



GROUNDWATER / AQUIFER CONDITIONS - OVERVIEW

SOUTHERN WILLCOX BASIN & NORTHERN DOUGLAS BASIN

This document has been prepared to provide a brief overview summary of groundwater / aquifer conditions occurring within portions of the Willcox and Douglas Basins and specifically within the vicinity of the community of Elfrida located in the northern Douglas Basin and Sunizona, Sunsites, Kansas Settlement and Cochise communities located within the southern Willcox basin. All of these noted communities are located in agricultural areas where groundwater produced from wells have historically provided essentially all irrigation water for a variety of crops commencing in the early 1900s with noticeable increases in groundwater pumping commencing in the 1940s – 1950s.

Groundwater pumping volumes within both the Douglas and Willcox Basins actually peaked in the mid-1970s with annual volumes approaching 140,000 and 340,000 acre-feet per year, respectively (see attached data table prepared by U.S. Geologic Survey). **One acre-foot equals about 326,000 gallons.** Current (2021) groundwater pumping for agricultural irrigation probably approaches about 200,000 acre-feet per year within the Willcox basin and about 60,000 acre-feet per year within the Douglas Basin. As indicated, current groundwater pumping for agriculture purposes is about 60 percent (over 100,000 acre-feet less) of the previous - historic peak **annual** pumping (mid – 1970s) within the Willcox Basin and about 40 percent (75,000 acre – feet less) of the previous – historic peak **annual** pumpage within the Douglas Basin.

Groundwater level declines in both the Willcox and Douglas Basins, due to irrigation well pumpage, were recognized as early as in the 1950s. Groundwater levels as shallow as 100 to 150 feet *or less* occurred in some areas of the Willcox and Douglas Basins in the early 1900s. Fast forward to 2021, and groundwater level depths (static non-pumping levels) in most areas of the Douglas Basin range from approximately 200 to 300 feet (**water table depth**) and typically range from 300 to 400 feet within the Willcox Basin.

The regional aquifer systems in the both the Douglas and Willcox Basins are comprised of basin fill alluvium consisting predominately of mixtures of gravel, sand, clay and silt with some volcanic rock interflow layers and volcanic tuff at depth. Studies by the Arizona Geologic Survey (AGS) and Arizona Department of Water Resources (ADWR) have indicated the regional aquifer system in the southern Willcox Basin exhibits a bottom depth approaching as much as 4,000 to 5,000 feet and upwards of 2,500 to 3,000 feet within the northern Douglas Basin. The ADWR has recently indicated the saturated thickness of the regional basin fill aquifer in the Elfrida area may approach 2,000 to 2,500 feet (see attached Figure 1 - ADWR – Hydrologic Monitoring Report No. 9, 2016). The ADWR has recently indicated maximum saturated aquifer thicknesses ranging upwards of 2,500 to 4,000 feet in the southern Willcox Basin (see attached Figure 2). **The aquifer thickness specifically reflects the distance from the current water table to the bottom (depth) of the basin fill aquifer.** Groundwater produced from wells within the Willcox and Douglas Basins is derived from the thick sequence of basin fill alluvium which comprises the regional aquifer systems in both basins.

Recent drilling of deep irrigation wells to depths upwards of 2,500 feet, have confirmed the recent ADWR studies which suggested aquifer depths approaching 2,500 to 4,000 feet in the southern Willcox Basin. Recent deep irrigation wells drilled in the Kansas Settlement and northeast Sunizona (Turkey Creek) areas have specifically confirmed recoverable / useable groundwater to depths of 2,500 feet. The confirmation of deep - useable and recoverable groundwater has also been recently confirmed in the northern Willcox Basin (Bonita area) to depths approaching 2,500 feet. Most of the recent deep wells drilled in the Willcox Basin (Kansas Settlement, Sunizona / Turkey Creek, Bonita areas) have revealed quite permeable aquifer conditions, even at extreme depths of 1,500 to 2,500 feet.

In summary, recent studies published by the ADWR along with recent deep irrigation wells drilled and test pumped by various farm groups indicate considerable recoverable and useable groundwater resources available to extreme depths of at least 2,500 feet.

The future Southeastern Arizona Water District (**SAWD**) proposes to provide domestic water to those interested customers in portions of the southern Willcox and northern Douglas Basins, from new 12 - inch cased wells to be completed to depths approaching 1,200 feet. These wells, depending on their locations, will exhibit water level heights ranging from about 800 to 900 feet. The technical plan is to also retrofit these new wells such that they can be deepened in the far – distant future, if so required. Given the depth and thickness of the aquifer systems in the southern Willcox and northern Douglas Basins (in excess of 2,000 to upwards of over 3,000 feet), and current groundwater level depths ranging from 200 to 400 feet, the SAWD should be readily capable of providing sufficient domestic water to interested customers far into the distant future. The attached Figure 3, presents a conceptual illustration of groundwater / aquifer conditions and future proposed SAWD domestic production wells within the southern Willcox Basin and northern Douglas Basin.



Appendix 13. USGS Estimated Groundwater Withdrawals in the Douglas Basin, Willcox Basin, and San Simon Valley Sub-basin, Pre-1915 to 1990.

*	Douglas	Willcox	San Simon			Douglas	Willcox	San Simon
Pre 1915	1	0	5		1953	45	94	25
1915	1	2	10		1954	42	105	32
1916	0	2	8		1955	50	110	40
1917	0	1	8		1956	60	120	40
1918	0	0	6		1957	55	135	48
1919	0	0	6		1958	55	155	50
1920	0	0	5		1959	55	183	50
1921	0	0	5		1960	60	195	60
1922	0	0	5		1961	65	184	65
1923	0	0	5		1962	65	180	65
1924	0	0	5		1963	65	180	65
1925	0	0	5		1964	60	220	75
1926	0	1	4		1965	90	250	70
1927	0	1	4		1966	105	240	72
1928	0	2	4		1967	120	300	76
1929	0	2	4		1968	120	290	81
1930	1	1	4		1969	104	291	78
1931	1	1	4		1970	103	289	105
1932	2	1	3		1971	95	309	107
1933	2	1	3		1972	89	292	104
1934	2	1	3		1973	110	305	115
1935	2	1	3		1974	138	339	135
1936	2	1	3		1975	118	293	122
1937	2	1	3		1976	112	306	122
1938	2	2	3		1977	87	220	117
1939	2	2	3		1978	80	169	121
1940	5	2	3		1979	81	175	113
1941	5	5	3		1980	91	199	139
1942	5	5	4		1981	85	180	127
1943	5	5	4		1982	76	140	75
1944	5	5	4		1983	50	82	42
1945	8	9	5		1984	46	94	44
1946	12	15	6		1985	49	91	45
1947	17	20	6		1986	38	86	42
1948	22	23	6		1987	37	82	46
1949	30	28	6		1988	36	93	47
1950	35	35	6		1989	46	108	49
1951	38	38	6		1990	42	87	47
1952	42	39	15					

* Figures are x 1,000 Acre-Feet/Year

TABLE 1

Appendix 14. USGS Estimated Municipal, Industrial, Electrical Power Generation and Mining Water Use in the Douglas Basin, Willcox Basin and San Simon Valley Sub-basin 1991 to 2014.

	Douglas Basin				Willcox Basin					San Simon Valley Sub-basin		
*	AG	MUNI	TOTAL		AG	MUNI	ELECTRIC POWER	MINING	TOTAL	AG	MUNI	TOTAL
1991	31	5.5	36.5		124	2.5	6.6	0.3	133.4	46	0.25	46.25
1992	34	5.4	39.4		112	2.6	6.5	0.3	121.4	42	0.25	42.25
1993	32.5	4.8	37.3		128	2.5	5	0.3	135.8	48	0.25	48.25
1994	36.5	6	42.5		130	2.6	5.9	0.3	138.8	48	0.25	48.25
1995	30	5.2	35.2		124	2.6	5.7	0.3	132.6	46	0.25	46.25
1996	37.5	7	44.5		125	2.7	4.1	0.3	132.1	47	0.25	47.25
1997	39.5	6	45.5		127	2.8	4.6	0.3	134.7	48	0.25	48.25
1998	37	6	43		128	2.8	5.6	0.3	136.7	48	0.25	48.25
1999	32.5	6	38.5		104	2.6	5.7	0.3	112.6	49	0.25	49.26
2000	39	5.8	44.8		134	2.7	6	0.3	143	51	0.25	51.25
2001	41.5	5	46.5		152	2.6	5.5	0.3	160.4	49	0.25	49.25
2002	47.5	5.6	53.1		166	2.8	5.2	0.3	174.3	46	0.25	46.25
2003	54.5	6.4	60.9		180	2.7	6.1	0.3	189.1	51	0.25	51.25
2004	48.5	5.1	53.6		151	2.8	5.7	0.3	159.8	48	0.25	48.25
2005	40.5	5.3	45.8		182	2.8	5.8	0.3	190.9	49	0.25	49.25
2006	48	5.5	53.5		166	2.8	6.2	0.3	175.3	50	0.25	50.25
2007	45	5.6	50.6		183	2.9	6.3	0.3	192.5	51	0.25	51.25
2008	52	5	57		198	2.7	6	0.3	207	49	0.25	49.25
2009	46	6	52		145	2.8	4.6	0.3	152.7	46	0.25	46.25
2010	46	5.7	51.7		162	2.8	5	0.3	170.1	50	0.25	50.25
2011	42	5.6	47.6		148	2.7	4.6	0.3	155.6	50	0.25	50.25
2012	68.5	4.8	73.3		161	2.5	3.8	0.3	167.6	48	0.25	48.25
2013	54	4.8	58.8		161	2.5	4.6	0.3	168.4	51	0.25	51.25
2014	45.5	4.8	50.3		172	2.5	5.3	NA	179.8	44	0.25	44.25

* Figures are X 1,000 Acre-Feet/Year

TABLE 1, continued



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North American Datum 1983
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FIGURE 1

For data go to:
<https://gisweb.azwater.gov/waterresourcedata/>

For more information or copies contact:
ADWR Information Services
3550 North Central Avenue
Phoenix, AZ 85012
(602) 771-8627
www.azwater.gov

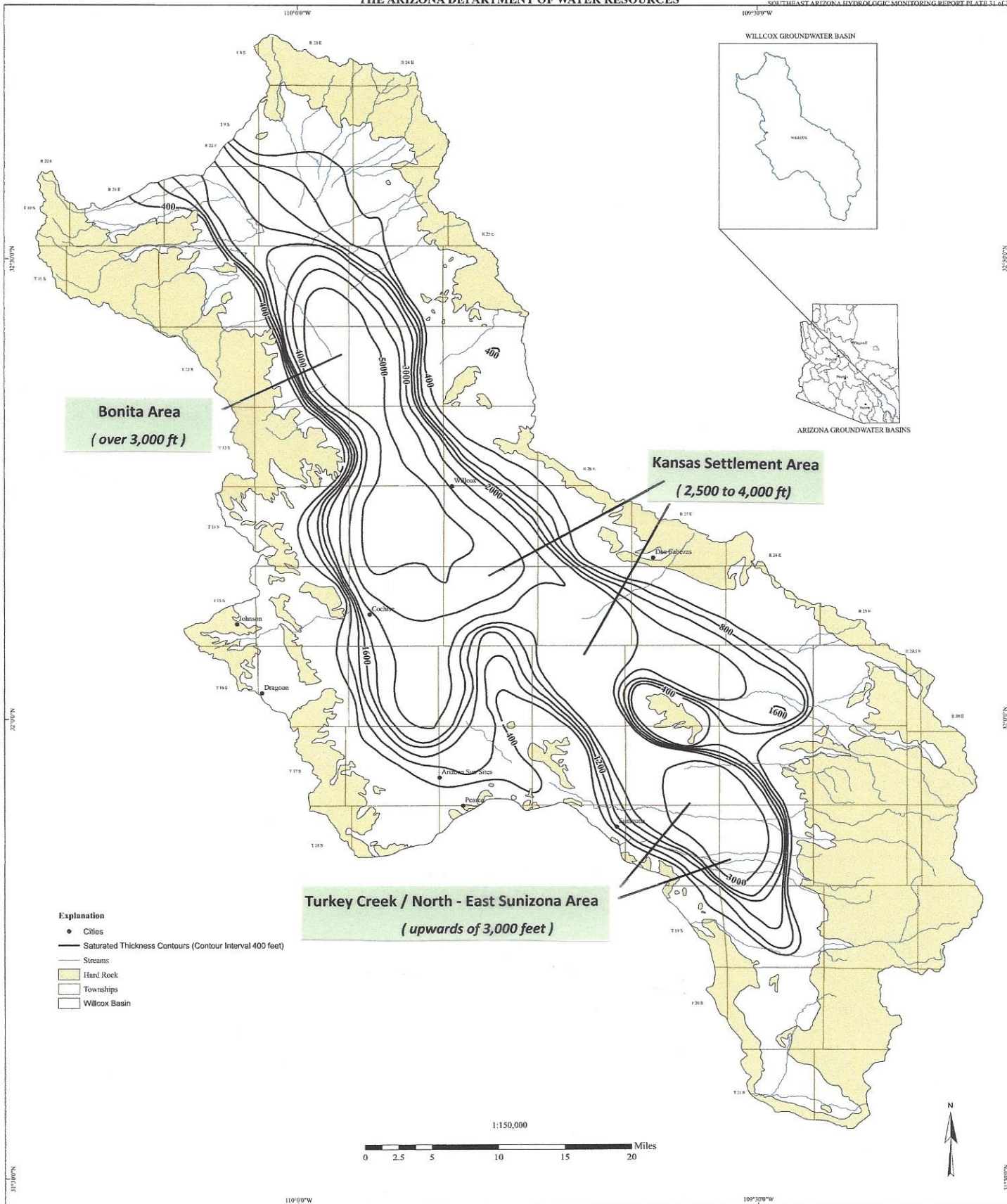


FIGURE 2

SATURATED THICKNESS IN OF BASIN-FILL DEPOSITS
IN THE WILLCOX BASIN - WATER YEAR 2015

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 North American Datum 1983
 NAD83/USGS AZ 11MR 2014-2015 Map
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For data go to:
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CONCEPTUAL GROUNDWATER / AQUIFER CONDITIONS

