2018-2019 ANNUAL ICR AND WELL FIELD REPORT

Prepared for

ICR WATER USERS ASSOCIATION

Prepared

By

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2018-2019 ANNUAL ICR WELL FIELD REPORT

PURPOSE OF THE REPORT

This report is one of an annual series of reports for the Inscription Canyon Ranch (ICR) well field dating back to 2012 intended to provide a description of the conditions at the well field including pumpage, water levels and yields of individual wells, and the water demand and use of water by the subdivisions served.

ICR WATER USES ASSOCIATION

The ICR Water Users Association (ICRWUA) is a private, non-profit water company providing water to the Inscription Canyon Ranch, Whispering Canyons, Preserve at the Ranch, and Talking Rock subdivisions as well as the Talking Rock golf course. The first three subdivisions obtain water from the ICR well field, which consists of two wells and constitutes the ICR groundwater system. The company is regulated by the Arizona Corporation Commission.
In 2018 and 2019, ICRWUA provided water to 342 residential customers in the Inscription Canyon Ranch, Whispering Canyons, and Preserve at the Ranch subdivisions, an increase of 24 customers since 2017 and 59 customers since 2012 (table 1). In addition to providing water to residential customers, ICRWUA serves several commercial entities located within the subdivisions and provides water for irrigation of the common areas in the subdivisions as well as for home construction purposes within the subdivisions.

Table 1, Residential Customers served December 2012 – June 2019

Subdivision	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
ICR	283	291	303	312	314	318	342	342

2018-2019 RESIDENTIAL, COMMERCIAL, AND LANDSCAPE DEMAND

The monthly and annual water demands shown in tables 2 and 3 are for all major users served by the ICR well field, excluding construction purposes. The values are based on monthly billing records that run on a mid-month billing cycle rather than a calendar basis. The billing records date from December 16, 2017 to December 17, 2018 for 2018, and December 18, 2018 to June 15, 2019 for 2019. Column 2 in tables 2 and 3 shows monthly residential water demand in gallons; column 3 shows the number of residential units served; column 4 shows the number of residential units that had zero water usage for the month; column 5 and 6 show monthly demand for commercial and landscape use in gallons; column 7 shows total residential, commercial, and landscape demand in gallons per day per residence (gpd/r) for each month and for the year.

These values demonstrate the significant variation of monthly demand, increasing during the drier, pre-monsoon months in response to increased drip irrigation of residential and common area landscape. The annual average use in gallons per day per residence in the ICR system, including commercial and landscape demand, decreased from 250 gpd/r in 2017 to 238 gpd/r in 2018. Thus far in 2019, the annual average use in gallons per day per residence is 188 gpd/r.

Table 2, 2018 ICR Groundwater System Residential, Landscape, and Commercial Water Demand, in gallons

Month	Residential Demand	Residential Customers	Zero Use Residential Customers	Commercial Demand	Landscape Demand	Total Demand	Average Residential Use (gpd/r)
January	1,429,740	318	13	1,470	850	1,432,060	151
February	1,282,700	317	14	1,640	3,110	1,287,450	152
March	1,205,220	319	22	560	2,220	1,208,000	131
April	1,739,180	342	17	2,800	4,810	1,746,790	179
May	2,848,210	319	8	2,050	17,910	2,868,170	297
June	2,834,950	334	8	6,430	8,570	2,849,950	291
July	4,348,290	323	5	8,260	31,970	4,388,520	445
August	2,965,110	330	9	1,180	25,420	2,991,710	301
September	2,976,620	332	8	8,760	32,180	3,017,560	310
October	2,375,830	333	9	4,920	25,590	2,406,340	240
November	1,987,760	326	9	4,270	40,110	2,032,140	214
December	1,435,960	330	11	2,630	640	1,439,290	146
Total/Avg	27,429,570	329[1]	11[1]	44,970	193,380	27,667,920	238[1]

[1]average annual value.

Table 3, 2019 Year-to-Date (YTD) ICR Groundwater System Residential, Landscape, and Commercial Water Demand, in gallons.

Month	Residential Demand	Residential Customers	Zero Use Residential Customers	Commercial Demand	Landscape Demand	Total Demand	Average Residential Use (gpd/r)
January	1,316,680	332	15	1,550	1,380	1,319,610	134
February	1,184,820	333	23	570	640	1,186,030	137
March	1,152,810	331	23	1,260	570	1,154,640	121
April	1,739,180	342	17	2,800	4,810	1,746,790	179
May	2,558,150	335	20	5,030	7,370	2,570,550	263
June	2,834,950	334	8	6,430	8,570	2,849,950	291
Total/Avg	10,786,590	335[1]	18[1]	17,640	23,340	10,827,570	188[1]

[1]average annual value.

THE ICR WELL FIELD

There are two wells, ICR 1 and ICR 2, in the ICR well field, located about 47 feet apart. The wells are within Section 17, Township 16 North, Range 3 West and are situated in the Mint Wash floodplain, about one-half mile west of Williamson Valley Road where the road crosses the wash.

Well 1 is the original well, originally constructed in 1994 by the developer of the Inscription Canyon Ranch to provide water to the subdivision. Whispering Canyons L.L.C. later constructed well 2, often referred to as Whispering Canyon 1 (WC 1), in 2002 to serve Inscription Canyon Ranch, Whispering Canyon, and Preserve at the Ranch subdivisions.

The wells are owned by Aqua Meadows and are on land owned by Aqua Meadows. ICRWUA has an agreement dated August 1, 1995 that gives the Association the right to operate and use ICR well 1 as a water supply for Inscription Canyon Ranch and Preserve at the Ranch subdivisions for 100 years, subject to renewal every 25 years. This agreement serves to satisfy the Arizona Department of Water Resources 100 Year Water Adequacy Requirement. An amendment to the agreement (Amendment 1), dated July 24, 2001, adds Whispering Canyon subdivision. ICRWUA is responsible for operating and maintaining the two wells and paying all costs associated with the operation and maintenance. Per contract with Aqua Meadows, the Association is permitted to withdraw 164,518,498 gallons per year to service the ICR, WC, and Preserve at the Ranch subdivisions.

The aquifer tapped by the wells is a mixture of unconsolidated sediments consisting of clay, silt, sand, and gravel, locally cemented to form conglomerate. The base of the aquifer is confined by crystalline basement rock, occurring at a depth of about 223 ft at well 1, and about 220 ft at well 2. The pump intake at ICR well 1 is 172 ft below land surface. The depth to pump intake at ICR well 2 is 160 ft below land surface.

The water table elevation naturally fluctuates in response to seasonal patterns of precipitation. At the time ICR well 1 was completed, the regional water table was at a depth of 18 ft below land surface at ICR well 1 and 19 ft below land surface at ICR well 2.

JANUARY 2018 - JUNE 2019 MONTHLY WELL DEMAND

Total pumpage at ICR wells 1 and 2 in 2018 was 31,647,670 gallons. Total pumpage at well 1 for the year was 26,850,670 gallons while total pumpage at well 2 for the year was 4,797,000 gallons (table 4). Total pumpage at ICR wells 1 and 2 for January through June 2019 was 12,253,811 gallons. Total pumpage at well 1 was 5,024,000 gallons while total pumpage at well 2 was 4,797,000 gallons (table 5). Monthly demand on the well field in 2018 increased from approximately 1,440,000 gallons in March to a high of 4,500,000 gallons in July when pumpage peaked. Demand then slowly decreased, falling to about 1,451,670 gallons in December. Monthly demand on the well field in 2019 increased from approximately 1,440,000 in March to a high of 3,100,497 gallons in June.

Table 4, 2018 ICR Wells 1 and 2 Monthly and Annual Pumpage, in gallons.

Month	Well 1	Well 2	Total
January	1,270,000	404,000	1,674,000
February	1,528,000	0	1,528,000
March	1,440,000	0	1,440,000
April	2,553,000	0	2,553,000
May	1,903,000	1,204,000	3,107,000
June	2,026,000	1,982,000	4,008,000
July	4,500,000	0	4,500,000
August	2,076,000	1,207,000	3,283,000
September	3,278,000	0	3,278,000
October	2,629,000	0	2,629,000
November	2,196,000	0	2,196,000
December	1,451,670	0	1,451,670
Total	26,850,670	4,797,000	31,647,670

Table 5, 2019 ICR Wells 1 and 2 Monthly and YTD Total Pumpage, in gallons.

Month	Well 1	Well 2	Total
January	1,545,000	0	1,545,000
February	1,451,000	0	1,451,000
March	1,440,000	0	1,440,000
April	588,000	1,261,284	1,849,284
May	0	2,868,030	2,868,030
June	0	3,100,497	3,100,497
Total	5,024,000	7,229,811	12,253,811

2012-2019 MONTHLY WELL FIELD DEMAND

Table 6 shows the variation in monthly demand at the ICR well field from January 2012 to June 2019. Minimum demand occurs in the winter months, with the lowest generally occurring in February. The highest demand occurs in June and July. The difference between maximum and minimum demand for a given year averages about 2.31 million gallons and has been as much as 3.06 million gallons.

The well field's annual demand during this time period has ranged from a low of 25,669,000 gallons in 2015 to a high of 31,647,670 gallons in 2018. These rates correspond to an average daily pumping rate ranging from 48 gallons per minutes to 60 gallons per minutes. The capacity of each ICR well is approximately 375 gpm.

Table 6, Monthly and Annual ICR Well Field Water Demand, Jan 2017- Jun 2019, in gallons.

Month	2012	2013	2014	2015	2016	2017	2018	2019
Jan	1,161,000	1,418,000	1,485,000	1,433,000	1,243,000	1,129,000	1,674,000	1,545,000
Feb	1,172,000	1,006,000	1,408,000	1,238,000	1,379,000	1,087,000	1,528,000	1,451,000
Mar	1,423,000	1,710,000	1,771,000	1,601,000	1,919,000	1,707,000	1,440,000	1,440,000
Apr	2,036,000	2,480,000	2,440,000	2,299,000	2,349,000	2,411,000	2,553,000	1,849,284
May	2,973,000	3,046,000	3,019,000	2,488,000	2,992,000	2,859,000	3,107,000	2,868,030
Jun	3,464,000	3,700,000	3,753,000	3,183,000	3,662,000	3,851,000	4,008,000	3,100,497
Jul	3,274,000	2,985,000	3,270,000	3,013,000	3,872,000	3,475,000	4,500,000	
Aug	2,995,000	2,817,000	2,603,000	2,820,000	3,031,000	2,905,000	3,283,000	
Sep	2,727,000	2,172,000	2,305,000	2,636,000	2,769,000	3,104,000	3,278,000	
Oct	2,621,000	2,304,000	2,642,000	2,161,000	2,369,000	2,896,000	2,629,000	
Nov	1,764,000	1,495,000	1,469,000	1,375,000	1,793,000	2,295,000	2,196,000	
Dec	1,402,000	1,242,000	1,335,000	1,422,000	1,220,000	1,672,000	1,451,670	
Total	27,012,000	26,375,000	27,500,000	25,669,000	28,598,000	29,391,000	31,647,670	12,253,811

MAXIMUM DAILY DEMAND

The maximum average daily demand for 2018 occurred in July, equaling 445 gpd/r. The maximum average daily demand for 2019 YTD occurred in June, equaling 291 gpd/r.

The July 2018 pumpage of 4,500,000 gallons exceeds that of all other months during the recorded time period. This demand equates to an average daily demand of approximately 145,161 gallons per day. There were 318 residential units served during this time with an average daily use of 457 gpd/r.

WELL FIELD HOURS OF USE AND YIELD

ICR well 1 was pumped for approximately 1165.4 hours during 2018 for an average daily use of about 3.2 hours per day. The maximum use occurred in July when the well was pumped for approximately 195.3 hours for an average daily use of 6.3 hours. ICR well 2 was pumped for approximately 215.5 hours during 2018 for an average daily use of about .6 hours per day. The maximum use occurred in June when the well was pumped for approximately 89.0 hours for an average daily use of about 3.0 hours.

ICR well 1 was used for approximately 218.1 hours during 2019 YTD for an average daily use of about 1.2 hours per day. ICR well 2 was used for approximately 324.8 hours during 2019 YTD for an average daily use of about 1.79 hours.

Average annual yield for ICR well 1 was approximately 384 gpm for both 2018 and 2019 YTD. Average annual yield for ICR well 2 was approximately 371 gpm for both 2018 and 2019 YTD. Average annual yields for ICR well 1 and well 2 over the last 5 years are shown below (table 7). The yields from each well have been stable during this time.

Table 7, 2015-2019 YTD Average Annual ICR Well Field Yields, in gpm.

ICR well	2015	2016	2017	2018	2019 YTD
well 1	385	374	381	384	384
well 2	375	369	370	371	371

WELL FIELD WATER LEVELS

For practical reasons, it is best to maintain the pumping water level in the wells at approximately two-thirds of the original thickness of the aquifer at each well. This will maximize production relative to the decline in the pumping water level and to pumping cost. For both wells, the suggested maximum pumping depth to water should be about 152 feet below land surface.

Another consideration is the requirement to maintain the pumping water level in a well above the pump intakes, 172 feet below land surface at ICR well 1 and 160 feet below land surface at ICR well 2. Long-term viability of the well requires a pumping level above these depths.

ICR WELL 1

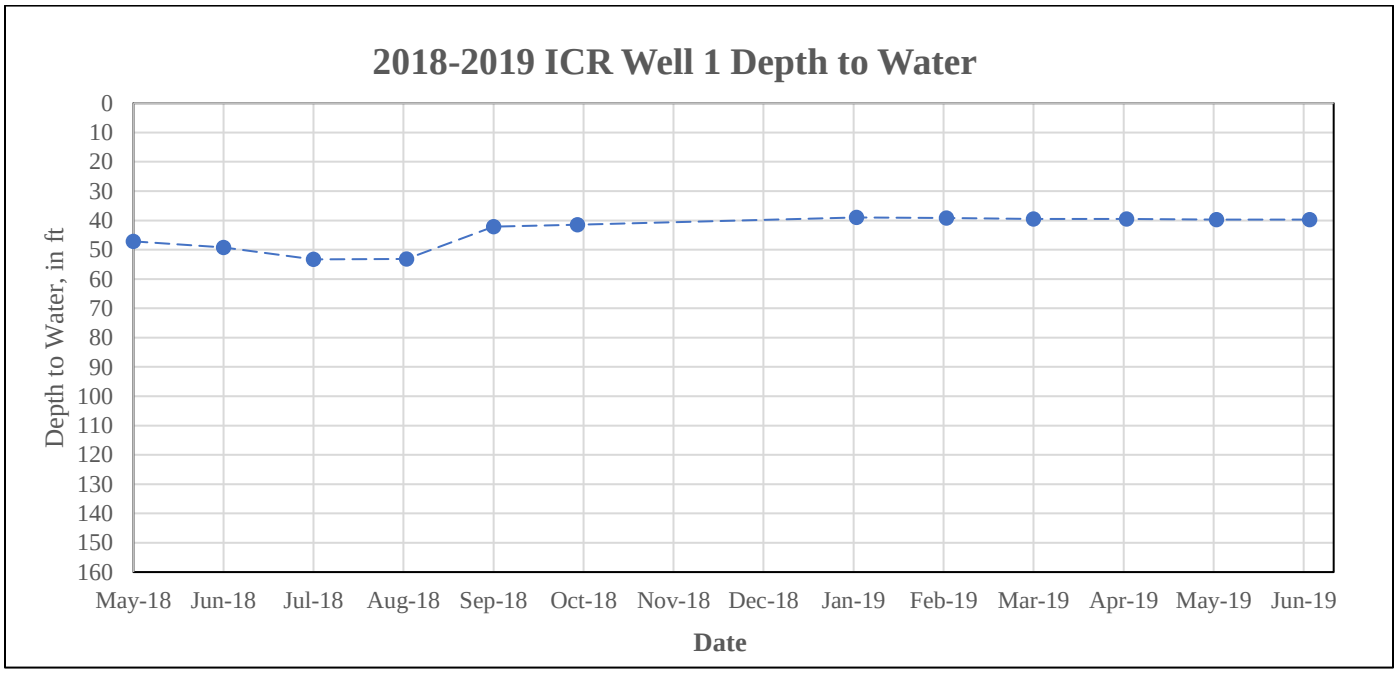
Static (non-pumping) depths to water at ICR well 1 in 2018 ranged from a low of 53.3 feet below land surface in July to a high of 41.5 feet below land surface in October. There are only 6 months of depth-to-water data recorded in 2019, May to October; however, there was a recorded difference of 11.8 feet throughout these 6 months due to a significant monsoon season during the summer months, increasing flow in Mint Wash and a subsequent increase in recharge to the aquifer tapped by the well field. The non-pumping water levels average about 47.7 feet below land surface compared to about 46 feet in 2017, a difference of 1.7 feet.

Non-pumping depths to water at ICR well 1 in 2019 YTD did not vary much, a range of 39.4 feet below land surface in January to 40.1 feet below land surface in June. The non-pumping water levels averaged about 39.8 feet below land surface compared to 47.7 feet in 2018, a difference of 9 feet.

Because of the short hourly use of the well, a pumping water level was recorded only once during 2019 following a 75 minute test at the well on July 18th. The pumping water level was recorded at 119 feet below land surface compared to the pumping water level of 113.3 feet below land surface recorded in 2017, both of which are well above the pump intakes.

Pumping and non-pumping depths and stable well yields are consistent with continued viability of the well.

Figure 1.



ICR WELL 2

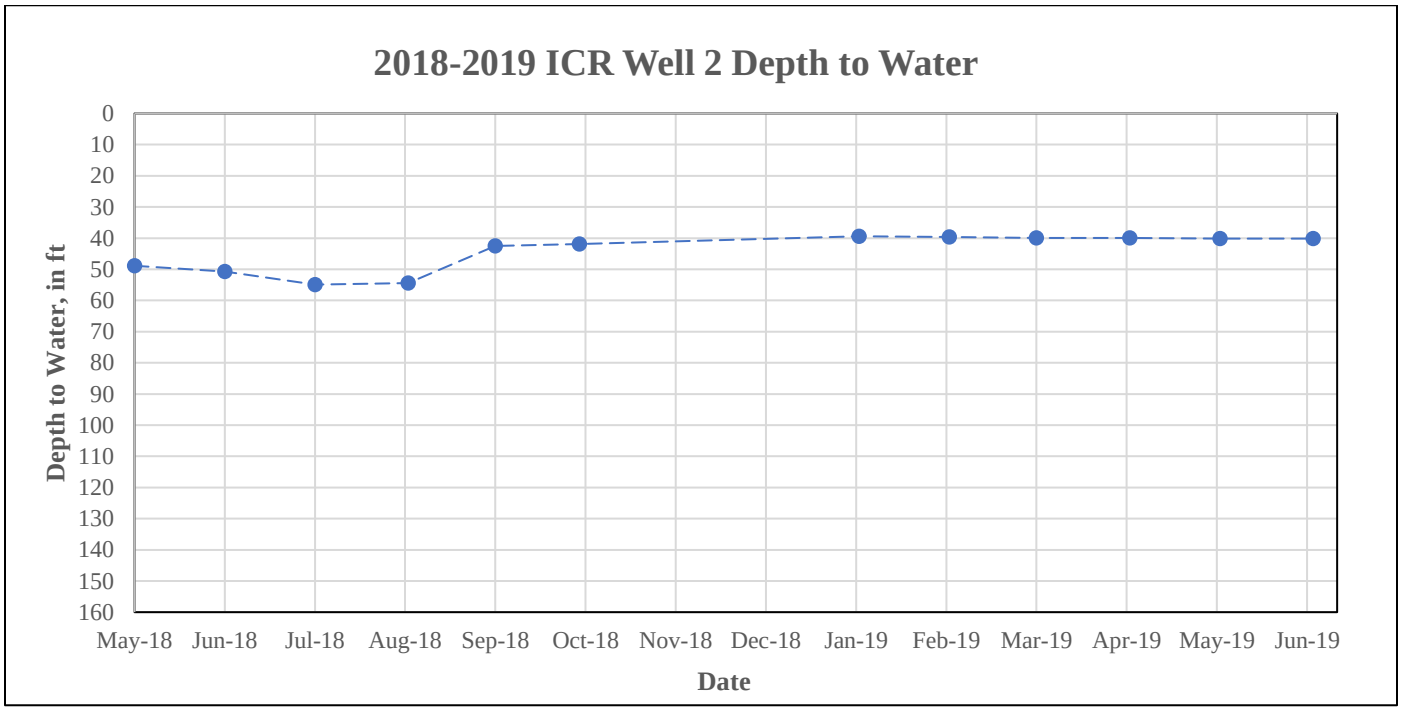
Non-pumping depths to water at ICR well 2 from May to October in 2018 ranged from a low of 54.9 feet below land surface in July to a high of 41.9 feet below land surface in October with a recorded difference of 13.0 feet. The non-pumping water levels averaged about 48.9 feet below land surface compared to 48 feet in 2017, a difference of about .9 feet.

Non-pumping depths to water at ICR well 1 in 2019 YTD remained stable with a range of 39.4 feet below land surface in January to 40.1 feet below land surface in June. The non-pumping water levels averaged about 39.8 compared to 48.9 feet in 2018, a difference of about 9 feet directly comparable to that in well 1.

Pumping depths were not recorded at ICR well 2 since the well was not pumping during the daily visits.

Non-pumping depths and stable well yields are consistent with continued viability of the well.

Figure 2.



SUMMARY

The ICR Water Users Association (ICRWUA) is a private, non-profit water company providing water to the Inscription Canyon Ranch, Whispering Canyons, Preserve at the Ranch, and Talking Rock subdivisions as well as the Talking Rock golf course. The first three subdivisions are serviced by the ICR well field, which is comprised of two wells, ICR well 1 and ICR well 2, located about 47 feet apart.

The 2018 annual demand at the ICR well field was 31,647,670 gallons, compared to 29,391,000 gallons in 2017. Average 2018 residential demand per residence, including landscape and commercial use, was 445 gpd/r for the subdivisions served by the ICR well field, compared to 250 gpd/r in 2017. The 2019 YTD average demand was 12,253,811 gallons. Average 2019 YTD residential demand per residence was 291gpd/r.

The maximum 2018 monthly demand occurred in July, equaling 4,500,000 gallons. The maximum 2019 YTD monthly demand occurred in June, equaling 3,100,497 gallons.

The ICR well field is operated with only one well pumping during a given day, ICR well 2 serving as a back-up well to ICR well 1. While ICR well 1 was shut off due to repairs during May and June of 2019, ICR well 2 serviced the subdivisions.

ICR well 1 was used for 1165.4 hours during 2018 for an average daily use of about 3.2 hour per day. Maximum use was in July when the well was pumped 195.3 hours for an average daily use of 6.3 hours. Average annual yield from ICR well 1 was approximately 384 gpm. Total production from the well for 2018 was 26,850,670 gallons. ICR well 1 was used for 218.1 hours during 2019 YTD for an average daily use of about 1.2 hours per day. Average YTD yield was approximately 384 gpm. Total production from the well for 2019 YTD was 5,024,000 gallons.

ICR well 2 was used for 215.5 hours during 2018 for an average daily use of about .6 hours. Maximum use was in June when the well was pumped for 89.0 hours for an average daily use of about 3.0 hours. Average annual yield from ICR well 2 was approximately 371 gpm. Total production from the well for 2018 was 4,797,000 gallons. ICR well 2 was used for 324.8 hours during 2019 YTD for an average daily use of about 1.8 hours per day. Average YTD yield was approximately 371 gpm. Total production from the well for 2019 YTD was 7,229,811 gallons.

Average yields for ICR wells 1 and 2 have been essentially stable over the last 5 years. This fact, combined with pumping and non-pumping depths to water in both wells, is consistent with the continued viability of the wells.