
113	Dec-99	2,700	2,478	116	107	-47,928
114	Jan-00	2,700	2,477	106	117	-47,811
115	Feb-00	2,700	2,475	192	33	-47,778
116	Mar-00	2,700	2,475	351	-125	-47,904
117	Apr-00	2,700	2,473	550	-323	-48,226
118	May-00	2,700	2,472	799	-571	-48,798
119	Jun-00	2,700	2,472	1,053	-824	-49,622
120	Jul-00	2,700	2,470	900	-670	-50,291
121	Aug-00	2,700	2,469	823	-592	-50,883
122	Sep-00	2,700	2,468	655	-423	-51,305
123	Oct-00	2,700	2,467	401	-168	-51,473
124	Nov-00	2,700	2,466	152	82	-51,391
125	Dec-00	2,700	2,465	109	126	-51,265
126	Jan-01	2,700	2,464	159	77	-51,188
127	Feb-01	2,700	2,463	335	-98	-51,286
128	Mar-01	2,700	2,462	378	-139	-51,425
129	Apr-01	2,700	2,461	482	-242	-51,667
130	May-01	2,700	2,460	771	-530	-52,197
131	Jun-01	2,700	2,459	949	-708	-52,905
132	Jul-01	2,700	2,457	809	-566	-53,471
133	Aug-01	2,700	2,457	452	-208	-53,679
134	Sep-01	2,700	2,455	374	-129	-53,808
135	Oct-01	2,700	2,455	294	-48	-53,857

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Natural Recharge of 32,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
136	Nov-01	2,700	2,454	151	95	-53,761
137	Dec-01	2,700	2,453	82	165	-53,596
138	Jan-02	2,700	2,452	89	160	-53,437
139	Feb-02	2,700	2,451	164	85	-53,351
140	Mar-02	2,700	2,451	231	18	-53,333
141	Apr-02	2,700	2,450	343	-93	-53,426
142	May-02	2,700	2,449	1,380	-1,129	-54,554
143	Jun-02	2,700	2,448	872	-620	-55,174
144	Jul-02	2,700	2,447	882	-629	-55,804
145	Aug-02	2,700	2,446	684	-430	-56,234
146	Sep-02	2,700	2,446	456	-201	-56,435
147	Oct-02	2,700	2,445	300	-45	-56,480
148	Nov-02	2,700	2,444	116	141	-56,340
149	Dec-02	2,700	2,444	82	174	-56,165
150	Jan-03	2,700	2,443	73	185	-55,980
151	Feb-03	2,700	2,442	97	161	-55,820
152	Mar-03	2,700	2,441	213	46	-55,773
153	Apr-03	2,700	2,441	411	-151	-55,925
154	May-03	2,700	2,440	896	-635	-56,560
155	Jun-03	2,700	2,439	950	-689	-57,249
156	Jul-03	2,700	2,439	975	-713	-57,962
157	Aug-03	2,700	2,438	666	-404	-58,366
158	Sep-03	2,700	2,437	442	-179	-58,544
159	Oct-03	2,700	2,436	229	35	-58,509
160	Nov-03	2,700	2,436	63	202	-58,307
161	Dec-03	2,700	2,435	82	184	-58,123
162	Jan-04	2,700	2,434	103	164	-57,960
163	Feb-04	2,700	2,433	75	191	-57,768
164	Mar-04	2,700	2,433	270	-2	-57,771
165	Apr-04	2,700	2,432	396	-128	-57,899
166	May-04	2,700	2,431	498	-229	-58,127
167	Jun-04	2,700	2,431	584	-315	-58,442
168	Jul-04	2,700	2,430	652	-382	-58,824
169	Aug-04	2,700	2,430	687	-416	-59,240
170	Sep-04	2,700	2,429	558	-287	-59,527
171	Oct-04	2,700	2,429	231	41	-59,486
172	Nov-04	2,700	2,429	115	157	-59,330
173	Dec-04	2,700	2,429	61	211	-59,119
174	Jan-05	2,700	2,428	37	235	-58,883
175	Feb-05	2,700	2,428	33	239	-58,644
176	Mar-05	2,700	2,428	181	91	-58,553
177	Apr-05	2,700	2,427	252	21	-58,531
178	May-05	2,700	2,427	490	-216	-58,748
179	Jun-05	2,700	2,427	889	-615	-59,363
180	Jul-05	2,700	2,427	905	-631	-59,994

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Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
181	Aug-05	2,700	2,426	760	-486	-60,479
182	Sep-05	2,700	2,426	504	-230	-60,709
183	Oct-05	2,700	2,425	299	-24	-60,733
184	Nov-05	2,700	2,425	208	67	-60,666
185	Dec-05	2,700	2,425	61	214	-60,452
186	Jan-06	2,700	2,424	75	201	-60,251
187	Feb-06	2,700	2,424	109	167	-60,084
188	Mar-06	2,700	2,424	188	89	-59,995
189	Apr-06	2,700	2,423	252	25	-59,971
190	May-06	2,700	2,423	504	-227	-60,197
191	Jun-06	2,700	2,423	748	-471	-60,668
192	Jul-06	2,700	2,422	690	-412	-61,079
193	Aug-06	2,700	2,422	666	-387	-61,466
194	Sep-06	2,700	2,421	567	-288	-61,755
195	Oct-06	2,700	2,421	291	-12	-61,766
196	Nov-06	2,700	2,421	282	-3	-61,769
197	Dec-06	2,700	2,421	64	215	-61,554
198	Jan-07	2,700	2,421	88	192	-61,362
199	Feb-07	2,700	2,421	86	193	-61,169
200	Mar-07	2,700	2,421	130	149	-61,020
201	Apr-07	2,700	2,421	472	-192	-61,212
202	May-07	2,700	2,421	512	-232	-61,444
203	Jun-07	2,700	2,420	629	-348	-61,792
204	Jul-07	2,700	2,420	493	-213	-62,005
205	Aug-07	2,700	2,420	428	-147	-62,152
206	Sep-07	2,700	2,419	317	-36	-62,188
207	Oct-07	2,700	2,419	193	88	-62,100
208	Nov-07	2,700	2,419	153	128	-61,972
209	Dec-07	2,700	2,419	86	195	-61,777
210	Jan-08	2,700	2,419	58	223	-61,554
211	Feb-08	2,700	2,419	54	227	-61,328
212	Mar-08	2,700	2,419	109	172	-61,156
213	Apr-08	2,700	2,419	169	112	-61,044
214	May-08	2,700	2,419	200	81	-60,963
215	Jun-08	2,700	2,420	346	-65	-61,028
216	Jul-08	2,700	2,419	344	-63	-61,091
217	Aug-08	2,700	2,420	194	86	-61,005
218	Sep-08	2,700	2,420	187	94	-60,911
219	Oct-08	2,700	2,420	174	106	-60,805
220	Nov-08	2,700	2,421	89	191	-60,614
221	Dec-08	2,700	2,421	45	234	-60,380
222	Jan-09	2,700	2,421	38	241	-60,139
223	Feb-09	2,700	2,422	48	231	-59,909
224	Mar-09	2,700	2,422	144	135	-59,774
225	Apr-09	2,700	2,423	216	62	-59,712

Table 1

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 32,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
226	May-09	2,700	2,423	226	51	-59,661
227	Jun-09	2,700	2,424	230	47	-59,614
228	Jul-09	2,700	2,424	397	-121	-59,735
229	Aug-09	2,700	2,425	236	40	-59,695
230	Sep-09	2,700	2,425	152	123	-59,572
231	Oct-09	2,700	2,426	115	160	-59,412
232	Nov-09	2,700	2,427	55	219	-59,193
233	Dec-09	2,700	2,427	26	247	-58,946
Annual Average from 1986 to 2009		32,453	30,260	4,649	-2,456	

[1] Model input data including natural recharge of 32,422 acre-ft/yr and artificial recharge for pilot infiltration testing conducted between Mar-99 and Sep-99

[2] Model-calculated

[3] Model input data

[4] = [1] - [2] - [3]

[5] cumulative values based on [4]

Table 2

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 16,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
1	1986	16,211	16,207	2,970	-2,966	-2,966
2	1987	16,211	16,169	3,366	-3,324	-6,290
3	1988	16,211	16,096	4,059	-3,944	-10,234
4	1989	16,211	15,994	5,940	-5,723	-15,957
5	1990	16,211	15,855	6,689	-6,333	-22,290
6	Jan-91	1,350	1,315	48	-12	-22,303
7	Feb-91	1,350	1,313	109	-72	-22,375
8	Mar-91	1,350	1,312	120	-82	-22,457
9	Apr-91	1,350	1,311	321	-282	-22,739
10	May-91	1,350	1,310	484	-444	-23,183
11	Jun-91	1,350	1,309	625	-584	-23,767
12	Jul-91	1,350	1,308	653	-611	-24,378
13	Aug-91	1,350	1,307	457	-414	-24,791
14	Sep-91	1,350	1,306	279	-235	-25,026
15	Oct-91	1,350	1,305	203	-157	-25,183
16	Nov-91	1,350	1,304	151	-105	-25,288
17	Dec-91	1,350	1,303	136	-89	-25,376
18	Jan-92	1,350	1,302	13	35	-25,341
19	Feb-92	1,350	1,301	143	-94	-25,434
20	Mar-92	1,350	1,300	287	-237	-25,671
21	Apr-92	1,350	1,299	479	-428	-26,098
22	May-92	1,350	1,298	592	-540	-26,638
23	Jun-92	1,350	1,297	594	-541	-27,179
24	Jul-92	1,350	1,296	797	-743	-27,921
25	Aug-92	1,350	1,295	395	-340	-28,261
26	Sep-92	1,350	1,294	285	-229	-28,490
27	Oct-92	1,350	1,293	56	1	-28,489
28	Nov-92	1,350	1,292	46	12	-28,477
29	Dec-92	1,350	1,291	77	-18	-28,495
30	Jan-93	1,350	1,291	127	-67	-28,562
31	Feb-93	1,350	1,290	157	-96	-28,659
32	Mar-93	1,350	1,289	228	-167	-28,826
33	Apr-93	1,350	1,288	319	-257	-29,082
34	May-93	1,350	1,287	622	-559	-29,641
35	Jun-93	1,350	1,286	747	-683	-30,324
36	Jul-93	1,350	1,285	781	-716	-31,040
37	Aug-93	1,350	1,284	479	-413	-31,453
38	Sep-93	1,350	1,284	349	-282	-31,736
39	Oct-93	1,350	1,283	295	-228	-31,963
40	Nov-93	1,350	1,282	125	-57	-32,020
41	Dec-93	1,350	1,281	46	23	-31,997
42	Jan-94	1,350	1,280	88	-19	-32,016
43	Feb-94	1,350	1,280	155	-84	-32,100
44	Mar-94	1,350	1,279	331	-260	-32,360
45	Apr-94	1,350	1,278	619	-547	-32,907

Table 2

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 16,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
46	May-94	1,350	1,277	796	-723	-33,630
47	Jun-94	1,350	1,276	895	-821	-34,451
48	Jul-94	1,350	1,275	858	-783	-35,234
49	Aug-94	1,350	1,275	475	-399	-35,633
50	Sep-94	1,350	1,274	235	-158	-35,792
51	Oct-94	1,350	1,273	83	-6	-35,798
52	Nov-94	1,350	1,272	47	31	-35,767
53	Dec-94	1,350	1,272	154	-76	-35,843
54	Jan-95	1,350	1,271	35	44	-35,798
55	Feb-95	1,350	1,270	249	-169	-35,967
56	Mar-95	1,350	1,269	382	-301	-36,267
57	Apr-95	1,350	1,268	577	-495	-36,762
58	May-95	1,350	1,267	960	-877	-37,640
59	Jun-95	1,350	1,266	1,233	-1,149	-38,789
60	Jul-95	1,350	1,266	605	-520	-39,309
61	Aug-95	1,350	1,265	624	-539	-39,848
62	Sep-95	1,350	1,264	589	-503	-40,350
63	Oct-95	1,350	1,263	417	-330	-40,680
64	Nov-95	1,350	1,262	171	-84	-40,764
65	Dec-95	1,350	1,262	128	-39	-40,803
66	Jan-96	1,350	1,261	156	-67	-40,870
67	Feb-96	1,350	1,260	275	-185	-41,055
68	Mar-96	1,350	1,259	612	-521	-41,576
69	Apr-96	1,350	1,258	770	-678	-42,254
70	May-96	1,350	1,257	919	-826	-43,080
71	Jun-96	1,350	1,256	951	-858	-43,938
72	Jul-96	1,350	1,256	855	-760	-44,698
73	Aug-96	1,350	1,255	418	-322	-45,020
74	Sep-96	1,350	1,254	428	-331	-45,352
75	Oct-96	1,350	1,253	217	-120	-45,471
76	Nov-96	1,350	1,252	57	41	-45,431
77	Dec-96	1,350	1,251	62	37	-45,394
78	Jan-97	1,350	1,250	114	-14	-45,407
79	Feb-97	1,350	1,250	194	-94	-45,501
80	Mar-97	1,350	1,249	433	-331	-45,832
81	Apr-97	1,350	1,248	659	-556	-46,389
82	May-97	1,350	1,247	814	-710	-47,099
83	Jun-97	1,350	1,246	969	-865	-47,963
84	Jul-97	1,350	1,245	862	-757	-48,721
85	Aug-97	1,350	1,244	593	-487	-49,207
86	Sep-97	1,350	1,243	387	-280	-49,487
87	Oct-97	1,350	1,242	262	-154	-49,641
88	Nov-97	1,350	1,242	76	33	-49,609
89	Dec-97	1,350	1,241	100	9	-49,600
90	Jan-98	1,350	1,240	120	-10	-49,609

Table 2

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 16,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
91	Feb-98	1,350	1,239	88	23	-49,587
92	Mar-98	1,350	1,238	257	-146	-49,732
93	Apr-98	1,350	1,238	442	-329	-50,062
94	May-98	1,350	1,237	758	-645	-50,707
95	Jun-98	1,350	1,236	810	-695	-51,402
96	Jul-98	1,350	1,235	909	-794	-52,195
97	Aug-98	1,350	1,234	776	-660	-52,856
98	Sep-98	1,350	1,233	393	-276	-53,132
99	Oct-98	1,350	1,233	290	-172	-53,304
100	Nov-98	1,350	1,232	114	4	-53,300
101	Dec-98	1,350	1,231	130	-11	-53,310
102	Jan-99	1,350	1,231	95	24	-53,286
103	Feb-99	1,350	1,230	145	-25	-53,311
104	Mar-99	1,533	1,229	461	-158	-53,468
105	Apr-99	1,451	1,228	779	-556	-54,024
106	May-99	1,395	1,228	954	-787	-54,811
107	Jun-99	1,502	1,227	1,151	-877	-55,687
108	Jul-99	1,598	1,226	1,228	-856	-56,544
109	Aug-99	1,568	1,225	1,046	-703	-57,247
110	Sep-99	1,467	1,225	696	-454	-57,701
111	Oct-99	1,350	1,224	344	-218	-57,919
112	Nov-99	1,350	1,223	179	-52	-57,971
113	Dec-99	1,350	1,223	116	12	-57,959
114	Jan-00	1,350	1,222	106	22	-57,937
115	Feb-00	1,350	1,221	192	-64	-58,001
116	Mar-00	1,350	1,221	351	-221	-58,222
117	Apr-00	1,350	1,220	550	-419	-58,642
118	May-00	1,350	1,219	799	-668	-59,310
119	Jun-00	1,350	1,218	1,053	-921	-60,231
120	Jul-00	1,350	1,217	900	-767	-60,997
121	Aug-00	1,350	1,217	823	-689	-61,687
122	Sep-00	1,350	1,216	655	-520	-62,207
123	Oct-00	1,350	1,215	401	-266	-62,473
124	Nov-00	1,350	1,214	152	-17	-62,490
125	Dec-00	1,350	1,214	109	28	-62,462
126	Jan-01	1,350	1,213	159	-22	-62,484
127	Feb-01	1,350	1,212	335	-197	-62,682
128	Mar-01	1,350	1,212	378	-239	-62,921
129	Apr-01	1,350	1,211	482	-342	-63,263
130	May-01	1,350	1,210	771	-631	-63,894
131	Jun-01	1,350	1,209	949	-808	-64,702
132	Jul-01	1,350	1,208	809	-668	-65,370
133	Aug-01	1,350	1,208	452	-309	-65,679
134	Sep-01	1,350	1,207	374	-231	-65,909
135	Oct-01	1,350	1,206	294	-150	-66,059

Table 2

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 16,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
136	Nov-01	1,350	1,205	151	-7	-66,066
137	Dec-01	1,350	1,205	82	63	-66,003
138	Jan-02	1,350	1,204	89	57	-65,945
139	Feb-02	1,350	1,203	164	-17	-65,962
140	Mar-02	1,350	1,202	231	-83	-66,046
141	Apr-02	1,350	1,202	343	-195	-66,241
142	May-02	1,350	1,201	1,380	-1,231	-67,472
143	Jun-02	1,350	1,200	872	-722	-68,194
144	Jul-02	1,350	1,199	882	-732	-68,926
145	Aug-02	1,350	1,199	684	-533	-69,459
146	Sep-02	1,350	1,198	456	-304	-69,762
147	Oct-02	1,350	1,197	300	-148	-69,910
148	Nov-02	1,350	1,197	116	37	-69,873
149	Dec-02	1,350	1,196	82	72	-69,801
150	Jan-03	1,350	1,196	73	82	-69,719
151	Feb-03	1,350	1,195	97	58	-69,661
152	Mar-03	1,350	1,194	213	-56	-69,717
153	Apr-03	1,350	1,194	411	-254	-69,972
154	May-03	1,350	1,193	896	-738	-70,710
155	Jun-03	1,350	1,192	950	-792	-71,502
156	Jul-03	1,350	1,191	975	-816	-72,318
157	Aug-03	1,350	1,191	666	-506	-72,825
158	Sep-03	1,350	1,190	442	-282	-73,106
159	Oct-03	1,350	1,189	229	-68	-73,174
160	Nov-03	1,350	1,189	63	99	-73,076
161	Dec-03	1,350	1,188	82	80	-72,996
162	Jan-04	1,350	1,188	103	60	-72,936
163	Feb-04	1,350	1,187	75	88	-72,848
164	Mar-04	1,350	1,186	270	-106	-72,954
165	Apr-04	1,350	1,186	396	-232	-73,186
166	May-04	1,350	1,185	498	-332	-73,518
167	Jun-04	1,350	1,184	584	-418	-73,937
168	Jul-04	1,350	1,184	652	-485	-74,422
169	Aug-04	1,350	1,183	687	-519	-74,942
170	Sep-04	1,350	1,183	558	-391	-75,332
171	Oct-04	1,350	1,182	231	-63	-75,395
172	Nov-04	1,350	1,181	115	54	-75,341
173	Dec-04	1,350	1,181	61	108	-75,233
174	Jan-05	1,350	1,180	37	133	-75,100
175	Feb-05	1,350	1,180	33	137	-74,963
176	Mar-05	1,350	1,180	181	-11	-74,973
177	Apr-05	1,350	1,179	252	-80	-75,054
178	May-05	1,350	1,178	490	-318	-75,371
179	Jun-05	1,350	1,178	889	-717	-76,088
180	Jul-05	1,350	1,177	905	-732	-76,820

Table 2

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 16,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
181	Aug-05	1,350	1,177	760	-586	-77,406
182	Sep-05	1,350	1,177	504	-331	-77,737
183	Oct-05	1,350	1,176	299	-125	-77,861
184	Nov-05	1,350	1,176	208	-34	-77,895
185	Dec-05	1,350	1,175	61	114	-77,781
186	Jan-06	1,350	1,175	75	100	-77,681
187	Feb-06	1,350	1,174	109	67	-77,614
188	Mar-06	1,350	1,174	188	-12	-77,626
189	Apr-06	1,350	1,173	252	-75	-77,702
190	May-06	1,350	1,173	504	-327	-78,029
191	Jun-06	1,350	1,172	748	-570	-78,599
192	Jul-06	1,350	1,172	690	-512	-79,111
193	Aug-06	1,350	1,171	666	-487	-79,598
194	Sep-06	1,350	1,171	567	-388	-79,986
195	Oct-06	1,350	1,171	291	-111	-80,097
196	Nov-06	1,350	1,170	282	-102	-80,199
197	Dec-06	1,350	1,170	64	116	-80,082
198	Jan-07	1,350	1,169	88	93	-79,989
199	Feb-07	1,350	1,169	86	95	-79,895
200	Mar-07	1,350	1,169	130	51	-79,843
201	Apr-07	1,350	1,168	472	-290	-80,133
202	May-07	1,350	1,168	512	-330	-80,464
203	Jun-07	1,350	1,168	629	-446	-80,910
204	Jul-07	1,350	1,167	493	-310	-81,220
205	Aug-07	1,350	1,167	428	-245	-81,464
206	Sep-07	1,350	1,166	317	-133	-81,597
207	Oct-07	1,350	1,166	193	-9	-81,606
208	Nov-07	1,350	1,166	153	31	-81,576
209	Dec-07	1,350	1,166	86	98	-81,477
210	Jan-08	1,350	1,165	58	127	-81,350
211	Feb-08	1,350	1,165	54	131	-81,220
212	Mar-08	1,350	1,165	109	76	-81,144
213	Apr-08	1,350	1,164	169	17	-81,127
214	May-08	1,350	1,164	200	-14	-81,140
215	Jun-08	1,350	1,164	346	-160	-81,300
216	Jul-08	1,350	1,164	344	-157	-81,457
217	Aug-08	1,350	1,163	194	-7	-81,464
218	Sep-08	1,350	1,163	187	0	-81,464
219	Oct-08	1,350	1,163	174	14	-81,450
220	Nov-08	1,350	1,163	89	99	-81,352
221	Dec-08	1,350	1,162	45	143	-81,209
222	Jan-09	1,350	1,162	38	150	-81,059
223	Feb-09	1,350	1,162	48	140	-80,919
224	Mar-09	1,350	1,162	144	45	-80,874
225	Apr-09	1,350	1,162	216	-27	-80,902

Table 2

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 16,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
226	May-09	1,350	1,162	226	-37	-80,939
227	Jun-09	1,350	1,161	230	-41	-80,980
228	Jul-09	1,350	1,161	397	-208	-81,189
229	Aug-09	1,350	1,161	236	-47	-81,236
230	Sep-09	1,350	1,161	152	37	-81,199
231	Oct-09	1,350	1,161	115	74	-81,124
232	Nov-09	1,350	1,161	55	135	-80,990
233	Dec-09	1,350	1,161	26	163	-80,826
Annual Average from 1986 to 2009		16,248	14,967	4,649	-3,368	

[1] Model input data including natural recharge of 16,211 acre-ft/yr and artificial recharge for pilot infiltration testing conducted between Mar-99 and Sep-99

[2] Model-calculated

[3] Model input data

[4] = [1] - [2] - [3]

[5] cumulative values based on [4]

Table 3

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 5,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
1	1986	5,058	5,055	2,970	-2,967	-2,967
2	1987	5,058	5,047	3,366	-3,355	-6,322
3	1988	5,058	5,036	4,059	-4,037	-10,359
4	1989	5,058	5,025	5,940	-5,907	-16,267
5	1990	5,058	5,012	6,689	-6,643	-22,910
6	Jan-91	421	417	48	-43	-22,953
7	Feb-91	421	417	109	-104	-23,057
8	Mar-91	421	416	120	-115	-23,173
9	Apr-91	421	416	321	-316	-23,489
10	May-91	421	416	484	-479	-23,968
11	Jun-91	421	416	625	-620	-24,587
12	Jul-91	421	416	653	-648	-25,235
13	Aug-91	421	416	457	-451	-25,686
14	Sep-91	421	416	279	-273	-25,960
15	Oct-91	421	415	203	-197	-26,157
16	Nov-91	421	415	151	-145	-26,302
17	Dec-91	421	415	136	-130	-26,432
18	Jan-92	421	415	13	-7	-26,438
19	Feb-92	421	415	143	-136	-26,575
20	Mar-92	421	415	287	-280	-26,855
21	Apr-92	421	414	479	-472	-27,327
22	May-92	421	414	592	-585	-27,912
23	Jun-92	421	414	594	-587	-28,499
24	Jul-92	421	414	797	-790	-29,288
25	Aug-92	421	414	395	-387	-29,676
26	Sep-92	421	413	285	-277	-29,953
27	Oct-92	421	413	56	-48	-30,001
28	Nov-92	421	413	46	-38	-30,038
29	Dec-92	421	413	77	-69	-30,107
30	Jan-93	421	413	127	-118	-30,225
31	Feb-93	421	412	157	-148	-30,374
32	Mar-93	421	412	228	-219	-30,592
33	Apr-93	421	412	319	-310	-30,902
34	May-93	421	412	622	-613	-31,515
35	Jun-93	421	412	747	-737	-32,252
36	Jul-93	421	411	781	-771	-33,023
37	Aug-93	421	411	479	-469	-33,492
38	Sep-93	421	411	349	-339	-33,831
39	Oct-93	421	411	295	-284	-34,115
40	Nov-93	421	411	125	-114	-34,230
41	Dec-93	421	410	46	-35	-34,265
42	Jan-94	421	410	88	-77	-34,342
43	Feb-94	421	410	155	-143	-34,486
44	Mar-94	421	410	331	-319	-34,805
45	Apr-94	421	409	619	-608	-35,413

Table 3

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 5,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
46	May-94	421	409	796	-784	-36,196
47	Jun-94	421	409	895	-883	-37,079
48	Jul-94	421	409	858	-846	-37,924
49	Aug-94	421	409	475	-462	-38,386
50	Sep-94	421	408	235	-222	-38,608
51	Oct-94	421	408	83	-70	-38,678
52	Nov-94	421	408	47	-33	-38,712
53	Dec-94	421	408	154	-141	-38,852
54	Jan-95	421	407	35	-21	-38,873
55	Feb-95	421	407	249	-235	-39,108
56	Mar-95	421	407	382	-367	-39,476
57	Apr-95	421	407	577	-562	-40,038
58	May-95	421	407	960	-945	-40,983
59	Jun-95	421	406	1,233	-1,218	-42,202
60	Jul-95	421	406	605	-590	-42,791
61	Aug-95	421	406	624	-608	-43,400
62	Sep-95	421	406	589	-573	-43,973
63	Oct-95	421	405	417	-401	-44,374
64	Nov-95	421	405	171	-155	-44,529
65	Dec-95	421	405	128	-111	-44,640
66	Jan-96	421	405	156	-140	-44,780
67	Feb-96	421	404	275	-258	-45,038
68	Mar-96	421	404	612	-595	-45,633
69	Apr-96	421	404	770	-753	-46,386
70	May-96	421	404	919	-901	-47,287
71	Jun-96	421	403	951	-934	-48,220
72	Jul-96	421	403	855	-837	-49,057
73	Aug-96	421	403	418	-400	-49,457
74	Sep-96	421	403	428	-409	-49,866
75	Oct-96	421	402	217	-198	-50,064
76	Nov-96	421	402	57	-38	-50,102
77	Dec-96	421	402	62	-43	-50,145
78	Jan-97	421	402	114	-94	-50,239
79	Feb-97	421	401	194	-175	-50,414
80	Mar-97	421	401	433	-413	-50,826
81	Apr-97	421	401	659	-639	-51,465
82	May-97	421	401	814	-793	-52,258
83	Jun-97	421	400	969	-948	-53,206
84	Jul-97	421	400	862	-841	-54,047
85	Aug-97	421	400	593	-571	-54,619
86	Sep-97	421	400	387	-365	-54,984
87	Oct-97	421	399	262	-240	-55,224
88	Nov-97	421	399	76	-54	-55,278
89	Dec-97	421	399	100	-78	-55,356
90	Jan-98	421	399	120	-97	-55,453

Table 3

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 5,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
91	Feb-98	421	398	88	-65	-55,519
92	Mar-98	421	398	257	-234	-55,753
93	Apr-98	421	398	442	-419	-56,172
94	May-98	421	398	758	-734	-56,906
95	Jun-98	421	397	810	-786	-57,691
96	Jul-98	421	397	909	-885	-58,576
97	Aug-98	421	397	776	-752	-59,328
98	Sep-98	421	396	393	-368	-59,696
99	Oct-98	421	396	290	-265	-59,960
100	Nov-98	421	396	114	-88	-60,049
101	Dec-98	421	396	130	-104	-60,153
102	Jan-99	421	395	95	-69	-60,222
103	Feb-99	421	395	145	-119	-60,341
104	Mar-99	604	395	461	-252	-60,593
105	Apr-99	522	395	779	-651	-61,244
106	May-99	466	394	954	-882	-62,126
107	Jun-99	573	394	1,151	-973	-63,099
108	Jul-99	669	394	1,228	-953	-64,052
109	Aug-99	639	393	1,046	-800	-64,851
110	Sep-99	538	393	696	-551	-65,403
111	Oct-99	421	393	344	-316	-65,719
112	Nov-99	421	393	179	-150	-65,869
113	Dec-99	421	392	116	-87	-65,956
114	Jan-00	421	392	106	-77	-66,033
115	Feb-00	421	392	192	-163	-66,196
116	Mar-00	421	391	351	-321	-66,517
117	Apr-00	421	391	550	-520	-67,037
118	May-00	421	391	799	-769	-67,806
119	Jun-00	421	391	1,053	-1,022	-68,828
120	Jul-00	421	390	900	-869	-69,696
121	Aug-00	421	390	823	-792	-70,488
122	Sep-00	421	390	655	-623	-71,111
123	Oct-00	421	389	401	-370	-71,481
124	Nov-00	421	389	152	-120	-71,601
125	Dec-00	421	389	109	-77	-71,678
126	Jan-01	421	389	159	-127	-71,804
127	Feb-01	421	388	335	-302	-72,106
128	Mar-01	421	388	378	-345	-72,451
129	Apr-01	421	388	482	-448	-72,899
130	May-01	421	388	771	-737	-73,636
131	Jun-01	421	387	949	-915	-74,552
132	Jul-01	421	387	809	-775	-75,327
133	Aug-01	421	387	452	-417	-75,744
134	Sep-01	421	386	374	-339	-76,083
135	Oct-01	421	386	294	-258	-76,342

Table 3

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 5,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
136	Nov-01	421	386	151	-116	-76,457
137	Dec-01	421	386	82	-47	-76,504
138	Jan-02	421	385	89	-53	-76,557
139	Feb-02	421	385	164	-127	-76,684
140	Mar-02	421	385	231	-195	-76,879
141	Apr-02	421	384	343	-307	-77,186
142	May-02	421	384	1,380	-1,343	-78,528
143	Jun-02	421	384	872	-835	-79,363
144	Jul-02	421	383	882	-844	-80,208
145	Aug-02	421	383	684	-646	-80,854
146	Sep-02	421	383	456	-418	-81,272
147	Oct-02	421	383	300	-262	-81,534
148	Nov-02	421	382	116	-77	-81,610
149	Dec-02	421	382	82	-43	-81,654
150	Jan-03	421	382	73	-33	-81,687
151	Feb-03	421	381	97	-58	-81,744
152	Mar-03	421	381	213	-173	-81,917
153	Apr-03	421	381	411	-370	-82,287
154	May-03	421	381	896	-855	-83,142
155	Jun-03	421	380	950	-909	-84,052
156	Jul-03	421	380	975	-934	-84,985
157	Aug-03	421	380	666	-625	-85,610
158	Sep-03	421	379	442	-400	-86,010
159	Oct-03	421	379	229	-187	-86,196
160	Nov-03	421	379	63	-21	-86,217
161	Dec-03	421	379	82	-39	-86,256
162	Jan-04	421	378	103	-60	-86,316
163	Feb-04	421	378	75	-32	-86,348
164	Mar-04	421	378	270	-226	-86,574
165	Apr-04	421	377	396	-353	-86,926
166	May-04	421	377	498	-454	-87,380
167	Jun-04	421	377	584	-540	-87,920
168	Jul-04	421	377	652	-607	-88,527
169	Aug-04	421	376	687	-642	-89,169
170	Sep-04	421	376	558	-513	-89,682
171	Oct-04	421	376	231	-185	-89,867
172	Nov-04	421	375	115	-69	-89,936
173	Dec-04	421	375	61	-15	-89,951
174	Jan-05	421	375	37	9	-89,941
175	Feb-05	421	375	33	13	-89,928
176	Mar-05	421	374	181	-134	-90,062
177	Apr-05	421	374	252	-204	-90,267
178	May-05	421	374	490	-442	-90,709
179	Jun-05	421	374	889	-841	-91,550
180	Jul-05	421	373	905	-857	-92,407

Table 3

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 5,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
181	Aug-05	421	373	760	-711	-93,118
182	Sep-05	421	373	504	-456	-93,574
183	Oct-05	421	372	299	-250	-93,824
184	Nov-05	421	372	208	-159	-93,983
185	Dec-05	421	372	61	-12	-93,995
186	Jan-06	421	372	75	-26	-94,020
187	Feb-06	421	371	109	-59	-94,080
188	Mar-06	421	371	188	-138	-94,218
189	Apr-06	421	371	252	-202	-94,420
190	May-06	421	371	504	-454	-94,873
191	Jun-06	421	370	748	-697	-95,571
192	Jul-06	421	370	690	-639	-96,210
193	Aug-06	421	370	666	-614	-96,824
194	Sep-06	421	369	567	-516	-97,339
195	Oct-06	421	369	291	-239	-97,578
196	Nov-06	421	369	282	-230	-97,807
197	Dec-06	421	369	64	-12	-97,819
198	Jan-07	421	369	88	-35	-97,854
199	Feb-07	421	368	86	-33	-97,887
200	Mar-07	421	368	130	-77	-97,964
201	Apr-07	421	368	472	-419	-98,383
202	May-07	421	367	512	-458	-98,841
203	Jun-07	421	367	629	-575	-99,416
204	Jul-07	421	367	493	-439	-99,855
205	Aug-07	421	367	428	-373	-100,228
206	Sep-07	421	366	317	-262	-100,490
207	Oct-07	421	366	193	-138	-100,628
208	Nov-07	421	366	153	-98	-100,726
209	Dec-07	421	366	86	-31	-100,757
210	Jan-08	421	365	58	-2	-100,759
211	Feb-08	421	365	54	2	-100,757
212	Mar-08	421	365	109	-53	-100,811
213	Apr-08	421	365	169	-112	-100,923
214	May-08	421	365	200	-143	-101,066
215	Jun-08	421	364	346	-289	-101,355
216	Jul-08	421	364	344	-287	-101,642
217	Aug-08	421	364	194	-137	-101,778
218	Sep-08	421	364	187	-129	-101,908
219	Oct-08	421	363	174	-116	-102,023
220	Nov-08	421	363	89	-31	-102,054
221	Dec-08	421	363	45	13	-102,041
222	Jan-09	421	363	38	21	-102,020
223	Feb-09	421	362	48	11	-102,010
224	Mar-09	421	362	144	-84	-102,094
225	Apr-09	421	362	216	-157	-102,251

Table 3

Groundwater Budget for Transient Model Calibration 1986 through 2009
Natural Recharge of 5,000 acre-ft/yr

Stress Period	Time	[1]	[2]	[3]	[4]	[5]
		Inflow	Outflow		Changes in Groundwater Storage	Cumulative Changes in Groundwater
		Recharge	ET	Cadiz Pumping		
		[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]	[acre-ft]
226	May-09	421	362	226	-166	-102,417
227	Jun-09	421	361	230	-171	-102,587
228	Jul-09	421	361	397	-337	-102,924
229	Aug-09	421	361	236	-175	-103,100
230	Sep-09	421	361	152	-92	-103,192
231	Oct-09	421	361	115	-54	-103,246
232	Nov-09	421	360	55	6	-103,239
233	Dec-09	421	360	26	35	-103,204
Annual Average from 1986 to 2009		5,100	4,752	4,649	-4,300	

[1] Model input data including natural recharge of 5,058 acre-ft/yr and artificial recharge for pilot infiltration testing conducted between Mar-99 and Sep-99

[2] Model-calculated

[3] Model input data

[4] = [1] - [2] - [3]

[5] cumulative values based on [4]

