

1 **Appendix H – Water Supply Calculations**

2 *A new appendix has been added to the RDEIR to show the water supply analysis calculations and data*  
3 *used. This is found in the next part of this document.*

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# Appendix H

## Water Supply Calculations

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# Water Supply Calculations

## Summary

The Proposed Project (or the 130-unit Alternative) will create water demands, consumptively use water, and will change groundwater recharge conditions on the project site. This appendix presents the baseline information on Rancho Canada golf course irrigation use, data on precipitation and evapotranspiration, Proposed Project/130-unit Alternative proposed water uses, consumptive use impacts compared to baseline, recharge analysis of non-impervious land covers using a soil-water balance model, and recharge analysis for impervious areas.

**Table H1-1** presents Rancho Canada Golf Course Irrigation Data for 1991 to 2014 along with estimated precipitation at the project site.

**Table H1-2** presents Rainfall Averages for the Monterey Peninsula and for the site from 1991 to 2014.

**Table H1-3** presents the fixture unit count assumptions used to estimate Proposed Project/130-unit Alternative water demands.

**Table H1-4** presents the estimated baseline consumptive use for different types of use years. The evapotranspiration factors used in the estimate of baseline consumptive use were derived from the soil-water balance modelling (see Table H2-1).

**Table H1-5** presents the estimated water demands and consumptive use for the Proposed Project.

**Table H1-6** compares the Proposed Project's consumptive use to the baseline consumptive use.

**Table H1-7** presents the estimated water demands and consumptive use for the 130-unit Alternative.

**Table H1-8** compares the 130-unit Alternative's consumptive use to the baseline consumptive use.

**Table H1-9** presents monthly data on golf course irrigation, precipitation, and reference evapotranspiration for Water Years 2009 to 2014. Figures and graphs follow this table to illustrate the relationship between irrigation, precipitation and evapotranspiration.

**Table H1-10** presents a profile of change in seasonal pumping from baseline conditions to Proposed Project and 130-unit Alternative Conditions.

- 1 **Table H1-11** presents data on individual wells on the Rancho Canada golf course including location,  
2 ownership, and pumping amounts from 1986 to 2014.
- 3 **Table H1-12** presents reported data on Cal-Am system losses in Water Years 2014 and 2015.
- 4 **Table H2-1** presents the results of the groundwater recharge analysis.
- 5 **Table H2-2** presents the land cover acreages used in the recharge analysis as well as plant factors for  
6 different land cover types.
- 7 **Table H2-3** presents data on precipitation and evapotranspiration used for the recharge analysis from the  
8 on-site CIMIS weather station (#210) on the Rancho Canada golf course for WY 2009 to WY 2016.
- 9 **Table H2-4** presents measured and modelled precipitation and reference evapotranspiration for Rancho  
10 Canada Golf Course for Water Years 1991 to 2016.
- 11 **Table H2-5** describes the factors and data used to estimate available water capacity for use in the soil-  
12 water balance modelling and describes the soil-water balance model source.
- 13 **Table H2-6** summarizes the results of the soil-water balance modelling for turf/landscape areas for 1991  
14 – 2016.
- 15 **Table H2-7** summarizes the results of the soil-water balance modelling for woodland areas for 1991 –  
16 2016.
- 17 **Table H2-8** summarized the results of the soil-water balance modelling for scrub areas for 1991 – 2016.
- 18 **Table H2-9** summarized the results of the soil-water balance modelling for wetland areas for 1991 –  
19 2016.
- 20 **Table H2-10** summarized the results of the soil-water balance modelling for pond areas for 1991 – 2016.
- 21 **Table H2-11** summarized the results of the soil-water balance modelling for grassland areas for 1991 –  
22 2016.
- 23 **Table H3-1** presents the results of the infiltration analysis for impervious parts of the Proposed Project  
24 and the 130-unit Alternative to estimate how much of runoff from impervious areas will contribute to  
25 recharge due to being routed to proposed infiltration basin(s). The analysis was done for Water Years  
26 2003 and 2009 to 2016, as hourly precipitation and evapotranspiration data were available for those  
27 periods. Two example output sheets from the modelling follow the table.

## 28 **References Cited in Appendix H**

- 29 Balance Hydrologics. 2005. Preliminary Stormwater Management Plan.
- 30 Cal-Am Water Company (Cal-Am). 2016. SWRCB Order WR 2009-0060. 1st Quarterly Report for the  
31 2015-2016 Water Year Addressing Operations for the Period of October 1, 2015 to December 31,  
32 2015.

- 1 California Irrigation Management Information System (CIMIS). 2016. Data for Carmel Meteorological  
2 Station, on Rancho Canada East Golf Course, CIMIS Station #210 data. Data retrieved directly from  
3 online and reported in this Appendix. <http://www.cimis.water.ca.gov/>
- 4 Dyer, James. 2015. User's Guide for Water Balance Toolbox (v. 2.2) for ArcGIS. Last modified March  
5 2015.
- 6 Dyer, James. 2009. Assessing topographic patterns in moisture use and stress using a water balance  
7 approach. *Landscape Ecol* (2009) 24:391–403.
- 8 Dyer, James. No Date. Soil-Water Balance Excel Model for Water Budget based on method of  
9 Thornthwaite & Mather. Available: [http://www.ohio.edu/people/dyer/water\\_balance.html](http://www.ohio.edu/people/dyer/water_balance.html)
- 10 Hopkins Marine Station. Various Dates. Monterey Weather Station Data [Precipitation 1991 - Sept. 1994  
11 and Oct. 2014 - Sept. 2016] from Weather Station #5795; accessed via Web at [http://www-](http://www-marine.stanford.edu/HMSweb/climate.htm)  
12 [marine.stanford.edu/HMSweb/climate.htm](http://www-marine.stanford.edu/HMSweb/climate.htm).
- 13 Lombardo 2006. Correspondence with Jacqueline Onciano, Monterey County regarding water supply.  
14 August 23.
- 15 MPWMD 2015a. Monthly Report. Exhibit 24-C: California American Water Production by Source-  
16 Water Year 2015. October 19.
- 17 MPWMD 2015b. How to Calculate Residential Construction Projects. July 10.
- 18 MPWMD 2016. Monthly Report. Exhibit 19C: California American Water Production by Source –  
19 Water Year 2016. August 15.
- 20 MWELO (California Model Water Efficient Landscape Ordinance). 2009. (California Code of  
21 Regulations, Title 23, Water, Division 2, Department of Water Resources, Chapter 2.7, Model Water  
22 Efficient Landscape Ordinance). September 10, 2009.
- 23 Natural Resources Conservation Service (NRCS). No Date. Web Soil Survey, On-line Soil Survey Data  
24 for Monterey County. Accessed: 11/7/2016.  
25 <http://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- 26 National Weather Service Climatological Station, Monterey, California. 1994 – 2014. Precipitation data  
27 1994- 2014 from National Weather Service Climatological Station, Monterey, California 93940  
28 (elevation 385'), accessed via web at: [http://met.nps.edu/~ldm/renard\\_wx/](http://met.nps.edu/~ldm/renard_wx/) Hard copy not available.  
29 Only available on the web.
- 30 Penn. State No date. The Cool-Season Turfgrasses: Basic Structures, Growth and Development.  
31 <http://plantscience.psu.edu/research/centers/turf/extension/factsheets/cool-season>
- 32 Saxton, K.E. and Rawls, W.J. 2006. Soil Water Characteristic Estimates by Texture and Organic Matter  
33 for Hydrologic Solutions. Available: <https://naldc.nal.usda.gov/catalog/3952>
- 34 Shellhorn, Gary. 1995. Defining Wetland Water Requirements and Evaporation Rates Relative to  
35 Lahontan Valley

- 1 U.S Department of Agriculture (USDA). 2007. Ecological Site Description (Coast Live Oak Woodland)
- 2 U.S. Department of Agriculture (USDA). 2008. Ecological Site Description (Coyote Brush Scrub
- 3 Profile)
- 4 University of California Cooperative Extension and California Department of Water Resources
- 5 (UCCE/DWR).). A Guide to Estimating Irrigation Water Needs of Landscape Plants in California:
- 6 The Landscape Coefficient Methods and WUCOLS (Water Use Classifications of Landscape
- 7 Species) III. August. Available: <http://www.water.ca.gov/wateruseefficiency/docs/wucols00.pdf>
- 8 Zischke 2014a. Rancho Canada Golf Course Water Use Data. September 15.
- 9 Zischke 2014b. Rancho Canada Golf Course Water Use Data and Other Information. December 22.
- 10 Zischke 2016. Response to ICF Data Request, October 7.

**Table H1-1: Existing Rancho Canada Golf Course Use., 1991 - 2014**

<b>Year</b>	<b>Irrigation</b>	<b>Type</b>	<b>Precip</b>	<b>Type</b>
1991	358.4	RY1991	11.9	WY1991
1992	425.0	RY1992	15.3	WY1992
1993	440.5	RY1993	25.8	WY1993
1994	465.9	RY1994	12.0	WY1994
1995	337.6	RY1995	24.4	WY1995
1996	457.2	RY1996	18.0	WY1996
1997	499.8	RY1997	18.7	WY1997
1998	346.6	RY1998	40.6	WY1998
1999	309.4	RY1999	17.2	WY1999
2000	489.3	RY2000	18.0	WY2000
2001	430.8	RY2001	16.5	WY2001
2002	522.0	WY2002	13.4	WY2002
2003	451.9	WY2003	15.8	WY2003
2004	451.8	WY2004	14.1	WY2004
2005	379.4	WY2005	26.2	WY2005
2006	368.8	WY2006	21.3	WY2006
2007	404.3	WY2007	12.1	WY2007
2008	443.3	WY2008	12.3	WY2008
2009	411.8	WY2009	19.7	WY2009
2010	324.1	WY2010	18.8	WY2010
2011	309.1	WY2011	19.9	WY2011
2012	340.6	WY2012	8.9	WY2012
2013	419.3	WY2013	8.9	WY2013
2014	442.3	WY2014	5.9	WY2014
<b>Avg. 1991 - 2014</b>	<b>409.6</b>		<b>17.3</b>	
"Low Use Year" (25th percentile)	355.42			
"High Use Year" (25th percentile)	451.85			
"Very High Use Year" (90th percentile)	482.29			
<i>Source: Water Use 1991 - 2005 from Lombardo 2006, based on MPWMD records (WMCALC spreadsheets); 2006 to 2014 based on Zitschke 2014a and 2014.</i>				
Notes:				
1. RY = Reporting Year = July 1 to June 30; WY = Water Year = October 1 through September 30				
2. Assumptions for low, high, and very high use year as follows: "Low use" year based on 25th percentile; "high use" year based on 75th percentile, and "very high use" year based on 95th percentile. Resultant calculations are that a "low use" year would be 87% of average, "high use" year would be 110% of average, and "very high use year" would be 118% of average. These assumption are not intended to be predictive for any particular year, but rather to reflect the range in the baseline irrigation use.				
3. Site precip for 2009-2016 from CIMIS for on-site Weather Station #210 ( <a href="http://www.cimis.water.ca.gov/">http://www.cimis.water.ca.gov/</a> ); Site precip for 1991 - 2008 estimated through linear regression using Monterey Weather Station data for 2008 - 2016 compared to site precip from CIMIS. Monterey Weather Station Precipitation 1991 - Sept. 1994 and Oct. 2014 - Sept. 2016 from Hopkins Marine Station, Monterey Weather Station #5795; accessed via Web at <a href="http://www-marine.stanford.edu/HMSweb/climate.html">http://www-marine.stanford.edu/HMSweb/climate.html</a> ; Precip Oct. 94- Sep.2014 from National Weather Service Climatological Station, Monterey, California 93940 (elevation 385'), accessed via web at: <a href="http://met.nps.edu/~ldm/renard_wx/">http://met.nps.edu/~ldm/renard_wx/</a> .				

**Table H1-2  
Monterey Peninsula and Site Rainfall 1991 - 2016  
(inches)**

	<b>Monterey</b>	<b>Site</b>
<b>Year</b>	<b>WY</b>	<b>WY</b>
1991	13.2	11.9
1992	17.9	15.3
1993	30.1	25.8
1994	14.0	12.0
1995	28.4	24.4
1996	21.0	18.0
1997	21.7	18.7
1998	47.4	40.6
1999	20.1	17.2
2000	21.0	18.0
2001	19.2	16.5
2002	15.6	13.4
2003	18.4	15.8
2004	16.4	14.1
2005	30.5	26.2
2006	24.8	21.3
2007	14.1	12.1
2008	14.4	12.3
2009	17.5	19.7
2010	23.9	18.8
2011	24.5	19.9
2012	13.5	8.9
2013	13.1	8.9
2014	8.9	<b>5.9</b>
2015	9.6	9.6
2016	25.5	25.5
<b>Avg. 95 - 14</b>	<b>20.7</b>	<b>17.5</b>
<b>Avg. 91 - 16</b>	<b>21.9</b>	<b>17.3</b>

Note: Precipitation 1991 - Sept. 1994 from Hopkins Marine Station, Monterey Weather Station #5795; accessed via Web at <http://www-marine.stanford.edu/HMSweb/climate.html>; Precip Oct. 94- Sep.2014 from National Weather Service Climatological Station, Monterey, California 93940 (elevation 385'), accessed via web at: accessed via web at: [http://met.nps.edu/~ldm/renard\\_wx/](http://met.nps.edu/~ldm/renard_wx/). Site precip from CIMIS, 10/24/2008 - 09/30/16; Site precip fro 1991 - 2008 estimated through linear regression using Monterey Weather Station data for 2008 - 2016 compared to site precip from CIMIS.



**Table H1-3  
Water Demand by Housing Type**

	FU Value	Condo		Townhouse		SFR- Small		SFR-Medium		SFR-Large	
		No.	FU Count	No.	FU Count	No.	FU Count	No.	FU Count	No.	FU Count
Wash Basins (lavatory sink) each	1.0	2	2.0	2	2.0	3	3.0	3	3.0	4	4.0
Two washbasins in Master Bathroom	1.0									1	1.0
Toilet (ULF, 1.6 gpf)	1.8										
Toilet (HET, 1.3 gpf)	1.3	2	2.6	2	2.6	3	3.9	3	3.9	4	5.2
Toilet (UHET, 0.8 gpf)	0.8										
Masterbath (Tub, sep. shower)	3.0		0.0		0.0		0.0	1	3.0	1	3.0
Large bathtub (w/ showerhead)	3.0									1	
Standard bathtub (w/ showerhead)	2.0	1	2.0	2	4.0	2	4.0	2	4.0	2	4.0
Shower, separate stall	2.0		0.0		0.0		0.0		0.0		0.0
Kitchen sink and dishwasher	2.0	1	2.0	1	2.0	1	2.0	1	2.0	2	4.0
Kitchen sink and HE dishwasher	1.5										
Laundry/utility sink	2.0		0.0		0.0	1	2.0	1	2.0	2	4.0
Washing Machine	2.0										
Washing Machine (HEW, WF 5 or less)	1.0	1	1.0	1	1.0	1	1.0	1	1.0	1	1.0
Bidet	2.0		0.0		0.0		0.0		0.0		0.0
Bar sink	1.0		0.0		0.0		0.0		0.0		0.0
Entertainment sink	1.0									1	1.0
Vegetable sink	1.0		0.0		0.0		0.0		0.0		0.0
<i>Subtotal Interior Fixture Units</i>			9.6		11.6		15.9		18.9		27.2
Landscaping (Interior FUs X 0.5)			4.8		5.8		8.0		9.5		13.6
Swimming Pools (per 100 SF)	1.0		0.0		0.0		0.0	3.0	3.0	4.5	4.5
<i>Fixture Unit Count</i>			14.4		17.4		23.9		31.4		45.3
<b>Acre-Feet/Unit (0.01 AF/FU)</b>			<b>0.14</b>		<b>0.17</b>		<b>0.24</b>		<b>0.31</b>		<b>0.45</b>

Prepared by ICF using MPWMD Fixture Unit Methodology (2015b). All Assumptions about number of fixtures by ICF

<b>Table H1-4: Baseline Consumptive Use (Acre-Feet)</b>				
	<b>Average Year</b>	<b>Low Use Year</b>	<b>High Use Year</b>	<b>Very High Use Year</b>
<b>Proposed Project</b>				
Irrigation Pumping	204.8	177.7	225.9	241.1
Evapotranspiration of Irrigation	145.1	113.4	170.8	195.0
<i>Baseline Consumptive Use</i>	<i>145.1</i>	<i>113.4</i>	<i>170.8</i>	<i>195.0</i>
Notes:				
1. Average Irrigation identified based on 50% of the average irrigation per golf course turf acre (1991-2014, see Table H1-1.				
2. Assumptions for low, high, and very high irrigation pumping years as follows: "Low use" year based on 25th percentile; "high use" year based on 75th percentile, and "very high use" year based on 95th percentile. Resultant calculations are that a "low use" year would be 84% of average, "high use" year would be 107% of average, and "very high use year" would be 118% of average. These assumption are not intended to be predictive for any particular year, but rather to reflect the range in the baseline irrigation use. These assumptions are general only to give an idea of the range of irrigation demand in the baseline and to reflect that range in the analysis.				
3. Consumptive use determined by determining average year evapotranspiration by conducting an soil-moisture water balance analysis using monthly data from 1991 to 2014 on applied water (irrigation), reference evapotranspiration, precipitation, using an appropriate turfgrass plan coefficient to adjust reference evapotranspiration, accounting for soil moisture change and then calculating evapotranspiration (see Table H2-1 and following tables). Approach to low, high, and high use the same method as above for irrigation pumping.				

**Table H1-5  
Rancho Canada Village Estimated Water Demand/Use  
(by ICF)**

	Units	AF/Unit	Total	Landscape Irrigation Adjustments			
				100%	87%	110%	118%
<b>Housing</b>							
Condominiums	35.0	0.14	5.0	1.7			
Townhouses	64.0	0.17	11.1	3.7			
Small Lot Single Family	67.0	0.24	16.0	5.3			
Medium Lot Single Family	114.0	0.31	35.7	11.9			
Large Lot Single Family	1.0	0.45	0.5	0.1			
<i>Housing Water Demand</i>	281		68.3	22.7	19.7	25.1	26.8
Evapotranspiration adjust for landscape in units			-6.6	-6.6	-7.1	-6.1	-5.1
<i>Housing Consumptive Use</i>			61.7	61.7	58.2	64.6	67.3
<b>Shared Landscape Areas</b>							
Active Park (per MAWA limit from MWELO)	2.6	1.0	2.6				
Landscape Parkways (per MAWA limit from MWELO)	3.3	2.3	7.7				
<i>Landscape Water Demand</i>			10.3	10.3	8.9	11.3	12.1
Evapotranspiration adjust for shared landscape			-3.0	-3.0	-3.2	-2.8	-2.3
<i>Landscape Consumptive Use</i>			7.3	7.3	5.7	8.6	9.8
<b>Subtotal Water Demand</b>			<b>78.6</b>	<b>78.6</b>	<b>74.3</b>	<b>82.0</b>	<b>84.5</b>
Treatment (15%) and System (7%) Loss			22.2	22.2	20.9	23.1	23.8
<b>Subtotal Consumptive Use</b>			<b>69.0</b>	<b>69.0</b>	<b>63.9</b>	<b>73.1</b>	<b>77.0</b>
Treatment (15%) and System (7%) Loss			19.5	19.5	18.0	20.6	21.7
<b>Average Year Water Demand</b>			<b>100.8</b>	<b>100.8</b>	<b>95.2</b>	<b>105.2</b>	<b>108.3</b>
<i>Wet Year</i>			95.2				
<i>Dry Year</i>			105.2				
<i>Very Dry Year</i>			108.3				
<b>Average Year Consumptive Use</b>			<b>88.5</b>	<b>88.5</b>	<b>81.9</b>	<b>93.8</b>	<b>98.8</b>
<i>Wet Year</i>			81.9				
<i>Dry Year</i>			93.8				
<i>Very Dry Year</i>			98.8				

MAWA = $ET_o \times 0.62 \times (ET_{adj} \times LA + 1 - E_{adj}) \times SLA$	10.27	Source		Acres	MAWA	Total (AFY)
ET <sub>o</sub>	40.10	CIMIS	Park	2.6	2.3	7.7
ET <sub>adj</sub>	0.7	MWELO	Parkways	3.3	1.0	2.6
LA (landscaped area in SF)	143,748	Project Data				10.3
0.62 - conversion for gallons	0.62	Factor				
325851 - gallons per AF	325,851	Factor				
SLA (special landscape area)	113,256	Park				

**Table H1-6  
Rancho Canada Village Water Impact  
(Acre-Feet)**

	<b>Baseline Use</b>	<b>Project Use</b>	<b>Net Change</b>
Average Year	145.1	88.5	-56.7
Wet Year	113.4	81.9	-31.5
Dry Year	170.8	93.8	-77.0
Very Dry Year	195.0	98.8	-96.3

Sources: See Tables H.1-4 and H.1-5.

**Table H1-7  
130 unit Alternative Estimated Water Demand/Use  
(by ICF)**

Housing	Units	AF/Unit	Total	Notes	Landscape Adjustments for Evaporation			
					100%	87%	110%	118%
Condominiums	12	0.14	1.7	Rev MPWMD factor	0.6			
Small Lot Single Family	110	0.24	26.2	Rev MPWMD factor	8.7			
Medium Lot Single Family	7	0.31	2.2	Rev MPWMD factor	0.7			
Large Lot Single Family	1	0.45	0.5		0.1			
<b>Housing Direct Water Demand</b>	<b>130</b>		<b>30.6</b>		<b>10.2</b>	<b>8.8</b>	<b>11.2</b>	<b>12.0</b>
Unit landscaping adjusted			-3.0		-3.0	-3.2	-2.7	-2.3
<b>Housing Consumptive Use</b>			<b>27.6</b>		<b>27.6</b>	<b>26.1</b>	<b>28.9</b>	<b>30.1</b>
<b>Shared Landscaping</b>								
Open Space Irrigation Demand	7.7	2.3	17.9	Used MAWA from	17.9	15.5	19.8	21.1
Shared landscaping adjusted			-5.2		-5.2	-5.6	-4.8	-4.0
<b>Shared Landscaping Consumptive Use</b>			<b>12.7</b>		<b>12.7</b>	<b>9.9</b>	<b>14.9</b>	<b>17.1</b>
<b>Subtotal Water Demand</b>								
			<b>48.5</b>		<b>48.5</b>	<b>44.8</b>	<b>51.4</b>	<b>53.5</b>
Treatment (15%) and System (7%) Loss			13.7	Total of 22% loss	13.7	12.6	14.5	15.1
<b>Subtotal Consumption Use</b>								
			<b>40.3</b>		<b>40.3</b>	<b>36.0</b>	<b>43.9</b>	<b>47.2</b>
Treatment (15%) and System (7%) Loss			11.4	Total of 22% loss	11.4	10.2	12.4	13.3
<b>Residential Element Water Demand</b>								
			<b>62.2</b>		<b>62.2</b>	<b>57.4</b>	<b>65.9</b>	<b>68.6</b>
<i>Wet Year</i>			57.4					
<i>Dry Year</i>			65.9					
<i>Very Dry Year</i>			68.6					
<b>Residential Element Consumptive Use</b>								
			<b>51.7</b>		<b>51.7</b>	<b>46.1</b>	<b>56.2</b>	<b>60.5</b>
<i>Wet Year</i>			46.1					
<i>Dry Year</i>			56.2					
<i>Very Dry Year</i>			60.5					
<b>Water Transfer</b>								
Water Transfer to Other Cal-Am Users			60.0					
<b>Net Water Demand (Average Year)</b>								
			<b>122.2</b>					
<i>Wet Year</i>			117.4					
<i>Dry Year</i>			125.9					
<i>Very Dry Year</i>			128.6					
<b>Net Water Use (Average Year)</b>								
			<b>111.7</b>					
<i>Wet Year</i>			106.1					
<i>Dry Year</i>			116.2					
<i>Very Dry Year</i>			120.5					
MAWA = EToX 0.62 X(ET adj X LA + 1-Ead jX SLA)	17.91	Acre-Feet						
MAWA = EToX 0.62 X(ET adj X LA + 1-Ead jX SLA)	2.3	Acre-Feet per Acre						
Eto	40.10	Inches						
ET adj	0.7	Factor from MWELo						
LA (landscaped area in SF)	335,412	Square Feet						
0.62 - conversion for gallons	0.62	Conversion factor						
Gallons per AF	325,851	Conversion factor						
SLA (special landscape area)	0	N/A						

**Table H1-8  
130 Unit Alternative Water Impact  
(Acre-Feet)**

	<b>Baseline Use</b>	<b>Alternative Use</b>	<b>Net Change</b>
Average Year	145.1	111.7	-33.4
Wet Year	113.4	106.1	-7.3
Dry Year	170.8	116.2	-54.6
Very Dry Year	195.0	120.5	-74.5

Note: The Applicant's proposed dedication for instream beneficial uses is not considered a consumptive use of water and is not used in the calculations above. On average, the 130-unit alternative would result in 46 AFY less consumptive water use than under defined baseline conditions. This amount would be available for dedication for instream purposes.

**Table H.1-9: Existing Rancho Canada Golf Course Use, Irrigation, Precipitation, and Reference Evapotranspiration 2009 - 2014**

Year	Irrigation - AFY	Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
2009	411.8	WY2009	43.8	6.5	5.0	11.7	1.8	8.5	42.9	50.3	62.7	69.8	59.4	49.4	411.8
2010	324.1	WY2010	26.5	17.4	5.0	0.0	0.0	9.1	0.0	41.0	60.4	61.7	50.0	52.7	323.8
2011	309.1	WY2011	22.6	13.4	0.0	6.4	6.1	1.8	27.0	44.3	39.1	58.4	44.9	45.0	309.0
2012	340.6	WY2012	17.7	4.0	13.8	10.1	8.1	11.8	7.9	55.2	56.5	57.9	54.4	41.6	339.0
2013	419.3	WY2013	32.0	6.1	0.0	0.0	0.0	23.4	42.0	64.3	68.1	63.5	67.1	52.8	419.3
2014	442.3	WY2014	40.0	21.2	16.0	30.9	4.2	8.0	19.0	63.4	67.7	72.4	53.3	46.5	442.6
<b>Avg. 2009 - 2014</b>	<b>374.5</b>		<b>30.4</b>	<b>11.4</b>	<b>6.6</b>	<b>9.9</b>	<b>3.4</b>	<b>10.4</b>	<b>23.1</b>	<b>53.1</b>	<b>59.1</b>	<b>64.0</b>	<b>54.9</b>	<b>48.0</b>	<b>374.2</b>

Source: See Table H>1-1

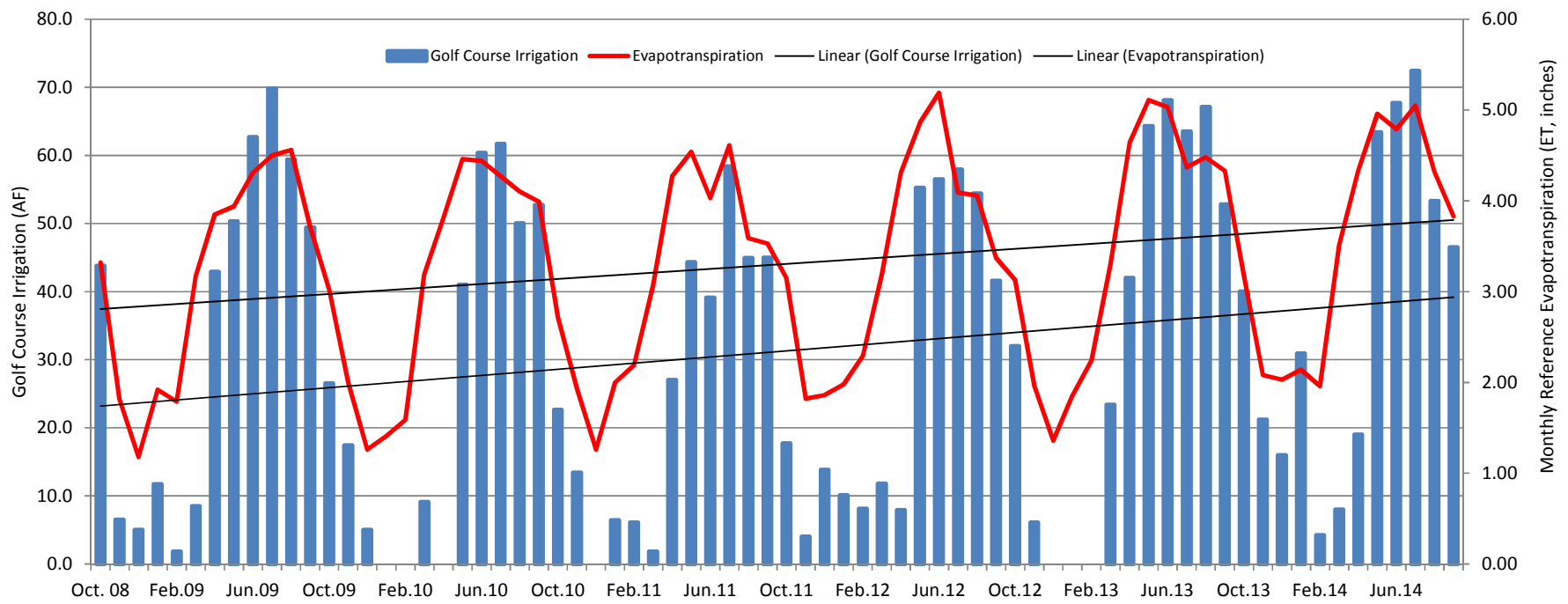
Year	Precip, - Inches	Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
2009	19.0	WY2009	0.0	2.0	3.0	2.2	6.4	2.7	2.4	0.2	0.1	0.0	0.0	0.1	19.0
2010	18.9	WY2010	2.7	0.3	1.5	5.6	1.8	2.2	4.1	0.4	0.0	0.0	0.1	0.1	18.9
2011	20.0	WY2011	0.7	1.6	4.2	1.2	4.8	5.0	0.2	1.0	1.3	0.0	0.0	0.0	20.0
2012	8.9	WY2012	1.4	1.5	0.1	1.5	0.5	2.1	1.4	0.2	0.3	0.1	0.0	0.0	8.9
2013	9.0	WY2013	0.2	1.0	3.8	1.3	0.8	1.3	0.3	0.1	0.1	0.0	0.0	0.1	9.0
2014	6.0	WY2014	0.2	0.2	0.2	0.1	1.4	2.2	1.2	0.2	0.0	0.0	0.1	0.3	6.0
<b>Avg. 2009 - 2014</b>	<b>13.6</b>		<b>0.9</b>	<b>1.1</b>	<b>2.1</b>	<b>2.0</b>	<b>2.6</b>	<b>2.6</b>	<b>1.6</b>	<b>0.3</b>	<b>0.3</b>	<b>0.0</b>	<b>0.0</b>	<b>0.1</b>	<b>13.6</b>

Source: CIMIS

Year	Reference ET (Eto)	Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
2009	34.7	WY2009	0.0	1.8	1.2	1.9	1.8	3.2	3.9	3.9	4.3	4.5	4.6	3.7	34.7
2010	37.6	WY2010	3.0	2.0	1.3	1.4	1.6	3.2	3.8	4.5	4.4	4.3	4.1	4.0	37.6
2011	37.7	WY2011	2.7	1.9	1.3	2.0	2.2	3.1	4.3	4.5	4.0	4.6	3.6	3.5	37.7
2012	40.2	WY2012	3.2	1.8	1.9	2.0	2.3	3.2	4.3	4.9	5.2	4.1	4.1	3.4	40.2
2013	41.8	WY2013	3.1	2.0	1.4	1.9	2.2	3.3	4.6	5.1	5.0	4.4	4.5	4.3	41.8
2014	42.2	WY2014	3.2	2.1	2.0	2.1	2.0	3.5	4.3	5.0	4.8	5.1	4.3	3.8	42.2
<b>Avg. 2009 - 2014</b>	<b>39.0</b>		<b>2.5</b>	<b>1.9</b>	<b>1.5</b>	<b>1.9</b>	<b>2.0</b>	<b>3.2</b>	<b>4.2</b>	<b>4.6</b>	<b>4.6</b>	<b>4.5</b>	<b>4.2</b>	<b>3.8</b>	<b>39.0</b>

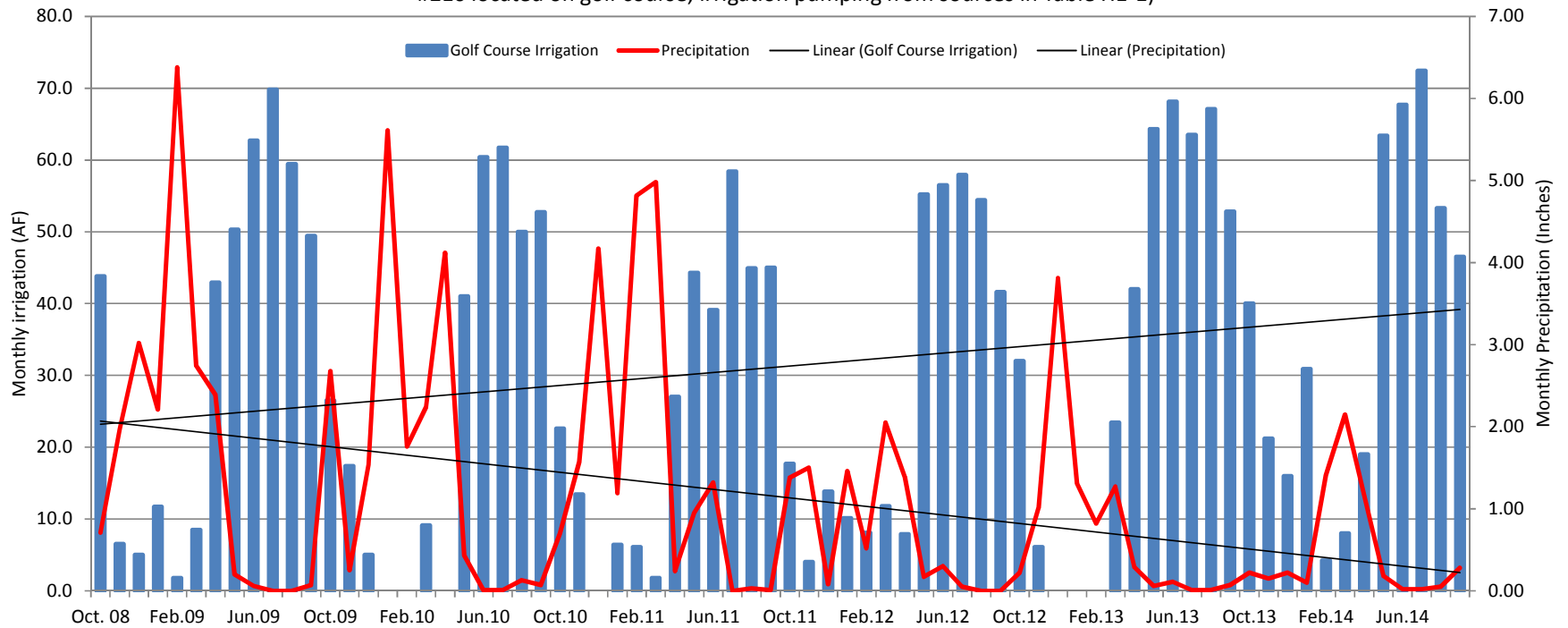
Source: CIMIS

Rancho Canada Golf Course Irrigation Compared to Reference Evaporation, WY 2009 to WY 2014  
 (Source: Evapotranspiration from CIMIS Station #210 located on golf course; irrigation pumping from sources in Table H1-1)

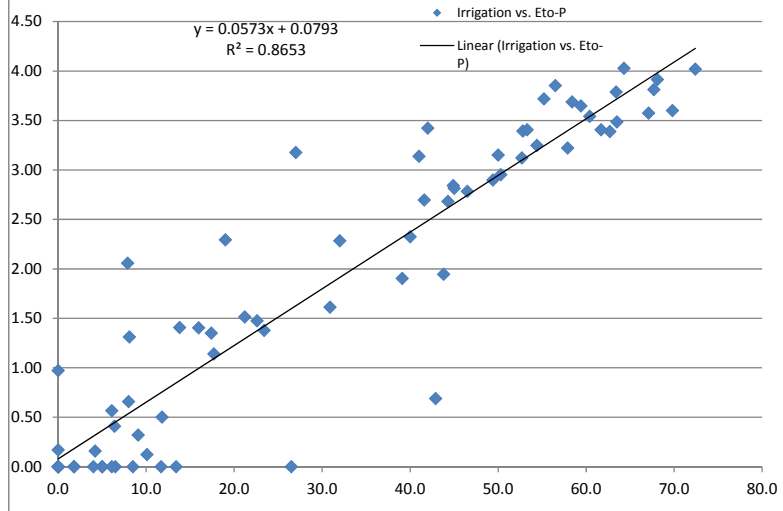




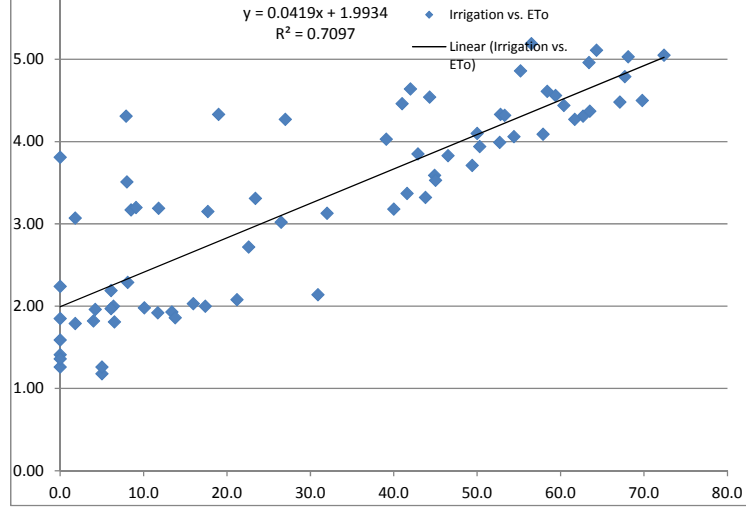
Rancho Canada Golf Course Irrigation Compared to Precipitation, WY 2009 to WY 2014 (Source: Precipitation from CIMIS Station #210 located on golf course; irrigation pumping from sources in Table H1-1)



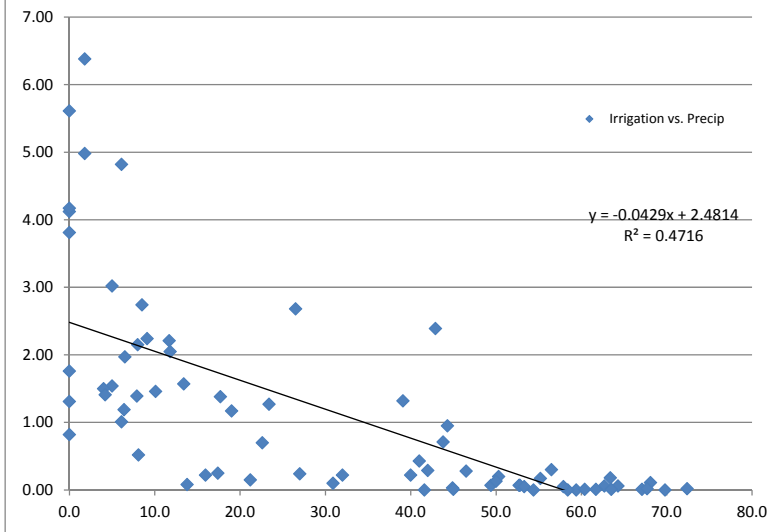
### Monthly Irrigation vs. Eto-P



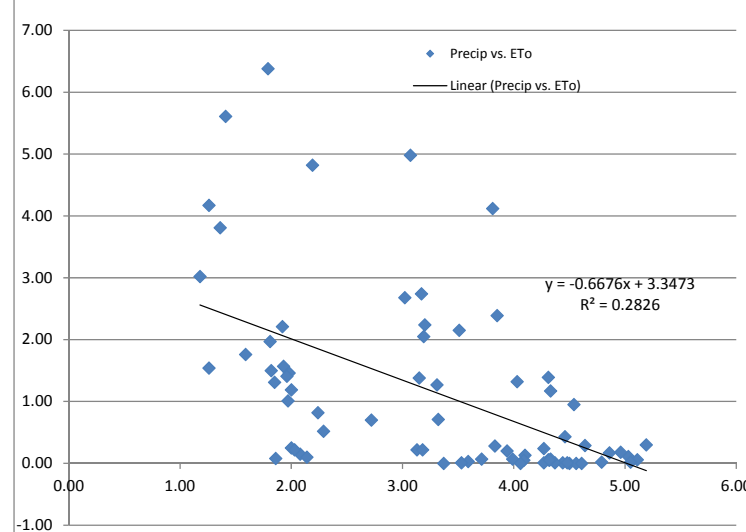
### Monthly Irrigation vs. Eto



### Monthly Irrigation vs. Precip



### Monthly Precip vs. Eto



**Table H1-10: Change in Seasonal Pumping Patterns**

<b>Proposed Project</b>	<b>Baseline(AF)</b>	<b>%</b>	<b>Project (AF)</b>	<b>%</b>	<b>Change (AF)</b>	<b>130-Unit Alt. (AF)</b>	<b>%</b>	<b>Change (AF)</b>
October	16.65	8.1%	8.33	8.3%	-8.3	9.47	7.7%	-7.2
November	6.26	3.1%	6.66	6.6%	0.4	8.04	6.6%	1.8
December	3.63	1.8%	6.23	6.2%	2.6	7.68	6.3%	4.1
January	5.39	2.6%	6.52	6.5%	1.1	7.92	6.5%	2.5
February	1.84	0.9%	5.94	5.9%	4.1	7.44	6.1%	5.6
March	5.71	2.8%	6.57	6.5%	0.9	7.97	6.5%	2.3
April	12.66	6.2%	7.69	7.6%	-5.0	8.92	7.3%	-3.7
May	29.05	14.2%	10.33	10.2%	-18.7	11.17	9.1%	-17.9
June	32.33	15.8%	10.86	10.8%	-21.5	11.62	9.5%	-20.7
July	34.99	17.1%	11.29	11.2%	-23.7	11.98	9.8%	-23.0
August	30.01	14.7%	10.49	10.4%	-19.5	11.30	9.2%	-18.7
September	26.26	12.8%	9.88	9.8%	-16.4	10.79	8.8%	-15.5
TOTAL	204.78	100.0%	100.79	100.0%	-104.0	122.21	100.0%	-82.6
Irrigation	204.78		42.33			36.02		
Other Use	0.00		67.77			86.19		

1. Baseline, Project and 130-unit pumping based on average year values.
2. Seasonality of irrigation based on golf course monthly irrigation records, WY 2009 - WY 2014.
3. Project and 130-unit Alternative irrigation use includes system losses relative to irrigation.

Table H1-11: Rancho Canada Golf Course: Well Production by Well 1986 to 2014

Well	RC3 (17West or 17W)	RC5 (15 East or 15E)	RC1 (12 East)	RC2	RC4			
Section	SW1/4,SE1/4,S18,T16S,R1E	SW1/4,SW1/4,S17,T16S,R1E						
Location	West Course, 17th Hole	East Course, 15th Hole	East Course, 12th Hole	Driving Range	Unknown			
Parcel	015-162-039	157-181-004						
Current Property Owner	Lombardo Land Group I	Lombardo Land Group II	Trust for Public Land	Lombardo Land II?	Unknown			
Water Year	Pumping	Pumping	Pumping	Pumping	Pumping	Total	Data Source	
1986	121.72	221.19	0	86.09	194.68	623.68	Lombardo 2006 (PCC method)	
1987	145.57	222.92	0	156.12	159.3	683.91	Lombardo 2006 (PCC method)	
1988	122.73	0	159.24	240.64	133.1	655.71	Lombardo 2006 (PCC method)	
1989	153.50	0	97.6	168.8	92.2	512.10	Lombardo 2006 (PCC method)	
1990	117.52	200.89	146.05	16	20.17	500.63	Lombardo 2006 (PCC method)	
1991	213.72	46.92	38.2	59.51	0	358.35	Lombardo 2006	
1992	243.95	2.14	0	178.94	0	425.03	Lombardo 2006	
1993	250.53	0.58	0	189.4	0	440.51	Lombardo 2006	
1994	265.55	2.33	0	198.01	0	465.89	Lombardo 2006	
1995	185.03	11.52	0	141	0	337.55	Lombardo 2006	
1996	244.98	0	0	212.2	0	457.18	Lombardo 2006	
1997	227.24	112.09	0	160.43	0	499.76	Lombardo 2006	
1998	190.42	128.47	0	27.72	0	346.61	Lombardo 2006	
1999	98.98	0	0	210.43	0	309.41	Lombardo 2006	
2000	178.49	187.71	0	123.12	0	489.32	Lombardo 2006	
2001	215.30	199.72	0	15.82	0	430.84	Lombardo 2006	
2002	199.26	265.7	0	57.04	0	522.00	Lombardo 2006	
2003	236.89	199.09	0	15.94	0	451.92	Lombardo 2006	
2004	200.40	251.43	0	0	0	451.83	Lombardo 2006	
2005	162.76	130.69	0	85.94	0	379.39	Lombardo 2006	
2006	199.81	169.03				368.84		
2007	213.83	190.49				404.32		
2008	227.38	215.93				443.31		
2009	215.84	195.93				411.77		
2010	161.52	162.54				324.06		
2011	158.45	150.69				309.14		
2012	186.04	153.14				339.19		
2013	227.53	191.78				419.31		
2014	227.97	214.37				442.34		
Average 1986 - 2014	192.86	131.98	15.21	80.80	20.67	441.51	Includes PCC method data	
Average 1991 - 2014	205.49	132.60	1.59	69.81	0.00	409.49	Only Includes Water Meter Data	

Other wells described in noted references

"11E (inactive)"	NE1/4,SE1/4,S17,T16S,R1E	11th hole, east course?
RC?	SW1/4,SE1/4,S18,T16S,R1E	
Cal-AM Canada Well	NE1/4,SW1/4,S17,T16S,R1E	East Side GC
Cal-AM Well B	NE1/4,SW1/4,S18,T16S,R1E	West of GC, not on GC properties
Cal-AM San Carlos Well	NE1/4,SE1/4,S17,T16S,R1E	East of GC, not on GC properties

MPWMD Water Production Reports and Statements of Water Diversion as presented in Zischke 2104a and Zischke 2014b.

**Table H1-12: Cal-AM System Production and Losses 2014 - 2015**

Month	Cal-AM Production (AF)
Nov 14	751
Dec. 14	770
Jan.15	763
Feb. 15	793
Mar. 15	796
Apr. 15	841
May. 15	841
Jun.15	879
Jul. 15	958
Aug. 15	985
Sep. 15	919
Oct. 15	867
Nov. 15	666
Dec. 15	644
Source: MPWMD Monthly reports, 2015a, 2016	

	Losses (AF)
Nov. 14 - Oct. 15	446
Dec 14 - Nov 15	221
Jan 15 - Dec 15	247
Source: CAL-Am CDO Report, Q1, 2016	

	Production (AF)	Losses (AF)	Percent
Nov. 14 - Oct. 15	10,163	446	4%
Dec 14 - Nov 15	10,078	221	2%
Jan 15 - Dec 15	9,952	247	2%

Source: See above

**Table H2-1a: Summary of Proposed Project Groundwater Recharge Analysis (Acre-Feet)**

<i>Groundwater Pumping</i>					
	Factors	Baseline		Project	
Groundwater Pumping (1)		204.78		100.79	
<i>Groundwater Recharge</i>					
Landcover	Recharge (2) AFY Per Acre	Landcover (3) Acre	Recharge (4) AFY	Landcover (3) Acres	Recharge (4) AFY
Turf	1.07	56.70	60.59	5.90	6.30
Developed Area - Impervious	NA	0.00	0.00	22.59	29.83
Developed Area - Pervious (5)	NA	0.00	0.00	14.46	15.45
Detention Basin (6)	NA	0.00	0.00	1.10	NA
Woodland	1.18	0.00	0.00	22.04	25.92
Scrub	1.04	10.90	11.35	0.50	0.52
Pond	0.47	1.40	0.65	0.00	0.00
Wetland	0.47	0.30	0.14	1.20	0.00
Grassland	0.64	0.00	0.00	8.60	5.49
<i>Subtotal</i>		69.30	72.73	76.39	83.52
<i>Net Groundwater Recharge</i>					
<b>Net Recharge</b>			<b>-132.05</b>		<b>-17.27</b>
<b>Change with Proposed Project</b>					<b>114.77</b>
Notes:					
1. Pumping amounts are total irrigation.					
2. Recharge estimates for natural and landscape land covers from soil-water balance calculations for 1991 to 2014.					
3. Land cover acreages from GIS analysis for biological resource evaluation. Adjustments made to avoid double-counting areas and to match baseline and project acreage overall.					
4. Recharge estimated by multiplying recharge estimate per acre by land cover acreage, except for analysis of impervious areas for the Proposed Project which were estimated using a modified runoff-infiltration model used by Balance Hydrologics.					
5. Pervious areas within the development footprint were treated as if they were turf.					
6. Detention basin is tied to impervious space; to avoid double-counting, no infiltration of direct precipitation in this area was included.					

**Table H2-1b: Summary of Groundwater Recharge Analysis, 130-unit Alternative**

<i>Groundwater Pumping</i>					
	Factors	Baseline		130-Unit Alternative	
Groundwater Pumping (1)		204.78		122.21	
<i>Groundwater Recharge</i>					
Landcover	Recharge (2) AFY Per Acre	Landcover (3) Acre	Recharge (4) AFY	Landcover (3) Acres	Recharge (4) AFY
Turf	1.07	56.90	60.80	7.70	8.23
Developed Area - Impervious	NA	3.40	17.10	17.10	22.64
Developed Area - Pervious (5)	NA	0.00	0.00	11.40	12.18
Detention Basin (6)	NA	0.00	0.00	0.84	NA
Woodland	1.18	7.10	8.35	22.04	25.92
Scrub	1.04	10.90	11.35	0.50	0.52
Pond	0.47	1.40	0.65	0.00	0.00
Wetland	0.47	0.30	0.14	1.20	0.56
Grassland	0.64	0.00	0.00	19.26	12.28
<i>Subtotal</i>		80.00	98.40	80.04	82.33
<i>Net Groundwater Recharge</i>					
<b>Net Recharge</b>			<b>-106.38</b>		<b>-39.88</b>
<b>Change with 130-unit Alternative</b>					<b>66.50</b>
Notes:					
1. Pumping amounts are total irrigation.					
2. Recharge estimates for natural and landscape land covers from soil-water balance calculations.					
3. Land cover acreages from GIS analysis for biological resource evaluation. Adjustments made to avoid double-counting areas and to match baseline and project acreage overall.					
4. Recharge estimated by multiplying recharge estimate per acre by land cover acreage, except for analysis of impervious areas for the Proposed Project which were estimated using a modified runoff-infiltration model used by Balance Hydrologics.					
5. Pervious areas within the development footprint were treated as if they were turf.					
6. Detention basin is tied to impervious space; to avoid double-counting, no infiltration of direct precipitation in this area was included.					

**Table H.2-2: Land Cover Estimates and Plant Factors Used for Recharge Analysis**

Baseline Land Cover (Acres)	Project	130 unit Alt.
Turf/Landscaped	56.7	56.9
Developed/Disturbed	0.0	3.4
Non-Native Monterey Pine	0.1	0.1
Coast Live Oak Woodland	0.8	0.8
Coyote Brush Scrub	10.9	10.9
Wetland Vegetation	0.3	0.3
Golf Course Ponds	1.4	1.4
Riparian Forest and Woodland	6.2	6.2
<b>Total</b>	<b>76.4</b>	<b>80.0</b>
Turf/Landscaped	56.7	56.9
Developed/Disturbed	0.0	3.4
Woodland	7.1	7.1
Scrub	10.9	10.9
Ponds	1.4	1.4
Wetland Vegetation	0.3	0.3
<b>Total</b>	<b>76.4</b>	<b>80.0</b>

Land Cover (Acres)	Project	130 unit Alt.
Turf/Landscaped	5.9	7.7
Impervious in Developed Area	22.6	17.1
Pervious in Developed Area	14.5	11.4
Non-Native Monterey Pine	0.0	0.0
Coast Live Oak Woodland	0.8	0.8
Coyote Brush Scrub	0.5	0.5
Wetland Vegetation	1.2	1.2
Ponds	1.4	1.4
Riparian Forest and Woodland	21.2	21.2
Grassland	8.3	18.7
<b>Total</b>	<b>76.4</b>	<b>80.0</b>
Turf/Landscaped	5.9	7.7
Developed Area (Impervious)	22.6	17.1
Developed Area (Pervious)	14.5	11.4
Detention Basin	1.1	0.8
Woodland - Preserve	22.0	22.0
Scrub - Preserve	0.5	0.5
Wetlands - Preserve	1.2	1.2
Grassland - Preserve (or Common)	8.6	19.3
<b>Total</b>	<b>76.4</b>	<b>80.0</b>
	WUCOLS III Classification (1)	Plant Factor
Turfgrass (Cool season varieties)	High	0.8

Species for Non-Turf Areas	WUCOLS III Classification (1)	Plant Factor
Woodland Species: Coast Live Oak	Very Low	0.1
Scrub species: Coyote Brush Scrub	Low	0.2
Wetland Vegetation species: California Bulrush	NA(1)	1.25
Non-Native Grassland species: Annual ryegrass	Low	0.8
Notes		

(1) Plant Factor (K) used to adjust reference ET to Crop ET. Values except for wetlands from UCDE/DWR 2000 Water Use Classification of Landscape Species (WUCOLS).

(2) Plant Factor for wetlands from Shellhorn 1995.

**Table H.2-3: Meteorologic Data for CIMIS Rancho Canada Golf Course Site****Carmel Precipitation 2009 - 2016 (inches)**

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY
2009		1.97	3.02	2.21	6.38	2.74	2.39	0.20	0.06	0.00	0.00	0.07	
2010	2.68	0.25	1.54	5.61	1.76	2.24	4.12	0.43	0.01	0.01	0.13	0.07	18.85
2011	0.70	1.57	4.17	1.19	4.82	4.98	0.24	0.95	1.32	0.00	0.03	0.01	19.98
2012	1.38	1.50	0.08	1.46	0.52	2.05	1.39	0.17	0.30	0.05	0.00	0.00	8.90
2013	0.22	1.01	3.81	1.31	0.82	1.27	0.29	0.06	0.11	0.01	0.01	0.07	8.99
2014	0.22	0.15	0.22	0.10	1.41	2.15	1.17	0.18	0.02	0.02	0.05	0.28	5.97
2015	1.63	0.97	6.05	0.00	0.80	0.01	0.00	0.18	0.00	0.01	0.00	0.01	9.66
2016	0.02	5.67	3.80	7.65	1.55	5.78	0.77	0.33	0.01	0.01	0.02	0.00	25.61
<b>Avg. 2009 - 2016</b>	0.98	1.64	2.84	2.44	2.26	2.65	1.30	0.31	0.23	0.01	0.03	0.06	14.75

Note: Carmel Meteorological Station, on RC East GC, CIMIS Station #210 data (<http://www.cimis.water.ca.gov/>)

**Carmel Evapotranspiration (Eto) 2009 - 2016 (inches)**

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	WY
2009		1.81	1.18	1.92	1.79	3.17	3.85	3.94	4.31	4.50	4.56	3.71	
2010	3.02	2.00	1.26	1.41	1.59	3.20	3.81	4.46	4.44	4.27	4.10	3.99	37.55
2011	2.72	1.93	1.26	2.00	2.19	3.07	4.27	4.54	4.03	4.61	3.59	3.53	37.74
2012	3.15	1.82	1.86	1.98	2.29	3.19	4.31	4.86	5.19	4.09	4.06	3.37	40.17
2013	3.13	1.97	1.36	1.85	2.24	3.31	4.64	5.11	5.03	4.37	4.48	4.33	41.82
2014	3.18	2.08	2.03	2.14	1.96	3.51	4.33	4.96	4.79	5.05	4.32	3.83	42.18
2015	3.47	2.08	1.37	2.19	2.40	3.87	4.29	3.68	4.97	5.09	5.03	4.12	42.56
2016	3.25	2.08	1.48	1.33	2.94	3.45	4.14	4.31	5.30	5.00	3.83	3.80	40.91
<b>Avg. 2009 - 2016</b>	3.13	1.97	1.48	1.85	2.18	3.35	4.21	4.48	4.76	4.62	4.25	3.84	40.10

Note: Carmel Meteorological Station, on RC East GC, CIMIS Station #210 data (<http://www.cimis.water.ca.gov/>)



**Table H.2-4: Measured and Modelled Precipitation and Reference Evapotranspiration for Rancho Canada Golf Course, 1991 - 2016**

Reference ET (ET <sub>o</sub> ) (inches)													
Year	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Annual
1990										3.00	2.06	1.86	6.92
1991	1.29	1.90	1.43	4.45	4.60	4.55	3.41	3.98	2.80	2.65	1.92	1.59	34.57
1992	1.81	2.07	3.03	5.10	4.30	4.16	4.56	4.19	3.52	2.56	2.00	1.47	38.76
1993	1.58	1.77	3.16	4.71	5.55	5.88	4.55	4.48	3.11	3.09	2.31	1.56	41.73
1994	1.81	1.86	3.56	4.22	4.70	5.57	3.21	4.00	2.98	2.93	1.65	1.23	37.72
1995	1.29	1.74	2.84	3.97	3.62	4.89	5.00	3.91	3.15	2.71	1.79	1.19	36.09
1996	1.49	1.76	3.47	4.79	5.12	5.49	4.64	4.26	3.35	3.16	1.75	1.38	40.65
1997	1.53	2.65	3.87	5.15	5.91	6.03	3.99	4.20	4.24	3.28	1.72	1.64	44.21
1998	1.29	1.38	2.99	4.49	5.11	4.54	3.86	4.07	3.01	3.05	1.77	1.72	37.29
1999	1.81	1.92	3.04	4.37	4.68	4.57	4.53	3.75	2.41	3.05	1.57	1.85	37.56
2000	0.95	1.66	3.39	4.70	5.15	4.44	4.02	3.77	3.86	2.37	2.02	1.97	38.29
2001	1.88	2.31	3.19	4.07	5.30	5.83	3.86	3.91	2.69	1.71	1.57	1.33	37.65
2002	1.69	2.46	3.79	3.91	5.07	4.86	4.32	3.53	3.56	2.67	2.09	1.36	39.33
2003	1.92	2.31	3.91	4.26	5.06	5.01	4.68	4.68	3.43	3.18	1.92	1.29	41.64
2004	1.37	1.77	3.64	4.67	5.83	5.55	3.70	3.80	3.63	1.78	2.03	1.78	39.53
2005	1.58	1.91	3.21	4.51	5.26	5.32	3.66	2.57	3.22	2.96	2.19	1.30	37.69
2006	1.71	2.43	3.05	3.11	4.80	4.53	4.94	3.31	2.86	3.19	1.71	1.61	37.26
2007	2.08	1.90	3.47	4.17	4.59	4.96	4.05	4.42	3.47	2.15	1.52	1.36	38.13
2008	1.29	1.91	3.36	4.98	4.83	4.97	4.60	3.72	3.68	3.32	1.82	1.18	39.66
2009	1.93	1.82	3.16	3.86	3.93	4.33	4.50	4.58	3.73	3.05	2.01	1.26	38.16
2010	1.39	1.61	3.18	3.81	4.46	4.46	4.26	4.11	3.99	2.68	1.94	1.26	37.15
2011	1.99	2.18	3.03	4.28	4.54	4.02	4.61	3.57	3.52	3.16	1.79	1.85	38.54
2012	1.99	2.30	3.19	4.31	4.87	5.18	4.10	4.06	3.37	3.11	1.98	1.34	39.80
2013	1.86	2.21	3.31	4.64	5.10	5.03	4.36	4.47	4.33	3.18	2.08	2.03	42.60
2014	2.14	1.95	3.51	4.36	4.95	4.80	5.02	4.31	3.82	3.47	2.06	1.36	41.75
2015	2.19	2.41	3.85	4.31	3.71	4.99	5.08	5.04	4.12	3.25	2.09	1.48	42.52
2016	1.30	2.93	3.43	4.14	4.32	5.27	5.01	3.82	3.80				34.02
Avg	<b>1.66</b>	<b>2.04</b>	<b>3.27</b>	<b>4.36</b>	<b>4.82</b>	<b>4.97</b>	<b>4.33</b>	<b>4.02</b>	<b>3.45</b>	<b>2.87</b>	<b>1.90</b>	<b>1.51</b>	39.20

**Table H.2-4: Measured and Modelled Precipitation and Reference Evapotranspiration for Rancho Canada Golf Course, 1991 - 2016 (Continued)**

Precipitation (Inches)													
Precip	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	Annual
1990										0.12	0.45	1.42	1.99
1991	0.60	1.94	6.45	0.41	0.21	0.03	0.04	0.22	0.02	1.10	0.12	3.00	14.14
1992	1.89	5.41	3.42	0.03	0.01	0.16	0.03	0.09	0.06	0.56	0.15	5.37	17.17
1993	8.29	6.49	2.66	0.79	0.71	0.72	0.03	0.03	0.01	0.13	1.51	1.89	23.27
1994	2.59	3.43	0.39	1.18	0.72	0.02	0.03	0.04	0.04	0.28	2.39	2.09	13.21
1995	9.11	0.63	6.23	1.92	0.50	1.20	0.02	0.03	0.00	0.03	0.19	2.01	21.85
1996	4.31	6.93	2.50	0.79	1.14	0.03	0.04	0.03	0.03	0.91	2.26	6.87	25.85
1997	7.51	0.18	0.15	0.34	0.10	0.07	0.03	0.20	0.03	0.50	6.42	3.06	18.59
1998	8.90	12.24	3.60	2.91	2.29	0.29	0.21	0.02	0.20	0.51	2.55	1.47	35.19
1999	3.06	3.48	3.78	1.75	0.05	0.27	0.03	0.07	0.17	0.16	1.41	0.14	14.39
2000	5.68	6.84	1.90	0.80	0.69	0.06	0.01	0.01	0.35	3.75	0.47	0.26	20.81
2001	4.38	3.39	2.09	1.89	0.00	0.04	0.02	0.09	0.11	0.17	2.53	5.38	20.09
2002	1.27	1.36	1.23	0.36	0.94	0.09	0.02	0.04	0.00	0.01	2.03	6.20	13.53
2003	1.32	1.99	0.98	2.35	0.82	0.04	0.00	0.07	0.00	0.24	1.48	5.84	15.12
2004	1.65	3.81	0.56	0.09	0.01	0.09	0.15	0.07	0.10	3.58	0.98	6.22	17.29
2005	4.51	4.22	3.93	1.72	0.70	0.31	0.03	0.01	0.00	0.17	1.28	4.41	21.28
2006	3.13	1.37	7.05	3.42	0.38	0.00	0.06	0.00	0.02	0.07	1.60	3.48	20.57
2007	1.15	3.26	0.69	1.04	0.26	0.07	0.08	0.03	0.40	0.86	0.51	1.40	9.73
2008	6.29	2.46	0.33	0.32	0.03	0.03	0.03	0.06	0.03	0.71	1.97	2.99	15.26
2009	2.22	6.37	2.74	2.40	0.20	0.06	0.00	0.00	0.07	2.68	0.24	1.53	18.51
2010	5.62	1.76	2.24	4.13	0.43	0.00	0.00	0.14	0.06	0.70	1.57	4.18	20.83
2011	1.17	4.82	4.97	0.23	0.95	1.32	0.00	0.02	0.01	1.38	1.48	0.08	16.43
2012	1.46	0.52	2.06	1.39	0.17	0.29	0.06	0.00	0.00	0.22	0.97	3.81	10.95
2013	1.31	0.81	1.28	0.29	0.07	0.10	0.01	0.00	0.07	0.22	0.14	0.22	4.52
2014	0.10	1.40	2.14	1.17	0.18	0.01	0.02	0.04	0.28	1.63	0.96	6.03	13.96
2015	0.00	0.79	0.00	0.00	0.17	0.00	0.01	0.00	0.00	0.01	5.65	3.78	10.41
2016	7.62	1.54	5.75	0.77	0.32	0.01	0.00	0.02	0.00				16.03
Avg	<b>3.66</b>	<b>3.36</b>	<b>2.66</b>	<b>1.25</b>	<b>0.46</b>	<b>0.20</b>	<b>0.04</b>	<b>0.05</b>	<b>0.08</b>	<b>0.80</b>	<b>1.59</b>	<b>3.20</b>	17.35

**Table H.2-4: Measured and Modelled Precipitation and Reference Evapotranspiration for Rancho Canada Golf Course, 1991 - 2016 (Continued)**

Source: Data for November 2008 to September 2016 from CIMIS weather station on site (Station #210) from CIMIS (<http://www.cimis.water.ca.gov/>). Data for 1991 to October 2008 developed by comparing on-site CIMIS data for late 2008 to 2016 to two other data sets: (1) precipitation was developed by comparing on-site data to late 2008 to 2016 data at the Monterey Weather Stations [Precipitation 1991 - Sept. 1994 and Oct. 2014 - Sept. 2016 from Hopkins Marine Station, Monterey Weather Station #5795; accessed via Web at <http://www-marine.stanford.edu/HMSweb/climate.html>; Precip Oct. 94- Sep.2014 from National Weather Service Climatological Station, Monterey, California 93940 (elevation 385'), accessed via web at: accessed via web at: [http://met.nps.edu/~ldm/renard\\_wx/](http://met.nps.edu/~ldm/renard_wx/)] to determine adjustment factor; this was then used to derive a precipitation data set for on-site conditions for 1991 - 2008; (2) evapotranspiration data developed by comparing late 2008 to 2016 on-site data to the Castroville Weather Station (data from CIMIS) to determine adjustment factor; this was then used to derive an evapotranspiration data set for 1991 - 2008.

Type		Turf	Woodland	Scrub	Pond	Wetland	Grassland
AWC calcs		Cool Season	Coast Live Oak	Coyote Brush	Used Wetland	California Bulrush	Used Turf
Rooting Zone	inches	6.0			6.0	6.0	6.0
AWFraction	Avg. based on site soi	0.15			0.35	0.35	0.1
AWC	Inches	0.9	6.0	1.6	2.1	2.1	0.9
AWC	mm	22.3	152.4	40.6	53.3	53.3	22.3

References:

Root zone	Turf (Penn. State. No Date); Woodland (USDA 2007); Scrub (USDA 2008): Wetland and pond assumed to have shallow rooting depths; Grassland (Used turf factor)							
AW Fraction	Used USDA on-line soil survey data (NRCS no date) for available water fraction for turf soils for soils on-site, but adjusted for approximate percent of soil areal extent on site. Used Saxton & Rawls. 2006 estimate for rate for clay/silty clay for pond/wetland							
Soils	Coverage	AW Fraction	Total	Slope	Depth (H2)	Total	H1	Total
Mf	0.1	0.17	0.017	0 to 2 percent	99	9.9	12	1.2
PF	0.75	0.15	0.1125	0 to 2 percent	72	54	55	41.25
TbB	0.15	0.11	0.0165	0 to 5 percent	60	9	60	9
	BH, 2005	BH, 2005	<b>0.146</b>	Soil Survey	Soil Survey	<b>72.9</b>		<b>51.45</b>

**SOIL-WATER BALANCE MODEL INFORMATION**

Source: [http://www.ohio.edu/people/dyer/water\\_balance.html](http://www.ohio.edu/people/dyer/water_balance.html) [See Dyer No Date, Dyer 2009 and Dyer 2015]

Calculates Water Budget based on method of Thornthwaite & Mather

Worksheet created by James Dyer, Ohio University

Modified by ICF to use Total Water (App. Water + Precip.) instead of Precip. Only and Crop ET instead of Eto

All other values computed automatically.

Calculations begin for month where Storage (ST) is full

Assumes decreasing availability of soil moisture (Mather 1974, curve C, WATBUG default)

According to the USDA Soil Survey, all of the site soils have permeability rates (nominally 2 inches/hour or more) that are significantly higher than typical rainfall intensities that can be expected at the site (max hourly rainfall in on-site hourly data reviewed by 1.1 inches). Therefore, runoff from typical storm events can be expected to be very low where there is no impervious cover or areas of soil compaction. Thus, the surplus identified in soil-water balance calculations for WY 91 to WY 14 was assumed to be recharge and not runoff for non-impervious areas. For impervious areas, a separate analysis was conducted to determine runoff and recharge; stormwater for these areas will be routed to an infiltration basin or basins designed to capture 85% of runoff.

**Table H2-6 Summary of Modelled Evapotranspiration and Recharge by Year**

Landcover Type <b>Turf</b>							
WY	Precip. (In.)	ETo (In.)	Irrigation (In.)	Total Water (Precip. + Irr.)	Modelled Recharge (In.)	Modelled Evapotranspiration/Total Applied Water	Modelled Recharge/Total Applied Water
1991	11.91	35.33	21.95	33.86	7.50	78%	22%
1992	15.31	38.90	26.04	41.35	12.01	71%	29%
1993	25.82	40.80	26.98	52.81	20.96	60%	40%
1994	11.98	38.86	28.54	40.52	10.72	74%	26%
1995	24.38	36.20	20.68	45.06	16.53	63%	37%
1996	18.03	40.06	28.00	46.04	14.69	68%	32%
1997	18.66	43.85	30.61	49.27	19.24	61%	39%
1998	40.64	37.40	21.23	61.87	32.04	48%	52%
1999	17.22	37.64	18.95	36.17	7.84	78%	22%
2000	18.04	38.41	29.97	48.01	18.04	62%	38%
2001	16.49	39.39	26.39	42.88	12.27	71%	29%
2002	13.39	37.82	31.98	45.36	16.34	64%	36%
2003	15.80	41.37	27.68	43.48	11.06	75%	25%
2004	14.07	40.34	27.68	41.74	12.85	69%	31%
2005	26.20	36.82	23.24	49.44	20.35	59%	41%
2006	21.28	37.20	22.59	43.88	14.30	67%	33%
2007	12.12	39.62	24.77	36.88	6.65	82%	18%
2008	12.35	38.36	27.16	39.50	11.53	71%	29%
2009	19.73	38.16	25.23	44.96	14.43	68%	32%
2010	18.83	37.59	19.83	38.66	8.82	77%	23%
2011	19.94	37.62	18.93	38.87	9.69	75%	25%
2012	8.89	40.17	20.77	29.66	0.00	100%	0%
2013	8.94	41.74	25.68	34.62	9.69	75%	8%
2014	5.92	42.15	27.11	33.03	0.22	99%	1%
Avg.	17.33	38.99	25.08	42.41	12.82	72%	28%
Percentile Statistics							
25th	19.78	40.21	27.68	45.53	16.39	64%	36%
50th	16.85	38.63	25.86	42.31	12.14	71%	29%
75th	12.29	37.61	21.77	38.22	9.47	76%	23%
90th	9.83	36.93	29.54	49.39	6.91	81%	11%

**Table H.2-7: Summary of Modelled Evapotranspiration and Recharge by Year** **Woodland**

WY	Precip. (In.)	ETo (In.)	Eto-P	Recharge	Irrigation (AFY)	AE	Recharge
1991	11.91	35.33	23.42	8.58	358.35	28%	72%
1992	15.31	38.90	23.59	11.79	425.03	23%	77%
1993	25.82	40.80	14.97	21.85	440.51	15%	85%
1994	11.98	38.86	26.88	8.29	465.89	31%	69%
1995	24.38	36.20	11.82	20.87	337.55	14%	86%
1996	18.03	40.06	22.03	14.29	457.18	21%	79%
1997	18.66	43.85	25.19	14.72	499.76	21%	79%
1998	40.64	37.40	0.00	36.95	346.61	9%	91%
1999	17.22	37.64	20.42	13.60	309.41	21%	79%
2000	18.04	38.41	20.37	14.33	489.32	21%	79%
2001	16.49	39.39	22.91	12.82	430.84	22%	78%
2002	13.39	37.82	24.44	9.77	522.00	27%	73%
2003	15.80	41.37	25.57	11.94	451.92	24%	76%
2004	14.07	40.34	26.27	10.42	451.83	26%	74%
2005	26.20	36.82	10.61	22.62	379.39	14%	86%
2006	21.28	37.20	15.92	17.79	368.84	16%	84%
2007	12.12	39.62	27.50	8.35	404.32	31%	69%
2008	12.35	38.36	26.01	8.86	443.31	28%	72%
2009	19.73	38.16	18.43	16.15	411.80	18%	82%
2010	18.83	37.59	18.76	15.24	324.10	19%	81%
2011	19.94	37.62	17.68	16.28	309.14	18%	82%
2012	8.89	40.17	31.28	4.94	340.63	44%	56%
2013	8.94	41.74	32.80	16.28	419.30	18%	58%
2014	5.92	42.15	36.23	2.01	442.30	66%	34%
Avg.	17.33	38.99	21.80	14.12	409.56	24%	75%
Percentile							
0.25	19.78	40.21	26.08	16.28	355.42	18%	82%
0.5	16.85	38.63	23.16	13.95	422.17	21%	78%
0.75	12.29	37.61	18.24	9.55	451.85	27%	72%
0.9	9.83	36.93	30.15	8.31	482.29	31%	61%

**Table H.2-8: Summary of Modelled Evapotranspiration and Recharge by Year** **Scrub**

WY	Precip. (In.)	ETo (In.)	Eto-P	Recharge	Irrigation (AFY)	AE	Recharge
1991	11.91	35.33	23.42	7.66	358.35	36%	64%
1992	15.31	38.90	23.59	10.97	425.03	28%	72%
1993	25.82	40.80	14.97	19.82	440.51	23%	77%
1994	11.98	38.86	26.88	6.51	465.89	46%	54%
1995	24.38	36.20	11.82	18.52	337.55	24%	76%
1996	18.03	40.06	22.03	12.68	457.18	30%	70%
1997	18.66	43.85	25.19	14.42	499.76	23%	77%
1998	40.64	37.40	0.00	34.42	346.61	15%	85%
1999	17.22	37.64	20.42	11.75	309.41	32%	68%
2000	18.04	38.41	20.37	12.70	489.32	30%	70%
2001	16.49	39.39	22.91	11.20	430.84	32%	68%
2002	13.39	37.82	24.44	8.15	522.00	39%	61%
2003	15.80	41.37	25.57	10.21	451.92	35%	65%
2004	14.07	40.34	26.27	9.95	451.83	29%	71%
2005	26.20	36.82	10.61	20.45	379.39	22%	78%
2006	21.28	37.20	15.92	16.42	368.84	23%	77%
2007	12.12	39.62	27.50	6.75	404.32	44%	56%
2008	12.35	38.36	26.01	8.33	443.31	33%	67%
2009	19.73	38.16	18.43	14.52	411.80	26%	74%
2010	18.83	37.59	18.76	13.51	324.10	28%	72%
2011	19.94	37.62	17.68	13.60	309.14	32%	68%
2012	8.89	40.17	31.28	2.23	340.63	75%	25%
2013	8.94	41.74	32.80	13.60	419.30	32%	50%
2014	5.92	42.15	36.23	1.48	442.30	86%	25%
Avg.	17.33	38.99	21.80	12.49	409.56	34%	65%
0.25	19.78	40.21	26.08	14.45	355.42	26%	74%
0.5	16.85	38.63	23.16	12.22	422.17	31%	69%
0.75	12.29	37.61	18.24	8.29	451.85	35%	63%
0.9	9.83	36.93	30.15	6.59	482.29	45%	51%

**Table H2-9: Summary of Modelled Evapotranspiration and Recharge by Year Wetland**

WY	Precip. (In.)	ETo (In.)	Eto-P	Recharge	Irrigation (AFY)	AE	Recharge
1991	11.91	35.33	23.42	3.17	358.35	91%	9%
1992	15.31	38.90	23.59	3.11	425.03	92%	8%
1993	25.82	40.80	14.97	13.47	440.51	74%	26%
1994	11.98	38.86	26.88	1.04	465.89	97%	3%
1995	24.38	36.20	11.82	10.07	337.55	78%	22%
1996	18.03	40.06	22.03	7.09	457.18	85%	15%
1997	18.66	43.85	25.19	11.09	499.76	77%	23%
1998	40.64	37.40	0.00	23.21	346.61	62%	38%
1999	17.22	37.64	20.42	1.74	309.41	95%	5%
2000	18.04	38.41	20.37	8.41	489.32	82%	18%
2001	16.49	39.39	22.91	2.85	430.84	93%	7%
2002	13.39	37.82	24.44	4.72	522.00	90%	10%
2003	15.80	41.37	25.57	3.15	451.92	93%	7%
2004	14.07	40.34	26.27	5.19	451.83	88%	12%
2005	26.20	36.82	10.61	10.77	379.39	78%	22%
2006	21.28	37.20	15.92	6.41	368.84	85%	15%
2007	12.12	39.62	27.50	0.46	404.32	99%	1%
2008	12.35	38.36	26.01	4.08	443.31	90%	10%
2009	19.73	38.16	18.43	4.57	411.80	90%	10%
2010	18.83	37.59	18.76	2.32	324.10	94%	6%
2011	19.94	37.62	17.68	3.52	309.14	91%	9%
2012	8.89	40.17	31.28	0.00	340.63	102%	0%
2013	8.94	41.74	32.80	3.52	419.30	91%	0%
2014	5.92	42.15	36.23	0.00	442.30	103%	0%
Avg.	17.33	38.99	21.80	5.58	409.56	88%	11%
Percentile							
0.25	19.78	40.21	26.08	7.42	355.42	84%	16%
0.5	16.85	38.63	23.16	3.80	422.17	90%	10%
0.75	12.29	37.61	18.24	2.72	451.85	94%	6%
0.9	9.83	36.93	30.15	0.64	482.29	98%	0%



**Table H2-10: Summary of Modelled Evapotranspiration and Recharge by Year**

**Pond**

WY	Precip. (In.)	ETo (In.)	Eto-P	Recharge	Irrigation (AFY)	AE	Recharge
1991	11.91	35.33	23.42	3.17	358.35	91%	9%
1992	15.31	38.90	23.59	3.11	425.03	92%	8%
1993	25.82	40.80	14.97	13.47	440.51	74%	26%
1994	11.98	38.86	26.88	1.04	465.89	97%	3%
1995	24.38	36.20	11.82	10.07	337.55	78%	22%
1996	18.03	40.06	22.03	7.09	457.18	85%	15%
1997	18.66	43.85	25.19	11.09	499.76	77%	23%
1998	40.64	37.40	0.00	23.21	346.61	62%	38%
1999	17.22	37.64	20.42	1.74	309.41	95%	5%
2000	18.04	38.41	20.37	8.41	489.32	82%	18%
2001	16.49	39.39	22.91	2.85	430.84	93%	7%
2002	13.39	37.82	24.44	4.72	522.00	90%	10%
2003	15.80	41.37	25.57	3.15	451.92	93%	7%
2004	14.07	40.34	26.27	5.19	451.83	88%	12%
2005	26.20	36.82	10.61	10.77	379.39	78%	22%
2006	21.28	37.20	15.92	6.41	368.84	85%	15%
2007	12.12	39.62	27.50	0.46	404.32	99%	1%
2008	12.35	38.36	26.01	4.08	443.31	90%	10%
2009	19.73	38.16	18.43	4.57	411.80	90%	10%
2010	18.83	37.59	18.76	2.32	324.10	94%	6%
2011	19.94	37.62	17.68	3.52	309.14	91%	9%
2012	8.89	40.17	31.28	0.00	340.63	102%	0%
2013	8.94	41.74	32.80	3.52	419.30	91%	0%
2014	5.92	42.15	36.23	0.00	442.30	103%	0%
Avg.	17.33	38.99	21.80	5.58	409.56	88%	11%
Percentiles							
0.25	19.78	40.21	26.08	7.42	355.42	84%	16%
0.5	16.85	38.63	23.16	3.80	422.17	90%	10%
0.75	12.29	37.61	18.24	2.72	451.85	94%	6%
0.9	9.83	36.93	30.15	0.64	482.29	98%	0%

**Table H2-11: Summary of Modelled Evapotranspiration and Recharge by Year**

**Grassland**

WY	Precip. (In.)	ETo (In.)	Eto-P	Recharge	Irrigation (AFY)	AE	Recharge
1991	11.91	35.33	23.42	4.85	358.35	59%	41%
1992	15.31	38.90	23.59	6.05	425.03	61%	39%
1993	25.82	40.80	14.97	15.56	440.51	40%	60%
1994	11.98	38.86	26.88	2.86	465.89	76%	24%
1995	24.38	36.20	11.82	12.81	337.55	47%	53%
1996	18.03	40.06	22.03	8.83	457.18	51%	49%
1997	18.66	43.85	25.19	12.04	499.76	35%	65%
1998	40.64	37.40	0.00	26.12	346.61	36%	64%
1999	17.22	37.64	20.42	5.26	309.41	69%	31%
2000	18.04	38.41	20.37	9.59	489.32	47%	53%
2001	16.49	39.39	22.91	4.57	430.84	72%	28%
2002	13.39	37.82	24.44	4.72	522.00	65%	35%
2003	15.80	41.37	25.57	4.59	451.92	71%	29%
2004	14.07	40.34	26.27	6.88	451.83	51%	49%
2005	26.20	36.82	10.61	12.93	379.39	51%	49%
2006	21.28	37.20	15.92	9.37	368.84	56%	44%
2007	12.12	39.62	27.50	2.89	404.32	76%	24%
2008	12.35	38.36	26.01	5.63	443.31	54%	46%
2009	19.73	38.16	18.43	7.49	411.80	62%	38%
2010	18.83	37.59	18.76	5.50	324.10	71%	29%
2011	19.94	37.62	17.68	7.60	309.14	62%	38%
2012	8.89	40.17	31.28	0.00	340.63	100%	0%
2013	8.94	41.74	32.80	7.60	419.30	62%	21%
2014	5.92	42.15	36.23	0.00	442.30	100%	0%
Avg.	17.33	38.99	21.80	7.65	409.56	61%	38%
Percentiles							
0.25	19.78	40.21	26.08	9.42	355.42	51%	49%
0.5	16.85	38.63	23.16	6.46	422.17	61%	39%
0.75	12.29	37.61	18.24	4.68	451.85	71%	29%
0.9	9.83	36.93	30.15	2.87	482.29	76%	22%

**Table H3-1: Summary of Recharge from Developed Impervious Areas through Infiltration basin**

Project	Annual Precip (In)	Annual Recharge (AF)	Max Hourly Rainfall (In)	Notes
WY03	18.40	29.54	0.69	Avg
WY09	19.23	30.38	1.10	Avg
WY10	17.76	28.29	0.49	Avg
WY11	19.71	31.10	0.49	Avg
WY12	8.22	13.13	0.25	Very Dry
WY13	9.33	14.89	0.87	Very Dry
WY14	5.26	8.40	0.32	Very Dry
WY15	9.59	15.26	0.55	Very Dry
WY16	25.16	40.04	0.76	Wet
AVG 09-16	16.58	26.38	0.69	
Average	18.78	29.83	0.69	
Very Dry	8.10	12.92	0.50	
Wet	25.16	40.04	0.76	

130 Unit Alternative	Precip. (In.)	Recharge (AF)	Max Hourly (In.)	Notes
WY03	18.40	22.20	0.69	Avg
WY09	19.23	23.16	1.10	Avg
WY10	17.76	21.40	0.49	Avg
WY11	19.71	23.78	0.49	Avg
WY12	8.22	9.92	0.25	Very Dry
WY13	9.33	11.24	0.87	Very Dry
WY14	5.26	6.35	0.32	Very Dry
WY15	9.59	11.59	0.55	Very Dry
WY16	25.16	30.38	0.76	Wet
AVG 09-16	16.58	20.00	0.69	
Average	18.78	22.64	0.69	
Very Dry	8.10	9.77	0.50	
Wet	25.16	30.38	0.76	

Source: Recharge modelling by ICF using Balance Hydrologics model used for 2005 Preliminary Stormwater Management Plan (Balance Hydrologics 2005). ICF adjusted model in terms of current site acreage; adjusted to run for both Proposed Project and 130-unit Alternative, and conducted additional runs for WY 09 to WY 16. Precipitation for WY 03 from original Balance Hydrologics model. Precipitation for WY 09 to WY 16 from on-site CIMIS meteorological station. Basin size set to provide 85% infiltration of runoff per original assumption in Balance Hydrologics model. Each model run for entire Water Year (except WY03 which was run per original data extent of October to June only and WY09 which was run from 10/24/08 to 09/30/09 due to lack of data from CIMIS station prior to 10/24/08). Recharge model includes runoff from developed impervious areas and analyze conditions hourly to determine how much runoff actually infiltrates. First page of model output for WY10 shown on next page for Proposed Project and 130-unit Alt.

**Appendix H.3: Infiltration analysis for Rancho Canada Village Project RDEIR: Proposed Project (First page of results only)**

Based on daily rainfall estimated for site Water Year 2010

Sub-watershed area (acres) =	37.7	Soil infiltration rate (in/hr) =	2.00	Total Runoff (ac-ft) =	33.43
Percent impervious =	60.0			Total Infiltrated (ac-ft) =	28.29
Basin area (ft <sup>2</sup> ) =	49000	Site mean rainfall (in/yr) =	17.76	Required Storage (ac-ft) =	5.14
				Total Rainfall (in) =	17.76
				Annual Runoff C =	0.60

**Sizing for infiltrating 85% of mean runoff**

Max hourly	0.49	0.92	0.00	0.92	0.19	0.73
TOTAL	17.76	33.43	0.00	33.43	28.29	5.14

Date	Hour	Site Rainfall (in)	East storm drain runoff (ac-ft)			Basin Perc (ac-ft)	Carryover (ac-ft)
			Imperv	Other	Total		
10/1/2009	100	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	200	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	300	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	400	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	500	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	600	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	700	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	800	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	900	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1000	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1100	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1200	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1300	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1400	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1500	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1600	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1700	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1800	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	1900	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	2000	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	2100	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	2200	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	2300	0	0.00	0.00	0.00	0.00	0.00
10/1/2009	2400	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	100	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	200	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	300	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	400	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	500	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	600	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	700	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	800	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	900	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1000	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1100	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1200	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1300	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1400	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1500	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1600	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1700	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1800	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	1900	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	2000	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	2100	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	2200	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	2300	0	0.00	0.00	0.00	0.00	0.00
10/2/2009	2400	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	100	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	200	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	300	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	400	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	500	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	600	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	700	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	800	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	900	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1000	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1100	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1200	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1300	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1400	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1500	0	0.00	0.00	0.00	0.00	0.00
10/3/2009	1600	0	0.00	0.00	0.00	0.00	0.00

